

This document was created to make public non-proprietary data contained in Special Conditions, Deviations and Equivalent Safety Findings that are part of the applicable Certification Basis as recorded in TCDS EASA.A.004.

TABLE OF CONTENT

TABLE OF CONTENT	1
RECORD OF REVISIONS	4
A-01-CCD: CABIN CREW DATA REQUIREMENTS	5
A-1: DISCRETE GUST REQUIREMENTS	9
A-2: INTERACTION OF SYSTEMS AND STRUCTURE	10
A-3: DESIGN MANOEUVRE REQUIREMENTS	11
A-4: DESIGN DIVE SPEED VD	14
A-5: LIMIT PILOT FORCES AND TORQUE	16
A-7: STALLING SPEEDS FOR STRUCTURAL DESIGN	18
A-11: AEROELASTIC STABILITY REQUIREMENTS	19
ACNS-B-GEN-01: REMOVAL OF DM89 MONITORING MESSAGE FROM THE REQUIRED CPDLC DOWNLINK MESSAGES LIST	22
B-01: STALLING AND SCHEDULED OPERATING SPEEDS	24
B-02: ELECTRONIC FLIGHT CONTROL SYSTEM (EFCS) CONTROL SURFACE AWARENESS	31
B-04: STATIC DIRECTIONAL, LATERAL AND LONGITUDINAL STABILITY AND LOW ENERGY AWARENESS	32
B-05: FLIGHT ENVELOPE PROTECTIONS	34
B-06: LOAD FACTOR LIMITING SYSTEM	36
B-09: SOFT GO-AROUND MODE	37
B-100: VIBRATION / BUFFETING COMPLIANCE CRITERIA FOR LARGE EXTERNAL ANTENNA INSTALLATION	42
B-01-700L: STALLING AND SCHEDULED OPERATING SPEEDS	44
B-02-700L: ELECTRONIC FLIGHT CONTROL SYSTEM (EFCS) CONTROL SURFACE AWARENESS	51
B-04-700L: STATIC DIRECTIONAL, LATERAL AND LONGITUDINAL STABILITY AND LOW ENERGY AWARENESS	52
B-05-700L: FLIGHT ENVELOPE PROTECTIONS	54
B-06-700L: LOAD FACTOR LIMITING SYSTEM	56
B-14-700L: ON-GROUND YAW STABILISATION LAW – R* LAW	58
CCD-01: DETERMINATION OF CERTIFICATION BASIS FOR CHANGES TO A330 CCD	59
D-03: BRAKE KINETIC ENERGY CAPACITY	61
D-04: CREW REST COMPARTMENTS	64
D-05: PACKS OFF OPERATION	72
D-06: INSTALLATION OF THREE POINT RESTRAINT & PRETENSIONER SYSTEM	74
D-07: INSTALLATION OF OBLIQUE SEATS	77
D-08: CABIN ATTENDANT SEAT MOUNTED ON MOVABLE PART OF AN INTERIOR MONUMENT	86
D-100: INSTALLATION OF MINI-SUITE TYPE SEATING	88
D-101: GREEN ARROW AND “OPEN” PLACARD FOR EMERGENCY EXIT MARKING	91
D-102: INCORPORATION OF INERTIA LOCKING DEVICE IN DYNAMIC SEATS	93
D-02-700L: COURIER AREA: ALLOWED OCCUPANTS	96
D-03-700L: EMERGENCY EVACUATION	101
D-06-700L: MAIN DECK CLASS E CARGO COMPARTMENT	106
D-07-700L: COCKPIT SLIDING WINDOWS – COMPLIANCE ASPECTS WITH CS 25.783	110
D-10-700L: BRAKE KINETIC ENERGY CAPACITY	113

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-11-700L: PRESSURE BULKHEAD AND CARGO ACCESS DOORS – COMPLIANCE ASPECTS WITH CS 25.783	117
D-15-700L: COCKPIT SLIDING WINDOWS FASTENERS– COMPLIANCE ASPECTS WITH CS 25.607(A) AND 25.607(C)	121
D-16-700L: MAIN DECK CARGO DOOR VISUAL INSPECTION PROVISION AS PER CS 25.783(F)	124
D-39: TYPE A+ EMERGENCY EXITS	128
D-50/700L/AIS: AIRBUS A330-700L NEW BELUGA COURIER AREA STC	134
E-02: WARNING MEANS FOR ROLLS ROYCE ENGINE FUEL FILTERS	138
E-03: FAN COWL RETENTION	141
E-05: THRUST REVERSER TESTING	143
E-2: UNDERFLOOR CREW REST COMPARTMENT	145
E-5.1: LOWER DECK LAVATORIES COMPARTMENT	148
E-8.1: LOWER DECK STOWAGE AREA	153
E-10: FIRE EXTINGUISHING AGENT CONCENTRATION	158
E-11: BULK CREW REST COMPARTMENT	160
E-12: RR ENGINE TURBINE OVERHEAT DETECTION	163
E-14: TRENT 7000 ENGINE ZONE SEALS AND CAPS FIRE WITHSTANDING CAPABILITY	165
E-15: NACELLE AREA BEHIND FIREWALLS	167
E-15: REINFORCED SECURITY COCKPIT DOOR STATUS	168
E-16: FUEL TANKS – DESIGN FEATURES APPLICABLE TO CS 25.963(E)(1) AMDT 13	171
E-17: TROLLEY LIFT	173
E-18: LOWER DECK GALLEY COMPARTMENT	175
E-19: FIRST CLASS SLIDING SCREENS	177
E-21: EMERGENCY EXIT MARKING REFLECTANCE	180
E-27: FORWARD FACING SEAT, OVER 18 DEGREES TO A/C CENTRELINE	182
E-28: PARTIAL BULK CREW REST COMPARTMENT WITH ATTACHED GALLEY	184
E-29: FUSELAGE BURN THROUGH – AFT PRESSURE BULKHEAD	186
E-30: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BELLY FAIRING	189
E-31: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BILGE AREA	191
E-124: COURIER COMPARTMENT	193
E-125: CLASS E CARGO COMPARTMENTS FIRE PROTECTION OF ESSENTIAL SYSTEMS	195
E-126: ACCESS TO CLASS E CARGO COMPARTMENTS IN FLIGHT	196
E-127: IMPROVED FLAMMABILITY STANDARD FOR THERMAL/ACOUSTIC INSULATION MATERIALS	198
E-128: IMPROVED FLAMMABILITY STANDARD FOR THERMAL/ACOUSTIC INSULATION MATERIALS – FLAME PENETRATION (EQUIVALENT TO FAR 25.856(B) AT AMENDMENT 111)	213
E-130: APPLICATION OF HEAT RELEASE AND SMOKE DENSITY REQUIREMENTS TO SEAT MATERIALS	229
E-134: INSTALLATION OF SEATS THAT MAKE AN ANGLE OF MORE THAN 18° WITH THE AIRCRAFT LONGITUDINAL AXIS	231
E-1014: HIC COMPLIANCE FOR FRONT ROW SEATING(INFLATABLE RESTRAINTS)	233
E-1022: IMPROVED FLAMMABILITY STANDARDS FOR THERMAL/ACOUSTIC INSULATION MATERIALS	237
E-1023: SIDE FACING SEATS WITH INFLATABLE RESTRAINTS	239
F-1: STALLING AND SCHEDULED OPERATING SPEEDS	243
F-2: MOTION AND EFFECT OF COCKPIT CONTROLS	251
F-3: STATIC LONGITUDINAL STABILITY	252
F-04: LANDING LIGHT SWITCH	253
F-4: STATIC DIRECTIONAL AND LATERAL STABILITY	255
F-5: FLIGHT ENVELOPE PROTECTIONS	256
F-6: NORMAL LOAD FACTOR LIMITING SYSTEM	258
F-8: ACCELERATE STOP DISTANCES	259
F-8.1: ACCELERATE STOP DISTANCES AND RELATED PERFORMANCE	262
F-101: STALLING AND SCHEDULED OPERATING SPEEDS	268
F-120: FLIGHT CONTROL LAW DESIGNED FOR SUPPORT OF MILITARY AIR TO AIR REFUELLING	276
F-126: FLIGHT RECORDERS INCLUDING DATA LINK RECORDING	278

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-128: MINIMUM MASS FLOW OF SUPPLEMENTAL OXYGEN	280
F-129: CREW DETERMINATION OF QUANTITY OF OXYGEN IN PASSENGER OXYGEN SYSTEM	282
F-131: FLIGHT INSTRUMENT EXTERNAL PROBES – QUALIFICATION IN ICING CONDITIONS	284
F-134: HEAD UP DISPLAY (HUD) INSTALLATION	288
F-137: SECURITY PROTECTION OF AIRCRAFT SYSTEMS AND NETWORKS	294
F-141: FLIGHT GUIDANCE SYSTEM – SPEED EXCURSION PROTECTION	296
FCD-MULTI-01: CS-FCD T3 EVALUATION PROCESS	298
F-GEN-01: INSTALLATION OF NON-RECHARGEABLE LITHIUM BATTERY	300
F-03-700L: LANDING LIGHT SWITCH	303
G-5: RESISTANCE TO FIRE TERMINOLOGY	304
G-7: FUNCTION AND RELIABILITY TESTING	305
G-08: ETOPS BEYOND 180 MIN CERTIFICATION	306
G-105: RESISTANCE TO FIRE TERMINOLOGY	308
H-01: ENHANCED AIRWORTHINESS PROGRAMME FOR AEROPLANE SYSTEMS - ICA ON EWIS	309
P-01: FADEC	312
P-02: CENTRE OF GRAVITY CONTROL SYSTEM	313
P-9: ROLLS-ROYCE TRENT 700 TURBINE OVERHEAT DETECTION	317
P-27: FLAMMABILITY REDUCTION SYSTEM	318
P-32: FUEL TANK SAFETY	323
S-3: LANDING GEAR WARNING	325
S-6: LIGHTNING PROTECTION INDIRECT EFFECTS	327
S-10: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS	329
S-10.1: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS	331
S-10.2: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS	334
S-13: AUTO-THRUST SYSTEM	337
S-16: CONTROL SIGNAL INTEGRITY	339
S-18: ELECTRICAL FLIGHT CONTROLS UNUSUAL FEATURES	341
S-20: EMERGENCY ELECTRICAL POWER	342
S-21: BRAKES WEAR LIMITS	344
S-23: MISCELLANEOUS ELECTRICAL REQUIREMENTS	348
S-24: DOORS	350
S-38: TOWBARLESS TOWING	351
S-45: OIL TEMPERATURE INDICATION	352
S-48: MINIMUM APPROACH BREAK-OFF HEIGHT	353
S-148: LONGITUDINAL TOUCHDOWN PERFORMANCE LIMIT AND MINIMUM APPROACH BREAK-OFF HEIGHT	355
S-1066: CAT III OPERATIONS - EXCESS DEVIATION ALERT	357

Disclaimer – This document is not exhaustive and it will be updated gradually.



RECORD OF REVISIONS

Starting from Issue 9

Issue	Date	Changes
9	12/02/2020	A330-700L Addition of SC/ESF related to the A330-700 BelugaXL serie A330-800 E-16: Addition of design features applicable to CS 25.963[e(1)] amdt 13
10	30/05/2022	Addition of ESF D-39 related to A330-941 Type A+ door Addition of DEV ACNS-B-GEN-01: Removal of DM89 MONITORING message from the required CPDLC downlink messages list Addition of F-133: Minimum Mass Flow of Supplemental Oxygen Addition of FCD-MULTI-01: CS-FCD T3 Evaluation Process
11	01/02/2023	Removal of F-133: Minimum Mass Flow of Supplemental Oxygen Rewording of F-GEN-01: Installation of non-rechargeable lithium battery
12	XX/12/2023	Addition of ESF F-141: Flight guidance system – speed excursion protection

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-01-CCD: CABIN CREW DATA REQUIREMENTS

SPECIAL CONDITION	A-01-CCD: Cabin Crew Data Requirements
APPLICABILITY:	A330 / A340
REQUIREMENTS:	Regulation (EU) 748/2012 of 03 August 2012, as amended
ISSUE:	1 dated 10/12/2015

Special Condition

BACKGROUND

The purpose of this CRI is to establish the certification basis for the grandfathered A330/-340 aircraft family Cabin Crew Operational Suitability Data.

There were no applicable certification specifications for operational suitability data issued in accordance with point 21.A.16A, effective on the date of the Type Certificate application for the A330-200/-300; A340-200/-300; A340-500; A340-600.

In accordance with Part 21, 21.A.17B (a), the operational suitability data certification basis needs to be defined for the A330/-340 aircraft Family Cabin Crew Operational Suitability Data, transferred from the “A330/-340 Family -OEB Cabin Crew Evaluation Report”.

The purpose of the (J) OEB CC evaluations, as requested by Airbus, was to:

- determine whether the A340-600 is a variant of the A340-300 (as per JAR-OPS 1.1030- Operation on more than one type or variant);
- determine whether the A330-200/-300; the A340-500; the A340-600 are variants of the A340-200/-300 (as per JAR-OPS 1.1030- Operation on more than one type or variant), thus constituting the “A330/340 family”;
- provide recommendations to support the establishment by operators, of cabin crew differences training programs for variants (as per JAR-OPS 1.1010 – Conversion and differences training).

NOTE: See also certification basis complement CCD-01 (published in this document), that comes in addition to the present SC A-01-CCD.

Disclaimer – This document is not exhaustive and it will be updated gradually.



SPECIAL CONDITION

Having regard of the applicable JAR-OPS 1 requirements and in accordance with "Part 3-Procedure Document for Joint Operational Evaluation Board (JOEB)-Cabin Crew", which governed the (J) OEB CC evaluations, the following aircraft type specific elements that would impact normal and/or emergency operations for cabin crew were compared and assessed, in order to fulfil the purpose of the evaluations:

- aircraft configuration:
 - number of aisles
 - number of passenger decks
- doors and exits
 - exit arming/disarming
 - direction of movement of the operating handle
 - direction of exit opening
 - power assist mechanism

Note: In accordance with JAR-OPS 1.1030/EU-OPS 1.1030 and later on with ORO.CC.250, self-help exits, for example Type III and Type IV exits, need not to be included in the determination of new type or variant.

- assisting evacuation means
- aircraft systems for cabin crew duties:
 - emergency lighting system
 - smoke detection system
 - built-in fire extinguishing system
 - drop-down oxygen system
 - communication and public address system
 - control and indication panels

Using the above categories as criteria, detailed Operator Differences Tables(ODRs) – the Airbus equivalent of Aircraft Differences Tables (ADTs) – were provided by Airbus, in order to highlight the exiting differences between the A340-200/-300 as the “base” aircraft and the A330-200/-300; the A340-500, the A340-600 as the “candidate” aircraft within the comparisons.

The ODRs also include recommended levels of cabin crew training associated to the levels of complexity of the identified differences between the base and the candidate aircraft.

The outcome of the A330/-340 aircraft family (J) OEB CC evaluations confirmed that for cabin crew, the A330-200/-300; the A340-500; the A340-600, are variants of the A340-200/-300 (as per JAR-OPS1.1030, and later on, in accordance with the EU-OPS 1.1030 and ORO.CC.250). As such, cabin

Disclaimer – This document is not exhaustive and it will be updated gradually.



crew differences training would be required when transferring from one aircraft to another, in order to ensure compliance at the operator level, with JAR-OPS 1.1010, and later on with EU OPS 1.1010 and ORO.CC 130.

As contained in the ODRs, Levels of training varying from Level 1 to Level 3, were identified as adequate in order to cover the design differences identified between the “base” and the “candidate” aircraft.

Difference Levels

The following is an excerpt from Chapter 4 – Difference Levels for Training and Checking of the EASA OEB Handbook, Part III- Draft Procedures Document for Cabin Crew Subgroup, version 4 of 19th July 2006, and defines the different levels of training.

Difference level	Training	Checking
1	Self-Instruction (Written information)	Not applicable
2	Aided Instruction (CBT, Video.)	Applicable as required
3	Hands-on Training (Training Device, or Aircraft)	Applicable

Level 1:

Applicable to aircraft with differences that can be adequately addressed through self-instruction. Level 1 training represents a knowledge requirement such that, once appropriate information is provided, understanding and compliance can be assumed to take place. Compliance with Level 1 training is typically achieved by methods such as issuance of operating manual page revisions, dissemination of cabin crew operating bulletins or differences hand-outs to describe minor differences between aircraft.

Level 2:

Applicable to aircraft with systems or procedural differences that can be adequately addressed through aided instruction. At Level 2, aided instruction is appropriate to ensure crew understanding, emphasise issues, provide a standardised method of presentation of material, or to aid retention of material following training. Level 2 aided instruction typically employs such means as slide/tape presentations, computer based training (CBT), stand-up lectures or videotapes.

Level 3:

Applicable to aircraft with differences that can only be addressed through use of devices capable of system training (i.e. hands-on training) Training devices are required to supplement instruction to ensure attainment or retention of crew skills and abilities to accomplish the more complex tasks,

Disclaimer – This document is not exhaustive and it will be updated gradually.

usually related to operation of particular aircraft systems. Typical training devices for Level 3 would include emergency evacuation procedures trainers, fire and smoke trainers, cabin crew panel trainers etc. When dedicated trainers are not available, Level 3 would require hands-on training using the aircraft.

In addition to the transfer of the A330/-340 OEB CC Report to A330/-340 Cabin Crew Operational Suitability Data compliance documentation, and in response to the Commission Regulation No 69/2014, Airbus and EASA have agreed on the Airbus proposed division of the operational suitability data in mandatory data (M) and non-mandatory data (AMC = Acceptable Means of Compliance), as highlighted in the compliance documentation.

As per the Commission Regulation (EU) No 69/2014, Article 7a, para.3, the elements identified in accordance with the JAA procedures (described above), shall be included in the relevant type-certificate and shall be deemed to constitute the A330/A340 aircraft family cabin crew operational suitability data.

NOTE: See also certification basis complement CCD-01 (published in this document), that comes in addition to the present SC A-01-CCD.

Acronyms and Abbreviations

ADT	Aircraft Differences Tables
CBT	Computer Based Training
CCD	Cabin Crew Data
JAR	Joint Aviation Regulation
JOEB-CC	Joint Operational Evaluation Board (JOEB)-Cabin Crew
ODR	Operator Differences Tables
OSD	Operational Suitability Data

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-1: DISCRETE GUST REQUIREMENTS

SPECIAL CONDITION	A-1: Discrete Gust Requirements
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.305 (c), JAR 25.341, JAR 25.351(b)
ISSUE:	4 dated 23/11/1992

Special Condition**BACKGROUND**

The dynamic response to vertical and lateral tuned discrete gust must be taken into account.

SPECIAL CONDITION

The applicable discrete gust requirements consist of:

- 1) The requirements of JAR 25 paragraphs 25.305(c), 25.341 Gust and Turbulence loads, 25.351(b) as modified by OP 91-1.
- 2) JAR 25.341(a) modified to read:

JAR 25.341(a)

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
OP	Orange Paper

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-2: INTERACTION OF SYSTEMS AND STRUCTURE

SPECIAL CONDITION	A-2: Interaction of systems and structure
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25 subpart C and D
ISSUE:	2 dated 12/04/1991

Special Condition

BACKGROUND

The A330 and A340 are equipped with systems which directly or as a result of failure or malfunction affect their structural performance. There is a need to develop interpretative material of existing requirements of JAR 25 subpart C and D to account for these 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.

SPECIAL CONDITION

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 of 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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
NPA	Notice of Proposed Amendment

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-3: DESIGN MANOEUVRE REQUIREMENTS

SPECIAL CONDITION	A-3: Design manoeuvre requirements
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.331(c)(1), 25.331(c)(2), 25.349(a), 25.351
ISSUE:	2 dated 12/04/1991

Special Condition**BACKGROUND**

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

SPECIAL CONDITION

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 n_z exceeds the maximum positive limit manoeuvring factor may be ignored.

(c)(2) Checked manoeuvre between V_A and V_D

A checked manoeuvre, 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) Manoeuvre loads induced by the system

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



(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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
CG	Centre of Gravity

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-4: DESIGN DIVE SPEED VD

SPECIAL CONDITION	A-4: Design dive speed VD
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.335(b)(1) and (b)(2)
ISSUE:	4 dated 17/01/1991

Special Condition

BACKGROUND

The A330/A340 is equipped with a high speed protection system which limits nose down pilot authority at speeds above V_C/M_C . The requirement of JAR 25.335(b)(1) must therefore be adapted for V_D selection.

SPECIAL CONDITION

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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 M_C is limited by compressibility effects may not be less than .05 M. (see ACJ 25.335(b)(2)).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ACJ	Advisory Circular Joint

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-5: LIMIT PILOT FORCES AND TORQUE

SPECIAL CONDITION	A-5: Limit pilot forces and torque
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.397 (c)
ISSUE:	2 dated 17/01/1991

Special Condition**BACKGROUND**

The A330 / A340 aircraft models are equipped, with a side stick instead of a conventional control stick. The requirement of JAR 25.397(c) is therefore not adequate and must be replaced by a special condition.

SPECIAL CONDITION

For the A330 / A340 equipped with stick controls designed for forces to be applied by one wrist and not arms, the limit pilot forces are as follows:

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

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

- 2) For all other components of the Side stick control assembly, but excluding the internal components of the electrical sensor assemblies, to avoid damage as a result of an in-flight jam.

PITCH	ROLL
Nose up 125 lb f.	Nose left 50 lb f.
Nose down 125 lb f.	Nose right 50 lb f.

Acronyms and Abbreviations

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-7: STALLING SPEEDS FOR STRUCTURAL DESIGN

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
ISSUE:	2 dated 17/01/1991

Special Condition

BACKGROUND

The A330/A340 is fitted with a stall protection system. The conventional stall speed V_s which is used to determine structural design airspeeds cannot be determined as on conventional aircraft. The problem was solved by using $V_s = 0.94 V_{s1g}$, V_{s1g} being the stalling speed corrected to 1-g conditions.

SPECIAL CONDITION

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

JAR 25.333	use .94 V_{s1g} in lieu of V_{s1} in manoeuvring envelope diagram
JAR 25.335	use .94 V_{s1g} in lieu of V_{s0} and V_{s1}
JAR 25.335(c) and (d)	use .94 V_{s1g} in lieu of V_{s1} and V_{s0}
JAR 25.335(e)	use .94 V_{s1g} in lieu of V_{s1} and V_{s0}
JAR 25.479(a)	use .94 V_{s1g} in lieu of V_{s0}
JAR 25.481(a)(1)	use .94 V_{s1g} in lieu of V_{s1} and V_{s0}
JAR 25.729(a)(1)(ii)	use .94 V_{s1g} in lieu of V_{s1} and V_s

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



A-11: AEROELASTIC STABILITY REQUIREMENTS

SPECIAL CONDITION	A-11: Aeroelastic stability requirements
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.629
ISSUE:	4 dated 09/10/1992

Special Condition

BACKGROUND

The aeroelastic stability requirements are in the process of being amended both by the FAA (ref.to NPRM 89-24) and by the JAA. The NPRM is now agreed with several amendments by the JAR structure study group and is therefore proposed as a special condition for the A330 / A340 aircraft models.

SPECIAL CONDITION

(a) General

The aeroelastic stability evaluations required under this section include flutter, divergence, control reversal and any undue loss of stability and control as a result of structural deformation. The aeroelastic evaluation must include whirl modes associated with any rotating device that contributes significant dynamic forces. Compliance must be shown by analysis, ground vibration tests and flight tests.

(b) Aeroelastic stability envelope

The aeroplane must be designed to be free from aeroelastic instability for all configurations and design conditions within the aeroelastic stability envelopes as follows:

- (1) For normal conditions without failures, malfunctions or adverse conditions, all combinations of altitudes and speeds encompassed by the V_D/M_D versus altitude envelope enlarged at all points by an increase of 15% in equivalent airspeed at both constant Mach number and constant altitude. In addition, a proper margin of stability must exist at all speeds up to V_D/M_D and, there must be no large and rapid reduction in stability as V_D/M_D is approached. The enlarged envelope may be limited to Mach 1.0 when M_D is less than 1.0 at all design altitudes and,
- (2) For the conditions described in paragraph (d) below, for all approved altitudes, any airspeed up to the greater airspeed defined by:
 - (i) The V_D/M_D envelope defined by JAR 25.335(b) or,
 - (ii) An altitude-airspeed envelope defined by a 15% increase in equivalent airspeed above V_C at constant altitude, from sea level to the altitude of the intersection of $1.15 V_C$ with

Disclaimer – This document is not exhaustive and it will be updated gradually.



the extension of the constant cruise Mach number line, M_C , then a linear variation in equivalent airspeed to $M_C + .05$ at the altitude of the lowest V_C/M_C intersection; then at higher altitudes, up to the maximum flight altitude, the boundary defined by a .05 Mach increase in M_C at constant altitude.

(c) Balance weights

If balance weights are used, their effectiveness and strength, including support structure, must be substantiated.

(d) Failures, malfunctions, and adverse conditions

The aeroplane must be shown to be free from any aeroelastic instability that would preclude continued safe flight and landing within the fail-safe envelope described in paragraph (b)(2) of this section for each of the failures described in (d)(3) of this section.

- (1) Safety following the failures, malfunctions or adverse conditions of paragraph (d)(3) may be substantiated by showing that losses in rigidity or changes in frequency, mode shape or damping are within the parameter investigations.
- (2) The damage tolerance requirements of JAR 25.571(b) must be used as a basis of evaluation to determine whether or not a structural element should be treated under the single failure criteria of (d)(3)(iv) or (d)(3)(v).
- (3) The damages, failures, malfunctions, and adverse conditions which must be considered in showing compliance with this section are:
 - (i) Any critical fuel loading conditions, not shown to be extremely improbable, which may result from mismanagement of fuel.
 - (ii) Any single failure in any passive flutter damping system.
 - (iii) The maximum likely accumulation of ice expected in service.
 - (iv) Failure of any single element of the structure supporting any engine, large auxiliary power unit, or large externally mounted aerodynamic body (such as external fuel tank).
 - (v) For aeroplanes with engines that have large rotating devices capable of significant dynamic forces, any single failure of the engine structure that would reduce the pitch or yaw rigidity of the rotational axis.
 - (vi) The absence of aerodynamic or gyroscopic forces resulting from the most adverse combination of rotating devices capable of significant dynamic forces. In addition, the effect of a single rotating device must be coupled with the failures of paragraphs (d)(3)(iv) and (d)(3)(v) of this section.
 - (vii) Any single rotating device capable of significant dynamic forces rotating at the highest likely overspeed.

Disclaimer – This document is not exhaustive and it will be updated gradually.



(viii) Any failure or malfunction, or combination thereof, in the flight control system considered under JAR 25.671, 25.672, and 25.1309. However, any failure or malfunction of control systems where the displacement of movables is actively controlled by a system reacting on the relative displacement of the aeroplane or part of the aeroplane must be addressed.

(ix) Any damage or failure condition required or selected for investigation by JAR 25.571 or 25.631, and,

(x) Any other combination of failures, malfunctions, or adverse conditions not shown to be extremely improbable.

(e) Flight flutter testing

Full scale flight flutter tests at speeds up to V_{DF}/M_{DF} must be conducted for new type designs and for modifications to a type design unless they have been shown to have an insignificant effect on the aeroelastic stability. These tests must demonstrate that the aeroplane has a proper margin of damping at all speeds up to V_{DF}/M_{DF} , and that there is no large and rapid reduction in damping as V_{DF}/M_{DF} is approached. If a failure, malfunction, or adverse condition is simulated during flight test in showing compliance with paragraph (d) of this section, the maximum speed investigated need not exceed V_{FC}/M_{FC} if it is shown, by correlation of the flight test data with other test data or analyses, that the aeroplane is free from any aeroelastic instability at all speeds within the altitude-airspeed envelope described in paragraph (b) (2) of this section.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
NPRM	New Proposal Rule Making
FAA	Federal Aviation Administration
JAA	Joint Aviation Authorities

Disclaimer – This document is not exhaustive and it will be updated gradually.



ACNS-B-GEN-01: REMOVAL OF DM89 MONITORING MESSAGE FROM THE REQUIRED CPDLC DOWNLINK MESSAGES LIST

DEVIATION	ACNS-B-GEN-01: Removal of DM89 MONITORING message from the required CPDLC downlink messages list
APPLICABILITY:	A330/A340
REQUIREMENTS:	CS ACNS-B
ISSUE:	Issue 1 dated 15 October 2018

Deviation

BACKGROUND

The purpose of this CRI is to address an installation that does not include the message DM89 MONITORING [unitname] [frequency] within the message set that can be downlinked. CS ACNS.B.DLS.B1.075 CPDLC Downlink Messages, requires DM89 message as part of the required ATN B1 message set. Additionally, this deviation requires to consider as well CS CNS.A.GEN.001 Applicability requirement.

CS-ACNS Subpart B Section 2 contains the applicable requirements and Acceptable means of compliance for Data link installations interoperable with ATN B1 data link, supporting the European Data link regulation (EC) No 29/2009. CS ACNS.A.GEN.001 indicates that “compliance with the appropriate section of these Certification Specifications ensures compliance with the following European regulations: ... (d) Commission Regulation (EC) No 29/2009 of 16 January 2009 laying down requirements on data link services for the Single European Sky; ...”. By deviating from CS ACNS.B.DLS.B1.075, compliance with Commission Regulation (EC) No 29/2009 may be affected. CS-ACNS Subpart B Section 2 requires that airborne ATN B1 Data link installations are compliant with certain paragraphs of EUROCAE ED-120, related to Safety and Performances, and EUROCAE ED-110B, related to Interoperability.

For the proposed installation, the ATN B1 capability is proposed through the ATN B2 Backward Compatibility with ATN B1 capability, as defined in the EUROCAE ED-231A (Interoperability requirements standard for Baseline 2 ATS data communications, ATN B1 accommodation (ATN Baseline 1 – Baseline 2 Interop standard)). This standard ED-231A defines the backward compatibility interoperability requirements on air and ground systems in order to support the required services when talking to ATN B1 ground and air implementations.

However, the lack of implementation of DM89 leads to partial lack of support of some ATC Communications Management (ACM) services, where it may be required:

- transfers from T-ATSU to R-ATSU both ATSUs using CPDLC;
- transfers from T-ATSU not using CPDLC to R-ATSU using CPDLC;
- transfers and/or change of frequency with no change in the established CPDLC, both sectors using CPDLC;
- transfers from T-sector not using CPDLC (OFF) to R-sector using CPDLC (ON), with no change in the established CPDLC;

Disclaimer – This document is not exhaustive and it will be updated gradually.



DEVIATION

Considering that:

- DM89 is not operationally used in European implementation of ATN B1 Data link services, as none of EU ANSP's use MONITOR concept under their standard operating methods
- ICAO has removed DM89 from the CPDLC Message set or identified as not operationally required
- International experts' community considers that silent transfer using DM89 message is not adequate; basic assumption of maintaining radio voice communications for intervention may be jeopardized in the absence of voice contact when entering a sector managed by the receiving ATSU.

It is proposed a deviation to CS ACNS.B.DLS.B1.075 requirement by not including DM89 MONITORING [unit name] [frequency] in the downlink message set installed.

Original CS-ACNS requirement	Proposed deviation to CS ACNS.B.DLS.B1.075
CS ACNS.B.DLS.B1.075 CPDLC Downlink Messages The data link system is capable of preparing and send the following downlink message elements: ... DM89 MONITORING [unitname] [frequency]	This installation is not capable to generate and downlink DM89 MONITORING message. DM89 MONITORING [unitname] [frequency]

As a consequence, since removal of DM89 does not allow to fully support the ACM operating methods referred in ED-120 Sections 5.1.1.1.1 to 5.1.1.1.7, which are required by Commission Regulation (EC) No 29/2009, compliance with CS ACNS.A.GEN.001 Applicability may not be assured.

Taking into account the previous justifications, EASA considers acceptable that airborne installations where DM89 is not implemented in CPDLC message set can still be interoperable with European ATN B1 ground ATC centres. Aircraft installations without DM89 implemented should include the following limitation in AFM:

Aircraft CPDLC installation complies with CS-ACNS Subpart B Section 2, except that the aircraft system is unable to generate DM89 MONITORING.

No additional mitigation means are foreseen as "Monitor" concept is not operationally used in European implementation of ATN B1 Data link services.

AC Advisory Circular
CRI Certification Review Item
CS Certification Specification
EASA European Union Aviation Safety Agency
DM Downlink Messages
JAR Joint Aviation Regulation
SC Special Condition
TCDS Type Certificate Data Sheet

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-01: STALLING AND SCHEDULED OPERATING SPEEDS

SPECIAL CONDITION	B-01: Stalling and Scheduled Operating Speeds
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.21, 25.103, 25.143 (h), 25.145, 25.201, 25.203, 25.207, 25.1323
ISSUE:	Issue 2 dated 30 Jan 2018

Special Condition

BACKGROUND

A330-800 and A330-900 are equipped with a low speed protection system providing a protection against stall that cannot be overridden by the pilot.

The requirements of CS 25 must therefore be adapted to consider this stall protection function.

SPECIAL CONDITION

1 Definitions

This Special Condition addresses novel features and uses terminology that does not appear in CS 25.

The following definitions shall apply:

- High incidence protection system: A system that operates directly and automatically on the aeroplane's flying controls to limit the maximum angle of attack that can be attained to a value below that at which an aerodynamic stall would occur.
- Alpha-floor system: A system that automatically increases thrust on the operating engines when angle of attack increases through a particular value
- Alpha-limit: The maximum angle of attack at which the aeroplane stabilises with the high incidence protection system operating and the longitudinal control held on its aft stop.
- Vmin: The minimum steady flight speed in the aeroplane configuration under consideration with the high

Disclaimer – This document is not exhaustive and it will be updated gradually.



- V_{min1g} : incidence protection system operating. See section 3 of this Special Condition.
- V_{min} corrected to 1g conditions. See section 3 of this Special Condition. It is the minimum calibrated airspeed at which the aeroplane can develop a lift force normal to the flight path and equal to its weight at an angle of attack not greater than that determined for V_{min}

2 Capability and Reliability of the High Incidence Protection System

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

- 1) It shall not be possible during pilot induced manoeuvres to encounter a stall and handling characteristics shall be acceptable, as required by section 5 of this Special Condition.
- 2) The aeroplane shall be protected against stalling due to the effects of wind shears and gusts at low speeds as required by section 6 of this Special Condition.
- 3) The ability of the high incidence protection system to accommodate any reduction in stalling incidence must be verified in icing conditions.
- 4) The high incidence protection system must be provided in each abnormal configuration of the high lift devices that is likely to be used in flight following system failures.
- 5) The reliability of the system and the effects of failures must be in accordance with CS 25.1309

3 Minimum Steady Flight Speed and 1g Stall Speed Reference Stall Speed

Delete CS 25.103 and replace as follows:

CS 25.103: Minimum steady flight speed and reference stall speed.

- a) The minimum steady flight speed, V_{min} , is the final stabilised calibrated airspeed obtained when the aeroplane is decelerated until the longitudinal control is on its stop in such a way that the entry rate does not exceed 1 knot per second.
- b) The minimum steady flight speed, V_{min} , must be determined with:
 - 1) The high incidence protection system operating normally
 - 2) Idle thrust and alpha-floor system inhibited;
 - 3) All combinations of flaps setting and landing gear position for which V_{min} is required to be determined;
 - 4) The weight used when VSR is being used as a factor to determine compliance with a required performance standard;
 - 5) The most unfavourable centre of gravity allowable; and

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- c) The one-g minimum steady flight speed, V_{min1g} , is the minimum calibrated airspeed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight, whilst at an angle of attack not greater than that at which the minimum steady flight speed of sub-paragraph a) was determined.
- d) The reference stall speed, VSR, is a calibrated airspeed defined by the applicant. VSR may not be less than a 1-g stall speed. VSR is expressed as:

$$V_{SR} \geq \frac{V_{CLMAX}}{\sqrt{n_{ZW}}}$$

Where

V_{CLMAX} =	Calibrated airspeed obtained when the load factor corrected lift coefficient ($n_{ZW} W / qS$) is first a maximum during the manoeuvre prescribed in sub-paragraph (f) of this paragraph.
n_{ZW} =	Load factor normal to the flight path at V_{CLMAX}
W =	Aeroplane gross weight;
S =	Aerodynamic reference wing area; and
q =	Dynamic pressure.

- e) V_{CLMAX} is determined with:
- 1) Engines idling, or, if that resultant thrust causes an appreciable decrease in stall speed, not more than zero thrust at the stall speed;
 - 2) The aeroplane in other respects (such as flaps and landing gear) in the condition existing in the test or performance standard in which VSR is being used;
 - 3) The weight used when VSR is being used as a factor to determine compliance with a required performance standard;
 - 4) The centre of gravity position that results in the highest value of reference stall speed;
 - 5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system, but not less than 1.13 VSR and not greater than 1.3 VSR;
 - 6) Alpha-floor system inhibited; and
 - 7) The High Incidence Protection System adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
 - 8) Starting from the stabilised trim condition, apply the longitudinal control to decelerate the aeroplane so that the speed reduction does not exceed 1 knot per second.

4 Stall Warning

Disclaimer – This document is not exhaustive and it will be updated gradually.



Delete existing CS 25.207 and replace as follows:

4.1 Normal operation

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

4.2 Failures cases

Following failures of the high incidence protection system, not shown to be extremely improbable, such that the capability of the system no longer satisfies items 1), 2) and 3) of paragraph 2, stall warning must be provided in accordance with CS 25.207(a), (b) and (f) at Amdt 2.

5 Handling Characteristics at High Incidence

Delete existing CS25.201, replace as follows:

5.1 High Incidence Handling Demonstrations

CS25.201: High incidence handling demonstration

- a) Manoeuvres to the limit of the longitudinal control, in the nose up sense, must be demonstrated in straight flight and in 30° banked turns with:
 - 1) The high incidence protection system operating normally.
 - 2) Initial power conditions of :
 - i Power off
 - ii The power necessary to maintain level flight at 1.5 VSR1, where VSR1 is the reference stall speed with flaps in approach position, the landing gear retracted and maximum landing weight.
 - 3) Alpha-floor system operating normally unless more severe conditions are achieved with inhibited alpha floor.
 - 4) Flaps, landing gear and deceleration devices in any likely combination of positions.
 - 5) Representative weights within the range for which certification is requested; and
 - 6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- b) The following procedures must be used to show compliance with 25.203, as amended by the special condition:
 - 1) 4) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed 1 knot per second until the control reaches the stop.
 - 2) The longitudinal control must be maintained at the stop until the aeroplane has reached a stabilised flight condition and must then be recovered by normal recovery techniques.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 3) The requirements for turning flight manoeuvre demonstrations must also be met with accelerated rates of entry to the incidence limit, up to the maximum rate achievable.

5.2 Characteristics in High Incidence Manoeuvres

Delete existing CS25.203 and the associated ACJ AMC. Replace as follows:

CS25.203: Characteristics in High Incidence

- a) Throughout manoeuvres with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30° banked turns, the aeroplane's characteristics shall be as follows:
 - 1) There shall not be any abnormal nose-up pitching.
 - 2) There shall not be any uncommand nose-down pitching, which would be indicative of stall. However reasonable attitude changes associated with stabilising the incidence at Alpha limit as the longitudinal control reaches the stop would be acceptable.
 - 3) There shall not be any uncommand lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.
 - 4) The aeroplane must not exhibit buffeting of a magnitude and severity that would act as a deterrent from completing the manoeuvre specified in § 5.1. a).
- b) In manoeuvres with increased rates of deceleration some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilised Alpha-limit. However the aeroplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal control on the stop for a period of time appropriate to the manoeuvre.
- c) It must always be possible to reduce incidence by conventional use of the controls.
- d) The rate at which the aeroplane can be manoeuvred from trim speeds associated with scheduled operating speeds such as V₂ and V_{ref} up to Alpha-limit shall not be unduly damped or be significantly slower than can be achieved on conventionally controlled transport aeroplanes.

5.3 Characteristics up to maximum lift angle of attack

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

- 1) The high incidence protection deactivated or adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
- 2) Alpha floor system inhibited
- 3) Engines idling

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 4) Flaps and landing gear in any likely combination of positions
- 5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

During such manoeuvres, the aeroplane must not exhibit dangerous characteristics; it must always be possible to reduce angle of attack by conventional use of the controls.

The pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.

6 Atmospheric Disturbances

Operation of the high incidence protection system must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of wind-shear.

7 Speed Associated with other requirements

- 1) CS 25.145(a) V_{min} in lieu of “stall identification”
- 2) CS 25.145 (b) V_{min} in lieu of V_{sw}
- 3) CS 25.1323 (d) “ From 1.23 V_{sr} to V_{min} ” in lieu of “ 1.23 V_{sr} to stall warning speed” and “ speeds below V_{min} ” in lieu of “ speeds below stall warning”

8 Alpha floor

The Alpha-floor setting must be such that the aircraft can be flown at normal landing operational speeds and manoeuvred up to bank angles consistent with the flight phase without triggering Alpha-floor.

In addition there must be no Alpha-floor triggering unless appropriate when the aircraft is flown in usual operational manoeuvres and in turbulence.

9 Proof of compliance

Add the following paragraph 25.21(b)

- (b) The flying qualities will be evaluated at the most unfavourable CG position.

Acronyms and Abbreviations

CG	Centre of Gravity
-----------	-------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 30 of 358

B-02: ELECTRONIC FLIGHT CONTROL SYSTEM (EFCS) CONTROL SURFACE AWARENESS

SPECIAL CONDITION	B-02: Electronic Flight Control System (EFCS) Control Surface Awareness
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.143
ISSUE:	Issue 1 dated 31 Mar. 2016

Special Condition**BACKGROUND**

Like A330-200 and A330-300 aircraft, A330-800 and A330-900 are equipped with Electronic Flight Control System (EFCS) with the side stick controllers. A special condition SC F-2 - Motion and Effect of Cockpit Controls has been developed on the A330-200 and A330-300 aircraft.

The applicable certification requirements of the A330-800 and A330-900 aircraft are the CS 25 amendment 15.

The side stick control system certification requirements have been introduced at CS 25 Amendment 13 through CS 25.143 (k) and CS 25.777 (i), but the control surface awareness requirements have not been included at that time. The A330 Special Condition F-02 is therefore partially captured by the CS 25 requirements.

As per Part 21.A.16 (a) (1), it is proposed to address the control surface awareness requirement defined in the A330 Special Condition F-02 in a dedicated A330-800 / A330-900 special condition.

SPECIAL CONDITION

Introduce a new paragraph CS 25.143 (m):

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

Acronyms and Abbreviations

EFCS	Electronic Flight Control System
-------------	----------------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-04: STATIC DIRECTIONAL, LATERAL AND LONGITUDINAL STABILITY AND LOW ENERGY AWARENESS

SPECIAL CONDITION	B-04: Static Directional, Lateral and Longitudinal Stability and Low Energy Awareness
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.171, CS 25.173, CS 25.175, CS 25.177, SC B-01
ISSUE:	Issue 1 dated 31 Mar. 2016

Special Condition

BACKGROUND

The A330-800 and A330-900, like A330-200 and A330-300, is equipped with an electronic flight control system.

For A330-800 and A330-900, this Special Condition (SC) replaces A330-200 and A330-300 SC F-3, SC F-4 and SC F-12 in order to:

- Propose a unique Special Condition for longitudinal, lateral, directional stability and low energy awareness,
- Update the Special Condition in accordance with CS 25 Amdt 15

SPECIAL CONDITION

1) Replace CS 25.171 by the following:

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

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

2) Remove CS 25.173

3) Remove CS 25.175

4) Remove CS 25.177 (b)

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (c) In straight, steady, sideslips over the range of sideslip angles appropriate to the operation of the aeroplane, the rudder control movements and forces must be substantially proportional to the angle of sideslip in a stable sense. The factor of proportionality must lie between limits found necessary for safe operation. The range of sideslip angles evaluated must include those sideslip angles resulting from the lesser of:
- (1) One-half of the available rudder control input; and
 - (2) A rudder control force of 801 N (180 lbf).

This requirement must be met for the configurations and speeds specified in subparagraph (a) of this paragraph. (See AMC 25.177(c))

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-05: FLIGHT ENVELOPE PROTECTIONS

SPECIAL CONDITION	B-05: Flight envelope protections
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.143
ISSUE:	Issue 1 dated 31 Mar. 2016

Special Condition**BACKGROUND**

Like A330-200 and A330-300 aircraft, A330-800 and A330-900 have flight envelope protections (high and low speed, angle of attack, bank angle) implemented in the Electrical Flight Control System (EFCS).

A special condition SC F-5 Flight Envelope Protections has been developed in the frame of A330-200/ A330-300 Certification, addressing this unusual feature. It is proposed to apply the same special condition to A330-800/-900, in accordance with IR 21.16(a)(1).

SPECIAL CONDITION

Add a new paragraph CS 25.143(n):

Normal operation:

- 1) Onset characteristics of each envelope protection feature must be smooth, appropriate to the phase of flight and type of manoeuvre and not in conflict with the ability of the pilot to satisfactorily change aeroplane flight path, or attitude as needed.
- 2) Limit values of protected flight parameters must be compatible with:
 - a) aeroplane structural limits,
 - b) required safe and controllable manoeuvring of the aeroplane, and
 - c) margin to critical conditions.

Unsafe flight characteristics/conditions must not result from:

- dynamic manoeuvring,
- airframe and system tolerances (both manufacturing and in-service), and
- non-steady atmospheric conditions, in any appropriate combination and phase of flight, if this manoeuvring can produce a limited flight parameter beyond the nominal design limit value.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 3) The aeroplane must respond to intentional dynamic manoeuvring within a suitable range of the parameter limit. Dynamic characteristics such as damping and overshoot must also be appropriate for the flight manoeuvre and limit parameter concerned.
- 4) When simultaneous envelope limiting is engaged, adverse coupling or adverse priority must not result.

Failure states:

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

Acronyms and Abbreviations

EFCS	Electrical Flight Control System
-------------	----------------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-06: LOAD FACTOR LIMITING SYSTEM

SPECIAL CONDITION	B-06: Load factor limiting system
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.143(I)
ISSUE:	Issue 1 dated 27 Apr. 2016

Special Condition

BACKGROUND

Like A330-200 and A330-300, A330-800 and A330-900 have a normal load factor limiting feature implemented in the flight control laws. A special condition SC F-6 Normal Load Factor Limiting System has been developed in the frame of A330-200 and A330-300 Certification to address this design feature.

CS25 amendment 13 has amended to introduce the new certification requirements for Electronic Flight Control Systems (EFCS) which embody a normal load factor limiting system through CS25.143 (I).

For A330-800 and A330-900, in the frame of Change Product Rule process, it became apparent that strict compliance with CS25.143 (I) would be impractical for some requirements. CS25.143 (I) revert to the same level of A330-200 / A330-300 Certification requirement through the impracticality criterion has been justified and accepted by EASA..

SPECIAL CONDITION

Replace CS25.143 (I) by following paragraph:

In the absence of other limiting factors:

- 1) The positive limiting load factor must not be less than:
 - a) 2.5 g for the EFCS normal state with high lift devices retracted.
 - b) 2.0 g for the EFCS normal state with the high lift devices extended.
- 2) The negative limiting load factor must be equal to or more negative than:
 - a) minus 1.0 g for the EFCS normal state with high lift devices retracted.
 - b) 0 g for the EFCS normal state with high lift devices extended.

Acronyms and Abbreviations

EFCS	Electrical Flight Control System
-------------	----------------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-09: SOFT GO-AROUND MODE

SPECIAL CONDITION	B-09: Soft Go-around mode
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	25.101(g) (h), 25.119, 25.121(d), 25.1001, 25.1581, 25.1587(b)(3)(ii), 25.1301, 25.1309
ISSUE:	Issue 2 dated 29 June 2016

Special Condition**BACKGROUND**

The A330-800 and A330-900 aircraft are proposed to be equipped with a new thrust setting “Soft go-around” which is available after Go-around initiation. When the pilot selects TOGA during an approach, the Soft Go-around thrust is «armed», and becomes active when thrust levers are retarded by the pilot to the MCT/FLX position. In this case, the MCT/FLX position corresponds to Soft Go-around thrust actually commanded (active). Auto thrust (A/THR) is engaged but not active and AP/FD modes switch to Go-around mode (SRS / GA TRK or NAV).

At Reduction Altitude (LVR CLB flashing on FMA), the pilot brings back thrust levers to CLB position and Engine Limit mode changes to “CLB” and the A/THR becomes active (to SPEED/THR CLB mode).

At any time during a Soft Go-around, Max thrust can still be commanded by pushing thrust levers to TOGA detent.

Thus there are two different thrust setting AFM procedures available to perform a go-around, the one for which one Throttle push would be required (TOGA Go-around procedure), and another one for which a throttle push followed by a retard to MCT/FLX would be required (Soft Go-around procedure).

1. Due to these two different thrust setting procedures, there is a potential risk of piloting error, and TOGA thrust may not be achieved in case of go-around with one engine failed. Whereas this concern only emerged during A380 compliance activities, it is however potentially unsafe for twin engine aircraft like A330. The new “Soft Go-around” thrust setting procedure which requires two successive actions and which induces two different thrust setting procedures is therefore considered as a novel and unusual design feature as defined in Part 21.A.16B, and it necessitates a Special Condition to be raised.
2. Soft Go-around setting is a function of weight, altitude and temperature designed to provide the thrust necessary to achieve the targeted vertical speed. When the targeted vertical speed is forecasted not achievable, GA thrust is used for Soft Go-around.

Disclaimer – This document is not exhaustive and it will be updated gradually.



According to CS 25.1587 (b) (3) (ii), the climb gradient in the approach configuration must be established in the Aeroplane Flight Manual in Performance section:

Quote

25.1587 Performance information

...

(b) Each aeroplane Flight Manual must contain the performance information computed under the applicable provisions of this CS-25 (including CS 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the aeroplane, and must contain the following:

(1) In each case, the conditions of power, configuration, and speeds, and the procedures for handling the aeroplane and any system having a significant effect on the performance information.

(2) VSR determined in accordance with CS 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and the maximum take-off weight):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

Unquote

AMC 25.1581 6d. (13), (15) & (16) gives further guidance as follows:

Quote

(13) Climb Limited Landing Weight. The climb limiting landing weight, which is the most limiting weight showing compliance with CS 25.119 and 25.121(d), should be provided.

(15) Approach Climb Performance. For the approach climb configuration, the climb gradients (CS 25.121(d)) and weights up to maximum take-off weight (CS 25.1587(b)(3)) should be presented, together with associated conditions (e.g. procedures and speeds). The effects of ice accretion on unprotected portions of the airframe and the effects of engine and wing ice protection systems should be provided.

(16) Landing Climb Performance. Data for the landing climb configuration should be presented in a manner similar to that described for the approach configuration above.

Unquote

In the above material, it has been implicitly assumed that the all-engines-operating go-around climb gradient would be higher than or equal to the one-engine-inoperative go-around climb gradient, and that publishing the latter in the Aeroplane Flight Manual would therefore be sufficient.

The new “Soft Go-around” thrust setting, potentially leading to lower climb performance with all engines operating than with one engine inoperative, invalidates this assumption and is therefore a novel and unusual design feature as defined in Part 21.A.16B, which necessitates a Special Condition to be raised.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 39 of 358

SPECIAL CONDITION

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

25.1587 Performance information

(b) ...

(3) ...

(ii) Climb in the approach configuration

Published approach climb performance shall represent the lower of

- c. the performance obtained with GA thrust and one engine inoperative
 - d. the performance obtained with “Soft Go-around” thrust and all engines operating
- Or

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

It is necessary to ensure that no unsafe conditions develop for the following scenario:

- When thrust lever is erroneously set to MCT position in the case of go-around with OEI
- When engine fails after initiation of Soft Go-around

Therefore, the following Special Condition shall be used:

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

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

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

Acronyms and Abbreviations

GA	Go-Around
LG	Landing Gear
OEI	One Engine Inoperative
TOGA	Take-Off / Go-Around

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-100: VIBRATION / BUFFETING COMPLIANCE CRITERIA FOR LARGE EXTERNAL ANTENNA INSTALLATION

EQUIVALENT SAFETY FINDING	B-100: Vibration / buffeting compliance criteria for large external antenna installation
APPLICABILITY:	A330
REQUIREMENTS:	JAR 25.251(b)
ISSUE:	05.April.2018

Equivalent Safety Finding

BACKGROUND

With regards to JAR 251(b), EASA highlighted that the demonstration in flight has to be free from excessive vibration under any appropriate speed and power conditions up to VDF/MDF.

The EASA has determined that if it cannot be shown by an acceptable method that the original compliance finding for this rule remains valid (i.e., no vibration/buffet issues exist due to the change), an equivalent level of safety can be shown.

Airbus requested an Equivalent Safety Finding with respect to JAR 25.251(b).

EQUIVALENT SAFETY FINDING

Unless it can be shown that the modification would not affect the original compliance demonstration to 25.251(b), the applicant must show compliance with JAR 25.251 either by flight test up to VDF/MDF, or by using the means of compliance proposed (associated with the interpretative material in Appendix 1) which are considered to provide an equivalent level of safety to flight testing up to VDF/MDF.

To evaluate whether the modification could affect the original compliance finding or to extrapolate findings beyond VMO/MMO, the applicant may propose to use any suitable combination of the following:

1. Similarity to other approved designs. (Consider the size, shape, and location of the respective modification, the aeroplanes they are installed on, the respective VDF/MDF speeds, and the method of compliance used for the approved designs.)
2. Flowfield analysis using an acceptable computational fluid dynamics tool. The applicant must show that the tool is valid for its intended use. For example, the tool must be capable of accurately assessing whether a shock is present, including its strength and location, and the area of separated flow. Generally, a full Navier-Stokes code with robust turbulence modeling is needed for such an analysis. Validation using flight test data is preferred, but suitable wind tunnel data may be acceptable. The applicant should also address other known limitations and characteristics of the code to be used, such as:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- a. Grid sizes and spacing.
 - b. Geometric fidelity of the aeroplane model – the effect of simplifications of the model (e.g., ignoring flap track fairings, vortex generators, small gaps, etc., how the engines are modeled, aeroelastic effects, other differences between the actual aeroplane and the digital model used in the analysis).
 - c. CFD modeling errors, particularly in turbulence modeling.
 - d. Location of the trip point from laminar to turbulent flow.
 - e. Boundary conditions (e.g., ensuring that far field conditions are applied sufficiently far away).
3. A vibration analysis, usually based on the results of the flowfield analysis addressed in (2).
 4. Flight testing to a speed from which the analyses described in paragraph (1), (2) and (3) can be used to extrapolate the findings to VDF/MDF. As a minimum, flight testing must include test points to cover the complete flight domain from low speed to speeds up to and including VMO/MMO and covering high lift configurations and sideslips which could be experienced in service.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
VDF/MDF	Demonstrated Flight Diving Speed
VMO/MMO	Maximum Operating Limit Speed

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-01-700L: STALLING AND SCHEDULED OPERATING SPEEDS

SPECIAL CONDITION	B-01-700L: Stalling and Scheduled Operating Speeds
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.21, 25.103, 25.143 (h), 25.145, 25.201, 25.203, 25.207, 25.1323(d)
ISSUE:	Issue 2 dated 24 Aug 2018

Special Condition

BACKGROUND

Like the A320, A330, A340, A380 and SAneo, A330-700L is equipped with a low speed protection system providing a protection against stall that cannot be overridden by the pilot.

The requirements of CS 25 must therefore be adapted to consider this stall protection function.

SPECIAL CONDITION

1 Definitions

This Special Condition addresses novel features and uses terminology that does not appear in CS 25.

The following definitions shall apply:

- High incidence protection system: A system that operates directly and automatically on the aeroplane's flying controls to limit the maximum angle of attack that can be attained to a value below that at which an aerodynamic stall would occur.
- Alpha-floor system: A system that automatically increases thrust on the operating engines when angle of attack increases through a particular value
- Alpha-limit: The maximum angle of attack at which the aeroplane stabilises with the high incidence protection system operating and the longitudinal control held on its aft stop.
- Vmin: The minimum steady flight speed in the aeroplane configuration under consideration with the high

Disclaimer – This document is not exhaustive and it will be updated gradually.



- V_{min1g} : incidence protection system operating. See section 3 of this Special Condition.
- V_{min} corrected to 1g conditions. See section 3 of this Special Condition. It is the minimum calibrated airspeed at which the aeroplane can develop a lift force normal to the flight path and equal to its weight at an angle of attack not greater than that determined for V_{min}

2 Capability and Reliability of the High Incidence Protection System

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

- 6) It shall not be possible during pilot induced manoeuvres to encounter a stall and handling characteristics shall be acceptable, as required by section 5 of this Special Condition.
- 7) The aeroplane shall be protected against stalling due to the effects of wind shears and gusts at low speeds as required by section 6 of this Special Condition.
- 8) The ability of the high incidence protection system to accommodate any reduction in stalling incidence must be verified in icing conditions.
- 9) The high incidence protection system must be provided in each abnormal configuration of the high lift devices that is likely to be used in flight following system failures.
- 10) The reliability of the system and the effects of failures must be in accordance with CS 25.1309

3 Minimum Steady Flight Speed and 1g Stall Speed Reference Stall Speed

Delete CS 25.103 and replace as follows:

CS 25.103: Minimum steady flight speed and reference stall speed.

- f) The minimum steady flight speed, V_{min} , is the final stabilised calibrated airspeed obtained when the aeroplane is decelerated until the longitudinal control is on its stop in such a way that the entry rate does not exceed 1 knot per second.
- g) The minimum steady flight speed, V_{min} , must be determined with:
 - 7) The high incidence protection system operating normally
 - 8) Idle thrust and alpha-floor system inhibited;
 - 9) All combinations of flaps setting and landing gear position for which V_{min} is required to be determined;
 - 10) The weight used when VSR is being used as a factor to determine compliance with a required performance standard;
 - 11) The most unfavourable centre of gravity allowable; and

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 12) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- h) The one-g minimum steady flight speed, V_{min1g} , is the minimum calibrated airspeed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight, whilst at an angle of attack not greater than that at which the minimum steady flight speed of sub-paragraph a) was determined.
- i) The reference stall speed, VSR, is a calibrated airspeed defined by the applicant. VSR may not be less than a 1-g stall speed. VSR is expressed as:

$$V_{SR} \geq \frac{V_{CLMAX}}{\sqrt{n_{ZW}}}$$

Where

V_{CLMAX} =	Calibrated airspeed obtained when the load factor corrected lift coefficient ($n_{ZW} W / qS$) is first a maximum during the manoeuvre prescribed in sub-paragraph (f) of this paragraph.
n_{ZW} =	Load factor normal to the flight path at V_{CLMAX}
W =	Aeroplane gross weight;
S =	Aerodynamic reference wing area; and
q =	Dynamic pressure.

- j) V_{CLMAX} is determined with:
- 9) Engines idling, or, if that resultant thrust causes an appreciable decrease in stall speed, not more than zero thrust at the stall speed;
 - 10) The aeroplane in other respects (such as flaps and landing gear) in the condition existing in the test or performance standard in which VSR is being used;
 - 11) The weight used when VSR is being used as a factor to determine compliance with a required performance standard;
 - 12) The centre of gravity position that results in the highest value of reference stall speed;
 - 13) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system, but not less than 1.13 VSR and not greater than 1.3 VSR;
 - 14) Alpha-floor system inhibited; and
 - 15) The High Incidence Protection System adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
 - 16) Starting from the stabilised trim condition, apply the longitudinal control to decelerate the aeroplane so that the speed reduction does not exceed 1 knot per second.

Disclaimer – This document is not exhaustive and it will be updated gradually.



4 Stall Warning

Delete existing CS 25.207 and replace as follows:

4.1 Normal operation

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

4.2 Failures cases

Following failures of the high incidence protection system, not shown to be extremely improbable, such that the capability of the system no longer satisfies items 1), 2) and 3) of paragraph 2, stall warning must be provided in accordance with CS 25.207(a), (b) and (f) at Amdt 2.

5 Handling Characteristics at High Incidence

Delete existing CS25.201, replace as follows:

5.1 High Incidence Handling Demonstrations

CS25.201: High incidence handling demonstration

- c) Manoeuvres to the limit of the longitudinal control, in the nose up sense, must be demonstrated in straight flight and in 30° banked turns with:
 - 7) The high incidence protection system operating normally.
 - 8) Initial power conditions of :
 - i Power off
 - ii The power necessary to maintain level flight at 1.5 VSR1, where VSR1 is the reference stall speed with flaps in approach position, the landing gear retracted and maximum landing weight.
 - 9) Alpha-floor system operating normally unless more severe conditions are achieved with inhibited alpha floor.
 - 10) Flaps, landing gear and deceleration devices in any likely combination of positions.
 - 11) Representative weights within the range for which certification is requested; and
 - 12) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- d) The following procedures must be used to show compliance with 25.203, as amended by the special condition:
 - 4) 4) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed 1 knot per second until the control reaches the stop.

Disclaimer – This document is not exhaustive and it will be updated gradually.



-
- 5) The longitudinal control must be maintained at the stop until the aeroplane has reached a stabilised flight condition and must then be recovered by normal recovery techniques.
 - 6) The requirements for turning flight manoeuvre demonstrations must also be met with accelerated rates of entry to the incidence limit, up to the maximum rate achievable.

Disclaimer – This document is not exhaustive and it will be updated gradually.



