CS-22 Amendment 3 — Change Information

EASA issues amendments to the certification specifications, acceptable means of compliance and guidance material as consolidated documents. These documents are used for establishing the certification basis for applications made after the date of entry into force of the applicable issue.

Consequently, except for a note '[Amdt No: 22/3]' under the amended paragraph, the consolidated text of CS-22 does not allow readers to see the detailed amendments that have been introduced compared to the previous issue. To allow readers to see them, this document has been created. The same format/layout has been used as for the publication of notices of proposed amendments (NPAs):

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Note to the reader

In the proposed amendments, and in particular in existing (that is, unchanged) text, the term 'Agency' *is used interchangeably with* 'EASA'. *The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the* 'European Union Aviation Safety Agency (EASA)'.

SUBPART A — GENERAL

~~AMC 22.1(a) Applicability~~

~~CS-22 is not applicable to aeroplanes classified as hang-gliders and ultralights or microlights. The definitions of these aeroplanes differ from country to country. However, hang-gliders can be broadly defined as sailplanes that can take-off and land by using the pilot's muscular energy and potential energy.~~

~~Ultralights or microlights can be described as very low-energy aeroplanes, as some of their main characteristics are strictly limited. The following criteria are often used (alone or in combination): stalling speed, weight to surface area ratio, maximum take-off weight, maximum empty weight, fuel quantity, number of seats.~~

~~In addition, both hang-gliders and ultralights/microlights are usually not type-certificated, and CS-22 prescribes minimum standards for the issue of type certificates.~~

SUBPART B — FLIGHT

CS 22.73 Descent, high speed

It must be shown that the sailplane with the airbrakes extended, will not exceed V_{NE} in a dive at an angle to the horizon of:

(a) 45° when the sailplane is approved for cloud flying ~~and/or aerobatics when certificated in the Aerobatic or Utility Category~~;

(b) in other cases,

(i) 30°,

(ii) less than 30° when a rate of descent of more than 30 m/s can be achieved.

AMC 22.152 Winch-launching and auto-tow launching

~~For showing compliance with the winch-launching requirements at least 6 winch-launches should be made, covering the range of speeds up to V_W. During these launches a range of release points should be selected along the flight path to cover the normal operating range and the release in emergency.~~

In demonstrating compliance with this requirement, in addition to the requirements of CS 22.21(a) and (b) and CS 22.713(b), the effects of at least the following should be investigated:

(1) Variations in the speed, up to V_W;

(2) A range of release points along the flight path to cover the normal operating range and the release in an emergency;

(3) Different winch characteristics (e.g. engine power, cable speed, acceleration); and

(4) Different cable types (e.g. steel or textile).

Appropriate limitations may be addressed by the operating limitations of the AFM.

SUBPART C — STRUCTURE

CS 22.331 Symmetrical flight conditions

[...]

(d) Aerodynamic data required for the establishment of the loading conditions must be verified by tests, calculations or by conservative estimation.

(1) In the absence of better information, the maximum negative lift coefficient in the normal configuration may be taken as –0.8

(2) If the pitching moment coefficient C_{mo} is less than ±0.025, a coefficient of at least ~~–~~ ±0.025 must be used for the wing and horizontal tail.

CS 22.335 Design air speeds

[...]

(f) *Design Maximum Speed V_D*. The design maximum speed may be chosen by the applicant but must not be lower than:

$$V_D = \cancel{18\sqrt[3]{\left(\frac{W}{S}\right)\left(\frac{1}{Cd_{min}}\right)}}\; 18 \cdot \sqrt[3]{\left(\frac{W}{S}\right) \cdot \left(\frac{1}{C_{D_{min}}}\right)}$$ (km/h) for sailplanes of Category U

$$V_D = 3.5\left(\frac{W}{S}\right) + 200$$ (km/h) for sailplanes of Category A

where:

$\frac{W}{S}$ = Wing loading (daN/m^2) at design

$C\cancel{d}_{D\,min}$ = The lowest possible drag coefficient of the sailplane

For a powered sailplane, V_D must also not be lower than 1.35 V_H.

