

European Aviation Safety Agency

**Certification Specifications
for
Normal-Category Aeroplanes

CS-23**

Amendment 5

29 March 2017¹

¹ For the date of entry into force of this Amendment, please refer to Decision 2017/013/R in the [Official Publication](#) of EASA.

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PREAMBLE

CS-23 Amendment 5

Effective: See Decision 2017/013/R

The following is a list of paragraphs affected by this amendment.

Book 1

Subpart A

- CS 23.1 through CS 23.3 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2000 through CS 23.2010 Created (NPA 2016-05)

Subpart B

- CS 23.21 through CS 23.253 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2100 through CS 23.2170 Created (NPA 2016-05)

Subpart C

- CS 23.301 through CS 23.575 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2200 through CS 23.2270 Created (NPA 2016-05)

Subpart D

- CS 23.601 through CS 23.871 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2300 through CS 23.2340 Created (NPA 2016-05)

Subpart E

- CS 23.901 through CS 23.1203 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2400 through CS 23.2445 Created (NPA 2016-05)

Subpart F

- CS 23.1301 through CS 23.1461 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2500 through CS 23.2555 Created (NPA 2016-05)

Subpart G

- CS 23.1501 through CS 23.1589 Deleted and moved to AMC (NPA 2016-05)
- CS 23.2600 through CS 23.2625 Created (NPA 2016-05)

Appendices

- Appendix A through K Deleted and moved to AMC (NPA 2016-05)

Book 2

AMC — Subpart C Deleted and moved to AMC (NPA 2016-05)

AMC — Subpart D Deleted and moved to AMC (NPA 2016-05)

AMC — Subpart E Deleted and moved to AMC (NPA 2016-05)

AMC — Subpart F Deleted and moved to AMC (NPA 2016-05)

AMC — Subpart G Deleted and moved to AMC (NPA 2016-05)

AMC — Appendix A Deleted and moved to AMC (NPA 2016-05)

Flight Test Guide (FTG) Deleted and moved to AMC (NPA 2016-05)

CS-23 Amendment 4

Effective: 16 July 2015

The following is a list of paragraphs affected by this amendment.

Book 1

Subpart F

- CS 23.1306 Created (NPA 2014-16)

- CS 23.1308 Created (NPA 2014-16)
- CS 23.1309 Amended (NPA 2014-16)

Appendices

- Appendix K Created (NPA 2014-16)

CS-23 Amendment 3

Effective: 20 July 2012

The following is a list of paragraphs affected by this amendment.

Book 1

Subpart D

- CS 23.851 Amended (NPA 2011-14)

Subpart E

- CS 23.1197 Amended (NPA 2011-14)

Book 2

AMC — Subpart D

- AMC 23.851(c) Amended (NPA 2011-14)

AMC — Subpart E

- AMC 23.1197 Created (NPA 2011-14)

CS-23 Amendment 2 (Corrigendum)

Effective: 28 September 2010

Subpart C

Amended (rectification of administrative oversight)

CS-23 Amendment 2

Effective: 9 September 2010

The following is a list of paragraphs affected by this amendment.

Book 1

Subpart B

- CS 23.221 Amended (Editorial correction)

Subpart D

- CS 23.603 Amended (NPA 2009-06)
- CS 23.813(b)(4) Amended (Editorial correction)

Subpart E

- CS 23.909 Amended (Editorial correction)

Appendices

- Appendix D Amended (Editorial correction)

Book 2

Subpart C

- AMC 23.573(a)(1)&(3) Amended (NPA 2009-06)

Subpart D

- AMC 23.603 Deleted (NPA 2009-06)
- AMC 23.613 Amended (NPA 2009-06)
- AMC 23.629 Amended (NPA 2009-06 & Editorial correction)

Flight Test Guide (FTG)

- 192 Paragraph 23.909 Amended (Editorial correction)
- 207 Paragraph 23.959 Amended (Editorial correction)
- 208 Paragraph 23.961 Amended (Editorial correction)

- 307 Paragraph 23.1329 Amended (Editorial correction)

CS-23 Amendment 1

Effective: 12 February 2009

The following is a list of paragraphs affected by this amendment.

Book 1

Subpart B

- CS 23.49(c) Amended (NPA 2008-08)
- CS 23.49(d) Created (NPA 2008-08)

Subpart C

- CS 23.562(d) Created (NPA 2008-08)
- CS 23.562(e) Amended (NPA 2008-08)

SUBPART A — GENERAL

CS 23.2000 Applicability and definitions

- (a) This Certification Specification prescribes airworthiness standards for the issuance of type certificates, and changes to those certificates, for aeroplanes in the normal category.
- (b) For the purposes of this Certification Specification, the following definition applies:
'Continued safe flight and landing' means an aeroplane is capable of continued controlled flight and landing, possibly using emergency procedures, without requiring exceptional pilot skill or strength. Upon landing, some aeroplane damage may occur as a result of a failure condition.

CS 23.2005 Certification of normal-category aeroplanes

- (a) Certification in the normal category applies to aeroplanes with a passenger seating configuration of 19 or less and a maximum certified take-off mass of 8 618 kg (19 000 pounds) or less.
- (b) Aeroplane certification levels are:
 - (1) Level 1 — for aeroplanes with a maximum seating configuration of 0 to 1 passengers;
 - (2) Level 2 — for aeroplanes with a maximum seating configuration of 2 to 6 passengers;
 - (3) Level 3 — for aeroplanes with a maximum seating configuration of 7 to 9 passengers; and
 - (4) Level 4 — for aeroplanes with a maximum seating configuration of 10 to 19 passengers.
- (c) Aeroplane performance levels are:
 - (1) Low speed — for aeroplanes with a V_{NO} or $V_{MO} \leq 250$ knots calibrated airspeed (KCAS) or a $M_{MO} \leq 0.6$; and
 - (2) High speed — for aeroplanes with a V_{NO} or $V_{MO} > 250$ KCAS or an $M_{MO} > 0.6$.
- (d) Aeroplanes not certified for aerobatics may be used to perform any manoeuvre incident to normal flying, including:
 - (1) stalls (except whip stalls); and
 - (2) lazy eights, chandelles, and steep turns, in which the angle of bank is not more than 60 degrees.
- (e) Aeroplanes certified for aerobatics may be used to perform manoeuvres without limitations, other than those limitations established under Subpart G.

