SECTION 2 - ACCEPTABLE MEANS OF COMPLIANCE AND INTERPRETATIONS (ACJ)

1 *GENERAL*

1.1 This Section contains Acceptable Means of Compliance and Interpretative Material that has been agreed for inclusion into JAR-VLA.

2 *PRESENTATION*

2.1 The Acceptable Means of Compliance and Interpretative Material are presented in full page width on loose pages, each page being identified by the date of issue or the Change number under which it is amended or reissued.

2.2 A numbering system has been used in which the Acceptable Means of Compliance or Interpretative Material uses the same number as the paragraph in JAR to which it is related. The number is introduced by the letters ACJ (Advisory Circular - Joint) to distinguish the material from the JAR.

2.3 The nature of the advisory material is indicated immediately following the heading and for this purpose the two types of material are defined as follows:

Interpretative Material helps to illustrate the meaning of a requirement.

Acceptable Means of Compliance illustrate a means, but not the only means, by which a requirement can be met.

2.4 Explanatory Notes not forming part of the ACJ text appear in a smaller typeface.

2.5 New, amended or corrected text is enclosed within heavy brackets.

INTENTIONALLY LEFT BLANK

ACJ VLA 1
Applicability (Interpretative Material)
See JAR-VLA 1

This JAR-VLA is considered to be applicable to conventional aeroplanes. Some specific, non conventional designs such as canards, tandem wings, winglets, may need additional requirements.

ACJ VLA 21 (c)
Proof of Compliance (Interpretative Material)
See JAR-VLA 21 (c)

Whenever used, the sentence 'may not require exceptional piloting skill' should be interpreted to mean that it is no more than the skill expected from an average pilot.

ACJ VLA 21 (d)
Proof of Compliance (Acceptable Means of Compliance
See JAR-VLA 21 (d)

1 Performance and flight characteristics related to stalling speed, take-off , and climb should be investigated with a wet profile.

2 Although the performance may exceed the limits specified in JAR-VLA 45, JAR-VLA 51, JAR-VLA 65, (dry conditions), the variations from those achieved in dry conditions should not exceed 5 kt for VS0, 50 m for take-off distance, 0.5 m/s (100 ft per min.) for rate of climb.

3 The test conditions should be such that the profile must remain wet throughout all of the test.

ACJ VLA 23
Load Distribution Limits (Interpretative Material)
See JAR-VLA 23

1 The centre of gravity range within which the aeroplane may be operated safely without the use of removable ballast should not be less than that which corresponds to -

a. An occupant weight of 55 kg to 86 kg for single-seat aeroplanes.

b. An occupant weight of 55 kg to 172 kg for two-seat aeroplanes.

2 In each case the safe c.g. range should permit operation with a fuel load ranging from the lower limit of usable fuel up to fuel sufficient for one hour of operation at rated maximum continuous power.

ACJ VLA 45
Performance, General (Acceptable Means of Compliance)
See JAR-VLA 45

1 The performance tests may be conducted in a non-standard atmosphere, not at sea level, and in non-still air. This requires testing procedures and data reduction methods that reduce the data to still air and standard sea level atmospheric conditions, where the performance must be met.

2 Data reduction should include corrections for engine power.

(NPA-VLA-1)
ACJ VLA 1(a)
Insert a new ACJ VLA 1(a) as follows:-

[ACJ VLA 1(a)
Applicability (Interpretative Material)
See JAR-VLA 1(a)

JAR-VLA is not applicable to such aeroplanes classified as ultralights or microlights. The definition of ultralights or microlights differs from country to country.

However, they could 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 ratio, maximum take-off weight, maximum empty weight, fuel quantity, number of seats.

In addition, these aeroplanes are usually not type-certificated and JAR-VLA prescribes minimum standards for the issue of type certificates. The latter interpretation could also be made for aeroplanes having restricted certificates of airworthiness; JAR-VLA is not applicable to such aeroplanes.]

