8.3 Landing data

The applicant should present landing data:

— either as separate data appropriate to a defined runway contaminant; or

— as incremental data based on the dry or wet runway information in the AFM.

The applicant should also include information on the use of speeds higher than the reference landing speed (V_{REF}) on landing, i.e. speeds up to the maximum recommended approach speed in addition to the V_{REF}, as well as on the related distances. The applicant should present the landing distance either directly or along with the factors that are required by the applicable air operations regulations, including a clear explanation, where appropriate.

Where the applicant provides data for a range of contaminant depths, e.g. greater than 3, 6, 9, 12, or 15 mm, then the AFM should clearly indicate how to define data for contaminant depths within the range of the contaminant depths provided.

When for at least one runway condition, the landing distances to be used at the time of dispatch are defined by the unfactored distance that is determined with one engine assumed to be failing in the flare, the applicant should present all landing distances at the time of dispatch as factored distances in the AFM. The AFM should clearly state this to avoid double application of operational factors.

The AFM should provide:

(a) definitions of runway surface conditions;

(b) the performance data for operations on contaminated runways;

(c) landing distances on contaminated runways;

(d) data with no reverse thrust credit to:

(1) cover operational restrictions on the use of reversers; and

(2) make flight crew aware of the importance of reverser selection on contaminated runways;

(e) the procedures and assumptions that are used to develop the performance data; and

(f) the appropriate statements as per Section 8.1 of this AMC.

The applicant should provide instructions on the use of the data in the appropriate operational documentation.

9.0 References

Federal Aviation Administration (FAA) Advisory Circular (AC) 25-32, ‘Landing Performance Data for Time-of-Arrival Landing Performance Assessments’, 22 December 2015.

[Amdt No: 25/27]

CS 25.1593 Exposure to volcanic cloud hazards

ED Decision 2013/010/R

(See AMC 25.1593)

The susceptibility of aeroplane features to the effects of volcanic cloud hazards must be established.

[Amdt 25/13]

AMC 25.1593 Exposure to volcanic cloud hazards

ED Decision 2016/010/R

The aim of CS 25.1593 is to support operators by identifying and assessing airworthiness hazards associated with operations in contaminated airspace. Providing such data to operators will enable those hazards to be properly managed as part of an established management system.

Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies.

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or other appropriate manual, and should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of aeroplane features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered:

(1) Identify the features of the aeroplane that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to, the following:

a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic, and hydraulic systems;

b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings;

c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque;

d. Fuel contamination;

e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cockpit and/or cabin;

f. Erosion, blockage, or malfunction of external and internal aeroplane components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced cooling efficiency of electronic components, leading to a wide range of aeroplane system failures.

(2) The nature and severity of effects.

(3) Details of any device or system installed on the aeroplane that can detect the presence of volcanic cloud hazards (e.g. volcanic ash (particulate) sensors or volcanic gas sensors).

(4) The effect of volcanic ash on operations to/from contaminated aerodromes. In particular, deposits of volcanic ash on a runway can lead to degraded braking performance, most significantly if the ash is wet.

(5) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to Aircraft Operating Manuals, Aircraft Maintenance Manuals, Master Minimum Equipment List/Dispatch Deviation, or equivalents required to support the operator. Pre-flight precautions should include clearly defined procedures for the removal of any volcanic ash found on parked aeroplanes.

(6) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash-contaminated aerodromes; this may take the form of Instructions for Continued Airworthiness or other advice.