CS 23.2010 Accepted means of compliance

- (a) An applicant must comply with this CS using an acceptable means of compliance (AMC) issued by EASA, or another means of compliance which may include consensus standards, when specifically accepted by EASA.
- (b) An applicant requesting EASA to accept a means of compliance must provide the means of compliance to EASA in an acceptable form and manner.

SUBPART B — FLIGHT

CS 23.2100 Mass and centre of gravity

- (a) The applicant must determine limits for mass and centre of gravity that provide for the safe operation of the aeroplane.
- (b) The applicant's design must comply with each requirement of this Subpart at critical combinations of mass and centre of gravity within the aeroplane's range of loading conditions using acceptable tolerances.
- (c) The condition of the aeroplane at the time of determining its empty mass and centre of gravity must be well defined and easily repeatable.

CS 23.2105 Performance data

- (a) Unless otherwise prescribed, an aeroplane must meet the performance requirements of this Subpart in:
 - (1) still air and standard atmospheric conditions at sea level for all aeroplanes; and
 - (2) ambient atmospheric conditions within the operating envelope for:
 - (i) Level-1 high-speed and Level-2 high-speed aeroplanes; and
 - (ii) Level-3 and Level-4 aeroplanes.
- (b) Unless otherwise prescribed, the applicant must develop the performance data required by this Subpart for the following conditions:
 - (1) airport altitudes from sea level to 3 048 m (10 000 ft); and
 - (2) temperatures above and below standard day temperature that are within the range of operating limitations if those temperatures could have a negative effect on performance.
- (c) The procedures used for determining take-off and landing distances must be executable consistently by pilots of average skill in atmospheric conditions expected to be encountered in service.
- (d) Performance data determined in accordance with CS 23.2105(b) must account for losses due to atmospheric conditions, cooling needs, and other demands on power sources.

CS 23.2110 Stall speed

The applicant must determine the aeroplane stall speed or the minimum steady flight speed for each flight configuration used in normal operations, including take-off, climb, cruise, descent, approach, and landing. The stall speed or minimum steady flight speed determination must account for the most adverse conditions for each flight configuration.

CS 23.2115 Take-off performance

- (a) The applicant must determine aeroplane take-off performance accounting for:
 - (1) stall speed safety margins;

- (2) minimum control speeds; and
 - (3) climb gradients.
- (b) For single-engine aeroplanes and Levels 1, 2, and 3 low-speed multi-engine aeroplanes, take-off performance includes the determination of ground roll and initial climb distance to 15 m (50 ft) above the take-off surface.
- (c) For high-speed multi-engine aeroplanes of Levels 1, 2, and 3, and for all Level-4 multi-engine aeroplanes, take-off performance includes a determination of the following distances after a sudden critical loss of thrust:
- (1) an aborted take-off at critical speed;
 - (2) ground roll and initial climb to 11 m (35 ft) above the take-off surface; and
 - (3) net take-off flight path.

CS 23.2120 Climb requirements

The design must comply with the following minimum climb performance out of ground effect:

- (a) with all engines operating and in the initial climb configuration(s):
- (1) for Level-1 and -2 low-speed aeroplanes, a climb gradient of 8.3 % for landplanes and 6.7 % for seaplanes and amphibians; and
 - (2) for Level-1 and -2 high-speed aeroplanes and all Level-3 and -4 aeroplanes, a climb gradient at take-off of 4 %.
- (b) after a critical loss of thrust on multi-engine aeroplanes:
- (1) for Level-1 and -2 low-speed aeroplanes that do not meet single-engine crashworthiness requirements, a climb gradient of 1.5 % at a pressure altitude of 1 524 m (5 000 ft) in the cruise configuration;
 - (2) for Level-1 and -2 high-speed aeroplanes, and Level-3 low-speed aeroplanes, a 1 % climb gradient at 122 m (400 ft) above the take-off surface with the landing gear retracted and flaps in the take-off configuration; and
 - (3) for Level-3 high-speed aeroplanes and all Level-4 aeroplanes, a 2 % climb gradient at 122 m (400 ft) above the take-off surface with the landing gear retracted and flaps in the approach configuration;
- (c) a climb gradient of 3 % during balked landing, without creating undue pilot workload, with the landing gear extended and flaps in the landing configuration(s).

CS 23.2125 Climb information

- (a) The applicant must determine, as applicable, climb and/or descent performance:
- (1) for all engines operating;
 - (2) following a critical loss of thrust on take-off; and
 - (3) after a critical loss of thrust, during the en route phase of flight.

CS 23.2130 Landing

The applicant must determine the following, for standard temperatures at critical combinations of mass and altitude within the operational limits:

- (a) the distance, starting from a height of 15 m (50 ft) above the landing surface, required to land and come to a stop; and
- (b) the approach and landing speeds, configurations, and procedures, which allow a pilot of average skill to land within the published landing distance consistently and without causing damage or injury, and which allow for a safe transition to the balked-landing conditions.