(NPA-VLA-1)
ACJ VLA 1(b)
Re-number the existing ACJ VLA 1 as ACJ VLA 1(b), as follows:-

[ACJ VLA 1(b)]
Applicability (Interpretative Material)
[See JAR-VLA 1(b)]

This JAR-VLA is considered to be applicable to conventional aeroplanes. Some specific, non-conventional designs such as canards, tandem wings, winglets, may need additional requirements.

ACJ VLA 173 and ACJ VLA 175
Static Longitudinal Stability (Interpretative Material)
See JAR-VLA 173 and 175

Instrumented stick force measurements should be made unless -

a. Changes in speed are clearly reflected by changes in stick forces; and

b. The maximum forces obtained under JAR-VLA 173 and 175 are not excessive.

ACJ VLA 201
Wings Level Stall (Interpretative Material)
See JAR-VLA 201

Yawing angles up to 5° should not appreciably change the stalling characteristics.

ACJ VLA 301 (d)
Loads (Interpretative Material)
See JAR-VLA 301 (d)

A conventional configuration may be taken as an aeroplane with -

a. A forward wing with an aft cruciform tail unit substantially separated in the fore and aft sense from the wing; and

b. Whose lifting surfaces are either untapered or have essentially continuous taper with no more than 30° fore or aft sweep at the quarter chord line and equipped with trailing edge controls. Trailing edge flaps may be fitted.

NOTE: Configurations for which specific investigation is required include -

(i) Canard, tandem-wing, close-coupled or tailless arrangements of the lifting surfaces;

(ii) Cantilever bi-planes or multiplanes;

(iii) T-tail or V-tail arrangements;

(iv) Highly swept (more than 30° at quarter chord), delta or slatted lifting surfaces;

(v) Winglets or other tip devices, including outboard fins.

ACJ VLA 307 (a)
Proof of Structure (Interpretative Material)
See JAR-VLA 307 (a)

1 Substantiating load tests made in accordance with JAR-VLA 307 (a) should normally be taken to ultimate design load.

2 The results obtained from strength tests should be so corrected for departures from the mechanical properties and dimensions assumed in the design calculations as to establish that the possibility of any structure having a strength less than the design value, owing to material and dimensional variation, is extremely remote.

ACJ VLA 405
Secondary Control System (Interpretative Material)
See JAR-VLA 405

Single hand or foot loads assumed for design should not be less than the following:

a. Hand loads on small hand-wheels, cranks, etc, applied by finger or wrist-force: P = 15 daN.

b. Hand loads on levers and hand-wheels applied by the force of an unsupported arm without making use of the body weight: P = 35 daN.

c. Hand loads on levers and hand-grips applied by the force of a supported arm or by making use of the body weight: P = 60 daN.

d. Foot loads applied by the pilot when sitting with his back supported (e.g. toe-brake operating loads): P = 75 daN.

ACJ VLA 441
Manoeuvring Loads (Interpretative Material and Acceptable Means of Compliance)
See JAR-VLA 441

For aeroplanes 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 roll-moments induced by the horizontal tail acting in the same direction.

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

$$Mr = 0{\cdot}3\ St \frac{\rho o}{2} BV^2 bh$$

where –

Mr = induced roll-moment at horizontal tail (Nm)

bH = span of horizontal tail (m)

ß = angle of zerolift line due to rudder deflection

$ß = \frac{dL}{d\eta}\ \eta\, f\eta$

η = rudder deflection

$\frac{dL}{d\eta}$ = change of zerolift angle of $\eta f\eta = 1$

$f\eta$ = effectivity factor in accordance with angle of rudder deflection

V = speed of flight (m/s)

St = area of horizontal tail (m^2)

ρo = air density at sea level (kg/m^3)

ACJ VLA 443
Gust Loads (Interpretative Material and Acceptable Means of Compliance)
See JAR-VLA 443

1 For aeroplanes 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 roll-moments induced by the horizontal tail acting in the same direction.

