CS 25.1721 Protection of EWIS

ED Decision 2008/006/R

(See AMC 25.1721)

(a) No cargo or baggage compartment may contain any EWIS whose damage or failure may affect safe operation, unless the EWIS is protected so that:

(1) It cannot be damaged by the movement of cargo or baggage in the compartment.

(2) Its breakage or failure will not create a fire hazard.

(b) EWIS must be designed and installed to minimise damage and risk of damage to EWIS by movement of people in the aeroplane during all phases of flight, maintenance, and servicing.

(c) EWIS must be designed and installed to minimise damage and risk of damage to EWIS by items carried onto the aeroplane by passengers or cabin crew.

[Amdt 25/5]

AMC 25.1721 Protection of EWIS

ED Decision 2008/006/R

1 The requirements of this paragraph are intended to prevent damage to EWIS by passengers, crew members, baggage or cargo handlers, or maintenance and service personnel. CS 25.1721(a) is applicable to EWIS located in cargo or baggage compartments, and CS 25.1721(b) and (c) apply to EWIS located elsewhere in the aeroplane.

2 CS 25.1721(a), specifies that EWIS cannot be located in cargo or baggage compartments if its damage or failure may affect safe operation unless it cannot be damaged by movement of cargo or baggage in the compartment, or its breakage or failure will not create a fire hazard. This means that any EWIS located in a cargo or baggage compartment must be protected against damage. EWIS in general and wiring in particular should be installed so the structure affords protection against its use as a handhold and damage from cargo. Wires and wire bundles should be routed or otherwise protected to minimise the potential for maintenance personnel stepping, walking, or climbing on them. Wire bundles should be routed along heavier structural members whenever possible. If the structure does not afford adequate protection, other protection means such as a mechanical guard should be provided. When EWIS is close to sharp metal edges, the edges should be protected to prevent chafing. Additionally, wires should not be routed between aircraft skin and fuel lines in the same plane.

3 Subparagraph 25.1721(b) requires that EWIS be designed and installed to minimise the risk of damage by movement of people in the aeroplane during all phases of flight, or during maintenance, and servicing. Some examples of areas of concern are the flight deck, passenger compartment, crew rest area, wheel wells, and wing leading and trailing edges.

a. Special consideration should be given to EWIS that are routed to, around, and on passenger seats. It should be protected so that passengers cannot damage it with their feet or access it with their hands.

b. EWIS located in the lavatories should not be readily accessible by passengers or aircraft cleaners. It should be designed and installed so that it cannot be damaged by the removal and replacement of items such as rubbish containers.

c. EWIS located in the galleys should not be readily accessible by cabin crew, aircraft cleaners, or passengers. EWIS should be designed and installed so that galley equipment, including galley carts, cannot come into contact with it and cause damage.

d. As with EWIS located in baggage and cargo compartments, EWIS in areas such as landing gear bays, the APU compartment, and electrical and electronic bays should be designed and installed to minimise potential for maintenance personnel stepping, walking, or climbing on them. Where the structure does not afford adequate protection, other protection such as a mechanical guard should be provided.

[Amdt 25/5]

CS 25.1723 Flammable fluid protection; EWIS

ED Decision 2008/006/R

(See AMC 25.1723)

EWIS components must be considered to be a potential ignition source in each area where flammable fluid or vapours might escape by leakage of a fluid system and must meet the requirements of CS 25.863.

[Amdt 25/5]

AMC 25.1723 Flammable fluid protection: EWIS

ED Decision 2008/006/R

CS 25.1723 requires that EWIS located in areas where flammable fluid or vapours might escape must be considered to be a potential ignition source. As a result, these EWIS components must meet the requirements of CS 25.863. CS 25.863 requires that efforts be made to minimise the probability of ignition of fluids and vapours, and the hazards if ignition does occur. See CS 25.1707 for the separation requirements between EWIS and flammable fluids.

EWIS components located in fuel vapour zones should be qualified as explosion proof, where appropriate, in accordance with Section 9 of EUROCAE ED-14 / RTCA Document DO-160 or other equivalent approved industry standard. The possibility of contamination with flammable fluids due to spillage during maintenance action should also be considered.