CS 23.2135 Controllability

- (a) The aeroplane must be controllable and manoeuvrable, without requiring exceptional piloting skills, alertness, or strength, within the operating envelope:
 - (1) at all loading conditions for which certification is requested;
 - (2) during all phases of flight;
 - (3) with likely reversible flight control or propulsion system failure; and
 - (4) during configuration changes.
- (b) The aeroplane must be able to complete a landing without causing substantial damage or serious injury using the steepest approved approach gradient procedures and providing a reasonable safe margin below V_{REF} or above approach angle of attack.
- (c) V_{MC} is the calibrated airspeed at which, following the sudden critical loss of thrust, it is possible to maintain control of the aeroplane. For multi-engine aeroplanes, the applicant must determine V_{MC} , if applicable, for the most critical configurations used in take-off and landing operations.
- (d) If the applicant requests certification of an aeroplane for aerobatics, the applicant must demonstrate those aerobatic manoeuvres for which certification is requested and determine entry speeds.

CS 23.2140 Trim

- (a) The aeroplane must maintain lateral and directional trim without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system, under the following conditions:
 - (1) for Level-1, -2, and -3 aeroplanes, in cruise;
 - (2) for Level-4 aeroplanes, in normal operations.
- (b) The aeroplane must maintain longitudinal trim without further force upon, or movement of, the primary flight controls or corresponding trim controls by the pilot, or the flight control system, under the following conditions:
 - (1) climb,
 - (2) level flight,

- (3) descent,
 - (4) approach.
- (c) Residual control forces must not fatigue or distract the pilot during normal operations of the aeroplane and likely abnormal or emergency operations, including a critical loss of thrust on multi-engine aeroplanes.

CS 23.2145 Stability

- (a) Aeroplanes not certified for aerobatics must:
- (1) have static longitudinal, lateral, and directional stability in normal operations;
 - (2) have dynamic short period and Dutch roll stability in normal operations; and
 - (3) provide stable control feedback throughout the operating envelope.
- (b) No aeroplane may exhibit any divergent longitudinal stability characteristic so unstable as to increase the pilot's workload or otherwise endanger the aeroplane and its occupants.

CS 23.2150 Stall characteristics, stall warning, and spins

- (a) The aeroplane must have controllable stall characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive stall warning that provides sufficient margin to prevent inadvertent stalling. A stall warning that is mutable for aerobatic flight phases is acceptable.
- (b) Single-engine aeroplanes, not certified for aerobatics, must not have a tendency to hazardously depart from controlled flight inadvertently.
- (c) Level-1 and -2 multi-engine aeroplanes, not certified for aerobatics, must not have a tendency to hazardously depart controlled flight inadvertently from thrust asymmetry after a critical loss of thrust.
- (d) Aeroplanes certified for aerobatics that include spins must have controllable stall characteristics and the ability to recover within one and one-half additional turns after initiation of the first control action from any point in a spin, not exceeding six turns or any greater number of turns for which certification is requested, while remaining within the operating limitations of the aeroplane.
- (e) Aeroplanes intended for aerobatics have the ability to recover from any approved manoeuvre, without exceeding limitations or exhibiting unsafe characteristics.

CS 23.2155 Ground- and water-handling characteristics

- (a) The aeroplane has controllable longitudinal and directional handling characteristics during taxi, take-off, and landing for the anticipated operation.

CS 23.2160 Vibration, buffeting, and high-speed characteristics

- (a) Vibration and buffeting, for operations up to V_D/M_D , must not interfere with the control of the aeroplane or cause excessive fatigue to the flight crew. Stall warning buffet within these limits is allowable.

- (b) For high-speed aeroplanes and all aeroplanes with a maximum operating altitude greater than 7 625 m (25 000 ft) pressure altitude, there must be no perceptible buffeting in cruise configuration at 1 g and at any speed up to V_{MO}/M_{MO} , except stall buffeting.
- (c) For high-speed aeroplanes, the applicant must determine the positive manoeuvring load factors at which the onset of perceptible buffet occurs in the cruise configuration within the operational envelope. Likely inadvertent excursions beyond this boundary must not result in structural damage.
- (d) High-speed aeroplanes must have recovery characteristics that do not result in structural damage or loss of control, beginning at any likely speed up to V_{MO}/M_{MO} , following:
 - (1) an inadvertent speed increase; and
 - (2) a high-speed trim upset for aeroplanes where dynamic pressure can impair the longitudinal trim system operation.

CS 23.2165 Performance and flight characteristics requirements for flight in icing conditions

- (a) An applicant who requests certification for flight in icing conditions must show the following in the icing conditions for which certification is requested under normal operation of the ice protection system(s):
 - (1) comply with each requirement of this Subpart, except those applicable to spins and any that must be demonstrated at speeds in excess of:
 - (i) 250 knots calibrated airspeed (KCAS);
 - (ii) V_{MO} or M_{MO} or V_{NE} ; or
 - (iii) a speed at which the applicant demonstrates the airframe will be free of ice accretion;
 - (2) the means by which stall warning is provided to the pilot for flight in icing conditions and non-icing conditions is the same.
- (b) If an applicant requests certification for flight in icing conditions, the applicant must provide a means to detect any icing conditions for which certification is not requested and demonstrate the aeroplane's ability to avoid or exit those conditions.
- (c) The applicant must develop an operating limitation to prohibit intentional flight, including take-off and landing, into icing conditions for which the aeroplane is not certified to operate.

FLIGHT INFORMATION

CS 23.2170 Operating limitations

- (a) The following flight information is established:
 - (1) operating limitations, procedures and instructions necessary for the safe operation of the aeroplane; and
 - (2) essential speed and performance information.

SUBPART C — STRUCTURES

CS 23.2200 Structural design envelope

The applicant must determine the structural design envelope, which describes the range and limits of aeroplane design and operational parameters for which the applicant will show compliance with the requirements of this Subpart. The applicant must account for all aeroplane design and operational parameters that affect structural loads, strength, durability, and aeroelasticity, including:

- (a) structural design airspeeds to be considered when determining the corresponding manoeuvring and gust loads must:
 - (1) be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air; and
 - (2) provide sufficient margin for the establishment of practical operational limiting airspeeds.
- (b) flight load conditions to be expected in service;
- (c) mass variations and distributions over the applicable mass and centre of gravity envelope, within the operating limitations;
- (d) loads in response to all designed control inputs; and
- (e) redistribution of loads if deflections under load would significantly change the distribution of external or internal loads.