CS 22.341 Gust load factors

(a) In the absence of a more rational analysis, the gust load factors must be computed as follows:

$$n = 1 \pm \left[\frac{\left(\frac{k}{2}\right)\rho_0 U V a}{\left(\frac{mg}{S}\right)}\right]$$

where:

ρ_0 = density of air at sea-level (kg/m^3)

U = gust velocity (m/s)

V = equivalent air speed (m/s)

a = slope of wing lift curve per radian

m = mass of the sailplane (kg)

~~G~~g= acceleration due to gravity (m/s²)

S = design wing area (m²)

k = gust alleviation factor calculated from the following formula:

$$\cancel{k = \frac{0.88\mu}{5.3+\mu}}$$

$$k = \frac{0.96 \frac{\mu}{H/l_m}}{0.475 + \frac{\mu}{H/l_m}}$$

where:

$\mu = \frac{2\frac{m}{S}}{\rho lm\ a}$ (non-dimensional sailplane mass ratio)

where:

ρ = density of air (kg/m³) at the altitude considered

1_m = mean geometric chord of wing (m)

H = length of the (1-cos)-shaped gust;

unless there is justification for a different value, H must be computed as follows:

$$H = (12.17 + 0.191\mu)l_m$$

(b) The value of n calculated from the expression given above need not exceed:

$$n = 1.25\left(\frac{V}{V_{S1}}\right)^2$$

CS 22.375 Winglets

[...]

(b) In the absence of more rational analysis, the loads must be computed as follows:

(1) The lift at the winglets due to sideslip at V_A –

$$L_{W_m} = 1.25 C_{L_{max}} S_W \frac{\rho o}{2} V_{A^2}$$

where:

$C_{L_{max}}$ = maximum lift coefficient of winglet profile

S_W = area of winglet

(2) The lift at the winglets due to lateral gust at V_B and V_D –

$$L_{W_g} = a_W\ S_W \frac{\rho o}{2} VUk$$

where:

U = lateral gust velocity at the values as described in CS 22.333(c)

a_W = slope of winglet lift curve per radian

k = Gust alleviation factor as defined in CS 22.443(b)

The above-described load L_{W_g} need not exceed the value

$$L_{W_{max}} = \cancel{1.25 C_{L_{max}} S_W \frac{\rho o}{2} V_{max}{}^2}\ 1.25 C_{L_{max}} S_W \frac{\rho_0}{2} V^2$$

[...]

AMC 22.441 Vertical tail surfaces

Manoeuvring load

For sailplanes where the horizontal tail is supported by the vertical tail, the tail surfaces and their supporting structure including the rear portion of the fuselage should be designed to withstand the prescribed loadings on the vertical tail and the rolling moment induced by the horizontal tail acting in the same direction.

For T-tails in the absence of a more rational analysis, the rolling moment induced by side-slip or deflection of the vertical rudder may be computed as follows:

$$M_r = 0.4\, S_t \frac{\rho_o}{2} \beta\, V^2\, b_v$$

where:

M_r = induced rolling moment at horizontal tail (Nm)

b_v = span of vertical tail, measured from the bottom of the fuselage

β = side-slip angle (radian)

This formula is only valid for vertical tail aspect ratios between 1 and ~~1.8~~ 2 (with span and area measured from the bottom of the fuselage) and horizontal tail with no dihedral and aspect ratio ~~6~~ 8 or less. For configurations in excess of these limits more detailed rational analysis will be required.

Designs in the Aerobatic Category must address all unlimited manoeuvres that are permitted and their ensuing loads upon the whole aircraft. In the course of this, the conditions defined in CS 22.441(a) and (b) may have to be amended for Category A sailplanes. For example, in aerobatics, it is common practice in flick manoeuvres to alternately deflect the rudder to superimpose the rudder deflection with sideslip, and thus increasing rudder authority. For Category A sailplanes, loads arising from such cases should be assessed.

