

# **Special Condition on Airworthiness Standards for CS-VLA Aeroplanes to be operated according to IFR**

## **Introductory Note:**

The hereby presented Special condition has been classified as an important Special Condition and as such shall be subject to public consultation, in accordance with EASA Management Board Decision 12/2007 dated 11 September 2007, Article 3 (2.), which states:

*"Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."*

## **Statement of Issue:**

The applicability of CS-VLA is limited to VFR-day operation only. This Special Condition establishes additional requirements in order to enlarge the scope of operation to IFR in accordance with 21A.16B.

## **Justification:**

Increasing the CS-VLA applicability will provide more flexibility for VLA design and operational possibilities. This is in line with the current technical developments of VLA. The range of aeroplanes certified to CS-VLA will increase, and therefore the boundary between CS-VLA and CS-23 will shift. The increase of the applicability to VFR-night has been already done with no negative safety record and acknowledged benefits on the market. The increase also to IFR is expected to provide a further development. Aircraft already certified for VFR day or night operation will have the potential to extend their type of operations to IFR via a major change to the type design.

The reference for this special condition is the basic CS-VLA code amendment 1. Aircraft certified for DAY-VFR operation will have to apply this special condition in its full content. Aircraft certified for night-VFR operation which meet the standards set by the existing special condition SC-VFR Night VLA 01, may take some credit of the already shown compliance. This shall be assessed at individual project level.

For this certification activity compliance with the applicable CS-23 paragraphs (especially flight stability and equipment) must be demonstrated. CS-23 amendment 3 has been used as reference for the applicable requirements. It is expected that such a compliance demonstration can be performed for modern VLA aeroplanes. However, the lightning protection needs special consideration because major parts of the aircraft structure often do not include conductive material. Should the applicant aim to have a lightning protection (for structure integrity, fuel systems and electric/electronic systems), the current standards used for CS-23 shall be used. Depending on the design of the aeroplane, testing is normally needed and the currently used special conditions would be needed (e.g. this would be the case for composite structure and electronic equipment), The AMC 20-29 can be followed as guidance. As an alternative, a strategic and a tactical approach for lightning avoidance can be followed with provisions to avoid lightning conditions. The strategic approach consists of suitable limitations for flight planning to be included in the flight manual (supplement). This approach is supplemented by a tactical component: it requires specific warning devices for weather avoidance to be on board and operational. The methods to use them must be also described under limitations in the flight manual. This strategic/tactical approach is deemed to provide the level of safety intended for CS-VLA aeroplanes.

For aircraft that have been already approved for VFR (day or night), it might be necessary to reassess the compliance to some requirements considering the operating envelope of IFR.

Considering all the above, the following Special condition is proposed:

### **SPECIAL CONDITION (SC-OVLA-div03 issue1)**

#### **IFR operation for VLA**

“SCVLA.1:

Replace “This airworthiness code is applicable to aeroplanes with a single engine (spark- or compression-ignition) having not more than two seats, with a Maximum Certificated Take-off Weight of not more than 750 kg and a stalling speed in the landing configuration of not more than 83 km/h (45 knots)(CAS), to be approved for day-VFR only. (See AMC VLA 1).” by:

“This airworthiness code is applicable to aeroplanes with a single engine (spark- or compression-ignition) having not more than two seats, with a Maximum Certificated Take-off Weight of not more than 750 kg and a stalling speed in the landing configuration of not more than 83 km/h (45 knots)(CAS), to be approved for day and night VFR and IFR, in non-icing conditions”. (See AMC VLA 1.)”.

“SCVLA.181(c):

In addition to CS-VLA.181, the following applies:

(c) Any long period oscillation of the flight path (phugoid) must not be so unstable as to cause an unacceptable increase in pilot workload or otherwise endanger the aeroplane. When in the conditions of CS-VLA 175, the longitudinal control force required to maintain speeds differing from the trimmed speed by at least plus or minus 15% are suddenly released, the response of the aeroplane must not exhibit any dangerous characteristics nor be excessive in relation to the magnitude of the control force released (see SC AMC VLA 181 (c)).

“SC AMC VLA 181(c) :

The long period or phugoid oscillation is characteristically lightly damped, sometimes even unstable. Mild levels of instability are acceptable as long as they do not significantly interfere with normal piloting tasks such as trimming to a desired speed or holding altitude. Useful guidelines are that the oscillation should be near neutrally stable if the period is less than 15 sec., or, for motions with longer period, the time to double amplitude should be greater than 55 sec.”.