CS 23.2205 Interaction of systems and structures

For aeroplanes equipped with systems that affect structural performance, either directly or as a result of failure or malfunction, the applicant must account for the influence and failure conditions of these systems when showing compliance with the requirements of this Subpart.

STRUCTURAL LOADS

CS 23.2210 Structural design loads

- (a) The applicant must:
 - (1) determine structural design loads resulting from likely externally or internally applied pressure, force or moment which may occur in flight, ground and water operations, ground- and water-handling, and while the aeroplane is parked or moored;
 - (2) determine the loads required by CS 23.2210(a)(1) at all critical combinations of parameters, on and within the boundaries of the structural design envelope; and
 - (3) the magnitude and distribution of these loads must be based on established physical principles within the structural design envelope.

CS 23.2215 Flight load conditions

- (a) Critical flight loads are established for symmetrical and asymmetrical loading from all combinations of airspeeds and load factors at and within the boundaries of the manoeuvre and gust envelope:
 - (1) at each altitude within the operating limitations, where the effects of compressibility are taken into account when significant;
 - (2) at each mass from the design minimum mass to the design maximum mass; and
 - (3) at any practical but conservative distribution of disposable load within the operating limitations for each altitude and weight.
- (b) Vibration and buffeting does not result in structural damage up to dive speed.
- (c) Flight loads resulting from a likely failure of an aeroplane system, component, or engine are determined.

CS 23.2220 Ground and water load conditions

The applicant must determine the structural design loads resulting from taxi, take-off, landing, and handling conditions on the applicable surface in normal and adverse attitudes and configurations.

CS 23.2225 Component loading conditions

- (a) The applicant must determine the loads acting upon all relevant structural components, in response to:
 - (1) interaction of systems and structures;
 - (2) structural design loads;
 - (3) flight load conditions; and
 - (4) ground and water load conditions.
- (b) The complete pressurised cabin, including doors, windows, canopy and valves, is exposed as a pressure vessel for the maximum relief valve setting multiplied by a factor of 1.33, without considering other loads.

CS 23.2230 Limit and ultimate loads

- (a) Unless special or other factors of safety are necessary to meet the requirements of this Subpart, the applicant must determine:
 - (1) the limit loads, which are equal to the structural design loads; and
 - (2) the ultimate loads, which are equal to the limit loads multiplied by a 1.5 factor of safety, unless otherwise provided.
- (b) Some strength specifications are specified in terms of ultimate loads only, when permanent detrimental deformation is acceptable.

STRUCTURAL PERFORMANCE

CS 23.2235 Structural strength

The structure must support:

- (a) limit loads without:
 - (1) interference with the safe operation of the aeroplane; and
 - (2) detrimental permanent deformation.
- (b) ultimate loads.

CS 23.2240 Structural durability

- (a) The applicant must develop and implement inspections or other procedures to prevent structural failures due to foreseeable causes of strength degradation, which could result in serious or fatal injuries, or extended periods of operation with reduced safety margins. Each of the inspections or other procedures developed under CS 23.2240 must be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness required by CS 23.2625.
- (b) For Level-4 aeroplanes, the procedures developed for compliance with CS 23.2240(a) must be capable of detecting structural damage before the damage could result in structural failure.
- (c) For pressurised aeroplanes:
 - (1) the aeroplane must be capable of continued safe flight and landing following a sudden release of cabin pressure, including sudden releases caused by door and window failures;
 - (2) for aeroplanes with maximum operating altitude greater than 12 497 m (41 000 ft), the procedures developed for compliance with CS 23.2240(a) must be capable of detecting damage to the pressurised cabin structure before the damage could result in rapid decompression that would result in serious or fatal injuries.
- (d) The aeroplane must be designed to minimise hazards to the aeroplane due to structural damage caused by high-energy fragments from an uncontained engine or rotating-machinery failure.

CS 23.2245 Aeroelasticity

- (a) The aeroplane must be free from flutter, control reversal, and divergence:
 - (1) at all speeds within and sufficiently beyond the structural design envelope;
 - (2) for any configuration and condition of operation;
 - (3) accounting for critical degrees of freedom; and
 - (4) accounting for any critical failures or malfunctions.
- (b) The applicants' design must account for tolerances for all quantities that affect flutter.

CS 23.2250 Design and construction principles

- (a) Each part, article, and assembly must be designed for the expected operating conditions of the aeroplane.
- (b) Design data must adequately define the part, article, or assembly configuration, its design features, and any materials and processes used.
- (c) The suitability of each design detail and part having an important bearing on safety in operations must be determined.
- (d) The control system must be free from jamming, excessive friction, and excessive deflection when the aeroplane is subjected to expected limit air loads.
- (e) Doors, canopies, and exits must be protected against inadvertent opening in flight, unless shown to create no hazard, when opened in flight.

CS 23.2255 Protection of structure

- (a) Each part of the aeroplane, including small parts such as fasteners, must be protected against deterioration or loss of strength due to any cause likely to occur in the expected operational environment.
- (b) Each part of the aeroplane must have adequate provisions for ventilation and drainage.
- (c) For each part that requires maintenance, preventive maintenance, or servicing, the applicant must incorporate a means into the aeroplane design to allow such actions to be accomplished.