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

$$Mr = 0{\cdot}3\ St \frac{\rho o}{2} VUbH\ K$$

where –

Mr = induced roll-moment at horizontal tail (Nm)

K = gust factor = 1.2

bH = span of horizontal tail (m)

St = area of horizontal tail (m^2)

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

V = speed of flight (m/s)

U = gust speed (m/s)

ACJ VLA 479(b)
Level Landing Conditions (Acceptable Means of Compliance)
See JAR-VLA 479 (b)

'Properly combined' may be defined by a rational analysis or as follows:

a. Max spin-up condition -

Pz = 0.6 Pz max; Px = -0.5 Pz max.

b. Max spring back condition -

Pz = 0.8 Pz max; Px = 0.5 Pz max.

c. Max vertical load condition -

Pz = Pz max; Px = ±0.3 Pz max.

where –

Px = horizontal component of ground reaction

Pz = vertical component of ground reaction.

ACJ VLA 572 (a)
Parts of Structure Critical to Safety (Interpretative Material)
See JAR-VLA 572 (a)

At least the wing main spar, the horizontal tail and their attachments to the fuselage should be investigated to determine whether or not their stress levels exceed the values given in the table in ACJ VLA 572 (b).

ACJ VLA 572 (b)
Parts of Structure Critical to Safety (Interpretative Material and Acceptable Means of Compliance)
See JAR-VLA 572 (b)

1 The use of the following stress levels may be taken as sufficient evidence, in conjunction with good design practices to eliminate stress concentrations, that structural items have adequate safe lives:

Material used	Allowable normal stress level of maximum limit load
– Glass rovings in epoxy resin	25 daN/mm^2
– Carbon fibre rovings in epoxy resin	40 daN/mm^2
– Wood	According to ANC-18*
– Aluminum Alloy	Half of rupture tensile strength
– Steel Alloy	Half of rupture tensile strength

2 Higher stress levels need further fatigue investigation using one or a combination of the following methods:

a. By a fatigue test, based on a realistic operating spectrum.

b. By a fatigue calculation using strength values which have been proved to be sufficient by fatigue tests of specimens or components.

*ANC-18 is the ANC Bulletin 'Design of wood aircraft structures'; issued June 1944 by the Army-Navy-Civil Committee on Aircraft Design Criteria (USA).

ACJ VLA 613 (b)
Material Strength Properties and Design Values (Interpretative Material)
See JAR-VLA 613(b)

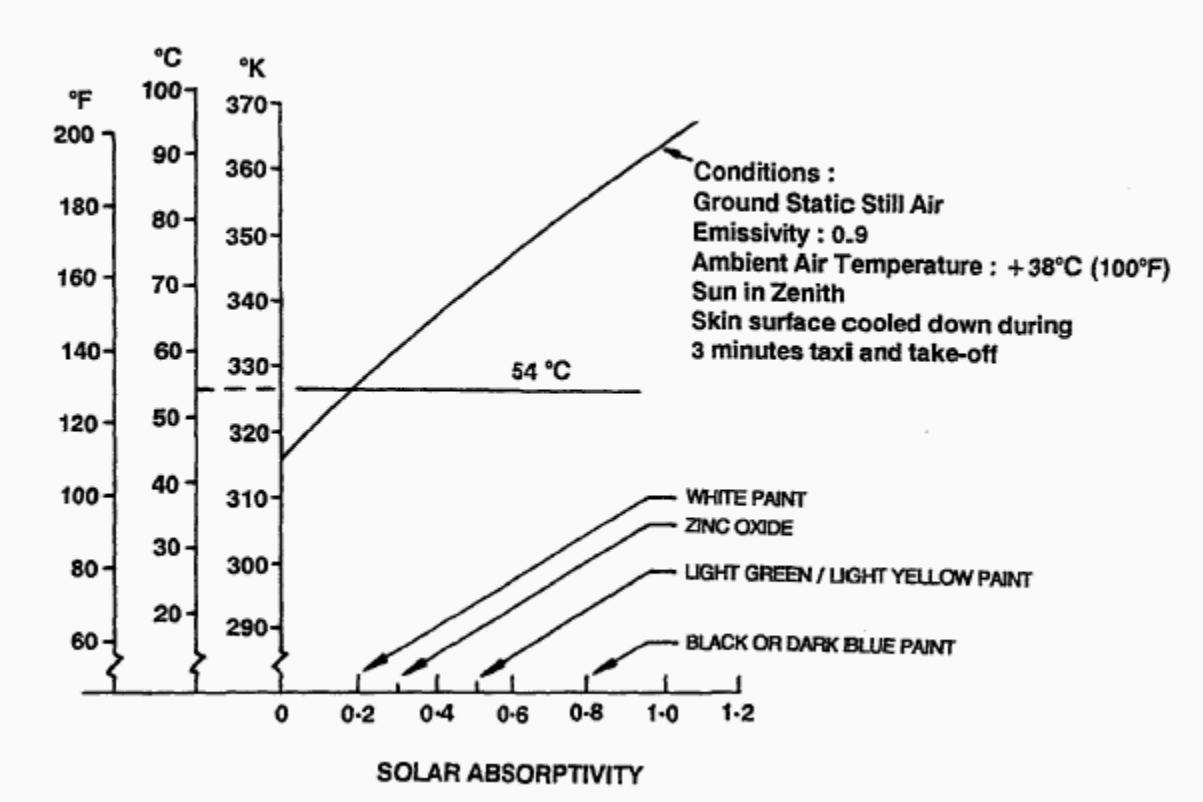
Material specifications should be those contained in documents accepted either specifically by the Authority or by having been prepared by an organisation or person which the Authority accepts has the necessary capabilities. In defining design properties these material specification values should be modified and/or extended as necessary by the constructor to take account of manufacturing practices (for example method of construction, forming, machining and subsequent heat treatment).