[Amdt 25/13]
[Amdt 25/18]

SUBPART H – ELECTRICAL WIRING INTERCONNECTION SYSTEMS

AMC 25 Subpart H Correlation with previous amendment of CS-25

ED Decision 2021/015/R

The following table provides correlation between CS-25 Subpart H and CS-25 amendment 4:

Subpart H paragraph	Subparagraph	Based on previous CS-25 paragraph
CS 25.1701 Definition	(a)	none
	(b)	none
	(c)	none
CS 25.1703 Function and installation; EWIS	(a)(1)	CS 25.1301(a)
	(a)(2)	CS 25.1301(c)
	(a)(3)	CS 25.1309(a)
	(a)(4)	none
	(b)	none
	(c)	CS 25.869(a)(3)
	(d)	none
	(e)	none
CS 25.1705 Systems and functions; EWIS	(a)	none
	(b)(1)	CS 25.773(b)(2)
	(b)(2)	CS 25.854
	(b)(3)	CS 25.885
	(b)(4)	CS 25.981
	(b)(5)	CS 25.1165
	(b)(6)	CS 25.1203
	(b)(7)	CS 25.1303(b)
	(b)(8)	CS 25.1310
	(b)(9)	CS 25.1316
	(b)(10)	CS 25.1331(a)(2)
	(b)(11)	CS 25.1351
	(b)(12)	CS 25.1355
	(b)(13)	CS 25.1360
	(b)(14)	CS 25.1362
	(b)(15)	CS 25.1365
	(b)(16)	CS 25.1431(c) & (d)
CS 25.1707 System separation; EWIS	(a)	CS 25.1353(a)
	(b)	CS 25.1353(a)
	(c)	CS 25.1353(b)
	(d)(1)	CS 25.1351(b)(1) CS 25.1351(b)(2)
	(d)(2)	
	(e)(1)	CS 25.869(a)(3)(i) CS 25.869(a) (3)(ii) CS 25.1353(d)(3)
	(e)(2)	

Subpart H paragraph	Subparagraph	Based on previous CS-25 paragraph
	(f)(1)	CS 25.869(a)(3)(i) CS 25.869(a) (3)(ii) CS 25.1353(d)(3)
	(f)(2)	
	(g)	CS 25.1353(d)(3)
	(h)(1)	CS 25.1353(d)(3)
	(h)(2)	
	(i)(1)	CS 25.1353(d)(3)
	(i)(2)	
	(i)(3)	
	(j)(1)	CS 25.1353(d)(3)
	(j)(2)	
	(k)	none
	(l)	CS 25.1353(d)(3)
CS 25.1709 System safety; EWIS	(a)(1)	CS 25.1309(b)(1)
	(a)(2)	CS 25.1309(b)(1)
	(b)	CS 25.1309(b)(2)
CS 25.1711 Component identification; EWIS	(a)	CS 25.1301(b)
	(b)(1)	none
	(b)(2)	none
	(c)	CS 25.1353(d)(2)
	(d)	none
	(e)	none
CS 25.1713 Fire protection; EWIS	(a)	CS 25.869(a)(1)
	(b)	CS 25.869(a)(2)
	(c)	CS 25.869(a)(4)
CS 25.1715 Electrical bonding and protection against static electricity; EWIS	(a)	CS 25.899
	(b)	CS 25.1353(e)
CS 25.1717 Circuit protection devices; EWIS		CS 25.1353(d)(1)
CS 25.1719 Accessibility provisions; EWIS		CS 25.611
CS 25.1721 Protection of EWIS	(a)(1)	CS 25.855(e)(1)
	(a)(2)	CS 25.855(e)(2)
	(b)	none
	(c)	none
CS 25.1723 Flammable fluid protection; EWIS		CS 25.863(b)(3)
CS 25.1725 Powerplants; EWIS	(a)	CS 25.903(b)
	(b)	CS 25.903(d)(1)
CS 25.1727 Flammable fluid shutoff means; EWIS		CS 25.1189(d)
CS 25.1729 Instructions for Continued Airworthiness; EWIS		CS 25.1529
CS 25.1731 Powerplant and APU fire detector system; EWIS	(a)	CS 25.1203(e)
	(b)(1)	CS 25.1203(f)(1)

Subpart H paragraph	Subparagraph	Based on previous CS-25 paragraph
	(b)(2)	CS 25.1203(f)(2)

Note: The term “none” in the above table indicates that the paragraph did not exist in the CS-25 amendment 4.