CS 23.2260 Materials and processes

- (a) The applicant must determine the suitability and durability of materials used for parts, articles, and assemblies, the failure of which could prevent continued safe flight and landing, accounting for the effects of likely environmental conditions expected in service.
- (b) The methods and processes of fabrication and assembly used must produce consistently sound structures. If a fabrication process requires close control to reach this objective, the applicant must define the process with an approved process specification as part of the design data.
- (c) Except as provided for in CS 23.2260(f) and (g), the applicant must select design values that ensure material strength with probabilities that account for the criticality of the structural element. Design values must account for the probability of structural failure due to material variability.
- (d) If material strength properties are required, a determination of those properties must be based on sufficient tests of material meeting specifications to establish design values on a statistical basis.
- (e) If thermal effects are significant on a critical component or structure under normal operating conditions, the applicant must determine those effects.
- (f) Design values, greater than the minimums specified by CS 23.2260, may be used, where only guaranteed minimum values are normally allowed, if a specimen of each individual item is tested before use to determine that the actual strength properties of that particular item will equal or exceed those used in the design.

- (g) An applicant may use other material design values if specifically approved by EASA.

CS 23.2265 Special factors of safety

- (a) The applicant must determine a special factor of safety for each critical design value for each part, article, or assembly for which that critical design value is uncertain, and for each part, article, or assembly that is:
- (1) likely to deteriorate in service before normal replacement; or
 - (2) subject to appreciable variability because of uncertainties in manufacturing processes or inspection methods.
- (b) The applicant must determine a special factor of safety using quality controls and specifications that account for each:
- (1) type of application;
 - (2) inspection method;
 - (3) structural test requirement;
 - (4) sampling percentage; and
 - (5) process and material control.
- (c) The applicant must multiply the highest pertinent special factor of safety in the design for each part of the structure by each limit load and ultimate load, or ultimate load only, if there is no corresponding limit load, such as occurs with emergency condition loading.

STRUCTURAL OCCUPANT PROTECTION

CS 23.2270 Emergency conditions

- (a) The aeroplane, even when damaged in an emergency landing, must protect each occupant against injury that would preclude egress when:
- (1) properly using safety equipment and features provided for in the design;
 - (2) the occupant experiences ultimate static inertia loads likely to occur in an emergency landing; and
 - (3) items of mass, including engines or auxiliary power units (APUs), within or aft of the cabin, that could injure an occupant, experience ultimate static inertia loads likely to occur in an emergency landing.
- (b) The emergency landing conditions specified in CS 23.2270(a) must:
- (1) include dynamic conditions that are likely to occur in an emergency landing; and
 - (2) not generate loads experienced by the occupants, which exceed established human-injury criteria for human tolerance due to restraint or contact with objects in the aeroplane.
- (c) The aeroplane must provide protection for all occupants, accounting for likely flight, ground, and emergency landing conditions.

- (d) Each occupant protection system must perform its intended function and not create a hazard that could cause a secondary injury to an occupant. The occupant protection system must not prevent occupant egress or interfere with the operation of the aeroplane when not in use.
- (e) Each baggage and cargo compartment must:
 - (1) be designed for its maximum loading and for the critical load distributions at the maximum load factors corresponding to the flight and ground load conditions determined under this CS;
 - (2) have a means to prevent the contents of the compartment from becoming a hazard by impacting occupants or shifting; and
 - (3) protect controls, wiring, lines, equipment, or accessories whose damage or failure would prevent continued safe flight and landing.

SUBPART D — DESIGN AND CONSTRUCTION

CS 23.2300 Flight control systems

- (a) The flight control systems are designed to:
 - (1) operate easily, smoothly, and positively enough to allow proper performance of their functions;
 - (2) protect against likely hazards.
- (b) Trim systems, if installed, are designed to:
 - (1) protect against inadvertent, incorrect, or abrupt trim operation;
 - (2) provide information that is required for safe operation.

CS 23.2305 Landing gear systems

- (a) The landing gear is designed to:
 - (1) provide stable support and control to the aeroplane during surface operation; and
 - (2) account for likely system failures and likely operation environment (including anticipated limitation exceedances and emergency procedures).
- (b) Aeroplanes must have a reliable means of stopping the aeroplane with sufficient kinetic energy absorption to account for landing. Aeroplanes that are required to demonstrate aborted take-off capability must account for this additional kinetic energy.
- (c) For aeroplanes that have a system that actuates the landing gear, there is:
 - (1) a positive means to keep the landing gear in the landing position; and
 - (2) an alternative means available to bring the landing gear in the landing position when a non-deployed system position would be a hazard.

CS 23.2310 Buoyancy for seaplanes and amphibians

Aeroplanes intended for operations on water must:

- (a) provide buoyancy of 80 % in excess of the buoyancy required to support the maximum weight of the aeroplane in fresh water; and
- (b) have sufficient margin so that the aeroplane will stay afloat at rest in calm water without capsizing in case of a likely float or hull flooding.

OCCUPANT SYSTEM DESIGN PROTECTION

CS 23.2315 Means of egress and emergency exits

- (a) With the cabin configured for take-off or landing, the aeroplane is designed to:
 - (1) Facilitate rapid and safe evacuation of the aeroplane in conditions likely to occur following an emergency landing, excluding ditching for Level-1, Level-2 and single-engine Level-3 aeroplanes.
 - (2) Have means of egress (openings, exits or emergency exits) that can be readily located and opened from the inside and outside. The means of opening must be simple and obvious.
 - (3) Have easy access to emergency exits when present.
- (b) Aeroplanes approved for aerobatics must have a means to egress the aeroplane in flight.