ACJ VLA 613 (c)
Material Strength Properties and Design Values (Acceptable Means of Compliance)
See JAR-VLA 613(c)

Test Temperature -

a. For white painted surface and vertical sunlight: 54°C. If the test cannot be performed at this temperature an additional factor of 1.25 should be used.

b. For other coloured surfaces the curve below may be used to determine the test temperature.



Curve based on: NASA Conference Publication 2036
NASA Contractor Report 3290

ACJ VLA 615
Design Properties (Acceptable Means of Compliance)
See JAR-VLA 615

When the manufacturer is unable to provide satisfactory statistical justification for A and B values, especially in the case of manufacturing of composite materials, a safety super factor should be applied to ensure that A and B values are met.

ACJ VLA 619
Special Factors (Acceptable Means of Compliance)
See JAR-VLA 619

For the substantiation of composite structures, unless more rational means are agreed by the Authority, one of the following may be used:

a. An additional factor of 1.2 for moisture conditioned specimen tested at maximum service temperature, providing that a well established manufacturing and quality control procedure is used.

b. An additional factor of 1.5 for specimen tested with no specific allowance for moisture and temperature.

NOTES: 1 For cold cured structures it may be assumed that the completed structure is fully moisture conditioned.

2 The factor in a. above may be varied based on the coefficient of variation that the manufacturer is able to show for this product. (See Table 1.)

TABLE 1

Coefficient of Variation %	Test Factor
5	1·00
6	1·03
7	1·06
8	1·10
9	1·12
10	1·15
12	1·22
14	1·30
15	1·33
20	1·55

Definition: Coefficient of Variation

For a population with mean M and standard deviation s, the coefficient of variation, Cv, is defined by-

$$Cv = \delta/M$$

The coefficient of variation is frequently expressed as a percentage, in which case

$$Cv\ (\%) = 100\ \delta/M$$

Additional Advisory Material:

When the population coefficient of variation is estimated from tests of critical structural features, the results from tests of at least 6 specimens should be used.

The sample coefficient of variation should be adjusted to obtain a 95% confidence estimate of the population coefficient of variation which may be used in Table 1.

In the absence of a more rational method, this may be done by multiplying the sample coefficient of variation by a Factor F, defined by -

$$F = \frac{1 + Up\left\{\frac{1}{2f}\left(1 - \frac{c^2Up^2}{n}\right) + \frac{c^2}{n}\right\}^{\frac{1}{2}}}{1 - \frac{c^2Up^2}{n}}$$

where -

Up is the standardised normal variate corresponding to the confidence level being used (for 95% confidence, Up = 1.6452)

n is the number of specimens in the Sample

f is the number of statistical degree of freedom [=(n-1)]

c is the population coefficient of variation. The value of the factor F is relatively insensitive to the value of c used - in the absence of more rational data, a value of 0.2 should be used.