5.2 Characteristics in High Incidence Manoeuvres

Delete existing CS25.203 and the associated ACJ AMC. Replace as follows:

CS25.203: Characteristics in High Incidence

- e) Throughout manoeuvres with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30° banked turns, the aeroplane's characteristics shall be as follows:
 - 5) There shall not be any abnormal nose-up pitching.
 - 6) There shall not be any uncommand nose-down pitching, which would be indicative of stall. However reasonable attitude changes associated with stabilising the incidence at Alpha limit as the longitudinal control reaches the stop would be acceptable.
 - 7) There shall not be any uncommand lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.
 - 8) The aeroplane must not exhibit buffeting of a magnitude and severity that would act as a deterrent from completing the manoeuvre specified in § 5.1. a).
- f) In manoeuvres with increased rates of deceleration some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilised Alpha-limit. However the aeroplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal control on the stop for a period of time appropriate to the manoeuvre.
- g) It must always be possible to reduce incidence by conventional use of the controls.
- h) The rate at which the aeroplane can be manoeuvred from trim speeds associated with scheduled operating speeds such as V₂ and V_{ref} up to Alpha-limit shall not be unduly damped or be significantly slower than can be achieved on conventionally controlled transport aeroplanes.

5.3 Characteristics up to maximum lift angle of attack

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

- 6) The high incidence protection deactivated or adjusted, at the option of the applicant, to allow higher incidence than is possible with the normal production system.
- 7) Alpha floor system inhibited
- 8) Engines idling
- 9) Flaps and landing gear in any likely combination of positions
- 10) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

Disclaimer – This document is not exhaustive and it will be updated gradually.



During such manoeuvres, the aeroplane must not exhibit dangerous characteristics; it must always be possible to reduce angle of attack by conventional use of the controls.

The pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.

6 Atmospheric Disturbances

Operation of the high incidence protection system must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of wind-shear.

7 Speed Associated with other requirements

- 4) CS 25.145(a) V_{min} in lieu of “stall identification”
- 5) CS 25.145 (b) V_{min} in lieu of V_{sw}
- 6) CS 25.1323 (d) “ From 1.23 V_{sr} to V_{min} ” in lieu of “ 1.23 V_{sr} to stall warning speed” and “ speeds below V_{min} ” in lieu of “ speeds below stall warning”

8 Alpha floor

The Alpha-floor setting must be such that the aircraft can be flown at normal landing operational speeds and manoeuvred up to bank angles consistent with the flight phase without triggering Alpha-floor.

In addition there must be no Alpha-floor triggering unless appropriate when the aircraft is flown in usual operational manoeuvres and in turbulence.

9 Proof of compliance

Add the following paragraph 25.21(b)

- (b) The flying qualities will be evaluated at the most unfavourable CG position.

Acronyms and Abbreviations

CG	Centre of Gravity
VSR	Reference stall speed

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-02-700L: ELECTRONIC FLIGHT CONTROL SYSTEM (EFCS) CONTROL SURFACE AWARENESS

SPECIAL CONDITION	B-02-700L: Electronic Flight Control System (EFCS) - Control Surface Awareness
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.143 (m)
ISSUE:	Issue 1 dated 22 Sep. 2016

Special Condition

BACKGROUND

Like A330 CEO (Current Engine Option), A330-700L is equipped with Electronic Flight Control System (EFCS) with the side stick controllers. A special condition SC F-2 - Motion and Effect of Cockpit Controls has been developed for A330-800 and A330-900.

CS25 amendment 13 has been amended to introduce the side stick control system certification requirements through CS25.143(k) and CS25.777(i), but the control surface awareness part of SC F-2 was not covered. It is proposed an adapted special condition to the A330-700L, in accordance with IR 21.A.16B(a)(1).

For A330-700L, in the frame of Change Product rule process, the paragraph 25.143 is applicable at CS25 amendment 15, except for subparagraph (i) and (j).

SPECIAL CONDITION

Introduce a new paragraph CS 25.143 (m):

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

Acronyms and Abbreviations

CEO	Current Engine Option
EFCS	Electronic Flight Control System

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-04-700L: STATIC DIRECTIONAL, LATERAL AND LONGITUDINAL STABILITY AND LOW ENERGY AWARENESS

SPECIAL CONDITION	B-04-700L: Static Directional, Lateral and Longitudinal Stability and Low Energy Awareness
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.171, CS 25.173, CS 25.175, CS 25.177 at amendment 15; Original certification basis CRIs for A330-300: F-3 (SC) Static longitudinal stability and F-4 (SC) Static directional and lateral stability
ISSUE:	Issue 1 dated 03 rd May. 2016

Special Condition

BACKGROUND

Like the A330-200 and A330-300, the derivative A330-700L Aircraft is equipped with an Electronic Flight Control System (EFCS).

For A330-700L Aircraft, a new CRI B-04-700L including both Special Condition and Interpretative Material is proposed to replace A330 Long Range (LR) CEO CRI F-3 (SC/IM) Static longitudinal stability, CRI F-4 (SC) Static directional and lateral stability and CRI F-12 (IM) Low energy awareness in order to:

- ☐ Provide a unique Special Condition and Interpretative Material for static longitudinal, lateral, directional stability and low energy awareness, the same approach as for recent Airbus projects, and
- ☐ Update the Special Condition content in accordance with CS 25 Amdt 15 (requirement CS25.177 evolution NPA 25B-333 and NPA 2009-12, already implemented), and
- ☐ Complete the low energy awareness interpretative material (similarly to SAneo and LRneo projects).

SPECIAL CONDITION

- 1) Replace CS 25.171 by the following:

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



-
- 2) Remove CS 25.173
- 3) Remove CS 25.175
- 4) Remove CS 25.177 (b)
- 5) Replace CS 25.177 (c) by the following:
- (c) In straight, steady, sideslips over the range of sideslip angles appropriate to the operation of the aeroplane, the rudder control movements and forces must be substantially proportional to the angle of sideslip in a stable sense. The factor of proportionality must lie between limits found necessary for safe operation. The range of sideslip angles evaluated must include those sideslip angles resulting from the lesser of:
- (1) One-half of the available rudder control input; and
- (2) A rudder control force of 801 N (180 lbf).

This requirement must be met for the configurations and speeds specified in subparagraph (a) of this paragraph. (See AMC 25.177(c).)

Acronyms and Abbreviations

CEO	Current Engine Option
EFCS	Electronic Flight Control System

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-05-700L: FLIGHT ENVELOPE PROTECTIONS

SPECIAL CONDITION	B-05-700L: Flight envelope protections
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.143 (n)
ISSUE:	Issue 1 dated 09 th Nov. 2016

Special Condition

BACKGROUND

Like A330 CEO (Current engine Option), BELUGA XL (A330-700L) has flight envelope protections (high and low speed, angle of attack, bank angle) implemented in the Electrical Flight Control System (EFCS).

A special condition SC F-5 Flight Envelope Protections has been developed in the frame of A330 CEO Certification to address this feature. It is proposed to apply the same special condition to A330-700L, in accordance with Part 21.A.16B(a)(1).

For A330-700L, in the frame of Change Product rule process, the paragraph 25.143 is applicable at CS25 amendment 15, except for subparagraphs (c), (i) and (j).

SPECIAL CONDITION

Add a new paragraph CS 25.143(n):

Normal operation:

- 1) Onset characteristics of each envelope protection feature must be smooth, appropriate to the phase of flight and type of manoeuvre and not in conflict with the ability of the pilot to satisfactorily change aeroplane flight path, or attitude as needed.
- 2) Limit values of protected flight parameters must be compatible with:
 - a) aeroplane structural limits,
 - b) required safe and controllable manoeuvring of the aeroplane, and
 - c) margin to critical conditions.

Unsafe flight characteristics/conditions must not result from:

- dynamic manoeuvring,
- airframe and system tolerances (both manufacturing and in-service), and

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 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 aeroplane must respond to intentional dynamic manoeuvring within a suitable range of the parameter limit. Dynamic characteristics such as damping and overshoot must also be appropriate for the flight manoeuvre and limit parameter concerned.
- 4) When simultaneous envelope limiting is engaged, adverse coupling or adverse priority must not result.

Failure states:

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

Acronyms and Abbreviations

CEO	Current Engine Option
EFCS	Electrical Flight Control System

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-06-700L: LOAD FACTOR LIMITING SYSTEM

SPECIAL CONDITION	B-06-700L: Load factor limiting system
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.143(l) at amendment 15.
ISSUE:	Issue 1 dated 20 th Sept. 2016

Special Condition

BACKGROUND

Like A330-200 and A330-300, A330-700L has a normal load factor limiting feature implemented in the flight control laws. A special condition SC F-6 Normal Load Factor Limiting System has been developed in the frame of LR CEO certification to address this design feature.

CS 25 amendment 13 has been amended to introduce the new certification requirements for Electronic Flight Control Systems (EFCS) which embody a normal load factor limiting system through CS 25.143(l).

For A330-700L, in the frame of Change Product Rule process, it became apparent that strict compliance with CS 25.143(l) would be impractical for some requirements. CS 25.143(l) revert to the same level of LR CEO certification requirement through the impracticality criterion has been justified and accepted by EASA

SPECIAL CONDITION

Replace CS25.143 (l) by following paragraph:

In the absence of other limiting factors:

- 1) The positive limiting load factor must not be less than:
 - a) 2.5 g for the EFCS normal state with high lift devices retracted.
 - b) 2.0 g for the EFCS normal state with the high lift devices extended.
- 2) The negative limiting load factor must be equal to or more negative than:
 - a) minus 1.0 g for the EFCS normal state with high lift devices retracted.
 - b) 0 g for the EFCS normal state with high lift devices extended.

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

Acronyms and Abbreviations

CEO	Current Engine Option
------------	-----------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



EFCS	Electrical Flight Control System
------	----------------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



B-14-700L: ON-GROUND YAW STABILISATION LAW – R* LAW

SPECIAL CONDITION	B-14-700L: In-Ground Yaw Stabilisation Law – R* law
APPLICABILITY:	A330-700L
REQUIREMENTS:	CS 25.107, 25.143 and 25.149 at amendment 15; A330-700L Special Condition B-02-700L
ISSUE:	Issue 1 dated 1 st June 2018

Special Condition

BACKGROUND

In normal operating state, the A330-700L derivative is equipped with a permanent ground control law in the yaw axis to improve the aircraft controllability on ground (RSTAR / R* law). This yaw stabilisation law (RSTAR) acts on the rudder and has a limited authority on the Nose Wheel Steering (NWS) to control a yaw rate target.

These aspects of controllability on ground are generally covered by current certification requirements as this law is permanently active in normal operating state. However, some requirements of CS-25 must be complemented and interpreted to consider this control law.

SPECIAL CONDITION

1 - Definition

This Special Condition addresses a novel design feature of the A330-700L and uses terminology that does not appear in CS25.

The following definition shall apply:

- Yaw stabilisation law (RSTAR / R*):

An automatic function within the electronic flight control system designed to improve stability in yaw axis on ground and to help controllability in case of engine failure on ground, acting on the rudder and on nose wheel steering.

This Special Condition assumes that the yaw stabilisation law is an integrated part of the electronic flight control system and can neither be armed, selected nor deselected by the pilot.

2 – Engine failure detection

If the inherent characteristics of the aeroplane do not provide adequate indication that an engine is failed, an alerting system must be provided to give the pilot a clear indication of engine failure during take-off.

Acronyms and Abbreviations

Disclaimer – This document is not exhaustive and it will be updated gradually.



RSTAR	Yaw stabilization law
NWS	Nose Wheel Steering

CCD-01: DETERMINATION OF CERTIFICATION BASIS FOR CHANGES TO A330 CCD

SPECIAL CONDITION	CCD-01: Determination of Certification Basis for changes to A330 CCD
APPLICABILITY:	A330
REQUIREMENTS:	PART 21A.101
ISSUE:	1 dated 14/08/2017

Special Condition

BACKGROUND

The Special Condition A-01-CCD currently establishes the certification basis for the grandfathered (initial) Cabin Crew Data (CCD) of the A330 and A340 aircraft models and limits the CCD scope to:

- the aircraft type determination for cabin crew, and
- the establishment of recommendations to support the establishment by operators, of cabin crew differences training programs for variants.

The certification of A330 future design changes requires the establishment of cabin crew operational data to be implemented in the cabin crew training and operating manual by operators.

The special condition below comes in addition to the SC A-01-CCD.

SPECIAL CONDITION

CASE (Cabin Aspects of Special Emphasis) are information relevant to the aircraft type design that cabin crew need to be aware of to ensure the safe operation of the aircraft. A CASE is established when:

- A novel and unique design or operational characteristic is applicable to an aircraft type, variant or modification (or a group of aircraft types), and
- Specific knowledge and skills are required for the safe operation of this novel and unique design or operational characteristic.

CASE are limited to novel, unconventional safety-related elements in the passenger cabin, that affect the cabin crew duties and for which cabin crew have to be informed on how to operate the element.

These safety-related elements of the passenger cabin are:

- doors and exits
- assisting evacuation means (slide, slideraft, etc.)
- emergency lighting system

Disclaimer – This document is not exhaustive and it will be updated gradually.



- evacuation alarm signal system
- smoke detection system
- automatic fire extinguishing system
- drop-down oxygen system
- communication and public address system
- information and control panels related to the above listed systems
- number of aisles
- number of decks
- any design features that impact emergency operations (e.g. emergency evacuation).

CASE constitute CCD and shall be made available to operators (in addition to the A330 initial CCD), for post-TC changes.

Acronyms and Abbreviations

CASE	Cabin Aspects of Special Emphasis
CCD	Cabin Crew Data
OSD	Operational Suitability Data

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-03: BRAKE KINETIC ENERGY CAPACITY

SPECIAL CONDITION	D-03: Brake Kinetic Energy Capacity
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	JAR 25.735 Change 13
ISSUE:	Issue 1 dated 20 Feb 2017

Special Condition**BACKGROUND**

In the frame of the A330/A340 Type Certification a Special Condition F-08 was issued to introduce new JAR 25 requirements based on the JAA NPA 25-244 – Accelerate Stop Distances. Later on in the frame of the A340-300 WV 020 certification, the Special Condition F-8 was further amended and Special Condition SC F-8.1 introduced.

On A330-800/ A330-900 aircraft, the applicable requirement is the CS 25 at amendment 15. This amendment contained the requirements of the Special Condition F8-1 and therefore SC F-8.1 is not relevant for the A330-800/ A330-900 Type Certification.

However, the Special Condition F-8.1 amends also the JAR 25.735 requirements. The brakes being unchanged and not affected by the A330-800/ A330-900 changes, it has been identified the need to recover the JAR 25.735 requirements defined in SC F-8.1.

SPECIAL CONDITION

SC F-8.1 – amendment of JAR 25.735 – Brakes

Amend JAR 25.735 (f) through (j) to read as follows

a) SC F-8.1 – 25.735 (f)

The design landing brake kinetic energy capacity rating of each main wheel brake assembly shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

- (1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during operational landings at maximum landing weight. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or powerplant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
- (2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels:

Disclaimer – This document is not exhaustive and it will be updated gradually.



$$KE = \frac{0.0443WV^2}{N}$$

where

K = kinetic energy per wheel (ft. lb)

W = design landing weight (lb)

V = aeroplane speed in knots. V must not be less than V_{so}, the power off stalling of the aeroplane at sea level

N = number of main wheels with brakes

The formula must be modified in case of unequal braking distribution

b) SC F-8.1 – 25.735 (g)

In the landing case the minimum stalling speed rating of each main wheel brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the V used in the determination of kinetic energy in accordance with sub-paragraph (f) of this paragraph, assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.

c) SC F-8.1 – 25.735 (h)

The rejected take-off brake kinetic capacity rating of each main wheel-brake assembly that is at the fully worn limit of its allowable brake wear range shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

- (1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during an accelerate-stop manoeuvre. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or powerplant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
- (2) Instead of rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels;

$$KE = \frac{0.0443WV^2}{N}$$

where

KE = kinetic energy per wheel (ft. lb)

Disclaimer – This document is not exhaustive and it will be updated gradually.



W = design landing weight (lb)

and W and V are the most critical combination of weight and speed

The formula must be modified in case of unequal braking distribution

d) SC F-8.1 – 25.735 (i)

In addition, a flight test demonstration of the maximum kinetic energy rejected take-off shall be conducted with not more than 10% of the allowable brake wear range remaining;

e) SC F-8.1 – 25.735 (j)

For each power-operated brake system incorporating an accumulator, the flight crew must be provided with an indication that adequate accumulator pressure is available.

Note: the brakes qualification standard defined by A330/ A340 special condition S-21 provides an acceptable equivalent to the J-TSO referred to in JAR paragraphs 25.735(f) and (h) as amended by this special condition.

Acronyms and Abbreviations

JAA NPA	Joint Aviation Authorities Notice of Proposed Amendment
JAR	Joint Aviation Requirement
J-TSO	Joint Technical Standard Order
WV	Weight Variant

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-04: CREW REST COMPARTMENTS

SPECIAL CONDITION	D-04: Crew Rest Compartments
APPLICABILITY:	A330
REQUIREMENTS:	25.785, 25.789, 25.791, 25.812, 25.831, 25.851, 25.853, 25.855, 25.858, SC A1-CCD, SC CCD-01, CS-FCO
ISSUE:	Issue 3 dated 08/02/2018

Special Condition

BACKGROUND

Special conditions are required for the certification of Crew Rest Compartments (CRC), including CRC installed in the lower deck area with access from the main deck (Lower Deck Crew Rest Compartments (LDCRC)), and with Flight Crew Rest Compartment (FCRC being occupied by flight crew members) separated from Cabin Crew Rest Compartment (CCRC being occupied by cabin crew members).

SPECIAL CONDITION

- 1) CRC occupancy is not allowed during Taxi, Take-off and Landing (TT&L) phases. During flight, occupancy of the CRC is limited to the total number of bunks and / or seats that are installed in the compartment. In addition, the maximum occupancy in the crew rest compartment may be limited as necessary to provide the required level of safety.
 - (a) There must be appropriate placards, inside and outside each entrance to the CRC to indicate
 - (1) The maximum number of crewmembers allowed during flight and,
 - (2) That occupancy is restricted to operating crewmembers trained in the use of emergency equipment, emergency procedures and the systems of the CRC,
 - (3) That smoking is prohibited in the CRC,
 - (4) That the crew rest area is limited to the stowage of crew personal luggage and must not be used for the stowage of cargo or passenger baggage
 - (b) There must be at least one ashtray on the inside and outside of any entrance to the CRC.
 - (c) A limitation in the Aeroplane Flight Manual or other suitable means must be established to restrict occupancy to crewmembers and to specify the phases of flight occupancy that are allowed for each installed CRC.
 - (d) For each occupant permitted in the CRC, there must be an approved seat or berth that must be able to withstand the maximum flight loads when occupied.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 2) For all doors and hatches installed, there must be a means to preclude anyone from being trapped inside the CRC. If a locking mechanism is installed, it must be capable of being unlocked from the outside without the aid of a key or other tool. The lock must not prevent opening from the inside of the compartment at any time.
- 3) There must be at least two emergency evacuation routes, which could be used by each occupant of the CRC to rapidly evacuate to the passenger decks.
 - (a) The routes must be located with sufficient separation within the CRC, and between the evacuation routes, to minimize the possibility of an event, either inside or outside of the crew rest compartment, rendering both routes inoperative
 - (b) The routes must be designed to minimize the possibility of blockage, which might result from fire (inside or outside the CRC), mechanical or structural failure, or persons standing below or against crew rest exits doors or hatches. If there is low headroom at or near the evacuation route, provisions must be made to prevent or to protect occupants (of the CRC) from head injury. The use of evacuation routes must not be dependent on any powered device. If a crew rest exit route is in an area where there are passenger seats, a maximum of five passengers may be displaced from their seats temporarily during the evacuation process of an incapacitated person(s). If the evacuation procedure involves the evacuee stepping on seats, the seats must not be damaged to the extent that they would not be acceptable for occupancy during an emergency landing.
 - (c) Emergency evacuation procedures, including the emergency evacuation of an incapacitated occupant from the CRC, must be established and demonstrated
 - (d) There must be a limitation in the Aeroplane Flight Manual or other suitable means requiring that crewmembers be trained in the use of evacuation routes
 - (e) There must be a means to prevent passengers on the passenger decks from entering the CRC in the event of an emergency, including an emergency evacuation, or when no flight attendant is present
 - (f) The means of opening CRC doors and hatches must be simple and obvious. In addition, the CRC doors and hatches must be able to be closed from outside
 - (g) It must be shown by actual demonstration that the maximum allowed number of CRC occupants can easily evacuate the CRC using the main access route. This demonstration must also be performed using the alternate evacuation route.
- 4) The evacuation of an incapacitated person (representative of a ninety-fifth percentile male in size, at the corresponding weight) must be demonstrated for all evacuation routes. The number of crewmembers, which may provide assistance in the evacuation from inside, are limited by the available space. Additional assistance may be provided by up to three persons in the passenger compartment.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

- (a) At least one exit sign located near each crew rest door or hatch, meeting the requirements of JAR 25.812(b)(1)(i)

However, in the case of Flight Crew Rest Compartments limited to four occupants or fewer, the Agency agrees that internal electrical illumination of the sign is not required provided the applicant can demonstrate that the emergency lighting system providing general lighting in the compartment sufficiently highlights an exit sign meeting all other requirements of JAR 25.812(b)(1)(i)

- (b) An appropriate placard located conspicuously on or near each crew rest emergency exit door or hatch to identify its location and the operating instructions
- (c) Placards must be readable from a distance of 30 inches under emergency lighting conditions
- (d) The door or hatch handles and operating instruction placards must be illuminated to at least 160 microlamberts under emergency lighting conditions

The above requirements may be subject to specific evaluation and possibly to a finding of equivalent level of safety

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

- (a) This emergency illumination must be independent of the main lighting system
- (b) The sources of general illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency lighting system is independent of the power supply to the main lighting system
- (c) The illumination level must be sufficient for the occupants of the CRC to locate and transfer to the passenger cabin by means of each evacuation route

7) There must be means for two-way voice communications between crewmembers on the flight deck and occupants of the CRC. There must also be two-way communications between the occupants of the CRC and each flight attendant station required to have a public address system microphone per JAR 25.1411(a) (2) in the passenger cabin. In addition, the public address system must include provisions to provide only the relevant information to the crewmembers in the CRC (e.g., fire in flight, aircraft depressurization, etc.). That is, provisions must be provided so that occupants of the CRC will not be disturbed with normal, non-emergency announcements made to the passenger cabin.

8) There must be a means for manual activation of an aural emergency alarm system, audible during normal and emergency conditions and certain to wake a sleeping occupant, to enable crewmembers on the flight deck and at each pair of required floor level emergency exits to alert

Disclaimer – This document is not exhaustive and it will be updated gradually.



occupants of the CRC of an emergency situation. Use of a public address or crew interphone system will be acceptable, provided an adequate means of differentiating between normal and emergency communications is incorporated. The system must be powered in flight, after the shutdown or failure of all engines and auxiliary power units (APU), for a period of at least ten minutes.

- 9) There must be a means, readily detectable by seated or standing occupants of the CRC, which indicates when seat belts should be fastened. Seat belt type restraints must be provided for all seats and berths in the CRC and in the latter case must be compatible for the sleeping attitude during cruise conditions. There must be a placard on each berth requiring that these restraints be fastened when occupied. If compliance with this or any of the other requirements of these special conditions is based on specific head location, there must be a placard identifying the head position.
- 10) Means must be provided to cover turbulence. If the seat backs do not provide a firm handhold, or if there is no seat installed, there must be a handgrip or rail to enable persons to steady themselves while in the CRC, in moderately rough air.
- 11) The following safety equipment must also be provided in the CRC
 - (a) At least one approved hand-held fire extinguisher appropriate for the kinds of fires likely to occur,
 - (b) One Portable Protective Breathing Equipment (PBE) device approved to European Technical Standard Order (ETSO)-C116 or equivalent and meeting JAR 25.1439 close to each hand-held fire extinguisher. If only one hand-held fire extinguisher is installed in the compartment, two PBE devices must be provided.
 - (c) One flashlight
- 12) A smoke or fire detection system (or systems) must be provided that monitors each occupiable area within the CRC, including those areas partitioned by curtains. Flight tests must be conducted to show compliance with this requirement. Each system (or systems) must provide:
 - (a) A visual indication to the flight crew within one minute after the start of a fire,
 - (b) An aural warning in the CRC that would be certain to wake a sleeping occupant, and
 - (c) A warning in the passenger decks. This warning must be readily detectable by a flight attendant, taking into consideration the positioning of flight attendants throughout the passenger compartment during various phases of flight.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 13) A means to fight and suppress a fire in the CRC must be provided. This means can either be a built-in extinguishing system or manual hand held bottle extinguishing system.
- (a) The design shall be such that any fire within the compartment can be controlled without entering the compartment or the design of the access provisions must allow crewmembers equipped for firefighting to have unrestricted access to the compartment.
 - (b) If a built-in fire extinguishing system is used in lieu of manual firefighting, the system must have adequate capacity to suppress any fire occurring in the crew rest compartment, considering the fire threat, volume of the compartment, the ventilation rate and the minimum performance standards (MPS) that have been established for the agent being used. In addition it must be shown that a fire will be contained within a controlled volume meeting the requirements of Appendix F, Part III.
 - (c) The firefighting procedures must describe the methods to search the crew rests for fire sources(s). Training and procedures must be demonstrated by test and documented in the suitable manuals
 - (d) The time for a crewmember on the passenger deck to react to the fire alarm, to don the firefighting equipment and to gain access to the crew rest compartment must not exceed the time for the compartment to become smoke-filled, making it difficult to locate the fire source.
 - (e) The material used to construct each enclosed stowage compartment up to 25 cft must at least be fire resistant (45° Bunsen burner test according App. F, Part I (a)(2)(ii)) and must meet the flammability standards for interior components specified in § 25.853. For bigger compartments design standards must be agreed with the Agency.
- 14) There must be a means provided to exclude hazardous quantities of smoke or extinguishing agent originating in the CRC from entering any other compartment occupied by crewmembers or passengers. This means must include the time periods during the evacuation of the crew rest compartment and, if applicable, when accessing the crew rest compartment to manually fight a fire. Flight tests must be conducted to show compliance with this requirement.
- (a) Small quantities of smoke may penetrate from the crew rest compartment into other occupied areas during the one-minute smoke detection time
 - (b) When built in fire extinguishing systems are used, there must be a provision in the firefighting procedures to ensure that all door(s) and hatch(es) at the crew rest compartment emergency exits are closed after evacuation of the crew rest and during firefighting.
 - (c) Smoke entering any occupiable compartment when access to the CRC is open must dissipate within five minutes after the access to the CRC is closed.
 - (d) It must be demonstrated that the complete fire detection and firefighting procedure can be conducted effectively without causing a hazard to passengers due to excess quantities of smoke and/or extinguishant accumulating and remaining in occupied areas.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 15) There must be a supplemental oxygen system within the crew rest compartment as follows:
- (a) There must be at least one mask for each seat and berth in the crew rest compartment
 - (b) If a destination area (such as a changing area) is provided in the crew rest compartment, then there must be an oxygen mask readily available for each occupant that can reasonably be expected to be in the destination area (with the maximum number of required masks within the destination area being limited to the placarded maximum occupancy of the crew rest).
 - (c) There must also be an oxygen mask readily accessible to each occupant that can reasonably be expected to be either transitioning from the main cabin into the crew rest compartment, transitioning within the crew rest compartment, or transitioning from the crew rest compartment to the main cabin.
 - (d) The system must provide an aural (that would be certain to wake a sleeping occupant) and visual alert to warn the occupants of the crew rest compartment to don oxygen masks in the event of decompression. The aural and visual alerts must activate concurrently with the deployment of the oxygen masks in the passenger cabin. To compensate for sleeping occupants, the aural alert must be heard in each section of the crew rest compartment and must sound continuously for a minimum of five minutes or until a reset switch within the crew rest compartment is activated. A visual alert that informs occupants that they must don an oxygen mask must be visible in each section.
 - (e) There must also be a means by which the oxygen masks can be manually deployed from the flight deck.
 - (f) Procedures for crew rest occupants in the event of decompression must be established. These procedures must be transmitted to the operator for incorporation into their training programs and appropriate operational manuals.
 - (g) The supplemental oxygen system for the crew rest shall meet the same JAR-25 requirements as the supplemental oxygen system for the passenger cabin occupants except for the 10 percent additional masks required by JAR 25.1447(c)(1).
 - (h) The illumination level of the normal crew rest compartment lighting system must automatically be sufficient for each occupant of the compartment to locate a deployed oxygen mask.
- 16) The following requirements apply to CRC that are divided into several sections by the installation of curtains or partitions:
- (a) A placard is required adjacent to each curtain that visually divides or separates, for privacy purposes, the CRC into small sections. The placard must require that the curtain(s) remains open when the private section it creates is unoccupied
 - (b) For each section of the CRC created by the installation of a curtain, the following requirements of these special conditions must be met with the curtain open or closed:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (1) Visibility of the No smoking placards (Special Condition No. 1),
 - (2) Emergency illumination (Special Condition No. 6),
 - (3) Emergency alarm system (Special Condition No. 8),
 - (4) Seat belt fasten signal or return to seat signal as applicable (Special Condition No. 9), unless it is agreed by the Agency that only short term occupancy is possible (e.g. a changing area with room for only one standing person and possessing no seat or feature useable as a seat), and
 - (5) The smoke or fire detection system (Special Condition No. 12).
 - (6) The oxygen system (Special Condition No. 15).
- (c) A CRC visually divided to the extent that evacuation could be affected must have exit signs that direct occupants to the primary evacuation route. The exit signs must be provided in each separate section of the CRC, except for curtained bunks, and must meet the requirements of JAR 25.812(b)(1)(i).
- (d) For sections within an CRC that are created by the installation of a partition with a door separating the sections, the following requirements of these special conditions must be met with the door open or closed:
- (1) There must be a secondary evacuation route from each section to the passenger decks, or alternatively, it must be shown that any door between the sections has been designed to preclude anyone from being trapped inside the compartment (i.e. any locking mechanism must be capable of being unlocked from either side without the aid of a key or other tool). Removal of an incapacitated occupant from within this area must be considered. A secondary evacuation route from a small room designed for only one occupant for short time duration, such as a changing area or lavatory, is not required. However, removal of an incapacitated occupant from within a small room, such as a changing area or lavatory, must be considered
 - (2) Any door between the sections must be shown to be openable when crowded against
 - (3) There may be no more than one door between any seat or berth and the primary emergency exit
 - (4) There must be exit signs in each section meeting the requirements of JAR 25.812(b) (1) (i) that direct occupants to the primary outlet. For single bed or small compartments reduced sizes might be acceptable.
 - (5) Special Conditions No. 1 (no smoking placards), No. 6 (emergency illumination), No. 8 (emergency alarm system), No. 9 (fasten seat belt signal or return to seat signal as applicable), No. 12 (smoke or fire detection system) and No. 15 (oxygen system) must be met with the door open or closed.
 - (6) Special Conditions No. 7 (two-way voice communication) and No. 11 (emergency firefighting and protective equipment) must be met independently for each separate section except for lavatories or other small areas that are not intended to be occupied for extended periods of time.
 - (7) Materials, Seat cushions and mattresses must comply with the requirements of JAR 25.853(b) (c).

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 17) Materials Seat cushions and mattresses must comply with the requirements of JAR 25.853(b)(c)
- 18) Where a waste disposal receptacle is fitted, it must be equipped with an automatic fire extinguisher that meets the performance requirements of JAR 25.854(b).
- 19) If the Crew Rest Compartment is designed as a removable container in the cargo compartment, the outside walls of the container in which the crew rest compartment is enclosed including any interface item between the container and the aeroplane structure and systems must meet the applicable requirements of JAR 25.855.
- 20) If the Crew Rest Compartment is designed as a removable container in the cargo compartment, means must be provided such that the fire protection level of the cargo hold meet the applicable requirements of JAR 25.855 when the container is not installed

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
CRC	Crew Rest Compartment
CCRC	Cabin Crew Rest Compartment
FCRC	Flight Crew Rest Compartment
LDCRC	Lower Deck Crew Rest Compartments
PBE	Protective Breathing Equipment
TT&L	Taxi, Take-off and Landing

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-05: PACKS OFF OPERATION

Equivalent Safety Finding	D-05: Packs Off Operation
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	JAR 25.831(a)
ISSUE:	Issue 1 dated 05 Dec.2016

Equivalent Safety Finding

BACKGROUND

JAR 25.831(a) states:

(a) Each passenger and crew compartment must be ventilated and each crew compartment must have enough fresh air (but not less than 10 cubic ft per minute per crewmember) to enable crewmembers to perform their duties without undue discomfort or fatigue. (See ACJ 25.831 (a).).

Considering that there are some air-conditioning packs off operation periods (i.e., at take-off, no fresh air for crew members) for the Model A330-800/-900, direct compliance with JAR 25.831a is not possible.

In accordance with IR 21.A.21, compensating factors are therefore proposed to show that an equivalent level of safety is achievable

A similar CRI, ESF S-1065, has been issued on A340-500/-600.

EQUIVALENT SAFETY FINDING

Following compensating factors must be demonstrated to achieve an Equivalent Level of Safety to JAR 25.831(a):

1. There must be a means to annunciate to the flight crew that the pressurization system (conditioned air supply) is selected off.
2. It must be demonstrated that the ventilation system continues to provide an acceptable environment in the passenger cabin and cockpit for the brief period when the pressurization system is not operating. The degradation of crewmember air quality will not reach the level that would cause undue discomfort and fatigue to the point that it could affect the performance of their duties.
3. Furthermore, equipment environment shall be evaluated during those short periods to ensure equipment reliability and performances are not impaired. This evaluation should cover the extremes of ambient hot air temperatures in which the aeroplane is expected to operate.
4. In addition, it will be demonstrated that no unsafe condition due to limited packs-off operation will result, should a fire occur. Following criteria will be considered:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (a) Cockpit Smoke Penetration and Evacuation regarding any cargo or electronic compartment fire and Cabin Smoke Penetration regarding cargo compartment fire will not be impaired by packs off operation.
- (b) During limited duration packs-off operation the smoke detection systems are effective and the AC packs can be turned on and returned to the approved packs-on configuration to exclude hazardous quantities of smoke.
5. Finally, the air conditioning packs-off operation is intended to be a short duration operation. Therefore, the maximum period of operation in this configuration will be defined by the applicant and specified in the AFM, along with any related operating procedures necessary to maintain compliance with the regulatory issues discussed above.

Acronyms and Abbreviations

AC	Air Conditionning
AFM	Aeroplane Flight Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-06: INSTALLATION OF THREE POINT RESTRAINT & PRETENSIONER SYSTEM

SPECIAL CONDITION	D-06: Installation of Three Point Restraint & Pretensioner System
APPLICABILITY:	A330
REQUIREMENTS:	JAR 25.562, 25.785, CS 25.1316, CS 25.1317
ISSUE:	Issue 2 dated 16/08/2017

Special Condition**BACKGROUND**

This Special Condition is issued in order to show compliance with JAR 25.562, with the installation of shoulder harnesses with pretensioners on seats as a means to reduce the potential for occupant injury in the event of an accident.

SPECIAL CONDITION**1) HIC Characteristic**

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

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

2) Intermediate Pulse Shape

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

3) Protection During Secondary Impacts

EASA acknowledges that the pretensioner will not provide protection during secondary impacts after actuation.

Therefore, 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 pretensioner is set to deploy is unnecessarily low, the protection offered by the pretensioner may be lost by the time the second

Disclaimer – This document is not exhaustive and it will be updated gradually.



larger impact occurs. It must be substantiated that the trigger point for the activation of the pre-tensioner has been chosen to maximize the probability of the protection being available when needed.

4) Protection of Occupants other than 50th Percentile

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

For pre-tensioned shoulder harnesses, test results for other size occupants need not be created if sufficient evidence is 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 no hazard shall be introduced by the pre-tensioner due to the following seating configurations:

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

5) Occupants Adopting the Brace Position

There is no requirement for protection to be assessed or measured for seat occupants in any other position or configuration than seated alone upright, as specified in FAA AC 25.562-1B.

In addition it has to be shown that there is no adverse effect on PAX adapting the traditional brace position if the pre-tensioner is activated.

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



-
- 8) It must be shown that the system is not susceptible to inadvertent actuation as a result of wear and tear, or inertial loads resulting from in-flight or ground manoeuvres likely to be experienced in service
- 9) It must be ensured by design that any incorrect orientation (twisting) of the belt does not compromise the pre-tensioning protection function.
- 10) The equipment must meet the requirements for HIRF and Indirect Effect of Lightning with additional tests as per the applicable category of RTCA DO-160 Section 20 and 22, Issue G.
- 11) The mechanisms and controls must be protected from external contamination associated with that which could occur on or around passenger seating.
- 12) The pre-tensioner system shall not induce a hazard to the occupants in case of fire.
- 13) The system must function properly after loss of normal aircraft electrical power and after a transverse separation in the fuselage at the most critical location. A separation at the location of the system does not have to be considered.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
HIC	Head Injury Criterion
PAX	Passenger

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-07: INSTALLATION OF OBLIQUE SEATS

SPECIAL CONDITION	D-04: Installation of Oblique Seats
APPLICABILITY:	A330
REQUIREMENTS:	JAR 25.785(c) and 25.562 at Change 13
ISSUE:	Issue 2 dated 16/08/2017

Special Condition

BACKGROUND

JAR 25.785(a) at Change 13 requires general occupant protection for occupants of seats that are occupied during take-off and landing and therefore may experience the inertia forces specified in 25.562. The intent of 25.562 was to improve the level of safety provided to occupants of passenger and cabin attendant seats installed on large aeroplanes. Because most seating on large aeroplanes is forward-facing, the pass/fail criteria developed in 25.562 focused primarily on these seats. With respect to seats other than forward-facing, the performance measures of 25.562(c) have proved to adequately address the injury criteria for occupants of aft-facing seats but not for occupants of side-facing seats, i.e. seats that make more than an 18° angle with the vertical plane containing the aeroplane centreline (ref. JAR 25.785(c) Change 13).

For single occupant side-facing seats equipped with an energy absorbing rest, EASA determined that a level of safety equivalent to that afforded to occupants of forward and aft-facing seating could be achieved by meeting the additional special conditions specified in CRI E-1023.

It must be mentioned that in 2009 EASA certified for the first time the installation of side-facing seats not compliant with JAR 25.785(c), i.e. seats whose occupants are not protected from head injury by a safety belt and an energy absorbing rest that will support the arms, shoulders, head and spine, or by a safety belt and shoulder harness that will prevent the head from contacting any injurious object. The certification approach was based on an Equivalent Safety Finding achieved mainly through the installation of inflatable restraint systems. The details of the ESF approach were initially documented in EASA CRI E-27 and were subsequently consolidated in CRI E-134, which limits the ESF applicability to seats installed at 30 degrees or less with respect to the aircraft longitudinal axis.

More recently EASA has been extensively involved in the development of SAE ARP6316 which sets new occupant injury criteria for the certification of the installation of oblique seats on large aeroplanes. In the context of ARP6316, occupant facing direction is defined as follows:

Forward facing seats - Seats installed into the aircraft where the occupant facing direction is at $0 \pm 18^\circ$ relative to the aircraft longitudinal axis.

Aft facing seats - Seats installed into the aircraft where the occupant facing direction is at $180^\circ \pm 18^\circ$ relative to the aircraft longitudinal axis.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Side facing seats - Seats installed into the aircraft where the occupant facing direction is at 90° relative to the aircraft longitudinal axis.

Oblique facing seats - Seats installed into the aircraft where the occupant angle relative to the aircraft longitudinal axis is other than those described above.

Disclaimer – This document is not exhaustive and it will be updated gradually.



SPECIAL CONDITION

Additional performance standards for oblique facing seats

This Appendix provides standards and information not provided in AS8049B necessary to run and evaluate dynamic tests on oblique facing seats. The test set ups and orientations are exactly as described in AS8049B. Test 1 is commonly referred to as the vertical test and is defined in AS8049B, section 5.3.1.1. Test 2 is commonly referred to as the horizontal test and is defined in AS8049B, section 5.3.1.2 and 5.3.1.3. Information relevant to the conducting of both these tests is contained throughout AS8049B, section 5.3.

Test 1 - Structural and Occupant Injury Evaluation (AS8049B, Section 5.3.1.1)

Occupant Simulation

For Test 1, a Hybrid II ATD, or equivalent, shall be used to simulate each occupant.

Contactable Items

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

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

Occupant Injury Criteria

The injury criteria listed in AS8049B are applicable to this test.

Test 2 - Structural Evaluation (AS8049B, Section 5.3.1.2 and 5.3.1.3)

Occupant Simulation

For Test 2 (structural evaluation), a Hybrid II ATD, or equivalent, shall be used to simulate each occupant.

Contactable Items

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

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

Selection of Test Conditions

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

Combining Structural and Occupant Injury Tests

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

Test 3 - Occupant Injury Evaluation (AS8049B, Section 5.3.1.2)

Occupant Simulation

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

Contactable Items and Occupant Injury Assessments

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

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

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

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

Selection of Test Conditions

AS8049B, Section 5.3.6, and Section 10.3.4 in this document provide the requirements for all occupant injury evaluation tests. Data from previous tests, simulation, or rational analysis shall be used to determine the critical case(s). When determining the critical case(s) all yaw angles within the ± 10 degree range must be considered. Multiple tests may be necessary to examine all injury criteria. Tests that only evaluate injury criteria do not require floor deformation.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Occupant Injury Criteria

Body Part	Injury Criterion
Head	<p>(1) $HIC \leq 1000$ (AS8049B Section 5.3.9.4) in the event of head contact with seats, or other structure (including airbags), ① <i>or</i></p> <p>(2) $HIC_{15} \leq 700$ (49 CFR 571.208) in the event of head contact with an airbag <i>only</i> ②</p> <p>① Following a test, calculate HIC. If this value is ≤ 1000, the test is successful. If HIC is > 1000, and contact is made with the seat or other structure, regardless of airbag usage, the test has failed.</p> <p>② Use of HIC 15 is permitted as an alternate to HIC if the ATD head only contacts an airbag and makes no head contact with the seat or other structure. ATD head contact with the seat or other structure, through the airbag, or contact subsequent to contact with the airbag requires the use of HIC.</p> <p>HIC 15 is not applicable if head contact has occurred. The following evaluations of the test data should be used to determine if head contact has occurred:</p> <p>a. A review of the dynamic test videos and evaluation of the ATD head path movement, head contact, and head reaction at contact should be made. There should be a noticeable change in the head movement at the time of contact.</p> <p>b. A review and evaluation of the ATD head acceleration plots (x, y, z and resultant) should be made. The resultant ATD head acceleration plot during the time period in which the critical HIC calculation was made should show an abrupt change in the head acceleration.</p>
Neck	<p>Nij (49 CFR 571.208)</p> <p>(1) Nij shall be below 1.0, where $Nij = Fz/Fzc + My/Myc$, and Nij critical values:</p> <ul style="list-style-type: none"> (a) $Fzc = 1530$ pounds (6805 N) tension (b) $Fzc = 1385$ pounds (6160 N) compression (c) $Myc = 229$ foot-pounds (310 Nm) in flexion (d) $Myc = 100$ foot-pounds (136 Nm) in extension <p>(2) In addition, peak Fz shall be below 937 pounds (4168 N) in tension and 899 pounds (3999 N) in compression.</p> <p>(3) Rotation of the head about its vertical axis relative to the torso is limited to 105 degrees in either direction from forward-facing.</p> <p>(4) Concentrated loading on the neck is unacceptable during any phase of the test. The intent is that the neck should not be a load path in any ATD contact with</p>

Disclaimer – This document is not exhaustive and it will be updated gradually.



Body Part	Injury Criterion
	the seat system, never the initial point of contact and for neck movement to be in unison with the head and shoulders. In particular, the front of the neck should never be contacted, however incidental contact, such as a sliding motion against a flat surface, or a headrest, during rebound may be acceptable. [Visual evidence and loading data shall be collected during the test to show that neck contact is non-injurious.]
Shoulder	<p>(1) Where upper torso straps are used, tension loads in individual straps shall not exceed 1750 pounds (7784 N). If dual straps are used for restraining the upper torso, the total strap tension loads shall not exceed 2000 pounds (8896 N).</p> <p>(2) The upper torso restraint straps (where installed) shall remain on the ATD's shoulder during the impact.</p>
Thorax	<p>Significant contact between the thorax and seat system structure is not permitted during initial impact, except for intentional contact with an airbag or shoulder restraint.</p> <p>For example, contact with a corner or protrusion would be significant contact and be unacceptable. Sliding along a smooth wall is not significant contact and could be acceptable, provided all other injury criteria is met.</p> <p>Rebound contact that produces an x direction acceleration exceeding 20g for more than 3ms is not permitted.</p>
Abdomen	Significant contact between the abdomen and seat structure is not permitted except for intentional contact with an airbag or seat cushion.
Spine	<p>(1) The lumbar spine force (Fz) cannot exceed 1200 pounds (5338 N) tension and 1500 pounds (6673 N) compression.</p> <p>(2) Spine forces and moments shall be recorded using a six axis load cell and shall be reported. This data is collected for knowledge gathering. There are no pass/fail criteria associated with this data except as noted above for Fz.</p>
Pelvis	<p>(1) The pelvic restraint shall remain on the ATD's pelvis during the impact and rebound phases of the test. Provided that the pelvic restraint remains on the ATD's pelvis, trapping of the belt between the ATD leg and the pelvis is acceptable.</p> <p>(2) Any part of the load-bearing portion of the bottom of the ATD pelvis shall not translate beyond the edges of its seat's bottom seat-cushion supporting structure.</p>

Disclaimer – This document is not exhaustive and it will be updated gradually.



Body Part	Injury Criterion
Femur	<p>(1) Where leg contact with seats or other structure occurs, the axial compressive load in each femur does not exceed 2250 pounds (10008 N).</p> <p>(2) Axial rotation of the upper leg shall be limited to 35 degrees in the strike direction from the nominal seated position. Evaluation during rebound is not biofidelic and need not be considered.</p>
All	Contact between the head, pelvis, torso, or shoulder area of one ATD with the adjacent-seated ATD's head, pelvis, torso, or shoulder area is not allowed. Contact during rebound is allowed.

Restraint Systems

General Design

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

Airbags

Airbag systems include inflatable restraints and structure mounted airbags.

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

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

Airbag systems, depending on their design and performance, may provide to the occupant of an oblique seat a level of safety equal or higher than that provided by an energy absorbing rest directly meeting the requirements of 14 CFR 25.785(d).

Oblique seating systems including airbags shall be shown to meet the occupant injury criteria of section 10.3.4 throughout the entire range of yaw that encompasses the installation angle ± 10 degrees relative to the aircraft longitudinal axis.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



Other Considerations

Recording of Shoulder Harness Loads

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

ATD Placement

As an alternative to AS8049B section 5.3.8.3(b) through (e), the following procedure has been found to be adequate from previous experience for placing the ATD in a consistent manner for Test 2 and to determine the nominal (1g) seated position for Test 1:

- 1) Lower the ATD vertically into the seat while simultaneously (see Figure 10.5.2 for illustration):
 - a) Aligning the midsagittal plane (a vertical plane through the midline of the body; dividing the body into right and left halves) with the middle of the seat place.
 - b) Applying a horizontal x-axis direction (in the ATD coordinate system) force of about 89N (20 pounds) to the torso at the intersection of the midsagittal plane and lower sternum of the HII or FAA HIII at the midsagittal plane, to compress the seat back cushion.
 - c) Keeping the upper legs as horizontal as possible by supporting them just behind the knees, or using an equivalent procedure.
- 2) Once all lifting devices have been removed from the ATD:
 - a) Rock the ATD slightly to settle it in the seat.
 - b) Separate the knees by about 100 mm (4 inches).
 - c) Position the HII or FAA HIII hands on top of its upper legs.
 - d) Position the feet such that the centrelines of the lower legs are approximately parallel to a lateral vertical plane (in the aircraft coordinate system).

Disclaimer – This document is not exhaustive and it will be updated gradually.



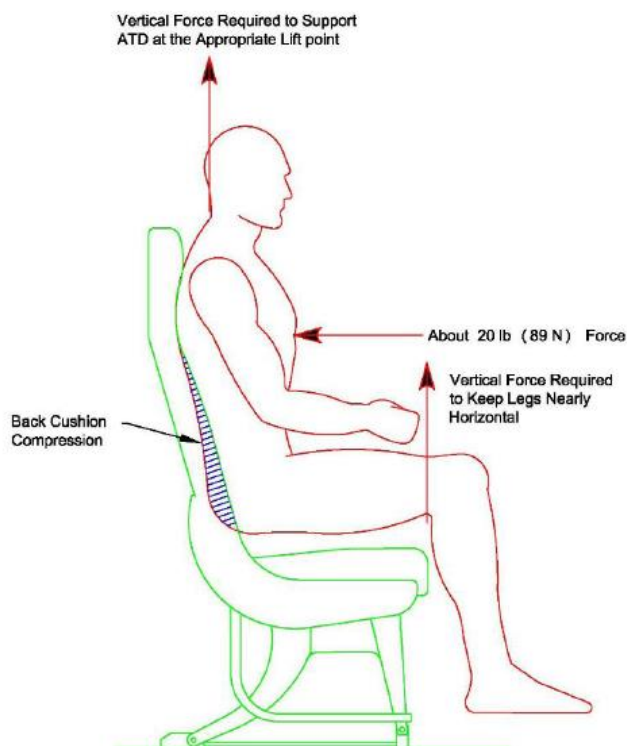


FIGURE 10.5.2 - ATD Placement

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ATD	Automated Test Dummy
HIC	Head Injury Criterion

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-08: CABIN ATTENDANT SEAT MOUNTED ON MOVABLE PART OF AN INTERIOR MONUMENT

SPECIAL CONDITION	D-08: Cabin Attendant Seat mounted on movable part of an interior monument
APPLICABILITY:	A330
REQUIREMENTS:	JAR 25.561, 25.562, 25.783(j), 25.1301, 25.1309
ISSUE:	Issue 2 dated 16/07/2019

Special Condition**BACKGROUND**

On the A330/A340 fleet, Airbus may install a Cabin Attendant Seat (CAS) that can be occupied during all phases of flight, including taxi take-off and landing, on the hinged door of a lavatory.

With the CAS mounted to the moveable door blade of the lavatory module, there is an unusual design feature that has to ensure normal operation of the lavatory module as well as safe operation of the CAS when it is occupied by a crewmember.

The applicable airworthiness regulations do not contain adequate or appropriate safety standards for such design. Special conditions are required for the certification of a CAS mounted to a hinged, moveable lavatory door, to supplement the JAR 25 requirements at Change 13.

SPECIAL CONDITION

1. The proposed installation of a cabin crew seat that can be occupied during all phases of flight on a movable part of an interior monument (e.g. a hinged door) must be capable to carry flight, ground and emergency landing condition loads in accordance with 25.301, 25.561, 25.562, including the special factors of 25.619 (e.g. fitting factors).
2. The design must ensure that the seat can only be used if the movable part of a cabin interior monument (lavatory door) is securely locked in the closed position and with all necessary locks engaged to carry the emergency landing loads as well as flight and ground loads. When applying these loads, the effect of deformation of the cabin interior monument as well as the movable part to which the seat is attached to, needs to be considered, to prevent any unlocking.
3. The applicant should investigate and address the additional risk of cabin crew seat not being available during flight when needed in case the seat cannot be used when the lavatory is occupied
4. In case the movable part of an interior monument is a lavatory door, the applicant should investigate and address the additional risk of a passenger being trapped inside the lavatory in accordance with 25.783(j)

Disclaimer – This document is not exhaustive and it will be updated gradually.



5. Potential deterioration of moving parts due to wear and tear (25.561 (c) (2)) needs to be addressed accordingly. Therefore, in addition to the application of the 1.33 wear and tear factor the mechanism should be cycle tested according to the use case of the movable part of the interior monument. In addition, appropriate Instructions for Continued Airworthiness shall be defined.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
CAS	Cabin Attendant Seat

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-100: INSTALLATION OF MINI-SUITE TYPE SEATING

SPECIAL CONDITION	D-100: Installation of mini-suite type seating
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.785(h)(2), 25.813(e)
ISSUE:	Issue 1 dated 30/04/2018

Special Condition**BACKGROUND**

This Special Conditions applies to mini-suites which are design features with a partial height partition that will surround an occupant providing additional comfort, convenience, and privacy (Complete enclosure may be achieved by moving sliding partition element(s)).

SPECIAL CONDITION

1. Only single occupancy of the Mini-suite is allowed during taxi, take-off and landing.
2. The mini-suite entrance must only provide access to the specific mini-suite.
3. Mini-suites must not provide the required egress path for any passenger other than for its single occupant.
4. Installation of the mini-suites must not introduce any additional obstructions or diversions to evacuating passengers, even from other parts of the cabin.
5. The design of the doors and surrounding "furniture" above the cabin floor in the aisles must be such that each passenger's actions and demeanour can be readily observed by cabin crew members with stature as low as the 5th percentile female.
6. The mini-suite door(s) must be open during taxi, take-off and landing.
7. A hold open retention mechanism for mini-suite doors must be provided and must hold the doors open under JAR 25.561(b) emergency landing conditions.
8. There must be a secondary, backup hold open retention mechanism for the mini-suite doors that can be used to "lock" the doors in the open position if there is an electrical or mechanical failure of the primary retention mechanism. The secondary retention mechanism must hold the doors open under JAR 25.561(b) emergency landing conditions.
9. There must be a means to readily check that all mini-suite doors are fully open and in the latched condition.

Disclaimer – This document is not exhaustive and it will be updated gradually.



10. There must be means to prevent the seated mini-suite occupant from operating the doors and thus ensure that the doors remain open during the TTOL phases of the flight.
11. Appropriate placards, or other equivalent means, must be provided to ensure the mini-suite occupants know that the doors must be in the open position for taxi, take-off and landing.
12. Operating instruction materials necessary to provide adequate compliance with SC 5, 9 and 10, considering also the number of individual mini-suites, shall be discussed and agreed with EASA and shall be provided to the operator for incorporation into their cabin crew training programs and associated operational manuals. This may affect the minimum acceptable number of cabin crew required to operate the aeroplane.
13. In the TTOL configuration, the mini-suite must provide an unobstructed access to the main aisle having a width of at least 30 cm (12 inches) at a height lower than 64 cm (25 inches) from the floor, and of at least 38 cm (15 inches) at a height of 64 cm (25 inches) and more from the floor. A narrower width not less than 23 cm (9 inches) at a height below 64 cm (25 inches) from the floor may be approved when substantiated by tests found necessary by the Agency.
14. In addition, the mini-suite must have an Emergency Passage Feature (EPF) to allow for evacuation of the mini-suite occupant in the event a door closes and becomes jammed during an emergency landing. The EPF must provide a free aperture for passage into the aisle consistent with SC 13 or meeting the requirements of JAR 25.807 applicable to a Type IV size emergency exit.

If the EPF consists of frangible and/or removable elements they must be easily broken/removed by the occupant of the mini-suite when a door becomes jammed.

If an EPF consists of dual independent sliding doors opening in opposite directions, the remaining unobstructed access width with one door in the fully closed position must be consistent with SC 13 or meet the requirements of JAR 25.807 applicable to a Type IV size emergency exit .

The occupant of the mini-suite must be made aware of the EPF and its way of operation.

In no case shall the occupant using the EPF have to rely on another occupant to assist in passage.
15. The height of the mini suite walls and doors must be such that a 95th percentile male can fit between them and the aeroplane interior furnishing.
16. No mechanism to latch the door(s) in the closed position shall be provided.
17. The mini-suite door(s) must be openable from the inside or outside with 25 pounds force or less regardless of power failure conditions.
18. If the mini-suite doors are electrically powered, in the event of loss of power to the mini-suite with the door(s) open, the door(s) must remain latched in the open position.

Disclaimer – This document is not exhaustive and it will be updated gradually.



-
19. The mini-suites installation must not encroach into any required main aisle, cross aisle or passage ways.
 20. No mini-suite door may impede main aisle or cross aisle egress paths in the open, closed or translating position.
 21. The mini-suite doors must remain easily openable, even with a crowded aisle.
 22. The seat of the Cabin Crew responsible for a suite area must be located to provide a direct view of the egress path from each mini-suite and of each main aisle adjacent to the mini-suites.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
EPF	Emergency Passage Feature
TTOL	Taxi, Take-Off and Landing

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-101: GREEN ARROW AND “OPEN” PLACARD FOR EMERGENCY EXIT MARKING

EQUIVALENT SAFETY FINDING	D-101: Green Arrow and “Open” Placard for Emergency Exit Marking
APPLICABILITY:	A330/A340
REQUIREMENTS:	CS 25.811(e)(4) Amdt 3
ISSUE:	Issue 1 dated 15/02/2018

Equivalent Safety Finding

BACKGROUND

CS 25.811(e)(4) states:

“All Type II and larger passenger emergency exits with a locking mechanism released by motion of a handle, must be marked by a red arrow with a shaft at least 19 mm (0.75inches) wide, adjacent to the handle, that indicates the full extent and direction of the unlocking motion required. The word OPEN must be horizontally situated adjacent to the arrowhead and must be in red capital letters at least 25mm (1 inch) high. The arrow and word OPEN must be located on a background, which provides adequate contrast. (See AMC 25.811(e) (4).)”

For A/C fitted with white symbolic exit signs on green background in accordance with EASA CS 25.811 (g) and CS 25.812(b)(1) at Amdt.3, as defined in EASA AMC to CS25.812(b)(1), Airbus believes that the arrow as well as the word “OPEN” required by CS 25.811(e)(4) should be green, in line with the colour code used for the symbolic exit signs.

EQUIVALENT SAFETY FINDING

The information displayed on the emergency exits should provide a consistent and coherent message to anyone operation the door in normal and emergency conditions. In that respect, a green arrow and green word “OPEN” on the door are more accurate on aircraft that are equipped with symbolic signs defined in EASA AMC to CS25.812 (b)(1), compared to the red ones. The green colour code used on A330 is standing for “positive” actions (e.g. correct/ready).

In addition, the industry standard SAE ARP 577D documents the improved contrast of green compared to red, thus the green marking meets the intent of the rule by providing a clear and readily visible indication of the full extent and direction of the unlocking handle motion. The green arrow and word “open” installed on the door will provide an accurate contrast to the background of the door linings.

Based on these arguments, Airbus opinion is that a green arrow as well as a green word “OPEN” provide an equivalent level of safety to the requirements of CS25.811(e)(4). The application of the colour changed placards is linked to and can only be installed when symbolic exit signs are selected on the aircraft.

Disclaimer – This document is not exhaustive and it will be updated gradually.



EASA partially agrees to the justification of the equivalence. Following latest rulemaking decision as resulted in CS25 Amnt19, EASA is of the opinion that the colour code of indication markings for opening the exits (the arrow and the word OPEN) should be consistent with the exit indicator signs. Therefore EASA can agree to the following:

The indication markings (arrow and the word OPEN) provide an equivalent level of safety to the requirements of CS 25.811(e)(4) when the aircraft is equipped with symbolic exit signs. The application of the colour changed placards is linked to and can only be installed when symbolic exit signs are selected on the aircraft.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-102: INCORPORATION OF INERTIA LOCKING DEVICE IN DYNAMIC SEATS

SPECIAL CONDITION	D-102: Incorporation of Inertia Locking Device in Dynamic Seats
APPLICABILITY:	A330/A340
REQUIREMENTS:	25.562, 25.785
ISSUE:	Issue 1 dated 29/01/2019

Special Condition**BACKGROUND**

This Special Conditions applies to the incorporation of an inertia locking device (ILD) in some passenger seats on the A330/A340 as a means to achieve compliance with particular aspects of regulation 25.562. In general, seats designed and tested to show compliance have, up until now, relied on either basic seat structure or in some cases, particular ‘passive’ energy absorbing features. The inertia locking device is an ‘active’ seat moving device to help achieve compliance, i.e. a system which mechanically deploys during the impact event. This is considered a novel design feature and one for which a special condition is needed to address requirements applicable to this feature in a seat.

SPECIAL CONDITION**1) Level of Protection Provided by Inertia Locking Device(s) (ILD)**

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



2) Protection Provided Below and Above the ILD Actuation Condition

The normal means of satisfying the structural and occupant protection requirements of 25.562 result in a non-quantified but nominally predictable progressive structural deformation and/or reduction of injury severity for impact conditions less than the maximum specified by the rule. A seat using the ILD technology however involves a step change in protection for impacts below and above that at which the ILD activates and deploys to its 'retention' position. This could result in the effects of the impact, for example structural deformation and occupant injury criteria, being higher at an intermediate impact condition than that resulting from the maximum.

It is acceptable for these effects to have such non-linear or step change characteristics provided that they do not exceed the allowable maximum at any condition at which the ILD does or does not deploy, up to the maximum severity pulse specified by the requirements. Tests must be performed to demonstrate this taking into account any necessary tolerances for deployment.

3) Intermediate Pulse Shape

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

4) Protection over a range of crash pulse vectors

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

5) Protection during Secondary Impacts

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

6) Protection of Occupants other than 50th Percentile

The ILD shall not affect compliance of the seat and installation with part 25 requirements, or those of this Special Condition, with respect to protecting the specified range of occupant sizes.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 8) The installation of the ILD on the seat shall be physically protected from any contamination likely to occur during operation, e.g. drink, food etc. The installation should also be protected against other foreign object ingress.
- 9) The effects of wear and criticality of manufacturing tolerances should be considered with respect to reliability and adverse effect on operation of the ILD. In addition other possible effects that may render the device inoperative must be taken into account such as aging/drying of lubricants and corrosion.
- 10) The design, installation and operation of the ILD shall be such that it is possible, by maintenance action, to check the functioning, i.e. movement, of the device in-situ.
- 11) A method of functional checking and a maintenance check interval should be established (if applicable).
- 12) If there is a need to include any means to release an inadvertently operated device (i.e. that has engaged in a non-crash condition where the seat could otherwise remain in-situ on the aircraft), this function shall not introduce additional hidden failures.