AMC 22.443 Vertical tail surfaces

Gust loads

For sailplanes ~~where the~~ whose horizontal tail is supported by the vertical tail, the tail surfaces and their supporting structure, including the rear portion of the fuselage, should be designed to withstand the prescribed loadings on the vertical tail and the rolling moment induced by the horizontal tail acting in the same direction.

For T-tails, in the absence of a more rational analysis, the rolling moment induced by gust load may be computed as follows:

$$M_r = 0.4\, S_t \frac{\rho_o}{2}\, V\, U\, b_v k$$

where:

M_r = induced rolling moment horizontal tail (Nm)

b_v = span of vertical tail, measured from the bottom of the fuselage

This formula is only valid for vertical tail aspect ratios between 1 and ~~1.8~~ 2 (with span and area measured from the bottom of the fuselage) and horizontal tail with no dihedral and aspect ratio ~~6~~ 8 or less. For configurations in excess of these limits, more detailed rational analysis will be required.

CS 22.473 Ground load conditions and assumptions

(a) The ground load requirements of this Subpart~~,~~ must be complied with at the design maximum weight.

(b) The selected limit vertical inertia load factor at the c.g. of the sailplane for the ground load conditions prescribed in this Subpart

(i) may not be less than that which would be obtained when landing with a descent velocity of ~~1.77~~ 1.70 m/s;~~.~~

(ii) may not be less than 3.

(c) Wing lift balancing the weight of the sailplane may be assumed to exist throughout the landing impact and to act through the c.g. The ground reaction load factor may be equal to the inertia load factor minus one.

CS 22.581 Aerotowing

(a) The sailplane must be initially assumed to be in stabilized level flight at speed V_T with a cable load acting at the launching hook in the following directions:

(1) horizontally forwards;

(2) in plane of symmetry forwards and upwards at an angle of 20° with the horizontal;

(3) in plane of symmetry forwards and downwards at an angle of 40° with the horizontal; and

(4) horizontally forwards and sidewards at an angle of 30° with the plane of symmetry.

(b) With the sailplane initially assumed to be subjected to the same conditions as specified in CS 22.581(a), the cable load due to surging suddenly increases to Q_{nom}, assuming the use of a textile rope.

(1) The resulting cable load increment must be balanced by linear and rotational inertia forces. These additional loads must be superimposed on those arising from the conditions of CS 22.581(a).

(2) ~~Q_{nom} is the rated ultimate strength of the towing cable (or weak link if employed).~~ For the purpose of these requirements, Q_{nom} ~~it~~ must be assumed to be not less than 1.3 times the sailplane maximum weight and not less than 500 daN.

(c) The ultimate strength tolerance of the weak link designated for operation must not exceed ± 10 % centred by the rated ultimate strength.

CS 22.583 Winch-launching

(a) The sailplane must be initially assumed to be in level flight at speed V_W with a cable load acting at the launching hook in a forward and downward direction at an angle ranging from 0° to 75° with the horizontal.

(b) The cable load must be determined as the lesser of the following two values:

(1) 1.2 Q_{nom} as defined in CS 22.581(b), or

(2) the loads at which equilibrium is achieved, with either:

(i) the elevator fully deflected in upward direction, or

(ii) the wing at its maximum lift.

A horizontal inertia force may be assumed to complete the equilibrium of horizontal forces.

(c) In the conditions of CS 22.583(a), a sudden increase of the cable load to the value of 1.2 Q_{nom}, as defined in CS 22.581(b), is assumed. The resulting incremental loads must be balanced by linear and rotational inertia forces.

(d) The rated ultimate strength of the weak link for winch tows must not be larger than 1.2 Q_{nom}. The ultimate strength tolerance of the weak link designated for operation shall not exceed ± 10 % centred by the rated ultimate strength.

CS 22.585 Strength of launching hook attachment

(a) The launching hook attachment must be designed to carry a limit load of ~~1.5 Q_{nom}, as defined in CS 22.581(b),~~ 125 % of the highest associated cable load, calculated according to and acting in the directions specified in CS 22.581 and CS 22.583.

