Certification Memorandum

To define a means to address CS-25 Subpart H Electrical Wiring Interconnection System (EWIS) during Engine Certification using CS-E

EASA CM No.: CM–PIFS-016 Issue 01 issued 08 January 2020

Regulatory requirement(s): See table in Paragraph 1.2

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Log of issues

Issue	Issue date	Change description
01	08/01/2020	First issue.

Table of Contents

1. Introduction

1.1. Purpose and scope

This Certification Memorandum describes a means by which CS-25 Subpart H – EWIS for engine wiring components may be addressed as part of CS-E compliance, by an applicant for an engine Type Certificate (TC), Major Change/Repair, Minor Change/Repair, or Supplemental Type Certificate (STC).

1.2. References

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

Reference	Title	Code	Issue	Date
CS-25 Subpart H	Electrical Wiring Interconnection System	CS-25	22	6 Nov 2018
CS-E 20	Engine Configuration and Interfaces	CS-E	5	14 Dec 2018
CS-E 25	Instructions For Continued Airworthiness	CS-E	5	14 Dec 2018
CS-E 30	Assumptions	CS-E	5	14 Dec 2018
CS-E 50	Engine Control Systems	CS-E	5	14 Dec 2018
CS-E 70	Materials and Manufacturing Methods	CS-E	5	14 Dec 2018
CS-E 80	Equipment	CS-E	5	14 Dec 2018
CS-E 120	Identification	CS-E	5	14 Dec 2018
CS-E 130	Fire Protection	CS-E	5	14 Dec 2018
CS-E 135	Electrical Bonding	CS-E	5	14 Dec 2018
CS-E 170	Engine Systems and Component Verification	CS-E	5	14 Dec 2018
CS-E 510	Safety Analysis	CS-E	5	14 Dec 2018
CS-E 650	Vibration Surveys	CS-E	5	14 Dec 2018
CS-E 740	Endurance Tests	CS-E	5	14 Dec 2018

1.3. Abbreviations

Abbreviation	Meaning
EWIS	Electrical Wiring Interconnection System
STC	Supplemental Type Certificate
TC	Type Certificate
TCDS	Type Certificate Data Sheet

1.4. Definitions

Abbreviation	Meaning
EWIS	See CS 25.1701

2. Background

The CS-25 Subpart H Electrical Wiring Interconnection System (EWIS) requirements were introduced following two major accidents (TWA 800 in 1996 and Swissair Flight 111 in 1998). Investigations showed that the condition of the wiring components in these ageing aircraft had deteriorated. The harmonised rulemaking effort which followed led to the introduction of a dedicated subpart that brought together new and existing wiring regulations in CS-25 / 14 CFR Part 25 Subpart H - EWIS.

Although these accidents were not caused by engine wiring, which is readily accessible for regular maintenance, and CS-E already contains requirements that are applicable to EWIS components because they are part of the engine equipment, it was determined that the intent of the EWIS requirements is applicable to engine EWIS components.

Therefore, in order to reduce duplication of certification effort, and to avoid issues during the installation of engines on a CS-25 aircraft, the following EASA policy was developed to establish a means to address the EWIS requirements during engine certification activities. This involves correlating the EWIS requirements with the equivalent CS-E paragraphs to ensure that the EWIS requirements are satisfied for the engine Type Design. The intent of this CM is to support the engine installation in large aircraft by performing and sharing compliance demonstrations regarding EWIS requirements and not to demonstrate compliance outside the scope of the OEM, however interfaces could be identified which should be recorded and communicated between the parties.

3. EASA Certification Policy

3.1. CS-E EWIS Requirements

The CS-E provisions that are equivalent to each EWIS requirement are detailed in Table 1 of Appendix 1.

For engines to be installed on a CS-25 aircraft, an applicant may elect to address the EWIS requirements during the engine certification. In such a case, a Certification Review Item (CRI) will be established which refers to each of the CS-25 EWIS requirements in Table 1. The applicant will detail the means by which all engine EWIS components will comply with the equivalent CS-E paragraphs, in a way that addresses the intent of CS-25.

Where the applicant has addressed the EWIS requirements using the approach outlined above, this will be documented in the instructions for installation that are required by CS-E 20(d). In case an engine applicant does not address EWIS requirements during the engine certification, the engine manufacturer will still need to be prepared to support the aircraft manufacturer in showing compliance to EWIS requirements. The end responsibility for the installation remains on the CS-25 applicant.

3.2. Whom this Certification Memorandum affects

This Certification Memorandum affects the TCs of engines and large aeroplanes, Major Changes / Repairs, Minor Changes / Repairs, and STC applications that require a compliance demonstration in accordance with CS-25 Subpart H - EWIS. This means Engine certification requirements that cover the intent of the CS 25 subpart H requirements where the engine installation aspects and assessment of systems comprising of parts of the engine type design and aircraft type design remain on the responsibility of the CS-25 applicant.