Acronyms and Abbreviations

ILD	Inertia Locking Device
-----	------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-02-700L: COURIER AREA: ALLOWED OCCUPANTS

SPECIAL CONDITION	D-02-700L: Courier Area: Allowed occupants
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B; CS 25.857 (e), CS 25.1581 and CS 25.1583 at amendment level 15
ISSUE:	Issue 2 dated 11 th Nov. 2016

Special Condition**BACKGROUND**

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative aircraft under the existing A330 Type Certificate (TC).

The aircraft is designed with a lowered cockpit which is extended by a courier area. Due to the structural adaptations the lowered cockpit will accommodate three occupants (Pilot, Copilot, and Observer) instead of four. The courier area provides a maximum of four seats and is needed for operational purpose to carry an additional flight crew, loadmaster or other occupants.

The cockpit door and its means of control are removed. At the location of the former cockpit door a curtain will be installed.

The emergency exits are the cockpit sliding windows for all aircraft occupants.

The aircraft is designed with a class E main deck cargo compartment, a class E AFT/Bulk lower deck cargo compartment and an entry area in the former FWD lower deck cargo compartment. These compartments are unpressurised.

CS 25.857 (e) at Amendment 15 defines an aeroplane with a class E cargo compartment as an aeroplane where only the carriage of cargo is allowed. No passengers can be transported. Therefore, the installation of a courier compartment occupied by persons in combination with class E cargo compartment is outside of the scope formally covered by CS 25. A Special Condition is therefore necessary to ensure a level of safety equivalent to that established in the applicable CS 25 Certification basis.

In reference to EU-OPS-1.1150 (the content of 1.1150 has not been transferred to EASA AIR OPS-Commercial Air Transport) or FAR 121.583 a terminology for occupants not defined as passengers will be taken into account.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Airbus does not intend to certify this derivative A330-700L aircraft to transport passengers but intends to take benefit of specific operational requirements which allows transportation of certain categories of persons without complying with all the specified passenger-carrying requirements.

The configuration of the courier area itself shall be developed and certified by Airbus Corporate Jet Centre (ACJC) under an STC in close cooperation with Airbus. As this Special Condition CRI D-02-700L will be part of the derivative aircraft certification basis it will be then a top requirement for the ACJ's STC certification basis.

SPECIAL CONDITION

1. Categories of occupants accepted in the courier compartment.

The approved AFM must contain an operating limitation restricting the total courier compartment occupancy to not more than 4 persons (subject to the number of approved seats) who are included in one of the following categories:

- a- a crew member
- b- an inspector or any other authorised representative of the Authorities
- c- any person determined by the operator, for the particular flight on which carried, to be necessary for:
 - 1- the safety of the flight
 - 2- the security of valuable or confidential cargo
 - 3- the preservation of fragile or perishable cargo
 - 4- the operation of special equipment for loading or unloading cargo
 - 5- the loading or unloading of outsized cargo
 - 6- crew member off-duty
 - 7- the maintenance of the Aircraft
- d- a person travelling to or from an assignment by the operator involving a function described in §1 (c)
- e- other categories of persons authorized by the Operational Authorities of the Operator

2. Conditions and limitations on courier compartment occupants as defined above.

The aircraft shall not be operated unless:

- a- Each occupant has been briefed by a flight crew member prior to each flight:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- on the location and operation of the emergency escape means (cockpit sliding window opening and rope)
- on the location and usage of oxygen equipment (automatic and portable) and procedures to be followed in case of depressurization
- on the usage of the two-way communication system between the flight deck and the courier area
- for extended overwater operations, the location of life rafts, and the location and operation of life preservers including a demonstration of the method of donning and inflating a life preserver.
- on the applicable passenger briefing items required by National Authority regulations, for example the non-smoking procedure.

b- Each occupant is physically able to accomplish the necessary emergency procedures. The pilot/captain may deny a courier compartment occupant boarding the aircraft if he or she has doubts that this person is in a condition which may impair the accomplishment of these emergency procedures.

c- Each occupant has unobstructed access from his seat to the pilot compartment and to the emergency exit.

d- The pilot in command has a means of notifying each person when smoking is prohibited and when safety belts must be fastened; and the airplane has an approved seat with an approved safety belt for each occupant.

e- The seat must be located so that the occupant is not in any position to interfere with the flight crewmembers performing their duties.

f- The pilot in command may authorize a person covered by paragraph 1(a) to 1(e) of this section to be admitted to the cockpit of the airplane.

g- A public address system complying with CS 25.1423 must be provided. It must be accessible from at least one courier area occupant when seat belts and harnesses are fastened.

Disclaimer – This document is not exhaustive and it will be updated gradually.



3. Amend the CS 25 amendment 15 content as follows:

Note: Modifications of existing CS 25 Amendment 15 paragraphs are made apparent by strikethrough, underlined and added bold text.

Concerning the main deck class E cargo compartment, the CS 25.857(e) is modified to read:

(e) Class E.

A Class E cargo compartment is one on aeroplanes used ~~only~~ for the carriage of cargo and in which -

(1) Reserved.

(2) ~~There is a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station;~~ **covered by separate Equivalent Level of Safety Finding (ESF) D-06-700L;**

(3) ~~There are means to shut off the ventilating airflow to, or within, the compartment, and the controls for these means are accessible to the flight crew in the crew compartment;~~ **covered by separate Equivalent Level of Safety Finding (ESF) D-06-700L;**

(4) There are means to exclude hazardous quantities of smoke, flames, or noxious gases, from ~~the flight crew~~ occupied compartments; and

(5) The required ~~crew~~ emergency exits are accessible under any cargo loading condition.

Concerning the underfloor aft/bulk class E cargo compartment, the CS 25.857(e) is modified to read:

(e) Class E.

A Class E cargo compartment is one on aeroplanes used ~~only~~ for the carriage of cargo and in which -

(1) Reserved.

(2) There is a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station;

(3) There are means to shut off the ventilating airflow to, or within, the compartment, and the controls for these means are accessible to the flight crew in the crew compartment;

(4) There are means to exclude hazardous quantities of smoke, flames, or noxious gases, from the ~~flight crew~~ occupied compartments; and

(5) The required ~~crew~~ emergency exits are accessible under any cargo loading condition.

Acronyms and Abbreviations

FWD	Forward
ACJC	Airbus Corporate Jet Centre (now AIS for Airbus Interiors Services)

Disclaimer – This document is not exhaustive and it will be updated gradually.



AFM	Aeroplane Flight Manual
ESF	Equivalent Level of Safety Finding

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-03-700L: EMERGENCY EVACUATION

SPECIAL CONDITION	D-03-700L: Emergency evacuation
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B; CS 25.803, 25.807, 25.809, 25.810, 25.811, 25.812 and 25.813 at amendment level 15
ISSUE:	Issue 3 dated 31 st October 2017

Special Condition

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative all cargo aircraft under the existing A330 Type Certificate (TC). This new derivative aircraft will show certain design similarities with the current Beluga A300-600ST design principles.

The aircraft is designed with a lowered cockpit which is extended by an adjacent courier area. Due to the structural adaptations the lowered cockpit will accommodate three occupants (Pilot, Copilot, and Observer) instead of four as on the baseline aircraft A330-343. The A330-700L's courier area provides a maximum of four seats and is needed for operational purpose to carry an additional flight crew, loadmaster or other occupants.

Airbus does not intend to certify this derivative A330-700L aircraft to transport passengers but intends to take benefit of specific operational requirements which allows transportation of certain categories of persons without demonstrating full compliance to all the specified passenger-carrying requirements.

The cockpit door and its means of control are removed. At the location of the former cockpit door a curtain will be installed, separating the cockpit from the courier area.

As per design restrictions for such specific purpose aircraft, the only emergency exits available are the two cockpit sliding windows (CSW) for all aircraft occupants, as no passenger door from the A330-300 baseline aircraft could be retained. A belly door with the same design principle as the one used on the A300-600ST (current Beluga) will be available for normal operation (access to and egress from the aircraft), but it cannot be qualified as ventral emergency exit mainly because the emergency egress is not guaranteed in the most adverse conditions of landing gear collapse.

Therefore, a Special Condition D-03-700L is needed as the CS 25 requirements intended to address emergency passenger provisions in a passenger aircraft are not adequate to the specific design features and intended use of this A330-700L cargo aircraft, considering that only a reduced number of occupants related with the aircraft operation will be allowed on board.

Disclaimer – This document is not exhaustive and it will be updated gradually.



The principle of this Special Condition D-03-700L is to complement the CS 25 requirements applicable to the two flight crew emergency exits available in the cockpit with specific additional requirements that are adequate for the reduced number (4 maximum) of allowed category occupants carried in the A330-700L courier area adjacent to the cockpit.

The two A330-700L's CSW are to be considered as non-over-wing exits in accordance with CS 25.810(a). The assisting/descent mean is a rope compliant with CS 25.810(a)(2).

The scope of this Special Condition D-03-700L are the requirements related with emergency evacuation issues applicable to the cockpit area configuration because the emergency exits functionality, which is usually located in the courier area is transferred into the cockpit where the two CSW's are located. This CRI D-03-700L does not cover requirements limited to the courier area installation which are to be developed by a supplemental type certificate by ACJC, as this will be the subject of a separate EASA CRI. In any case as this special condition D-03-700L is part of the A330-700L derivative aircraft certification basis it stands anyway as a top level requirement for the STC certification basis when applicable.

SPECIAL CONDITION

This Special Condition D-03-700L sets the EASA certification requirements applicable to the emergency evacuation provisions available in the cockpit area of the all-cargo derivative aircraft A330-700L Beluga, particularly for the emergency evacuation exits available to all aircraft occupants (no passengers) which for this aircraft consist solely of the two flight deck sliding emergency exits / cockpit sliding windows (CSW). References made to CS 25 content apply to amendment level 15, unless otherwise specified.

- 1) The maximum number of aircraft total allowed occupants is 7 persons: 3 in the cockpit plus 4 in the courier area adjacent to the cockpit.
- 2) No passenger can be carried on board. The allowed categories of occupants in A330-700L aircraft's courier area are those defined in EASA Special Condition D-02-700L CRI "*Courier Area: Allowed occupants*".
- 3) Paragraph CS 25.803 "Emergency evacuation" requirements apply to the A330-700L aircraft, including the subparagraph c).
- 4) Except for CS 25.807(j), the content of paragraph CS 25.807 "Emergency Exits" is substituted by the following:

The aircraft emergency exits must meet the following requirements in order to be usable by the A330-700L Beluga occupants allowed in the courier area:

- a. Type and number required. For an occupant (non-passenger) seating configuration in the courier area up to 4 seats, at least one emergency exit must be provided on each side of the aeroplane. These emergency exits can be those already provided to comply with

Disclaimer – This document is not exhaustive and it will be updated gradually.



subparagraph 25.807(j) “flight crew emergency exits”. Each of those exits must encompass an unobstructed rectangular opening of at least 48.3 cm by 50.8 cm (19 by 20 inches).

- b. Size: minor deviations less than 5% compared to the dimensions of the rectangle specified in subparagraph 4.a may be submitted to EASA for review and acceptance provided that:
 - i. The deviation, if impacting both dimensions of the rectangle, is located and limited to one corner of the rectangle, and
 - ii. The total emergency exit unobstructed area is higher than the one resulting from the dimensions of a rectangular opening with the minimum dimensions as specified in subparagraph 4a, and
 - iii. Satisfactorily exit utility can be demonstrated by any allowed aircraft occupant.
- c. Asymmetry: the two cockpit exits need to be diametrically opposite each other, have the same geometry and size and the same opening means.
- d. Location: Each of the exits as required by subparagraph 4a of this special condition must be accessible to all the occupants in the courier area and located and arranged in a way that will afford an effective means of evacuation for all aircraft occupants.
- e. Ditching emergency exits: whether or not ditching certification is requested, the emergency exits required by paragraph 4 must be qualified as ditching emergency exits by ensuring they stay above the waterline for the most unfavourable expected combination of aircraft weight and centre of gravity.

5) The content of paragraph CS 25.809 “Emergency Exit Arrangement” is substituted by the following:

The A330-700L Beluga emergency exit arrangement must meet the following requirements (see CS 25 AMC 25.809(a)):

- i. The CS 25.809(a)(1) applies.
- ii. The CS 25.809(a)(3) content is substituted by: the flight deck sliding emergency exits as conventionally configured in open condition, used in conjunction with a suitable accessible and powerful portable illumination device must permit an adequate viewing of the likely areas of evacuee ground contact with the landing gears extended or in any condition of landing gear collapse, during all ambient lighting conditions.
- iii. The CS 25.809(b) content applies, with the addition that the flight deck sliding emergency exits are required to be openable also from the outside.
- iv. The CS 25.809(c) content is substituted by: the means of opening the flight deck sliding emergency exits must be simple and obvious and may not require exceptional effort; and must be arranged and be identifiable so that it can be readily located and operated, even in darkness, by the flight crew members and by the allowed aircraft occupants who are knowledgeable on their use and operation.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- v. The CS 25.809(d) applies
- vi. The CS 25.809(e) applies.
- vii. The CS 25.809(g) applies.
- viii. The CS 25.809(i) applies.

6) The paragraph CS 25.810 “Emergency egress assisting means and escape routes” is substituted by the following content:

The A330-700L Beluga emergency egress assisting means for the flight deck emergency sliding exits must meet the following requirements:

- a. Each flight deck sliding emergency exit must have an approved mean to assist the occupants in descending to the ground, if the exit is located more than 1.8 m (6 feet) from the ground with the aeroplane on the ground and the landing gear extended.
- b. The assisting means for the flight deck sliding emergency exits may be a rope or any other means demonstrated to be suitable for the purpose. If the assisting means is a rope, it must be:
 - i. Attached to the fuselage structure at or above the top of the emergency exit opening, or at another approved location if the stowed device, or its attachments, would reduce the pilot’s view visibility in flight, and
 - ii. Able (with its attachment) to withstand a 1779 N (400-lbf) static load.

7) For what concerns paragraphs CS 25.811 “Emergency exit marking” and CS 25.812 “Emergency lighting” requirements in the cockpit area, is substituted by the following content:

- a. The Aeroplane Flight Manual will contain a normal procedure for the flight crew to ensure that courier area illumination will be dimmed during taxi, take-off, approach and landing phases.
- b. The Aeroplane Flight Manual will contain a normal procedure for the flight crew to ensure that if there is at least one occupant in the courier area:
 - i. The curtain separating the cockpit from the courier area may be opened or closed during taxi, take-off, approach and landing phases in the following conditions: Low visibility take-off (LVTO), CAT II or CAT III approaches.
 - ii. If the conditions of 7.b.(i) are not met, the curtain will remain open during taxi, take-off, approach and landing phases.

For emergency procedures associated with forced landings or unplanned ditching, the AFM content must ensure that the curtain will remain open.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Compatibility of the design solution and the AFM procedure with the CS/JAR 25.773(a)(2) requirements (pilot compartment must be free of glare and reflection) will need to be substantiated.

- c. Both sliding emergency exits and their external opening means must satisfy the outside marking requirements as laid down in CS 25.811(f).

- 8) For what concerns paragraph CS 25.813 “Emergency exit access and ease of operation” requirements in the cockpit area, the following apply:

No door may be installed between any courier area seat that is occupiable for take-off and landing and any aircraft emergency exit, such that the door crosses any egress path (including aisles, cross-aisles and passageways).

Acronyms and Abbreviations

CSW	Cockpit Sliding Window
ACJC	Airbus Corporate Jet Centre (now AIS for Airbus Interiors Services)
AFM	Aeroplane Flight Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-06-700L: MAIN DECK CLASS E CARGO COMPARTMENT

EQUIVALENT SAFETY FINDING	D-06-700L: Main Deck Class E Cargo Compartment
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B and 21.A.21(c)(2); CS 25.855(a), (b) and (c)(2); CS 25.857(e)(2) and (e)(3) at CS 25 amendment 15 level.
ISSUE:	Issue 2 dated 17 th Jul. 2017

Equivalent Safety Finding

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative aircraft under the existing A330 Type Certificate (TC).

The purpose of this special aircraft is to transport outsize cargo items on dedicated TCU (Transport Cargo Units), mainly aircraft components between the Airbus sites of its manufacturing/production locations on the main deck which has a large volume and height.

The maximum flight level shall be 35 200 ft.

The aircraft is designed with two class E cargo compartments: The main deck cargo compartment and the underfloor Aft/Bulk cargo compartment. These two compartments are not pressurized. Only the Aft/Bulk Class E Cargo Compartment will be ventilated.

Airbus proposes the same design principle as already certified on the A300-600ST (Current Beluga) that the required liner according CS 25.855(b) and the smoke detection system according CS 25.857(e)(2) will not be installed on the main deck Class E Cargo Compartment mainly because risk of hazardous fire ignition will be precluded.

EQUIVALENT LEVEL OF SAFETY FINDING

The A330-700L (Beluga XL) will be certified by EASA as a derivative all cargo aircraft under the existing A330 Type Certificate (TC). This new derivative aircraft will show certain design similarities with the current Beluga A300-600ST design principles.

The purpose of this special aircraft is to transport outsized cargo items (mainly aircraft components and sub-assemblies) between the Airbus sites of its manufacturing/production locations. These

Disclaimer – This document is not exhaustive and it will be updated gradually.



outsized cargo items will be carried on top of dedicated TCU's (Transport Cargo Units) placed in the aircraft's Main Deck Cargo Compartment.

The aircraft is designed with two class E cargo compartments: the Main Deck Cargo Compartment (MDCC) and the underfloor Aft/Bulk cargo compartment. Both cargo compartments are not pressurized.

In addition, the MDCC is not ventilated by an active system. Due to the MDCC's very large volume (2.400,00 m³ air-volume) and height (7.5 meters loadable cross section maximum height), this cargo compartment is not equipped with the smoke or fire detector system required by CS 25.857(e)(2) for class E cargo compartments. In addition the MDCC is not provided with the liners required by CS 25.855(b)(1) (same design principles than current A300-600 ST Beluga).

Therefore the following equivalent level of safety finding applicable to the Class E Main Deck Cargo Compartment is provided for compliance with CS 25.855(b)(1) and 25.857(e)(2) at amendment level 15, by demonstrating that the A330-700L MDCC does not incorporate any feature which could create a fire risk and that the cargo items which will be allowed to be carried in this compartment are of such a nature, are conditioned and disposed so to avoid the risk of hazardous fire ignition which could preclude aircraft continued safe flight and landing.

A. Requirements applicable to the class E main deck cargo compartment:

- 1) Design precautions must be taken to prevent the risk of fire in this compartment.
- 2) The compartment must meet the requirements of CS 25.855(d), (e), (f) and (g).
- 3) Cockpit voice and flight data recorder systems, windows and systems or equipment shown to be essential for aircraft continued safe flight and landing according to CS 25.1309 and which are installed within or in the vicinity of this cargo compartment must be installed and protected in accordance with CS 25.855(c)(2) requirements.
- 4) Any additional equipment installation to be performed in the class E main deck cargo compartment subsequent to the certification of the derivative aircraft will need to be specifically assessed under these ESF D-06-700L principles concerning their contribution as a possible fire source.

B. Requirements for the items of cargo to be carried in the main deck cargo compartment:

Concerning the carriage of items transported in the class E main deck cargo compartment it shall be ensured that any fire risk is minimized and any uncontrolled fire risk is eliminated. To this effect:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 1) The category of items to be carried are limited to Airbus' aircraft components and subassemblies together with their associated devices required for their transportation under the limitations addressed in this paragraph B).
- 2) Interface specifications and procedures for transportation of items will need to be developed by the type certificate holder to identify and describe:
 - i. The kind of items to be carried.
 - ii. The necessary instructions to prepare, check and load the aircraft's components and subassemblies together with their associated devices required for their transportation in the aeroplane. These instructions can be prepared and delivered as part of the instructions for continued airworthiness and manuals required by CS 25.1529.
 - iii. Prior to the commencement of the flight, an acceptance checklist must be provided to the flight crew by the operator or organization responsible for the management and handling of the cargo declaring that the cargo items and the associated devices required for their transportation have been prepared, loaded in the aircraft and checked in accordance with the type certificate holder interface specifications and procedures referred in this paragraph B2. The aeroplane flight manual must contain an adequate limitation or procedure to this effect.
- 3) The interface specifications to be developed by the type certificate holder shall include technical principles and instructions aimed to ensure that no parts or components in the sub-assemblies to be carried may be contributing to or presenting individual risk to induce any hazardous fire ignition while carried in the main deck cargo compartment. To this effect the following aspects shall be taken into account:
 - i. Flammable fluids (i.e: fuel, hydraulic, oil, etc) tanks and lines shall be drained and cleaned such that they do not contain hazardous quantities of these fluids neither accumulation of flammable gases or vapours. Flammable fluid tanks and lines are adequately sealed or plugged before their transport.
 - ii. For payloads containing systems with a power sources/power supply potentially creating a fire risk, the system must be deactivated and the associated power source / power supply properly insulated or removed prior to transportation.
- 4) The interface specifications referred in this paragraph and to be developed by the type certificate holder shall be approved by their design organization. In addition:
 - i. The aircraft AFM/EASA approved part of the WBM shall contain limitations regarding loading, unloading and transportation of items in the main deck cargo compartment will be performed in accordance with the type certificate holder specifications, and
 - ii. The type certificate holder shall furnish a complete set of interface specifications to each known aircraft owner and provide them with any updated version.
 - iii. In case additional allowed items of cargo are to be contemplated or differences from previous cargo preparation, handling and loading procedures and instructions are to

Disclaimer – This document is not exhaustive and it will be updated gradually.



be introduced, these shall be properly substantiated by the type certificate holder and finally formalized through an airworthiness approval triggering if deemed necessary by the Agency an updated AFM/WBM revision.

C. Additional requirements applicable to other items of cargo than those specified in paragraph B:

The carriage of any other cargo item different to Airbus' aircraft components and subassemblies not covered by the type certificate holder interface specifications referred in this ESF will require a specific airworthiness design approval on a case by case basis. For this specific airworthiness design approval process:

- 1) The type certificate holder interface specifications will need to be updated accordingly. The principles for these specifications as described in this ESF will need to be met taking in consideration the specificities of the new cargo item to be carried and
- 2) An adequate entry/link in the AFM/WBM shall be provided for contemplating the carriage of these specific cargo items.

Acronyms and Abbreviations

TCU	Transport Cargo Units
MDCC	Main Deck Cargo Compartment
ESF	Equivalent Level of Safety Finding
AFM	Aeroplane Flight Manual
WBM	Weight and Balance Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-07-700L: COCKPIT SLIDING WINDOWS – COMPLIANCE ASPECTS WITH CS 25.783

EQUIVALENT SAFETY FINDING	D-07-700L: Cockpit Sliding Windows – Compliance aspects with CS 25.783
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.21(c)(2); CS 25.783(e)(1) and (e)(3) at amendment level 15.
ISSUE:	Issue 2 dated 24 th Jan. 2019

Equivalent Safety Finding

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative all cargo aircraft under the existing A330 Type Certificate (TC).

The aircraft is designed with a lowered cockpit extended by an adjacent courier area. Due to the structural adaptations the lowered cockpit will accommodate three occupants (Pilot, Copilot, and Observer) instead of four as on the baseline aircraft A330-343. The A330-700L's courier area provides a maximum of four seats and is needed for operational purpose to carry an additional flight crew, loadmaster or other occupants.

As per design restrictions for such specific purpose aircraft, the only emergency exits available are the two cockpit sliding windows (CSW) for all aircraft occupants, as no passenger door from the A330-300 baseline aircraft could be retained.

Among the requirements of CS 25.783(e) regarding warning, caution and advisory indications for aircraft doors there are:

- CS 25.783(e)(1): “There must be a positive means to indicate at the door operator’s station that all required operations to close, latch, and lock the door(s) have been completed”.
- CS 25.783(e)(3): “There must be a visual means on the flight deck to signal the pilots if any door is not fully closed, latched, and locked. The means must be designed such that any failure or combination of failures that would result in an erroneous closed, latched, and locked indication is remote for:
 - (i) each door that is subject to pressurisation and for which the initial opening movement is not inward; or
 - (ii) each door that could be a hazard if unlatched”.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Compliance of the Cockpit Sliding Window (CSW) with CS 25.783(d)(2) is achieved by an overcentering of the latches in relation to the rails and with a spring which confirms the overcentered position.

The latch overcentering and the spring prevent backdriving forces on the latching mechanism.

The visual indicator of the CSW does not provide indication whether the latches of the CSW are overcentered or not.

During the closing and latching process, the indicator retracts before the latches reach the overcentered position, which is a non-compliance with CS 25.783(e)(1).

Likewise, the fact that the latches can be in a not-overcentered position without the red unlock indicator protruding from the handle is a non-compliance with CS 25.783(e)(3).

EQUIVALENT LEVEL OF SAFETY FINDING

For the cockpit sliding windows (CSW's) in the A330-700L New Beluga derivative, compliance with CS 25.783(d)(2) at amendment level 15 is achieved by an overcentering of the latches in relation to the rails and with a spring which confirms the overcentered position.

The latch overcentering and the spring prevent backdriving forces on the latching mechanism.

The visual indicator of the CSW does not provide indication whether the latches of the CSW are overcentered or not.

1. The content of CS 25.783(e)(1) states:

"There must be a positive means to indicate at the door operator's station that all required operations to close, latch, and lock the door(s) have been completed".

During the closing and latching process, the CSW visual indicator retracts before the latches reach the overcentered position, which is a non-compliance with CS 25.783(e)(1).

2. The content of CS 25.783(e)(3) states.

"There must be a visual means on the flight deck to signal the pilots if any door is not fully closed, latched, and locked. The means must be designed such that any failure or combination of failures that would result in an erroneous closed, latched, and locked indication is remote for:

- i. each door that is subject to pressurisation and for which the initial opening movement is not inward; or*
- ii. each door that could be a hazard if unlatched".*

The fact that the latches can be in a not-overcentered position without the red unlock indicator protruding from the handle is a non-compliance with CS 25.783(e)(3).

The following ESF is agreed for the A330-700L New Beluga's CSW's with regards compliance with CS 25.783(e)(1) and 25.783(e)(3):

Disclaimer – This document is not exhaustive and it will be updated gradually.



A preflight check will be in place to be performed by the flight crew to ensure that the sliding window is correctly closed and latched, that the handle of the sliding window has been pushed fully forward to the closed position, and that it has been verified that the red indicator is no longer visible.

This physical preflight check supplements the visual indicator of the CSW's. By means of this preflight check:

- A. The flight crew will confirm that all required operations to close and latch the CSW's have been completed, which results in an equivalent level of safety compared with a design compliant with CS 25.783(e)(1).
- B. In case the CSW is not fully closed and latched when the check is started, the flight crew will recognize this by a residual forward handle movement during the check, which results in an equivalent level of safety compared with a design compliant with CS 25.783(e)(3).

Acronyms and Abbreviations

CSW	Cockpit Sliding Window
ESF	Equivalent Level of Safety Finding

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-10-700L: BRAKE KINETIC ENERGY CAPACITY

SPECIAL CONDITION	D-10-700L: Brake kinetic energy capacity
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B; JAR 25.735 at change 13
ISSUE:	Issue 1 dated 26 th April 2017

Special Condition**BACKGROUND**

In the frame of the A330/A340 Type Certification a Special Condition F-08 was issued to introduce new JAR 25 requirements based on the JAA NPA 25-244 – Accelerate Stop Distances. Later on and in the frame of the A340-300 WV 020 certification, the Special Condition F-8 was further amended and Special Condition SC F-8.1 introduced.

On A330-700L derivative aircraft, the applicable requirements for significantly changed areas is the CS 25 at amendment 15, although reversion to previous CS 25 amendment is requested and justified by Airbus in a few specific cases. The performance and handling qualities related requirements are among those aircraft areas impacted by the significant changes on A330-700L therefore most of the SC F-8.1 content is no longer relevant for this derivative Type Certification.

However, the Special Condition F-8.1 amended also the JAR 25.735 (change 13) requirements. In the case of A330-700L derivative the design changes introduced at the level of ATA 320 landing gear are:

- The nose landing gear is located at the same X position relative to the main landing gear as on the A330-300. The pintle vertical attachment is shifted downwards, and the NLG bay is translated accordingly. This change is considered as a secondary change. In addition, some landing gear items require relocation or minor modification, as well as an adaptation of the landing gear bay to the new fuselage loft, and adaptation of the landing gear doors / door stops accordingly. These changes have been classified as secondary changes, with application of original A330-300 certification basis.
- The BSCU (brake and steering control unit) is modified in order to change the deceleration target in autobrake mode, in order to allow better landing performance on short runway. This change has been classified as non-related change, again with application of original A330-300 certification basis.

Therefore it has been identified the need to recover the JAR 25.735 requirements defined in SC F-8.1.

Disclaimer – This document is not exhaustive and it will be updated gradually.



SPECIAL CONDITION

Incorporation of SC F-8.1 requirements for amendment of JAR 25.735 – Brakes

Amend JAR 25.735 (f) through (j) to read as follows:

25.735 (f)

The design landing brake kinetic energy capacity rating of each main wheel brake assembly shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

- (1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during operational landings at maximum landing weight. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or powerplant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
- (2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels:

$$KE = \frac{0.0443WV^2}{N}$$

where

K = kinetic energy per wheel (ft. lb)

W = design landing weight (lb)

V = aeroplane speed in knots. V must not be less than V_{so}, the power off stalling of the aeroplane at sea level, at the design landing weight, and in the landing configuration; and

N = number of main wheels with brakes

The formula must be modified in case of unequal braking distribution

25.735 (g)

In the landing case the minimum stalling speed rating of each main wheel brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the V used in the determination of kinetic energy in accordance with sub-paragraph (f) of this paragraph,

Disclaimer – This document is not exhaustive and it will be updated gradually.



assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.

25.735 (h)

The rejected take-off brake kinetic capacity rating of each main wheel-brake assembly that is at the fully worn limit of its allowable brake wear range shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

- (1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during an accelerate-stop manoeuvre. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or powerplant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
- (2) Instead of rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels;

$$KE = \frac{0.0443WV^2}{N}$$

Where

KE = kinetic energy per wheel (ft. lb)

W = design landing weight (lb)

and W and V are the most critical combination of weight and speed.

N = number of main wheels with brakes

The formula must be modified in case of unequal braking distribution

25.735 (i)

In addition, a flight test demonstration of the maximum kinetic energy rejected take-off shall be conducted with not more than 10% of the allowable brake wear range remaining;

25.735 (j)

For each power-operated brake system incorporating an accumulator, the flight crew must be provided with an indication that adequate accumulator pressure is available.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Note: the brakes qualification standard defined by A330/ A340 special condition S-21 provides an acceptable equivalent to the J-TSO referred to in JAR paragraphs 25.735(f) and (h) as amended by this special condition.

Acronyms and Abbreviations

WV	Weight Variant
SC	Special Condition
NLG	Nose Landing Gear
BSCU	Brake and Steering Control Unit
J-TSO	Joint Technical Standard Order

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-11-700L: PRESSURE BULKHEAD AND CARGO ACCESS DOORS – COMPLIANCE ASPECTS WITH CS 25.783

EQUIVALENT SAFETY FINDING	D-11-700L: Pressure Bulkhead and Cargo Access Doors – Compliance aspects with CS 25.783
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.21(c)(2); CS 25.783(c)(1) at amendment level 15
ISSUE:	Issue 1 dated 10th July 2018

Equivalent Safety Finding

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative all cargo aircraft under the existing A330 Type Certificate (TC).

The purpose of this special aircraft is to transport outsized cargo items on dedicated TCU (Transport Cargo Units), mainly aircraft components between the Airbus sites of its manufacturing/production locations on the main deck which has a large volume and height.

The aircraft is designed with two class E cargo compartments: The main deck cargo compartment and the underfloor Aft/Bulk cargo compartment. These two compartments are not pressurized.

The aircraft is designed with a lowered pressurized cockpit (Pilot, Copilot and Observer) extended by an adjacent courier area (provided with a maximum of four seats to carry additional flight crew members, loadmaster or other authorised occupants). Both manned pressurized decks are located just below the level of the main deck cargo compartment.

There is a Pressure Bulkhead Door (PBD) located in the right half side of the courier compartment pressure bulkhead. This door gives access from the unpressurized area aft of the pressure bulkhead into the courier compartment. Through this door flight crew members, other authorised aircraft occupants and maintenance staff get access to the flight deck and courier area.

In addition, there is a Cargo Access Door (CAD) located in the pressure ceiling panel of the courier compartment. It is located on the centreline of the aircraft, above the nose landing gear bay. The function of this door is to provide access (only while aircraft is on ground) from the courier compartment to the main deck cargo compartment located in the upper deck.

The prevention of pressurization function of the Door Control and Monitoring System (DCMS) uses the “closed and latched” signal of the PBD sensor and the “closed and latched” signal of the CAD sensor.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Only if both sensors provide “closed and latched” signals during takeoff, the DCMS will provide an “all doors closed” signal to the Cabin Pressure Control System (CPCS) and pressurization is enabled.

The fact that the PBD and CAD are only monitored by a single sensor each, means that the single-failure objective and the quantitative objective “extremely improbable” of CS 25.783(c)(1) cannot be reached.

EQUIVALENT LEVEL OF SAFETY FINDING

The CS 25.783(c)(1) requires that:

(c) Pressurisation prevention means. There must be a provision to prevent pressurisation of the aeroplane to an unsafe level if any door subject to pressurisation is not fully closed, latched, and locked.

(1) The provision must be designed to function after any single failure, or after any combination of failures not shown to be extremely improbable.

The prevention of pressurization function of the DCMS uses the “closed and latched” signal of the PBD sensor and the “closed and latched” signal of the CAD sensor.

Only if both sensors provide “closed and latched” signals during takeoff, the DCMS will provide an “all doors closed” signal to the CPCS and pressurization is enabled.

The fact that the PBD and CAD are only monitored by a single sensor each, means that the single-failure objective and the quantitative objective 'extremely improbable' of CS 25.783(c)(1) cannot be reached.

The equivalence justification below details the means and provisions (i.e. the compensating factors) that the applicant intends to use to demonstrate an equivalent level of safety with regards CS 25.783(c)(1) requirements:

- 1) The Aeroplane Flight Manual (AFM) will include a flight crew procedure to physically check the closed and latched condition of the PBD and CAD before each takeoff, and
- 2) This AFM pre-flight check will consist of visually confirming the closed position of the doors, the latched position of the door handles and the closed position of the PBD vent flap, and
- 3) In addition, the check will include a confirmation of the closed and latched position by pulling on the door in open direction.

Therefore, this pre-flight check will ensure that an unlatched door will not remain undetected before takeoff, even if the monitoring by the DCMS should be erroneous.

EASA considers that the implementation of this additional AFM pre-flight check before every flight to provide an equivalent level of safety to full and literal compliance with CS 25.783(c)(1).

Disclaimer – This document is not exhaustive and it will be updated gradually.



Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 119 of 358

Acronyms and Abbreviations

TCU	Transport Cargo Unit
PBD	Pressure Bulkhead Door
CAD	Cargo Access Door
DCMS	Door Control and Monitoring System
CPCS	Cabin Pressure Control System
AFM	Aeroplane Flight Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-15-700L: COCKPIT SLIDING WINDOWS FASTENERS– COMPLIANCE ASPECTS WITH CS 25.607(A) AND 25.607(C)

EQUIVALENT SAFETY FINDING	D-15-700L: Cockpit Sliding Windows Fasteners– Compliance aspects with CS 25.607(a) and 25.607(c)
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.21(c)(2); CS 25.607(a) and 25.607(c) at amendment level 15.
ISSUE:	Issue 3 dated 11th Jun 2019

Equivalent Safety Finding

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on December 01st 2014. The A330-700L (Beluga XL) will be certified as a derivative all cargo aircraft under the existing A330 Type Certificate (TC).

The purpose of this special aircraft is to transport outsize cargo items on dedicated TCU (Transport Cargo Units), mainly aircraft components between the Airbus sites of its manufacturing/production locations on the main deck which has a large volume and height.

The aircraft is designed with a lowered cockpit extended by an adjacent courier area. Due to the structural adaptations the lowered cockpit will accommodate three occupants (Pilot, Copilot, and Observer) instead of four as on the baseline aircraft A330-343. The A330-700L's courier area provides a maximum of four seats and is needed for operational purpose to carry an additional flight crew, loadmaster or other occupants.

As per design restrictions for such specific purpose aircraft, the only emergency exits available are the two cockpit sliding windows (CSW) for all aircraft occupants, as no passenger door from the A330-300 baseline aircraft could be retained. The CS 25.783(a)(5) requires that "Each removable bolt, screw, nut, pin, or other removable fastener must meet the locking requirements of CS 25.607". The CS 25.607(a) is requesting that each removable bolt, screw, nut, pin or other removable fastener must incorporate two separate locking devices if its loss could preclude continued flight and landing or result in reduction of aircraft control capability. The CS 25.607(c) is requesting that no self-locking nut may be used on any bolt subject to rotation in operation unless a non-friction locking device is used in addition to the self-locking device.

The baseline design of the A330-700L CSW's is based on those of the previous Airbus A300, A330 and A340 aircraft's CSW's, with the addition of a mechanism to make possible the opening of these emergency exits from the outside of the aircraft, which was already introduced in the past for some cargo only derivative configurations of these aircraft.

Disclaimer – This document is not exhaustive and it will be updated gradually.



EQUIVALENT LEVEL OF SAFETY FINDING

As per A330-700L Beluga XL derivative aircraft design restrictions, the only existing emergency exits are both cockpit sliding windows (CSW's).

Therefore, applicable CS 25.783 at amendment 15 requirements for "Fuselage Doors" applies to the CSWs, more particularly 25.783(a)(5) *"Each removable bolt, screw, nut, pin, or other removable fastener must meet the locking requirements of CS 25.607"*.

The CS 25.607 "Fasteners" requires:

In its subparagraph (a):

"(a) Each removable bolt, screw, nut, pin or other removable fastener must incorporate two separate locking devices if –

- (1) Its loss could preclude continued flight and landing within the design limitations of the aeroplane using normal pilot skill and strength; or*
- (2) Its loss could result in reduction in pitch, roll or yaw control capability or response below that required by Subpart B of this CS-25."*

And in its subparagraph (c):

"(c) No self-locking nut may be used on any bolt subject to rotation in operation unless a non-friction locking device is used in addition to the self-locking device."

The baseline design of the A330-700L CSW's is based on those of the previous Airbus A300, A330 and A340 aircraft's CSW's, with the addition of a mechanism to make possible the opening of these emergency exits from the outside of the aircraft, which was already introduced in the past for some cargo only derivative configurations of these aircraft.

The A330-700L's CSW's have a fail-safe design. The loss of any single removable fastener will not preclude aircraft continued flight and landing.

However, there are some CSW's removable fasteners with a single or with no locking device the loss of which would result in a non-capability to open the CSW. Such non-capability to open contributes to the following potentially catastrophic failure cases:

- Total loss of external visibility during takeoff or landing due to total loss of heating system and impossibility to open at least one of the two CSWs in icing condition (ice formation), and
- Loss of capability to open CSWs during Taxi in case of emergency evacuation.

In addition, the CSWs have also several fasteners which are clamping bushes or inner rings of bearings in axial direction. As long as the clamping force is maintained and the bearing works as

Disclaimer – This document is not exhaustive and it will be updated gradually.

intended, the rotation will be inside the bearing and not on the fastener. In a conservative approach, it is considered these fasteners are subject to rotation, however several of them do not have the non-friction locking device required by CS 25.607(c).

For these removable fasteners it is impractical to introduce the locking devices as required for compliance with CS 25.607(a) and (c) because of the CSW's mechanism inherent space limitations and required clearances.

The following Equivalent Level of Safety (ESF) is agreed for the A330-700L Beluga XL CSW fasteners which do not comply with CS 25.607(a) and (c) requirements:

1. The A330-700L's CSW's have a fail-safe design. The loss of any single removable fastener will not preclude aircraft continued flight and landing, and
2. A pre-flight AFM check once a day will be in place to confirm the correct CSW's capability for opening and closing from the inside. The pre-flight check shall consist of one complete opening from the inside, verifying the retaining function for the CSW in open position and the re-closure of it, and
3. Periodic maintenance checks/ instructions for continued airworthiness will be developed as necessary to ensure that the CSW's fasteners installation is kept in satisfactory condition, and
4. At time of EASA certification, there are not known reported cases of fasteners loss leading to the impossibility to open the CSW during the in service life of the A330 type, which shows a proven and mature CSW design.

Note: The AFM procedure does not involve mechanism for opening the CSW from outside, as this mechanism does not affect the capability to open the CSW from inside.

Acronyms and Abbreviations

TCU	Transport Cargo Unit
CSW	Cockpit Sliding Window
ESF	Equivalent Level of Safety Finding
AFM	Aeroplane Flight Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-16-700L: MAIN DECK CARGO DOOR VISUAL INSPECTION PROVISION AS PER CS 25.783(F)

EQUIVALENT SAFETY FINDING	D-16-700L: Main Deck Cargo Door visual inspection provision as per CS 25.783(f)
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.21(c)(2); CS 25.783(f) at amendment level 15
ISSUE:	Issue 1 dated 29th May 2019

Equivalent Safety Finding**BACKGROUND**

In the A330-700L Beluga XL aircraft, the 24 latches of the Main Deck Cargo Door (MDCD) are arranged in 11 latch chains. Each latch chain consists of 2 or 3 latches which are mechanically linked. An actuator is positioned at the beginning of each latch chain and, one latched and one unlatched sensor-target pair is positioned at the end of each latch chain. In addition, each latch chain has one visual indicator which is attached to the same shaft as the targets for the latched and unlatched sensors.

The principle for the locks, their actuation, monitoring and visual indication is identical, except that the 24 locks are arranged in 6 lock chains of 2 or 5 locks each.

The MDCD visual indicators for the latched and locked condition are not intended to be used in normal operation. They were designed with the intent to verify the condition of the latches and locks in case a remote indication of an unsafe door on the ECAM-SD Doors (ECAM Electronic Centralised Aircraft Monitoring) page remains after the closing, latching and locking operations are completed.

These MDCD visual indicators are considered non-compliant to CS 25.783(f) because they do not provide a direct, nor indirect visual inspection means of each individual latch and lock of the door.

EQUIVALENT LEVEL OF SAFETY FINDING

In the A330-700L Beluga XL aircraft, the 24 latches of the Main Deck Cargo Door (MDCD) are arranged in 11 latch chains. Each latch chain consists of 2 or 3 latches which are mechanically linked. An actuator is positioned at the beginning of each latch chain and, one latched and one unlatched sensor-target pair is positioned at the end of each latch chain. In addition, each latch chain has one visual indicator which is attached to the same shaft as the targets for the latched and unlatched sensors.

Disclaimer – This document is not exhaustive and it will be updated gradually.



The principle for the locks, their actuation, monitoring and visual indication is identical, except that the 24 locks are arranged in 6 lock chains of 2 or 5 locks each.

The MDCCD visual indicators for the latched and locked condition are not intended to be used in normal operation. They were designed with the intent to verify the condition of the latches and locks in case a remote indication of an unsafe door on the ECAM-SD Doors (ECAM Electronic Centralised Aircraft Monitoring) page remains after the closing, latching and locking operations are completed.

The CS 25.783(f) at amendment level 15 requires that:

“Visual inspection provision. Each door for which unlatching could be a hazard must have a provision for direct visual inspection to determine, without ambiguity, if the door is fully closed, latched, and locked. The provision must be permanent and discernible under operational lighting conditions, or by means of a flashlight or equivalent light source.”

Therefore these MDCCD visual indicators are considered non-compliant to CS 25.783(f) because they do not provide a direct, nor indirect visual inspection means of each individual latch and lock of the door.

The CS25 AMC associated to this requirement further clarifies its scope and intention:

“AMC to CS 25.783(f) Visual inspection provision

Each door for which unlatching could be a hazard, must have provisions for direct visual inspection to determine, without ambiguity, if the door is fully closed, latched, and locked. The provision must be permanent and discernible under operational lighting conditions or by means of a flashlight or equivalent light source.

A provision is necessary for direct visual inspection of the closed position of the door and the status of each of the latches and locks, because dispatch of an aeroplane may be permitted in some circumstances when a flight deck or other remote indication of an unsafe door remains after all door closing, latching and locking operations have been completed. Because the visual indication is used in these circumstances to determine whether to permit flight with a remote indication of an unsafe door, the visual indication should have a higher level of integrity than, and be independent of, the remote indication.

(a) The provisions should:

1) allow direct viewing of the position of the locking mechanism to show, without ambiguity, whether or not each latch is latched and each lock is locked. For doors which do not have a lock for each latch, direct viewing of the position of the latches and restraining mechanism may be necessary for determining that all the latches are latched. Indirect viewing, such as

Disclaimer – This document is not exhaustive and it will be updated gradually.



by optical devices or indicator flags, may be acceptable provided that there is no failure mode that could allow a false latched or locked indication.

2) preclude false indication of the status of the latches and locks as a result of changes in the viewing angle. The status should be obvious without the need for any deductive processes by the person making the assessment.

3) be of a robust design so that, following correct rigging, no unscheduled adjustment is required. Furthermore, the design should be resistant to unauthorised adjustment.

4) preclude mis-assembly that could result in a false latched and locked indication.

(b) If markings are used to assist the identification of the status of the latches and locks, such markings must include permanent physical features to ensure that the markings will remain accurately positioned.

(c) Although the visual means should be unambiguous in itself, placards and instructions may be necessary to interpret the status of the latches and locks.

(d) If optical devices or windows are used to view the latches and locks, it should be demonstrated that they provide a clear view and are not subject to fogging, obstruction from dislodged material or giving a false indication of the position of each latch and lock. Such optical devices and window materials should be resistant to scratching, crazing and any other damage from all materials and fluids commonly used in the operation and cleaning of aeroplanes."

In order to compensate the non-compliance to CS 25.783(f) (the available visual inspection provisions do not provide direct, nor indirect visual inspection means of each individual latch and lock of the MD CD), it is proposed that the cockpit ECAM or MD CD operator station indication of a not fully closed latched and locked MD CD shall become a NO-GO item in the MMEL. The cause for such an ECAM or operator station indication would have to be solved by a suitable maintenance action before aircraft is returned to service.

The above proposed compensation results in an equivalent level of safety, because any ECAM or operator station indication of a not fully closed latched and locked MD CD is a NO-GO item in the MMEL, and thus the visual indicators would not be used to dispatch the aircraft. Credit for aircraft dispatch under these conditions is then totally denied to these MD CD visual inspection means, which is the real purpose of these provisions as per AMC to CS 25.783(f).

In addition, no credit is taken of the visual indicators function for the MoC 3 (Safety Assessment) compliance demonstration.

Acronyms and Abbreviations

Disclaimer – This document is not exhaustive and it will be updated gradually.



MDCD	Main Deck Cargo Door
ECAM	Electronic Centralised Aircraft Monitoring
MMEL	Master Minimum Equipment List
AMC	Acceptable Means of Compliance

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-39: TYPE A+ EMERGENCY EXITS

EQUIVALENT SAFETY FINDING	D-39: Type A+ Emergency Exits
APPLICABILITY:	A330-941
REQUIREMENTS:	CS 25.807(g) amendment 23
ISSUE:	Issue 1 dated 21 st Mar 2022

Equivalent Safety Finding**BACKGROUND**

The A330-941 aeroplanes, equipped in their high-density configurations with four pairs of Type A emergency exits and in compliance with CS 25.807(g) would be eligible for a Maximum Passenger Seating Capacity (MPSC) limited to 440 passenger seats.

The increase to this MPSC is justified by introducing design and operational requirements over and above those associated with a Type A exit. The resultant emergency exit, with its associated additional operational requirements, has for working purposes been given the term "Type A+".

EASA is prepared to grant an ESF for 25.807(g), allowing a maximum number of 120 passenger seats for each pair of Type A+ emergency exits, provided compliance with the requirements reported in the following.

Equivalent Safety Finding

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

(a) The Type A+ emergency exit shall meet all the requirements applicable to Type A emergency exits included in CS 25.807, 25.809, 25.810, 25.811, 25.812 and 25.813 amdt. 23, and all relevant Special Conditions and Equivalent Safety Findings as per the applicable type certification basis.

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

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

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

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

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

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

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

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

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

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

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

A330 specific cabin interior limitations associated with the installation of Type A+ emergency exits

A) The following limitations have been established for A330-941 aeroplanes based on the similarity analysis with the cabin layout configuration successfully tested by Airbus on 22 April 2018 in order to demonstrate compliance with requirement (2)(d) above for the A350-900/-1000 with Type A+ emergency exits. Except if otherwise noted, the limitations apply regardless of the number of Type A+ exit pairs included in the cabin exit arrangement.

1) Any change to the A330 type design definition specified in the similarity analysis affecting the following items shall be discussed and agreed with EASA:

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

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

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

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

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

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

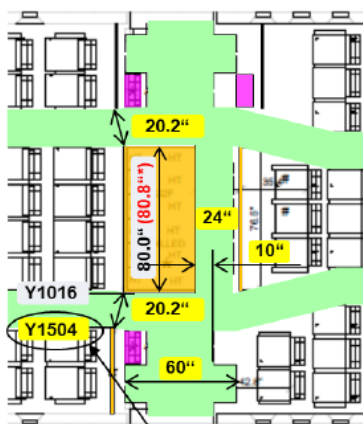
Door	Position of the monument/partition	Minimum distance of lateral monument from centerline (Y-dimension)"	Max center monument width
D1	Aft of the cross aisle	1210 mm	53,5" (monument) with the possibility to have ancillary equipment (e.g. literature pockets, etc.) provided that the total width is not exceeding 55,3"
D2 (option 1)	Forward of the cross aisle	1504 mm	80" (monument) with the possibility to have a bumper on each side of the monument at no more of 25" from the floor provided that the total width is not exceeding 80,8"
	Aft of the cross aisle	N/A	76,6" (monument)
D2 (option 2)	Forward of the cross aisle	1268 mm	53,5" (monument) with the possibility to have ancillary equipment (e.g. literature pockets, etc.) provided that the total width is not exceeding 59,9"

Disclaimer – This document is not exhaustive and it will be updated gradually.

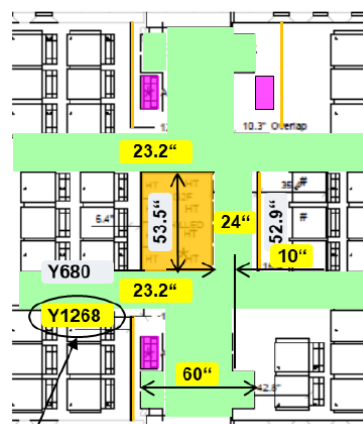
	Aft of the cross aisle	N/A	52,9" (monument)
D3	Forward of the cross aisle	1268 mm	57" (monument) with the possibility to have ancillary equipment (e.g. literature pockets, etc.) provided that the total width is not exceeding 59,8"
D4 (option 1)	Forward of the cross aisle	1214 mm	53,5" (monument) with the possibility to have ancillary equipment (e.g. literature pockets, etc.) provided that the total width is not exceeding 55,7"
D4 (option 2)	Forward of the cross aisle	N/A	57" (monument)



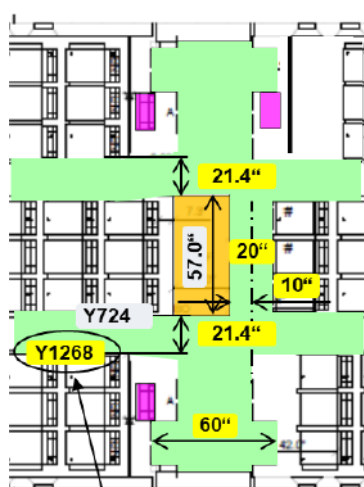
D1



D2 Option 1



D2 Option 2



D3



D4 Option 1



D4 Option 2

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

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

B) EASA has determined criteria that Airbus will have to meet when developing evacuation analysis that will support the delivery of A330 cabin layouts equipped with Type A+ emergency exits. The proposed criteria are reported below:

1) Pax number increase of max. +10 above a tested configuration-loading are acceptable only after appropriate justification (e.g. 190 vs. 180 pax seats in the mid cabin zone) and only in a direct neighbouring zone.

Rationale: The overall evacuation time reached at e.g. D3 in the A350 Full Scale Evacuation Tests was close to the max. time limit of 90 seconds. For this reason, an increase of pax-seats in the adjacent cabin areas principally has the potential to compromise a successful evacuation process in the required time frame.

2) Suitable baseline cabin configurations with A-A-A-A exit arrangement should be provided as starting point for all configurations introducing A+ Exits.

Rationale: an exit arrangement with Type A+ Exits can be introduced only after an acceptable baseline configuration is established making use of Type A emergency exits only.

3) A seat-number increase with respect to the baseline cabin configurations (identified under criterion 2)) is considered acceptable only in cabin zones where a Type A+ Exit is provided.

Rationale: Dedicated use of the performance-improving properties of Type A+ Exits shall be made primarily in high density seating zones, not in areas where e.g. the provision of a third CAS (as part of the A+ package) would be possible more easily or less space-consuming.

4) Exit arrangements with one pair of Type A+ emergency exits are allowed with the Type A+ exit pair at D3 or at D2, provided that it is adjacent to the cabin zone with the highest density. Other locations may be accepted only with a sufficiently conservative reduction of the maximum seating capacity of the aircraft.

Rationale: An increase in seating capacity beyond the currently approved 440 pax MPSC is allowed only if the Type A+ emergency exits are introduced in high density seating zones and in locations in which their performance is maximized, i.e. in mid-of-cabin exits.

5) Exit arrangements with two pairs of Type A+ emergency exits are allowed only with the Type A+ exit pairs at D2 and D3. Other locations may be accepted only with a sufficiently conservative reduction of the maximum seating capacity of the aircraft.

Rationale: An increase in seating capacity beyond the currently approved 440 pax MPSC is allowed only if the Type A+ emergency exits are introduced in high density seating zones and in locations in which their performance is maximized, i.e. in mid-of-cabin exits.

Disclaimer – This document is not exhaustive and it will be updated gradually.

- 6) Exit arrangements with three pairs of Type A+ emergency exits are allowed only with the Type A+ exit pairs at D2, D3 and D4. Other locations may be accepted only with a sufficiently conservative reduction of the maximum seating capacity of the aircraft.

Rationale: An increase in seating capacity beyond the currently approved 440 pax MPSC is allowed only if the Type A+ emergency exits are introduced in high density seating zones and in locations in which their performance is maximized, i.e. in mid-of-cabin exits.

**A330 specific cabin crew training content associated with the installation of
Type A+ emergency exits**

The training of cabin crew members involved in the operation of A330 aeroplanes equipped with Type A+ emergency exits shall include a Crowd Control training module.

Disclaimer – This document is not exhaustive and it will be updated gradually.



D-50/700L/AIS: AIRBUS A330-700L NEW BELUGA COURIER AREA STC

SPECIAL CONDITION	D-50/700L/AIS: Airbus A330-700L New Beluga Courier Area STC
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B; CS 25.773(a); CS 25.785(j); CS 25.791; CS 25.813(e); CS 25.815; CS 25.851(a); CS 25.853(g); CS 25.854(a); CS 25.857 (e); CS 25.1439; CS 25.1541; CS 25.1581 and CS 25.1583 at amendment level 15
ISSUE:	Issue 1 dated 04th February 2019

Special Condition

BACKGROUND

Airbus has applied to EASA for the A330-700L (Beluga XL) certification on 01st December 2014. The A330-700L (Beluga XL) will be certified as a derivative aircraft under the existing A330 Type Certificate (TC).

The Airbus application for the derivative aircraft was complemented by an Airbus Interiors Services' Supplemental Type Certificate (STC) application effective 28th May 2015 aimed to provide a courier area between the aircraft cockpit and the pressurized bulkhead.

The A330-700L derivative cargo aircraft is provided with a class E main deck cargo compartment, a class E AFT/Bulk lower deck cargo compartment and an entry area in the former FWD lower deck cargo compartment. These compartments are unpressurised.

The A330-700L derivative cargo aircraft is designed with a lowered cockpit which is extended by the AIS' STC courier area. Due to the structural adaptations the lowered cockpit will accommodate three occupants (Pilot, Co-Pilot, and Observer) instead of four as on the cockpit of the A330 baseline aircraft.

The AIS' STC courier area provides a maximum of four seats able to be occupied during taxi, take-off and landing (TTOL) and is needed for operational purpose to provide transportation means and workplace for special kind of allowed occupants such as additional flight crew, loadmaster, etc.

In addition, the A330-700L courier area is equipped with one lavatory as well as with a galley and stowage compartments.

The A330 baseline aircraft's cockpit door and its means of control are removed. At the location of the former cockpit door a curtain will be installed between the cockpit and the courier area. The emergency exits are the two cockpit sliding windows for all aircraft occupants.

Disclaimer – This document is not exhaustive and it will be updated gradually.



In the frame of the Airbus A330-700L Beluga XL derivative aircraft certification process:

- A Special Condition D-02-700L “Courier Area: Allowed occupants” was issued (closed at issue 2) to define the categories of occupants (non-passengers) allowed on such a cargo aircraft with a class E cargo compartment, and
- A Special Condition D-03-700L “Emergency Evacuation” was also issued (closed at issue 3) to define the applicable airworthiness requirements for the emergency evacuation design features and capabilities, imposed by the aircraft specific design features: the only available emergency exits are the two cockpit sliding windows.

These two airworthiness requirements (SC’s D-02-700L and D-03-700L) are part of the A330-700L derivative certification basis and as top requirements at aircraft global level are applicable also to the AIS’ STC installation on those aspects that may have a direct impact on the design features of the courier area and in its interfaces with the derivative aircraft configuration.

In addition to these top level derivative aircraft airworthiness requirements, an STC specific Special Condition and associated Acceptable Means of Compliance D-50-700L-AIS is required to define suitable airworthiness requirements applicable to the AIS STC courier area arrangement and design features, considering that the A330-700L will be a low occupancy aeroplane (an overall seating capacity far less than 19 seats).

The requirements introduced by this SC/AMC D-50-700L-AIS are based on those of Appendix S content for low occupancy aeroplanes, as introduced on CS25 amendment 19.

SPECIAL CONDITION

GEN-1) General – Applicability: This special condition and associated acceptable means of compliance are applicable to the A330-700L derivative’s courier area as per AIS proposed STC configuration.

GEN-2) General – Number and categories of allowed courier area occupants: no more than 4 persons (subject to the number of approved seats) as per limitations and conditions of EASA special condition D-02-700L items 1) from a) to e). This shall be properly documented in the aircraft AFM.

GEN-3) General – Conditions and limitations on courier area occupants: as per limitations and conditions of EASA special condition D-02-700L items 2) from a) to g). Applicable limitations and content shall be properly documented in the aircraft AFM.

In addition, the courier area design features and arrangement must satisfy the following D-50-700L-AIS specific requirements:

Disclaimer – This document is not exhaustive and it will be updated gradually.



S.25.10 General Cabin Arrangement:

- a) *Interior Doors:* No interior door shall be installed between any courier area seat that is occupiable for take-off and landing and the two aircraft emergency exits (the Cockpit Sliding Windows CSW's) in the cockpit. Compliance with EASA Special Condition D-03-700L "Emergency Evacuation" requirement 8) (CS 25.813(e)) must be demonstrated also for the courier area.
- b) *Interior Curtains:*
- 1) It is allowed to install a divider curtain separating the cockpit from the courier area provided it allows free access on both ways between both compartments, and
 - 2) The EASA Special Condition D-03-700L "Emergency Evacuation" requirement 7) apply also to the courier area, concerning AFM content (normal procedure for dimmed illumination during TTOL phases; curtain open or closed position during TTOL phases, forced landing or unplanned ditching). Compatibility of the design solution and the AFM procedure with the CS/JAR 25.773(a)(2) requirements (pilot compartment must be free of glare and reflection) will need to be substantiated
- c) *Courier Area as Isolated Compartment (See AMC S.25.10.a and b):*
- 1) The courier area compartment must be equipped with a smoke/fire detection system which allows detection within one minute after the start of a fire in the courier area compartment. This fire /smoke detection system must provide a warning light indication in the cockpit and in addition, a visual indication and audible warning in the courier area that should be readily detected by any courier area occupant, and
 - 2) A smoke / fire detection system compliant with CS 25.854a) must be provided in the courier area lavatory, which shall provide a warning light indication in the cockpit and in addition, a visual indication and audible warning in the courier area that should be readily detected by any occupant, and
 - 3) Design provisions must be available to avoid the entry of hazardous quantities of smoke, flames or extinguishing agent into the cockpit in case of fire or smoke in the courier area, considering all divider curtain positions. Flight tests in accordance with CS 25.855h) and i) and CS 25.857b) must be conducted to show compliance with these provisions, and
 - 4) 4. Protective breathing equipment as per CS 25.1439 must be installed for use of crew members or appropriate occupants for fighting fires in all courier areas accessible in flight.

S.25.30 Emergency exit access and circulation inside cabin during flight:

- a) There must be unobstructed access from every courier area seating position as well as from the door of the lavatory to the entry of the pilot compartment.
- b) Passageways must be unobstructed.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- c) *Width of aisle*: the design must be such that the dimensional requirements of CS 25.815 can be achieved during all flight phases.
- d) *Firm handholds*: in lieu of the requirements of CS 25.785(j), if the courier area seat backs do not provide a firm handhold, there must be acceptable means to enable persons to steady themselves while using the aisles in moderately rough air (See AMC to S.25.30d).