CS 23.2320 Occupant physical environment

- (a) The applicant must design the aeroplane to:
 - (1) allow clear communication between the flight crew and passengers;
 - (2) protect the pilot against serious injury due to hazards originating from high energy, associated with systems and equipment; and
 - (3) protect the occupants from serious injury due to breakage of windshields, windows, and canopies.
- (b) For Level-4 aeroplanes, each windshield and its supporting structure directly in front of the pilot must withstand, without penetration, the impact equivalent to a two-pound bird when the velocity of the aeroplane is equal to the aeroplane's maximum approach flap speed.
- (c) The aeroplane must provide each occupant with air at a breathable pressure, free of hazardous concentrations of gases, vapours and smoke during normal operations and likely failures.
- (d) If a pressurisation system is installed in the aeroplane, it must be designed to protect against:
 - (1) decompression to an unsafe level; and
 - (2) excessive differential pressure.
- (e) If an oxygen system is installed in the aeroplane, it must:
 - (1) effectively provide oxygen to each user to prevent the effects of hypoxia; and
 - (2) be free from hazards in itself, in its method of operation, and its effect upon other components.

FIRE AND HIGH ENERGY PROTECTION

CS 23.2325 Fire protection

- (a) The aeroplane is designed to minimise the risk of fire initiation due to:

- (1) anticipated heat or energy dissipation or system failures or overheating that are expected to generate heat sufficient to ignite a fire;
 - (2) ignition of flammable fluids, gases or vapours; and
 - (3) fire-propagating or -initiating system characteristics (e.g. oxygen systems).
- (b) The aeroplane is designed to minimise the risk of fire propagation by:
- (1) providing adequate fire or smoke awareness and extinguishing means when practical;
 - (2) application of self-extinguishing, flame-resistant, or fireproof materials that are adequate to the application, location and certification level; or
 - (3) specifying and designing designated fire zones that meet the specifications of CS 23.2330.

CS 23.2330 Fire protection in designated fire zones

- (a) Flight controls, engine mounts, and other flight structures within or adjacent to designated fire zones must be capable of withstanding the effects of a fire.
- (b) A fire in a designated fire zone must not preclude continued safe flight and landing.
- (c) Terminals, equipment, and electrical cables used during emergency procedures must be fire-resistant.

CS 23.2335 Lightning protection

For operations where the exposure to lightning is likely, the aeroplane must be protected against catastrophic effects of lightning.

CS 23.2340 Design and construction information

The following design and construction information is established:

- (a) operating limitations, procedures and instructions necessary for the safe operation of the aeroplane;
- (b) the need for instrument markings or placards;
- (c) any additional information necessary for the safe operation of the aeroplane; and
- (d) inspections or maintenance to assure continued safe operation.

SUBPART E — POWERPLANT INSTALLATION

CS 23.2400 Powerplant installation

- (a) For the purpose of this Subpart, the aeroplane powerplant installation must include each component that is necessary for propulsion, affects propulsion safety, or provides auxiliary power to the aeroplane.
- (b) Each aeroplane engine, propeller and auxiliary power unit (APU) must be type certified, or meet accepted specifications.
- (c) The applicant must construct and arrange each powerplant installation to account for:
 - (1) all likely operating conditions, including foreign object threats;
 - (2) sufficient clearance of moving parts to other aeroplane parts and their surroundings;
 - (3) likely hazards in operation, including hazards to ground personnel; and
 - (4) vibration and fatigue.
- (d) Hazardous accumulations of fluids, vapours or gases are isolated from the aeroplane and personnel compartments and are safely contained or discharged.
- (e) Installations of powerplant components that deviate from the component limitations or installation instructions must be shown to be safe.
- (f) For the purposes of this Subpart, 'energy' means any type of energy for the powerplant, including, for example, fuels of any kind or electric current.

CS 23.2405 Power or thrust control systems

Power or thrust control systems are systems that intervene with the power selection commanded by the direct power settings.

- (a) Power or thrust control systems must be designed so no unsafe condition will result during normal operation of the system.
- (b) Any single failure or likely combination of failures of a power or thrust control system must not prevent continued safe flight and landing of the aeroplane.
- (c) Inadvertent operation of a power or thrust control system by the flight crew must be prevented, or if not prevented, must not result in an unsafe condition.
- (d) Unless the failure of an automatic power or thrust control system is 'extremely remote', the system must:
 - (1) provide a means for the flight crew to verify that the system is in an operating condition;
 - (2) provide a means for the flight crew to override the automatic function if the hazard outweighs the safety benefits; and
 - (3) prevent inadvertent deactivation of the system.

CS 23.2410 Powerplant installation hazard assessment

The applicant must assess each installation separately and in relation to other aeroplane systems and installations to show that any hazard resulting from the likely failure of any system component or accessory will not:

- (a) prevent continued safe flight and landing or, if continued safe flight and landing cannot be ensured, the hazards have been minimised;
- (b) cause serious injury that may be avoided; and
- (c) require immediate action by crew members for continued operation of any remaining powerplant system.

CS 23.2415 Powerplant installation ice protection

- (a) The aeroplane design must prevent foreseeable accumulation or shedding of ice or snow that adversely affect powerplant operation.
- (b) The powerplant installation design must prevent any accumulation of ice or snow that adversely affects powerplant operation in those icing conditions for which certification is requested.

CS 23.2420 (reserved)**CS 23.2425 Powerplant operational characteristics**

- (a) The installed powerplant must operate without any hazardous characteristics during normal and emergency operation within the range of operation limitations for the aeroplane and powerplant installation.
- (b) The design must allow the shutdown and restart of the powerplant in flight within an established operating envelope.

CS 23.2430 Powerplant installation, energy storage and distribution systems

- (a) Each system must:
 - (1) Be designed to provide independence between multiple energy storage and supply systems so that a failure of any one component in one system will not result in the loss of energy storage or supply of another system.
 - (2) Be designed to prevent catastrophic events due to lightning strikes taking into account direct and indirect effects for aeroplanes where the exposure to lightning is likely.
 - (3) Provide energy to the powerplant installation with adequate margins to ensure safe functioning under all permitted and likely operating conditions, and accounting for likely component failures.
 - (4) Provide the information established in CS 23.2445(a)(7) to the flight crew and provide uninterrupted supply of that energy when the system is correctly operated, accounting for likely energy fluctuations.