[Amdt No: 25/5]
[Amdt No: 25/27]

CS 25.1701 Definition

ED Decision 2008/006/R

(See AMC 25.1701)

(a) Electrical wiring interconnection system (EWIS) means any wire, wiring device, or combination of these, including termination devices, installed in any area of the aeroplane for the purpose of transmitting electrical energy, including data and signals between two or more intended termination points. Except as provided for in subparagraph (c) of this paragraph, this includes:

(1) Wires and cables.

(2) Bus bars.

(3) The termination point on electrical devices, including those on relays, interrupters, switches, contactors, terminal blocks, and circuit breakers and other circuit protection devices.

(4) Connectors, including feed-through connectors.

(5) Connector accessories.

(6) Electrical grounding and bonding devices and their associated connections.

(7) Electrical splices.

(8) Materials used to provide additional protection for wires, including wire insulation, wire sleeving, and conduits that have electrical termination for the purpose of bonding.

(9) Shields or braids.

(10) Clamps and other devices used to route and support the wire bundle.

(11) Cable tie devices.

(12) Labels or other means of identification.

(13) Pressure seals.

(b) The definition in subparagraph (a) of this paragraph covers EWIS components inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks, including, but not limited to, circuit board back-planes, wire integration units and external wiring of equipment.

(c) Except for the equipment indicated in subparagraph (b) of this paragraph, EWIS components inside the following equipment, and the external connectors that are part of that equipment, are excluded from the definition in subparagraph (a) of this paragraph:

(1) Electrical equipment or avionics that is qualified to environmental conditions and testing procedures when those conditions and procedures are -

(i) Appropriate for the intended function and operating environment, and

(ii) Acceptable to the Agency.

(2) Portable electrical devices that are not part of the type design of the aeroplane. This includes personal entertainment devices and laptop computers.

(3) Fibre optics.

[Amdt 25/5]

AMC 25.1701 Definition

ED Decision 2008/006/R

1 Paragraph CS 25.1701 defines EWIS for the purposes of complying with the subpart H requirements and other EWIS-related requirements of CS 25. CS 25.1701 clearly identifies which wires and components these requirements apply to. Although this definition is located in subpart H to CS 25, it applies to all EWIS requirements regardless of location within CS 25.

2 Subparagraph CS 25.1701(a) defines EWIS as any wire, wiring device, or combination of these, including termination devices, installed in any area of the aeroplane for the purpose of transmitting electrical energy, including data and signals between two or more intended termination points. The term "wire" means bare or insulated wire used for the purpose of electrical energy transmission, grounding, or bonding. This includes electrical cables, coaxial cables, ribbon cables, power feeders, and data busses.

3 Subparagraph CS 25.1701(a) of the requirement provides a listing of the component types that are considered part of the EWIS. These component types are listed as items CS 25.1701(a)(1) through CS 25.1701(a)(13). While these are the most widely used EWIS components it is not an all inclusive list. There may be components used by an applicant to support transmission of electrical energy that are not listed but meet the EWIS definition. They will be EWIS components subject to EWIS related regulatory requirements.

4 CS 25.1701(b) says that EWIS components located inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks (e.g., circuit board back-planes, wire integration units, external wiring of equipment) are covered by the EWIS definition. These components are included in the EWIS definition because the equipment they are inside of or part of, is typically designed and made for a particular aeroplane model or series of models. So the requirements that apply to aeroplane EWIS components must be applied to the components inside that equipment. These contrast with avionics components that must be sent back to their manufacturer or a specialized repair shop for service. Components inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks are maintained, repaired, and modified by the same personnel who maintain, repair, and modify the EWIS in the rest of the aeroplane. For example, in an electrical distribution panel system separation must be designed and maintained within the panel just like the EWIS leading up to that panel. Identification of components inside the panel is just as important as outside the panel since the wiring inside the panel is treated much the same. Also, while this type of equipment is designed for its intended function and is manufactured and installed to the same standards as other EWIS, it is typically not qualified to an environmental standard such as EUROCAE ED-14 / RTCA DO-160.