ACJ VLA 773
Pilot Compartment View (Acceptable Means of Compliance)
See JAR-VLA 773

Compliance with JAR-VLA 773 may be provided by the canopy having a suitable opening.

ACJ VLA 775 (a)
Windshields and Windows (Acceptable Means of Compliance)
See JAR-VLA 775 (a)

Windshields and windows made of synthetic resins are accepted as complying with this requirement.

ACJ VLA 777
Cockpit Controls (Interpretative Material)
See JAR-VLA 777

The pilot should not need to change the hand operating the primary controls in order to operate a secondary control during critical stages of the flight (e.g. during take-off and landing).

ACJ VLA 785 (e)
Seats, Safety Belts and Harnesses (Acceptable Means of Compliance)
See JAR-VLA 785 (e)

Installation of shoulder harness. Figures 1(a), 1(b) and 1(c) show the recommended installation geometry for this type of restraint.

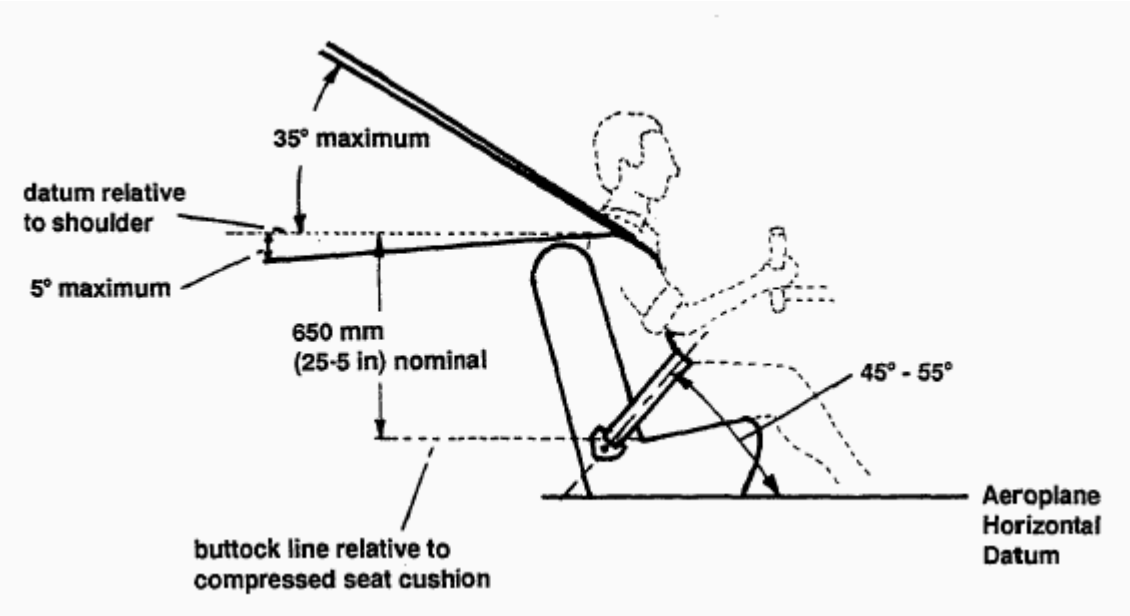


FIGURE 1(a)