[Amdt 25/5]

CS 25.1725 Powerplants; EWIS

ED Decision 2008/006/R

(a) EWIS associated with any powerplant must be designed and installed so that the failure of an EWIS component will not prevent the continued safe operation of the remaining powerplants or require immediate action by any crew member for continued safe operation, in accordance with the requirements of CS 25.903(b).

(b) Design precautions must be taken to minimise hazards to the aeroplane due to EWIS damage in the event of a powerplant rotor failure or of a fire originating within the powerplant, which burns through the powerplant case, in accordance with the requirements of CS 25.903(d)(1).

[Amdt 25/5]

CS 25.1727 Flammable Fluid Shutoff Means; EWIS

ED Decision 2008/006/R

EWIS associated with each flammable fluid shutoff means and control must be fireproof or must be located and protected so that any fire in a fire zone will not affect operation of the flammable fluid shutoff means in accordance with the requirements of CS 25.1189.

[Amdt 25/5]

CS 25.1729 Instructions for Continued Airworthiness; EWIS

ED Decision 2008/06/R

The applicant must prepare Instructions for Continued Airworthiness applicable to EWIS in accordance with the requirements of CS 25.1529 and Appendix H paragraphs H25.4 and H25.5.

[Amdt 25/5]

CS 25.1731 Powerplant and APU fire detector system; EWIS

ED Decision 2008/006/R

(a) EWIS that are part of each fire or overheat detector system in a fire zone must be at least fire-resistant.

(b) No EWIS component of any fire or overheat detector system for any fire zone may pass through another fire zone, unless:

(1) It is protected against the possibility of false warnings resulting from fires in zones through which it passes; or

(2) Each zone involved is simultaneously protected by the same detector and extinguishing system.

[Amdt 25/5]

SUBPART J – AUXILIARY POWER UNIT INSTALLATIONS

GENERAL

CS 25J901 Installation

ED Decision 2016/010/R

(See AMC 25J901)

(a) For the purpose of this subpart, the APU installation includes:

(1) The APU;

(2) Each component that affects the control of the APU;

(3) Each component that affects the safety of the APU.

(b) For the purpose of this subpart,

(1) An essential APU is defined as an APU whose function is required for the dispatch of the aeroplane and/or continued safe flight.

(2) A non-essential APU is defined as an APU whose function is a matter of convenience, either on the ground or in flight, and may be shut down without jeopardising safe aeroplane operation.

(c) For each APU:

(1) The installation must comply with:

(i) The installation instructions provided under CS-APU, and

(ii) The applicable provisions of this subpart for non-essential APUs, or

(iii) The applicable provisions of this subpart for essential APUs.

(2) The components of the installation must be constructed, arranged, and installed so as to ensure their continued safe operation between normal inspections or overhauls. (See AMC 25J901(c)(2).)

(3) The installation must be accessible for necessary inspections and maintenance; and

(4) The major components of the installation must be electrically bonded to the other parts of the aeroplane. (See AMC 25J901(c)(4).)

(d) The APU installation must comply with CS 25.1309, except that the effects of the following need not comply with CS 25.1309(b) (see AMC 25.901(c)):

(1) APU case burn through or rupture; and

(2) Uncontained APU rotor failure.

[Amdt 25/1]
[Amdt 25/18]

AMC 25J901(c)(2) Assembly of Components

ED Decision 2005/006/R

The objectives of CS 25.671(b) should be satisfied with respect to APU systems, where the safety of the aeroplane could otherwise be jeopardised.

[Amdt 25/1]

AMC 25J901(c)(4) Electrical Bonding

ED Decision 2005/006/R

Where the APU is not in direct electrical contact with its mounting the engine should be electrically connected to the main earth system by at least two removable primary conductors, one on each side of the APU.

[Amdt 25/1]

CS 25J903 Auxiliary power unit

ED Decision 2005/006/R

(a) Each APU must meet the appropriate requirements of CS-APU for its intended function:

(1) Essential: Category 1 APU,

(2) Non-essential: Category 1 or Category 2 APU.

(b) Reserved

(c) Control of APU rotation and shut-down capability.

(1) It shall be possible to shut down the APU from the flight deck in normal and emergency conditions.

(2) Where continued rotation of an APU could jeopardise the safety of the aeroplane, there must be a means for stopping rotation. Each component of the stopping system located in the APU compartment must be at least fire resistant.