5 There are some exceptions to the EWIS definitions and those are given in CS 25.1701(c). Paragraph excepts EWIS components inside the following equipment, and the external connectors that are part of that equipment:

5.1 Electrical equipment or avionics that is qualified to environmental conditions and testing procedures when those conditions and procedures are –

— appropriate for the intended function and operating environment, and

— acceptable to the Agency.

5.2 Portable electrical devices that are not part of the type design of the aeroplane including personal entertainment devices and laptop computers.

5.3 Fibre optics.

6 The first exception means EWIS components located inside avionic or electrical equipment such as flight management system computers, flight data recorders, VHF radios, primary flight displays, navigation displays, generator control units, integrated drive generators, and galley ovens, if this equipment has been tested to industry-accepted environmental testing standards. Examples of acceptable standards are EUROCAE ED-14 / RTCA DO-160, and equipment qualified to a European Technical Standard Order (ETSO)

7 An applicant may use any environmental testing standard if the applicant can demonstrate that the testing methods and pass/fail criteria are at least equivalent to the widely accepted standards of EUROCAE ED-14 / RTCA DO-160, or a specific ETSO. Applicants should submit details of the environmental testing standards and results of the testing that demonstrate the equipment is suited for use in the environment in which it will be operated.

[Amdt 25/5]

CS 25.1703 Function and Installation; EWIS

ED Decision 2008/006/R

(See AMC 25.1703)

(a) Each EWIS component installed in any area of the aeroplane must:

(1) Be of a kind and design appropriate to its intended function.

(2) Be installed according to limitations specified for the EWIS components.

(3) Function properly when installed.

(4) Be designed and installed in a way that will minimise mechanical strain.

(b) The selection of wires must take into account known characteristics of the wire in relation to each particular installation and application in order to minimise the risk of wire damage, including any arc tracking phenomena.

(c) The design and installation of the main power cables, including generator cables, in the fuselage must allow for a reasonable degree of deformation and stretching without failure.

(d) EWIS components located in areas of known moisture accumulation must be adequately protected to minimise any hazardous effect due to moisture.

(e) EWIS modifications to the original type design must be designed and installed to the same standards used by the original aeroplane manufacturer or other equivalent standards acceptable to the Agency.

[Amdt 25/5]

AMC 25.1703 Function And Installation; EWIS

ED Decision 2008/006/R

1 CS 25.1703 requires that applicants select EWIS components that are of a kind and design appropriate to their intended function just as CS 25.1301 requires this for other pieces of equipment installed on the aeroplane. Factors such as component design limitations, functionality, and susceptibility to arc tracking and moisture or other known characteristics of the particular component must be considered.

2 Subparagraph 25.1703(a)(1) requires that each EWIS component be of a kind and design appropriate to its intended function. In this context, the requirement means that components must be qualified for airborne use, or otherwise specifically assessed as acceptable for their intended use. To be “appropriate” means that the equipment is used in a manner for which it was designed. For example, a wire rated at 150 degrees Celsius would not be appropriate for installation if that installation would cause the wire to operate at a temperature higher than 150 degrees Celsius. Wire and other components made for household or consumer products use may not be appropriate for airborne use because they are manufactured for the consumer market and not for use in an airborne environment. Other factors that must be considered for EWIS component selection are mechanical strength, voltage drop, required bend radius, and expected service life.

3. Subparagraph 25.1703(a)(2) requires that EWIS components be installed according to their limitations. As used here, limitations means the design and installation requirements of the particular EWIS component. Examples of EWIS component limitations are maximum operating temperature, degree of moisture resistance, voltage drop, maximum current-carrying capability, and tensile strength. EWIS component selection and installation design must take into account various environmental factors including, but not limited to, vibration, temperature, moisture, exposure to the elements or chemicals (de-icing fluid, for instance), insulation type, and type of clamp.