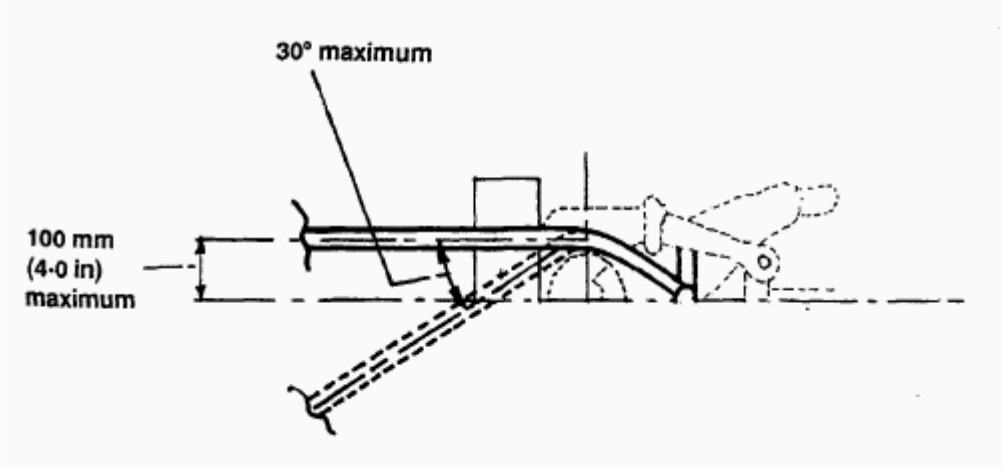


FIGURE 1(b)

RANGE OF ANGLES OF SHOULDER STRAPS

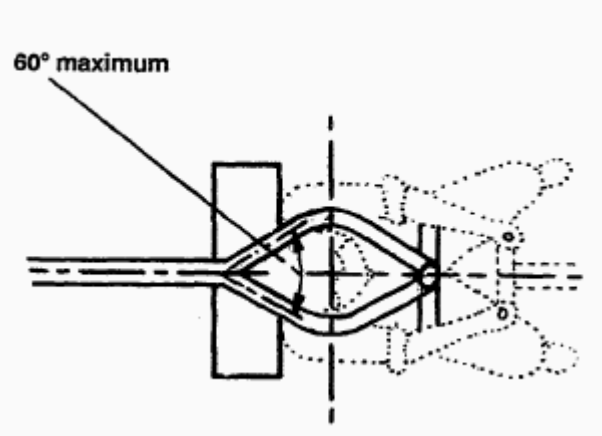


FIGURE 1(c)

NOTES:
1 Where possible it is recommended that a negative g or crotch strap is fitted, otherwise during abrupt decelerations the shoulder straps tend to raise the belt portion (unless tightly adjusted) from around the hips onto the stomach, thus allowing the wearer to slide underneath the lap portion of the belt.
2 Where there is more than 152 mm (6 in) of webbing between the attachment point of the shoulder straps, and the lop of the seat back, suitable means should be provided to limit sideways movement e.g. guide loops, in order to ensure compliance with JAR-VLA 785 (e) and to ensure adequate separation of shoulder straps to minimise injury or chafing of the wearer's neck.
3 Where the seat back is of adequate strength and such height that the harness geometry relative to the shoulder conforms with Figure 1(a) (i.e. 650 mm (25.5 in)), it is permissible to attach the shoulder straps to the seat back or via guide loops to the aeroplane floor.
4 Where the seat back is of adequate strength the use of means, e.g. guide loop of suitable strength, will limit sideways movement during the emergency alighting accelerations of JAR-VLA 561 (b)(2).

Safety belt with one diagonal shoulder strap (ODS Safety Belt). Figures 2(a) and 2(b) show the recommended installation geometry for this type of restraint.