- (5) Provide a means to safely remove or isolate the energy stored within the system.
 - (6) Be designed to retain the energy under all likely operating conditions and minimise hazards to the occupants during any survivable emergency landing. For Level-4 aeroplanes, failure due to overload of the landing system must be taken into account.
 - (7) Prevent hazardous contamination of the energy supplied to each powerplant installation.
- (b) Each storage system must:
- (1) withstand the loads under likely operating conditions without failure, accounting for installation;
 - (2) be isolated from personnel compartments and protected from likely hazards;
 - (3) be designed to prevent significant loss of stored energy due to energy transfer or venting under likely operating conditions;
 - (4) provide energy for at least one-half hour of operation at maximum continuous power or thrust; and
 - (5) be capable of jettisoning energy safely if this functionality is provided.
- (c) Each energy-storage-refilling or -recharging system must be designed to:
- (1) prevent improper refilling or recharging;
 - (2) prevent contamination of the stored energy during likely operating conditions; and
 - (3) prevent the occurrence of any hazard to the aeroplane or to persons during refilling or recharging.
- (d) Likely errors during ground handling of the aeroplane must not lead to a hazardous loss of stored energy.

CS 23.2435 Powerplant installation support systems

- (a) Powerplant installation support systems are all systems whose direct purpose is to support the powerplant or the energy storage device in its intended function as part of the powerplant installation.
- (b) Powerplant installation support systems that have a direct effect on the engine availability are considered in the engine reliability.
- (c) Powerplant installation support systems are designed for the operating conditions applicable to the location of installation.
- (d) Systems must be capable of operating under the conditions likely to occur.
- (e) System function and characteristics that have an effect on the powerplant installation system performance are established.
- (f) Ingestion of likely foreign objects that would be hazardous to the engine is prevented.
- (g) The pilot must be aware of the air intake configuration and able to influence it.
- (h) Any likely single failures of powerplant installation support systems that result in a critical loss of thrust are mitigated.

CS 23.2440 Powerplant installation fire protection

There must be means to isolate and mitigate hazards to the aeroplane in the event of a powerplant system fire or overheat in operation.

CS 23.2445 Powerplant installation information

The following powerplant installation information is established:

- (a) operating limitations, procedures and instructions necessary for the safe operation of the aeroplane;
- (b) the need for instrument markings or placards;
- (c) any additional information necessary for the safe operation of the aeroplane;
- (d) inspections or maintenance to assure continued safe operation;
- (e) information related to the air intake configuration;
- (f) techniques and associated limitations for engine starting and stopping; and
- (g) energy level information to support energy management, including consideration of a likely component failure within the system.

SUBPART F — SYSTEMS AND EQUIPMENT

CS 23.2500 General requirements on systems and equipment function

- (a) Requirements CS 23.2500, CS 23.2505 and CS 23.2510 are general requirements applicable to systems and equipment installed in the aeroplane, and should not be used to supersede any other specific CS-23 requirement.
- (b) Equipment and systems required to comply with type certification requirements, airspace requirements or operating rules, or whose improper functioning would lead to a hazard, must be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the aeroplane is certified.

CS 23.2505 General requirements on equipment installation

- (a) Each item of installed equipment is installed according to limitations specified for that equipment.
- (b) On multi-engine aeroplanes, engine-driven accessories essential to safe operation must be distributed among multiple engines.

CS 23.2510 Equipment, systems, and installations

- (a) The equipment and systems identified in CS 23.2500, considered separately and in relation to other systems, must be designed and installed such that:
 - (1) each catastrophic failure condition is extremely improbable; and
 - (2) each hazardous failure condition is extremely remote; and
 - (3) each major failure condition is remote.
- (b) The operation of equipment and systems not covered by CS 23.2500 does not cause a hazard to the aeroplane or its occupants throughout the operating and environmental limits for which the aeroplane is certified.

CS 23.2515 Electrical and electronic system lightning protection

For an aeroplane where the exposure to lightning is likely:

- (a) each electrical or electronic system that performs a function, the failure of which would prevent the continued safe flight and landing of the aeroplane, must be designed and installed such that:
 - (1) the function at the aeroplane level is not adversely affected during and after the time the aeroplane is exposed to lightning; and
 - (2) the system recovers normal operation of that function in a timely manner after the aeroplane is exposed to lightning unless the system's recovery conflicts with other operational or functional requirements of the system;

- (b) each electrical and electronic system that performs a function, the failure of which would significantly reduce the capability of the aeroplane or the ability of the flight crew to respond to an adverse operating condition, must be designed and installed such that the system recovers normal operation of that function in a timely manner after the aeroplane is exposed to lightning.

CS 23.2520 High-intensity radiated fields (HIRF) protection

- (a) Each electrical and electronic system that perform a function, the failure of which would prevent the continued safe flight and landing of the aeroplane, must be designed and installed such that:
 - (1) the function at the aeroplane level is not adversely affected during and after the time the aeroplane is exposed to the HIRF environment; and
 - (2) the system recovers normal operation of that function in a timely manner after the aeroplane is exposed to the HIRF environment, unless the system's recovery conflicts with other operational or functional requirements of the system.
- (b) For aeroplanes approved for instrument flight rules (IFR) operations, each electrical and electronic system that performs a function, the failure of which would reduce the capability of the aeroplane or the ability of the flight crew to respond to an adverse operating condition, must be designed and installed such that the system recovers normal operation of that function in a timely manner after the aeroplane is exposed to the HIRF environment.

CS 23.2525 System power generation, storage, and distribution

The power generation, storage, and distribution for any system must be designed and installed to:

- (a) supply the power required for operation of connected loads during all intended operating conditions;
- (b) ensure no single failure or malfunction will prevent the system from supplying the essential loads required for continued safe flight and landing; and
- (c) have enough capacity, if the primary source fails, to supply essential loads, including non-continuous essential loads for the time needed to complete the function, required for safe flight and landing.