(d) For APU installation:

(1) Design precautions must be taken to minimise the hazards to the aeroplane in the event of an APU rotor failure or of a fire originating within the APU which burns through the APU casing. (See AMC 20-128A.)

(2) The systems associated with APU control devices, systems and instrumentation, must be designed to give reasonable assurance that those APU operating limitations that adversely affect turbine rotor structural integrity will not be exceeded in service.

(e) In-flight start capability.

(1) For non-essential APUs that can be started in-flight and all essential APUs:

(i) Means must be provided to start the APU in-flight, and

(ii) An altitude and airspeed envelope must be established and demonstrated for APU in-flight starting.

(2) For essential APUs:

Cold soak must be considered in establishing the envelope of CS 25J903(e)(1)(ii).

[Amdt 25/1]

CS 25J939 APU operating characteristics

ED Decision 2005/006/R

(a) APU operating characteristics must be investigated in all aeroplane operating conditions from APU start until shutdown to determine that no adverse characteristics (such as stall, surge, or flame-out) are present, to a hazardous degree, during normal and emergency operation within the range of operation limitations of the aeroplane and of the APU.

(b) Reserved

(c) The APU air inlet system may not, as a result of air-flow distortion during normal operation, cause vibration harmful to the APU.

(d) It must be established over the range of operating conditions for which certification is required, that the APU installation vibratory conditions do not exceed the critical frequencies and amplitudes established under CS-APU 120.

[Amdt 25/1]

CS 25J943 Negative acceleration

ED Decision 2005/006/R

No hazardous malfunction of an APU or any component or system associated with the APU may occur when the aeroplane is operated at the negative accelerations within the flight envelopes prescribed in CS 25.333. This must be shown for the greatest duration expected for the acceleration.

[Amdt 25/1]

AMC 25J943 APU Operating Characteristics

ED Decision 2005/006/R

1 Compliance with CS 25J943 should be shown by design analysis and flight tests. The flight tests should include manoeuvre in which less than zero 'g' occurs for one continuous period of at least 5 seconds and a further manoeuvre with two periods of less than zero 'g' with a total time for these two periods of at least 5 seconds.

2 In the case of non-essential APUs, inadvertent shut-down due to negative accelerations is acceptable.

[Amdt 25/1]

FUEL SYSTEM

CS 25J951 General

ED Decision 2010/005/R

(a) Each fuel system must be constructed and arranged to ensure a flow of fuel at a rate and pressure established for proper APU functioning under each likely operating condition, including any manoeuvre for which certification is requested and during which the APU is permitted to be in operation.

(b) For essential APUs:

Each fuel system must be arranged so that any air which is introduced into the system will not result in flameout.

(c) For essential APUs:

Each fuel system for an essential APU must be capable of sustained operation throughout its flow and pressure range with fuel initially saturated with water at 26.7 °C and having 0.20 cm^3 of free water per liter added and cooled to the most critical condition for icing likely to be encountered in operation.

[Amdt 25/1]
[Amdt 25/9]

CS 25J952 Fuel system analysis and test

ED Decision 2005/006/R

(a) Proper fuel system functioning under all probable operating conditions must be shown by analysis and those tests found necessary by the Agency. Tests, if required, must be made using the aeroplane fuel system or a test article that reproduces the operating characteristics of the portion of the fuel system to be tested.

(b) The likely failure of any heat exchanger using fuel as one of its fluids may not result in a hazardous condition.

[Amdt 25/1]

CS 25J953 Fuel system independence

ED Decision 2005/006/R

Each fuel system must allow the supply of fuel to the APU:

(a) Through a system independent of each part of the system supplying fuel to the main engines; or

(b) From the fuel supply to the main engine if provision is made for a shut-off means to isolate the APU fuel line.

[Amdt 25/1]

CS 25J955 Fuel Flow

ED Decision 2016/010/R

(See AMC 25J955)

(a) Each fuel system must provide at least 100 percent of the fuel flow required by the APU under each intended operating condition and manoeuvre. Compliance must be shown as follows:

(1) Fuel must be delivered at a pressure within the limits specified for the APU.

(2) For essential APUs:

(i) The quantity of fuel in the tank may not exceed the amount established as the unusable fuel supply for that tank under the requirements of CS 25.959 plus that necessary to show compliance with this paragraph.