4. Remarks

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-Mail: CM@easa.europa.eu
2. For any question concerning the technical content of this EASA Certification Memorandum, please contact:

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Table 1 (EWIS List)

Certification Specification - CS-25	Applicable to Engine?	CS-E Content/Title	Applicability Statement
25.1701 Definition (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.	Y		This is the definition of EWIS, and is considered applicable to engine EWIS components for engines to be installed on a CS 25 aeroplane. The relevant CS-E requirements apply to all components included in this definition. Continuation of the definition of EWIS

(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.	Y		Continuation of the definition of EWIS
(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.	Y	*CS-E80*	Continuation of the definition of EWIS. Components substantiated to CS-E 80 (except electrical harness assemblies) are exempt from EWIS requirements. Wiring inside engine components certified under CS-E80 don't need to be addressed separately under EWIS. *(e.g. internal wiring inside an engine control).*

25.1703 Function and installation; EWIS (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.	Y	*CS-E20 (a) Engine Configuration and Interfaces* *CS-E 30 (a) Assumptions* *CS-E 50 (a) Engine Control Systems* *CS-E 70 (a) Materials and Manufacturing Methods*	The engine type design of EWIS components, including assembly instructions, must be clearly defined, with reference to appropriate specifications (CS-E 20(a)). The suitability of these components must be ensured (CS-E 70(a)), and when installed and operated in the intended installation (CS-E 20(d)), including necessary assumptions (CS-E 30(a)), they must perform the intended function (CS-E 50(a)).
(b) Selection of wires must take into account known characteristics of the wire in relation to each installation and application to minimise the risk of wire damage, including any arc tracking phenomena.	Y	*CS-E20 a) Engine Configuration and Interfaces* *CS-E30 a) Assumptions* *CS-E50 a) Engine Control Systems* *CS-E70 a) Materials and Manufacturing Methods*	The suitability and durability of engine EWIS components must be established (CS-E 70(a)), taking into account the assembly (CS-E 20(a), intended installation and operation (CS-E 20(d), CS-E 30(a)).
(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.	N	Not applicable to engine certification	Not applicable to engine configurations - specific for power cables.

(d) EWIS components located in areas of known moisture accumulation must be adequately protected to minimise any hazardous effect due to moisture.	Y	*CS-E 70(a) Materials and Manufacturing Methods* *CS-E 80(b) Equipment (AMC E 80)*	The engine EWIS components selected must be suitable (CS-E 70(a)), and a demonstration of satisfactory moisture protection is required (CS-E 80(b)).
(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.	Y	*CS-E 20 (a) Engine Configuration and Interfaces*	Any engine EWIS component not designed by the engine TC holder, must meet CS-E requirement applicable to EWIS, and show equivalence to the type design definition.
25.1705 Systems and functions; EWIS			
(a) EWIS associated with system required for type certification or by operating rules must be considered an integral part of that system and must be considered in showing compliance with the applicable requirements for that system.	N		This requirement is addressed to the CS-25 applicant. Any engine EWIS component which is part of a required system must be included in the evidence presented by the CS-25 applicant in showing compliance.
(b) For systems to which the following rules apply, the components of EWIS associated with those systems must be considered an integral part of that system or systems and must be considered in showing compliance with the applicable requirements for that system.	N		This requirement is addressed to the CS-25 applicant. Any engine EWIS component which is part of a system addressed by the listed regulations, must be included in the evidence presented by the CS-25 applicant in showing compliance.

(1) CS 25.773(b)(2) Pilot compartment view.	N		Check if any other CS-E requirement would be relevant for EWIS. The compliance of EWIS towards CS 25 Subpart H does not imply other system requirement to be no longer applicable.
(2) CS 25.854 Lavatory fire protection.	N		
(3) CS 25.858 Cargo compartment fire detection systems	N		
(4) CS 25.981 Fuel tank ignition prevention	N		
(5) CS 25.1165 Engine ignition systems.	N		
(6) CS 25.1203 Fire-detector systems	N		
(7) CS 25.1303(b) Flight and Navigation Instruments	N		
(8) CS 25.1310 Power source Capacity and Distribution	N		
(9) CS 25.1316 System lightning protection	N		
(10) CS 25.1331(a)(2) Instruments using a power supply	N		
(11) CS 25.1351 General.	N		
(12) CS 25.1355 Distribution system.	N		
(13) CS 25.1360 Precautions against injury.	N		
(14) CS 25.1362 Electrical supplies for emergency conditions.	N		
(15) CS 25.1365 Electrical appliances, motors, and transformers.	N		
(16) CS 25.1431(c) and (d) Electronic equipment.	N		