S.25.40 Markings and Placards. Seating locations available only for flight use:

- a) *No Smoking' Placards and Lavatory Ashtrays*: if smoking is to be prohibited, in lieu of the requirements of CS 25.791(a) and CS 25.791(d), a reduced number of 'No smoking' placards may be provided and lavatory ashtrays do not need to be provided in accordance with the following:
 - 1) A 'No smoking' placard must be conspicuously located inside the courier area compartment in the immediate vicinity of each door that can be used as a boarding door. Each placard must be clearly legible for occupants entering the aeroplane, and
 - 2) Compliance with CS 25.853(g) is not required; and
 - 3) The indication that smoking is prohibited must be the subject of an occupant briefing, and the requirement for this briefing must be part of the AFM
- b) *Briefing Card Placard*: the instructions required by CS 25.1541 for properly setting the cabin in its configuration approved for taxiing, take-off, and landing must be part of the briefing provided by the flight crew to the allowed occupants before the flight starts and the content of this pre-flight briefing properly documented (FCOM for example). If in addition to this briefing delivered by the flight crew, supporting placards referring to briefing cards are provided then (See AMC to S.25.40(b)):
 - 1) The detailed minimum instructions to be included in the briefing card must be part of the type design and referred to in the 'Limitations' section of the AFM; and
 - 2) The briefing card must be easily accessible from each occupant seat. A dedicated stowage must be provided to stow the briefing card within easy reach of each seated occupant with their seat belts fastened
- c) *Seating locations available for in-flight use only*: For each seating location available for in-flight use only (including in-flight-only seats, beds, berths, and divans), a placard indicating that the location is not to be occupied during taxiing, take-off, and landing must be installed such that the placard is legible to the seated occupant.

Acronyms and Abbreviations

AIS	Airbus Interiors Services
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



STC	Supplemental Type Certificate
FWD	Forward
TTOL	Taxi, Take-off and Landing
SC	Special Condition
AMC	Acceptable Means of Compliance
CSW	Cockpit Sliding Window
AFM	Aeroplane Flight Manual
FCOM	Flight Crew Operating Manual

E-02: WARNING MEANS FOR ROLLS ROYCE ENGINE FUEL FILTERS

Equivalent Safety Finding	E-02: Warning Means for Rolls Royce Engine Fuel Filters
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1305 (c) (6), 25.997 (d)
ISSUE:	Issue 1 dated 06 Sep. 2016

Equivalent Safety Finding

BACKGROUND

The engine fuel filtration system of the Rolls Royce Trent 7000 equipped Airbus Model A330-800/900 aircraft incorporates a two filters system. A small-micron main filter (LP fuel filter), with a bypass, is located between the fuel tank outlet and the inlet of the engine pump. Impending bypass of the LP filter is indicated on the aeroplane flight deck display system by an amber caution message and an audible chime. A large micron secondary filter (HP fuel filter), located between the fuel flowmeter and the combustor, has no bypass means, and no indication to the flight crew of excessive pressure drop across the filter stage. The fuel filtration system does not directly comply with the provisions of CS 25.1305(c)(6) section at Amendment 4.

CS 25.1305(c)(6) requires "An indicator for the fuel strainer or filter required by CS 25.997, to indicate the occurrence of contamination of the strainer or filter before it reaches the capacity established in accordance with CS 25.997(d)." No such indicator for the HP fuel filter is present on the proposed two fuel filters system of Rolls Royce Trent 7000 equipped Airbus Model A330-800/900.

On turbine-engine powered transport aeroplanes, a warning of a contaminated fuel filter or strainer is required by CS 1305(c)(6) so that the pilot will receive warning of an impending fuel flow and pressure loss condition. The contaminated filter warning is intended to be an advanced warning of possible engine failure, which allows the pilot to take appropriate action before the engine must be shut down due to low fuel pressure.

EQUIVALENT SAFETY FINDING

The engine fuel filtration system of the Rolls Royce Trent 7000 equipped Airbus Model A330-800/900 aircraft incorporates a two filters system. A small-micron main filter (LP fuel filter), with a

Disclaimer – This document is not exhaustive and it will be updated gradually.



bypass, is located between the fuel tank outlet and the inlet of the engine pump. A large micron secondary filter (HP fuel filter) is located between the fuel flowmeter and the combustor, with no bypass means.

CS / FAR 25.1305(c)(6) requires an indicator for the fuel strainer or filter required by § 25.997, to indicate the occurrence of contamination of the strainer or filter before it reaches the capacity established in accordance with 25.997(d).

CS / FAR 25.997 requires a fuel strainer or filter between the fuel tank outlet and the inlet of either the fuel metering device or an engine driven positive displacement pump, whichever is the nearer of the fuel tank outlet.

Airbus considers the Rolls-Royce Trent 7000 LP fuel filter is the filter required per CS / FAR 25.997. As such, this filter fully complies with CS / FAR 25.1305(c)(6) requirements. It has a 95% efficiency at 10 microns and 100% efficiency at 40 microns. It is the primary source of protection from debris residing in the supply fuel / wing fuel system. Its bypass valve setting is 25psid, with its impending blockage alert set at 8psid. The impending blockage alert is an amber ECAM caution with an audible chime

The HP fuel filter has been introduced to improve safety levels by protecting the engine fuel burners from debris (as required by CS-E 560), which may be generated downstream of the LP filter (as a result of a pump mechanical failure or degradation) within a given engine. The filter is sized at 250 microns, to arrest particles that may block the burners and are of much greater size than those considered for the LP filter. Blockage of the fuel burners may lead to an inadequate distribution of the fuel flow into the combustor and possibly result in a casing burn through. Airbus considers that the HP filter is not strictly required by CS / FAR 25.997, and as such has not to comply with the provisions of CS / FAR 25.1305(c)(6).

Airbus consider the dual filtering system as designed for the Rolls-Royce Trent 700 provides an increased level of safety compared to a single filtering system that could be shown to be literally compliant to CS / FAR 25.997 and CS / FAR 25.1305(c)(6) even if the HP filter is not fitted with an impending blockage indication.

The following compensating factors are used to substantiate an equivalent level of safety compared to a direct compliance to CS / FAR 25.997 and CS / FAR 25.1305(c)(6):

- o The impending bypass of the main LP fuel filter is indicated by an amber warning on ECAM E/WD and by a CLOG indication on ECAM ENGINE SD:
 - o FUEL FILTER PARTLY CLOG: dispatch allowed for limited duration without maintenance action. Displayed on ground only.
- o When the LP fuel filter is bypassed, an amber warning is raised on ECAM E/WD and a BYPASS indication is shown on ECAM ENGINE SD:
 - o FUEL FILTER BYPASS: NO GO. Crew is requested not to cross-feed fuel if the alert is displayed in flight.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- Even though the HP fuel filter does not have an indication of clogging, it is considered that this filter improves the minimum safety level warranted by the literal compliance with § 25.1305(c)(6). Blockage of this filter may occur due to a contamination of the engine fuel system itself and lead at worst to a complete single engine thrust loss. The same type of contamination in the engine fuel system not equipped with such a filter but fully compliant with § 25.997 would result in an engine casing burn through which is considered to have more adverse consequences on the aircraft than a single engine thrust loss.
- Tests performed for Engine type certification, as part of demonstration of compliance with CS E-560 & E-670, shall show that even in case of LP filter bypass operation, the HP filter is not susceptible to blockage. In-service experience of the Rolls-Royce RB211 engines (which include the Trent family and exceed 100 million engine operating hours) confirm that the HP filter is not susceptible to blockage under normal engine operation.
- The maintenance procedure associated with a blocked LP filter includes checking of the HP filter.

Acronyms and Abbreviations

ECAM	Electronic Centralized Aircraft Monitoring
HP	High Pressure
LP	Low Pressure

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-03: FAN COWL RETENTION

SPECIAL CONDITION	E-03: Fan Cowl Retention
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1193
ISSUE:	Issue 1 dated 06 Sep. 2016

Special Condition

BACKGROUND

In-service experience has shown a number of events of partial and complete fan cowl loss and separation from the aircraft. Most of the time, it has been possible to trace the initiating factors of the cowl separation as being a maintenance error, generally resulting from failure of maintenance crew to properly close the fan cowl latches.

Flight crews were not able to or did not detect this situation during their pre-flight walk-around, resulting in the cowl being liberated due to air scooping during the subsequent take-off run or during climb.

Such events are not unique to a single Airbus family type of aircraft: similar records exist on other aircraft types and models, including other manufacturers.

The FAA in the past issued NPRM 89-25 proposing the introduction of cowl latch retention requirements, including cockpit indications for unclosed latches. The final rule was however never published.

Considering the adverse in-service experience and the potential consequences associated with fan cowl separation, EASA made the determination the most appropriate course of action was to introduce a Special Condition, as per the provision of 21A.16B (a) 3, introducing specific requirements for fan cowl retention.

SPECIAL CONDITION

Add to CS 25.1193 the following material (e) (4)

(e) Each aeroplane must--

* * * * *

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

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (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 departure.

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 cowlings have shown a satisfactory in-service experience and are not intended to be addressed under the requirements of this special condition.

Acronyms and Abbreviations

CDL	Configuration Deviation List
MMEL	Master Minimum Equipment List

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-05: THRUST REVERSER TESTING

Equivalent Safety Finding	E-05: Thrust Reverser Testing
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.934, CS-E 890
ISSUE:	Issue 1 dated 28 Apr. 2016

Equivalent Safety Finding

BACKGROUND

The A330-800/-900 design, equipped with Rolls-Royce Trent 7000 engines, includes thrust reversers.

Airbus shall demonstrate compliance with the requirements for thrust reverser testing as per CS 25.934, which requires that the “thrust reversers installed on turbo-jet engines must meet the requirements of CS-E 890”.

CS-E 890 (b) requires that "The thrust reverser shall be fitted to the engine for the whole of the Endurance Test of CS-E 740 and a representative control system shall be used".

The engine manufacturer, however, does not intend to install the A330-800, A330-900 thrust reverser unit during their Engine type certification 150h Endurance test requested by CS-E 890, but will use slave C-ducts. Similar situations have occurred on other large transport aircraft, usually resulting from the thrust reverser being an airframe part not supplied by the engine manufacturer.

EQUIVALENT SAFETY FINDING

The Airbus A330-800/-900 engines is equipped with Thrust Reversers intended for ground use only. Airbus shall therefore demonstrate compliance with CS 25.934, requesting “thrust reversers installed on turbo-jet engines [to] meet the requirements of CS-E 890”.

CS-E 890(b) requests that the thrust reverser be fitted to the Engine for the whole of the Endurance test of CS-E 740.

Strict compliance with CS-E 890(b) requirements is however not be demonstrated for the A330-800/-900. Indeed, slave C-ducts instead of the real A330-800/-900 thrust reverser are used for the engine CS-E 740 endurance certification test. The intent for this test is indeed to have as much flexibility as possible to adapt the nozzle size and thus reach the engine redlines (LP, IP and HP shaft rotational speeds + TGT).

For effects of the stowed thrust reverser on the engine, the consequences of not installing an actual thrust reverser unit during the CS-E740 test are addressed at CS-E certification level.

For the effects of the engine on the stowed thrust reverser, for CS 25.934 compliance, Airbus consider that the compensating factors described herebelow are supporting an Equivalent Safety Finding:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 150 hours of forward thrust running is not significantly loading the Thrust Reverser
- The Thrust Reverser structure is designed for significantly greater life cycle and significantly higher loads (such as Fan Blade-Out event and in-flight limit manoeuvres)
- Durability of the Thrust Reverser components is not significantly exposed during the 150h forward running and the CS-E 890(c) reverse cycles which are performed for the A330-800/-900 certification are more constraining for this aspect.

Acronyms and Abbreviations

LP, IP, HP	Low Pressure, Intermediate Pressure, High Pressure
TGT	Turbine Gas Temperature

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-2: UNDERFLOOR CREW REST COMPARTMENT

SPECIAL CONDITION	E-2: Underfloor crew rest compartment
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.819, 25.812, 25.853, 25.855
ISSUE:	2 dated 05/02/1993

Special Condition**BACKGROUND**

Airbus Industrie will be offering in option the possibility to install under the cabin floor in the aft cargo hold a crew rest compartment. This crew rest compartment will be enclosed in a removable container, with necessary access to the cabin. It will be occupied by a maximum of 7 crew members and is for in flight use only.

The proposed installation of an underfloor crew compartment is a novel and unusual design feature and the regulation incorporated in the Type Certification Basis do not provide standards for this type of installation. A special condition is therefore necessary to define adequate certification requirements. JAR 25.819 applies to lower deck service compartments occupied during taxi and flight and while not directly related to the issue, will be used as a guideline for the Special Condition.

SPECIAL CONDITION**Lower Deck Underfloor Crew Rest Compartement**

- 1- Occupancy is limited to the number of seats and/or berths installed in the crew rest compartment and is not permitted during taxi, take-off or landing. Smoking is not permitted in the compartment.
Appropriate placards must be installed to indicate these restrictions.
- 2- There must be a stairway between the cabin floor and the crew rest compartment and there must be an alternate evacuation route for occupants of the crew rest compartment. The hatch of the alternate evacuation route must be openable from the passenger cabin. The stairway and the alternate evacuation route must have sufficient separation within the compartment. They must provide for evacuation of an incapacitated person, with assistance, from the crew rest compartment to the cabin floor, must not be dependent on any powered device, and must be designed to minimize the possibility of blockage which might result from fire, mechanical or structural failure. The procedure for carriage of an uncapacitated person from the crew rest compartment to the cabin floor must be established.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 3- In the event the aeroplane's main power system should fail, emergency illumination of the crew rest compartment must be automatically provided. Unless two independent sources of normal lighting are provided, the emergency illumination of the crew rest compartment must be automatically provided if the crew rest compartment normal lighting system should fail. The illumination level must be sufficient for the occupants of the crew rest compartment to locate and climb to the cabin floor by means of the stairway and/or the alternate evacuation route, and to read any required operating instructions.
- 4- There must be means for two-way voice communication between crewmembers in the cockpit and occupants of the crew rest compartment, and at least one cabin attendant seat in the passenger cabin and occupants of the crew rest compartment. The means provided must be useable should the normal electrical power system fail.
- 5- There must also be either public address speaker(s), or other means of alerting the occupants of the crew rest compartment of an emergency situation, installed in the crew rest compartment.
- 6- There must be a means, readily detectable by occupants of the crew rest compartment that indicates when belts should be fastened. In addition, a placard must be installed on each berth, requiring that belts must be fastened when lying down on the berth.
- 7- For each occupant permitted in the crew rest compartment, there must be an approved seat or berth that must be able to withstand the maximum flight loads when occupied.
- 8- The following equipment must be provided in the compartment:
 - a) At least one approved fire extinguisher appropriate to the kinds of fires likely to occur.
 - b) One protective breathing equipment, approved to TSO-C116 or equivalent, suitable for fire-fighting.
 - c) One flashlight
- 9- A smoke detection system that meets the requirements of JAR 25.858 must be provided. It must annunciate in the flight deck and be audible in the crew rest compartment. If waste container(s) is installed, it must meet the requirements of JAR 25.853(e).
- 10- A supplemental oxygen system equivalent to that provided for passengers must be provided for each seat and berth.
- 11- The outside walls of the container in which the crew rest compartment is enclosed including any interface item between the container and the aeroplane structure and systems must meet the applicable requirements of JAR 25.855.
- 12- Means must be provided so that the fire protection level of the cargo hold meets the applicable requirements of JAR 25.855 when the container is not installed.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 13- Means must be provided to suppress a fire in the crew rest compartment when unoccupied from the passenger cabin without having to enter the compartment. No hazardous quantities of smoke, flames, or extinguishing agents may enter any compartment occupied by the crew or passengers. The quantity of extinguishing agent shall be adequate for the remaining of the flight.
- 14- There must be an aural warning alerting the occupants of the crew rest compartment of a decompression. It must be activated simultaneously with the corresponding cockpit warning. The warning must sound continuously until a reset button in the crew rest compartment is depressed, unless it can be shown that a time limited warning is adequate.
- 15- If there is low head room at or near the evacuation routes, provisions must be taken to prevent or to absorb head strikes.
- 16- Mattresses used in the crew rest compartment must comply with JAR 25.853(b) and (c).
- 17- It must be shown by actual demonstration that the maximum allowed number of crew rest occupants can easily evacuate the crew rest compartment using the main access route. This demonstration must also be performed using the alternate evacuation route.
- 18- Crew members must be trained in the use of the evacuation routes and in the use of the fire suppression procedures. Fire suppression procedures must be approved.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
TSO	Technical Standard Order

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-5.1: LOWER DECK LAVATORIES COMPARTMENT

SPECIAL CONDITION	E-5.1: 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)
ISSUE:	9 dated 13/11/2003

Special Condition**BACKGROUND**

The installation of a Lower Deck Lavatory Compartment is a novel and unusual design feature and the regulation incorporated in the Type Certification Basis do not provide adequate standards for this type of installation. A special condition is therefore necessary to define adequate certification requirements and to establish a level of safety equivalent to that established by the airworthiness standards for transport category aeroplanes.

SPECIAL CONDITION**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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 aeroplane 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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
TSO	Technical Standard Order

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-8.1: LOWER DECK STOWAGE AREA

SPECIAL CONDITION	E-8.1: Lower Deck Stowage Area (Installed in combination with a Lower Deck Lavatories Compartment)
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.819, 25.853, 25.855, 25.857, 25.858
ISSUE:	4 dated 30/08/2000

Special Condition**BACKGROUND**

The installation of a Lower Deck Stowage area is a novel and unusual design feature and the regulation incorporated in the Type Certification Basis do not provide adequate standards for this type of installation. A special condition is therefore necessary to define adequate certification requirements and to establish a level of safety equivalent to that established by the airworthiness standards for transport category aeroplanes.

SPECIAL CONDITION**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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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)

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 detectable 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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 mentioned access provisions (e.g. standard galley containers), those portions of the stowage area not directly accessible from the entrance must comply with the fire containment 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).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-10: FIRE EXTINGUISHING AGENT CONCENTRATION

Equivalent Safety Finding	E-10: Fire Extinguishing Agent Concentration
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1195 (c)
ISSUE:	Issue 1 dated 27 Jan. 2016

Equivalent Safety Finding

BACKGROUND

CS 25.1195(c) requires that a nacelle fire extinguishing system be able to simultaneously protect each zone of the nacelle for which protection is provided. Associated Interpretative Material is giving information on the required agent concentration to be maintained as well as the required presence time of this concentration (see AMC 25.1195 (b) that calls AC 20 100).

The Rolls-Royce Trent 7000 engine that is installed on the A330-800/900 features two Designated Fire Zones (DFZ). Each DFZ is physically separated from the other by firewalls (CS 25.1191).

For this engine, fire extinguishing protection is provided for both DFZ. This protection is simultaneous in the sense that extinguishing agent will flow to each DFZ as a result of the same unique action. However the extinguishing system is constructed so that the required minimum agent concentration may not be present during 0.5s (as indicated in the AC 20-100) across all areas of all DFZ. The 0.5 s criterion will be met in each DFZ separately.

EQUIVALENT SAFETY FINDING

The engine fire extinguishing system as defined for the A330-800/900 meets the intent of CS 25.1195(c) and provides the necessary level of safety based on the compensating factors detailed hereafter.

1. There is a unique agent discharge action that ensures flowing of the agent towards both nacelles zones.

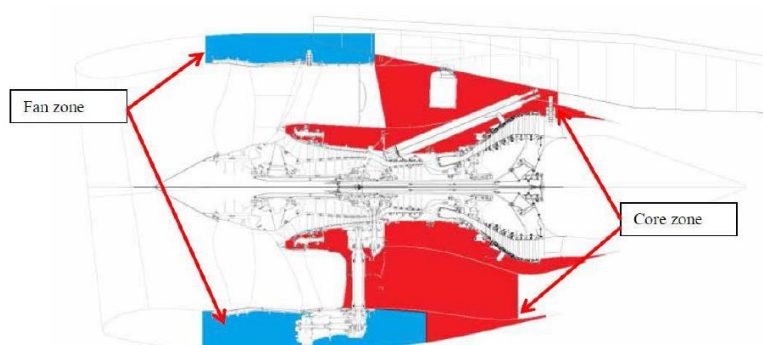
The extinguishing agent distribution system is designed to transport the agent from the storage bottles to each zone with a single pipe work that splits into several branches feeding each of the fire zones (Fan compartment, Core compartment). Once the discharge command is set, the total content of the storage bottle is expelled from the bottle into the pipe and flows towards each zone without any need for further system operation. The time taken by the agent to reach each zone is dependent upon the pipe length to reach this zone.

2. Each DFZ, individually considered, has all its portions simultaneously protected as per the AC 20-100 0.5s minimum agent concentration presence time criterion.
3. The DFZ is separated by firewall constructions demonstrated compliant to CS 25.1191(b) ensuring no hazardous quantity of fluid, air or flame can pass from the compartment to other zone.

The two Trent 7000 Designated Fire Zones are shown on the figure below.

Disclaimer – This document is not exhaustive and it will be updated gradually.





The fan compartment and core compartment are adjacent zones.

The compliance exercise with § 25.1191(b) includes tests:

- Component fire tests to show that no fires penetrate across the separations between the zones.
 - Complete propulsion system ground static and flight drainage tests to show that no hazardous quantities of flammable fluid can pass from one compartment to the other.
 - An acceptable pass-fail criterion for the drainage tests is that cross-contamination between different zones is limited to isolated droplets (fluid dribbles) and limited continuous thin lines of fluid (fluid trickles); continuous fluid path from a fire zone to the other is not acceptable.
4. Maintenance instructions is defined and provided to the operators, as part of the Instructions for Continued Airworthiness (ICA), with the objective to ensure that the firewall integrity is maintained throughout the operational life of the nacelle.

Maintenance programs established for the propulsion system through the MSG-3 method include dedicated inspections for fire seals and fire protection features. They are clearly identified in the MRBR.

Acronyms and Abbreviations

DFZ	Designated Fire Zones
MSG	Maintenance Steering Group
ICA	Instructions for Continued Airworthiness
MRBR	Maintenance Review Board Report

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-11: BULK CREW REST COMPARTMENT

SPECIAL CONDITION	E-11: Bulk Crew Rest Compartment
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.819, 25.812, 25.853, 25.855
ISSUE:	2 dated 31/02/2002

Special Condition**BACKGROUND**

Airbus Industrie will be offering in option the possibility to install under the cabin floor in the aft cargo hold a bulk crew rest compartment. This crew rest compartment will be installed in the bulk area with necessary access to the cabin. It will provide for a maximum of 12 crew berth. Alternatively a configuration of up to 8 cabin crew berth plus 2 flight crew berth may be installed in zones separated by a door. The Bulk Crew Rest Compartment (BCRC) is for in flight use only.

The proposed installation of an underfloor crew rest compartment is a novel and unusual design feature and JAR 25 does not provide standards for this type of installation.

A special condition is therefore necessary to define adequate certification requirements.

SPECIAL CONDITION

- 1) Occupancy is limited to the number of seats and/or berths installed in the crew rest compartment and is not permitted during taxi, take-off or landing. Smoking is not permitted in the compartment. Appropriate placards must be installed to indicate these restrictions.
- 2) There must be a primary access from the crew rest compartment to the main deck and there must be an alternate evacuation route for occupants of the crew rest compartment. The hatch of the alternate evacuation route must be openable from the passenger cabin. It must also be openable from the crew rest, when a person or fully loaded trolley is standing on the hatch on the main deck.

The primary and the alternate evacuation route must have sufficient separation within the compartment, and allow for occupants, wherever they may be in the compartment, to have access to both exits by two separate evacuation routes. Both evacuation routes must provide for evacuation of an incapacitated person, with assistance, from the crew rest compartment to the cabin floor, must not be dependent on any powered device, and must be designed to minimize the possibility of blockage which might result from fire, mechanical or structural failure. The procedure for carriage of an incapacitated person from the crew rest compartment to the cabin floor must be established.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 3) In the event the aeroplane's main power system should fail, emergency illumination of the crew rest compartment must be automatically provided. Unless two independent sources of normal lighting are provided, the emergency illumination of the crew rest compartment must be automatically provided if the crew rest compartment normal lighting system should fail. The illumination level must be sufficient for the occupants of the crew rest compartment to locate and climb to the cabin floor by means of the ladder and/or the alternate evacuation route, and to read any required operating instructions.
- 4) There must be means for two-way voice communication between crew members in the cockpit and occupants of the crew rest compartment, and at least one cabin attendant seat in the passenger cabin and occupants of the crew rest compartment. The means provided must be useable should the normal electrical power system fail.
- 5) There must also be either public address speaker(s), or other means of alerting the occupants in any part of the crew rest compartment of an emergency situation, installed in the crew rest compartment.
- 6) There must be a means, readily detectable by occupants of the crew rest compartment that indicates when belts should be fastened. In addition, a placard must be installed on each berth, requiring that belts must be fastened when lying down on the berth.
- 7) For each occupant permitted in the crew rest compartment, there must be an approved seat or berth that must be able to withstand the maximum flight loads when occupied.
- 8) The following equipment must be provided in each compartment separated by a door:
 - a) At least one approved fire extinguisher appropriate to the kinds of fires likely to occur.
 - b) One protective breathing equipment approved to TSO-C116a equivalent, suitable for fire fighting.
 - c) One flashlight.
- 9) A smoke detection system (SDS) that meets the requirements of JAR 25.858 must be provided. Alternatively to 25.858(c) automatic tests of the SDS are acceptable. In addition, it must annunciate in the flight deck and be audible in the cabin and in the crew rest compartment. If a waste container(s) is installed, it must meet the requirement of JAR 25.853(f).
- 10) A supplement oxygen system equivalent to that provided for passengers must be provided for each seat and berth.
- 11) The materials inside the BCRC must be in compliance with JAR 25.853(a). Internal Wall and ceiling panel materials have to be in compliance with JAR 25.855(c).

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 12) Means must be provided to suppress a fire in the crew rest compartment when unoccupied from the passenger cabin without having to enter the compartment. No hazardous quantities of smoke, flames or extinguishing agents may enter any compartment occupied by the crew or passengers.
The quantity of extinguishing agent shall be adequate for the remaining of the flight.
- 13) There must be an aural warning alerting the occupants of the crew rest compartment of a decompression. It must be activated simultaneously with the corresponding cockpit warning. The warning must sound continuously until a reset button in the crew rest compartment is depressed, unless it can be shown that a time limited warning is adequate.
- 14) If there is low head room at or near the evacuation routes, provisions must be taken to prevent or to absorb head strikes.
- 15) Mattresses used in the crew rest compartment must comply with JAR 25.853(a) and (b).
- 16) It must be shown by actual demonstration that the maximum allowed number of crew rest occupants can easily evacuate the crew rest compartment using the main access route. This demonstration must also be performed using the alternate evacuation route.
- 17) Crew members must be trained in the use of the evacuation routes and in the use of the fire suppression procedures. Fire suppression procedures must be established.
- 18) If rigid doors are installed within the lower crew rest area to separate zones it must be shown that nobody can be trapped inside an isolated compartment. These doors must be openable from either side without the need for a special tool, and must be easily frangible from either side. There should be not more than one door between the isolated zone and the next escape route. There should be not more than one door or hatch between any occupant and the main deck, for at least one of the escape routes.
Exit signs according JAR 25.811(d)(3) have to be installed on this door.
- 19) Seats or bunks which serve as in-flight seats only have to be equipped with lap belts.

Acronyms and Abbreviations

BCRC	Bulk Crew Rest Compartment
TSO	Technical Standard Order
JAR	Joint Aviation Regulation
SDS	Smoke Detection System

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-12: RR ENGINE TURBINE OVERHEAT DETECTION

Equivalent Safety Finding	E-12: RR Engine Turbine Overheat Detection
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1203 (d)
ISSUE:	Issue 1 dated 26 Jan. 2016

Equivalent Safety Finding

BACKGROUND

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

The turbine overheat detection portion of the Airbus A330-800/900 with Trent 7000 design, as presently configured, does not allow the crew to check its functioning during flight. Although the fire zone compartment detector portion of the fire / overheat system can be fully tested in flight, and complies with CS 25.1203(d), the inability to test the turbine overheat detection circuit in flight does not satisfy the testing provisions of this rule.

EQUIVALENT SAFETY FINDING

The turbine overheat detection system installed on the Rolls Royce Trent 7000 engines fitted on A330-800/900 aircraft ensures that the turbine does not overheat in case of failure of the internal cooling air system or in case of internal oil fires.

This turbine overheat detection system is comprised of:

- A duplex thermocouple at the Turbine Cooling Air Front location to protect HP and IP turbines from failure of the HP3 cooling air system and oil fires
- A duplex thermocouple at the Turbine Cooling Air Rear location, to protect the LP turbine from failure of the IP8 cooling air system and oil fires.

The duplex thermocouple is made of two measuring elements mounted side by side within a single common housing. Each sensor feeds into a separate channel of the EEC (A and B respectively). The EEC is in turn linked to the Flight Warning System (FWS) to generate a warning to the cockpit (with associated procedure), if an overheat is detected by the thermocouples.

The condition of the turbine overheat detection system is continuously monitored by the EEC from power up. Any system fault generates a maintenance message. Flight deck effect will depend on the detected fault and associated dispatch condition:

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

Based on this continuous system monitoring feature, the intent of CS 25.1203(d) is met. There is no need on the A330-800/-900 to provide a means to allow the flight crew to be able to directly check the turbine overheat system's functioning in flight.

Acronyms and Abbreviations

LP, IP HP	Low Pressure, Intermediate Pressure, High Pressure
EEC	Engine Electronic Controller
FWS	Flight Warning System

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-14: TRENT 7000 ENGINE ZONE SEALS AND CAPS FIRE WITHSTANDING CAPABILITY

Equivalent Safety Finding	E-14: Trent 7000 Engine zone seals and caps fire withstanding capability
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1181, 25.1191, 25.1193(e)
ISSUE:	Issue 2 dated 04 Oct. 2017

Equivalent Safety Finding**BACKGROUND**

The Rolls Royce Trent 7000 engine incorporates small components (non-structural elements such as seals and caps) as part of the fan and core Designated Fire Zones boundaries that are qualified for a fire resistant (5 minutes) capability on ground. This results from the CS E fire integrity compliance definition, since the concerned components are part of the Engine TC and therefore covered by CS E-130. At CS 25 level this is considered as a deviation from the current CS 25.1191 fire rule which requires a 15 minutes fire withstanding capability (whether in flight or on ground). For the in-flight condition, those components have been demonstrated as fireproof (15 minute's capability).

For the ground case, the worst consequences for the concerned components not meeting the required fire proof fire withstanding capability, could be a possible migration of a hazardous quantity of air, fluid or flame to another aircraft or engine zone which could cause a hazard to the aircraft or such hazard that could adversely affect the safe evacuation of the passengers and crew.

EQUIVALENT SAFETY FINDING

In lieu of showing that engine firewall components are fireproof for all aeroplane operating conditions, it may be acceptable to show that these components provide an equivalent level of safety to CS 25.1191(b) & CS 25.1193(e) by demonstrating for aeroplane ground operations:

1. Firewall structure where the component is installed is fireproof.
2. No air, fluid, or flame can pass from one designated fire zone into another designated fire zone.
3. Component burn-through (or other adverse effects of a fire) will not result in a hazard to the aeroplane or serious injury to crew, passengers or ground personnel.

Hazards of concern include, but are not limited to, events such as:

- a. Spread of fire around the firewall or loss of firewall structural integrity;
- b. Impingement of flame on the wing, potentially resulting in fuel tank breach or explosion;
- c. Spread of fire to flammable fluid sources outside the fire zone;
- d. Spread of fire to areas with systems wiring or flight control cables, rods, etc.;
- e. Engine ingestion of flammable fluid released from the fire zone, which could prevent safe

Disclaimer – This document is not exhaustive and it will be updated gradually.

engine shutdown;

f. Overheating of critical structural elements outside the fire zone;

g. Failure or significant deformation of the engine mounting system or pylon; and

h. Fuselage penetration.

4. Compliance with CS 25.865 is maintained for engine mounts and other flight structures located in the designated fire zone after bum-through (or other adverse effects of a fire).
5. Component bum-through (or other adverse effects of a fire) will not compromise fire detection and extinguishing capability of the designated fire zone for a period of at least 5 minutes after the initiation of a detectable fire to allow for fire detection, extinguishing and safe engine shutdown.

Acronyms and Abbreviations

TC	Type Certificate
----	------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-15: NACELLE AREA BEHIND FIREWALLS

Equivalent Safety Finding	E-15: Nacelle area behind firewalls
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1182(a)
ISSUE:	Issue 1 dated 06 Sept. 2016

Equivalent Safety Finding**BACKGROUND**

The Rolls Royce Trent 7000 design includes a Thrust Reverser Actuation System that uses hydraulic oil, and that is located in a nacelle area behind a firewall. The hydraulic fluid, although limited in quantity, is considered a flammable fluid.

With regard to CS 25.1182(a) this nacelle area therefore must meet each requirement of CS 25.1103(b), 25.1165 (d) and (e), 25.1183, 25.1185(c), 25.1187, 25.1189 and 25.1195 through 25.1203.

The consequences are that the nacelle area behind the firewall need to comply with CS 25.1195 (fire extinguishing systems) and CS 25.1203 (Fire detector system).

Airbus has requested the granting of an equivalent level of safety for CS 25.1182(a) for not having a design including a fire detection and a fire extinguishing system as required for the nacelle area behind the fire wall.

EQUIVALENT SAFETY FINDING

The equivalent safety for not having a fire detection and fire extinguishing system in the nacelle area behind the fire wall is based on compensating factors, among which:

- The absence of ignition sources in the specific zone
- The limited volume of flammable fluid
- The positive in-service experience

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-15: REINFORCED SECURITY COCKPIT DOOR STATUS

Equivalent Safety Finding	E-15: Reinforced Security Cockpit Door Status
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.305(b), 307(a), 365, 771, 772, 789(a), 809, 831, 853(a), 1301, 1309 JAR 21.21(c)
ISSUE:	3 dated 11/07/2002

Equivalent Safety Finding

BACKGROUND

The FAA has introduced new security standards in FAR 25 through amendment 25-106 for new Type Certificates effective on January 15, 2002. This amendment introduces a new paragraph 25.795 which provides standards for resistance of the cockpit door to unauthorized intrusion and small arm fire or fragmentation devices. The FAA is requiring that aeroplanes operating in FAR part 121 service comply with this FAR 25 requirement before April 9, 2003. FAR 25 amendment 25-106 technical standards for resistance to bullet penetration and unauthorized intrusion are based on the work performed by the FAA / JAA "design for security" harmonization working group.

Amendment 27 of ICAO annex 6 is also revised to require that large transport aeroplanes be equipped with a cockpit door designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusion by unauthorized persons, before 1 November 2003.

The JAA intends to propose a NPA to introduce similar design and operational requirements. In particular, it is expected that the JAA would retain the same or similar technical standards for resistance to bullet penetration and unauthorized intrusion as FAR 25 amendment 106, as such standards are based on the work performed by the FAA / JAA "design for security" harmonization working group.

Airbus has applied for the certification of a reinforced cockpit door designed to meet the requirements of FAR 25 amendment 106.

Compared to the existing Airbus cockpit door design, the proposed modification would include:

- New door materials and strengthening of the door structure and door frame / surrounding structure
- Emergency kick out panel in the door to meet cockpit egress requirements
- Three electro-mechanically actuated door latches controlled by a toggle switch located in the cockpit. The toggle switch can be actuated by both pilots from their seat position. The electrical latches can also be released by the signal of redundant pressure sensors to meet the rapid decompression requirements (decompression case towards the cockpit).
- A manual override unlocking mechanism on the cockpit side
- A code pad in the cabin next to the cockpit door to control requests for access to the cockpit

Disclaimer – This document is not exhaustive and it will be updated gradually.



- Dedicated buzzer and warning system in the cockpit
- A bullet resistant spy hole to monitor cabin access from the cockpit.

As an option, Airbus intends to propose a video camera system to make the forward cabin area visible to the pilots.

The video camera system will be certified independently of the new cockpit doors design, and is not addressed by this Equivalent Safety Finding.

EQUIVALENT SAFETY FINDING

Revised 25.772 and new 25.795 requirements are acceptable to the JAA as an equivalent safety finding to existing JAR 25.772 paragraph, in accordance with JAR 21.21(c)(2).

The JAA team will check the compliance of the proposed design against the following requirements introduced by FAR 25 amendment 106:

Section 25.772 is amended by revising the introductory language and paragraph (a) and by adding a new paragraph (c) to read as follows:

Sec. 25.772 Pilot compartment doors.

For an aeroplane that has a lockable door installed between the pilot compartment and the passenger compartment:

- (a) For aeroplanes with a maximum passenger seating configuration of more than 20 seats, the emergency exit configuration must be designed so that neither crewmembers nor passengers require use of the flightdeck door in order to reach the emergency exits provided for them; and

* * * * *

- (c) There must be an emergency means to enable a flight attendant to enter the pilot compartment in the event that the flightcrew becomes incapacitated.

3. Part 25 is amended by adding a new Sec. 25.795 to read as follows:

Sec. 25.795 Security considerations.

- (a) Protection of flightdeck. If a flightdeck door is required by operating rules, the door installation must be designed to:

- (1) Resist forcible intrusion by unauthorized persons and be capable of withstanding impacts of 300 Joules (221.3 foot-pounds) at the critical locations on the door, as well as a 250 pound (1113 Newtons) constant tensile load on the knob or handle, and
- (2) Resist penetration by small arms fire and fragmentation devices to a level equivalent to level IIIa of the National Institute of Justice Standard (NIJ) 0101.04.

- (b) [Reserved]

Disclaimer – This document is not exhaustive and it will be updated gradually.



In order to show that the modified cockpit door can fulfil its intended function in normal and emergency (failure case and hijacking situation) conditions, Airbus should present to the JAA certification team the foreseen minimum sequence of events from which operational procedures associated to this new door design can be developed. Foreseen MMEL relief cases should be presented to the JAA certification team. The JAA requires that the level of safety intended by basic airworthiness requirements related to rapid decompression and emergency evacuation be maintained under MMEL conditions. In the event of a system failure that would result in a door unlocking, the door should maintain at least the ability to be closed in flight. Airbus should propose operational and or design measures to reduce exposure to the risk of an unauthorized cockpit intrusion in such a case.

Regarding A330 aircraft models, pending availability of a JAA policy, the JAA recommends that the minimum value is used (30s) when considering the emergency unlock function time delay.

Nevertheless, Airbus has indicated that they will include the possibility to program this value between 15s and 120s (with a setting by default at 30s), which could then be modified according to national requirements.

Airbus will inform its operators that the value of the timer present by Airbus is 30s that the recommended setting should be between 30 and 60 seconds, and that operator who would wish a setting below 30 seconds or above 60 seconds should seek the position of their national authority.

In addition, it is proposed to apply the FAA memorandum on Certification of Strengthened Flight Deck Doors on Transport Category Aeroplanes, dated 28 May 2002.

Acronyms and Abbreviations

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
JAA	Joint Aviation Authorities

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-16: FUEL TANKS – DESIGN FEATURES APPLICABLE TO CS 25.963(e)(1) AMDT 13

Design Features	E-16: Fuel tanks – Design Features applicable to CS 25.963(e)(1) at Amdt 13
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.963(e)(1)
ISSUE:	1 dated 30/01/2020

Design features**BACKGROUND**

The application of the latest requirements does not contribute materially to the level of safety of the product (GM to 21.A.101).

CONDITIONS

Design features ensuring the current demonstrated safety level for future product developments

Definitions:

Zone subject to engine debris impact: - 15 degrees forward of the front engine compressor or fan plane measured from the centre of rotation to 45 degrees aft of the rear most engine turbine plane measured from the centre of rotation.

Engine debris: is characterized by the impact of a 9.5 mm (3/8 inch) cube steel debris at 213.4 m/s (700 fps). The angle of the debris impact to the surface depends on the volume considered from rotor centreline as follows:

- 90 degrees to the impacted surface or area should be used within the zone from 15 degrees forward of the front engine compressor or fan plane measured from the centre of rotation to 15 degrees aft of the rear most engine turbine plane measured from the centre of rotation,
- actual incidence angle to the impacted surface should be used within the zone from 15 to 45 degrees aft of the rear most engine turbine plane measured from the centre of rotation.

Fuel tank penetration: means an event where the whole engine debris enters the fuel tank creating a hole in fuel tank allowing fuel leakage.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Fuel tank perforation: means an event where the specified debris is stopped at the fuel tank surface (no penetration), but creates a fuel tank damage (e.g. hole or crack) that results in a fuel leak that does not meet the no hazardous fuel leak criteria of AMC 25.963 Amdt 15

Design features

- 1.1. The fuel tank surface area within the zone subject to engine debris impact is not greater than that of the reference aircraft.
- 1.2. For areas that could be penetrated by the specified engine debris, the overall consequences at aircraft level of the leaks created present equivalent or lower risk. This assessment may include qualities such as reduced risk of penetration by debris of less energy than the specified debris, reduction of ignition sources, etc.
- 2.1. There is no individual fuel tank surface that could be penetrated or perforated by engine debris due to direct impingement;
- 2.2. No penetration or perforation from rebounds assuming reasonable angles (incidence angle=reflection angle) and energy loss (not greater than 20% loss);
- 2.3. Qualitative assessment shows only a limited area of vulnerability to penetration and/or the resulting leak is not likely to be hazardous;
- 2.4. The area of the fuel tank surface that could be penetrated or perforated by the engine debris is:
 - o not greater than 5% of the total tank's surface area, and
 - o within any one tank, not greater than 10% of that tank's surface area.
- 2.5. Demonstration of no penetration in the vulnerable areas specified in 2.4, even if perforation is possible.

Note: Each listed supporting design features shall not be regarded as an individual pass-fail criteria but shall be assessed globally, in addition with any other possible mitigation factors that the Applicant may propose (fuel tank risk exposure duration, proportion of the impacted area, location and/or function of the impacted tank, solid angle trajectories etc...).

Acronyms and Abbreviations

GM	Guidance Material
UERF	Uncontained Engine Rotor Failure

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-17: TROLLEY LIFT

Equivalent Safety Finding	E-17: Trolley Lift
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.819(g)(2)(3)
ISSUE:	2 dated 13/11/2003

Equivalent Safety Finding**BACKGROUND**

Airbus offers lower deck facilities on A340 series aircraft as an option. These facilities are located below the main cabin floor, utilizing space which was previously not accessible during flight.

A Lower Deck Galley Compartment is one of the intended utilizations and may be combined with other lower deck passenger or crew facilities, such as lavatory compartments and a crew rest area or stowage area.

To provide adequate transport capability for catering equipment between the main deck and the lower deck galley compartment a trolley lift will be installed. The lift is not designed for transportation of people.

The following design characteristics are typical for the proposed trolley lift design addressed by this Equivalent Safety Finding:

“Two independent trolley lift systems are installed each providing a cage for transportation of e.g. one full size trolley plus two standard container, two half-size trolleys with two containers or container only on ground or during cruise. The transport cage itself as well as the trunk opening on bath decks, are covered each by a door. Sensors on bath doors/latches provide signals to a controller to avoid misuse (e.g. overload, no lift operation with open doors etc.). Operating panels on bath decks above the doors allow a controlled operation of the lift.”

Current applicable requirements include JAR 25.819(g).

JAR 25.819(g)(2)(3);

(g) For each powered lift system installed between a lower deck service compartment and the main deck for the carriage of persons or equipment, or both, the system must meet the following requirements:

- (2) An emergency stop button, that when activated will immediately stop the lift, must be installed within the lift and at each entrance to the lift.
- (3) There must be a hatch capable of being used for evacuating persons from the lift that is openable from inside and outside the lift without tools, with the lift in any position.

Disclaimer – This document is not exhaustive and it will be updated gradually.



The actual design of the trolley lift cage does not provide a stop button inside the lift and does not provide a hatch within the cage.

EQUIVALENT SAFETY FINDING

The actual design of the trolley lift provides design precautions and safety features as an alternative means to the requirements in 25.819(g)(2)(3), as there are:

- The lift is not designed for transport of persons and is adequately placarded.
- The cage has a limited inner dimension for a single full size trolleys.
- The cage door (inner door) cannot be closed from the inside due to non-availability of grip/handle and air damper that is forcing the door open.
- The trunk door (outer door) cannot be closed if the cage door is not properly closed and latched.
- The lift can only be operated when all doors (inner and outer) are closed and latched.
- On the main deck the operating panel is arranged at a height, which is outside of the accessibility by children.
- At least a second person is necessary (both ignoring all safety features) to trap somebody inside a cage.
- The trolley lift system safety assessment provides data, which a failure causing a lift stop during transit in between both decks is highly improbably.

The above described provisions are sufficient to be satisfied that persons will not travel in the lift. Therefore the provision of a stop button and escape hatch as required by JAR 25.819(g)(2)(3), will provide no additional level of safety. The design is thus considered to be equivalent safe to full and literal compliance to these requirements.

Acronyms and Abbreviations

ESF	Equivalent Safety Finding
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-18: LOWER DECK GALLEY COMPARTMENT

Equivalent Safety Finding	E-18: Lower Deck Galley Compartment
APPLICABILITY:	A330 / A340/A340-500/-600
REQUIREMENTS:	JAR 25.819(f)
ISSUE:	2 dated 13/11/2003

Equivalent Safety Finding

BACKGROUND

Airbus offers lower deck facilities on A330 / A340 series including A340-500/-600 aircraft as an option. These facilities are located below the main cabin floor, utilizing space which was previously not accessible during flight.

A Lower Deck Galley Compartment is one of the intended utilizations and may be combined with other lower deck passenger or crew facilities, such as lavatory compartments and a crew rest area or stowage area.

The following design characteristics are typical for the proposed lower deck galley compartment addressed by this Equivalent Safety Finding:

- Located next to a lavatory area accessible by passengers via a stairway, the galley is within an access restricted area separated by a door. Typical installations are two longitudinal galleys, a trolley lift, stowage areas and access to an optional associated Dock on Crew Rest (DCR). An escape hatch in the galley area provides an additional escape route to the main deck. System installations such as air-conditioning, communication from/to the main deck, smoke detection, oxygen, illumination and all relevant placards and signs are installed to support the working area as well as the single Cabin Attendant Seat (CAS) justified for flight loads (25.785(d)).

The proposed installation of a Lower Deck Galley Compartment is reflected in JAR 25.819.

25.819(f) states:

(f) For each occupant permitted in a lower deck service compartment, there must be a forward or aft facing seat, which meets the requirements of JAR 25.785 (d) and must be able to withstand maximum flight loads when occupied.

The galley compartment will not be limited to be used by one Cabin Attendant (CA) only. Due to the installation of one single CAS literal compliance is not achieved.

EQUIVALENT SAFETY FINDING

Disclaimer – This document is not exhaustive and it will be updated gradually.



The design of the lower deck galleys with a single CAS provides an acceptable alternative means due to following aspects:

- Galley area is only accessible to authorized cabin crew.
- Cabin crew is trained for this environment.
- Distance to the next available CAS on the main deck is comparatively shorter than distances on the main deck.
- Accessibility from the lower deck galley area to the next CAS on the main deck is comparatively better and does not rely on system function (lift system) as in former design solutions. This includes that several CA can reach the main deck nearly simultaneously by using the stair and do not have to wait for a lift system requiring various transits.

To maintain a same level of safety to that found on the main deck (i.e. the likely distances that cabin crew would need to move from their work areas to a seat), the following additional requirements should be met:

- Each of these seats must be a forward or aft facing seat, which meets the requirements of JAR 25.785(d).
- The number of cabin crew permitted to occupy the lower deck galley must not exceed the number of seats in the galley plus those located for crew use close to the top of the staircase.
- The maximum number of cabin crew permitted to occupy the lower deck galley must be adequately placarded in the galley area.
- There must be adequate placard in the galley to inform the cabin crew that seats are available on the main deck and to indicate the location of these seats.
- The operator must be informed that operational procedures need to be developed to ensure that:
 1. CA's working in the galley are aware that their assigned seats are those close to the top of the stairs (or the single seat in the galley)
 2. These seats will be available to them when needed.

Acronyms and Abbreviations

CA	Cabin Attendant
CAS	Cabin Attendant Seat
DCR	Dock on Crew Rest
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-19: FIRST CLASS SLIDING SCREENS

SPECIAL CONDITION	E-19: First Class Sliding Screens
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.785(h)(2), 25.813(e)
ISSUE:	4, dated 22/06/2009

Special Condition

BACKGROUND

The Special Condition (SC) E-19 was issued to determine the regulatory context for so called “mini-suites” in dedicated customized First Class Cabin design. After its closure SC E-19 was reopened to introduce adapted level of requirements after application of further customized designs.

The special conditions from SC E-19 should be seen as guideline. For any new implementation of mini-suites the respective airworthiness authority shall be contacted.

SPECIAL CONDITION

SC E-19 was closed at issue 02, on 15 September 2003 with the following conclusion:

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 demeanor can be readily observed by cabin crew members with stature as low as the 5th percentile female.

SC E-19 was reopened at issue 3 for extension and finally closed at issue 4 on 22 June 2009 with the following conclusion:

Mini-Suites on A330/A340 will be accepted as complying with the intent of JAR 25.785(h)(2) and JAR25.813 (e), provided the following Special Conditions are met:

1. Only single occupancy of the Mini-suite is allowed during taxi, take-off and landing
2. Mini-suite entrance can only provide access to the specific mini-suite
3. Mini-suites cannot provide an egress path for evacuation other than the path out of the mini-suite for its single occupant
4. Installation of the mini-suites must not introduce any additional obstructions or diversions to evacuating passengers, even from other parts of the cabin
5. The design of the doors and surrounding "furniture" above the cabin floor in the aisles must be such that each passenger's actions and demeanour can be readily observed by cabin crew members with stature as low as the 5th percentile female, when walking along the aisle.
6. The mini-suite doors must be open during taxi, take off and landing
7. The hold open retention mechanism for mini-suite doors must hold the doors open under JAR 25.561(b) emergency landing conditions
8. There must be a secondary, backup hold open retention mechanism for the mini-suite doors that can be used to "lock" the doors in the open position if there is an electrical or mechanical failure of the primary retention mechanism. The secondary retention mechanism must hold the doors open under JAR 25.561(b) emergency landing conditions
9. There must be a means by which cabin crew can readily check, that all mini-suite doors are in the fully open and in the latched condition.
10. There must be means by which cabin crew can prevent the seated mini-suite occupant from operating the doors. This means is envisaged to be used in particular to secure the TTOL phases of the flight.
11. Appropriate placards, or other equivalent means must be provided to ensure the mini-suite occupants know that the doors must be in the open position for taxi, take off and landing
12. Training and operating instruction materials regarding the proper configuration of the mini-suite doors for taxi, take off and landing must be provided to the operator for incorporation into their cabin crew training programs and associated operational manuals.
13. The mini-suite must have an Emergency Passage Feature (EPF) to allow for evacuation of the mini-suite occupant in the event the door closes and becomes jammed during an emergency landing. This EPF may be through frangibility and /or a removable of emergency panel, or

Disclaimer – This document is not exhaustive and it will be updated gradually.



equivalent (such as dual sliding doors). The EPF must be easily broken /removed by the occupant of the mini-suite when the door becomes jammed. Trapping of any occupant is not acceptable and in no case shall the occupant using the EPF have to rely on another occupant to assist in passage. The EPF design must be such that any occupant's egress route to the aisle cannot present (after manipulation of frangible/removable/movable items, if applicable) an aperture of less than 15 inches wide following any possible failure/malfunction occurring during an emergency landing. It must be demonstrated that any frangible/removable/movable items can be easily manipulated. The occupant of the mini-suite must be made aware of the EPF and its way of operation.

14. The height of the mini suite walls and doors must be such that a 95th percentile male can fit between them and the aeroplane interior furnishing.
15. No mechanism to latch the doors together in the closed position is allowed
16. The mini-suite doors must be openable from the inside or outside with 25 pounds force or less regardless of power failure conditions
17. If the mini-suite doors are electrically powered the doors must remained "locked" in the open position after power loss to the mini-suite
18. Mini-suites installation must maintain the main, cross aisles and passage ways
19. Mini-suite doors must not impede main aisle or cross aisle egress paths in the open, closed or translating position
20. The mini-suite doors must be openable even with a crowded aisle
21. The number of individual passenger seat modules shall not exceed 25% of the max. number of passenger seats allowed between the doors as defined in the seat frame specification.
22. The length of each main aisle adjacent to the seat modules must be visible, at least such that the main aisle part remaining unobservable does not exceed 50% of the total main aisle width at the end of this cabin section (entrance area of last seat module)
23. In case the main aisle width cannot be observed to at least 50% at the end of the cabin section (entrance area of last seat module), it is equivalent to have at least 80% of the seat module entrance areas in direct view from designated direct view seats, under the conditions of CRI E-4. An entrance area is considered visible, if a person standing in the main aisle, directly at the seat module entrance is observable. In line with the current assist space dimension a body depth of 12 inches is therefore assumed.

Note: Compliance with 25.785(h)(2) can be demonstrated either by meeting special conditions 22 and 23 as listed above or by complying with Special Condition E-4.

Acronyms and Abbreviations

SC	Special Condition
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-21: EMERGENCY EXIT MARKING REFLECTANCE

Equivalent Safety Finding	E-21: Emergency exit marking reflectance
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.811(f)
ISSUE:	1 dated 06/12/2004

Equivalent Safety Finding

BACKGROUND

Following JAR 25.811(f), each emergency exit that is required to be openable from the outside, and its means of opening, must be marked on the outside of the aeroplane. In addition, the following apply:

1. The outside marking for each passenger emergency exit in the side of the fuselage must include a 2-inch coloured band outlining the exit.
2. Each outside marking including the band must have colour contrast to be readily distinguishable from the surrounding fuselage surface. The contrast must be such that if the reflectance of the darker colour is 15% or less, the reflectance of the lighter colour must be at least 45%. "Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives. When the reflectance of the darker colour is greater than 15%, at least a 30% difference between its reflectance and the reflectance of the lighter colour must be provided.

EQUIVALENT SAFETY FINDING

In some rare cases amongst the numerous associations of two contrasted colours, Airbus may face a non-compliance with the required reflectance value imposed by the JAR 25.811(f). For a specific case, the black colour is at 0.5% (thus less than the 15% threshold condition which requires the 45% value for the contrasted colour) and that the grey colour at 38.2% only for the reflectance, the association of both these colours does not meet the §25.811(f) requirements.

Considering the design of the handle and its operation is simple and obvious as well as the movement required to open the door is indicated by an arrow clearly identifiable. The door surrounding band contrast is well above the requirement of 25.811(f). The reflectance of the grey colour is at 38.2% which is below the required value of 45%. However, it is accepted that the outside marking have a colour contrast which is readily distinguishable from the surrounding fuselage surface.

Acronyms and Abbreviations

ESF	Equivalent Safety Finding
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR

Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.

Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 181 of 358

E-27: FORWARD FACING SEAT, OVER 18 DEGREES TO A/C CENTRELINE

EQUIVALENT SAFETY FINDING	E-27: FORWARD FACING SEAT, OVER 18 DEGREES TO A/C CENTRELINE
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.785 (d)
ISSUE:	Issue 3 dated 22 June 2009

Equivalent Safety Finding**BACKGROUND**

JAR 25.785(d) requires that:

“each occupant of a seat that makes more than 18 degrees angle with the vertical plane containing the aeroplane centreline must be protected from head injury by a safety belt and an energy absorbing rest that will support the arms, shoulders, head and spine, or by a safety belt and shoulder harness that will prevent the head from contacting any injurious object”.

Airbus is installing seats up to 23.5 degrees that including inflatable restraint systems (airbags) to manage occupant trajectory, but do not include any feature or features that can be construed to constitute an energy absorbing rest or a shoulder harness.

EQUIVALENT SAFETY FINDING

It may be possible to design a seat for installation at an angle above the value of 18 degrees set in JAR 25.785(d), with an acceptable level of occupant safety, without providing an energy absorbing rest or shoulder harness.

The designs of the seat and surrounding items have been carefully chosen to maximize the ability of the occupant to align with the deceleration vector during the impact. EASA is prepared to accept this as a compensating factor as required by 21A.21.

It appears that the occupant does not realign as much as was originally expected and that in fact the design of the airbag plays a significant role in maintaining acceptable protection.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



EASA agrees that an equivalent level of safety to JAR 25.785(d) can be shown by the approach outlined above.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ACJ	Advisory Circular Joint
ATD	Aircraft Technical Description
DEV	Deviation
ESF	Equivalent Safety Finding
SC	Special Condition
TCDS	Type Certificate Data Sheet

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-28: PARTIAL BULK CREW REST COMPARTMENT WITH ATTACHED GALLEY

SPECIAL CONDITION	E-28: PARTIAL BULK CREW REST COMPARTMENT WITH ATTACHED GALLEY
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.819, 25.812, 25.853, 25.855
ISSUE:	Issue 2 dated 26 Jan 2009

Special Condition

BACKGROUND

Airbus intend to install a galley stowage area in the bulk crew rest compartment. Due to the fact that the galley area will be handled in a different operational form from that of a pilot sleeping area, new special conditions is proposed.

SPECIAL CONDITION

All references to JAR 25 paragraphs are to be understood as references to JAR change 14 plus OP 96/1.

The following special conditions are applicable in the case where a galley stowage are is installed adjacent to a partial bulk crew rest.

- 1) CRI SE-11 remains applicale to all areas of the BCRC unaffected by the addition of the galley stowage area.
- 2) JAR 25.819 (a) and (f) need not be complied with for the subject galley stowage area.
- 3) Temporary occupancy is limited to two persons in the galley area. This is in excess of the number allowed in the crew rest sleeping area. Access is prohibited during taxi, take-off and landing appropriate placars must be installed.
- 4) Due to the non-permanent occupied character of the galley area, a single access to/from the partial bulk crew rest compartment entrance area is sufficient. This access must only be closed off by a curtain, which must be such that easy entrance / egress is assured, even when closed.
- 5) In the event the aeroplane's main power system should fail, emergency illumination of the galley area must be automatically provided.
- 6) There must be public address speaker(s), or other means of alerting the occupants of an emergency situation, in the galley area.
- 7) A smoke detection and fire suppression system must be provided that is fully effective in both the crew rest ans in the galley area. Its effectiveness must not be reduced by any separation provided between the partial BCRC and the galley area.
- 8) A epplumentary oxygen system with at least two masks, equivalent to that provided for passengers, must be provided in the galley area.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 9) The materials inside the galley area of the BCRC must be in compliance with JAR 25.853(a) internal wall and ceiling panel materials as well as the outer walls forming a wall to the remaining cargo compartment must be in compliance with JAR 25.855(c).
- 10) An exit sign according to JAR 25.811(d)(3) must be appropriately installed in the galley area. However, a sign with reduced background area of no less than 5.3 square inches (excluding the letters) may be utilized, provided that it is installed such that the material surrounding the exit sign is light in color (e.g. white, cream, light beige).
- 11) Means must be provided to prevent opening of the cargo service door into the class C cargo compartment, from the galley stowage area, once it has been closed. Placards must also be provided on both sides of the cargo service door requiring that the cargo service door be closed before all aeroplane flight operations.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
BCRC	bulk crew rest compartment

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-29: FUSELAGE BURN THROUGH – AFT PRESSURE BULKHEAD

EQUIVALENT SAFETY FINDING	E-29: FUSELAGE BURN THROUGH – AFT PRESSURE BULKHEAD
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.853(b) at change 13 JAR 25.853(a) at change 14 JAR 25.855(d) at change 14 FAR 25.856(a) at amendment 111 (ESF E-1022) FAR 25.856(b) at amendment 111 (SC E-128)
ISSUE:	Issue 3 dated 16 March 2009

Equivalent Safety Finding

BACKGROUND

In order to improve the overall aircraft flammability standard, Airbus voluntarily elected to comply with FAR 25.856(b) rule, through SC E-128. Airbus A330/A340 design incorporates a carbon Fiber aft pressure bulkhead. The insulation on the aft pressure bulkhead does not comply with the requirements of SC E-128 (FAR 25.856(b)), however, the bulkhead itself does. Airbus proposes an alternative method under the provisions of Part 21A.16B.

EQUIVALENT SAFETY FINDING

In order to improve the overall aircraft flammability standard, Airbus voluntarily elects to comply with FAR 25.856(b) rule, through SC E-128. This requires, for aircraft with a passenger capacity of 20 or greater, thermal/acoustic insulation materials (including the means of fastening the materials to the fuselage) installed in the lower half of the aircraft fuselage to meet the flame penetration resistance test requirements according to FAR Part 25.856(b), appendix F part VII. The intent of the rule is to provide a fire barrier that will delay entry of post-crash fire into the passenger occupied areas of the aircraft. If an aircraft were to incorporate insulation not on the fuselage shell, but along the underside of the cargo floor, this insulation would be subject to the flame penetration test of final FAR Part 25.856(b).

For pressure bulkheads made from composite parts, the bulkheads will be covered with thermal/acoustic insulation materials that meet FAR 25.856(a) requirements. The present ELOS demonstrates that the existing pressure bulkhead, designed with composite material are flame penetration resistant. As a consequence, the upgrade of the insulation materials inboard of the pressure bulkhead, according to the flammability standard of FAR 25.856(b), will not improve the overall flame penetration protection of the current installation.

Disclaimer – This document is not exhaustive and it will be updated gradually.



According to Part 21A.16B, alternate standards and design features that can meet the objective of the requirement can be used. Using the composite material of the pressure bulkhead is an alternative method to meet the intent of FAR 25.856(b) (SC E-128). Composite parts provide post-crash fire protection that is as good as the protection provided by FAR 25.856(b) compliant insulation materials. So, the composite pressure bulkhead is an alternate design feature to FAR 25.856(b) insulation materials to demonstrate an equivalent level of safety with respect to post-crash fires. With this approach, Airbus takes benefit of existing composite pressure bulk-head design and does not intend to extend or generalize it to new composite applications or designs. In the approach used in this demonstration, the premises under which the rule has been developed remain valid.