(b) The launching hook attachment must be designed to carry a limit load equal to the maximum weight of the sailplane, acting at an angle of 90° to the plane of symmetry.

SUBPART D — DESIGN AND CONSTRUCTION

GM1 22.697(b) Wing-flap and air-brake controls

The air brakes, when closed but not locked, remain substantially closed during the launch take-off phase of the sailplane.

CS 22.723 Shock absorption test

The proof of sufficient shock absorption capacity must be determined by test. The landing gear must be able to absorb ~~1.44~~ 1.50 times the energy described in CS 22.473 without failure although it may yield during the test.

CS 22.725 Level landing

(a) The shock absorbing elements (including tyres) must be capable of absorbing the kinetic energy developed in a landing without being fully depressed.

(b) The value of kinetic energy must be determined under the assumption that the weight of the sailplane corresponds to the design maximum weight with a constant rate of descent equalling the value given in CS 22.473(b) and the wing lift balancing the weight of the sailplane.

(c) Under the assumption of (b), the c.g. acceleration must not exceed ~~4.5~~ 4.0 g.

AMC 22.777(b) Cockpit controls

Special consideration should be given to ensuring that cable release mechanisms can be operated at any stage of the launch without restricting the range of movement of any flying control, including when the pilot has the hand on the release during the launch.

SUBPART G — OPERATING LIMITATIONS AND INFORMATION

AMC 22.1581 Flight manual

General

The flight manual is not intended to teach good airmanship. The flight manual supplies information about the specific characteristics of the sailplane type. The reader of the flight manual is not a professional pilot; therefore, information should be presented clearly and condensed. Thus, the properties that stem from the specifications of Subpart C and, therefore, are general characteristics of gliders, are not described, except if listed within the paragraphs of the section 'Flight Manual' of Subpart G.

An acceptable format for a Flight Manual is given on the next pages.

[...]

CS 22.1583 Operating limitations

[...]

(e) *Flight load factors.* Manoeuvring load factors; the following must be furnished:

(1) The factors corresponding to point A and point G of Figure 1 of CS 22.333(b), stated to be applicable at V_A;

(2) The factors corresponding to point D and point E of Figure 1~~,~~ of CS 22.333(b), stated to be applicable at V_{NE}.

(3) The factor with air brakes ~~airbrakes~~ extended as specified in CS 22.345.

(4) The factor with wing flaps ~~wing-flaps~~ extended as specified in CS 22.345.

(5) Markings in accordance with CS 22.1548.

(6) The reduction of load factors with ailerons deflected as used for demonstration of CS 22.349.

(7) A statement that full manoeuvring loads are considered without gust loads, and full gust loads are only considered without manoeuvring loads.

[…]

CS 22.1585 Operating data and procedures

[…]

(o) In connection with high-speed flight, and, if applicable, the following cautions must be given:

(1) Exceed the rough-air speed only in calm air (yellow arc of airspeed indicator).

(2) Above the manoeuvring speed (the yellow arc of the airspeed indicator), full control deflections must not be applied. At V_{NE} (red radial line), only one third of the full travel is permissible.

(3) In the yellow range, air brakes may only be operated under g-loads between –1.5 g and +3.5 g.

(4) Reference to Section 2.9 'Manoeuvring load factors' (in the case of the specimen flight manual), or whichever section in the actual manual, conditions of reduced manoeuvring load must be provided.

AMC 22.1585 Operating data and procedures

(1) A statement should be included if the sailplane is not, or is not in all configurations, approved for intentional spins. If applicable, the influence of water ballast should be taken into account.

(2) Spiral dive characteristics, including how to distinguish a spin dive from a spin, and the recommended recovery procedure should be provided.

If the use of air brakes reduces the permissible load factors as specified in CS 22.345, this should be pointed out, and consequently a recommendation should be given to not use the air brakes on recovery from a spiral dive.

The influence of water ballast should be taken into account.