“SCVLA.773 :

Replace CS-VLA.773 by:

(a) Each pilot compartment must be:

(1) Arranged with sufficiently extensive clear and undistorted view to enable the pilot to safely taxi, take-off, approach, land and perform any manoeuvres within the operating limitations of the aeroplane.

(2) Free from glare and reflections that could interfere with the pilot's vision. Compliance must be shown in all operations for which certification is requested; and

(3) Designed so that each pilot is protected from the elements so that moderate rain conditions do not unduly impair the pilot's view of the flight path in normal flight and while landing.

(b) Each pilot compartment must have a means to either remove or prevent the formation of fog or frost on an area of the internal portion of the windshield and side windows sufficiently large to provide the view specified in sub-paragraph (a) (1). Compliance must be shown under all expected external and internal ambient operating conditions, unless it can be shown that the windshield and side windows can be easily cleared by the pilot without interruption of normal pilot duties.

“SC AMC VLA.773:

For aircraft to be certified for IFR it has to be shown that a safe landing can be demonstrated with IFR certified minimum visibility conditions. (Refer to Flight test guide para 23.773).

“SCVLA.807:

In addition to the requirements of CS-VLA.807, the following applies:  
Markings must be suitable for IFR, if this kind of operation is requested.

“SC AMC VLA 807:

Self-illuminating placards or signs are acceptable.

“SCVLA.867:

The risk of catastrophic effect of lightning shall be addressed by either (a,b,c) or (d):

- (a) The aeroplane must be protected against catastrophic effects from lightning.
- (b) For metallic components, compliance with sub-paragraph (a) may be shown by
  - (1) Bonding the components properly to the airframe; or
  - (2) Designing the components so that a strike will not endanger the aeroplane.
- (c) For non-metallic components, compliance with sub-paragraph (a) may be shown by
  - (1) Designing the components to minimize the effect of a strike; or
  - (2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the aeroplane.
- (d) By way of derogation from points (a) (b) and (c), as an alternative procedure, the following mitigation is acceptable:

The aeroplane is designed with provisions to avoid lightning conditions. These provisions consist of appropriate limitations in the AFM supplemented by marking and placard and suitable on board warning device for lightning avoidance. In this case the pilot shall be also made aware that the design of the aeroplane is not protected from the catastrophic effects of lightning strike.

“SCVLA.903:

In addition to CS-VLA.903, the following applies:

- (c) For IFR operations the Engine must meet the Specification of CS-E.

“SCVLA.905:

In addition to CS-VLA.905, the following applies:

- (c) For IFR operations the Propeller and the Control System must meet the Specification of CS-P.

“SCVLA.954:

The risk of catastrophic effect of lightning shall be addressed by either (a) or (b):

- (a) The fuel system must be designed and arranged to prevent the ignition of fuel vapour within the system by
  - (i) Direct lightning strikes to areas having a high probability of stroke attachment.
  - (ii) Swept lightning strokes on areas where swept strokes are highly probable; and
  - (iii) Corona or streamering at fuel vent outlets.

- (b) By way of derogation from point (a), as an alternative procedure, the following mitigation is acceptable:

The aeroplane is designed with provisions to avoid lightning conditions. These provisions consist of appropriate limitations in the AFM supplemented by marking and placard and suitable on board warning device for lightning avoidance. In this case the pilot shall be also made aware that the design of the aeroplane is not protected from the catastrophic effects of lightning strike.

“SCVLA.1091:

Replace “(b) Primary air intakes may open within the cowling if that part of the cowling is isolated from the engine accessory section by a fire-resistant diaphragm or if there are means to prevent the emergence of backfire flames.” by:

“(b) Each reciprocating engine installation must have at least two separate air intake sources and must meet the following:

(1) Primary air intakes may open within the cowling if that part of the cowling is isolated from the engine accessory section by a fire-resistant diaphragm or if there are means to prevent the emergence of backfire flames.

(2) Each alternate air intake must be located in a sheltered position and may not open within the cowling if the emergence of backfire flames will result in a hazard”.

(3) The supplying of air to the engine through the alternate air intake system may not result in a loss of excessive power in addition to the power loss due to the rise in air temperature.

(4) Each automatic alternate air door must have an override means accessible to the flight crew.

(5) Each automatic alternate air door must have a means to indicate to the flight crew when it is not closed.

“SCVLA.1107:

If an air filter is used to protect the engine against foreign material particles in the induction air supply:

(a) Each air filter must be capable of withstanding the effects of temperature extremes, rain, fuel, oil, and solvents to which it is expected to be exposed in service and maintenance; and

(b) Each air filter must have a design feature to prevent material separated from the filter media from re-entering the induction system and interfering with proper fuel metering operation.