The composite pressure bulkhead is a full part, so that it provides a surface of protection above and below the split line (see figure), while the rule requires a fire barrier below the split line. The protection provided in terms of crash fire protection is therefore locally increased compared to the requirements of FAR 25.856(b).

It is also clear that the composite pressure bulkheads that are fitted on existing Airbus designs will stay in the aeroplane. This is a reason why Airbus is taking credit of their fire properties in lieu of the insulation materials. Where FAR 25.856(b) applies – the modification of insulation materials and fixation installed on the existing composite pressure bulkhead will not bring an improved fire penetration protection:

- The modification of the insulation and fixation on existing composite parts will not decrease the delay for a fire to penetrate into the passenger compartment, in terms of FAR 25.856(b).
- On existing Airbus aeroplanes, the composite parts are remotely used to demonstrate compliance with FAR 25.856(b), as only few of them are installed with insulation materials that are subject to the requirements of FAR 25.856(b).

The pressure bulkhead made of CFRP, min thickness 3mm, is burn through resistant according to FAR 25.856(b). Therefore it overtakes the function of a Thermal/Acoustic Burnthrough resistance fire barrier.

Tests performed according to 25.856(b) and Appendix F Part VII:

- A 3-ply/side CFRP Sandwich floor Panel,
- A 3 mm CFRP pressure bulkhead Panel and

Tests performed according to AC20-107A:

- A 1.75 mm CFRP Flap Panel

These tests demonstrate the burn through resistance of in minimum 3 layers CFRP with a min thickness of 0.32 mm/layer.

Disclaimer – This document is not exhaustive and it will be updated gradually.



The results show that this material is a Fire Barrier, with equivalent performances in terms of FAR25.856 (b) protection, compared to the insulation materials.

Based on that analysis, it is demonstrated that the composite materials used for the pressure bulkhead behave as a fire barrier, in terms of FAR 25.856(b) in combination with a thermal/acoustic insulation blanket. No additional means or modification for burn through is therefore required on the insulation materials that are installed on the pressure bulkhead.

The scope of the ESF is limited to the composite pressure bulkhead, which is continuous and protects the upper half in addition to the lower half of the fuselage. For clarification, the rule requires the flammability standard upgrade according to FAR 25.856(b) of thermal/acoustic insulation materials that are installed in the lower half fuselage. The continuity is therefore provided between the pressure bulkhead and FAR 25.856(a) insulation materials in the upper fuselage and with FAR 25.856(b) insulation materials in the lower fuselage. AIRBUS considers that EASA request to have continuity between the FAR 25.856(b) composite pressure bulkhead and the FAR 25.856(b) insulation materials exceed the scope of this ESF. However, it is provided in the lower half of the fuselage according to AIRBUS design principles for compliance with FAR 25.856(b).

EASA agrees to the above Airbus position. This ESF is limited to the composite pressure bulkhead to provide equivalent burnthrough resistance as FAR 25.856(b) compliant insulation material.

The continuity of the burnthrough resistant barrier will be part of the overall compliance demonstration of Airbus regarding FAR 25.856(b).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
CFRP	Carbon Fiber Reinforced Regulations
DEV	Deviation
ELOS	Equivalent Level of Safety
ESF	Equivalent Safety Finding
OP	Orange Paper
SC	Special Condition
TCDS	Type Certificate Data Sheet

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-30: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BELLY FAIRING

EQUIVALENT SAFETY FINDING	E-30: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BELLY FAIRING
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.853(b) at change 13 JAR 25.853(a) at change 14 JAR 25.855(d) at change 14 FAR 25.856(a) at amendment 111 (ESF E-1022) FAR 25.856(b) at amendment 111 (AMC E-128)
ISSUE:	Issue 3 dated 20 April 2009

Equivalent Safety Finding

BACKGROUND

In order to improve the overall aircraft flammability standard, Airbus voluntarily elects to comply with FAR 25.856(b) rule, through the AMC E-128. This requires, for aircraft with a passenger capacity of 20 or greater, thermal/acoustic insulation materials (including the means of fastening the materials to the fuselage) installed in the lower half of the aircraft fuselage to meet the flame penetration resistance test requirements according to FAR Part 25.856(b), appendix F part VII.

The Belly Fairing covers the lower half of the fuselage in its lower part. Per design, the Belly Fairing on Long Range is a composite part, which is post-crash fire resistant in terms of FAR 25.856(b). Consequently, the Belly Fairing can be used as an alternative method to meet the intent of FAR 25.856(b), and thus the modification according to FAR 25.856(b) of existing insulation materials inboard of the lowest part of the fuselage, could be avoided. Thus, Airbus proposes an alternative method under the equivalent level of safety provisions of Part 21A16B.

The scope of the present ESF for A330 is limited to the protection of the frame 53.2. The other areas of the lower fuselage that are covered by the Belly Fairing will have modified insulation materials in the fuselage in accordance with FAR 25.856(b).

For A330/A340 aircraft models, Airbus drew up an analysis based on tests performed on the worst-case composite Belly Fairing design (thinner composite panel used on existing design, junction between panels and access panels).

The tests performed according to FAR 25.856(b) and Appendix F Part VII and AC20-107A have demonstrated that the material, as well as the junction between the panels were acting as a fire barrier - no burn through occurred - with flame penetration performance comparable to the one obtained with FAR 25.856(b) insulation materials.

Disclaimer – This document is not exhaustive and it will be updated gradually.



The tests also revealed some weakness at the access door latches. However, the area considered for the A330/A340 is limited to Frame 53.2, which does not include access panels (i.e. no modification of the access panels are needed to meet the intent of the present ESF).

In order to ensure a continuity of the fire protection at the Belly Fairing contour, Airbus determined by test an overlap area between the FAR 25.856(b) compliant insulation materials and the Belly Fairing contour. This overlap will ensure a continuous flame penetration protection through rough the lower half of the fuselage.

The composite Belly Fairing is installed as a standard part on existing Airbus A330/A340 aircraft models. Therefore, Airbus wants to take credit of the fire properties instead of modifying the insulation materials. The modification of insulation materials in the fuselage underneath the Belly Fairing at Frame 53.2 will not increase the delay for a fire to penetrate into the passenger compartment, with respect to FAR 25.856(b) requirements. In addition, the Belly Fairing improves the flame penetration resistance in areas that are per design not insulated, and which per rule do not need to be modified according to FAR 25.856(b).

EQUIVALENT SAFETY FINDING

Based on the above mentioned tests performed by Airbus, for Frame 53.2 only, the composite Belly Fairing installed on Airbus A330/A340 aircraft models provides an equivalent fire barrier to that requested by FAR 25.856(b).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ESF	Equivalent Safety Finding
FAR	Federal Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-31: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BILGE AREA

EQUIVALENT SAFETY FINDING	E-30: FUSELAGE BURNTHROUGH SUBSTANTIATION FOR BILGE AREA
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.853(b) at change 13 JAR 25.853(a) at change 14 JAR 25.855(d) at change 14 FAR 25.856(a) at amendment 111 (ESF E-1022) FAR 25.856(b) at amendment 111 (AMC E-128)
ISSUE:	Issue 3 dated 20 April 2009

Equivalent Safety Finding

BACKGROUND

A330/A340 aircraft models Design typically do not have thermal/acoustic insulation installed on the fuselage skin in the bilge areas (the area below the lower lobe cargo floor). Instead, most Airbus aeroplanes have the insulation installed on the underside of the cargo floor, and per the flame penetration requirements of FAR 25.856(b), this insulation would be subject to the fire penetration resistance test of appendix F, part VII. Since implementing this level of fire protection into the insulation on the floor panels presents several design and implementation challenges, Airbus has proposed an alternative method of compliance under the provisions of Part 21A16B.

EQUIVALENT SAFETY FINDING

The existing cargo floor panels have been tested and the results showed that the layers are flame penetration resistant in terms of FAR 25.856 (b). The floor panels constitute a fire barrier (Barrier 1), with a determined amount of openings (drain pans, Power Drive Units, etc.). The cargo compartment lining is qualified and certified according to 25.855(c), appendix F part III, and constitutes also a fire barrier (Barrier 2).

With respect to the burn through resistance of LDCC floor, the barrier 1 acts as a "filter". Airbus has demonstrated that the remaining heat flux that passes through it dissipates in the LDCC (forward and aft sections). The amount of heat flux to which the cargo lining and cargo ceiling (Barrier 2) are exposed reduces extremely significantly. The analysis performed shows that the heat flux to which the cargo ceiling (Barrier 2) can be exposed is below the maximum heat flux value mandated by the rule Furthermore, tests performed by Airbus have demonstrated that the temperature at the level of the cargo ceiling (Barrier 2) never exceeds 1700°F (927°C) within 4 minutes.

Airbus has demonstrated that the LDCC constitutes an effective burn through barrier. The combination of Barrier 1 according to FAR Part 25.856 (b) and of the Barrier 2 according to FAR Part

Disclaimer – This document is not exhaustive and it will be updated gradually.



25.855 (c) increases the time for evacuation in case of a post-crash fire sufficiently to meet the intent of the requirements of FAR 25.856 (b).

Based on the LDCC demonstration, similar analysis has been conducted for all the different Lower Deck Compartments, and demonstrates that these compartments provide an effective flame penetration protection. This analysis takes into account the specificities of each Airbus design and covers the different type of existing Crew Rest Compartments/Lower Deck Facilities: Mobile Crew Rest Compartment Aft, Bulk Crew rest Compartment Aft, Lower Deck Facilities Aft and Forward on A330 aircraft models.

In view of the above considerations and related test evidences, the LDCC on Airbus Long Range Aeroplanes are considered compliant with FAR part 25.856(b) through the here described equivalent level of safety approach.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ESF	Equivalent Safety Finding
FAR	Federal Aviation Regulation
LDCC	Lower Deck Crew Compartment

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-124: COURIER COMPARTMENT

SPECIAL CONDITION	E-124: Courier Compartment
APPLICABILITY:	A330-200F
REQUIREMENTS:	PART 21.19, CS 25.857(e)
ISSUE:	4 dated 06/06/2008

Special Condition**BACKGROUND**

Airbus has applied to EASA for an Amended Type Certificate to convert the A330-200 passenger model aircraft into a full freighter including a Class E cargo compartment on the main deck, with a courier compartment consisting of a main deck supernumerary area, forward of the cargo bulkhead. The courier compartment provides a maximum of 12 seats, in two rows of 6 seats facing each other.

CS 25.857(e) at Amendment 1 defines an aeroplane with a Class E cargo compartment as an aeroplane where only the carriage of cargo is allowed. No passengers can be transported. Therefore, the installation of a courier compartment occupied by persons in combination with class E cargo compartment is outside of the scope formally covered by CS 25. A Special Condition is therefore necessary to ensure a level of safety equivalent to that established in the applicable CS 25 Certification basis.

SPECIAL CONDITION**1. Categories of occupants accepted in the courier compartment:**

"The approved Aeroplane Flight Manual (AFM) must contain an operating limitation, restricting the total courier compartment occupancy to 12 persons who are:

(i) Briefed by a flight crew member prior to each flight:

- on the use of the emergency escape means (door opening, slide release)
- on the location and usage of oxygen equipment (automatic and portable) and procedures to be followed in case of depressurization

(ii) Physically able to accomplish the necessary emergency procedures"

2. CS 25.813 (b) Emergency exit access is deleted.**3. CS 25.857(e) is modified to read:**

(e) Class E

A Class E cargo compartment is one on aeroplanes used for the carriage of cargo and in which:

(1) Reserved

(2) There is a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station;

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (3) There are means to shut off the ventilating airflow to, or within, the compartment, and the controls for these means are accessible to the flight crew in the crew compartment;
- (4) There are means to exclude hazardous quantities of smoke, flames, or noxious gases, from occupied compartments; and
- (5) The required emergency exits are accessible under any cargo loading condition.

Acronyms and Abbreviations

AFM	Aeroplane Flight Manual
EASA	European Union Aviation Safety Agency
CS	Certification specification

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-125: CLASS E CARGO COMPARTMENTS FIRE PROTECTION OF ESSENTIAL SYSTEMS

SPECIAL CONDITION	E-125: Class E Cargo Compartments Fire Protection of Essential Systems
APPLICABILITY:	A330-200F
REQUIREMENTS:	JAR 25.855
ISSUE:	2 dated 27/02/2008

Special Condition**BACKGROUND**

Airbus has applied to EASA for an Amended Type Certificate to convert the A330-200 passenger model aircraft into a full freighter including a Class E cargo compartment on the main deck.

From other freighter aircraft manufacturer's in-service experience, the Authorities identified the need to provide adequate fire protection of essential systems. The lack of protection may in fact contribute up to the loss of the aeroplane. The same potential for damage exists on aeroplanes with Class E cargo compartments. Consequently, Special Conditions have been issued to require the essential systems/equipment within the Class E cargo compartments to be protected against fire to a level equivalent to that of JAR 25, Appendix F, Part III.

SPECIAL CONDITION

Cockpit voice and flight data recorders, windows and other systems or equipment within the Class E cargo compartments shown to be essential for continued safe flight and landing, according to CS 25.1309, must be adequately protected against fire. If protective covers are used they must meet the requirements of Appendix F, Part III.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
EASA	European Union Aviation Safety Agency

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-126: ACCESS TO CLASS E CARGO COMPARTMENTS IN FLIGHT

SPECIAL CONDITION	E-126: ACCESS TO CLASS E CARGO COMPARTMENTS IN FLIGHT
APPLICABILITY:	A330-200F
REQUIREMENTS:	JAR 25.831, 25.855, 25.857, 25.1309, 25.1439, 25.1443
ISSUE:	26 April 2009

Special Condition

BACKGROUND

The proposed type certificated design for the A330-200F exhibits a courier area separated from the class E main deck cargo compartment by a rigid cargo barrier fitted with two side doors on the rigid cargo barrier.

In order to allow the in-flight access to a class E cargo compartment, specific requirements are needed and defined by a special conditions.

SPECIAL CONDITION

1. All passenger safety requirements, such as but not restricted to 25.831 (a)&(b), should be considered for compliance in perspective of the number and type of occupant being allowed, and the maximum duration of access to the class E cargo compartment, when appropriately defined through maximum seating capacity, maximum number of safety equipment, AFM limitations, etc.
2. Portable oxygen equipment readily accessible in the courier compartment, must meet 25.1443(e) and be provided for the maximum number of supernumeraries allowed to access the class E cargo compartment in-flight.
3. Occupant accessing the class E cargo compartment must be trained in the use of portable oxygen equipment.
4. Number of occupant accessing the class E cargo compartment at the same time is restricted to the number of readily detectable from any accessible location in the class E.
5. Aural and visual means, readily detectable from any accessible location in the class E cargo compartment, must be provided to warn any occupant who may be present in the class E cargo compartment when to don the oxygen equipment and / or when a return to seat is required.
6. A means or a procedure must be provided to allow each flight crew to assess, from his/her seat, when the class E cargo compartment is occupied.
7. The AFM must include clear instructions:
 - a. To define fire fighting procedures in the class E cargo compartment in particular for the case of fire while the cargo compartment is being assessed,

Disclaimer – This document is not exhaustive and it will be updated gradually.



- b. To require that portable oxygen equipment be carried by an occupant each time the cargo compartment is accessed.
- 8. Placards must be installed on each in-flight access door intruscting that:
 - a. Smocking is not allowed at all time during access.
 - b. Door must be kept closed (except during the actual in-flight access period).
 - c. Portable oxygen equipment be carried each time the cargo compartment is accessed by an occupant.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AFM	Aircraft Flight Manual

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-127: IMPROVED FLAMMABILITY STANDARD FOR THERMAL/ACOUSTIC INSULATION MATERIALS

SPECIAL CONDITION	E-127: Improved flammability standard for thermal/acoustic insulation materials
APPLICABILITY:	A330-200F
REQUIREMENTS:	Part 21A.16B, CS 25.853, CS 25.855, FAR 25.856(a) at amendment 111
ISSUE:	1 dated 18/04/2008

Special Condition**BACKGROUND**

Airbus applied for EASA Type Certification of A330-200F, which is a General Market Freighter aircraft based on the passenger version of the Enhanced A330-200.

The FAA has adopted on July 31, 2003 upgraded Flammability Standards for Thermal/Acoustic Insulation Materials that are used in Transport Category Aeroplanes. These requirements are incorporated into FAR Part 25 amendment 25-111, as a new paragraph 25.856 and new parts VI and VII of Appendix F.

Typically, thermal/acoustic insulation materials addressed in this new rule are the one installed behind interior panels in transport category aeroplanes: FAR 25.856(a) incorporates the flame propagation requirements, and FAR 25.856(b) introduces the flame penetration requirements. The new Parts VI and VII of Appendix F respectively describe flammability test methods and criterion for flame propagation (radiant panel test) and flame penetration (entry of an external post-crash fire into the aeroplane under realistic post-crash fire scenario)

Amendment 111 of 14CFR Part 25 is part of the A330-200F FAA Certification Basis, therefore, insulation materials installed on A330-200F will comply with FAR 25.856(a) and part VI of appendix F (Note: the requirements of FAR 25 856(b) apply to aircraft that operates for public transportation with a passenger capacity of 20 or greater, and consequently are not applicable to A330-200F).

SPECIAL CONDITION

Amend CS 25.853(a), CS 25.855(d) and define a new requirement CS 25.856 as follows:

- " CS 25.853 Compartment interiors.
(a) Except for thermal/acoustic insulation materials, materials (including finishes or decorative surfaces applied to the materials) must meet the applicable test criteria prescribed in part I of appendix F of this part, or other approved equivalent methods, regardless of the passenger capacity of the aeroplane"

Disclaimer – This document is not exhaustive and it will be updated gradually.



- " CS 25.855 Cargo or baggage compartments.
(d) Except for thermal/acoustic insulation materials, all other materials used in the construction of the cargo or baggage compartment must meet the applicable test criteria prescribed in part I of appendix F of this part or other approved equivalent methods."
- " CS 25.856 Insulation materials
(a) Thermal/acoustic insulation material installed in the fuselage must meet the flame propagation test requirements of part VI of Appendix F to this part, or other approved equivalent test requirements. This requirement does not apply to "small parts", as defined in part I of Appendix F of this part.

PROPOSED APPENDIX F PART VI

Part VI-Test Method To Determine the Flammability and Flame Propagation Characteristics of Thermal/Acoustic Insulation Materials

Use this test method to evaluate the flammability and flame propagation characteristics of thermal/acoustic insulation when exposed to both a radiant heat source and a flame

(a) Definitions

"Flame propagation" means the furthest distance of the propagation of visible flame towards the far end of the test specimen, measured from the midpoint of the ignition source flame. Measure this distance after initially applying the ignition source and before all flame on the test specimen is extinguished. The measurement is not a determination of burn length made after the test.

"Radiant heat source" means an electric or air propane panel

"Thermal/acoustic insulation" means a material or system of materials used to provide thermal and/or acoustic protection.

Examples include fiberglass or other batting material encapsulated by a film covering and foams

"Zero point" means the point of application of the pilot burner to the test specimen

(b) Test apparatus

Disclaimer – This document is not exhaustive and it will be updated gradually.



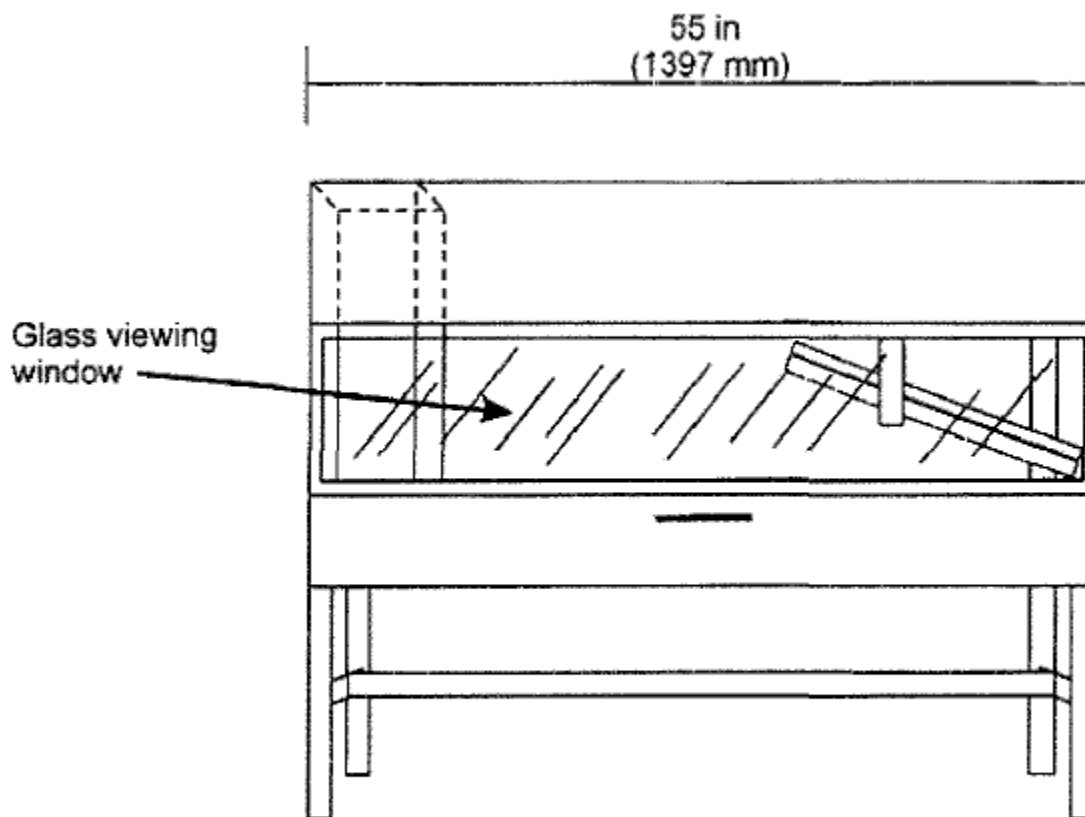


Figure 1 - Radiant Panel Test Chamber

Disclaimer – This document is not exhaustive and it will be updated gradually.



(1) Radiant panel test chamber.

Conduct tests in a radiant panel test chamber (see figure 1 above). Place the test chamber under an exhaust hood to facilitate clearing the chamber of smoke after each test. The radiant panel test chamber must be an enclosure 55 inches (1397 mm) long by 19.5 (495 mm) deep by 28 (710 mm) to 30 inches (maximum) (762 mm) above the test specimen. Insulate the sides, ends, and top with a fibrous ceramic insulation, such as Kaowool MTM board. On the front side, provide a 52 by 12-inch (1321 by 305 mm) draft-free, high-temperature, glass window for viewing the sample during testing. Place a door below the window to provide access to the movable specimen platform holder. The bottom of the test chamber must be a sliding steel platform that has provision for securing the test specimen holder in a fixed and level position. The chamber must have an internal chimney with exterior dimensions of 5.1 inches (129 mm) wide, by 16.2 inches (411 mm) deep by 13 inches (330 mm) high at the opposite end of the chamber from the radiant energy source. The interior dimensions must be 4.5 inches (114 mm) wide by 15.6 inches (395 mm) deep. The chimney must extend to the top of the chamber (see figure 2).

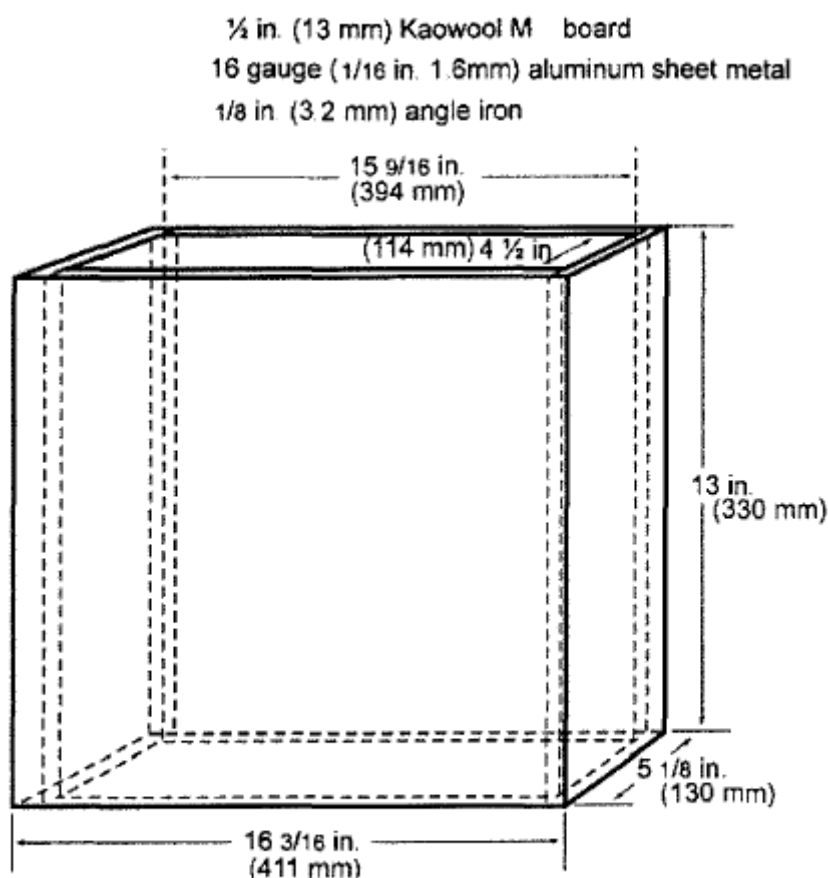


Figure 2 - Internal Chimney

(2) Radiant heat source

Disclaimer – This document is not exhaustive and it will be updated gradually.

Mount the radiant heat energy source in a cast iron frame or equivalent. An electric panel must have six, 3-inch wide emitter strips. The emitter strips must be perpendicular to the length of the panel. The panel must have a radiation surface of 12 7/8 by 18 1/2 inches (327 by 470 mm).

The panel must be capable of operating at temperatures up to 1300°F (704°C). An air propane panel must be made of a porous refractory material and have a radiation surface of 12 by 18 inches (305 by 457 mm). The panel must be capable of operating at temperatures up to 1500°F (816°C). See figures 3a and 3b.

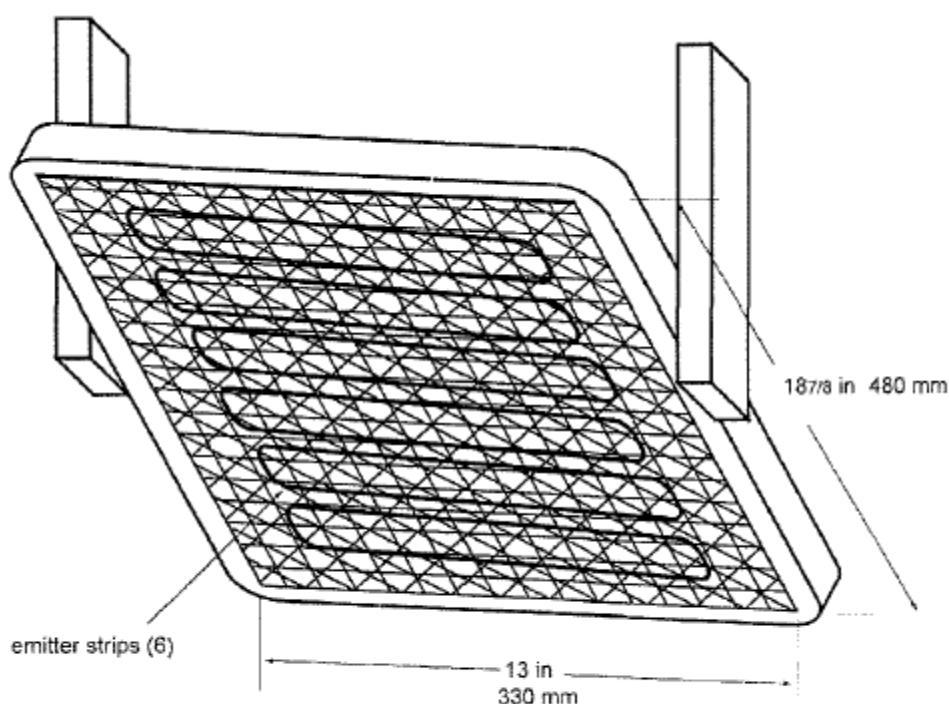


Figure 3a – Electric Panel

Disclaimer – This document is not exhaustive and it will be updated gradually.



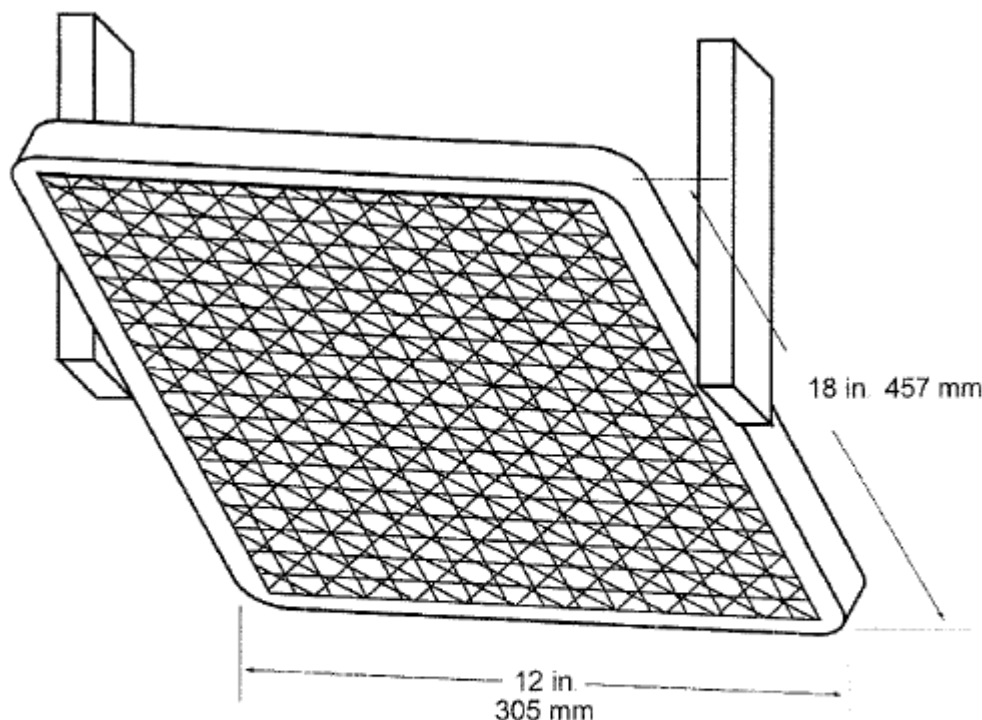


Figure 3b – Air Propane Radiant Panel

(i) *Electric radiant panel*

The radiant panel must be 3-phase and operate at 208 volts. A single-phase, 240 volt panel is also acceptable. Use a solid-state power controller and microprocessor-based controller to set the electric panel operating parameters.

(ii) *Gas radiant panel*

Use propane (liquid petroleum gas-2.1 UN 1 075) for the radiant panel fuel. The panel fuel system must consist of a venturi-type aspirator for mixing gas and air at approximately atmospheric pressure. Provide suitable instrumentation for monitoring and controlling the flow of fuel and air to the panel. Include an air flow gauge, an air flow regulator, and a gas pressure gauge.

(iii) *Radiant panel placement*

Mount the panel in the chamber at 30° to the horizontal specimen plane, and 7 1/2 inches above the zero point of the specimen.

(3) *Specimen holding system*

(i) The sliding platform serves as the housing for test specimen placement. Brackets may be attached (via wing nuts) to the top lip of the platform in order to accommodate various thicknesses of test specimens. Place the test specimens on a sheet of Kaowool MTM board.

Disclaimer – This document is not exhaustive and it will be updated gradually.

or 1260 Standard Board (manufactured by Thermal Ceramics and available in Europe), or equivalent, either resting on the bottom lip of the sliding platform or on the base of the brackets.

It may be necessary to use multiple sheets of material based on the thickness of the test specimen (to meet the sample height requirement). Typically, these noncombustible sheets of material are available in 1/4 inch (6 mm) thicknesses. See figure 4. A sliding platform that is deeper than the 2- inch (50.8mm) platform shown in figure 4 is also acceptable as long as the sample height requirement is met.

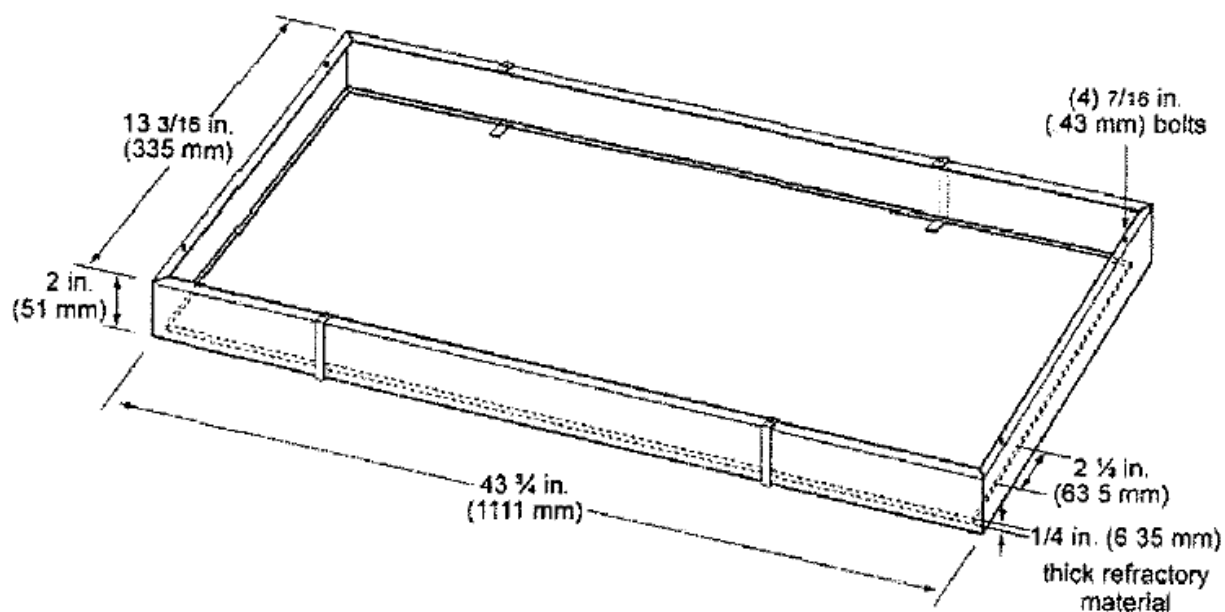


Figure 4 - Sliding Platform

(ii) Attach a 1/2 inch (13 mm) piece of Kaowool MTM board or other high temperature material measuring 41 1/2 by 8 1/4 inches (1054 by 210 mm) to the back of the platform. This board serves as a heat retainer and protects the test specimen from excessive preheating. The height of this board must not impede the sliding platform movement (in and out of the test chamber). If the platform has been fabricated such that the back side of the platform is high enough to prevent excess preheating of the specimen when the sliding platform is out, a retainer board is not necessary.

(iii) Place the test specimen horizontally on the non-combustible board(s). Place a steel retaining/securing frame fabricated of mild steel, having a thickness of 1/8 inch (3.2 mm) and overall dimensions of 23 by 13 1/8 inches (584 by 333 mm) with a specimen opening of 19 by 10 3/4 inches (483 by 273 mm) over the test specimen. The front, back, and right portions of the top flange of the frame must rest on the top of the sliding platform, and the

Disclaimer – This document is not exhaustive and it will be updated gradually.

bottom flanges must pinch all 4 sides of the test specimen. The right bottom flange must be flush with the sliding platform. See figure 5.

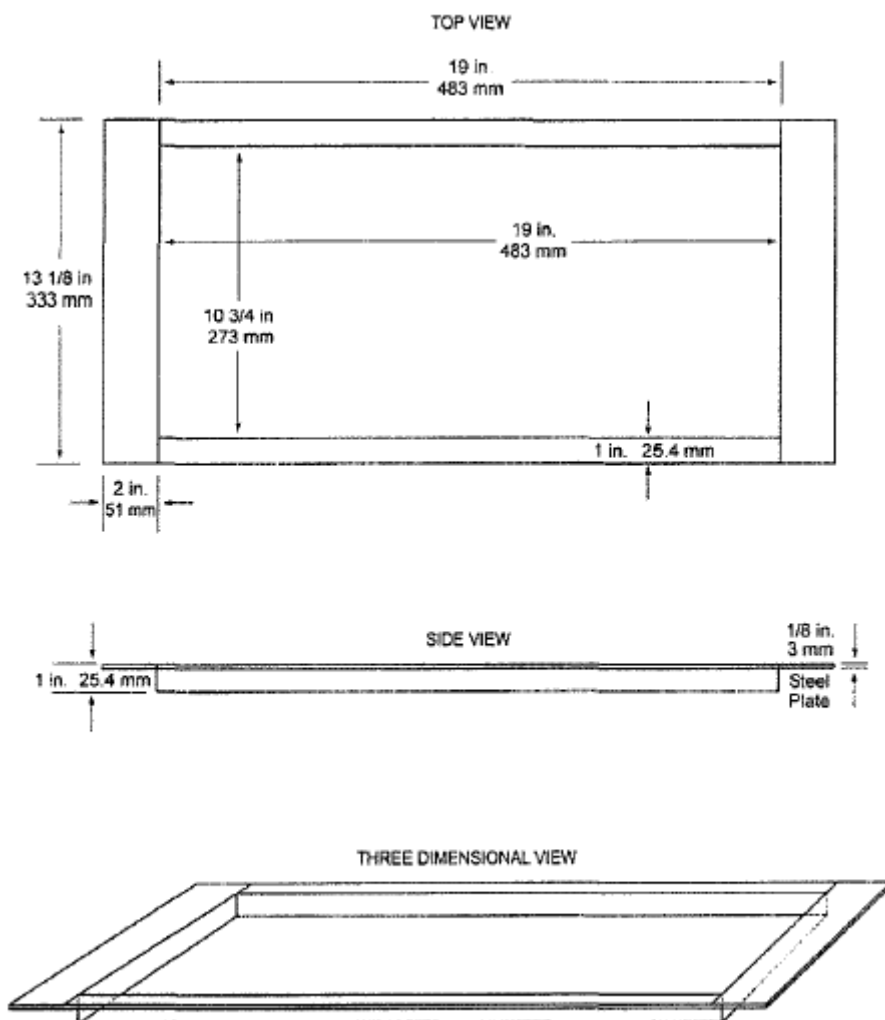


Figure 5: 3 views

(4) Pilot Burner.

The pilot burner used to ignite the specimen must be a Bernzomatic TM commercial propane venturi torch with an axially symmetric burner tip and a propane supply tube with an orifice diameter of 0.006 inches (0.15 mm). The length of the burner tube must be 2 7/8 inches (71 mm). The propane flow must be adjusted via gas pressure through an in-line regulator to produce a blue inner cone length of 3/4 inch (19 mm). A 3/4 inch (19 mm) guide (such as a thin strip of metal) may be soldered to the top of the burner to aid in setting the flame height. The overall flame length must be approximately 5 inches long (127 mm). Provide a way to move the burner out of the ignition position so that the flame is horizontal and at least 2 inches (50 mm) above the specimen plane. See figure 6.

Disclaimer – This document is not exhaustive and it will be updated gradually.



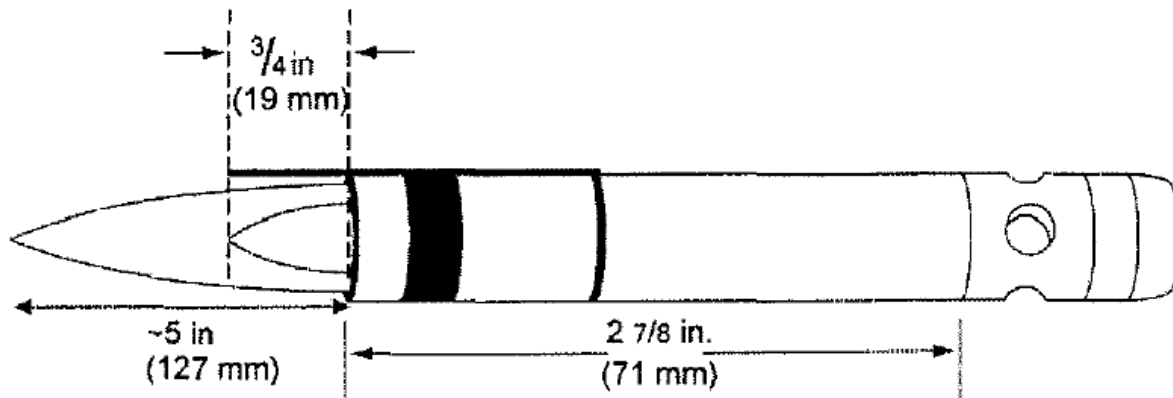


Figure 6 – Propane Pilot Burner

(5) *Thermocouples*

Install a 24 American Wire Gauge (AWG) Type K (Chromel- Alumel) thermocouple in the test chamber for temperature monitoring. Insert it into the chamber through a small hole drilled through the back of the chamber. Place the thermocouple so that it extends 11 inches (279 mm) out from the back of the chamber wall, 11 1/2 inches (292 mm) from the right side of the chamber wall, and is 2 inches (51 mm) below the radiant panel. The use of other thermocouples is optional.

(6) *Calorimeter*

The calorimeter must be a one-inch cylindrical water-cooled, total heat flux density, foil type Gardon Gage that has a range of 0 to 5 BTU/ft²-second (0 to 5.7 Watts/cm²).

(7) *Calorimeter calibration specification and procedure*

(i) *Calorimeter specification*

- (A) Foil diameter must be 0.25 +/-0.005 inches (6.35 +/-0.13 mm).
- (B) Foil thickness must be 0.0005 +/- 0.0001 inches (0.013 +/-0.0025 mm).
- (C) Foil material must be thermocouple grade Constantan.
- (D) Temperature measurement must be a Copper Constantan thermocouple.
- (E) The copper centre wire diameter must be 0.0005 inches (0.013 mm).
- (F) The entire face of the calorimeter must be lightly coated with "Black Velvet" paint having an emissivity of 96 or greater.

(ii) *Calorimeter calibration*

- (A) The calibration method must be by comparison to a like standardized transducer.
- (B) The standardized transducer must meet the specifications given in paragraph VI(b)(6) of this appendix.
- (C) Calibrate the standard transducer against a primary standard traceable to the National Institute of Standards and Technology (NIST).
- (D) The method of transfer must be a heated graphite plate.

Disclaimer – This document is not exhaustive and it will be updated gradually.

- (E) The graphite plate must be electrically heated, have a clear surface area on each side of the plate of at least 2 by 2 inches (51 by 51 mm), and be 1/8 inch +/- 1/16 inch thick (3.2 +/- 1.6 mm).
- (F) Centre the 2 transducers on opposite sides of the plates at equal distances from the plate.
- (G) The distance of the calorimeter to the plate must be no less than 0.0625 inches (1.6 mm), nor greater than 0.375 inches (9.5 mm).
- (H) The range used in calibration must be at least 0-3.5 BTUs/ft² second (0-3.9 Watts/cm²) and no greater than 0-5.7 BTUs/ft² second (0-6.4 Watts/cm²).
- (I) The recording device used must record the 2 transducers simultaneously or at least within 1.10 of each other.

(8) *Calorimeter fixture*

With the sliding platform pulled out of the chamber, install the calorimeter holding frame and place a sheet of non-combustible material in the bottom of the sliding platform adjacent to the holding frame. This will prevent heat losses during calibration. The frame must be 13 1/8 inches (333 mm) deep (front to back) by 8 inches (203 mm) wide and must rest on the top of the sliding platform. It must be fabricated of 1/8 inch (3.2 mm) flat stock steel and have an opening that accommodates a 1/2 inch (12.7 mm) thick piece of refractory board, which is level with the top of the sliding platform. The board must have three 1-inch (25.4 mm) diameter holes drilled through the board for calorimeter insertion. The distance to the radiant panel surface from the centreline of the first hole ("zero" position) must be 7 1/2 +/- 1/8 inches (191 +/- 3 mm). The distance between the centreline of the first hole to the centreline of the second hole must be 2 inches (51 mm). It must also be the same distance from the centreline of the second hole to the centreline of the third hole. See figure 7. A calorimeter holding frame that differs in construction is acceptable as long as the height from the centreline of the first hole to the radiant panel and the distance between holes is the same as described in this paragraph.

Disclaimer – This document is not exhaustive and it will be updated gradually.



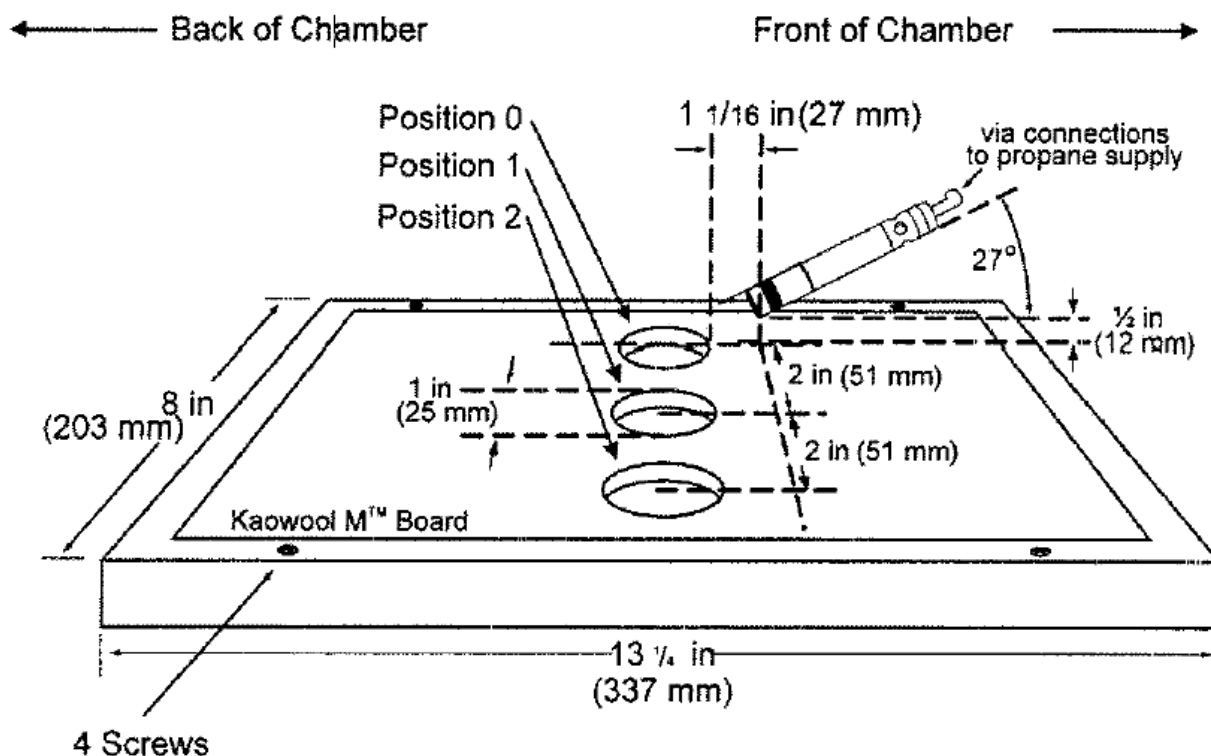


Figure 7 - Calorimeter Holding Frame

(9) Instrumentation

Provide a calibrated recording device with an appropriate range or a computerized data acquisition system to measure and record the outputs of the calorimeter and the thermocouple. The data acquisition system must be capable of recording the calorimeter output every second during calibration.

(10) Timing device

Provide a stopwatch or other device, accurate to ± 1 second/hour, to measure the time of application of the pilot burner flame.

(c) Test specimens

(1) Specimen preparation

Prepare and test a minimum of three test specimens. If an oriented film cover material is used, prepare and test both the warp and fill directions.

(2) Construction

Test specimens must include all materials used in construction of the insulation (including batting, film, scrim, tape etc.). Cut a piece of core material such as foam or fiberglass, and cut a piece of film cover material (if used) large enough to cover the core material. Heat sealing is

Disclaimer – This document is not exhaustive and it will be updated gradually.

the preferred method of preparing fiberglass samples, since they can be made without compressing the fiberglass ("box sample"). Cover materials that are not heat sealable may be stapled, sewn, or taped as long as the cover material is over-cut enough to be drawn down the sides without compressing the core material. The fastening means should be as continuous as possible along the length of the seams. The specimen thickness must be of the same thickness as installed in the aeroplane.

(3) Specimen Dimensions

To facilitate proper placement of specimens in the sliding platform housing, cut non-rigid core materials, such as fiberglass, 12 1/2 inches (318mm) wide by 23 inches (584mm) long. Cut rigid materials, such as foam, 11 1/2 +/- 1/4 inches (292 mm +/- 6mm) wide by 23 inches (584mm) long in order to fit properly in the sliding platform housing and provide a flat, exposed surface equal to the opening in the housing.

(d) Specimen conditioning

Condition the test specimens at 70 +/- 5°F (21 +/- 2°C) and 55% +/- 10% relative humidity, for a minimum of 24 hours prior to testing.

(e) Apparatus Calibration

(1) With the sliding platform out of the chamber, install the calorimeter holding frame. Push the platform back into the chamber and insert the calorimeter into the first hole ("zero" position). See figure 7. Close the bottom door located below the sliding platform. The distance from the centreline of the calorimeter to the radiant panel surface at this point must be 7 1/2 inches +/- 1/8 (191 mm +/- 3mm). Prior to igniting the radiant panel, ensure that the calorimeter face is clean and that there is water running through the calorimeter.

(2) Ignite the panel. Adjust the fuel/air mixture to achieve 1.5 BTUs/ft²-second +/- 5% (1.7 Watts/cm² +/- 5%) at the "zero" position. If using an electric panel, set the power controller to achieve the proper heat flux. Allow the unit to reach steady state (this may take up to 1 hour). The pilot burner must be off and in the down position during this time.

(3) After steady-state conditions have been reached, move the calorimeter 2 inches (51 mm) from the "zero" position (first hole) to position 1 and record the heat flux. Move the calorimeter to position 2 and record the heat flux. Allow enough time at each position for the calorimeter to stabilize. Table 1 depicts typical calibration values at the three positions.

TABLE 1 —CALIBRATION TABLE

Position	BTUs/ft ² sec	Watts/cm ²
"Zero" Position	1.5	1.7
Position 1	1.51–1.50–1.49	1.71–1.70–1.69
Position 2	1.43–1.44	1.62–1.63

Disclaimer – This document is not exhaustive and it will be updated gradually.



(4) Open the bottom door. Remove the calorimeter and holder fixture. Use caution as the fixture is very hot.

(f) *Test Procedure*

(1) Ignite the pilot burner. Ensure that it is at least 2 inches (51 mm) above the top of the platform. The burner must not contact the specimen until the test begins.

(2) Place the test specimen in the sliding platform holder. Ensure that the test sample surface is level with the top of the platform. At "zero" point, the specimen surface must be 7 1/2 inches +/- 1/8 inch (191 mm +/- 3mm) below the radiant panel.

(3) Place the retaining/securing frame over the test specimen. It may be necessary (due to compression) to adjust the sample (up or down) in order to maintain the distance from the sample to the radiant panel (7 1/2 inches +/- 1/8 inch (191 mm +/- 3mm) at "zero" position). With film/fiberglass assemblies, it is critical to make a slit in the film cover to purge any air inside. This allows the operator to maintain the proper test specimen position (level with the top of the platform) and to allow ventilation of gases during testing. A longitudinal slit, approximately 2 inches (51mm) in length, must be centred 3 inches +/- 1/2 inch (76mm +/- 13mm) from the left flange of the securing frame. A utility knife is acceptable for slitting the film cover.

(4) Immediately push the sliding platform into the chamber and close the bottom door.

(5) Bring the pilot burner flame into contact with the centre of the specimen at the "zero" point and simultaneously start the timer. The pilot burner must be at a 27° angle with the sample and be approximately 1/2 inch (12 mm) above the sample. See figure 7 A stop, as shown in figure 8, allows the operator to position the burner correctly each time.

Disclaimer – This document is not exhaustive and it will be updated gradually.



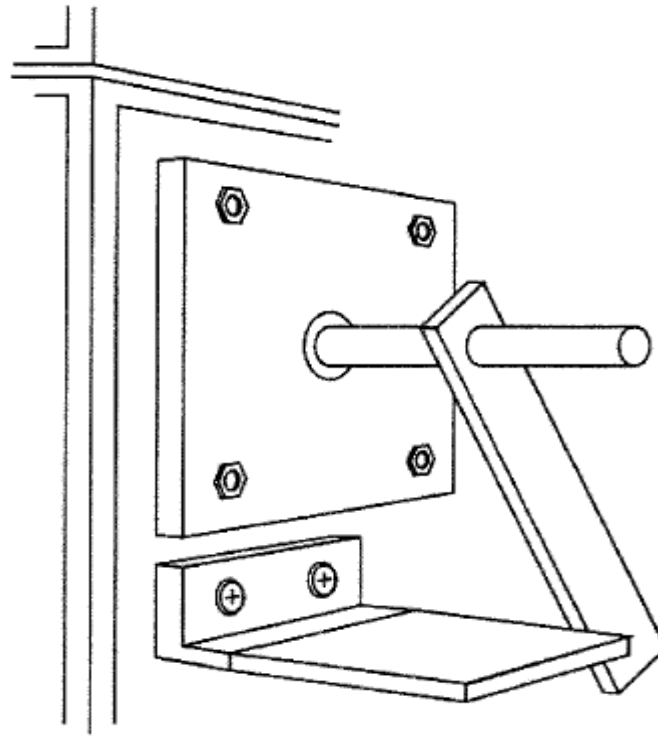


Figure 8 – Propane Burner stop

(6) Leave the burner in position for 15 seconds and then remove to a position at least 2 inches (51 mm) above the specimen.

(g) Report

(1) Identify and describe the test specimen.

(2) Report any shrinkage or melting of the test specimen.

(3) Report the flame propagation distance. If this distance is less than 2 inches, report this as a pass (no measurement required).

(4) Report the after-flame time.

(h) Requirements

(1) There must be no flame propagation beyond 2 inches (51 mm) to the left of the centreline of the pilot flame application.

(2) The flame time after removal of the pilot burner may not exceed 3 seconds on any specimen.

Disclaimer – This document is not exhaustive and it will be updated gradually.

Acronyms and Abbreviations

EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
CS	Certification specification

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-128: IMPROVED FLAMMABILITY STANDARD FOR THERMAL/ACOUSTIC INSULATION MATERIALS – FLAME PENETRATION (EQUIVALENT TO FAR 25.856(B) AT AMENDMENT 111)

SPECIAL CONDITION	E-128: Improved flammability standard for thermal/acoustic insulation materials – Flame penetration (equivalent to FAR 25.856(b) at amendment 111)
APPLICABILITY:	A330/A340/A340-500/A340-600
REQUIREMENTS:	Part 21A.16B, JAR 25.853, JAR 25.855, Post TC CRI E-1022 – Improved flammability standards for Thermal/acoustic insulation – Flame propagation (equivalent to FAR 25.856(a) at amendment 111)
ISSUE:	2 dated 03/02/2009

Special Condition

BACKGROUND

Current European flammability standards for thermal/acoustic insulation do not realistically address situations in which thermal/acoustic insulation materials may contribute to protect the aircraft against post crash fire. The purpose of the FAR 25.856(b) is to upgrade the flammability standards and thus to reduce the incidence and severity of cabin fires, particularly those associated to the entry of fire in post crash scenario by increasing the time for passenger to evacuate in case of a survivable crash.

EASA considers that there is a need to define a special condition because the airworthiness requirements of the relevant CS do not contain adequate or appropriate safety standards for product, which in service experience has shown that unsafe conditions may develop.

SPECIAL CONDITION

Amend CS 25.853(a), CS 25.855(d) and define a new requirement CS 25.856 as follows:

JAR 25.853 Compartment interiors.

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

JAR 25.855 Cargo or baggage compartments.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



CS 25.856 Insulation materials.

(b) For aeroplanes with a passenger capacity of 20 or greater, thermal/ acoustic insulation materials (including the means of fastening the materials to the fuselage) installed in the lower half of the aeroplane fuselage must meet the flame penetration resistance test requirements of part VII of Appendix F to this part, or other approved equivalent test requirements. This requirement does not apply to thermal/ acoustic insulation installations that the EASA finds would not contribute to fire penetration resistance.

PROPOSED APPENDIX F PART VII

Part VII— Test Method To Determine the Burnthrough Resistance of Thermal/Acoustic Insulation Materials.

Use the following test method to evaluate the burnthrough resistance characteristics of aircraft thermal/acoustic insulation materials when exposed to a high intensity open flame.

(a) Definitions.

Burnthrough time means the time, in seconds, for the burner flame to penetrate the test specimen, and/or the time required for the heat flux to reach 2.0 Btu/ft²sec (2.27 W/cm²) on the inboard side, at a distance of 12 inches (30.5 cm) from the front surface of the insulation blanket test frame, whichever is sooner. The burnthrough time is measured at the inboard side of each of the insulation blanket specimens. Insulation blanket specimen means one of two specimens positioned in either side of the test rig, at an angle of 30° with respect to vertical. Specimen set means two insulation blanket specimens. Both specimens must represent the same production insulation blanket construction and materials, proportioned to correspond to the specimen size.

(b) Apparatus.

(1) The arrangement of the test apparatus is shown in figures 1 and 2 and must include the capability of swinging the burner away from the test specimen during warm-up.

Disclaimer – This document is not exhaustive and it will be updated gradually.



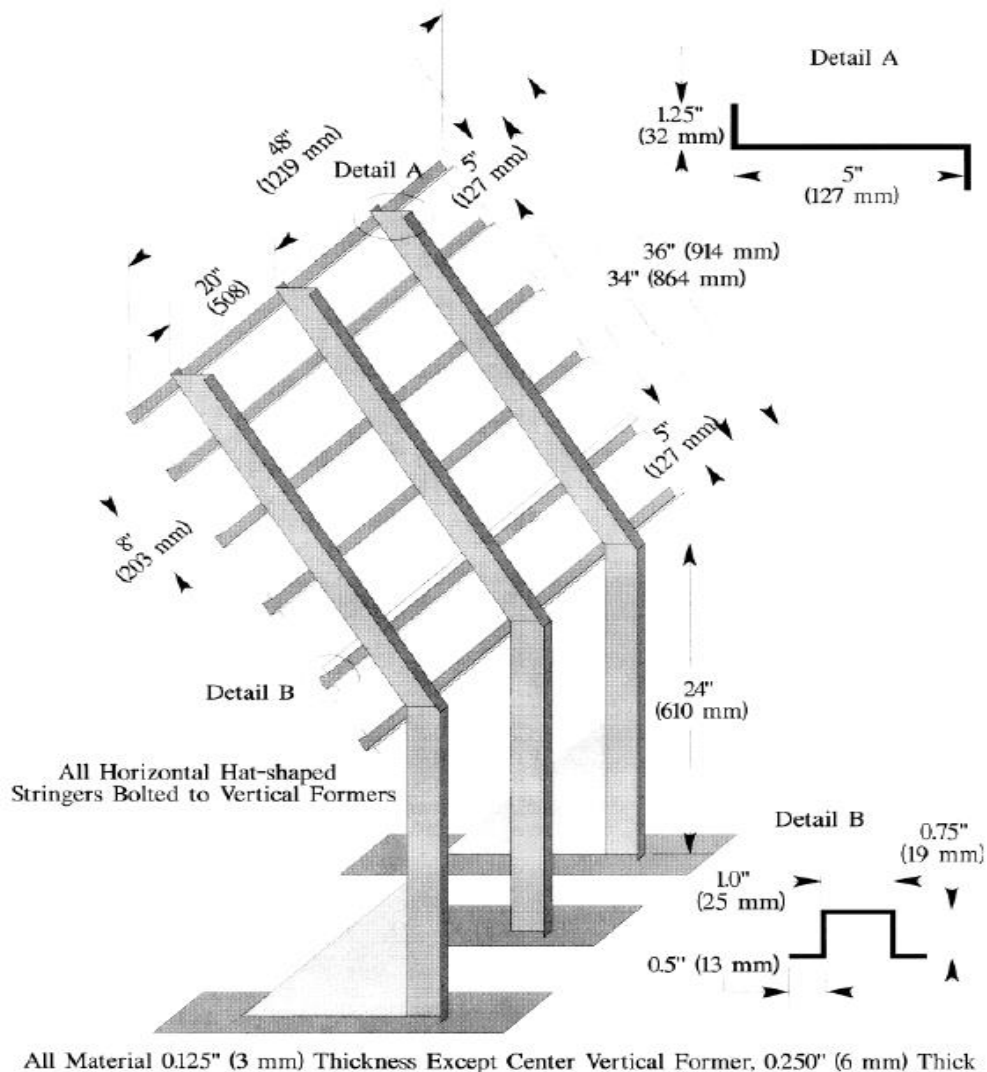


Figure 1 - Burnthrough Test Apparatus Specimen Holder

(2) Test burner. The test burner must be a modified gun-type such as the Park Model DPL 3400. Flame characteristics are highly dependent on actual burner setup. Parameters such as fuel pressure, nozzle depth, stator position, and intake airflow must be properly adjusted to achieve the correct flame output.

Disclaimer – This document is not exhaustive and it will be updated gradually.