4 Subparagraph 25.1703(a)(3) requires that EWIS function properly when installed. The key word in understanding the intent of this paragraph is “properly,” as that relates to airworthiness of the aeroplane. For an EWIS component to function properly means that it must be capable of safely performing the function for which it was designed. For example, the fact that an in-flight entertainment (IFE) system fails to deliver satisfactory picture or sound quality is not what the term “properly” refers to. This is not a safety issue and therefore not a concern for certification aspects. The failure of an EWIS component has the potential for being a safety hazard whether it is part of a safety-related system or an IFE system. Therefore, EWIS components must always function properly (safely) when installed, no matter what system they are part of and any malfunction of the EWIS must not degrade the airworthiness of the aeroplane (refer to CS 25.1709 for terminology relating to failure classifications).

5 Subparagraph 25.1703(a)(4) requires that EWIS components be designed and installed so mechanical strain is minimised. This means the EWIS installation must be designed so that strain on wires would not be so great as to cause the wire or other components to fail. This paragraph requires that adequate consideration be given to mechanical strain when selecting wire and cables, clamps, strain relieves, stand-offs, and other devices used to route and support the wire bundle when designing the installation of these components.

6 Subparagraph 25.1703(b) requires that selection of wires take into account known characteristics of different wire types in relation to each specific application, to minimise risk of damage. It is important to select the aircraft wire type whose construction matches the application environment. The wire type selected should be constructed for the most severe

environment likely to be encountered in service. This means, for example, that insulation types susceptible to arc tracking should not be used in areas exposed to high vibration and constant flexing in a moisture-prone environment.

7 Subparagraph 25.1703(c) contains the requirement formerly located in CS 25.869(a)(2) that design and installation of the main power cables allow for a reasonable degree of deformation and stretching without failure. Although it is now located in 25.1703(c), the meaning of the requirement has not changed. The reason for this requirement is the same as for CS 25.993(f), which requires that each fuel line within the fuselage be designed and installed to allow a reasonable degree of deformation and stretching without leakage. The idea is that the fuselage can be damaged with partial separation or other structural damage without the fuel lines or electrical power cables breaking apart. Allowing for a certain amount of stretching will help to minimise the probability of a fuel-fed fire inside the fuselage. As it is used in this requirement, a "reasonable degree of deformation and stretching" should be about 10% of the length of the electrical cable.

8 Subparagraph 25.1703(d) requires that EWIS components located in areas of known moisture build-up be adequately protected to minimise moisture's hazardous effects. This is to ensure that all practical means are used to ensure damage from fluid contact with components does not occur. Wires routed near a lavatory, galley, hydraulic lines, severe wind and moisture problem areas such as wheel wells and wing trailing edges, and any other area of the aeroplane where moisture collection could be a concern must be adequately protected from possible adverse effects of exposure to moisture.

9 EWIS component selection

9.1 Expected service life.

Expected service life is a factor needing consideration in selecting EWIS components to use. Expected service life means the expected service lifetime of the EWIS. This is not normally less than the expected service life of the aircraft structure. If the expected service life requires that all or some of the EWIS components be replaced at certain intervals, then these intervals must be specified in the ICA as required by CS 25.1529. If the aircraft service life is extended, then EWIS components should be taken into account.

9.2 Qualified components.

EWIS components should be qualified for airborne use or specifically assessed as acceptable for the intended use and be appropriate for the environment in which they are installed.

Aircraft manufacturers list approved components in their manuals, such as the standard wiring practices manual (ATA Chapter 20). Ideally, only the components listed in the applicable manual or approved substitutes should be used for the maintenance, repair or modification of the aircraft. EWIS modifications to the original type design should be designed and installed to the same standards used by the original aircraft manufacturer or other equivalent standards acceptable to the Agency. This is because the manufacturer's technical choice of an EWIS component is not always driven by regulatory requirements alone. In some cases specific technical constraints would result in the choice of a component that exceeds the minimum level required by the regulations.