CS 23.2530 External and cockpit lighting

- (a) The applicant must design and install all lights to minimise any adverse effects on the performance of flight crew duties.
- (b) Any position and anti-collision lights, if required by operational rules, must have the intensities, flash rate, colours, fields of coverage, and other characteristics to provide sufficient time for another aircraft to avoid a collision.
- (c) Any position lights, if required by operational rules, must include a red light on the left side of the aeroplane, a green light on the right side of the aeroplane, spaced laterally as far apart as practicable, and a white light facing aft, located on an aft portion of the aeroplane or on the wing tips.
- (d) Taxi and landing lights, if required, must be designed and installed so they provide sufficient light for night operations.

- (e) For seaplanes or amphibian aeroplanes, riding lights must provide a white light visible in clear atmospheric conditions.

CS 23.2535 Safety equipment

Safety and survival equipment, required by the operating rules, must be reliable, readily accessible, easily identifiable, and clearly marked to identify its method of operation.

CS 23.2540 Flight in icing conditions

An applicant who requests certification for flight in icing conditions must show the following in the icing conditions for which certification is requested:

- (a) the ice protection system provides for safe operation; and
- (b) the aeroplane design must provide protection from stalling when the autopilot is operating.

CS 23.2545 Pressurised systems elements

Pressurised systems must withstand appropriate proof and burst pressures.

CS 23.2550 (reserved)

CS 23.2555 Installation of recorders (e.g. cockpit voice recorders and flight data recorders)

If recording is required by the operating rules, the system:

- (a) is installed so as to ensure accurate and intelligible recording and safeguarding of the required data, also in conditions encountered during crash, water immersion or fire;
- (b) is powered by the most reliable power source and remains powered for as long as possible without jeopardising service to essential or emergency loads and emergency operation of the aeroplane;
- (c) includes features to facilitate the localisation of a memory medium after an accident; and
- (d) is installed so that it automatically records when the aeroplane is capable of moving under its own power.

SUBPART G — FLIGHT CREW INTERFACE AND OTHER INFORMATION

CS 23.2600 Flight crew compartment

- (a) The pilot compartment arrangement, including pilot view, and its equipment must allow the flight crew to perform their duties within the operating envelope of the aeroplane, without excessive concentration, skill, alertness, or fatigue.
- (b) The applicant must install flight, navigation, surveillance, and powerplant installation controls and displays so that a qualified flight crew can monitor and perform defined tasks associated with the intended functions of systems and equipment. The system and equipment design must minimise flight crew errors, which could result in additional hazards.
- (c) For Level-4 aeroplanes, the flight crew interface design must allow for continued safe flight and landing after the loss of vision through any one of the windshield panels.

CS 23.2605 Installation and operation information

- (a) Each item of installed equipment related to the flight crew interface must be labelled, if applicable, as for its identification, function, or operating limitations, or any combination of these factors.
- (b) There must be a discernible means of providing system operating parameters required to operate the aeroplane, including warnings, cautions, and normal indications, to the responsible crew member.
- (c) Information concerning an unsafe system operating condition must be provided in a timely manner to the crew member responsible for taking corrective action. The information must be clear enough to avoid likely crew member errors.
- (d) Information related to safety equipment is easily identifiable and its method of operation is clearly marked.

CS 23.2610 Instrument markings, control markings and placards

- (a) Each aeroplane must display in a conspicuous manner any placard and instrument marking necessary for operation.
- (b) The design must clearly indicate the function of each cockpit control, other than primary flight controls.
- (c) The applicant must include instrument marking and placard information in the Aeroplane Flight Manual.

CS 23.2615 Flight, navigation, and powerplant instruments

- (a) Installed systems must provide the flight crew member who sets or monitors parameters for the flight, navigation, and powerplant the information necessary to do so during each phase of flight. This information must:
 - (1) be presented in a manner that the crew members can monitor the parameters and trends, as needed to operate the aeroplane; and

- (2) include limitations, unless the limitation cannot be exceeded in all intended operations.
- (b) Indication systems that integrate the display of flight or powerplant parameters required to safely operate the aeroplane, or required by the operating rules, must:
 - (1) not inhibit the primary display of flight or powerplant parameters needed by any flight crew member in any normal mode of operation; and
 - (2) in combination with other systems, be designed and installed so information essential for continued safe flight and landing will be available to the flight crew in a timely manner after any single failure or probable combination of failures.

CS 23.2620 Aeroplane Flight Manual

The applicant must provide an aeroplane flight manual that must be delivered with each aeroplane and contains the following information:

- (a) operating limitations and procedures;
- (b) performance information;
- (c) loading information;
- (d) instrument marking and placard information; and
- (e) any other information necessary for the safe operation of the aeroplane.

CS 23.2625 Instructions for Continued Airworthiness

- (a) The applicant must prepare Instructions for Continued Airworthiness that are appropriate for the certification level and performance level of the aeroplane.
- (b) If Instructions for Continued Airworthiness are not supplied by the manufacturer of an appliance or product installed in the aeroplane, the Instructions for Continued Airworthiness for the aeroplane must include the information essential to the continued airworthiness of the aeroplane.
- (c) The Instructions for Continued Airworthiness must contain a Section titled 'Airworthiness limitations' that is segregated and clearly distinguishable from the rest of the document. This Section must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure required for type certification. This Section must contain a legible statement in a prominent location that reads: 'The Airworthiness limitations Section is approved and variations must also be approved'.
- (d) The applicant must develop and implement procedures to prevent structural failures due to foreseeable causes of strength degradation, which could result in serious or fatal injuries, loss of the aeroplane, or extended periods of operation with reduced safety margins. The Instructions for Continued Airworthiness must include procedures developed under CS 23.2255.