“SCVLA.1121:

In addition to CS-VLA.1121, the following applies:

(g) No exhaust gases may be discharged where they will cause a glare seriously affecting the pilot's vision at night.

“SCVLA.1143:

In addition to CS-VLA.1143, the following applies :

(c), each power or thrust control must be designed so that if the control separates at the engine fuel metering device, the aeroplane is capable of continuing safe flight and landing.

“SC AMC VLA.1143(c):

When throttle linkage separation occurs, the fuel control should go to a setting that will allow the pilot to maintain level flight in the cruise configuration.

“SCVLA.1147:

In addition to CS-VLA.1147, the following applies :

The manual engine mixture control must be designed so that, if the control separates at the engine fuel metering device, the aeroplane is capable of continuing safe flight and landing.

“SC AMC VLA.1147:

When mixture linkage separation occurs, the mixture control should go to a full rich setting.

“SCVLA.1182:

In addition to CS-VLA.1182, the following applies:

Components lines and fittings subject to the provision of CS-VLA.1351 (e) are excepted.

“SCVLA.1303:

In addition to CS-VLA.1303, the following applies :

The following are required flight and navigation instruments:

..  
..

(d) When an attitude display is installed the instrument design must not provide any means, accessible to the flight crew, of adjusting the relative positions of the attitude reference symbol and the horizon line beyond that necessary for parallax correction.

“SCVLA.1305:

In addition to CS-VLA.1305, the following applies :

(b) In addition to the powerplant instruments required by sub-paragraph (a), the following powerplant instruments are required:

(1) An induction system air temperature indicator for engine equipped with a preheater and having induction air temperature limitations that can be exceeded with preheat.

(2) For turbocharger installation: If its oil system is separate from the engine oil system, oil pressure and oil temperature indicators must be provided.

“SCVLA.1309:

Replace CS-VLA.1309 by:

(a) Each item of equipment, each system, and each installation –

(1) When performing its intended function, may not adversely affect the response, operation, or accuracy of any –

(i) Equipment essential to safe operation; or

(ii) Other equipment unless there is a means to inform the pilot of the effect.

(2) In a single-engine aeroplane, must be designed to minimise hazards to the aeroplane in the event of a probable malfunction or failure.

(b) The design of each item of equipment, each system, and each installation must be examined separately and in relationship to other aeroplane systems and installations to determine if the aeroplane is dependent upon its function for continued safe flight and landing and, for aeroplanes not limited to VFR conditions, if failure of a system would significantly reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions. Each item of equipment, each system, and each installation identified by this examination as one upon which the aeroplane is dependent for proper functioning to ensure continued safe flight and landing, or whose failure would significantly reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions, must be designed to comply with the following additional requirements:

(1) It must perform its intended function under any foreseeable operating condition.

(2) When systems and associated components are considered separately and in relation to other systems

(i) The occurrence of any failure condition that would prevent the continued safe flight and landing of the aeroplane must be extremely improbable; and

(ii) The occurrence of any other failure condition that would significantly reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions must be improbable.

(3) Warning information must be provided to alert the crew to unsafe system operating conditions and to enable them to take appropriate corrective action. Systems, controls, and associated monitoring and warning means must be designed to minimize crew errors that could create additional hazards.

(4) Compliance with the requirements of sub-paragraph (b) (2) may be shown by analysis and, where necessary, by appropriate ground, flight, or simulator test. The analysis must consider –

(i) Possible modes of failure, including malfunctions and damage from external sources.

(ii) The probability of multiple failures, and the probability of undetected faults.

(iii) The resulting effects on the aeroplane and occupants, considering the stage of flight and operating conditions, and

(iv) The crew warning cues, corrective action required, and the crew's capability of determining faults.

(c) Each item of equipment, each system, and each installation whose functioning is required for certification and that requires a power supply, is an “essential load” on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations:

- 1) Loads connected to the power distribution system with the system functioning normally.
- 2) Essential loads after failure of any power converter or energy storage device.
- 3) Essential loads for which an alternate source of power is required by the operating rules, after any failure or malfunction in any one power supply system, distribution system, or other utilization system.

(d) In determining compliance with sub-paragraph (c) (2), the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operations authorised.