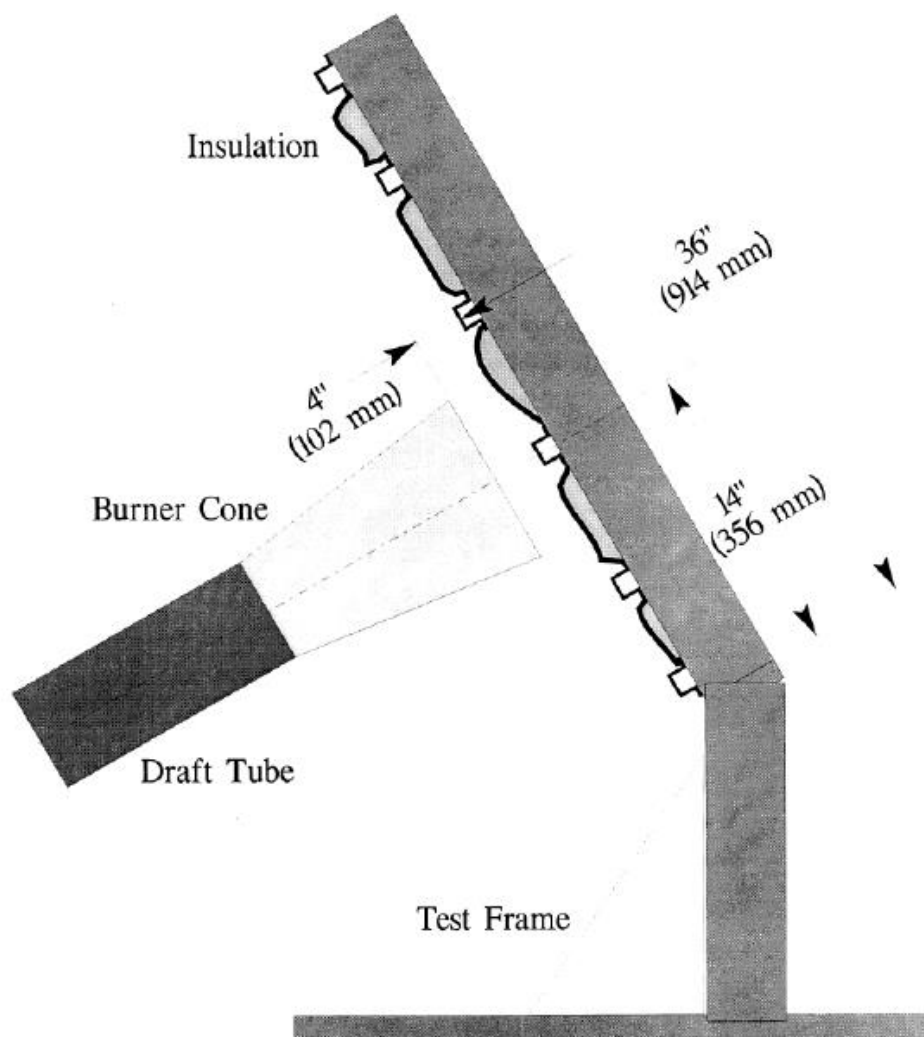


Figure 2 – Burnthrough Test Apparatus

(i) Nozzle. A nozzle must maintain the fuel pressure to yield a nominal 6.0 gal/hr (0.378 L/min) fuel flow. A Monarch-nominally rated at 6.0 gal/hr at 100 lb/in² (0.71 MPa) delivers a proper spray pattern.

(ii) Fuel Rail. The fuel rail must be adjusted to position the fuel nozzle at a depth of 0.3125 inch (8 mm) from the end plane of the exit stator, which must be mounted in the end of the draft tube.

(iii) Internal Stator. The internal stator, located in the middle of the draft tube, must be positioned at a depth of 3.75 inches (95 mm) from the tip of the fuel nozzle. The stator must also be positioned such that the integral igniters are located at an angle midway between

Disclaimer – This document is not exhaustive and it will be updated gradually.

the 10 and 11 o'clock position, when viewed looking into the draft tube. Minor deviations to the igniter angle are acceptable if the temperature and heat flux requirements conform to the requirements of paragraph VII (e) of this appendix.

(iv) Blower Fan. The cylindrical blower fan used to pump air through the burner must measure 5.25 inches (133 mm) in diameter by 3.5 inches (89 mm) in width.

(v) Burner cone. Install a 12 +0.125-inch (305 +/- 3 mm) burner extension cone at the end of the draft tube. The cone must have an opening 6 +/- 0.125-inch (152 +/- 3 mm) high and 11 +/- 0.125-inch (280 +/- 3 mm) wide (see figure 3).

(vi) Fuel. Use JP-8, Jet A, or their international equivalent, at a flow rate of 6.0 +/- 0.2 gal/hr (0.378 +/- 0.0126 L/min). If this fuel is unavailable, ASTM K2 fuel (Number 2 grade kerosene) or ASTM D2 fuel (Number 2 grade fuel oil or Number 2 diesel fuel) are acceptable if the nominal fuel flow rate, temperature, and heat flux measurements conform to the requirements of paragraph VII (e) of this appendix.

(vii) Fuel pressure regulator. Provide a fuel pressure regulator, adjusted to deliver a nominal 6.0 gal/hr (0.378 L/min) flow rate. An operating fuel pressure of 100 lb/in² (0.71MPa) for a nominally rated 6.0 gal/hr 80° spray angle nozzle (such as a PL type) delivers 6.0 +/- 0.2 gal/hr (0.378 +/- 0.0126 L/min).

Disclaimer – This document is not exhaustive and it will be updated gradually.



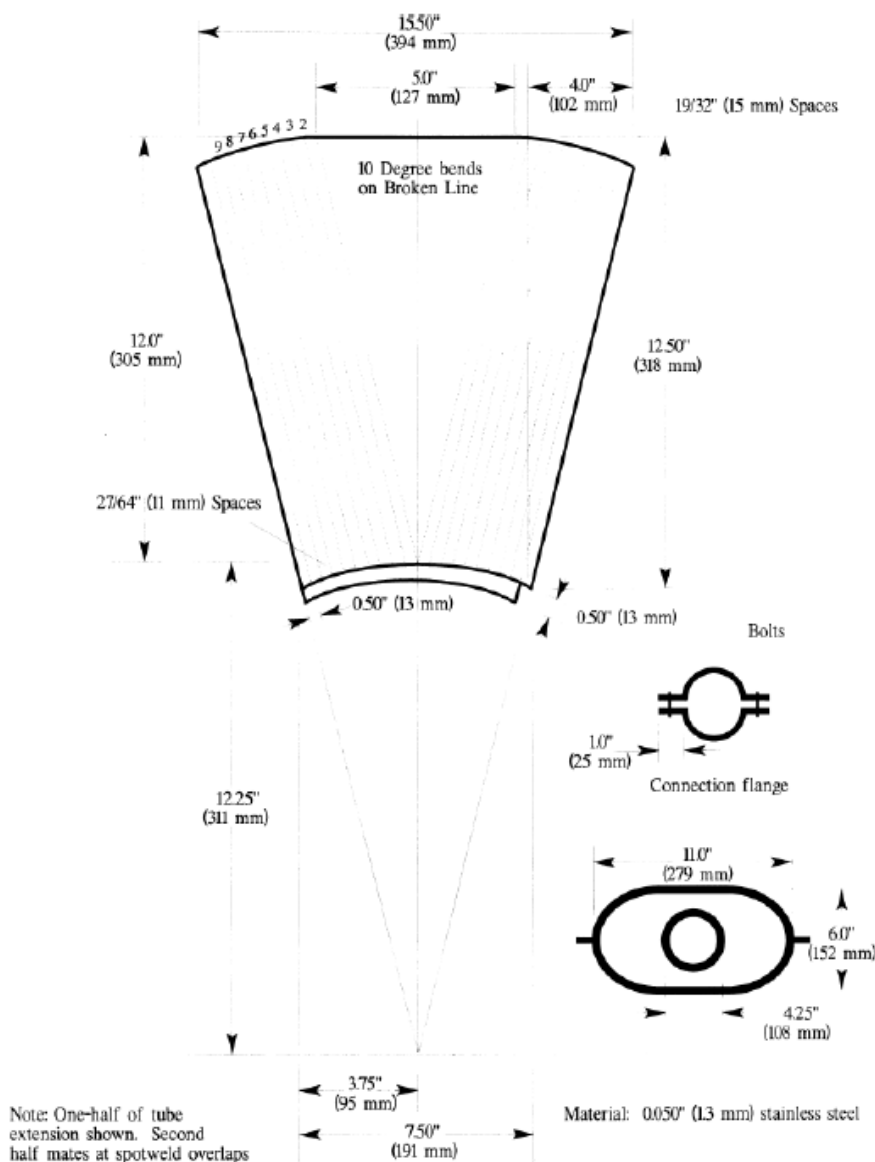


Figure 3 – Burner Draft Tube Extension Cone Diagram

(3) Calibration rig and equipment.

(i) Construct individual calibration rigs to incorporate a calorimeter and thermocouple rake for the measurement of heat flux and temperature. Position the calibration rigs to allow movement of the burner from the test rig position to either the heat flux or temperature position with minimal difficulty.

(ii) Calorimeter. The calorimeter must be a total heat flux, foil type Gardon Gage of an appropriate range such as 0–20 Btu/ft²-sec (0–22.7 W/cm²), accurate to +/- 3% of the indicated reading. The heat flux calibration method must be in accordance with paragraph VI (b)(7) of this appendix.

Disclaimer – This document is not exhaustive and it will be updated gradually.

(iii) Calorimeter mounting. Mount the calorimeter in a 6- by 12- +/- 0.125 inch (152- by 305- +/- 3 mm) by 0.75 +/- 0.125 inch (19 mm +/- 3 mm) thick insulating block which is attached to the heat flux calibration rig during calibration (figure 4). Monitor the insulating block for deterioration and replace it when necessary. Adjust the mounting as necessary to ensure that the calorimeter face is parallel to the exit plane of the test burner cone.

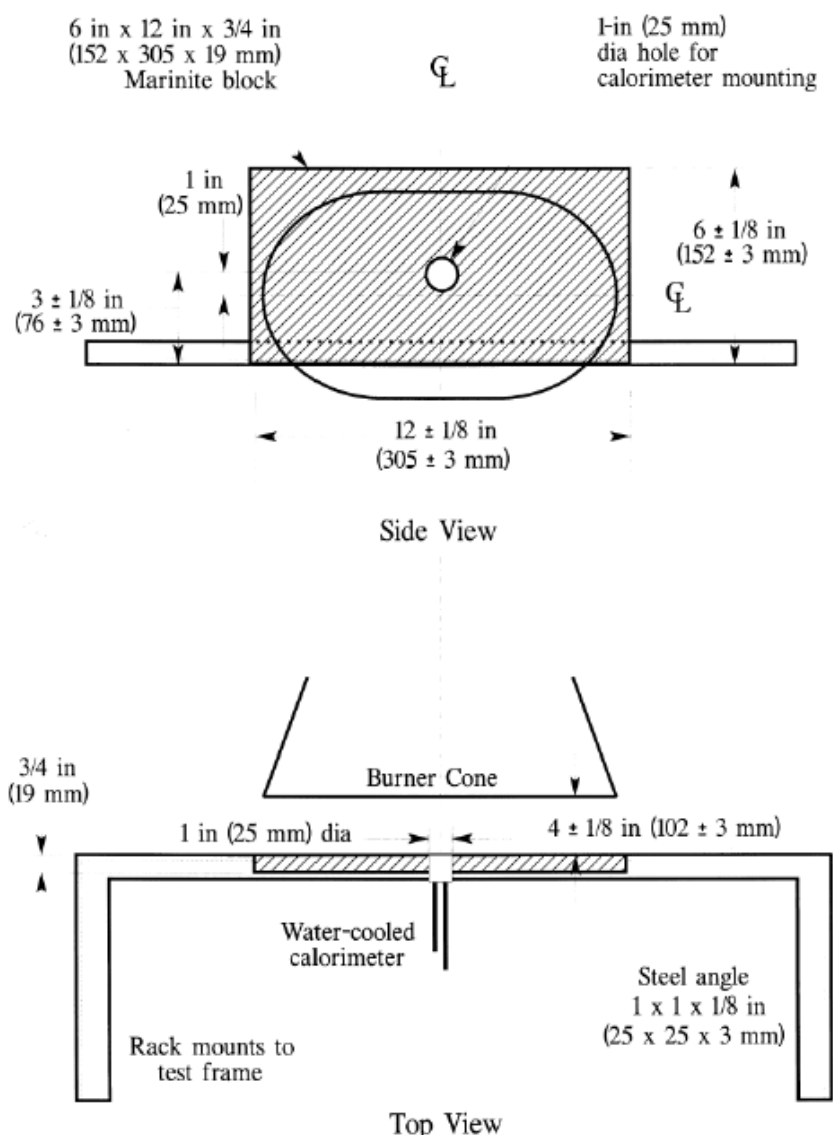


Figure 4 - Calorimeter Position Relative to Burner Cone

(iv) Thermocouples. Provide seven 1/8-inch (3.2 mm) ceramic packed, metal sheathed, type K (Chromel-alumel), grounded junction thermocouples with a nominal 24 American Wire Gauge (AWG) size conductor for calibration. Attach the thermocouples to a steel angle

Disclaimer – This document is not exhaustive and it will be updated gradually.



bracket to form a thermocouple rake for placement in the calibration rig during burner calibration (figure 5).

(v) Air velocity meter. Use a vane-type air velocity meter to calibrate the velocity of air entering the burner. An Omega Engineering Model HH30A is satisfactory. Use a suitable adapter to attach the measuring device to the inlet side of the burner to prevent air from entering the burner other than through the measuring device, which would produce erroneously low readings. Use a flexible duct, measuring 4 inches wide (102 mm) by 20 feet long (6.1 meters), to supply fresh air to the burner intake to prevent damage to the air velocity meter from ingested soot. An optional airbox permanently mounted to the burner intake area can effectively house the air velocity meter and provide a mounting port for the flexible intake duct.

(4) Test specimen mounting frame. Make the mounting frame for the test specimens of 1/8-inch (3.2 mm) thick steel as shown in figure 1, except for the centre vertical former, which should be 1/4-inch (6.4 mm) thick to minimize warpage. The specimen mounting frame stringers (horizontal) should be bolted to the test frame formers (vertical) such that the expansion of the stringers will not cause the entire structure to warp. Use the mounting frame for mounting the two insulation blanket test specimens as shown in figure 2.

(5) Backface calorimeters. Mount two total heat flux Gardon type calorimeters behind the insulation test specimens on the backside (cold) area of the test specimen-mounting frame as shown in figure 6.

Position the calorimeters along the same plane as the burner cone centreline, at a distance of 4 inches (102 mm) from the vertical centreline of the test frame.

Disclaimer – This document is not exhaustive and it will be updated gradually.



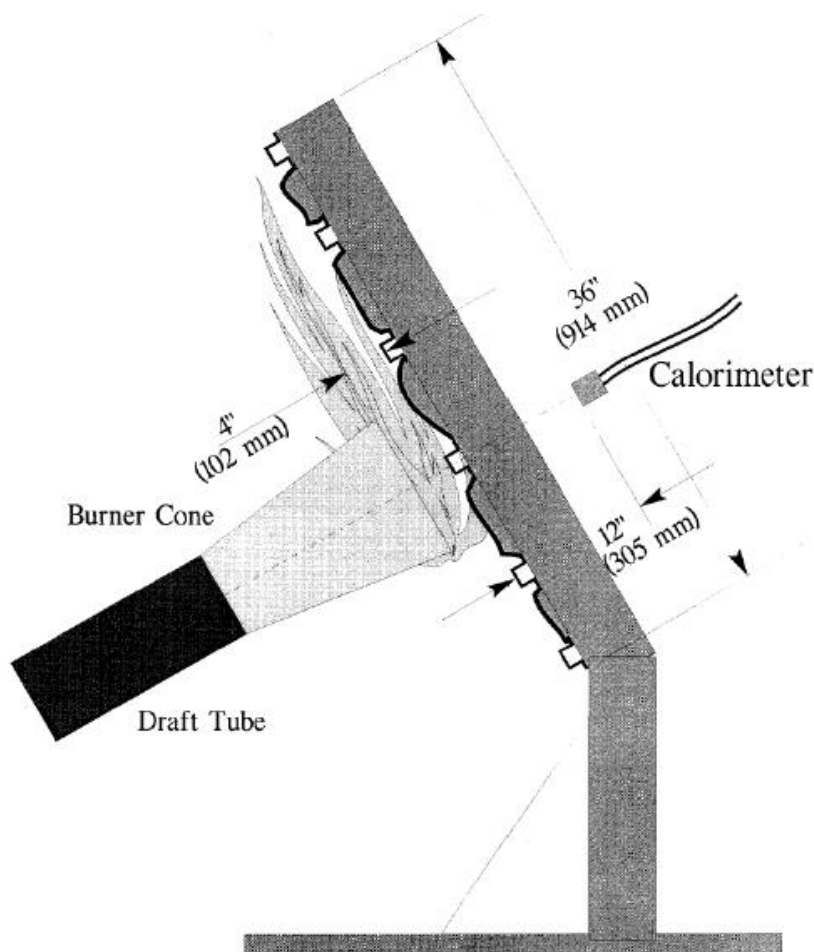


Figure 6 - . Position of Backface Calorimeters Relative to Test Specimen Frame

- (i) The calorimeters must be a total heat flux, foil type Gardon Gage of an appropriate range such as 0–5 Btu/ft²-sec (0–5.7 W/cm²), accurate to +/- 3% of the indicated reading. The heat flux calibration method must comply with paragraph VI (b)(7) of this appendix.
- (6) Instrumentation. Provide a recording potentiometer or other suitable calibrated instrument with an appropriate range to measure and record the outputs of the calorimeter and the thermocouples.
- (7) Timing device. Provide a stopwatch or other device, accurate to +/- 1%, to measure the time of application of the burner flame and burnthrough time.
- (8) Test chamber. Perform tests in a suitable chamber to reduce or eliminate the possibility of test fluctuation due to air movement. The chamber must have a minimum floor area of 10 by 10 feet (305 by 305 cm).

Disclaimer – This document is not exhaustive and it will be updated gradually.

(i) Ventilation hood. Provide the test chamber with an exhaust system capable of removing the products of combustion expelled during tests.

(c) Test Specimens.

(1) Specimen preparation. Prepare a minimum of three specimen sets of the same construction and configuration for testing.

(2) Insulation blanket test specimen.

(i) For batt-type materials such as fiberglass, the constructed, finished blanket specimen assemblies must be 32 inches wide by 36 inches long (81.3 by 91.4 cm), exclusive of heat sealed film edges.

(ii) For rigid and other non-conforming types of insulation materials, the finished test specimens must fit into the test rig in such a manner as to replicate the actual in-service installation.

(3) Construction. Make each of the specimens tested using the principal components (i.e., insulation, fire barrier material if used, and moisture barrier film) and assembly processes (representative seams and closures).

(i) Fire barrier material. If the insulation blanket is constructed with a fire barrier material, place the fire barrier material in a manner reflective of the installed arrangement. For example, if the material will be placed on the outboard side of the insulation material, inside the moisture film, place it the same way in the test specimen.

(ii) Insulation material. Blankets that utilize more than one variety of insulation (composition, density, etc.) must have specimen sets constructed that reflect the insulation combination used. If, however, several blanket types use similar insulation combinations, it is not necessary to test each combination if it is possible to bracket the various combinations.

(iii) Moisture barrier film. If a production blanket construction utilizes more than one type of moisture barrier film, perform separate tests on each combination. For example, if a polyimide film is used in conjunction with insulation in order to enhance the burnthrough capabilities, also test the same insulation when used with a polyvinyl fluoride film.

(iv) Installation on test frame. Attach the blanket test specimens to the test frame using 12 steel spring type clamps as shown in figure 7. Use the clamps to hold the blankets in place in both of the outer vertical formers, as well as the centre vertical former (4 clamps per former). The clamp surfaces should measure 1 inch by 2 inches (25 by 51 mm). Place the top and bottom clamps 6 inches (15.2 cm) from the top and bottom of the test frame, respectively. Place the middle clamps 8 inches (20.3 cm) from the top and bottom clamps.

Disclaimer – This document is not exhaustive and it will be updated gradually.

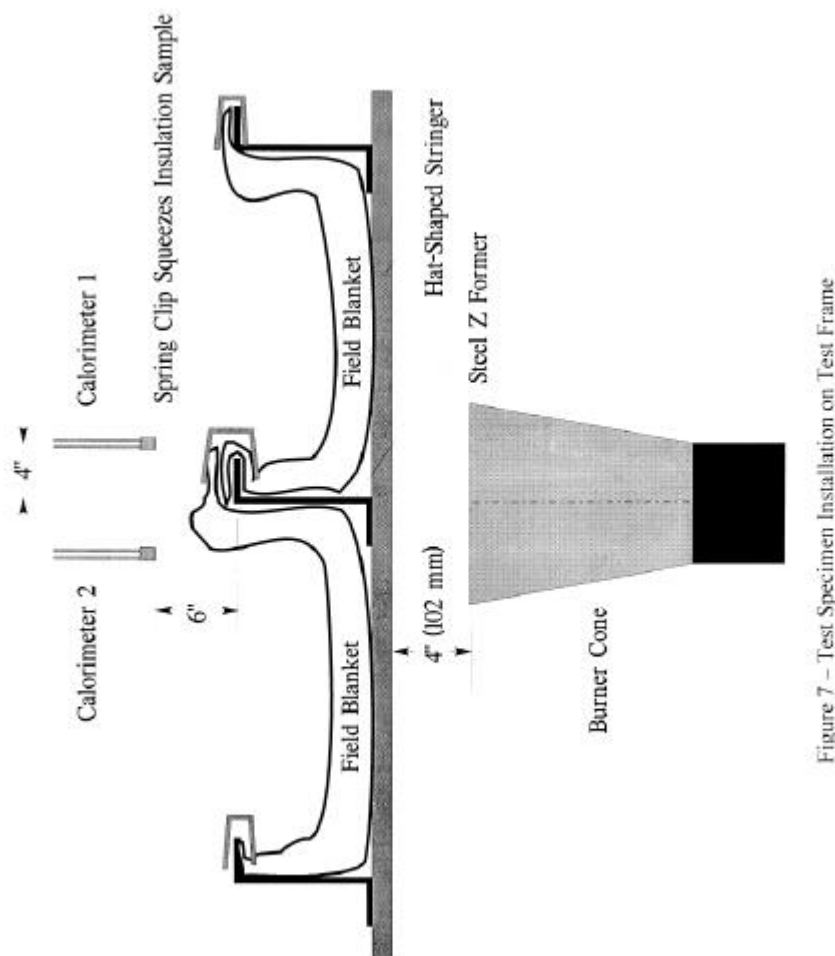


Figure 7 – Test Specimen Installation on Test Frame

(Note: For blanket materials that cannot be installed in accordance with figure 7 above, the blankets must be installed in a manner approved by the FAA.)

(v) Conditioning. Condition the specimens at 70° +/- 5°F (21° +/- 2°C) and 55% +/- 10% relative humidity for a minimum of 24 hours prior to testing.

(d) Preparation of apparatus.

Level and centre the frame assembly to ensure alignment of the calorimeter and/or thermocouple rake with the burner cone.

Turn on the ventilation hood for the test chamber. Do not turn on the burner blower. Measure the airflow of the test chamber using a vane anemometer or equivalent measuring device. The vertical air velocity just behind the top of the upper insulation blanket test specimen must be 100

Disclaimer – This document is not exhaustive and it will be updated gradually.

+/- 50 ft/min (0.51 +/- 0.25 m/s). The horizontal air velocity at this point must be less than 50 ft/min (0.25 m/s).

If a calibrated flow meter is not available, measure the fuel flow rate using a graduated cylinder of appropriate size. Turn on the burner motor/fuel pump, after insuring that the igniter system is turned off. Collect the fuel via a plastic or rubber tube into the graduated cylinder for a 2-minute period. Determine the flow rate in gallons per hour. The fuel flow rate must be 6.0 +/- 0.2 gallons per hour (0.378 +/- 0.0126 L/min).

(e) Calibration.

(1) Position the burner in front of the calorimeter so that it is centred and the vertical plane of the burner cone exit is 4 +/- 0.125 inches (102 +/- 3 mm) from the calorimeter face. Ensure that the horizontal centreline of the burner cone is offset 1 inch below the horizontal centreline of the calorimeter (figure 8). Without disturbing the calorimeter position, rotate the burner in front of the thermocouple rake, such that the middle thermocouple (number 4 of 7) is centred on the burner cone.

Disclaimer – This document is not exhaustive and it will be updated gradually.



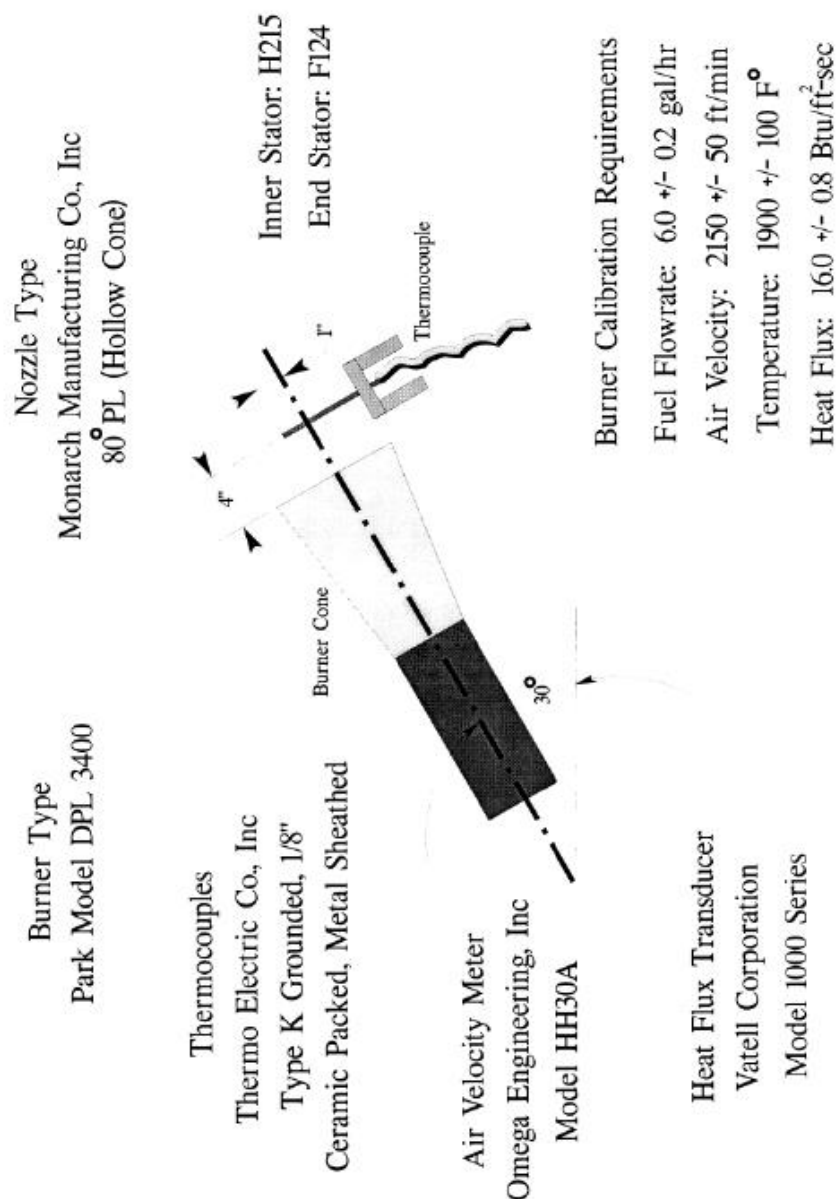


Figure 8 – Burner Information and Calibration Settings

Ensure that the horizontal centreline of the burner cone is also offset 1 inch below the horizontal centreline of the thermocouple tips. Re-check measurements by rotating the burner to each position to ensure proper alignment between the cone and the calorimeter and thermocouple rake. (Note: The test burner mounting system must incorporate “detents” that ensure proper centring of the burner cone with respect to both the calorimeter and the thermocouple rakes, so that rapid positioning of the burner can be achieved during the calibration procedure.)

(2) Position the air velocity meter in the adapter or air box, making certain that no gaps exist where air could leak around the air velocity-measuring device. Turn on the blower/motor while ensuring that the fuel solenoid and igniters are off. Adjust the air intake velocity to a level of 2150 ft/min, (10.92 m/s) and then turn off the blower/motor.

Disclaimer – This document is not exhaustive and it will be updated gradually.

(Note: The Omega HH30 air velocity meter measures 2.625 inches in diameter. To calculate the intake airflow, multiply the cross-sectional area (0.03758 ft²) by the air velocity (2150 ft/min) to obtain 80.80 ft³/min. An air velocity meter other than the HH30 unit can be used, provided the calculated airflow of 80.80 ft³/min (2.29 m³/min) is equivalent.)

(3) Rotate the burner from the test position to the warm-up position. Prior to lighting the burner, ensure that the calorimeter face is clean of soot deposits, and there is water running through the calorimeter. Examine and clean the burner cone of any evidence of buildup of products of combustion, soot, etc. Soot buildup inside the burner cone may affect the flame characteristics and cause calibration difficulties. Since the burner cone may distort with time, dimensions should be checked periodically.

(4) While the burner is still rotated to the warm-up position, turn on the blower/motor, igniters and fuel flow, and light the burner. Allow it to warm up for a period of 2 minutes. Move the burner into the calibration position and allow 1 minute for calorimeter stabilization, then record the heat flux once every second for a period of 30 seconds. Turn off burner, rotate out of position, and allow to cool. Calculate the average heat flux over this 30-second duration. The average heat flux should be 16.0 +/- 0.8 Btu/ft² sec (18.2 +/- 0.9 W/cm²).

(5) Position the burner in front of the thermocouple rake. After checking for proper alignment, rotate the burner to the warm-up position, turn on the blower/motor, igniters and fuel flow, and light the burner. Allow it to warm up for a period of 2 minutes. Move the burner into the calibration position and allow 1 minute for thermocouple stabilization, then record the temperature of each of the 7 thermocouples once every second for a period of 30 seconds. Turn off burner, rotate out of position, and allow to cool. Calculate the average temperature of each thermocouple over this 30-second period and record. The average temperature of each of the 7 thermocouples should be 1900°F +/- 100°F (1038 +/- 56°C)

(6) If either the heat flux or the temperatures are not within the specified range, adjust the burner intake air velocity and repeat the procedures of paragraphs (4) and (5) above to obtain the proper values. Ensure that the inlet air velocity is within the range of 2150 ft/min +/- 50 ft/min (10.92 +/- 0.25 m/s).

(7) Calibrate prior to each test until consistency has been demonstrated. After consistency has been confirmed, several tests may be conducted with calibration conducted before and after a series of tests.

(f) Test procedure.

Secure the two insulation blanket test specimens to the test frame. The insulation blankets should be attached to the test rig centre vertical former using four spring clamps positioned as

Disclaimer – This document is not exhaustive and it will be updated gradually.



shown in figure 7 (according to the criteria of paragraph (c)(4) or (c)(4)(i) of this part of this appendix).

Ensure that the vertical plane of the burner cone is at a distance of 4 ± 0.125 inch (102 ± 3 mm) from the outer surface of the horizontal stringers of the test specimen frame, and that the burner and test frame are both situated at a 30° angle with respect to vertical.

When ready to begin the test, direct the burner away from the test position to the warm-up position so that the flame will not impinge on the specimens prematurely. Turn on and light the burner and allow it to stabilize for 2 minutes.

To begin the test, rotate the burner into the test position and simultaneously start the timing device.

Expose the test specimens to the burner flame for 4 minutes and then turn off the burner. Immediately rotate the burner out of the test position.

Determine (where applicable) the burnthrough time, or the point at which the heat flux exceeds $2.0 \text{ Btu/ft}^2\text{-sec}$ (2.27 W/cm^2).

(g) Report.

Identify and describe the specimen being tested.

Report the number of insulation blanket specimens tested.

Report the burnthrough time (if any), and the maximum heat flux on the back face of the insulation blanket test specimen, and the time at which the maximum occurred.

(h) Requirements.

(1) Each of the two insulation blanket test specimens must not allow fire or flame penetration in less than 4 minutes.

(3) Each of the two insulation blanket test specimens must not allow more than $2.0 \text{ Btu/ft}^2\text{-sec}$ (2.27 W/cm^2) on the cold side of the insulation specimens at a point 12 inches (30.5 cm) from the face of the test rig.

Acronyms and Abbreviations

FAR	Federal Aviation Regulations
CS	Certification specification
EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration

Disclaimer – This document is not exhaustive and it will be updated gradually.



Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 228 of 358

E-130: APPLICATION OF HEAT RELEASE AND SMOKE DENSITY REQUIREMENTS TO SEAT MATERIALS

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
ISSUE:	2 Rev.1 dated 04/03/2011

Special Condition

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. Aeroplanes with passenger capacities of 19 or less and
 - b. Aeroplanes exempted from smoke and heat release requirements.
4. Only aeroplanes 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 aeroplane fleet and follow-on deliveries of aeroplanes 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”.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms and Abbreviations

JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-134: INSTALLATION OF SEATS THAT MAKE AN ANGLE OF MORE THAN 18° WITH THE AIRCRAFT LONGITUDINAL AXIS

Equivalent Safety Finding	E-134: Acceptable Means of Compliance: Installation of seats that make an angle of more than 18° with the aircraft longitudinal axis.
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.785(c) at Change 13, JAR 25.785(d) at Change 14
ISSUE:	2 dated 13/11/2013

Equivalent safety finding

BACKGROUND

Some Cabin of A330 aircraft models will be equipped with B/C seats that form an angle to the aircraft centreline of 25.5°.

“Each occupant of a seat [...] that makes more than an 18° angle with the vertical plane containing the aeroplane centreline must be protected from head injury by a safety belt and an energy absorbing rest that will support the arms, shoulders, head and spine, or by a safety belt and shoulder harness that will prevent the head from contacting any injurious object. Each occupant of any other seat must be protected from head injury by a safety belt and as appropriate to the type, location and angle of facing of each seat, by one or more of the following:

- (1) A shoulder harness that will prevent the head from contacting any injurious object.
- (2) The elimination of any injurious object within striking radius of the head.
- (3) An energy absorbing rest that will support the arms, shoulders, head and spine.”

Airbus has made a request for an Equivalent Safety Finding with JAR 25.785(c) at change 13. It is Airbus intention to demonstrate that this design has an equivalent Level Of Safety to a normal facing seat installation of 0° and hence, makes the energy absorbing rest for arms, head and spine and a shoulder harness required by JAR 25.785(c) at change 13 not necessary.

EQUIVALENT SAFETY FINDINGS

An equivalent safety finding shall be used for the Long Range A/C by showing compliance to JAR 25.785(c) at Change 13 or JAR 25.785(d) at Change 14 for passenger seats that are installed in the aircraft making an angle up to 30° with the aircraft longitudinal axis by the following:

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

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

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

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ESF	Equivalent Safety Finding
ATD	Automated Test Dummy
B/C	Business Class
A/C	Aircraft

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-1014: HIC COMPLIANCE FOR FRONT ROW SEATING(INFLATABLE RESTRAINTS)

SPECIAL CONDITION	E-1014: HIC Compliance for front row seating(Inflatable Restraints)
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.562(c)(5)
ISSUE:	4 dated 19/07/2007

Special Condition**SPECIAL CONDITION****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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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) 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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms and Abbreviations

HIC	Head Injury Criterion
FAA	Federal Aviation Administration
EASA	European Union Aviation Safety Agency
JAR	Joint Aviation Regulation
HIRF	High Intensity Radiated Fields
RF	Radio Frequency

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-1022: IMPROVED FLAMMABILITY STANDARDS FOR THERMAL/ACOUSTIC INSULATION MATERIALS

Equivalent Safety Finding	E-1022: Improved flammability standards for thermal/acoustic insulation materials
APPLICABILITY:	A330 / A340, A340-500/-600
REQUIREMENTS:	JAR 25.853(b) at change 13 JAR 25.853(a) at change 14 JAR 25.855(d) at change 14 FAR 25.856(a) at amendment 111
ISSUE:	2 dated 01/08/2005

Equivalent Safety Finding

BACKGROUND

The FAA has introduced upgraded flammability standards for thermal and acoustic insulation materials used in transport category aeroplanes through FAR 25 amendment 111, and with FAR 25, Part VI of Appendix F.

FAR 25 amendment 111 introduces new paragraph 25.856, which provides in sub-paragraph (a): new flammability propagation standards and in sub-paragraph (b): new burn through flammability standards.

FAR 25.856(a) introduces higher flammability standards for the thermal / acoustic insulation materials.

According to relevant JAR 25.853, Airbus insulation materials were until now tested to the 12s vertical Bunsen burner. The proposed modification introduces insulation materials tested to the radiant panel, according the requirements of FAR 25.856(a) and Appendix F Part VI. This test consists in the evaluation of the flammability and flame propagation characteristics of the different thermal / acoustic insulation materials, exposed to both a radiant heat source and a flame.

FAR 25.856(a) covers the overall thermal / acoustic insulation materials. Relevant JAR 25.853 applies to the materials used in each compartment occupied by the crew or passengers. FAR 25.856(a) applies to all the thermal / acoustic insulation materials, indifferently installed in pressurized or unpressurized areas.

Therefore, areas covered previously by JAR 25.855(a) at change 13 and by JAR 25.855(d) at change 14 are also impacted. However, JAR 25.855(a) at change 13 compliance is directly fulfilled by compliance with JAR 25.853(b), hence this ESF will only refer to JAR 25.853(b) at change 13, JAR 25.853(a) at change 14 and JAR 25.855(d) at change 14.

All the insulation materials installed on the US-registered aeroplanes manufactured after September 2nd, 2005, and the insulation materials installed in the fuselage, that are replaced after

Disclaimer – This document is not exhaustive and it will be updated gradually.



September 2nd, 2005 on the US-registered aeroplanes have to comply with these new flammability standards.

The FAA is requiring that aeroplanes operating in FAR part 121 to comply with the requirements of FAR 25.856(a) before September 2nd, 2005.

EQUIVALENT SAFETY FINDINGS

Thermal/acoustic insulation that meets FAR 25.856(a) at Amendment 111 can be considered equivalently safe for the purposes of showing compliance with JAR 25.853(b) at change 13, JAR 25.853(a) at change 14, and JAR 25.855(d) at change 14. Since A330/340 aeroplanes do not have amendment 111 in their certification basis, compliance with JAR 25.853 and JAR 25.855 is still required.

However, once compliance with FAR 25.856(a) has been shown, it is not necessary to test in accordance with JAR 25.853(b) at change 13, JAR 25.853(a) at change 14, and JAR 25.855(d) at change 14, and these requirements can be substantiated based on equivalent safety.

Acronyms and Abbreviations

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
JAR	Joint Aviation Regulation
ESF	Equivalent Safety Finding

Disclaimer – This document is not exhaustive and it will be updated gradually.



E-1023: SIDE FACING SEATS WITH INFLATABLE RESTRAINTS

SPECIAL CONDITION	E-1023: Side Facing Seats with Inflatable Restraints
APPLICABILITY:	A340-500/-600
REQUIREMENTS:	JAR 25.785, 25.562, 25.853
ISSUE:	2 dated 27/12/2005

Special Condition**SPECIAL CONDITION****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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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 injury criteria but evidence from head paths etc. to determine likely areas of impact.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



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) 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).

Acronyms and Abbreviations

HIC	Head Injury Criterion
SID	Side Impact Dummy
TTI	Thoracic Trauma Index
FMVSS	Federal Motor Vehicle Safety Standard
FAA	Federal Aviation Administration
HIRF	High Intensity Radiated Fields
SC	Special Condition
RF	Radio Frequency

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-1: STALLING AND SCHEDULED OPERATING SPEEDS

SPECIAL CONDITION	F-1: Stalling and scheduled operating speeds
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.103, 25.107, 25.121, 25.125, 25.201, 25.203, 25.205, 25.207
ISSUE:	6 dated 29/09/1993

Special Condition

BACKGROUND

The A330 / A340 aircraft models are equipped with a low speed protection system provided against stall a protection that cannot be overridden by the pilot.

The requirement of JAR 25 must therefore be adapted to consider this stall protection function.

SPECIAL CONDITION

1- Definitions

This Special Condition is concerned with novel features of the A330/A340 aircraft models and uses terminology that does not appear in JAR 25.

The following definitions shall apply:

- **High incidence protection system:** A system that operates directly and automatically on the aeroplane's flying controls to limit the maximum incidence that can be attained to a value below that at which an aerodynamic stall would occur.
- **Alpha-floor system:** A system that automatically increases thrust on the operating engines when incidence increases through a particular value.
- **Alpha-limit:** The maximum steady incidence at which the aeroplane stabilises with the high incidence protection system operating and the longitudinal control held on its aft stop.
- **V_{min}:** The minimum steady flight speed in the aeroplane configuration under consideration with the high incidence protection system operating. See section 3 of this Special Condition.
- **V_{min 1g}:** V_{min} corrected to 1 g conditions. See section 3 of this Special Condition.
- **V_{s1g}:** The minimum speed in the configuration under consideration at which the aeroplane can develop a lift equal to the weight the aeroplane with engines set to idle thrust. This speed may be demonstrated with the high incidence system adjusted to permit a higher incidence to be achieved, than is possible with the normal production system.

Disclaimer – This document is not exhaustive and it will be updated gradually.



2- Capability and Reliability of the High Incidence protection System.

Those paragraphs of JAR 25 quoted in reference may be amended in accordance with Special Condition provided that acceptable capability and reliability of the high incidence protection system can be established by flight test, simulation, and analysis as appropriate. The capability and reliability required are as follows:

- 1- It shall not be possible during pilot induced manoeuvres to encounter a stall and handling characteristics shall be acceptable, as required by section 6 of this Special Condition.
- 2- The aeroplane shall be protected against stalling due to the effects of windshears and gusts at low speeds as required by section 7 of this Special Condition.
- 3- The ability of the high incidence protection system to accommodate any reduction in stalling incidence resulting from residual ice must be verified.
- 4- The reliability of the system and the effects of failures must be acceptable in accordance with JAR 25.1309.

3- Minimum Steady Flight Speed and One g Stall Speed

Delete existing JAR 25.103 and replace as follows:

JAR 25.103: Minimum steady flight speed and one g stall speed

- (a) The minimum steady flight speed, V_{min} , must be determined with:
 - (1) The high incidence protection system operating normally.
 - (2) Idle thrust and alpha-floor system inhibited.
 - (3) All combinations of flap settings and landing gear position for which V_{min} is required to be determined.
 - (4) The weight used when V_{s1g} is being used as a factor to determine compliance with a required performance standard;
 - (5) The most unfavourable centre of gravity allowable; and
 - (6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- (b) The minimum steady flight speed is the final stabilised calibrated airspeed obtained when the aeroplane is decelerated at an entry rate not exceeding 1 knot per second until the longitudinal control is on its stop.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (c) The one-g minimum steady flight speed, $V_{\min 1g}$, is the minimum calibrated airspeed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight, whilst at an angle of attack not greater than that at which the minimum steady flight speed of sub-paragraph (b) was determined.
- (d) The one-g stall speed, V_{s1g} , must be determined with:
- (1) Idle thrust and Alpha-floor system inhibited;
 - (2) All combinations of flap settings and landing gear position for which V_{s1g} is required to be determined;
 - (3) The weight used when V_{s1g} is being used as a factor to determine compliance with a required performance standard;
 - (4) The most unfavourable centre of gravity allowable; and
 - (5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

4- Scheduled operating speeds

4.1 Take off Speeds

Delete existing JAR 25.107(b) and replace as follows:

JAR 25.107(b): V_2 , in terms of calibrated airspeed, may not be less than:

- (1) $1.13 V_{s1g}$
- (2) 1.10 times V_{MC} established under JAR 25.149
- (3) A speed that provides the manoeuvre capability specified in paragraph 4.4

4.2 Climb one engine inoperative

In JAR 25.121 (c) Final Take-off, amend "at not less than $1.25 V_s$..." to read "...at not less than the greater of $1.18 V_{s1g}$ and a speed that provides the manoeuvre capability specified in paragraph 4.4, with..."

4.3 Landing Speeds

In JAR 25.125 the value of V_{REF} used for landing performance determination must not be less than:

- (1) $1.23 V_{s1g}$
- (2) V_{MCL} established under JAR 25-149(f), (See ACJ 25.125(a)(2))
- (3) A speed that provides the manoeuvre capability specified in paragraph 4.4

4.4 Manoeuvrability at operating speeds

The manoeuvring capabilities in a constant speed coordinated turn at forward centre of gravity, as specified in the table below, must be free of stall warning (if any), or other characteristics which might interfere with normal manoeuvring.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Configuration	Speed	Manoeuvring bank angle in a coordinated turn	Thrust/Power setting
Take-off	V_2	30°	Asymmetric WAT-limited (1)
Take-off	$V_2+XX(2)$	40°	All engines climb (3)
En route	V_{FTO}	40°	Asymmetric WAT-limited (1)
Landing	V_{REF}	40°	Symmetric for -3° flight path angle

(1) A combination of weight, altitude and temperature (WAT) such that the thrust or power setting produces the minimum climb gradient specified in JAR 25.121 for the flight condition.

(2) Airspeed approved for all engines initial climb.

(3) That thrust or power setting which, in the event of failure of the critical engine and without any crew action to adjust the thrust or power of the remaining engines, would result in the thrust or power specified for the take-off condition at V_2 , or any lesser thrust or power setting that is used for all engines-operating initial climb.

5- Stall Warning

5.1 Normal operation

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

5.2 Failures cases

Following failures of the high incidence protection system, not shown to be extremely improbable, such that capability of the system no longer satisfies items 1, 2 and 3 of paragraph 2 stall warning must be provided in accordance with JAR 25.207(a) and (b).

6- Handling Characteristics at High Incidence

6.1 High Incidence Handling Demonstrations

Delete existing JAR 25.201 and replace as follows:

JAR 25.201: High incidence handling demonstration

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

(1) The high incidence protection system operating normally.

(2) Initial power conditions of:

I: Power off

II: The power necessary to maintain level flight at $1.5 V_{s1g}$, where V_{s1g} corresponds to the one g stall speed with flaps in approach position, the landing gear retracted and maximum landing weight.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (3) Alpha-floor system operating normally unless more severe conditions are achieved with inhibited alpha floor.
 - (4) Flaps, landing gear and deceleration devices in any likely combination of positions
 - (5) Representative weights within the range for which certification is requested; and
 - (6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- (b) The following procedures must be used to show compliance with JAR 25.203. (*)
- (1) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed one knot per second until the control reaches the stop
 - (2) The longitudinal control must be maintained at the stop until the aeroplane has reached a stabilised flight condition and must then be recovered by normal recovery techniques.
 - (3) The requirements for turning flight manoeuvre demonstrations must also be met with accelerated rates of entry to the incidence limit, up to the maximum rate achievable.
- (*) as amended by this special condition

6.2 Characteristics in High Incidence Manoeuvres

Delete existing JAR 25.203 and the associated ACJ.

Replace as follows:

JAR 25.203: Characteristics in High Incidence Manoeuvres.

- (a) Throughout manoeuvres with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30° banked turns, the aeroplane's characteristics shall be as follows:
 - (1) There shall not be any abnormal nose-up pitching.
 - (2) There shall not be any uncommanded nose-down pitching, which would be indicative of stall. However reasonable attitude changes associated with stabilising the incidence at Alpha limit as the longitudinal control reaches the stop would be acceptable
 - (3) There shall not be any uncommanded lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.
 - (4) The aeroplane must not exhibit severe buffeting of a magnitude and severity that would act as a deterrent to completing the manoeuvre specified in JAR 25.201 (a)*.
- (*) As amended by this Special Condition
- (b) In manoeuvres with increased rates of deceleration some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilised Alpha-limit. However the aeroplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal control on the stop for a period of time appropriate to the manoeuvre.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (c) It must always be possible to reduce incidence by convention use of the controls.
- (d) The rate at which the aeroplane can be manoeuvred from trim speeds associated with scheduled operating speeds such as V_2 and V_{REF} up to Alpha-limit shall not be unduly damped or be significantly slower than can be achieved on conventionally controlled transport aeroplanes.

6.3 High Incidence Handling with the Critical Engine Inoperative

Delete existing JAR 25.205 and replace as follows:

JAR 25.205: High incidence handling-critical engine inoperative

- (a) It must be possible to safely recover from a manoeuvre to Alpha-limit with the critical engine inoperative:
 - (1) With the high incidence protection system operating normally;
 - (2) Without applying power to the inoperative engine;
 - (3) With high lift devices and landing gear retracted;
 - (4) With the operating engine at up to 75% of maximum continuous power, or up to power at which the wings can be held level with use of maximum control travel (prior to operation of the alpha-floor system) whichever is less; and
 - (5) With the alpha-floor system working normally.
- (b) The operating engine may be throttled back during the recovery from the manoeuvre to Alpha-limit.

7- Atmospheric Disturbances

Operation of the high incidence protection system must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of windshear.

8- Speeds Associated with Other Requirements

JAR 25 specifies requirements that have to be met at speeds quoted as factors of the stall speed V_S . For the A330 / A340 aircraft models V_S will be interpreted in each paragraph of the requirements according to the appendix.

9- Alpha floor

The Alpha-floor setting must be such that the aircraft can be flown at normal landing operational speeds and manoeuvred up to bank angles consistent with the flight phase without triggering Alpha-floor.

Disclaimer – This document is not exhaustive and it will be updated gradually.



In addition there must be no alpha-floor triggering unless appropriate when aircraft is flown in usual operational manoeuvres and in turbulence.

APPENDIX TO SPECIAL CONDITION F-1

1- Replace JAR 25.21 paragraph (b) by:

(b) The flying qualities will be evaluated at the most unfavourable CG position.

2- In lieu of JAR 25.119 paragraph (b)

(b) A climb speed which is:

(1) not less than

i) $1.08 V_{s1g}$ for aeroplanes with four engines on which the application of power results in significant reduction in stalling speed; or

ii) $1.13 V_{s1g}$ for all other aeroplanes

(2) not less than V_{MCL} ; and

(3) not more than the greater of V_{REF} and V_{MCL}

3- Replace JAR 25.121 paragraph (d) by:

(d) Discontinued approach. In a configuration in which V_{s1g} does not exceed 110% of the V_{s1g} for the related all-engines operating landing configuration, the steady gradient may not be less than 2.1% for two engines aeroplanes, and 2.7% for four engines aeroplanes with:

(1) the critical engine inoperative, the remaining engines at the available take off thrust;

(2) the maximum landing weight; and

(3) a climb speed established in connexion with normal landing procedures; but not exceeding $1.41 V_{s1g}$.

4- Replace the speeds V_s mentioned in the following JAR 25 requirements as follows:

JAR 25.145 (a) V_{min} in lieu of V_s

JAR 25.145 (b) (1) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.145 (b) (4) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.145 (b) (6) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

V_{min} in lieu of $1.1 V_{s1}$

$1.6 V_{s1g}$ in lieu of $1.7 V_{s1}$

JAR 25.145 (c) $1.13 V_{s1g}$ in lieu of $1.2 V_{s1}$

JAR 25.147 (a) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (a) (2) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (c) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (d) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-2: MOTION AND EFFECT OF COCKPIT CONTROLS

SPECIAL CONDITION	F-2: Motion and effect of cockpit controls
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.143, JAR 25.777
ISSUE:	2 dated 11/03/1991

Special Condition

BACKGROUND

The A330 / A340 aircraft models are equipped with a side stick control system. The current requirements JAR 25.143 and JAR 25.777 must be adapted to side stick controls.

SPECIAL CONDITION

1. Add to paragraph JAR 25.777(b):

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

2. Introduce new paragraph JAR 25.143(i):

Pilot strength:

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

3. Introduce new paragraph JAR 25.143(j):

Pilot control:

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

4. Introduce new paragraph JAR 25.143(k):

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

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-3: STATIC LONGITUDINAL STABILITY

SPECIAL CONDITION	F-3: Static longitudinal stability
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.171, 25.173, 25.175, SC F-1
ISSUE:	2 dated 11/03/1991

Special Condition**BACKGROUND**

The A330/A340 longitudinal control laws provide a neutral stability within the normal flight envelope. Therefore, the A/C design does not literally comply with the static longitudinal stability requirements of JAR 25.171, 25.173 and 25.175.

These requirements must consequently be replaced by the following special condition:

SPECIAL CONDITION

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

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-04: LANDING LIGHT SWITCH

Equivalent Safety Finding	F-04: Landing Light Switch
APPLICABILITY:	A330-800/-900
REQUIREMENTS:	CS 25.1383(b)
ISSUE:	Issue 1 dated 8 Nov.2016

Equivalent Safety Finding**BACKGROUND**

CS 25.1383(b) requires separate switches for each landing light but allows that one switch is used for the lights of a multiple light installation at one location. There was no evolution since the creation of FAR 25 in 1965, which itself was derived from identical CAR 4b text.

On A330-800/ A330-900 aircraft, the two fixed position landing lights are located in each wing leading edge. Airbus plan to have a single cockpit switch which will activate the landing lights.

Use of a single landing light switch in the cockpit is not in direct compliance with CS 25.1383(b) requirement. Airbus has therefore requested an equivalent safety finding described in their position below.

EQUIVALENT SAFETY FINDING

For the Airbus A330-800/-900, the two fixed position landing lights integrated in each wing leading edge will be activated by a single landing light switch in the cockpit, thus creating a non-compliance to the requirement CS 25.1383(b) which requires separate switches for each landing light, but allows that one switch is used for the lights of a multiple light installation at one location.

The requirement §25.1383(b), which has been originally introduced in 14 CFR Part 25 in 1965 (directly derived from identical CAM 4d text), historically addresses the need to duplicate the power switch for the landing lights (power switching was actually located on the cockpit panel) to reduce the risk of not having any landing lights available. This requirement was addressing in particular aircraft for which the landing lights were more critical for night landings than in the proposed A330-800/-900 configuration where evolved systems such as e.g. ILS; Radio Alt, ADIRU, etc. are installed.

On A330/A340 aircraft family, as on other aircraft families (A318/A319/A320/A321, A380 or A350), the overhead panel landing lights switches are “command” switches that provide a command signal to the actual power switching device. The status information of the landing light switch is provided by two independent sources. In case of discrepancy between those two signals the default value is ON.

In terms of human factors and cockpit design the single switch has the following advantages:

- it is more logical to associate a single switch with a single function than two switches with a single function;

Disclaimer – This document is not exhaustive and it will be updated gradually.



- it results in a less-cluttered overhead panel which makes switch identification easier and thus reduces workload and errors;
- it reduces the risk of mis-selection (selecting only one switch when the intention was to select both).

In-service experience with the A318/A319/A320/A321/A380/A350 aircraft types reveals no problems with the single switch design, and indicates universal pilot preference for the single switch.

In terms of safety, night landings without landing lights are common, particularly in misty conditions where the glare from the lights is distracting, and should be well within the capabilities of all qualified commercial pilots. Thus a complete failure of the landing lights would have only minor repercussions.

Acronyms and Abbreviations

ADIRU	Air Data/Inertial Reference Unit
CAR	Civil Air Regulations (FAA)
CFR	Code of Federal Regulation
ILS	Instrument Landing System

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-4: STATIC DIRECTIONAL AND LATERAL STABILITY

SPECIAL CONDITION	F-4: Static directional and lateral stability
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.177(c)
ISSUE:	2 dated 11/03/1991

Special Condition

BACKGROUND

JAR 25.177 is not adapted to the A330/A340 roll axis control feature.

These requirements must consequently be replaced by the following special condition:

SPECIAL CONDITION

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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-5: FLIGHT ENVELOPE PROTECTIONS

SPECIAL CONDITION	F-5: Flight envelope protections
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.143(g)
ISSUE:	2 dated 11/03/1991

Special Condition

BACKGROUND

The A330/A340 has flight envelope protections (high and low speed, Angle of Attack) implemented in the EFCS. This unusual feature is addressed by the following special condition:

SPECIAL CONDITION

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 aeroplane flight path, or attitude as needed.

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

- a) Aeroplane structural limits,
- b) Required safe and controllable manoeuvring of the aeroplane and,
- c) Margin to critical conditions.

Unsafe flight characteristics/conditions must not result from:

- Dynamic manoeuvring,
- Airframe and system tolerances (both manufacturing and in-service), and
- Non-steady atmospheric conditions, in any appropriate combination and phase of flight, if this manoeuvring can produce a limited flight parameter beyond the nominal design limit value.

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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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

Failure states:

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

Acronyms and Abbreviations

EFCS	Electrical Flight Control System
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-6: NORMAL LOAD FACTOR LIMITING SYSTEM

SPECIAL CONDITION	F-6: Normal load factor limiting system
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.143
ISSUE:	2 dated 11/03/1991

Special Condition

BACKGROUND

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

SPECIAL CONDITION

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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
EFCS	Electrical Flight Control System

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-8: ACCELERATE STOP DISTANCES

SPECIAL CONDITION	F-8: Accelerate stop distances
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 1.1, 1.2, JAR 25.101, 105, 109, 113, 115, 735, 25x1591, NPA 25-244
ISSUE:	5 dated 14/03/1996

Special Condition

BACKGROUND

The applicable JAR for A330/A340 aircraft models certification includes the amendments introduced by FAR 25 amendment 42 / JAR 25 change 5.

These requirements were the subject of a review by the aviation community through NPA 25B, D, G-244 in order to establish new standards that would be applicable not only to new types but also to derivative models and even, for some parts, to in-service aircraft.

It is proposed to apply these revised requirements to A330/A340 aircraft by means of a special condition based on this NPA.

SPECIAL CONDITION

1. Proposed amendments to JAR 1.

1.1. Add definitions of "Take-off decision speed" and "Screen height" to JAR 1.1 as follows :

"Take-off decision speed" means a speed in the take-off at which, if the pilot activates the first deceleration device (spoilers, brakes, throttles, etc...) at this speed, the aeroplane can be stopped within the accelerate-stop distance and, alternatively, if the take-off is continued beyond this speed with the critical engine failed at V_{EF} , the aeroplane can achieve the take-off screen height within the take-off distance.

"Screen height" means the height of an imaginary screen which the aeroplane would just clear when taking off or landing in an unbanked attitude with landing gear extended.

1.2. Add a definition of the abbreviation V_{EF} to JAR 1.2 as follows:

" V_{EF} " means the speed at which the critical engine is assumed to fail-during take-off.

2. Proposed amendments to JAR 25.

2.1. Amendment to JAR 25 .101 : General

Add a new sub-paragraph (i) to read as follows:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (i) The accelerate-stop and landing distances prescribed in JAR 25.109 and 25.125, respectively, must be determined with all the aircraft brake assemblies on the fully worn limit of their allowable wear range.

2.2. Amendment to JAR 25.105 : Take-off

Amend Sub-paragraph (c) to read as follows:

- (c) The take-off data must be based on smooth, dry and wet, hard-surfaced runways

2.3. Amendment to JAR 25.109 : Accelerate-stop distance

Amend sub-paragraph (a), add a new sub-paragraph (b), re-designate existing (b) as sub-paragraph (c), add a new sub-paragraph (d) and re-designate existing sub-paragraph (c) and (d) as (e) and (f) respectively JAR 25.109 would thus read as follows:

- (a) The accelerate-stop distance on a dry runway is the greater of the following distances :
 - (1) The sum of the distances necessary to:
 - (i) Accelerate the aeroplane from a standing start with all engines operating to V_{EF} for take-off from a dry runway;
 - (ii) Accelerate the aeroplane from V_{EF} to V_1 , assuming the critical engine fails at V_{EF} ; and
 - (iii) Come to a full stop on a dry runway from the point reached at the end of the acceleration period prescribed in sub-paragraph (a)(1)(ii) of this paragraph, assuming that the pilot does not apply any means to retard the aeroplane until that point is reached; plus
 - (iv) A distance equivalent to 2 seconds at V_1 for take-off from a dry runway.
 - (2) The sum of the distances necessary to:
 - (i) Accelerate the aeroplane from a standing start with all engines operating to V_1 for take-off from a dry runway; and
 - (ii) Come to a full stop on a dry runway from the point reached at the end of the acceleration period prescribed in sub-paragraph (a)(2)(i) of this paragraph, assuming that the pilot does not apply any means to retard the aeroplane until that point is reached; plus
 - (iii) A distance equivalent to 2 seconds at V_1 for take-off from a dry runway.
- (b) The accelerate-stop distance on a wet runway is the greater of the following distances:
 - (1) The accelerate-stop distance on a dry runway determined in accordance with sub-paragraph (a) of this paragraph.
 - (2) The accelerate-stop distance determined in accordance with sub-paragraph (a) of this paragraph except that the runway is wet and the corresponding values of V_{EF} and V_1 are used. The wet runway stopping requirements of this paragraph must be determined assuming a braking coefficient of friction equal to one half the dry runway braking coefficient determined in meeting the requirements of sub-paragraph (a) of this

Disclaimer – This document is not exhaustive and it will be updated gradually.



paragraph, unless a higher wet runway braking coefficient of friction has been demonstrated. (See ACJ 25.109(b)).

(c) (As existing sub-paragraph (b)).

(d) The effects of available reverse thrust.

(1) May not be included as an additional means of deceleration when determining the accelerate-stop distance on a dry runway, and

(2) May be included as an additional means of deceleration using recommended reverse thrust procedures when determining the accelerate-stop distance on a wet runway, provided the requirements of sub-paragraph (c) of this paragraph are met.

(e) (As existing sub-paragraph (c)).

(f) (As existing sub-paragraph (d)).