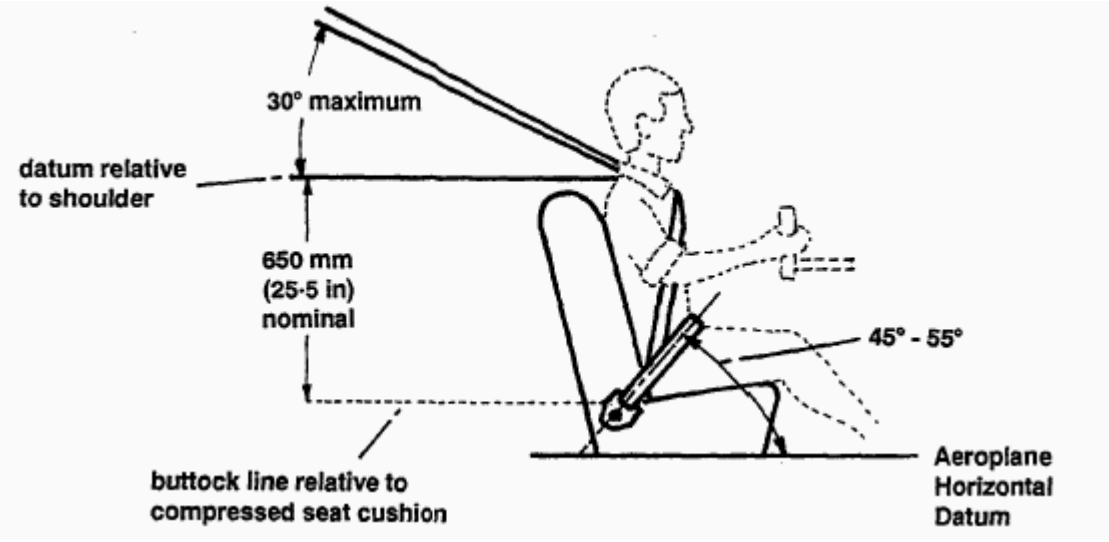


FIGURE 2(a)

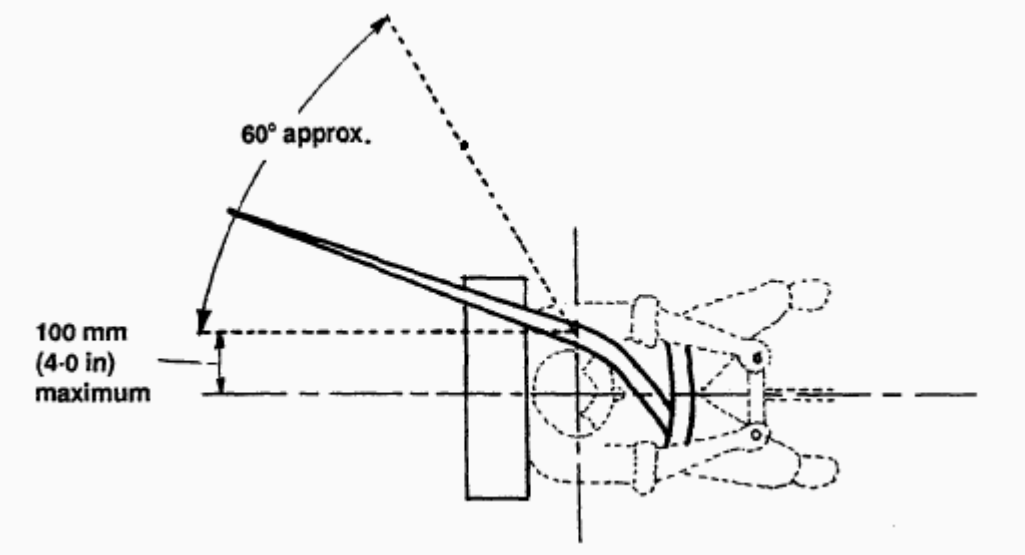


FIGURE 2(b)

NOTES:
1. The total length of the diagonal shoulder strap should be kept as short as possible in order to reduce the effect of webbing stretch under the emergency alighting loads.
2. Where the seat back is of adequate strength and such height that the harness geometry relative to the shoulder conforms with the Figure 2(a) (i.e. 650 mm (25.5 in)), it is permissible to attach the shoulder strap to the seat back or via guide loops to the aeroplane floor.
3. The installation should be such as to minimise the risk of injury or chafing of the wearer's neck, a guide loop may assist in achieving this.

ACJ VLA 903 (a)
Engine Type Certificate (Acceptable Means of Compliance)
See JAR-VLA 903 (a)

The engine may be type certificated under JAR-E, JAR-22 Subpart H, or FAR Part 33.

ACJ VLA 905 (a)
Propellers (Acceptable Means of Compliance)
See JAR-VLA 905 (a)

The propeller may be type certificated or otherwise approved under JAR-P, JAR-22 Subpart J, or FAR Part 35.

ACJ VLA 943
Negative Acceleration (Acceptable Means of Compliance)
See JAR-VLA 943

Compliance with JAR-VLA 943 may be shown by submitting the aeroplane to such period of negative acceleration that is within the capability of the aeroplane, but not less than -

a. One continuous period of 2 seconds at less than zero 'g'; and separately,

b. At least two excursions to less than zero 'g' in rapid succession in which the total time at less than zero 'g' is at least 2 seconds.