(e) In showing compliance with this paragraph with regard to the electrical power system and to equipment design and installation, critical environmental and atmospheric conditions, including radio frequency energy, and the effects (both direct and indirect) of lightning strikes, must be considered. For electrical generation, distribution, and utilisation equipment required by or used in complying with this subpart, the ability to provide continuous, safe service under foreseeable environmental conditions may be shown by environmental tests, design analysis, or reference to previous comparable service experience on other aeroplanes.

(f) As used in this paragraph, “systems” refers to all pneumatic systems, fluid systems, electrical systems, mechanical systems, and powerplant systems included in the aeroplane design, except for the following:

- (1) Powerplant systems provided as part of the certificated engine.
- (2) The flight structure (such as wing, empennage, control surfaces and their systems, the fuselage, engine mounting, and landing gear and their related primary attachments) whose requirements are specific in Subparts C and D of CS-VLA.

(g) for what concerns direct and indirect effects of lightning strikes, by way of derogation from point (e), as an alternative procedure, the following mitigation is acceptable:

The aeroplane is designed with provisions to avoid lightning conditions. These provisions consist of appropriate limitations in the AFM supplemented by marking and placard and suitable on board warning device for lightning avoidance. In this case the pilot shall be also made aware that the design of the aeroplane is not protected from the catastrophic effects of lightning strike.

“SC AMC VLA.1309 (e):

HIRF: The effects of HIRF environment on the equipment shall be evaluated. The guidance of AC 23.1309e can be followed. Depending on the criticality of the equipment, the material of the structure of the aeroplane and the protection/shielding of the electrical system, testing might be needed, in which case, the special condition used for CS-23 certification shall be applied.

“SCVLA.1311:

(a) Electronic display indicators, including those with features that make isolation and independence between powerplant instrument systems impractical, must

- (1) Meet the arrangement and visibility requirements of SC VLA 1321;

(2) Be easily legible under all lighting conditions encountered in the cockpit including direct sunlight, considering the expected electronic display brightness level at the end of an electronic display indicator’s useful life. Specific limitations on display system useful life must be addressed in the instructions for continued airworthiness requirements (CS-VLA.1529).

(3) Not inhibit the primary display of attitude, airspeed, altitude, or powerplant parameters needed by any pilot to set power within established limitations, in any normal mode of operation.

(4) Not inhibit the primary display of engine parameters needed by any pilot to properly set or monitor powerplant limitations during the engine starting mode of operation.

(5) Have an independent magnetic direction indicator and an independent secondary mechanical altimeter, airspeed indicator, magnetic direction indicator, and attitude instrument, or individual electronic display indicators for the altimeter, airspeed and attitude that are independent from the aeroplane’s primary electrical power system. These secondary instruments may be installed in panel positions that are displaced from the primary positions specified by SC VLA 1321 (c) but must be located where they meet the pilot’s visibility requirements of SC VLA 1321 (a).

(6) Incorporate sensory cues for the pilot that are equivalent to those in the instrument being replaced by the electronic display indicators; and

(7) Incorporate visual displays of instrument markings, required by SC VLA 1541 to SC VLA 1553, or visual displays that alert the pilot to abnormal operational values or approaches to established limitation values, for each parameter required to be displayed by CS-VLA.

(b) The electronic display indicators, including their systems and installations, and considering other aeroplane systems, must be designed so that one display of information essential for continued safe flight and landing will remain available to the crew, without need for immediate action by any pilot for continued safe operation, after any single failure or probable combination of failures.

(c) As used in this paragraph "instrument" includes devices that are physically contained in one unit, and devices that are composed of two or more physically separate units or components connected together (such as a remote indicating gyroscopic direction indicator that includes a magnetic sensing element, a gyroscopic unit, an amplifier, and an indicator connected together). As used in this paragraph "primary" display refers to the display of a parameter that is located in the instrument panel such that the pilot looks at it first when wanting to view that parameter unit, and devices that are composed of two or more physically separate units or components connected together (such as a remote indicating gyroscopic direction indicator that includes a magnetic sensing element, a gyroscopic unit, an amplifier, and an indicator connected together). As used in this paragraph "primary" display refers to the display of a parameter that is located in the instrument panel such that the pilot looks at it first when wanting to view that parameter.

"SCVLA.1321:

Replace CS-VLA.1321 by:

(a) Each flight, navigation and powerplant instrument for use by any required pilot during take-off, initial climb, final approach, and landing must be located so that any pilot seated at the controls can monitor the aeroplane's flight path and these instruments with minimum head and eye movement. The powerplant instruments for these flight conditions are those needed to set power within powerplant limitations.