2.4. ACJ 25.109 (b)

Add a new ACJ 25 .109(b) to read as follows:

ACJ 25.109(b)

Means of Compliance

[See Jar 25.109(b)]

The means of demonstrating a wet braking coefficient of friction greater than one half of the dry value shall be agreed with the Authority. It should be determined whether the demonstrated performance is applicable to the full range of wet runway surface conditions that are expected to be encountered in service. Alternatively, the use of performance based on a braking coefficient of friction greater than one half of the dry value shall be restricted to specified runway and/or to the provision and maintenance of a specified runway surface condition.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
NPA	Notice of Proposal Amendment
FAR	Federal Aviation Regulations
ACJ	Advisory Circular Joint

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-8.1: ACCELERATE STOP DISTANCES AND RELATED PERFORMANCE

SPECIAL CONDITION	F-8.1: Accelerate stop distances and related performance
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 1.1, 1.2, JAR 25.101, 105, 109, 113, 115, 735, 25x1591, NPA 25B, D, G-244
ISSUE:	5 dated 14/03/1996

Special Condition**BACKGROUND**

The applicable JAR for A330/A340 aircraft models certification includes the amendments introduced by FAR 25 amendment 42 / JAR 25 change 5.

These requirements were the subject of a review by the aviation community through NPA 25B, D, G-244 in order to establish new standards that would be applicable not only to new types but also to derivative models and even, for some parts, to in-service aircraft.

It is proposed to apply these revised requirements to A330/A340 aircraft by means of a special condition based on this NPA.

SPECIAL CONDITION**1. Amendments to JAR 1**

1.1 Amend the definition of V_1 in JAR 1.2 as follows:

" V_1 " means the maximum speed in the take-off at which the pilot must take the first action (e.g. apply brakes, reduce thrust, deploy speed brakes) to stop the aeroplane within the accelerate-stop distance. V_1 also means the minimum speed in the take-off, following a failure of the critical engine at V_{EF} , at which the pilot can continue the take-off and achieve the required height above the take-off surface within the take-off distance.

1.2 Add a definition of the abbreviation V_{EF} to JAR 1.2 as follows:

" V_{EF} " means the speed at which the critical engine is assumed to fail during take-off.

2. Amendment to JAR 25.101 : General

Amend sub-paragraph (i) to read as follows:

- (i) The accelerate-stop and landing distances prescribed in JAR 25.109 and 25.125, respectively, must be determined with all the aircraft brake assemblies at the fully worn limit of their allowable wear range.

3. Amendment to JAR 25.105 Take-off :

Disclaimer – This document is not exhaustive and it will be updated gradually.



Amend sub-paragraph (c) to read as follows:

(c) The take-off data must be based on:

- (1) Smooth, dry and wet, hard-surfaced runways and, optionally;
- (2) Grooved and/or porous friction course wet, hard-surfaced runways;

4. Amendment to JAR 25.109; Accelerate-stop distance:

Amend JAR 25.109 to read as follows:

(a) The accelerate-stop distance on a dry runway is the greater of the following distances:

(1) The sum of the distance necessary to:

- (i) Accelerate the aeroplane from a standing start with all engines operating to V_{EF} for take-off from a dry runway.
- (ii) Accelerate the aeroplane from V_{EF} to V_1 and subsequently to the highest speed reached, assuming the critical engine fails at V_{EF} and,
- (iii) Come to a full stop on a dry runway from the point reached at the end of the acceleration period prescribed in sub-paragraph 4.(a)(1)(ii), assuming that the pilot does, not apply any means to retard the aeroplane until V_1 is reached; plus
- (iv) A distance equivalent to 2 seconds at V_1 for take-off from a dry runway.

(2) The sum of the distance necessary to

- (i) Accelerate the aeroplane from a standing start with all engines operating to V_1 for take-off from a dry runway and subsequently to the highest speed reached and
- (ii) Come to a full stop on a dry runway from the point reached at the end of the acceleration period prescribed in sub-paragraph 4.(a)(2)(i), assuming that the pilot does not apply any means to retard the aeroplane until V_1 is reached, and that all engines are still operating; plus
- (iii) A distance equivalent to 2 seconds at V_1 for take-off from a dry runway.

(b) The accelerate-stop distance on a wet runway is the greater of the following distances;

- (1) The accelerate stop-distance on a dry runway determined in accordance with sub-paragraph 4.(a): or
- (2) The accelerate-stop distance determined in accordance with sub-paragraph 4.(a), except that the runway is wet and the corresponding wet runway values of V_{EF} and V_1 are used. The wet runway stopping requirements of this paragraph must be determined assuming for smooth wet runways, the braking coefficient of friction versus speed determined using the standard, and not exceeding the braking coefficient of friction determined in meeting the requirements of Sec.25.101(i) and sub-paragraph 4.(a).

Optionally, for acceptably maintained grooved or porous friction course runways, a braking coefficient of friction not more than 70% of the demonstrated dry-runway, anti-skid controlled braking coefficient determined in meeting the requirements of Sec. 25.101(i) and sub-paragraph (a) of this section.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Alternatively, for acceptably maintained grooved or porous friction course runways, the braking coefficient of friction versus speed determined using the standard, and meeting the requirements of Sec.25.101(i) and sub-paragraph (a) of this section.

- (c) Except as provided in sub-paragraph 4.(d)(1), means other than wheel brakes may be used to determine the accelerate-stop distance if that means:
 - (1) is safe and reliable.
 - (2) is used so that consistent results can be expected under normal operating conditions; and
 - (3) is such that exceptional skill is not required to control the aeroplane
- (d) The effects of available reverse thrust.
 - (1) Shall not be included as an additional means of deceleration when determining the accelerate-stop distance on a dry runway and
 - (2) May be included as an additional means of deceleration using recommended reverse thrust procedures when determining the accelerate-stop distance on a wet runway, provided the requirements of sub-paragraph 4.(c) are met.
- (e) The landing gear must remain extended throughout the accelerate-stop distance.
- (f) If the accelerate-stop distance includes a stop way with surface characteristics substantially different from those of the runway, the take-off data must include operational correction factors for the accelerate-stop distance. The correction factors must account for the particular surface characteristics of the stop way and the variations in these characteristics with seasonal weather conditions (such as temperature, rain, snow and ice) within the established operational limits.

5. Amendment to JAR 25.113 Take-off distance and take-off run to read as follows:

- (a) Take-off distance on a dry runway is the greater of
 - (1) The horizontal distance along the take-off path from the start of the take-off to the point at which the aeroplane is 35 ft. above the take-off surface, as determined by a procedure consistent with JAR 25.111, or;
 - (2) 115% of the horizontal distance along the take-off path, with all engines operating, from the start of the take-off to the point at which the aeroplane is 35 ft above the take-off surface, as determined by a procedure consistent with JAR 25.111.
- (b) Take-off distance on a wet runway is the greater of
 - (1) The take-off distance on a dry runway determined in accordance with sub-paragraph 5.(a); or
 - (2) The horizontal distance along the take-off path from the start of the take-off to the point at which the aeroplane is 15 ft above the take-off surface, achieved in a manner

Disclaimer – This document is not exhaustive and it will be updated gradually.



consistent with the achievement of V_2 before reaching 35 ft above take-off surface determined under JAR 25.111 for a wet runway.

(c) If the take-off distance includes a clearway, the take-off run is greater of

(1) The horizontal distance along the take-off path from the start of the take-off to a point equivalent between the point at which VLOF is reached and the point at which the aeroplane is 35 ft above the take-off surface, as determined under JAR 25.111, except that, in the case of take-off on a wet runway, this distance need not be greater than the horizontal distance determined in accordance with sub-paragraphs 5.(b)(1) and 5.(b)(2); or

(2) 115% of the horizontal distance along the take-off path with all engines operating, from the start of the take-off to a point equidistant between the point at which VLOF is reached and the point at which the aeroplane is 35 ft above the take-off surface, determined by a procedure consistent with JAR 25.111.

6. Amendment to JAR 25.115 Take-off Flight Path sub-paragraph (a) to read as follows :

(b) The take-off flight path shall be considered to begin 35 ft. above the take-off surface at the end of the take-off distance determined in accordance with JAR 25.113 (a) or (b), as appropriate for the runway surface condition.

7. Amendment to JAR 25.735 : Brakes

Amend JAR 25.735 (f) through (j) to read as follows:

(f) The design landing brake kinetic energy capacity rating of each main wheel brake assembly shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:

1. The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during operational landings at maximum landing weight. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or power plant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
2. Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels:

$$KE = \frac{0.0443WV^2}{N}$$

Where

K = kinetic energy per wheel (ft. lb.);

W = design landing weight (lb);

V = aeroplane speed in knots. V must not be less than V_{SO} , the power off stalling of the aeroplane at sea-level, at the design landing weight, and in the landing configuration; and

N = number of main wheels with brakes.

Disclaimer – This document is not



The formula must be modified in case of unequal braking distributions.

- (g) In the landing case the minimum stalling speed rating of each main wheel brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the aeroplane speed used in the determination of kinetic energy in accordance with subparagraph (f) of this paragraph, assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.
- (h) The rejected take-off brake kinetic capacity rating of each main wheel-brake assembly that is at the fully worn limit of its allowable brake wear range shall be used during qualification testing of the brake to the applicable Joint Technical Standard Order (J-TSO) or an acceptable equivalent. This kinetic energy rating may not be less than the kinetic energy absorption requirements determined under either of the following methods:
1. The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events expected during an accelerate-stop manoeuvre. This analysis must include conservative values of aeroplane speed at which the brakes are applied, braking coefficient of friction between tyres and runway, aerodynamic drag, propeller drag or power plant forward thrust and (if more critical) the most adverse single engine or propeller malfunction.
 2. Instead of rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels;

$$KE = \frac{0.0443WV^2}{N}$$

Where

KE = kinetic energy per wheel (ft. lb.);
W = design landing weight (lb.);
and W and V are the most critical combination of weight and speed.

The formula must be modified in cases of designed unequal braking distribution.

- (i) In addition, a flight test demonstration of the maximum kinetic energy rejected take-off shall be conducted with not more than 10% of the allowable brake wear range remaining;
- (j) For each power-operated brake system incorporating an accumulator, the flight crew must be provided with an indication that adequate accumulator pressure is available.

8. Amendment to JAR 25 x 1591 Supplementary performance information: to read as follows:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 8.1 Delete the words "wet and" on the 6th line of sub-paragraph (a).
- 8.2 Delete "wet/" from the 3rd and 6th lines of sub-paragraph (b).
- 8.3 Delete sub-paragraph (c)(1) and combine the introduction to subparagraph (c) with (c)(2) to read as follows:
- (c) Supplementary performance information for runways contaminated with standing water, slush, loose snow, compacted snow or ice must be furnished. Information on the effect of runway contaminants on the expected performance of the aeroplane during take-off and landing on hard-surfaced runways must be furnished. If it appears in the Aeroplane Flight Manual, this information must be segregated, identified as guidance material and clearly distinguished from the additional operating limitations of JAR 25.1533 and the performance information of JAR 25.1587.
- 8.4 Amend sub-paragraph (d) to read as follows:
- (d) The information required by sub-paragraph (a) of this paragraph may be established by calculation or by testing.

9. Amendments to AMJ 25x1591 : to read as follows :

- 9.1 Delete the words "for Take-off from Wet Runways and" from the title.
- 9.2 Delete the words "take-off performance information for wet runways and" from the 2nd line of paragraph 1.
- 9.3 Delete the opening words of sub-paragraph 3.1 "Take-off performance information for wet runways and".
- 9.4 Delete the whole of sub-paragraph 3.2.
- 9.5 Delete "wet/" from the 3rd line of sub-paragraph 6a.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AMJ	Advisory Material Joint
FAR	Federal Aviation Regulations
NPA	Notice of Proposed Amendment
J-TSO	Joint Technical Standard Order
LOF	Lift Off Speed

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-101: STALLING AND SCHEDULED OPERATING SPEEDS

SPECIAL CONDITION	F-101: Stalling and scheduled operating speeds
APPLICABILITY:	A330-200
REQUIREMENTS:	JAR 25.103, 25.107, 25.121, 25.125, 25.201, 25.203, 25.205, 25.207
ISSUE:	2 dated 07/01/1998

Special Condition

BACKGROUND

The A330-200 aircraft models are equipped with a low speed protection system providing against stall a protection that cannot be overridden by the pilot.

The requirement of JAR 25 must therefore be adapted to consider this stall protection function.

Special Condition F-1 has been developed for A330-300 aircraft models. The JAR 25 paragraphs affected by this special condition have been upgraded to change 14 therefore the existing Special Condition F-1 need to be revised to be consistent with JAR 25 Change 14.

SPECIAL CONDITION

1- Definitions

This Special Condition is concerned with novel features of the A330 aircraft models and uses terminology that does not appear in JAR 25.

The following definitions shall apply:

- **High incidence protection system:** A system that operates directly and automatically on the aeroplane's flying controls to limit the maximum incidence that can be attained to a value below that at which an aerodynamic stall would occur.
- **Alpha-floor system:** A system that automatically increases thrust on the operating engines when incidence increases through a particular value.
- **Alpha-limit:** The maximum steady incidence at which the aeroplane stabilises with the high incidence protection system operating and the longitudinal control held on its aft stop.
- **V_{min}:** The minimum steady flight speed in the aeroplane configuration under consideration with the high incidence protection system operating. See section 3 of this Special Condition.
- **V_{min 1g}:** V_{min} corrected to 1 g conditions. See section 3 of this Special Condition.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- **V_{s1g} :** The minimum speed in the configuration under consideration at which the aeroplane can develop a lift equal to the weight the aeroplane with engines set to idle thrust. This speed may be demonstrated with the high incidence system adjusted to permit a higher incidence to be achieved, than is possible with the normal production system.

2- Capability and Reliability of the High Incidence protection System.

Those paragraphs of JAR 25 quoted in reference may be amended in accordance with Special Condition provided that acceptable capability and reliability of the high incidence protection system can be established by flight test, simulation, and analysis as appropriate. The capability and reliability required are as follows:

- 1- It shall not be possible during pilot induced manoeuvres to encounter a stall and handling characteristics shall be acceptable, as required by section 6 of this Special Condition.
- 2- The aeroplane shall be protected against stalling due to the effects of windshears and gusts at low speeds as required by section 7 of this Special Condition.
- 3- The ability of the high incidence protection system to accommodate any reduction in stalling incidence resulting from residual ice must be verified.
- 4- The reliability of the system and the effects of failures must be acceptable in accordance with JAR 25.1309.

3- Minimum Steady Flight Speed and One g Stall Speed

Delete existing JAR 25.103 and replace as follows:

JAR 25.103: Minimum steady flight speed and one g stall speed

- (a) The minimum steady flight speed, V_{min} , must be determined with:
 - (1) The high incidence protection system operating normally.
 - (2) Idle thrust and alpha-floor system inhibited.
 - (3) All combinations of flap settings and landing gear position for which V_{min} is required to be determined.
 - (4) The weight used when V_{s1g} is being used as a factor to determine compliance with a required performance standard;
 - (5) The most unfavourable centre of gravity allowable; and
 - (6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- (b) The minimum steady flight speed is the final stabilised calibrated airspeed obtained when the aeroplane is decelerated at an entry rate not exceeding 1 knot per second until the longitudinal control is on its stop.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (c) The one-g minimum steady flight speed, $V_{\min 1g}$, is the minimum calibrated airspeed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight, whilst at an angle of attack not greater than that at which the minimum steady flight speed of sub-paragraph (b) was determined.
- (d) The one-g stall speed, V_{s1g} , must be determined with:
- (1) Idle thrust and Alpha-floor system inhibited;
 - (2) All combinations of flap settings and landing gear position for which V_{s1g} is required to be determined;
 - (3) The weight used when V_{s1g} is being used as a factor to determine compliance with a required performance standard;
 - (4) The most unfavourable centre of gravity allowable; and
 - (5) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.

4- Scheduled operating speeds

4.1 Take off Speeds

Delete existing JAR 25.107(b) and replace as follows:

JAR 25.107(b): V_2 , in terms of calibrated airspeed, may not be less than:

- (1) $1.13 V_{s1g}$
- (2) 1.10 times V_{MC} established under JAR 25.149
- (3) A speed that provides the manoeuvre capability specified in paragraph 4.4

4.2 Climb one engine inoperative

In JAR 25.121 (c) Final Take-off, amend "at not less than $1.25 V_{s...}$ " to read "...at not less than the greater of $1.18 V_{s1g}$ and a speed that provides the manoeuvre capability specified in paragraph 4.4, with..."

4.3 Landing Speeds

In JAR 25.125 the value of V_{REF} used for landing performance determination must not be less than:

- (1) $1.23 V_{s1g}$
- (2) $VMCL$ established under JAR 25-149(f), (See ACJ 25.125(a)(2))
- (3) A speed that provides the manoeuvre capability specified in paragraph 4.4

4.4 Manoeuvrability at operating speeds

The manoeuvring capabilities in a constant speed coordinated turn at forward centre of gravity, as specified in the table below, must be free of stall warning (if any), or other characteristics which might interfere with normal manoeuvring.

Configuration	Speed	Manoeuvring bank angle in a coordinated turn	Thrust/Power setting
---------------	-------	----------------------------------------------------	----------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



Take-off	V_2	30°	Asymmetric WAT-limited (1)
Take-off	$V_2+XX(2)$	40°	All engines climb (3)
En route	V_{FTO}	40°	Asymmetric WAT-limited (1)
Landing	V_{REF}	40°	Symmetric for -3° flight path angle

(1) A combination of weight, altitude and temperature (WAT) such that the thrust or power setting produces the minimum climb gradient specified in JAR 25.121 for the flight condition.

(2) Airspeed approved for all engines initial climb.

(3) That thrust or power setting which, in the event of failure of the critical engine and without any crew action to adjust the thrust or power of the remaining engines, would result in the thrust or power specified for the take-off condition at V_2 , or any lesser thrust or power setting that is used for all engines-operating initial climb.

5- Stall Warning

5.1 Normal operation

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

5.2 Failures cases

Following failures of the high incidence protection system, not shown to be extremely improbable, such that capability of the system no longer satisfies items 1, 2 and 3 of paragraph 2 stall warning must be provided in accordance with JAR 25.207(a) and (b).

6- Handling Characteristics at High Incidence

6.1 High Incidence Handling Demonstrations

Delete existing JAR 25.201 and replace as follows:

JAR 25.201: High incidence handling demonstration

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

(1) The high incidence protection system operating normally.

(2) Initial power conditions of:

I: Power off

II: The power necessary to maintain level flight at $1.5 V_{s1g}$, where V_{s1g} corresponds to the one g stall speed with flaps in approach position, the landing gear retracted and maximum landing weight.

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

(4) Flaps, landing gear and deceleration devices in any likely combination of positions

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (6) The aeroplane trimmed for straight flight at a speed achievable by the automatic trim system.
- (b) The following procedures must be used to show compliance with JAR 25.203. (*)
- (1) Starting at a speed sufficiently above the minimum steady flight speed to ensure that a steady rate of speed reduction can be established, apply the longitudinal control so that the speed reduction does not exceed one knot per second until the control reaches the stop
 - (2) The longitudinal control must be maintained at the stop until the aeroplane has reached a stabilised flight condition and must then be recovered by normal recovery techniques.
 - (3) The requirements for turning flight manoeuvre demonstrations must also be met with accelerated rates of entry to the incidence limit, up to the maximum rate achievable.
- (*) as amended by this special condition

6.2 Characteristics in High Incidence Manoeuvres

Delete existing JAR 25.203 and the associated ACJ.

Replace as follows:

JAR 25.203: Characteristics in High Incidence Manoeuvres.

- (a) Throughout manoeuvres with a rate of deceleration of not more than 1 knot per second, both in straight flight and in 30° banked turns, the aeroplane's characteristics shall be as follows:
- (1) There shall not be any abnormal nose-up pitching.
 - (2) There shall not be any uncommanded nose-down pitching, which would be indicative of stall. However reasonable attitude changes associated with stabilising the incidence at Alpha limit as the longitudinal control reaches the stop would be acceptable
 - (3) There shall not be any uncommanded lateral or directional motion and the pilot must retain good lateral and directional control, by conventional use of the controls, throughout the manoeuvre.
 - (4) The aeroplane must not exhibit severe buffeting of a magnitude and severity that would act as a deterrent to completing the manoeuvre specified in JAR 25.201 (a)*.
- (*) As amended by this Special Condition
- (b) In manoeuvres with increased rates of deceleration some degradation of characteristics is acceptable, associated with a transient excursion beyond the stabilised Alpha-limit. However the aeroplane must not exhibit dangerous characteristics or characteristics that would deter the pilot from holding the longitudinal control on the stop for a period of time appropriate to the manoeuvre.
- (c) It must always be possible to reduce incidence by convention use of the controls.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (d) The rate at which the aeroplane can be manoeuvred from trim speeds associated with scheduled operating speeds such as V_2 and V_{REF} up to Alpha-limit shall not be unduly damped or be significantly slower than can be achieved on conventionally controlled transport aeroplanes.

6.3 High Incidence Handling with the Critical Engine Inoperative

Revoked

7- Atmospheric Disturbances

Operation of the high incidence protection system must not adversely affect aircraft control during expected levels of atmospheric disturbances, nor impede the application of recovery procedures in case of windshear.

8- Speeds Associated with Other Requirements

JAR 25 specifies requirements that have to be met at speeds quoted as factors of the stall speed V_S . For the A330 aircraft models V_S will be interpreted in each paragraph of the requirements according to the appendix.

9- Alpha floor

The Alpha-floor setting must be such that the aircraft can be flown at normal landing operational speeds and manoeuvred up to bank angles consistent with the flight phase without triggering Alpha-floor.

In addition there must be no alpha-floor triggering unless appropriate when aircraft is flown in usual operational manoeuvres and in turbulence.

APPENDIX TO SPECIAL CONDITION F-101

1- JAR 25.21:

Add the following paragraph 25.21(b):

- (b) The flying qualities will be evaluated at the most unfavourable CG position.

2- In lieu of JAR 25.119 paragraph (b)

- (b) A climb speed which is:

- (1) not less than

- i) $1.08 V_{S1g}$ for aeroplanes with four engines on which the application of power results in significant reduction in stalling speed; or
ii) $1.13 V_{S1g}$ for all other aeroplanes

- (2) not less than V_{MCL} ; and

- (3) not more than the greater of V_{REF} and V_{MCL}

Disclaimer – This document is not exhaustive and it will be updated gradually.



3- Replace JAR 25.121 paragraph (d) by:

- (d) Discontinued approach. In a configuration in which V_{s1g} does not exceed 110% of the V_{s1g} for the related all-engines operating landing configuration, the steady gradient may not be less than 2.1% for two engines aeroplanes, and 2.7% for four engines aeroplanes with:
- (1) the critical engine inoperative, the remaining engines at the available take off thrust;
 - (2) the maximum landing weight; and
 - (3) a climb speed established in connexion with normal landing procedures; but not exceeding $1.41 V_{s1g}$.

4- Replace the speeds V_s mentioned in the following JAR 25 requirements as follows:

JAR 25.145 (a) V_{min} in lieu of V_s

JAR 25.145 (b) (1) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.145 (b) (4) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.145 (b) (6) $1.32 V_{s1g}$ in lieu of $1.4 V_{s1}$

V_{min} in lieu of $1.1 V_{s1}$

$1.6 V_{s1g}$ in lieu of $1.7 V_{s1}$

JAR 25.145 (c) $1.13 V_{s1g}$ in lieu of $1.2 V_{s1}$

JAR 25.147 (a) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (a) (2) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (c) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.147 (d) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.149 (c) $1.13 V_{s1g}$ in lieu of $1.2 V_{s1}$

JAR 25.161 (b) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.161 (c) (1) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.161 (c) (2) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.161 (c) (3) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.161 (d) $1.3 V_{s1g}$ in lieu of $1.4 V_{s1}$

JAR 25.175 (a) not applicable, see SC F-3

JAR 25.175 (d) not applicable, see SC F-3

JAR 25.177 (a) $1.13 V_{s1g}$ in lieu of $1.2 V_{s1}$

JAR 25.177 (b)(1) $1.13 V_{sg}$ to $1.23 V_{s1g}$ in lieu of

$1.2 V_{s1}$ to $1.3 V_{s1}$

JAR 25.177 (b) (2) $1.13 V_{s1g}$ to $1.23 V_{s1g}$ in lieu of

$1.2 V_{s1}$ to $1.3 V_{s1}$

JAR 25.177 (b)(3) $1.23 V_{s1g}$ in lieu of $1.3 V_{s1}$

JAR 25.181 (a) $1.13 V_{s1g}$ in lieu of $1.2 V_s$

JAR 25.233 (a) replace $0.2 V_{so}$ by $0.2 V_{s1g}$

JAR 25.237 $0.94 V_{s1g}$ in lieu of V_{so}

JAR 25.735 (f) (2) $0.94 V_{s1g}$ in lieu of V_{so}

JAR 25.773 (b)(1)(i) $1.5 V_{s1g}$ in lieu of $1.6 V_{s1}$

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR25.1001 (c)(1) .94 V_{s1g} in lieu of V_{s1}
 JAR 25.1001 (c) (3) .94 V_{s1g} in lieu of V_{s1}
 JAR 25.1323(c) (1) (i) .94 V_{s1g} in lieu of V_{s1}
 JAR 25.1323(c) (1) (ii) .94 V_{s1g} in lieu of V_{s0}
 JAR 25.1323 (c) (2) "From 1.3 x 0.94 V_{s1g} to V_{min} " in lieu of
 "1.3 V_s to stall warning speed" and
 "speeds below V_{min} " in lieu of
 "speeds below stall warning"
 JAR 25.1325(e) replace 1.3 V_{s0} by 1.3 x .94 V_{s1g} and
 1.8 V_{s1} by 1.8 x .94 V_{s1g}

Acronyms and Abbreviations

ACJ	Advisory Circular Joint
JAR	Joint Aviation Regulation
WAT	Weight Altitude Temperature
CG	Centre of Gravity

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-120: FLIGHT CONTROL LAW DESIGNED FOR SUPPORT OF MILITARY AIR TO AIR REFUELLING

EQUIVALENT SAFETY FINDING	F-120: Flight control law designed for support of military air to air refuelling
APPLICABILITY:	A330-200 (MRTT aircraft only)
REQUIREMENTS:	JAR 25.143, 25.333, 25.337, 25X1516
ISSUE:	Issue 2 dated 04 th August 2008

Equivalent Safety Finding**BACKGROUND**

Based on an A330-200, the A330 MRTT is the Benchmark for new-generation multi-role tankers. The aircraft is capable of performing Air-To-Air refueling, passenger transport, medical evacuation and cargo transport.

The aircraft in its tanker role includes new aircraft configurations with different possible air-to-air refueling devices:

- Two hoses and drogues from two wing pods, operated separately, and/or
- One hose and drogue from fuselage refuelling unit, and/or
- One boom.

These devices may be either extended, or stowed.

Civil certification covers embodiment on the A330-200 MRTT of Air-to-Air refueling devices, stowed in their normal position and with the aircraft considered in free air.

The A330-200 flight control “*normal law*” of the civil configuration has been reconfigured to allow activation of a “*tanker law*” designed for military operations but allowed to be used during civil operations. This law is designed to ease the tanker military operations and it introduces as such a specific load factor limitation in clean configuration to [0g ; 2g], which is not in compliance with requirements of JAR 25.143 (including SC F-6), 25.333 and 25.337. This load factor limitation acts as a structural protection for boom and pods when the aircraft will be in tanker configuration.

The purpose of this Equivalent Safety Finding is to propose a way to demonstrate that this “*tanker law*” is providing an acceptable level of safety. The activation of the tanker law reduces the nominal A330-200 flight envelope in clean configuration from [-1g ; 2.5g] down to [0g ; 2g], which is the maneuverability required in high lift configurations.

EQUIVALENT SAFETY FINDING

Disclaimer – This document is not exhaustive and it will be updated gradually.



The tanker law introduces in clean configuration a limiting load factor feature to [0g ; 2g] instead of [-1g ; 2.5g].

The following requirements are applicable to the Flight Control Law Design of the A330-200 MRTT in tanker law mode:

- Use of tanker law in civil configuration is limited in time, consistent with the preparation of air to air refuelling in military configuration.
- Exit from tanker law mode shall be available at anytime, to recover the normal law and [-1 ; 2,5g] manoeuvrability.
- During all flight phases where tanker law mode is used, it must be possible to make a smooth transition from tanker law mode to normal law without exceptional piloting skill and strength.
- The activation of the tanker law mode shall not be allowed below a minimum altitude: 1500 ft AGL. The minimum altitude shall ensure safe operations of the aeroplane, in tanker law mode, for the whole speed range considered.
- The tanker law should be activated only when aircraft is clear of conflict with other civil aircraft.
- The tanker law shall be only activated with low to moderate turbulence.
- The domain of use of the tanker law mode, associated limitations and procedures shall be stated in the Aircraft Flight Manual.
- It shall be demonstrated that erroneous activation of the tanker law mode outside the allowed domain is classified in the safety analysis, and safety objectives met.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AGL	Above Ground Level
MRTT	Multi-Role Transport and Tanker

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-126: FLIGHT RECORDERS INCLUDING DATA LINK RECORDING

SPECIAL CONDITION	F-126: Flight Recorders including Data Link Recording
APPLICABILITY:	Post TC A330 / A340
REQUIREMENTS:	JAR 25.1301, 25.1457, 25.1459
ISSUE:	2 dated 26/06/2013

Special condition

BACKGROUND

Commission Regulation (EC) N°29/2009, laying down requirements on the data link services for the Single European Sky, requires certain aircraft operating in designated airspace to be equipped with systems capable of providing Datalink Services (DLS), with the intention to augment or replace voice communications. For new aircraft, the requirements of EC 29/2009 apply from January 1st 2011.

In addition CAT.IDE.A.195 of Commission Regulation (EU) 965/2012, proposes new operational requirements for recording of data link communications, including but not limited to the required data link services identified in Annex II to European Commission Regulation EC N°29/2009.

Effectivity:

SC F-126 is applicable for all European operators operating a/c for which the Individual Certificate of Airworthiness is first issued on or after April 8, 2014 (aligned with EU OPS CAT.IDE.A.195).

SC F-126 is applicable for all a/c for which the individual certificate of airworthiness is first issued on or after 1 January 2016 (aligned with ICAO Annex 6 Part I paragraph 6.3.3), except for US operators that operate under FAR121 and FAR 125.

The above mentioned regulations cover airspace and operational requirements but reveal a loophole which would result in aircraft equipped with the capability to provide DLS, not being required to record the DLS messages. The intent of JAR 25.1457 was to allow accident investigators to have as far as practicable a recording of all communications received or sent by each crew member. With the introduction of data link technology, much of the information which was previously transmitted by voice communications will be replaced by data link messages. With the requirement to provide DLS capability but no requirement to record the data link communication, the original intent of JAR 25.1457 would be jeopardized, making it more difficult for accident investigators to perform their tasks

SPECIAL CONDITION

The flight recorder (Cockpit Voice recorder or Flight Data Recorder) shall record:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (a) Data Link communications related to air traffic services (ATS communications*) to and from the aeroplane.
- (b) All messages whereby the flight path of the aircraft is authorized, directed or controlled and which are relayed over a digital data link rather than by voice communication.
- (c) The minimum recording duration shall be equal to the duration of the Cockpit Voice Recorder and the recorded data shall be time correlated to the recorded cockpit audio.
- (d) To enable an aircraft operator to meet the intent of current EU OPS 1.160 (a)(4)(ii) Commission Regulation (EU) 965/2012 (CAT.IDE.A.195(b)), information shall be provided explaining how the recorded data can be converted back to the format of the original data link messages in order to determine an accurate sequence of events for the aircraft and the cockpit operation.

*ATS communications (ATSC) are defined by ICAO as communications related to air traffic services including air traffic control, aeronautical and meteorological information, position reporting and services related to safety and regularity of flight.

Acronyms and Abbreviations

ATS	Air Traffic Service
ATSC	Air Traffic Service Communications
SC	Special Condition
DLS	Data Link Service
EASA	European Union Aviation Safety Agency
ICAO	International Civil Aviation Organization
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-128: MINIMUM MASS FLOW OF SUPPLEMENTAL OXYGEN

EQUIVALENT SAFETY FINDING	F-128: Minimum Mass Flow of Supplemental Oxygen
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.1443(c)
ISSUE:	1 dated 04/11/2014

Equivalent Safety Findings

BACKGROUND

Current airworthiness requirements of JAR 25.1443 (c) and associated standards of TSO C64a/SAE AS 8025 focus on the substantiation of the mean tracheal oxygen partial pressure, which is based on the existing oxygen dispensing technology.

Alternatively it is possible to verify the hypoxia protection capability of oxygen equipment by using the blood oxygenation level instead of the mean tracheal oxygen partial pressure. The ESF approach is in more detail specified below.

EQUIVALENT SAFETY FINDING

Minimum Mass Flow of Supplemental Oxygen

In lieu of the airworthiness requirements of JAR 25.1443(c) and associated standards of TSO C64a/SAE AS 8025, the following compliance method is considered acceptable:

For passengers and cabin crew members, it shall be shown, that the passenger oxygen system provides an equivalent level of protection from hypoxia as detailed below:

- (1) Between 10,000 ft and 18,500 ft cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at 10,000 ft cabin pressure altitude when breathing standard air. Breathing standard air at 10,000 ft cabin pressure altitude provides a mean tracheal oxygen partial pressure of 100 mmHg as required by JAR 25.1443(c).
- (2) Between 18,500 ft and 40,000 ft cabin pressure altitude, the supplemental oxygen system for the passenger and cabin crew shall provide a blood oxygenation level that is equivalent with the blood oxygenation level reached at 14,000 ft cabin pressure altitude when breathing standard air. Breathing standard air at 14,000 ft cabin pressure altitude provides a mean tracheal oxygen partial pressure of 83.8 mmHg as required by JAR 25.1443(c).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
-----	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



TSO	Technical Standard Order
SAE	Society of Automotive Engineers

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-129: CREW DETERMINATION OF QUANTITY OF OXYGEN IN PASSENGER OXYGEN SYSTEM

EQUIVALENT SAFETY FINDING	F-129: Crew Determination of Quantity of Oxygen in Passenger Oxygen System
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.1441(c),
ISSUE:	1 dated 05/11/2014

Equivalent Safety Findings**BACKGROUND**

According to FAA AD 2011-04-09 all chemical oxygen generators installed within lavatories had to be removed or deactivated due to security reasons. All aircraft under FAA registration and operating under 14 CFR part 129 are affected, and some non-US registered aircraft were modified following requests of operator's local Authorities. The affected A/C are currently operated without any supplementary oxygen supply in the lavatories. AD 2012-NM-004-AD now require to install a supplement oxygen system till September 2015 that meets the new applicable sections of parts 25 and 121 of the Federal Aviation Regulations.

The major mods 203608/203609 defines new type II oxygen container based on a gaseous oxygen source 22 minutes/15 minutes to cover the AD 2012-NM-004-AD. The oxygen container will have the same dimensions and interfaces (electrical and mechanical) as current type II oxygen containers. For those small, one-time use gaseous oxygen bottles located in the lavatories, no means will be incorporated to inform the crew of the quantity of oxygen available in each source of supply. As design, the system will not meet the EASA Certification Specification 25.1441 (c) which requires a means to allow the crew to readily determine, during flight, the quantity of oxygen available in each oxygen supply source.

EQUIVALENT SAFETY FINDINGS

In lieu of the airworthiness requirements of JAR 25.1441(c), the following is considered acceptable if substantiated following the compliance method as described in further below:

If the oxygen source is a lifetime sealed oxygen high-pressure cylinder, the oxygen source can be considered as full oxygen capacity provided the oxygen quantity has not depleted since the date of manufacture.

- 1) A detailed description of the design details must be provided to describe the compensating features which provide an equivalent level of safety.
- 2) The oxygen supply source is designed and tested to ensure that it will retain its required quantity of oxygen or chemicals throughout its expected life limit under foreseeable operating conditions.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 1) A means is provided for maintenance to readily determine when oxygen is no longer available in the supply source due to inadvertent activation.
- 2) The life limit of the oxygen supply source is established by test and analysis.
- 3) Each oxygen supply source is labeled such that the expiration date can be easily determined by maintenance.
- 6) Airbus defines maintenance and inspection procedures in the maintenance planning documents to ensure that the oxygen supply source
 - a. that are discharged are removed from the aeroplane,
 - b. are not installed on the aeroplane past their expiration date.
- 7) Each oxygen supply source does not supply oxygen to more than six oxygen masks.

Acronyms and Abbreviations

AD	Airworthiness Directives
CFR	Code of Federal Regulation
AD	Airworthiness Directives

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-131: FLIGHT INSTRUMENT EXTERNAL PROBES – QUALIFICATION IN ICING CONDITIONS

SPECIAL CONDITION	F-131: Flight Instrument External Probes – Qualification in Icing Conditions
APPLICABILITY:	A330 / A340
REQUIREMENTS:	CS 25.1309, CS 25.1323(h), CS 25.1323(i), CS 25.1325(b), CS 25.1419, CS 25.1529
ISSUE:	Issue 3 dated 05 April 2016

Special Condition

BACKGROUND

Icing conditions related contamination of Flight Instrument External Probes is currently regulated through requirement CS 25.1323(h) and CS 25.1323 (i) for airspeed indicating system and CS 25.1325(b) for static pressure system.

CS 25 Appendix C conditions and ETSO C16a / ETSO C54 do not include mixed phase and ice crystal icing conditions and the operating rules do not prohibit operations in such environment.

In consideration of the above requirement limitations, EASA, through the use of the CS advisory materials, has extended the icing conditions of CS 25 Appendix C to include mixed phase and ice crystal conditions.

In accordance with IR 21, § 21A.16B, it is the Agency position that the related airworthiness code does not contain adequate or appropriate safety standards regarding the installation of probes for new environmental conditions on Long Range family aircraft. Therefore the Special Condition detailed in Appendix to this CRI shall be met for the new probes.

SPECIAL CONDITION

1. Replace CS 25.1323(i), AMC 25.1323(i) by SC 2 and respective AMC's

2. Flight Instrument External Probes Heating Systems

Each flight instrument external probes systems, including, but not necessarily limited to, pitot tubes, pitot-static tubes, static probes, angle of attack sensors, side slip vanes, and temperature probes, must be heated or have an equivalent means of preventing malfunction in the heavy rain conditions defined in table of this paragraph, in the icing conditions as defined in CS 25 Appendices C and in mixed phase / ice crystal conditions as defined in Appendix 1 of this Special Condition

Disclaimer – This document is not exhaustive and it will be updated gradually.



Rain test conditions

Altitude Range		Liquid Water Content	Horizontal Extent		Droplet MVD
(ft)	(m)	(g/m ³)	(km)	(NM)	(µm)
0 to 10000	0 to 3000	1	100	50	500 to 2000
		6	5	3	
		15	1	0.5	

Mixed Phase and Ice Crystal Icing Envelope (Deep Convective Clouds)

References

1. THE ANALYSIS OF MEASUREMENTS OF FREE ICE AND ICE/WATER CONCENTRATIONS IN THE ATMOSPHERE OF THE EQUATORIAL ZONE, IAN I. MCNAUGHTON, B.SC., DIP. R.T.C., ROYAL AIRCRAFT ESTABLISHMENT (FARNBOROUGH) TECHNICAL NOTE NO: MECH. ENG. 283
2. SNOW AND ICE PARTICLE SIZES AND MASS CONCENTRATIONS AT ALTITUDES UP TO 9 KM (30,000 FT), R. K. JECK, DOT/FAA/AR-97/66, AUGUST, 1998.
3. CLOUD MICROPHYSICAL MEASUREMENTS IN THUNDERSTORM OUTFLOW REGIONS DURING ALLIED/BAE 1997 FLIGHT TRIALS, STRAPP, J.W., P. CHOW, M. MALTBY, A.D. BEZER, A. KOROLEV, I. STOMBERG, AND J. HALLETT, 37TH AIAA AEROSPACE SCIENCES MEETING AND EXHIBIT, JAN. 11-14, 1999, RENO, NV. AIAA 99-0498.
4. ARAC EHWG PROPOSED APPENDIX D TO 14 CFR PART 33

Ice crystal conditions associated with convective storm cloud formations exist within the CS 25 Appendix C Intermittent Maximum Icing envelope (including the extension to -40 deg C) and the Mil Standard 310 Hot Day envelope. This ice crystal icing envelope is depicted in the Figure D-1.

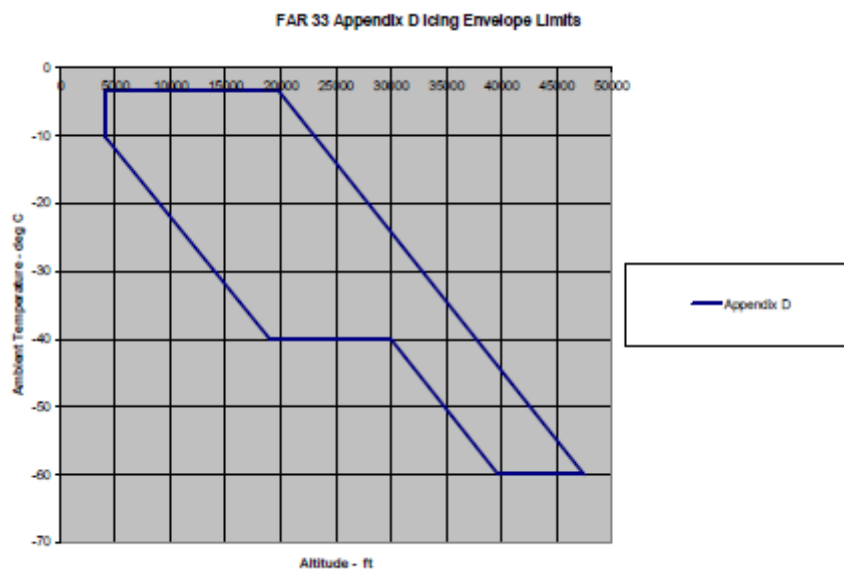


Figure D-1 Convective Cloud Ice Crystal Envelope

Disclaimer – This document is not exhaustive and it will be updated gradually.



Within the envelope, total water content (TWC) in gms/m³ have been assessed based upon the adiabatic lapse defined by the convective rise of 90% relative humidity air from sea level to higher altitudes and scaled by a factor of 0.65 to a standard cloud length of 17.4 nautical miles. TWC is displayed for this distance over a range of ambient temperature within the boundaries of the ice crystal envelope in Figure D-2.

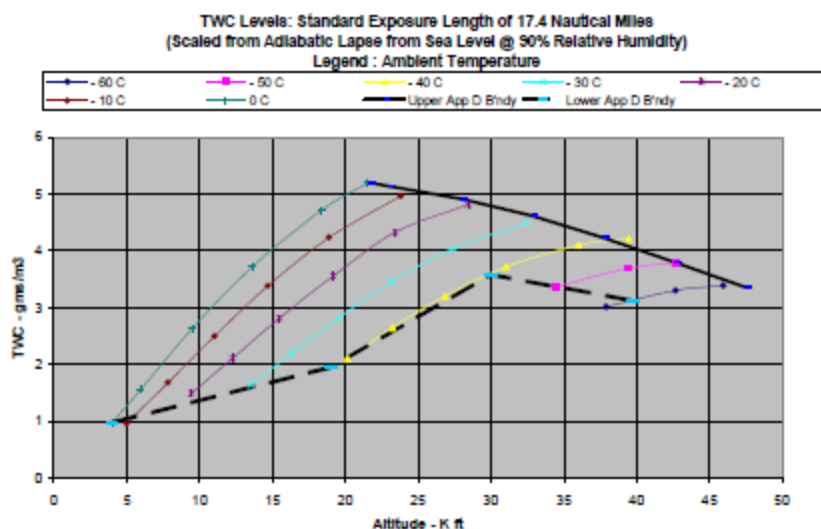


Figure D-2 Total Water Content

Ice crystal size median mass dimension (MMD) range is 50 - 200 microns (equivalent spherical size) based upon measurements near convective storm cores.

The TWC can be treated as completely glaciated except as noted in the Table D-1.

Temperature Range – deg C	Horizontal Cloud Length	LWC – gm/m ³
0 to -20	<= 50 miles	<=1.0
0 to -20	Indefinite	<=0.5
< -20		0

Table D-1 Supercooled Liquid Portion of TWC

The TWC levels displayed in Figure D-2 represent TWC values for a standard exposure distance (horizontal cloud length) of 17.4 nautical miles that must be adjusted with length of icing exposure. The assessment from data measurements in References 1 supports the reduction factor with exposure length shown in Figure D-3.

Disclaimer – This document is not exhaustive and it will be updated gradually.



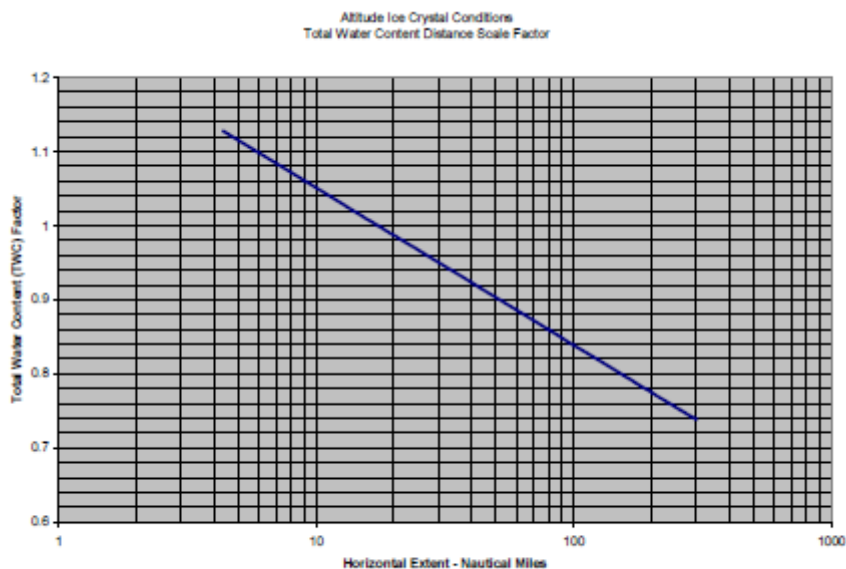


Figure D-3 Exposure Length Influence on TWC

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AC	Advisory Circular
AMC	Acceptable Means of Compliance
ARAC	Aviation Rulemaking Advisory Committee
IPHWG	Ice Protection Harmonisation Working Group

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-134: HEAD UP DISPLAY (HUD) INSTALLATION

SPECIAL CONDITION	F-134: HEAD UP DISPLAY (HUD) INSTALLATION
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.773, 25.777, 25.785, 25.789, 25.803, 25.1301, 25.1303, 25.1309, 25.1321, 25.1322, 25.1323, 25.1333, 25.1381, 25.1411, 25.1431, 25.1447, 25.1459, 25.1529, 25.1541, 25.1581 CS 25.1322(e), CS 25.1329(i) JAR-AWO 202, 302, 338 CS-AWO Subpart 4 Directional Guidance for Take-Off in Low Visibility
ISSUE:	Issue 3 dated 05 October 2017

Disclaimer – This document is not exhaustive and it will be updated gradually.



Special Condition

BACKGROUND

Airbus has applied for EASA airworthiness approval of a Head-Up Display (HUD) system installed on an A330/A340 aircraft. Approval is sought for dual system installation providing capability for the following types of operations:

- take-off, climb, cruise and descent (for either autopilot-coupled, flight-director engaged or manual flight)
- visual approaches
- Take-off in low visibility (assumed to be no lower than 75m RVR) using head-up lateral guidance information
- Non-precision approaches.
- Category I, manually flown precision approaches using head-up guidance
- Monitoring of autopilot-coupled Category I, II and III precision approaches including automatic landing roll-out phases

The HUD system is not considered to be a hybrid installation, since it is not intended to provide primary guidance for Category II or III approaches, nor is the intention to use the system to continue the approach in the event of autopilot failure during single-channel, autopilot-coupled Category II or III approaches. However, in the event of autopilot disconnect during the roll-out phase, the roll-out can be continued manually using external cues and lateral guidance information provided on the HUD. This does not result in any change in the minimum RVR granted through operational approval.

When considering the stated operational use of the HUD system on the A330/A340 aircraft and the available EASA certification requirements, a combination of criteria in CS-AWO and AMC 25-11 (change 17) will address all of the types of HUD operations being proposed.

Disclaimer – This document is not exhaustive and it will be updated gradually.



SPECIAL CONDITION

The following Special Conditions are applicable to the HUD Installation

SC F-134-25.1322 (e)

Visual alert indications must:

1. conform to the following colour convention:
 - i. Red for Warning alert indications.
 - ii. Amber or yellow for Caution alert indications.
 - iii. Any colour except red or green for Advisory alert indications.
2. use visual coding techniques, together with other alerting function elements on the flight deck, to distinguish between Warning, Caution and Advisory alert indications, if they are presented on monochromatic displays that are incapable of conforming to the colour convention in paragraph (e)(1).

SC F-134-25.1329 (i)

The flight guidance system functions, controls, indications, and alerts must be designed to minimise flight crew errors and confusion concerning the behaviour and operation of the flight guidance system. Means must be provided to indicate the current mode of operation, including any armed modes, transitions, and reversions. Selector switch position is not an acceptable means of indication. The controls and indications must be grouped and presented in a logical and consistent manner. The indications must be visible to each pilot under all expected lighting conditions.

SC F-134-CS AWO Subpart 4 - Directional Guidance for Take-off in Low Visibility

CS-AWO 400 Applicability and Terminology

- (a) Subpart 4 of this airworthiness code is applicable to aeroplanes for which certification is sought to allow the performance of take-off in lower visibilities than those which are sufficient to ensure that the pilot will at all times have sufficient visibility to complete or abandon the take-off safely. It is only concerned with directional guidance during the ground-borne portion of the take-off (i.e. from start to main wheel lift-off, or standstill in the event of abandoned take-off). (See AMC AWO 400(a))
- (b) Take-off Guidance System: A take-off guidance system provides directional guidance information to the pilot during the take-off or abandoned take-off. It includes all the airborne sensors, computers, controllers and indicators necessary for the display of such guidance. Guidance normally takes the form of command information, but it may alternatively be situation (or deviation) information.

CS-AWO 401 Safety level

Disclaimer – This document is not exhaustive and it will be updated gradually.



The Safety level in take-off in low visibility must not be less than the average safety level achieved in take-off in good visibility. Hence, in showing compliance with the performance and failure requirements, the probabilities of performance or failure effects may not be factored by the proportion of take-offs that are made in low visibility.

CS-AWO 417 Guidance information

The take-off guidance system must provide guidance information which will, in the event of loss of visibility during the take-off, enable the pilot to control the aeroplane to the runway centreline during the take-off or abandoned take-off using the normal steering controls. Its use must not require exceptional piloting skill or alertness.

CS-AWO 418 Guidance display

- (a) The take-off guidance information must be provided in such a form that it is immediately usable by the pilot who is making the take-off. Its use must not require him to refer to his instrument panel for this information, nor must it require the other pilot to take control of the aeroplane. Reversion to the system must be easy and natural.
- (b) The information display must be usable in all appropriate conditions of ambient light, runway lighting and visibility.
- (c) The system must be designed to minimise crew errors. (See AMC AWO 418(c)). Equipment

CS-AWO 422 Minimum equipment

The minimum equipment, which must be serviceable at the start of the take-off for compliance with the general criteria of this Subpart 4 and those relating to performance and failure conditions, must be established.

CS-AWO 431 Performance demonstration

(See AMC AWO 431 and Figure 1)

- (a) It must be demonstrated that the performance of the take-off guidance system is such that the aeroplane will not deviate significantly from the runway centreline during take-off while the system is being used within the limitations established for it. Compliance may be demonstrated by flight test, or by a combination of flight test and simulation. Flight testing must cover those factors affecting the behaviour of the aeroplane, e.g. wind conditions, ILS and/or MLS ground facility characteristics, aeroplane configurations, weight, and centre of gravity.
- (b) In the event that the aeroplane is displaced from the runway centreline at any point during the take-off or abandoned take-off, the system must provide such guidance as would enable the pilot to control the aeroplane smoothly back to the runway centreline without any sustained nuisance oscillation.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (c) In the event of an engine failure, if the pilot follows the guidance information and disregards external visual reference, the lateral deviation of the aeroplane must remain safely within the confines of the runway.

CS-AWO 445 Limitations and procedures

Limitations on the use of the system and appropriate procedures must be established, where these are necessary for compliance with the criteria of CS-AWO 431. Account should be taken of the method by which the system defines the runway centreline and associated errors or delays.

CS-AWO 455 WARNINGS

(See AMC AWO 455)

- (a) System warnings must be so designed and located as to ensure rapid recognition of failures.
- (b) The information display and system warnings must not distract the pilot making the take-off or significantly degrade forward view.

CS-AWO 461 Guidance system

(see AMC 25.1309)

- (a) The take-off guidance system must be such that the display of incorrect guidance information to the pilot during the take-off run is assessed as Remote. In demonstrating compliance with this criterion account need only be taken of incorrect guidance of such magnitude that it would lead to the aeroplane deviating from the runway, if it is followed.
- (b) Probability of loss of take-off guidance during the take-off must be assessed as Remote.

CS-AWO 462 Aeroplane failures

(see AMC 25.1309)

Any single failure of the aeroplane which disturbs the take-off path (e.g. engine failure) must not cause loss of guidance information or give incorrect guidance information.

CS-AWO 481 General

(See AMC AWO 481)

In relation to the approval of the aeroplane for take-off in reduced visibility, the aeroplane Flight Manual must state –

- (a) Limitations,
- (b) Normal and abnormal procedures including where appropriate the most critical conditions demonstrated,
- (c) Minimum required equipment.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms and Abbreviations

AMC	Acceptable Means of Compliance
AWO	All Weather Operations
CRI	Certification Review Item
EASA	European Union Aviation Safety Agency
HUD	Head Up Display
JAR	Joint Aviation Regulation
RVR	Runway Visual Range

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-137: SECURITY PROTECTION OF AIRCRAFT SYSTEMS AND NETWORKS

SPECIAL CONDITION	F-137: Security protection of Aircraft systems and networks
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.1309 Change 13
ISSUE:	17 May 2018

Special condition

BACKGROUND:

JAR/CS 25 does not address Cyber Security and AMJ/AMC 25 1309 explicitly exclude act of sabotage from the list of events to be addressed during the safety assessment.

Airbus intends to install new systems with connectivity to non-trusted services in the Airbus Long Range aircraft which may introduce the potential for unauthorized electronic access to Aircraft Systems. They may introduce new threats to the safety of the aircraft by the exploitation of potential known and unknown vulnerabilities with the aim to intentionally alter the integrity and availability of critical data, aircraft networks, systems or databases.

Therefore, this Special Condition (SC) has been established to address the issue.

SPECIAL CONDITION

- a) The applicant shall ensure security protection of the aircraft systems from unauthorized electronic access through the system introducing connectivity to non-trusted services, if corruption of these systems (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 systems, including those possibly caused by maintenance activity on the system having connectivity to non-trusted services or by any unprotected equipment/devices connected to this system, are identified, assessed and risk mitigation strategies are implemented to protect the aircraft systems from all adverse impacts on safety, and
- c) When required by paragraph (a), the applicant shall make available procedures and instructions for continued airworthiness to ensure security protections are maintained.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms and Abbreviations

AMC	Acceptable Means of Compliance
CRI	Certification Review Item
CS	Certification Specification
EASA	European Union Aviation Safety Agency
ED	EUROCAE Document
FLS	Field Loadable Software
RTCA	Radio Technical Commission for Aeronautics
SC	Special Condition

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-141: FLIGHT GUIDANCE SYSTEM – SPEED EXCURSION PROTECTION

EQUIVALENT SAFETY FINDING	F-141: Flight guidance system – speed excursion protection
APPLICABILITY:	A330-841/A330-941
REQUIREMENTS:	CS 25.1329(h) Amendment 27
ISSUE:	13 June 2023

Equivalent Safety Finding

BACKGROUND

The flight guidance functions (AP/FD/ATHR) of the existing design are lost when several ADRs are faulty or when an unreliable airspeed situation occurs. Moreover, the flight control laws switch from normal law to alternate law which increases crew workload. The Alternate AP function is designed to maintain the automation (AP/FD/ATHR) in situations of unreliable speed or ADR loss to provide a continuous aircraft guidance and alleviate the crew workload.

This new flight guidance system function requires the UAMM step 2 (Unreliable Airspeed Mitigation Means) to be installed. It introduces an additional independent airspeed (i.e., a back-up speed) and monitoring function which is able to identify the unreliable airspeed source.

The new modes introduced by this design change are:

- AP/ATHR on single ADR: maintains AP, FD and A/THR availability when only one ADR data source is considered reliable.
- AP/ATHR on Backup Data: maintains AP, FD and A/THR availability when the digital backup speed is the only reliable speed source.
- Backup AP/ATHR: Backup AP/ATHR: adapts the vertical command and thrust to maintain a vertical speed/flight path angle equal to zero considering the current aircraft altitude and weight when the status of all airspeed data sources are unreliable including the backup airspeed data source. The A/THR will also have a backup mode which sets N1 allowing flying at 270kt/Mach 0.8.

When one of the first two modes are active, direct compliance with CS 25.1329(h) at Amdt. 27 can be demonstrated.

CS25.1329(h) requests the implementation of speed protections. Compliance with the requirement presumes that speed information will be available. However, the third mode of Alternate AP (Backup AP/ATHR) is intended to maintain a level of automation when there is no reliable speed information.

EASA is prepared to grant an ESF to CS 25.1329(h) provided compliance with the requirements reported in the following:

Equivalent Safety Finding

In lieu of direct compliance with CS 25.1329(h), and provided that the below compensating factors are complied with, a mechanism might be implemented to protect the aeroplane from excursions

Disclaimer – This document is not exhaustive and it will be updated gradually.



beyond an acceptable margin from the airspeed range of the normal flight envelope that is not based on sensed airspeed.

COMPENSATING FACTORS

- a) In cases where no reliable airspeed data source is available, other protection mechanism(s) must be provided to ensure that the aircraft remains in its normal flight envelope.
- b) The protection mechanism(s) per 3.a) must be shown to meet the first objective set by CS 25.1329(h) *'avoiding excursion beyond an acceptable margin from the speed range of the normal flight envelope'*.
- c) The protection mechanism(s) per 3.a) must be shown to meet the second objective of CS 25.1329(h) in case of speed excursion outside of the normal flight envelope: *'If the aircraft experiences an excursion outside this range, the flight guidance system must not provide guidance or control to an unsafe speed.'*
- d) If dedicated flight crew action is required, this must be clearly indicated to the flight crew in compliance with JAR/CS 25.1322¹ and the difference in training properly assessed and addressed via the Operational Suitability Data.
- e) The AFM must include corresponding limitations and procedures, if any.

Acronyms and abbreviations

AP/FD/ATHR: AutoPilot/Flight Director/AutoThrust

ADR: Air Data Reference

UAMM: Unreliable Aircraft Mitigation Means

AFM: Aircraft Flight Manual

¹ The JAR or CS 25.1322 amendment indicated in the type certification basis of the actual change applies.

Disclaimer – This document is not exhaustive and it will be updated gradually.

FCD-MULTI-01: CS-FCD T3 EVALUATION PROCESS

EQUIVALENT SAFETY FINDING	FCD-MULTI-01: CS-FCD T3 Evaluation Process
APPLICABILITY:	A330 / A340
REQUIREMENTS:	CS FCD.425(g)
ISSUE:	5 dated 05 Nov 2021

1. APPLICABILITY

This ESF to CS FCD.425(g) may be applied if:

- Type specific pilot training is required for the installation of the same equipment, system or function on more than one aircraft type of the same type certificate holder.
- The training differences levels associated with the installation of this equipment, system or function on a candidate aircraft are determined as level C or D in accordance with CS-FCD initial issue.

1.1 AFFECTED CS

CS FCD.425(g)

2. Equivalent Safety Finding

In lieu of direct compliance to CS FCD.425(g), and provided that the below compensating factors are fulfilled, for the installation of the same equipment, system or function on an additional aircraft type or variant of the same type certificate holder, the validity of the T3 evaluation results for the basic aircraft may be extended to a variant of that aircraft type or to another aircraft type of the same applicant and training credits between types based on commonalities shall be granted, even if the appropriate level for training is determined as level C or D.

3. COMPENSATING FACTORS

a. The equipment, system or function installed on a variant of the same aircraft type or another aircraft type of the same type certificate holder shall:

- be identical; and
- have the same pilot interface; and
- be operated according to the same procedures, under normal, abnormal and emergency operations; and

b. The variant of the aircraft type or the other aircraft type from the same type certificate holder on which the equipment, system or function is installed has no influence on its functionality and the related pilot interface; and

c. The proposed differences training and checking programmes and training devices are evaluated through a T3 evaluation in accordance with CS FCD.425(g) by the same type certificate holder; and

d. It is excluded that a new T3 evaluation on the candidate aircraft would lead to a different result compared to the results from the original T3 evaluation performed in accordance with CS FCD.425(g).

Acronyms and Abbreviations

Disclaimer – This document is not exhaustive and it will be updated gradually.



CS Certification Specifications
ESF Equivalent Safety Finding
FCD Flight Crew Data
TCDS Type Certificate Data Sheet
SC Special Condition

Disclaimer – This document is not exhaustive and it will be updated gradually.



An agency of the European Union

TE.CERT.00053-001 © EASA, 2024. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Page 299 of 358

F-GEN-01: INSTALLATION OF NON-RECHARGEABLE LITHIUM BATTERY

SPECIAL CONDITION	F-GEN-01: Installation of non-rechargeable lithium battery
APPLICABILITY:	A330 / A340
REQUIREMENTS:	CS 25.601, 25.863, 25.869, 25.1301, 25.1309, 25.1353(c), 25.1529, 25.1360(b)
ISSUE:	6 dated 30 Nov 2021

Special Condition**BACKGROUND**

Non-rechargeable lithium batteries and battery systems have certain failure, operational, and maintenance characteristics that can present hazards that are not adequately identified and addressed through traditional compliance methods.

A Special Condition is needed to establish the means by which known or anticipated hazards associated with non-rechargeable lithium batteries and battery systems shall be addressed.