(ii) Each main pump must be used that is necessary for each operating condition and attitude for which compliance with this paragraph is shown, and the appropriate emergency pump must be substituted for each main pump so used.

(iii) If there is a fuel flowmeter, it must be blocked and the fuel must flow through the meter or its bypass. (See AMC 25J955(a)(2)(iii).)

(b) For essential APUs:

If an APU can be supplied with fuel from more than one tank, the fuel system must, in addition to having appropriate manual switching capability, be designed to prevent interruption of fuel flow to that APU, without attention by the flight crew, when any tank supplying fuel to that APU is depleted of usable fuel during normal operation, and any other tank, that normally supplies fuel to that APU, contains usable fuel.

[Amdt 25/1]
[Amdt 25/18]

AMC 25J955(a)(2)(iii) Fuel Flow

ED Decision 2005/006/R

The word "blocked" should be interpreted to mean "with the moving parts fixed in the position for maximum pressure drop".

[Amdt 25/1]

CS 25J961 Fuel system hot weather operation

ED Decision 2005/006/R

For essential APUs:

(a) The fuel supply of an APU must perform satisfactorily in hot weather operation. It must be shown that the fuel system from the tank outlet to the APU is pressurised under all intended operations so as to prevent vapour formation. Alternatively, it must be shown that there is no evidence of vapour lock or other malfunctioning during a climb from the altitude of the airport selected by the applicant to the maximum altitude established as an operating limitation under CS 25J1527, with the APU operating at the most critical conditions for vapour formation but not exceeding the maximum essential load conditions. If the fuel supply is dependant on the same fuel pumps or fuel supply as the main engines, the main engines must be operated at maximum continuous power. The fuel temperature must be at least 43°C at the start of the climb.

(b) The test prescribed in sub-paragraph (a) of this paragraph may be performed in flight or on the ground under closely simulated flight conditions. If a flight test is performed in weather cold enough to interfere with the proper conduct of the test, the fuel tank surfaces, fuel lines, and other fuel system parts subject to cold air must be insulated to simulate, insofar as practicable, flight in hot weather.

[Amdt 25/1]

CS 25J977 Fuel Tank Outlet

ED Decision 2005/006/R

For essential APUs:

(a) There must be a fuel strainer for the fuel tank outlet or for the booster pump. This strainer must prevent the passage of any object that could restrict fuel flow or damage any fuel system component.

(b) The clear area of each fuel tank outlet strainer must be at least five times the area of the outlet line.

(c) The diameter of each strainer must be at least that of the fuel tank outlet.

(d) Each finger strainer must be accessible for inspection and cleaning.

[Amdt 25/1]

FUEL SYSTEM COMPONENTS

CS 25J991 Fuel Pumps

ED Decision 2008/006/R

(See AMC 25J991)

For essential APUs:

(a) Main pumps. Each fuel pump required for proper essential APU operation, or required to meet the fuel system requirements of this subpart (other than those in sub-paragraph (b) of this paragraph), is a main pump. For each main pump, provision must be made to allow the bypass of each positive displacement fuel injection pump other than a fuel pump approved as part of the APU.

(b) Emergency pumps. There must be emergency pumps or another main pump to feed an essential APU immediately after failure of any main pump (other than a fuel pump approved as part of the APU).

[Amdt 25/1]
[Amdt 25/5]

AMC 25J991 Fuel Pumps

ED Decision 2005/006/R

If the fuel supply to the APU is taken from the fuel supply to the main engine, no separate pumps need be provided for the APU.

[Amdt 25/1]

CS 25J993 Fuel system lines and fittings

ED Decision 2005/006/R

(a) Each fuel line must be installed and supported to prevent excessive vibration and to withstand loads due to fuel pressure and accelerated flight conditions.

(b) Each fuel line connected to components of the aeroplane between which relative motion could exist must have provisions for flexibility.

(c) Each flexible connection in fuel lines that may be under pressure and subjected to axial loading must use flexible hose assemblies.

(d) Flexible hose must be approved or must be shown to be suitable for the particular application.

(e) No flexible hose that might be adversely affected by exposure to high temperatures may be used where excessive temperatures will exist during operation or after an APU shut-down.

(f) Each fuel line within the fuselage must be designed and installed to allow a reasonable degree of deformation and stretching without leakage.

[Amdt 25/1]