(b) Instrument panel vibration may not damage, or impair the accuracy of, any instrument.

(c) For each aeroplane the flight instruments required by SC VLA.1303 and, as applicable, by the Operating Rules must be grouped on the instrument panel and centered as nearly as practicable about the vertical plane of the pilot's forward vision. In addition

(1) The instrument that most effectively indicates the attitude must be on the panel in the top center position.

(2) The instrument that most effectively indicates airspeed must be adjacent to and directly to the left of the instrument in the top center position.

(3) The instrument that most effectively indicates altitude must be adjacent to and directly to the right of the instrument in the top center position; and

(4) The instrument that most effectively indicates direction of flight, other than the magnetic direction indicator required by CS-VLA 1303 (c), must be adjacent to and directly below the instrument in the top center position.

(5) Electronic display indicators may be used for compliance with sub-paragraphs (c)(1) to (c)(4) when such displays comply with requirements in SC VLA.1311.

(d) If a visual indicator is provided to indicate malfunction of an instrument, it must be effective under all probable cockpit lighting conditions.

"SCVLA.1322:

In addition to CS-VLA.1322, the following applies:

(e) If warning, caution, or advisory lights are installed in the cockpit, they must be effective under all probable cockpit lighting conditions.

“SCVLA.1323:

Replace CS-VLA.1323 by:

(a) Each airspeed indicating instrument must be calibrated to indicate true airspeed (at sea-level with a standard atmosphere) with a minimum practicable instrument calibration error when the corresponding pitot and static pressures are applied.

(b) Each airspeed system must be calibrated in flight to determine the system error. The system error, including position error, but excluding the airspeed indicator instrument calibration error, may not exceed 3% of the calibrated airspeed or 9.3 km/h (5 knots), whichever is greater, throughout the following speed ranges:

- 1) 1.3 VS1 to VMO/MMO or VNE, whichever is appropriate with flaps retracted.
- 2) 1.3 VS1 to VFE with flaps extended.

(c) The design and installation of each airspeed indicating system must provide positive drainage of moisture from the pitot static plumbing.

(d) If certification for instrument flight rules is requested, each airspeed system must have a heated pitot tube or an equivalent means of preventing malfunction due to icing.

“SCVLA.1325:

Replace CS-VLA.1325 by:

(a) Each instrument provided with static pressure case connections must be so vented that the influence of aeroplane speed, the opening and closing of windows, airflow variations, moisture, or other foreign matter will least affect the accuracy of the instruments except as noted in sub-paragraph (b)(3).

(b) If a static pressure system is necessary for the functioning of instruments, systems, or devices, it must comply with the provisions of sub-paragraphs (1) to (3).

(1) The design and installation of a static pressure system must be such that

- (i) Positive drainage of moisture is provided.
- (ii) Chafing of the tubing and excessive distortion or restriction at bends in the tubing, is avoided, and
- (iii) The materials used are durable, suitable for the purpose intended and protected against corrosion.

(2) A proof test must be conducted to demonstrate the integrity of the static pressure system in the following manner:

Evacuate the static pressure system to a pressure differential of approximately 3.4 kPa (1 inch of mercury) or to a reading on the altimeter, 305 m (1 000 ft) above the aircraft elevation at the time of the test. Without additional pumping for a period of 1 minute, the loss of indicated altitude must not exceed 30 m (100 ft) on the altimeter.

(c) Except as provided in sub-paragraph (d), if the static pressure system incorporates both a primary and an alternate static pressure source, the means for selecting one or the other source must be designed so that

- (1) When either source is selected, the other is blocked off, and
- (2) Both sources cannot be blocked off simultaneously.

(d) Sub-paragraph (c) (1) does not apply if it can be demonstrated that the static pressure system calibration, when either static pressure source is selected, is not changed by the other static pressure source being open or blocked.

(e) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed  $\pm 9$  m ( $\pm 30$  ft) per 185 km/h (100 knot) speed for the appropriate configuration in the speed range between 1.3 VSO with flaps extended and 1.8 VS1 with flaps retracted. However, the error need not be less than  $\pm 9$  m ( $\pm 30$  ft).

“SCVLA.1326:

If a flight instrument pitot heating system is installed to meet the requirements specified in SC VLA 1323(d), an indication system must be provided to indicate to the flight crew when that pitot heating system is not operating. The indication system must comply with the following requirements:

- (a) The indication provided must incorporate an amber light that is in clear view of a flightcrew member.
- (b) The indication provided must be designed to alert the flight crew if either of the following conditions exists:
  - (1) The pitot heating system is switched “off”.
  - (2) The pitot heating system is switched “on” and any pitot tube heating element is inoperative.