SPECIAL CONDITION

In lieu of the requirements of CS 25.1353(c)(1) through (c)(4), non-rechargeable lithium batteries and battery installations must comply with the following:

1. Be designed so that safe cell temperatures and pressures are maintained under all foreseeable operating conditions to preclude fire and explosion.
2. Be designed to preclude the occurrence of self-sustaining, uncontrolled increases in temperature or pressure.
3. Not emit explosive or toxic gases in normal operation, or as a result of its failure, that may accumulate in hazardous quantities within the airplane.
4. Must meet the requirements of CS 25.863(a) through (d).
5. Not damage surrounding structure or adjacent systems, equipment or electrical wiring of the airplane from corrosive fluids or gases that may escape and that may cause a major or more severe failure condition.
6. Have provisions to prevent any hazardous effect on airplane structure or essential systems caused by the maximum amount of heat it can generate due to any failure of it or its individual cells.
7. Have a means to detect its failure and alert the flight crew in case its failure affects safe operation of the aircraft.

Disclaimer – This document is not exhaustive and it will be updated gradually.



8. Have a means for the flight crew or maintenance personnel to determine the battery charge state if its function is required for safe operation of the airplane.

Note 1: A battery system consists of the battery and any protective, monitoring and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging. For the purpose of this special condition, a battery and battery system are referred to as a battery.

Note 2: This Special Condition applies in lieu of 25.1353(c)(1) through (c)(4) to non-rechargeable lithium battery installations as follows:

- To all changed installation (new battery part number or new environment) except if the design change can be considered cosmetic. A cosmetic change is a change in appearance only, and does not change any function or safety characteristic of the battery installation.
- To all relocated lithium batteries, except if the relocation is demonstrated to improve the safety of the airplane and of the occupants, leading to a change that provides a substantial, fire safety improvement.
- To all existing non-rechargeable lithium battery installations affected by a design change, even if the battery or battery installation itself does not change.(e.g. change in ambient temperature or pressure environment in which the battery operates, change on the electrical load on a battery). Except if the design change improves the safety of the non-rechargeable lithium battery installation.

Applicants who intend to justify that this Special Condition is not applicable shall generate the evidence that the proposed design meets the above criteria in this note 2. This evidence shall include a detailed assessment of the battery installation on the baseline aircraft and the improvement due to the proposed change considering a battery thermal runaway failure for both installations. The assessment should:

- Consider the battery thermal runaway effects of heat, explosive energy, projecting debris and toxic gases.
- Address the proximity of the battery to occupants, critical systems and equipment, structure, and any other installations that could be a hazard if exposed to a battery thermal runaway (e.g., oxygen bottles/lines, fuel lines).

The above exceptions are limited to changes/relocations to baseline aircraft installations approved for certification projects for which the special condition was not applicable.

Section 25.1353(c)(1) through (c)(4) will remain in effect for other battery installations.

Note 3: For very small non-rechargeable lithium batteries (equal or less than 2 Watt-hour of energy), an acceptable MoC with this Special Conditions is showing these batteries compliant with Underwriters Laboratories (UL) 1642 or UL 2054.

Disclaimer – This document is not exhaustive and it will be updated gradually.



Note 4: For the purpose of SCs 7 and 8, “safe operation of the airplane” is defined as continued safe flight and landing following failures or other non-normal conditions. The following are examples of devices with batteries that are not required for continued safe flight and landing of the airplane: emergency locator transmitters, underwater locator beacons, seat belt air bag initiators and flashlights. A backup flight instrument with a non-rechargeable lithium battery is an example that would be required for safe operation of the airplane.

Note 5: Minimum Operational Performance Standards (MOPS) for Non-Rechargeable Lithium Batteries DO-227A + risk assessment at A/C level (limited to SC 3, 4, 5 & 6) is an acceptable MoC to the SC's 1 to 6 contained in this CRI. Alternative Means of Compliance can be proposed by the applicant to show compliance with the SC's included in this CRI and agreed by EASA in a case-by-case basis.

Disclaimer – This document is not exhaustive and it will be updated gradually.



F-03-700L: LANDING LIGHT SWITCH

EQUIVALENT SAFETY FINDING	F-03-700L: Landing Light Switch
APPLICABILITY:	A330-700L
REQUIREMENTS:	Part 21.A.16B and 21.A.21(c)(2); JAR 25.1383(b) at change 13
ISSUE:	Issue 1 dated 17th January 2017

Equivalent Safety Finding

BACKGROUND

JAR 25.1383(b) at change 13 requires separate switches for each landing light but allows that one switch is used for the lights of a multiple light installation at one location. There was no evolution on the content of this requirement since the creation of FAR 25 in 1965, which itself was derived from identical CAR 4b text. The CS 25.1383(b) content at amendment level is identical.

On A330-700L derivative aircraft and as for the A330-343 reference aircraft model, the two fixed position landing lights integrated in each wing leading edge will be activated by a single landing light switch in the cockpit.

Use of a single landing light switch in the cockpit is not in direct compliance with JAR 25.1383(b) requirement. Airbus has therefore requested an equivalent safety finding as described in their position below.

EQUIVALENT LEVEL OF SAFETY FINDING

The A330-700L landing light switch proposed design provides an Equivalent level of Safety Finding with regards to the intent of JAR 25.1383(b).

Acronyms and Abbreviations

FAR	Federal Aviation Regulations
------------	------------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



G-5: RESISTANCE TO FIRE TERMINOLOGY

SPECIAL CONDITION	G-5: Resistance to fire terminology
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 1, JAR 25.853, JAR 25.863, JAR 25.867, ACJ 25.1181
ISSUE:	2 dated 07/05/1991

Special Condition

BACKGROUND

Although Orange Paper (OP) 91/1 is not applicable to A330/A340 aircraft models it has been found by the JAA that the NPA 25D-181 is of sufficient importance as to be applied as special condition in accordance with draft JAR 21.16(a)/JCP document par.4.2.

SPECIAL CONDITION

- Amend JAR 25.853(e) to read:
(e) Each disposal receptacle for towels paper or waste must be fully enclosed and constructed of materials adequate in resistance to fire such that any fire likely to occur in it under normal use will be contained. The ability of the disposal receptacle to contain those fires under all probable conditions of wear, misalignment and ventilation expected in service must be demonstrated by test. A placard containing the legible words "No Cigarette Disposal" must be located on or near each disposal receptacle door.
- Amend JAR 25.863(b)(4) to read:
(4) Means available for controlling or extinguishing a fire, such as stopping flow of fluids, shutting down equipment, fire containment, or use of extinguishing agents.
- Amend JAR 25.863(b)(4) to read:
(a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centreline must be constructed of materials at least equivalent in resistance to fire as aluminium alloy in dimensions appropriate for the purpose for which they are used.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
OP	Orange Paper
NPA	Notice of Proposal Amendment

Disclaimer – This document is not exhaustive and it will be updated gradually.



G-7: FUNCTION AND RELIABILITY TESTING

SPECIAL CONDITION	G-7: Function and reliability testing
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 21.35
ISSUE:	2 dated 02/10/1992

Special Condition

BACKGROUND

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.

(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.
- (2) For all other aircraft, at least 150 hours of operation.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
SC	Special Condition

Disclaimer – This document is not exhaustive and it will be updated gradually.



G-08: ETOPS BEYOND 180 MIN CERTIFICATION

SPECIAL CONDITION	G-08: ETOPS Beyond 180 min certification
APPLICABILITY:	A330
REQUIREMENTS:	JAR 1, JAR 25
ISSUE:	3 dated 20/05/2009

Special Condition**BACKGROUND**

All A330 models are currently certified for ETOPS up to 180 minutes against current applicable AMC 20-6. Airbus applied for the ETOPS beyond 180 min certification of all A330 models.

The current EASA guidance material on ETOPS Type Certification as defined by AMC 20-6 does not contain criteria for ETOPS beyond 180 minutes certifications.

While the FAA has published its final "Extended Operations" (ETOPS) regulation including Amendment 120 of FAR 25 on 16 January 2007, addressing the ETOPS approval beyond 180 minutes, EASA has published the corresponding NPA 2008-01 for public consultation on 1 March 2008.

Pending the release of the EASA final rule on ETOPS updating the CS-Definition, CS-25 and AMC 20-6 in order to account for the possibility of an EASA ETOPS approval beyond 180 minutes maximum diversion time, the Special Condition as specified in this CRI aim to define a Certification Basis and acceptable means of compliance to be used for the EASA ETOPS beyond 180 min Certification of the Airbus A330.

SPECIAL CONDITION**1. Amend JAR-1 in order to introduce new definitions as follows:**

'ETOPS Configuration, Maintenance and Procedures (CMP) Standard' means the particular aeroplane or engine configuration minimum requirements, including any special inspection, hardware life limits, Master Minimum Equipment List (MMEL) constraints and maintenance practices found necessary by the Agency to establish the suitability of an airframe/engine combination for ETOPS.

'ETOPS (Extended Range Operations for Two-Engined Aeroplanes)' means those operations of two-engined aeroplanes that are approved by the Authority (ETOPS approval), to operate beyond the threshold distance determined in accordance with operational requirements from an "Adequate Aerodrome".

'Adequate Aerodrome' means an aerodrome which the operator considers to be satisfactory, taking account of the applicable performance requirements and runway characteristics; at the

Disclaimer – This document is not exhaustive and it will be updated gradually.



expected time of use, the aerodrome will be equipped with necessary ancillary services such as ATS, sufficient lighting, communications weather reporting, nav aids and emergency services .

2. Amend JAR-25 in order to introduce new paragraph JAR 25.1535 to read as follows:

JAR 25.1535 ETOPS approval

Each applicant seeking approval for ETOPS must:

- (a) Comply with the requirements of JAR-25 considering the maximum mission time and the longest diversion time for which approval is being sought.
- (b) Consider crew workload and operational implications and the flight crew's and passenger's physiological needs of continued operations with failure effects for the longest diversion time for which approval is being sought
- (c) Establish appropriate limitations.

Acronyms and Abbreviations

ETOPS	Extended Range Operations for Two-Engined Aeroplanes
AMC	Acceptable Means of Compliance
JAR	Joint Aviation Regulation
EASA	European Union Aviation Safety Agency
NPA	Notice of Proposed Amendment
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
CS	Certification specification
CMP	Configuration, Maintenance and Procedures
MMEL	Master Minimum Equipment List
ATS	Air Traffic System

Disclaimer – This document is not exhaustive and it will be updated gradually.



G-105: RESISTANCE TO FIRE TERMINOLOGY

SPECIAL CONDITION	G-105: Resistance to fire terminology
APPLICABILITY:	A330-200
REQUIREMENTS:	JAR 1, JAR 25.853, JAR 25.867
ISSUE:	2 dated 07/01/1998

Special Condition

BACKGROUND

Special Condition G-5 has been developed for A330/A340 certification, based on NPA 25D-181 revision 3, which was published in JAR 25 with orange paper 91/1.

For A330-200 certification, the applicant has elected to comply to change 14 for the following JAR 25 paragraphs affected by this special condition:

- JAR 25.853 Flammable fluid fire protection
- JAR 25.867 Fire protection: other components

Therefore the existing Special Condition G-5 needs to be revised to be consistent with JAR 25 Change 14.

SPECIAL CONDITION

Amend JAR 25.853 (6) to read:

(e) each disposable receptacle for towels, paper, or waste must be fully enclosed and constructed of material adequate in resistance to fire such that any fire likely to occur in it under normal use will be contained. The ability of the disposable receptacle to contain those fires under all probable conditions of wear, misalignment, and ventilation expected in service must be demonstrated by test. A placard containing the legible words "No Cigarette Disposal" must be located on or near each disposal receptacle door.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
------------	---------------------------

Disclaimer – This document is not exhaustive and it will be updated gradually.



H-01: ENHANCED AIRWORTHINESS PROGRAMME FOR AEROPLANE SYSTEMS - ICA ON EWIS

SPECIAL CONDITION	H-01: Enhanced Airworthiness Programme for Aeroplane Systems - ICA on EWIS
APPLICABILITY:	A330/A340
REQUIREMENTS:	21A.16B(a)(3), 21A.3B(c)(1), CS 25.1529 & App. H
ADVISORY MATERIAL:	2 dated 06/05/2010

Special Condition**BACKGROUND**

To enhance the safety of large aeroplanes wiring systems, EASA has developed in cooperation with FAA a regulatory package including new and revised certification and maintenance requirements to address shortcomings of current wiring systems design, installation and maintenance practices. These new certification requirements are contained in CS-25 amendment 5 dated 5 September 2008.

EASA has requested Airbus, as holder of type certificates of A330 aircraft models, to develop appropriate Instructions for Continued Airworthiness (ICA) on the Electrical Wiring Interconnection System (EWIS), derived from the Enhanced Zonal Analysis Procedure (EZAP) in accordance with CS-25 Appendix H paragraph H25.5. These ICA's must be furnished before 10 December 2009 or the date of issuance of the certificate whichever occur later.

SPECIAL CONDITION

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



(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.

Acronyms and Abbreviations

EWIS	Electrical Wiring Interconnection System
EZAP	Enhanced Zonal Analysis Procedure
ICA	Instructions for Continued Airworthiness
EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration
CS	Certification specification

Disclaimer – This document is not exhaustive and it will be updated gradually.



P-01: FADEC

SPECIAL CONDITION	P-01: FADEC
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.901, JAR 25.903
ISSUE:	2 dated 21/06/1991

Special Condition

BACKGROUND

The A330 / A340 engines incorporate a Full Authority Digital Engine Control (FADEC) ensuring electrical control and exchanging appropriate signals with the associated aircraft computers.

FADEC is considered an unusual feature. It must be shown that the safety level is not degraded compared with aircraft with hydro-mechanical engine control systems.

The adequacy of existing regulations, considering the principle of complementarity between compliance demonstrations at the level of aircraft certification (JAR 25) and at the level of engine certification (JAR E), was reviewed during the first phase of the joint A330 and A340 certification activities.

Based on these considerations, it appeared that the existing requirements, although adequate, for both engine and aircraft certification, might need special interpretations and acceptable specific means of compliance to be defined for engines equipped with electronic control.

In addition, a JAR 25/JAR E partitioning document providing the work-sharing between the engine and aircraft manufacturers has been established to cover A330 / A340 propulsion system certification (including FADEC).

SPECIAL CONDITION

The overall propulsion control system on the A330 / A340 aircraft models including the FADEC and associated electronic equipment, must be substantiated to have an availability of the functions essential for safe flight and landing, in the installed configuration, at least equivalent to those of a conventional propulsion control system of a similar type encompassing a hydro mechanical engine control system which has already been certified to the JAR regulations.

Acronyms and Abbreviations

FADEC	Full Authority Digital Engine Control
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



P-02: CENTRE OF GRAVITY CONTROL SYSTEM

SPECIAL CONDITION	P-02: Centre of gravity control system
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25-27, 25-143, 25-161, 25-171 to 25-181, 25-631, 25-672, 25-951 to 25-1001, 25-1301, 25-1309, 25-1322, 25-1329 and 25-1351, 25-1431, SC S-06, SC S-10
ISSUE:	2 dated 09/10/1992

Special Condition

BACKGROUND

The A330 / A340 aircraft models are equipped with a centre of gravity (CG) control system using fuel transfer between the tailtank and the centre tank.

Applicable airworthiness requirements do not specifically take into consideration new system such as CG control systems and a special condition is necessary to cover this unusual feature.

SPECIAL CONDITION

The following technical conditions are to be met:

1 – Bird Strike Damage

Current applicable requirement JAR 25.631 requires that aeroplane structure must be able to withstand a 4 lbs bird strike at the conditions developed in this paragraph.

Presence of fuel in the horizontal tailplane may potentially result in more serious sequences of events in case of bird strike causing damage to the tank structure. In particular, fuel or vapour may be released in areas where sources of ignition exist (APU, electrical bundles...).

Consequently:

- JAR 25-631 requirement must be met without creating a fuel leakage.
- The addition of fuel in the empennage must not impair the capability of the aircraft of safe flight and landing for any higher energy bird impact that would be survivable without fuel presence.

2 – Damage to Fuel Transfer Line in Pressurized Compartment

A means must be provided to isolate the tailplane tank from the main fuel system to minimize the risks of fuel spillage in lower part of fuselage, in case of accidental damage to fuel transfer lines. Typical events considered are:

- Crash landing
- Fatigue and vibrations

Disclaimer – This document is not exhaustive and it will be updated gradually.



- Damage to supporting structure
- High energy rotor burst
- Loose items of mass in cargo hold
- Installation and maintenance errors

Fuel transfer pipes located in the lower part of the fuselage must be at least fire resistant.

3 – Fuel Gravity Transfer

In addition to the provision of §25.1351 (d), it must be shown that fuel transfer from tailplane to centre tank is possible with normal electrical power inoperative in the most adverse position of tailplane encountered in all flight phases where transfer function is necessary for continued safe flight and landing.

4 – Unusable Fuel

Unusable fuel will be declared with the tailplane setting corresponding to aircraft trimmed for the considered flight phase.

5 – In addition to the criteria developed in §25.672 and 25.1309, the Following Apply

The aeroplane must be able to complete a safe flight and landing in case of absence of transfer. Unless it is shown that the aeroplane may meet this objective either naturally or by application of adequate procedures, the following arrangements could be considered satisfactory:

1. - Duplicate system with segregated transfer line
2. - Tailplane tank jettisoning system

In the analysis that will be provided to show compliance with JAR 25.1309, possible misloadings due to ground personnel will be taken into account.

6 – Target CG

Most rearward target CG must be established so that without any system failure in consideration of all CG control system settings and accuracies the certified CG aft limit will not be exceeded on a 2 sigma basis, taking account of:

- Initial CG computation error coming from either airline loading sheet system inaccuracy or weight and balance system performance (if installed).
- Passengers and crew movements.
- FCMC computation inaccuracy.

Alternately consideration of in accuracies related to loading operational procedures may be accounted for by appropriate procedures and/or limitations in the Aeroplane Flight Manual.

7 – Aft CG Warning

The aeroplane must be fitted with an independent aft CG position warning which provides the flight crew with visual and aural warning whenever CG position exceeds aft certified limits.

Disclaimer – This document is not exhaustive and it will be updated gradually.



It must be shown by analysis and simulation and/or flight tests that CG warning setting considering production tolerances and system accuracy is such that :

- a. Occurrence of nuisance warning in the normal flight envelop is minimized
- b. No unsafe situation may result from flight at any CG position up to rear warning limit.
- c. There is a sufficient margin between the CG warning setting and the CG value beyond which an unsafe condition may be encountered.

Note 1: The limit rate of inadvertent warnings has to be assessed by test pilots during flight or simulator tests, the limit rate for late warnings will have to be assessed considering recovery actions.

8 – Software Classification

FCM computer software level classification shall be determined by an assessment, in accordance with JAR 25.1309 procedures, of the consequences on the aircraft of system failure. The software level will be declared in the Systems Safety Assessment.

Verification and validation of the level so derived will have to be demonstrated appropriately.

9 – Lightning and External Radiation Protection

SC S-6 and SC S-10 will have to be applied.

10 – Automatic Flight Control System

In addition to criteria developed in §25.1329 the following conditions must be shown:

- a. Absence of adverse oscillations of the AFS due to fuel movements in tailplane tank.
- b. No failure condition which would result in exceedance of certified aft CG limit when AFS is in use may prevent continued safe flight and landing unless this condition is shown to be extremely improbable.
- c. If use of AFS beyond certified aft CG limit is predicted disconnection should not require exceptional pilot skill or strength.

11 – Aeroplane Flight Manual

The AFM must indicate:

- a) System limitations
- b) Instructions for proper use of the system including procedures to be applied in case of system failures
- c) Performance information (if affected).

Acronyms and Abbreviations

AFM	Aeroplane Flight Manual
AFS	Automatic Flight System
APU	Auxiliary Power Unit
CG	Centre of Gravity
FCMC	Fuel Control and Monitoring Computer

Disclaimer – This document is not exhaustive and it will be updated gradually.



SC	Special Condition
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



P-9: ROLLS-ROYCE TRENT 700 TURBINE OVERHEAT DETECTION

Equivalent Safety Finding	P-09: Rolls-Royce Trent 700 turbine overheat detection
APPLICABILITY:	A330-341/-342/-343/-243
REQUIREMENTS:	JAR 25.1203 (d)
ISSUE:	2 dated 11/12/1998

Equivalent Safety Finding

BACKGROUND

JAR 25.1203(d) states "there must be means to allow the crew to check, in flight, the functioning of each tire or overheat detector circuit". The turbine overheat detection portion of the Airbus A330/Trent 700 design, as presently configured, does not allow the crew to check its functioning during flight. Although the fire zone compartment detector portion of the fire/overheat system can be fully tested in flight, and complies with JAR 25.1203(d), the inability to test the turbine overheat detection circuit in flight does not satisfy the testing provisions of this rule.

CONCLUSION

The turbine overheat detection system is installed only on the Trent 700 engines (of the A330 aircraft models). Its purpose is to ensure that the intermediate pressure (IP) turbine does not overheat (overheat threshold fixed at 672°C). This system is comprised of 4 thermocouples: 2 at the front and at the rear of the IP disc. Each thermocouple is associated to one EEC (electronic engine control) channel. The EEC is in turn linked to the flight warning computer (FWC).

The condition of the turbine overheat detection system is continuously monitored in-flight by the FADEC, and any system fault is signalled to the crew in-flight.

Acronyms and Abbreviations

EEC	Electronic Engine Control
ESF	Equivalent Safety Finding
FADEC	Full Authority Digital Engine Control
FWC	Flight Warning Computer
JAR	Joint Aviation Regulation
IP	Intermediate pressure

Disclaimer – This document is not exhaustive and it will be updated gradually.



P-27: FLAMMABILITY REDUCTION SYSTEM

SPECIAL CONDITION	P-27: Flammability Reduction System (consisting of Conditioned Serviced Air System (CSAS) and Inert Gas Generation System (IGGS))
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.1309, FAR 25.981 (c)
ISSUE:	3 dated 18/06/2010

Special Condition**BACKGROUND**

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

The IGGS is intended to reduce the fleet average flammability exposure of the centre 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.

This EASA special condition has been harmonized with the corresponding FAA special condition no. 25-285-SC for the Nitrogen Generating System installed on Boeing 747.

SPECIAL CONDITION**1 – General**

The following special conditions are part of the type design certification basis for Airbus A330/A340 with a centre tank equipped with a FRS.

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

1 - 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

Disclaimer – This document is not exhaustive and it will be updated gradually.



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.

3 - 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.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (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.

4 - Maintenance

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.

5 - 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:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
CSAS	Conditioned Serviced Air System
IGGS	Inert Gas Generation System
FAR	Federal Aviation Regulations
FRS	Flammability Reduction System
NEA	nitrogen enriched air
EASA	European Union Aviation Safety Agency
FAA	Federal Aviation Administration
SC	Special Condition
MMEL	Master Minimum Equipment List
FEET	Flammability Exposure Evaluation Time
PCA	Primary Certification Authority

Disclaimer – This document is not exhaustive and it will be updated gradually.



P-32: FUEL TANK SAFETY

SPECIAL CONDITION	P-32: Fuel Tank Safety
APPLICABILITY:	A330-200/-300 / A340-200/-300
REQUIREMENTS:	CS 25.981
ISSUE:	3 dated 25/11/2013

Special Condition**BACKGROUND**

Following various in-service events, FAA and JAA have required Type Certificate holders to conduct design reviews in order to verify their products did not feature any unsafe condition possibly associated with fuel tank safety. FAA issued SFAR 88, which mandated FAR 25.981 as introduced by Amdt 102, and JAA required the members states to conduct design review per INT/POL/25/12.

It should be noted that while it is commonly stated that the products which were reviewed are 'SFAR 88 compliant' or 'INT/POL compliant', actually it was not practical for most designs to demonstrate full compliance to FAR 25.981 as introduced by Amdt 102. Instead, FAA and JAA agreed to use an additional filter - a harmonized unsafe condition criteria - to determine which corrective actions would be required to close the fuel tank safety design reviews. The unsafe condition criteria made a distinction between low and high flammability exposure tanks; while for high flammability exposure tanks full FAR 25.981 compliance was required, for low flammability exposure tanks the criteria relied on addressing 'no single failure', 'no known combination of failures', and 'no adverse in-service experience'.

Issuance of ADs on product fully compliant with their original certification demonstrates the original fuel tank safety requirements are not adequate. However, neither SFAR 88 nor INT/POL/25/12 have been formally introduced in the product certification basis., and still features the requirements established for the original certification of the product (in the case of the Airbus Long Range this is JAR 25 change 13). This resulted for subsequent design changes potentially affecting fuel tank safety in having a certification basis less stringent than the design review previously conducted to address SFAR 88.

Furthermore, the initial certification basis (typically, FAR 25.981 pre Amdt 102, or JAR / CS 25.981 pre Amdt 1) have been shown to be inappropriate as fully compliant designs had to be modified with corrective actions (including maintenance actions) to address potential unsafe conditions.

Relying exclusively on the unsafe condition criteria is not satisfactory. This criteria allowed to determine the existence of unsafe conditions, prompting the issuance of Airworthiness Directives, but were not drafted to address the safety objectives normally targeted for Type Certification.

SPECIAL CONDITION

Disclaimer – This document is not exhaustive and it will be updated gradually.



CS 25.981 (a) at amendment 1 and the related AMC should be included in the certification basis of A330-200/300 and A340-200/300 aircraft, instead of the current JAR 25.981 at change 13, irrespectively of any Change Product Rule consideration. The applicant shall demonstrate that any design change potentially affecting fuel tank safety is compliant with CS 25.981 as modified at Amendment 1, and its associated guidance material as found in AMC 25.981 (a).

Note: CS 25.981 post Amendment 1 and FAR 25.981 post Amendment 102 are Significant Standard differences (SSD). While both requirements have their own backgrounds and merits, it certainly appears that some specific text of FAR 25.981 is difficult to address, for instance the considerations related to latent failure not shown to be extremely remote. EASA clearly does not intent to pre-empt the application of FAR 25.981 at Amendment 102 with this Special Condition.

Acronyms and Abbreviations

AD	Airworthiness Directives
SSD	Significant Standard Differences
CSAS	Conditioned Service Air System
AMC	Acceptable Means of Compliance
FAA	Federal Aviation Administration
JAA	Joint Aviation Authorities
FAR	Federal Aviation Regulations
INT/POL	Interim Policy
SFAR	Special Federal Aviation Regulations

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-3: LANDING GEAR WARNING

SPECIAL CONDITION	S-3: Landing Gear Warning
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.729, NPA 25D-162
ISSUE:	4 dated 02/10/1992

Special Condition

BACKGROUND

The current requirements are considered inadequate for modern aeroplanes. For this reason, NPA 25D-162 was issued. The FAA has also issued NPRM 89-20 on the same subject. The latest version of the NPA dated November 1991 covers both JAA and FAA objectives.

SPECIAL CONDITION

Delete the existing sub-paragraph 25.729(e)(2) to (4) inclusive and substitute the following:

- 25.729(e)(2): The flight crew must be given an aural warning that functions continuously, or is periodically repeated, if a landing is attempted when the landing gear is not locked down.
- 25.729(e)(3): The warning must be given in sufficient time to allow the landing gear to be locked down or a go-around to be made.
- 25.729(e)(4): There must not be a manual shut-off means readily available to the flight crew for the warning required by paragraph (e)(2) of this section such that it could be operated instinctively, inadvertently or by habitual reflexive action.
- 25.729(e)(5): The system used to generate the aural warning must be designed to minimise false or inappropriate alerts.
- 25.729(e)(6): Failures of systems used to inhibit the landing gear aural warning, that would prevent the warning system from operating, must be improbable (See ACJ 25-729(e)).

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
NPA	Notice of Proposal Amendment
FAA	Federal Aviation Administration
NPRM	New Proposal Rule Making

Disclaimer – This document is not exhaustive and it will be updated gradually.

JAA	Joint Aviation Authorities
ACJ	Advisory Circular Joint

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-6: LIGHTNING PROTECTION INDIRECT EFFECTS

SPECIAL CONDITION	S-6: Lightning protection indirect effects
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.581, 25.X899, 25.954, 25.1309
ADVISORY MATERIAL:	3 dated 15/03/1991

Special Condition

BACKGROUND

The A330/A340 are equipped with computers performing essential or critical functions, which must be protected against the effects of a lightning strike.

The JAA require that recent knowledge on severe lightning strike threat levels and probability, be taken into consideration in establishing the acceptability of the indirect effects lightning protection provisions employed.

SPECIAL CONDITION - CONCLUSION

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 x 106 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

Disclaimer – This document is not exhaustive and it will be updated gradually.



23 Strokes - Peak Rate of Rise, 140 KA/micro-second
Action Integral, 2×10^6 Amp² -sec.
Peak Amplitude, 50KA
Peak Rate of Rise, 70KA/micro-second
Action Integral, each 0.062×10^6 Amp² -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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
JAA	Joint Aviation Authorities
AA	Aviation Authorities
MOC	Means of Compliance

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-10: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS

SPECIAL CONDITION	S-10: Effect of external radiation upon aircraft systems
APPLICABILITY:	A330 / A340-200/-300
REQUIREMENTS:	JAR 25.1309(a) and (b), JAR 25.1431
ISSUE:	3 dated 24/04/1992

Special Condition

BACKGROUND

Military experience has shown that radiated transmissions from civil or military stations may cause interference with critical flight systems (e.g. flight or engine controls), such as to cause system loss or malfunction which can hazard the aircraft.

Such ground transmission may be at varying power and frequency levels and may be produced by ground installations whose actual performance is secret.

The A330/340 aircraft models are equipped with computers that perform essential and critical functions that must be adequately protected against these external radiations.

SPECIAL CONDITION

- (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 aeroplane operation is not affected during and after exposure to external radiations.
- (b) 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 external radiations.

The external threat frequency bands and corresponding average and peak levels that shall be used for showing compliance with the above special condition are defined in the revised appendix to this CRI.

APPENDIX TO CRI S-10

HIRF Environment (External radiations)

The HIRF Environment is a critical environment condition and is defined by the following Table in terms of field strength in volts per metre versus the given frequency range. This environment is

Disclaimer – This document is not exhaustive and it will be updated gradually.



based on the available data representing all known transmitters in the U.S. and the following contributing countries: United Kingdom, France, West Germany, The Netherlands and Sweden.

Frequency	FIELD STRENGTH (Volts/meter)	
	PEAK	AVERAGE
10 kHz – 500 kHz	60	60
500 kHz – 2000 kHz	80	80
2 MHz – 30 MHz	200	200
30 MHz – 100 MHz	33	33
100 MHz – 200 MHz	150	33
200 MHz – 400 MHz	70	70
400 MHz – 1000 MHz	4020	935
1 GHz – 2 GHz	7850	1750
2 GHz – 4 GHz	6000	1150
4 GHz – 6 GHz	6800	310
6 GHz – 8 GHz	3600	666
8 GHz – 12 GHz	5100	1270
12 GHz – 18 GHz	3500	551
18GHz – 40GHz	2400	750

Note 1: At 10 kHz - impedance field of

Note 2: The detailed compliance for each be agreed with JAA.

100 KHz, a high 320 V/M peak exists.

means of establishing system will need to

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
JAA	Joint Aviation Authorities
HIRF	High Intensity Radiated Fields

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-10.1: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS

SPECIAL CONDITION	S-10.1: Effect of external radiation upon aircraft systems
APPLICABILITY:	A330 / A340-200/-300
REQUIREMENTS:	JAR 25.1309(a) and (b), JAR 25.1431
ISSUE:	4 dated 24/02/1999

Special Condition

BACKGROUND

When the A330/A340 was first certified, the normal HIRF environment was not defined. JAA INT POL 25/2, dated February 10, 1992, provides a more up to date definition for the certification HIRF environment and in addition, a normal HIRF environment is also provided.

This Special Condition S-10.1 will apply for new applications (new or modified aeroplane system and associated components) and supersede the SC-10..

SPECIAL CONDITION

The aeroplane systems and associated components, considered separately and in relation to other systems, must be designed and installed so that:

- (1) Each system that performs a critical or essential function is not adversely affected when the aeroplane is exposed to the Normal HIRF Environment.
- (2) All critical functions must not be adversely affected when the aeroplane is exposed to the Certification HIRF Environment.
- (3) After the aeroplane is exposed to the Certification HIRF environment, each affected system that performs a critical function recovers normal operation without requiring any crew action, unless this conflicts with other operational or functional requirements of that system.

The external threat frequency bands and corresponding average and peak levels that shall be used for showing compliance with the above special condition are defined in the following appendix.

Disclaimer – This document is not exhaustive and it will be updated gradually.



APPENDIX TO CRI S-10.1

Certification HIRF Environment

Frequency	FIELD STRENGTH (Volts/meter)	
	PEAK	AVERAGE
10 kHz – 100 kHz	40	40
100 kHz – 500 kHz	40	40
500 kHz – 2 MHz	40	40
2 MHz – 30 MHz	100	100
30 MHz – 70 MHz	20	20
70 MHz – 100 MHz	20	20
100 MHz – 200 MHz	50	30
200 MHz – 400 MHz	70	70
400 MHz – 700 MHz	730	30
700 MHz – 1 GHz	1300	70
1 GHz – 2 GHz	2500	160
2 GHz – 4 GHz	3500	240
4 GHz – 6 GHz	3200	280
6 GHz – 8 GHz	800	330
8 GHz – 12 GHz	3500	330
12 GHz – 18 GHz	1700	180

Note: At 10 kHz - 100 kHz a High Impedance Field of 320 V/m peak exists, AMJ 25.1317 should be referred to for the applicability of this environment.

Normal HIRF Environment

Frequency	FIELD STRENGTH (Volts/meter)	
	PEAK	AVERAGE
10 kHz – 100 kHz	20	20
100 kHz – 500 kHz	20	20
500 kHz – 2 MHz	30	30
2 MHz – 30 MHz	50	50

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms	and	30 MHz – 70 MHz	10	10	Abbreviations
		70 MHz – 100 MHz	10	10	
		100 MHz – 200 MHz	30	30	
		200 MHz – 400 MHz	25	25	
		400 MHz – 700 MHz	730	30	
		700 MHz – 1 GHz	40	10	
		1 GHz – 2 GHz	1700	160	
		2 GHz – 4 GHz	3000	170	
		4 GHz – 6 GHz	2300	280	
		6 GHz – 8 GHz	530	230	
JAR	Joint Aviation Regulation				
JAA	Joint Aviation Authorities				
HIRF	High Intensity Radiated Fields				
AMJ	Advisory Material Joint				

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-10.2: EFFECT OF EXTERNAL RADIATION UPON AIRCRAFT SYSTEMS

SPECIAL CONDITION	S-10.2: Effect of external radiation upon aircraft systems
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.1309(a) and (b), JAR 25.1431
ISSUE	5 dated 14/02/2000

Special Condition**BACKGROUND**

When the A340 was first certified, the normal HIRF environment was not defined. CRI S10 at Issue 3 dated April 24, 1992 has covered the concerns and this is recorded as SC C10.

JAA INT POL 25/2 Issue 1, dated February 10, 1992, has provided an up-to-date definition for the certification HIRF environment and a normal HIRF environment. Based on this JAA interim policy, on February 24, 1999, CRI S10 has been reviewed and this has resulted in a new Special Condition SC S10.1. This revised SC10.1 superseded the initial SC 10 for the new applications (new or modified aeroplane system and associated components).

JAA are currently developing in co-operation with the FAA, a regulatory project for HIRF. This project is co-ordinated by the FAA/JAA Electromagnetic Effects Harmonization Working Group and relies heavily on work conducted by EUROCAE WG 33, in co-operation with SAE-AE4R.

The objective of the project is the issuance of an NPA (Notice of Proposed Amendment) in parallel with an FAA NPRM leading to a final rule and associated advisory material (Advisory Material Joint, and Users Guide).

In November 1998, the Electromagnetic Effects Harmonisation Working Group adopted a set of HIRF environment levels together with a proposed NPA/NPRM, which were agreed upon by the JAA, FAA and industry working group participants. As a result, the HIRF environments in the revised Interim Policy 25/2 at issue 2 reflect the environment levels recommended by this working group.

This Special Condition S-10.2 will apply for new applications (new or modified aeroplane system and associated components).

SPECIAL CONDITION

The aeroplane electrical and electronic systems, equipment, and installations considered separately and in relation to other systems must be designed and installed so that:

- A. Each function, the failure of which would prevent the continued safe flight and landing of the aeroplane:

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 1) Is not adversely affected when the aeroplane is exposed to the Certification HIRF environment defined in Appendix.
 - 2) Following aeroplane exposure to the Certification HIRF environment, each affected system that performs such a function automatically recovers normal operation unless this conflicts with other operational or functional requirements of that system.
- B. Each system that performs a function, the failure of which would prevent the continued safe flight and landing of the aeroplane, is not adversely affected when the aeroplane is exposed to the Normal HIRF environment defined in Appendix.
- C. Each system that performs a function, the failure of which would cause large reductions in the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions, is not adversely affected when the equipment providing these functions is exposed to the equipment HIRF test levels defined in Appendix.
- D. Each system that performs a function, the failure of which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions, is not adversely affected when the equipment providing these functions is exposed to the equipment HIRF test levels in Appendix.

APPENDIX TO CRI S-10.2

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 – 00 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

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

Disclaimer – This document is not exhaustive and it will be updated gradually.



Acronyms and Abbreviations

JAR	Joint Aviation Regulation
JAA	Joint Aviation Authorities
SC	Special Condition
HIRF	High Intensity Radiated Fields
FAA	Federal Aviation Administration
NPA	Notice of Proposed Amendment
NPRM	New Proposal Rule Making

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-13: AUTO-THRUST SYSTEM

SPECIAL CONDITION	S-13: Auto-thrust system
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25. 1141, JAR 25.1143, JAR 25.1329
ISSUE:	3 dated 02/10/1992

Special Condition

BACKGROUND

The A330 / A340 aircraft models are equipped with an Auto-Thrust System (ATS) for which additional requirements need to be considered.

SPECIAL CONDITION

1. Disconnection of the ATS shall be by means of a quick release control readily useable by both pilots.
2. It must be possible to accomplish manual thrust control by means of a single pilot action.
3. Automatic disengagement of ATS shall be indicated by an appropriate aural warning.
4. Disconnection of the ATS and manual thrust control recovery shall not result in:
 - Significant disturbances in engine thrust, flight path or speed control;
 - Exceedance of engine limitations.
5. The ATS shall be compatible with the manual control including the manual flare.
6. The flight manual shall contain procedures for the ATS usage to ensure that failure conditions meet the requirements of JAR 25.1309 and its ACJ n°1 in the most adverse conditions (low visibility, wind, gust, wind shear, ...).
7. It must be shown by test and analysis that adequate cues are provided to the crew to monitor thrust changes and thrust values during normal auto-thrust operation.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ATS	Auto-Thrust System
ACJ	Advisory Circular Joint

Disclaimer – This document is not exhaustive and it will be updated gradually.



Disclaimer – This document is not exhaustive and it will be updated gradually.



S-16: CONTROL SIGNAL INTEGRITY

SPECIAL CONDITION	S-16: Control Signal Integrity
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.671, 699, 1309, 1431
ISSUE:	2 dated 31/10/1991

Special Condition

BACKGROUND

On conventional aeroplanes transmission of control signals (flight controls, engine controls) was made through hydro-mechanical devices.

Determination of origin of perturbations to signal transmission was relatively straight forward since failure cases could usually be classified in a limited number of categories: maintenance error, jamming, disconnection or failure of mechanical elements or structural failure of hydraulic components. Therefore it was almost always possible to extract the most severe failure cases that would serve as an envelope to all other cases having the same consequence.

The JAR requirements are not adapted to fly by wire systems.

It is therefore necessary to amend them to introduce a more general requirement to cover integrity of signal transmission.

General experience on electrical digital transmission lines shows that perturbation of signal from internal and external sources is not unlikely.

In FBW systems, the occurrence of spurious signals coupling into the command signal loop may lead to unacceptable system response, with consequent flight hazards. Malfunctions could cause system instabilities, loss of function, or freeze-up of the control actuator. It is imperative that the command signal remain continuous. Hence, no command signal discontinuities shall be observed when sampling successive finite time intervals. Therefore, special design measures will be required to maintain the integrity of the FBW interfaces to a level of safety equivalent to that which is achieved with traditional hydro-mechanical designs.

SPECIAL CONDITION

Control and command signal transmission lines of Electrical control System must be designed and installed to provide adequate signal integrity and protection against unintentional alterations from internal or external sources.

Acronyms and Abbreviations

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR	Joint Aviation Regulation
FBW	Fly By Wire

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-18: ELECTRICAL FLIGHT CONTROLS UNUSUAL FEATURES

SPECIAL CONDITION	S-18: Electrical flight controls unusual features
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.671
ISSUE:	2 dated 06/05/1991

Special Condition

BACKGROUND

A330/A340 aircraft models are equipped with an Electrical Flight Control System (EFCS). A special condition had been issued to address unusual features not addressed by JAR.

SPECIAL CONDITION

Add to JAR 25.671 new paragraph (f)

(f) In case of abnormal attitude or excursion of any other flight parameter outside protected flight boundaries that might be reached due to external events :

- (i) The Electric Flight Control System (EFCS) shall continue to operate.
- (ii) The design of the EFCS control laws, including the automatic protection function, must, not hinder aircraft recovery.

Acronyms and Abbreviations

EFCS	Electrical Flight Control System
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-20: EMERGENCY ELECTRICAL POWER

SPECIAL CONDITION	S-20: Emergency Electrical Power
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.1309, JAR 25.1351, JAR 25.1353, NPA 25D,F-179 rev 4
ISSUE:	4 dated 02/10/1992

Special Condition**BACKGROUND**

The A330 / A340 aircraft models are using various computers performing critical and essential functions. The electrical power on such aircraft is more important than on conventional aircraft which can be operated without electrical power.

NPA 25D, F-179 (rev.4) has been issued to update the requirements concerning emergency electrical systems.

Taking into account the importance of the electrical system on the A330, this NPA will be applied as special condition.

SPECIAL CONDITION

Replace entirely the existing text of JAR 25.1351 (d) with the following:

(d) OPERATION WITHOUT NORMAL ELECTRICAL POWER

Unless it can be shown that the loss of the normal electrical power generating system(s) is extremely improbable, alternate, high integrity, electrical power system(s) independent of the normal electrical power generating system(s), must be provided to power those services necessary to complete a flight and make a safe landing.

(1) The services to be powered must include:

- (i) Those required for immediate safety and which must continue to operate, following the loss of the normal electrical power generating system(s) without the need for flight crew action.
- (ii) Those required for continued controlled flight.
- (iii) Those required for descent, approach and landing

And

- (2) Failures, including junction box, control panel or wire bundle fires, which would result in the loss of the normal and alternate systems must be shown to be extremely improbable.**

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR	Joint Aviation Regulation
NPA	Notice of Proposed Amendment

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-21: BRAKES WEAR LIMITS

SPECIAL CONDITION	S-21: Brakes Wear Limits
APPLICABILITY:	A330/A340
REQUIREMENTS:	JAR 25.735
ISSUE:	5 dated 02/10/1992

Special Condition

BACKGROUND

This Special Condition introduces new requirements on brake wheel and tyre assembly demonstrating their capability to absorb the maximum kinetic energy corresponding to RTO (Rejected Take-Off) up to the wear limit authorized for the A330/A340.

SPECIAL CONDITION

(a) Each brake must be approved and tested according to the appended annex. (See also ACJ 25.735(a))

(b) Each wheel and brake assembly must be provided with a means to indicate the limit of permitted wear. The means must be reliable and positioned for easy inspection.

ANNEX TO SPECIAL CONDITION S-21 - BRAKES QUALIFICATION REQUIREMENTS

The brakes qualification requirements consist of the CAA specification 17 amended as follows:
Replace par 4.2 of CAA spec 17 by the following:

4.2 Wheel and Brake assembly test

A sample of a wheel and brake assembly design, with a suitable tyre of proper fit installed, must meet the following tests to qualify the design for its kinetic energy ratings. The wheel of a wheel and brake assembly must be separately tested under paragraph 4.1. The wheel and brake assembly must be tested with the operating medium specified by the manufacturer.

(A) Dynamic Tests

Test the wheel and brake assembly on a suitable inertial brake testing machine in accordance with the following:

(1) Speed and weight values. Select either method I or II below to calculate the kinetic energy level which a single wheel and wheel brake assembly will be required to absorb.

(i) Calculate the kinetic energy level to be used in the brake testing machine by using the equation:

Where

KE = kinetic energy per wheel and brake assembly (ft. lb.);

W = design landing weight (lb.);

V = aeroplane speed in knots.

V must not be less than VSO the power off stalling speed of the aircraft at sea level, at the design landing weight and in the landing configuration. For the accelerate stop test applicable only to wheel-brake assemblies for aeroplanes certificated under JAR 25, the manufacturer must determine the most critical combination of take-off weight and speed.

N = number of main wheels with brakes.

Disclaimer – This document is not



An agency of the European Union

TE.CERT.00053-001 © EASA, 202
Proprietary document. Copies are

$$KE = \frac{0.0443 * W * V^2}{N}$$

(ii) Method II. The speed and weight values may be determined by other equations based on a rational analysis of the sequence of events expected to occur during the accelerate-stop manoeuvre or an operational landing at maximum landing weight. The analysis must include rational or conservative values for braking coefficients of friction between the tyre and runway, aerodynamic drag, propeller drag, power plant forward thrust and, if critical, loss of drag credit for the most adverse single-engine or propeller due to malfunction.

(2) Test Requirements

The wheel and brake assembly must bring the inertial testing machine to a stop at the average deceleration, and for the number of repetitions specified in table III without failure, impairment of operation, or replacement of parts except as permitted in paragraph 4.2(A)(3).

Table III

• :

Category of Aircraft	Test
JAR 25	<p>KE_{DL} design landing stops</p> <ul style="list-style-type: none"> 100 design landing stop at a deceleration selected by manufacturer but not less than 10 ft/s². KE_{RT} 1 accelerate-stop at a deceleration selected by the manufacturer to be representative of the Flight Manual scheduled accelerates stop data but not less than 6 ft/s².

(3) General Conditions

During landing stop tests (KE_{DL}), one change of brake lining is permissible. The remainder of the brake assembly parts must withstand the 100 KE_{DL} stops without failure or impairment of operation.

(4) Accelerate Stop Test (KE_{RT})

(i) The brake, wheel and tyre assembly must be capable of absorbing the accelerate stop test energy KE_{RT} throughout the entire defined usable wear range of the heat sink elements (as determined by the means provided to comply with E.2.(3a). Compliance must be shown by an accelerate stop test (KE_{RT}) carried out on a brake in which the usable wear range of the heat sink has been fully consumed (100%). For this test, no

Disclaimer – This document is not exhaustive and it will be updated gradually.

allowance may be made for the decelerating effects of available powerplant thrust reversers.

At the commencement of the test the temperature of the brake should be representative of the following combined conditions:

1. Maximum permissible temperature for dispatch from the ramp.

2. Energy input to the brake as a result of braking during taxiing, up to the point of brakes release for take-off.

Note: For the purpose of this test an arbitrary value of 10 percent of KE_{RT} would be acceptable to the JAA.

However, the applicant may choose to submit a value based on a more rational analysis.

(ii) The applicant shall define the tyre nominal loaded radius and the relative load rating and inflation pressure used for the tyre, wheel and brake during the test.

(iii) The applicant shall determine the amount of energy absorbed by the tyre, wheel and brake individually during the test.

(iv) After the test the brake must continue to be functional for taxiing and allow the wheel to rotate freely with the brake selected off. There should be no failure which would result in fluid leakage or fire.

(v) If so desired it will be permissible in performing the test for the brake pressure to be released at a speed less than 10 knots in order to simulate a taxi roll sufficient to clear the runway, provided that the capability to have stopped the aircraft within the scheduled distance can be extrapolated from the test record and also that at the end of such a taxi roll the brake is still capable of bringing the wheel to a stop from whatever taxiing speed is used on the test machine.

(B) Brake Structural Torque Test.

Apply load S and a torque load specified in paragraph 4.2 (B) (1) or (2) as applicable, for at least 3 seconds. Rotation of the wheel must be resisted by a reaction force transmitted through the brake or brakes by an application of at least maximum brake line pressure or maximum brake cable tension in the case of a mechanically operated brake. If such pressure or tension is insufficient to prevent rotation, the friction surface may be clamped, bolted, or otherwise restrained while applying the pressure or tension.

(1) For landing gears with only one wheel per landing gear strut, the torque load is 1.2 SR, where R is the normal loaded radius of the tyre at rated inflation pressure under load S.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- (2) For landing gears with multiple wheels per landing gear strut, the torque load is $1.44 SR$ where R is the normal loaded radius of the tyre at rated inflation pressure under load S .

(C) Overpressure-Hydraulic Brakes

The brake with actuator piston extended to simulate a maximum worn condition must withstand hydraulic pressure for at least 3 seconds, equal to 2 times the maximum brake line pressure available to the brakes.

(D) Endurance Tests - Hydraulic Brakes

The hydraulic brake assembly must be subjected to an endurance test during which the total leakage may not exceed 5cc and no malfunction may occur during or upon completion of the test. Minimum piston travel during the test may not be less than the maximum allowable piston travel in operation. The tests must be conducted by subjecting the hydraulic brake assembly to:

- (1) 100.000 cycles, of application and release of the average hydraulic pressure needed in the KE_{DL} tests specified in paragraph 4.2(A)(2) except that manufacturers using the method specified in paragraph 4.2(A)(2) must subject the wheel and brake assembly to the average of the maximum pressures needed in those tests. The piston must be adjusted so that 25.000 cycles are performed at each of the four positions where the piston would be at rest when adjusted for 25, 50, 75, and 100 percent of the wear limit; and
- (2) 5. 000 cycles at the maximum system pressure available to the brakes.

Acronyms and Abbreviations

CAA	Civil Aviation Authority
JAR	Joint Aviation Regulation
ACJ	Advisory Circular Joint
RTO	Rejected Take-off

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-23: MISCELLANEOUS ELECTRICAL REQUIREMENTS

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
ISSUE:	6 dated 07/02/1993

Special Condition

BACKGROUND

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:

Disclaimer – This document is not exhaustive and it will be updated gradually.



(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 60° 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.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
NPA	Notice of Proposed Amendment
ACJN	
AMJ	Advisory Material Joint
ACJ	Advisory Circular Joint

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-24: DOORS

SPECIAL CONDITION	S-24: Doors
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.783
ISSUE:	2 dated 03/06/1991

Special Condition

BACKGROUND

Paragraph 783 of the JAR code is identical to the corresponding FAR paragraph.

Following the needs to provide clarification and to cope with some printing errors which have been crept into the published code, this Special condition has been created.

SPECIAL CONDITION

- 1) Modify JAR 25.783(g) to read:
Cargo and service doors not suitable for use as an exit in an emergency need only meet subparagraph (e) and (f) of this paragraph and be safeguarded against opening in flight as a result of mechanical failure or failure of a single structural element.
- 2) Subparagraphs (b), (c), (d) of JAR 25.783 are only applicable to doors suitable as an exit in an emergency.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
FAR	Federal Aviation Regulations

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-38: TOWBARLESS TOWING

SPECIAL CONDITION	S-38: Towbarless towing
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25X745(d)
ISSUE:	5 dated 22/10/1999

Special Condition

BACKGROUND

The design of the nose landing gear incorporates means to preclude damage to the steering system in the event that loads induced in the steering system by conventional towbar towing activities approach the capability of the design to withstand the loads. Airbus is intending to give approval to other methods of towing the aeroplane, typically referred to as "Towbarless Towing" which utilise means which do not connect to the aeroplane nose landing gear via the protection device installed to ensure compliance with the requirement.

PNPA25D-275 is an acceptable alternative to the requirement JAR 25X745(d) and Airbus is requested to demonstrate compliance with PNPA25D-275 issue 1 rev 1 which is the basis of Special Condition S-38.

SPECIAL CONDITION

Delete the entire text of the current paragraph JAR 25X745(d) and replace with the following:

JAR 25X745 (d) Nose-Wheel Steering

(d) (see ACJ 25X745(d)) The nose wheel steering system, towing attachment(s), and associated elements must be designed or protected by appropriate means such that during ground manoeuvring operations effected by means independent of the aeroplane:

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

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
ACJ	Advisory Circular Joint
AMJ	Advisory Material Joint
PNPA	Preliminary Notice Per Amendment

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-45: OIL TEMPERATURE INDICATION

Equivalent Safety Finding	S-45: Oil temperature indication
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR 25.1549(a)
ISSUE:	1 dated 18/06/1996

Equivalent Safety Finding

BACKGROUND

The A330 / A340 engine oil temperature is displayed on the ECAM (Electronic Centralised Aircraft Monitoring) CRT. The indication is provided in digital form:

- it is normally green
- it pulses green if the temperature exceeds 160°C,
- it turns amber if the temperature exceeds 160°C for more than 15 minutes or the maximum oil temperature indicated by the engine manufacturer without delay

JAR 25.1549(a) requires that each maximum safe operating limit must be marked with a red radial or a red line.

Although written for conventional indicators, this has been generally applied to digital CRT indications by using a colour coding consistent with the conventional indicators.

The Airbus Oil temperature indication on ECAM therefore does not literally comply with JAR 25.1549(a), which would require the indication to turn red instead of amber when the maximum limit is exceeded.

CONCLUSION

The Equivalent Safety Finding is considered that the current design provide to the crew an unmistakable indication to the crew in case of maximum oil temperature exceedance, consistent with the degree of urgency of the required action (immediate awareness and subsequent action).

Acronyms and Abbreviations

CRT	Cathode Ray Tube
ECAM	Electronic Centralised Aircraft Monitoring
ESF	Equivalent Safety Finding
JAR	Joint Aviation Regulation

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-48: MINIMUM APPROACH BREAK-OFF HEIGHT

SPECIAL CONDITION Equivalent Safety Finding	S-48: Minimum Approach Break-off Height
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR-AWO 313, 314, 316, 381- NPA AWO 8
ISSUE:	2 dated 25/08/1997

Special Condition**BACKGROUND**

The JAR AWO Change 1 requires that a Minimum Approach Break-off Height (MABH) be established. The MABH is the altitude at which the probability of contacting the runway during go-around is one in ten thousand. The operational Decision Height can be no lower than the MABH. JAR AWO 313 implies that contacting the runway during a go-around, in low visibility conditions, is unsafe.

The FAA has no requirement for a MABH but relies on a demonstration of a safe go-around from any altitude down to touch down.

Agreement was reached in the JAA/FAA harmonisation group that, since aeroplane systems are required by JAR AWO 316 to demonstrate that a safe go-around can be accomplished from any point to touch down, the MABH concept can be removed from JAR AWO without detriment to safety of operation. In its place, information would be included in the approved flight manual giving go-around height loss information on which operational decision height, if required, can be based.

In the frame of the JAR/FAR harmonization, the JAR AWO working group has developed NPA AWO 8 which replace MABH requirements.

SPECIAL CONDITION

The original JAR AWO requirements listed below have to be modified as follow:

JAR AWO subpart 3, page 3-3: Delete the definition of MABH

Delete JAR-AWO 313

JAR-AWO 314: Delete the first sentence such that the paragraph reads "when the decision height is during ... place".

JAR-AWO 316: Go-around
Add "(see ACJ AWO 316)" to the title.

Disclaimer – This document is not exhaustive and it will be updated gradually.



JAR-AWO 316(a): revise to read:

"The aircraft must be capable of safely executing a go-around from any point on the approach to touchdown in all configurations to be certificated. The manoeuvre may not require exceptional piloting skill...Category II or III"

JAR-AWO 381: Aeroplane flight manual (general)

Add a new paragraph (f):

"(f) The height losses for go-around initiation heights below 100 ft. determined in accordance with ACJ AWO 316 paragraph 2a."

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AWO	All Weather Operations
MABH	Minimum Approach Break-off Height
FAA	Federal Aviation Administration
JAA	Joint Aviation Authorities

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-148: LONGITUDINAL TOUCHDOWN PERFORMANCE LIMIT AND MINIMUM APPROACH BREAK-OFF HEIGHT

SPECIAL CONDITION Equivalent Safety Finding	S-148: Longitudinal touchdown performance limit and Minimum Approach Break-off Height
APPLICABILITY:	A330 / A340
REQUIREMENTS:	JAR AWO 131, 313, 314, 316, 381- NPA AWO 8
ISSUE:	2 dated 04/08/1998

Special Condition**BACKGROUND**

In the frame of A330 / A340, Airbus Industrie has elected to comply with JAR NPA AWO-8. This NPA addresses the following JAR / FAA AWO harmonization items:

- Longitudinal touchdown performance limit (proposal n°1)
- Revised strategy for demonstrating a safe go-around (proposal n°2)

The longitudinal touchdown performance limit for automatic landing differs between current FAA and JAA requirements, with the FAA requirement being more severe. The end of the touchdown box for the current JAA requirement is 3,000 feet from the runway threshold.

The JAR AWO Change 1 requires that a Minimum Approach Break-off Height (MABH) be established. The MABH is the altitude at which the probability of contacting the runway during go-around is one in ten thousand. The operational Decision Height can be no lower than the MABH. JAR AWO 313 implies that contacting the runway during a go-around, in low visibility conditions, is unsafe.

The FAA has no requirement for a MABH but relies on a demonstration of a safe go-around from any altitude down to touchdown.

Agreement has been reached in the JAA / FAA AWO Harmonisation Working Group that since aeroplane systems are required by JAR AWO 316 to demonstrate that a safe go-around can be accomplished from any point to touchdown, the MABH concept can be removed from JAR AWO without detriment to safety of operation. In its place, information would be included in the approved flight manual giving go-around height loss information on which operational decision height, if required can be based.

In the frame of the JAR FAR harmonization, the JAA AWO working group has developed JAR NPA AWO-8 which replace MABH requirement.

SPECIAL CONDITION

The original JAR AWO requirements listed below have to be modified as follow:

Disclaimer – This document is not exhaustive and it will be updated gradually.



Revise JAR-AWO 131(c)(2) by deleting the limit 900 m (3,000 ft.) and substituting 823 m (2,700 ft.).

JAR AWO subpart 3, page 3-3: Delete the definition of MABH.

Delete JAR-AWO 313

JAR-AWO 314: Delete the first sentence such that the paragraph reads "When the decision height is during ... place."

JAR-AWO 316: Go-around

Add "(see ACJ AWO 316)" to the title.

JAR-AWO 316(a): revise to read:

"The aircraft must be capable of safely executing a go-around from any point on the approach to touchdown in all configurations to be certificated. The manoeuvre may not require exceptional piloting skill... Category II or III"

JAR-AWO 381: Aeroplane Flight Manual (General)

Add a new paragraph (t):

"(t) The height losses for go-around initiation heights below 100 ft. determined in accordance with ACJ AWO 316 paragraph 2a.

Acronyms and Abbreviations

JAR	Joint Aviation Regulation
AWO	All Weather Operations
DEV	Deviation
MABH	Minimum Approach Break-off Height
NPA	Notice of Proposed Amendment
FAA	Federal Aviation Administration

Disclaimer – This document is not exhaustive and it will be updated gradually.



S-1066: CAT III OPERATIONS - EXCESS DEVIATION ALERT

Equivalent Safety Finding	S-1066: Cat III Operations - Excess deviation alert
APPLICABILITY:	A330-800/-900 / A340-500/-600
REQUIREMENTS:	JAR AWO 236, AWO 321(a)(5)
ISSUE:	4 dated 27/03/2002

Equivalent Safety Finding**BACKGROUND**

JAR AWO 236(c) requires that excess deviation alerts “must be active at least from 90 m (300 ft) to the decision height but the glide path alert should not be active below 30 ft.”

On A330-800/-900 and A340-500/-600, the localizer (LOC) excess deviation alerts are inhibited under 15ft whatever the kind of autoland operations. Airbus interpretation of JAR AWO 236(c) is that LOC excessive deviation alert is required down to DH, but is not required down to the ground in NO DH operations (The NO DH autoland operation concept is different from operations that would be conducted with a DH =0).

As a consequence, Airbus consider that the design where the LOC excessive deviation alert is inhibited below 15 feet, complies with JAR AWO Change 2 requirement for autoland operation with no DH whereas direct compliance would require that the localizer excess deviation alert be active until the ground.

EQUIVALENT SAFETY FINDING

Airbus design for localizer excess deviation alert, whilst not strictly complying with JAR AWO 236 and JAR AWO 321 (a)(5), does meet the intent of the rule and presents an equivalent safety level. This equivalent safety level is based on:

- Airbus technical analysis of relevant failure cases,
- The localizer excess deviation threshold set at 20 micro Amperes, being more severe than the standard required by JAR AWO (25 micro Amperes),
- The design robustness including derotation law and prevention to manually change the ILS course under 700 ft, which can therefore not induce a destabilised approach condition.

1) Nominal performances of the AP guidance (without failure) are demonstrated through flight test and simulation. This demonstration account for external perturbations, like crosswind and gusts. In particular, the demonstration of lateral gust during flare is part of the autopilot failure condition simulator assessment. One objective was to check that the guidance remains within LOC excess deviation limits.

Disclaimer – This document is not exhaustive and it will be updated gradually.



- 2) The acceptability of the equivalent safety level is based on a justification that continuing the landing will be safe under the realistic scenarios associated with LOC deviations of greater than 20 micro amps at or below 15 feet and that a go-around may safely be performed from any point on the approach to touchdown.

Acronyms and Abbreviations

AP	AutoPilot
AWO	All Weather Operations
DH	Decision Height
ESF	Equivalent Safety Finding
ILS	Instrument Landing System
JAR	Joint Aviation Regulation
LOC	Localizer

– END –

Disclaimer – This document is not exhaustive and it will be updated gradually.