ACJ VLA 1011 (c)
Oil System, General (Interpretative Material)
See JAR-VLA 1011 (c)

In assessing the reliance that can be placed upon the means for providing the appropriate fuel/oil mixture to the engine to prevent a hazardous condition, account should be taken of, for example -

a. The tolerance of the engine to fuel/oil mixture ratios other than the optimum;

b. The procedure established for refuelling and introducing the appropriate amount of oil; and

c. The means by which the pilot may check that the fuel contains an adequate mixture of oil.

ACJ VLA 1105 (b)
Induction System Screens (Acceptable Means of Compliance)
See JAR-VLA 1105 (b)

The de-icing of the screen may be provided by heated air.

ACJ VLA 1305 (a)
Powerplant Instruments (Interpretative Material)
See JAR-VLA 1305(a)

A single indicator is acceptable for each group of interconnected tanks functioning as a single tank, such that individual tanks cannot be isolated.

ACJ VLA 1436
Hydraulic Manually-Powered Brake Systems (Interpretative Material)
See JAR-VLA 1436

For hydraulic systems other than manually-powered brake systems the requirement of FAR 23.1435 should be applied.

ACJ VLA 1587 (a)(4)
Performance Information (Interpretative Material)
See JAR-VLA 1587(a)(4)

The variation in aerodrome altitude to be covered need not exceed from sea level to the smaller of 2438 m (8000 ft), and the altitude at which a steady rate of climb of 1.02 m/s (200 ft per min.) may be achieved. The temperature variations to be covered at each altitude need not exceed 33°C below standard to 22°C above standard.

22 October 1991

JOINT AVIATION REQUIREMENTS

JAR-VLA

AMENDMENT VLA/91/1

The requirements and other material contained in this Orange Paper Amendment VLA/91/1 have been accepted by the Joint Aviation Authorities Committee for inclusion in JAR-VLA and become effective on the date printed on these sheets.

Amendment VLA/91/1 consists of the following:-

Correction to JAR-VLA 473(b)

This Amendment VLA/91/1 will be incorporated in Change 1 of JAR-VLA at a future date.

Each of the pages of this Amendment have been given a number prefixed by "(OP)" denoting "Orange Paper". The orange pages should be inserted between the text pages of JAR-VLA in the position indicated below but the pages in JAR-VLA bearing the corresponding numbers should not be removed.

The orange pages to be inserted into JAR-VLA (at first issue status) are:-

(OP) 1-C-10/1-C-11 between pages 1-C-10 and 1-C-11

JOINT AVIATION REQUIREMENTS 1 January 1992

JAR-VLA

AMENDMENT VLA/92/1

The requirements and other material contained in this Orange Paper Amendment VLA/92/1 have been accepted by the Joint Aviation Authorities Committee for inclusion in JAR-VLA and become effective on the date printed on these sheets.

Amendment VLA/92/1 consists of the following:-

Revision to the third paragraph and the addition of a list of countries on page ii

NPA-VLA-1

This Amendment VLA/92/1 will be incorporated in Change 1 of JAR-VLA at a future date.

Each of the pages of this Amendment has been given a number prefixed by "(OP)", denoting "Orange Paper". The orange pages should be inserted between the text pages of JAR-VLA in the positions indicated below, but the pages in JAR-VLA bearing the corresponding numbers should not be removed.

If an Orange Paper Amendment page is inserted where there already exists an orange page from the present or previous current Orange Paper Amendment, all orange pages bearing the same (OP) page number are applicable.

The orange pages to be inserted into JAR-VLA are:-

(OP) ii/C-1	between pages ii and C-1
(OP) 1-0-2/1-A-1	between pages 1-0-2 and 1-A-1
(OP) 2-0-2/2-1	between pages 2-0-2 and 2-1

Note:

At the back of this Orange Paper Amendment will be found a summary of responses to the various comments that were made on the NPA during the consultation period. This information is intended to help the reader to understand how the final text has been developed.

It is suggested that this page be filed at the back of JAR-VLA.