“SCVLA.1327:

Replace CS-VLA.1327 by:

- (a) Except as provided in sub-paragraph (b):
  - (1) Each magnetic direction indicator must be installed so that its accuracy is not excessively affected by the aeroplane’s vibration or magnetic fields, and
  - (2) The compensated installation may not have a deviation, in level flight, greater than 10° on any heading.
- (b) A magnetic non-stabilized direction indicator may deviate more than 10° due to the operation of electrically powered systems such as electrically heated windshields if either a magnetic stabilized direction indicator, which does not have a deviation in level flight greater than 10° on any heading, or a gyroscopic direction indicator is installed. Deviations of a magnetic non-stabilized direction indicator of more than 10° must be placarded in accordance with SCVLA.1547 (c).

“SCVLA.1331:

Replace CS-VLA.1331 by:

For each instrument that uses a power source, the following applies:

- (a) Each instrument must have an integral visual power annunciator or separate power indicator to indicate when power is not adequate to sustain proper instrument performance. If a separate indicator is used, it must be located so that the pilot using the instruments can monitor the indicator with minimum head and eye movement. The power must be sensed at or near the point where it enters the instrument. For electric and vacuum/pressure instruments, the power is considered to be adequate when the voltage or the vacuum / pressure, respectively, is within approved limits.
- (b) The installation and power supply systems must be designed so that-
  - (1) The failure of one instrument will not interfere with the proper supply of energy to the remaining instrument, and
  - (2) The failure of the energy supply from one source will not interfere with the proper supply of energy from any other source.
- (c) There must be at least two independent sources of power, and a manual or an automatic means to select each power source.

“SCVLA.1337:

In addition to

CS-VLA.1337, the following applies:

- (b) Fuel quantity indicator. There must be a means to indicate to the pilot the quantity of fuel in each tank during flight. In addition
  - (5) No fuel quantity indicator is required for an auxiliary tank that is used only to transfer fuel to other tanks if the relative size of the tank, the rate of fuel transfer and operating instructions are adequate to
    - (i) Guard against overflow, and

- (ii) Give to the flight-crew members a prompt warning if transfer is not proceeding as planned.
- (6) There must be a means to indicate the amount of usable fuel in each tank when the aeroplane is on the ground (such as by a stick gauge).
- (d) Oil quantity indicator. There must be a means to indicate the quantity of oil in each tank in flight, if there is an oil transfer system or a reserve oil supply system.

“SCVLA.1351:

Replace CS-VLA.1351 by:

(a) Electrical system capacity. Each electrical system must be adequate for the intended use. In addition -

1) Electric power sources, their transmission cables, and their associated control and protective devices, must be able to furnish the required power at the proper voltage to each load circuit essential for safe operation, and

2) Compliance with sub-paragraph (a)(I) of this paragraph must be shown by an electrical load analysis, or by electrical measurements, that account for the electrical loads applied to the electrical system in probable combinations and for probable durations.

(b) Functions. For each electrical system, the following apply:

(1) Each system, when installed, must be

(i) Free from hazards in itself, in its method of operation, and in its effects on other parts of the aeroplane.

(ii) Protected from fuel, oil, water, other detrimental substances, and mechanical damage, and

(iii) So designed that the risk of electrical shock to occupants and ground personal is reduced to a minimum.

(2) Electric power sources must function properly when connected in combination or independently.

(3) No failure or malfunction of any electric power source may impair the ability of any remaining source to supply load circuits essential for safe operation.

(c) Generating system. There must be at least one generator/alternator if the electrical system supplies power to load circuits essential for safe operation. In addition

(1) Each generator/alternator must be able to deliver its continuous rated power; or such power as is limited by its regulation system.

(2) Generator/alternator voltage control equipment must be able to dependably regulate the generator output within rated limits.

(3) Automatic means must be provided to prevent either damage to any alternator/generator, or adverse effects on the aeroplane electrical system, due to reverse current. A means must also be provided to disconnect each generator/alternator from the battery and the other generators/alternators.

(4) There must be a means to give immediate warning to the pilot of a failure of any generator/alternator, and

(5) Each generator/alternator must have an overvoltage control designed and installed to prevent damage to the electrical system, or to equipment supplied by the electrical system, that could result if that generator/alternator were to develop an overvoltage condition.

(d) Instruments. A means must exist to indicate to the pilot the electric power system quantities essential for safe operation:

For direct current systems, an ammeter that can be switched into each generator feeder may be used and, if only one generator exists, the ammeter may be in the battery feeder.

(e) Fire resistance. Electrical equipment must be so designed and installed that in the event of a fire in the engine compartment, during which the surface of the firewall adjacent to the fire is heated to 1100°C for 5 minutes or to a lesser temperature substantiated by the applicant, the equipment essential to continued safe operation and located behind the firewall will function satisfactorily and will not create an additional fire hazard. This may be shown by test or analysis.

(f) External power. If provisions are made for connecting external power to the aeroplane, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, or a reverse phase sequence, can supply power to the aeroplane's electrical system. The external power connection must be located so that its use will not result in a hazard to the aeroplane or ground personnel.

(g) It must be shown by analysis, tests or both, that the aeroplane can be operated safely in VFR conditions, for a period of not less than five minutes, with the normal electrical power (electrical power sources excluding the battery and any other stand-by electrical sources) inoperative, with critical type fuel (from the standpoint of and restart capability), and with the aeroplane initially at the maximum certificated altitude. Parts of the electrical system may remain on if:

(1) A single malfunction, including a wire bundle or junction box fire, cannot result in loss of the part turned off and the part turned on, and

(2) The parts turned on are electrically and mechanically isolated from the parts turned off.

AMC SC VLA 1351(a)(2).

If compliance is shown by electrical measurements, the procedures should include sufficient testing to show that the electrical systems meet the requirements of SC VLA.1351. When laboratory tests of the electrical system are conducted

(1) The tests may be performed on a mock-up using the same generating equipment used in the aeroplane.

(2) The equipment should simulate the electrical characteristics of the distribution wiring and connected loads to the extent necessary for rated test results, and

(3) Laboratory generator drives should simulate the actual prime movers on the aeroplane with respect to their reaction to generator loading, including loading due to faults.

“SCVLA.1353:

In addition to CS-VLA.1353, the following applies :

In the event of a complete loss of the primary electrical power generating system, the battery must be capable of providing 30 minutes of electrical power to those loads that are essential to continued safe flight and landing. The 30-minute time period includes the time needed for the pilot(s) to recognise the loss of generated power and to take appropriate load shedding action.

“SCVLA.1359:

(a) Components of the electrical system must meet the applicable fire protection requirements of SCVLA.1182 and CS-VLA.863.

(b) Electrical cables, terminals and equipment in designated fire zones, which are used during emergency procedures, must be fire-resistant.

(c) Insulation on electrical wire and cable must be self-extinguishing when tested at an angle of 60° in accordance with the applicable portions of Appendix F of CS-23 or other approved equivalent methods. The average burn length must not exceed 76 mm (3 in) and the average flame time after removal of the flame source must not exceed 30 seconds. Drippings from the test specimen must not continue to flame for more than an average of 3 seconds after falling.

“SCVLA.1361:

Replace CS-VLA.1361 by:

(a) There must be a master switch arrangement to allow ready disconnection of each electric power source from the power distribution systems, except as provided in sub-paragraph (b). The point of disconnection must be adjacent to the sources controlled by the switch arrangement. A separate switch may be incorporated into the arrangement for each separate power source provided the switch arrangement can be operated by one hand with a single movement.

(b) Load circuits may be connected so that they remain energized when the master switch is open; if

(1) The circuits are isolated, or physically shielded, to prevent their igniting flammable fluids or vapours that might be liberated by the leakage or rupture of any flammable fluid systems, and

(2) The circuits are required for continued operation of the engine, or

(3) The circuits are protected by circuit protective devices with a rating of five amperes or less adjacent to the electric power source. In addition, two or more circuits installed in accordance with the requirements of sub-paragraph (b)(2) must not be used to supply a load of more than five amperes.

(c) The master switch or its controls must be so installed that the switch is easily discernible and accessible to a crew member.

“SCVLA.1365:

In addition to CS-VLA.1365, the following applies:

(c) Means of identification must be provided for electrical cables, connectors and terminal.

(d) Electrical cables must be installed such that the risk of mechanical damage and/or damage caused by fluids, vapours or sources of heat, is minimized.

(e) Main power cables (including generator cables) must be designed to allow a reasonable degree of deformation and stretching without failure and must

(1) Be separated from flammable fluid lines, or

(2) Be shrouded by means of electrically insulated flexible conduit or equivalent, which is in addition to the normal cable insulation.

(f) Where a cable cannot be protected by a circuit protection device or other overload protection it must not cause a fire hazard under fault conditions.

“SCVLA.1381:

The instrument lights must –

(a) Make each instrument and control easily readable and discernible;

(b) Be installed so that their direct rays, and rays reflected from the windshield or other surface, are shielded from the pilot’s eyes, and

(c) Have enough distance or insulating material between current carrying parts and the housing so that vibration in flight will not cause shorting.

A cabin dome light is not an instrument light.

“SCVLA.1383:

Each taxi and landing light must be designed and installed so that –

(a) No dangerous glare is visible to the pilots.

(b) The pilot is not seriously affected by halation.

(c) It provides enough light for night operations, and

(d) It does not cause a fire hazard in any configuration.

“SCVLA.1431:

Replace CS-VLA.1431 by:

(a) In showing compliance with SCVLA.1309(b)(1) and (2) with respect to radio and electronic equipment and their installations, critical environmental conditions must be considered.

(b) Radio and electronic equipment, controls, and wiring must be installed so that operation of any unit or system of units will not adversely affect the simultaneous operation of any other radio or electronic unit, or system of units.

(c) For those aeroplanes required to have more than one flight-crew member, or whose operation will require more than one flight-crew member, the cockpit must be evaluated to determine if the flight crew members, when seated at their duty station, can converse without difficulty under the actual cockpit noise conditions when the aeroplane is being operated. If the aeroplane design includes provisions for the use of communication headsets, the evaluation must also consider conditions where headsets are being used. If the evaluation shows conditions under which it will be difficult to converse, an intercommunication system must be provided.

(d) If installed, communication equipment incorporates transmitter “on-off” switching, that switching means must be designed to return from the “transmit” to the “off” position when it is released and ensure that the transmitter will return to the off (non-transmitting) state.

(e) If provisions for the use of communication headsets are provided, it must be demonstrated that the flight crew members will receive all aural warnings under the actual cockpit noise conditions when the aeroplane is being operated when any headset is being used.

“AMC SC VLA 1431(e):

For those installations where all warnings are not provided through the radio/audio equipment, consideration should be given to the pilot(s) ability to hear and recognize warnings when headsets are used, including noise cancelling headsets.

“SCVLA.1525:

Replace CS-VLA.1525 by:

The kinds of operation (such as VFR, IFR, day or night) to which the operation of the aeroplane is limited or from which it is prohibited, must be established appropriate to the installed equipment. In case the provisions for lightning avoidance (as defined in SCVLA.867(d), SCVLA.954(b) and SCVLA.1309(g)) are followed, these shall be appropriately defined in this section and in the limitation section of the AFM.

“SCVLA.1547:

In addition to CS-VLA.1547, the following applies :

(e) If a magnetic non-stabilized direction indicator can have a deviation of more than 10° caused by the operation of electrical equipment, the placard must state which electrical loads, or combination of loads, would cause a deviation of more than 10° when turned on.

“SCVLA.1553:

A red radial line must be marked on each indicator at the calibrated zero reading, as specified in SCVLA.1337 (b)(1).

“SCVLA.1559:

Replace “(b) A placard stating ‘This aeroplane is classified as a very light aeroplane approved for day VFR only, in non-icing conditions. All aerobatic manoeuvres including intentional spinning are prohibited. See Flight Manual for other limitations’.” by

“(b) A placard stating ‘This aeroplane is classified as a very light aeroplane (and that specifies the kind of operations to which the aeroplane is limited or from which it is prohibited under SCVLA.1525). All aerobatic manoeuvres including intentional spinning are prohibited. See Flight Manual for other limitations’.”

“SCVLA.1583:

Replace “(f) The kinds of operation (day VFR) in which the aeroplane may be used, must be stated. The minimum equipment required for the operation must be listed.” by

“(f) A list of the kinds of operation to which the aeroplane is limited or from which it is prohibited under SCVLA.1525, and also a list of installed equipment that affects any operating limitation and identification as to the equipment’s required operational status for the kinds of operation for which approval has been granted.”

“SCVLA.1585:

In addition to CS-VLA.1585, the following applies :

Information concerning normal and emergency procedures and other pertinent information necessary for safe operation must be furnished, including

..  
..

- (h) For each aeroplane showing compliance with CS-VLA 1353 (g)(2) or (g (3), the operating procedure fo disconnecting the battery from its charging source must be furnished.
- (i) Information on the total quantity of usable fuel for each fuel tank and the effect on the usable fuel quantity as a result of a failure of any pump must be furnished.
- (j) Procedures for the safe operation of the aeroplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.