25.1707 System separation; EWIS (See AMC 25.1707)			
(a) Each EWIS must be designed and installed with adequate physical separation from other EWIS and aeroplane systems so that an EWIS component failure will not create a hazardous condition. Unless otherwise stated, for the purposes of this paragraph, adequate physical separation must be achieved by separation distance or by a barrier that provides protection equivalent to that separation distance.	Y	*CS-E 50 Engine Control Systems (c)(2)(3)(4)(d)* *CS-E510 Safety Analysis*	The objective of this paragraph is satisfied by CS-E 50 (c)(2),(3) and (4), and (d), as well as CS-E 510. These paragraphs require that the Engine Control System, including engine EWIS components, are designed and constructed so that single failures of Engine Control System components do not result in a LOTC/LOPC event or Hazardous Engine Effect. Also foreseeable failures or malfunctions leading to local events in the intended aircraft installation, such as fire, overheat, or Failures leading to damage to Engine Control System components, must not result in a Hazardous Engine Effect due to Engine Control System Failures or malfunctions.
(b) Each EWIS must be designed and installed such that any electrical interference likely to be present in the aeroplane will not result in hazardous effects upon the aeroplane or its systems except under extremely remote conditions.	Y	*CS-E80 Equipment AMC E 80 (2)(b)* *CS-E50 Engine Control Systems (c)(3)(4)(d)* *CS-E510 Safety Analysis* *AMC 20-1* *AMC 20-3*	CS-E 80 applies to engine EWIS components, and required demonstration of acceptable operation under EMI conditions defined in AMC20-1, and AMC 20-3, as appropriate.

(c) Wires and cables carrying heavy current and their associated EWIS components must be designed and installed to ensure adequate physical separation and electrical isolation, so that damage to essential circuits will be minimised under fault conditions.	Y	*CS-E50 Engine Control Systems (c)(d)* *CS-E 80 (c) Equipment* *CS-E510 Safety Analysis* *CS-E170 Engine System and Component Verification*	In an aircraft installation, electrical power generators, and associated cabling is in most cases supplied by the aircraft manufacturer. In such cases, the associated EWIS components must be approved under the relevant aircraft Type Certificate. Aircraft parts supplied by the engine manufacturer, but not part of the engine type design, are the responsibility of the aircraft manufacturer. If there are any heavy current cables and associated EWIS components included in the engine type design, the cables and associated EWIS components must meet all of the relevant requirements of CS-E, including CS-E 510 Safety Analysis, and CS-E 170 Engine System and Component Verification.
(d) Each EWIS associated with independent aeroplane power sources or power sources connected in combination must be designed and installed to ensure adequate physical separation and electrical isolation so that a fault in any one aeroplane power source EWIS will not adversely affect any other independent power sources. In addition: (1) Aeroplane independent electrical power sources must not share a common ground terminating location, and (2) Aeroplane system's static grounds must not share a common ground terminating location with any of the aeroplane independent electrical power sources.	Y	*CS-E20 (d) Engine Configuration and Interfaces* *CS-E 50 (h) Engine Control Systems* *CS-E510 Safety Analysis*	CS-E 20 (d) requires instructions for installing and operating the Engine. These instructions must contain a definition of the physical and functional interfaces with the aircraft and aircraft equipment. For aircraft-supplied power, CS-E 50 (h) requires the electrical interface to be defined. Engine EWIS components must also meet CS-E 510 Safety Analysis.

(e) Except to the extent necessary to provide electrical connection to the fuel systems components the EWIS must be designed and installed with adequate physical separation from fuel lines and other fuel system components, such that: (1) An EWIS component failure will not create a hazardous condition, and (2) Fuel leakage onto EWIS components will not create a hazardous condition.	Y	*CS-E130 Fire Protection* *CS-E135 Electrical Bonding* *CS-E510 Safety Analysis*	CS-E 130 requires that the design and construction of the Engine and the materials used must minimise the probability of the occurrence and spread of fire during normal operation and Failure conditions and must minimise the effects of such a fire. In addition, the design and construction of Engines must minimise the probability of the occurrence of an internal fire that could result in structural Failure or Hazardous Engine Effects. CS-E 510 requires an analysis of the Engine, including the control system, must be carried out in order to assess the likely consequence of all Failures that can reasonably be expected to occur. This analysis must take account of: Aircraft-level devices and procedures assumed to be associated with the installation. It must be shown that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote (probability less than 10^{-7} per Engine flight hour). CS-E 135 requires that any components, modules, equipment and accessories that are susceptible to or are potential sources of static discharges or currents from electrical Faults, must be designed and constructed so as to be grounded to the main Engine earth, as necessary to minimise the accumulation of electro-static or electrical charge that would cause: - Unintentional ignition in areas where flammable fluids or vapours could be present,

(f) Except to the extent necessary to provide electrical connection to the hydraulic systems components the EWIS must be designed and installed with adequate physical separation from hydraulic lines and other hydraulic system components, such that: (1) An EWIS component failure will not create a hazardous condition, and (2) Hydraulic fluid leakage onto EWIS components will not create a hazardous condition.	Y	*CS-E130 Fire Protection* *CS-E135 Electrical Bonding* *CS-E510 Safety Analysis*	CS-E 130 requires that the design and construction of the Engine and the materials used must minimise the probability of the occurrence and spread of fire during normal operation and Failure conditions and must minimise the effects of such a fire. In addition, the design and construction of Engines must minimise the probability of the occurrence of an internal fire that could result in structural Failure or Hazardous Engine Effects. CS-E 510 requires an analysis of the Engine, including the control system, must be carried out in order to assess the likely consequence of all Failures that can reasonably be expected to occur. This analysis must take account of: Aircraft-level devices and procedures assumed to be associated with the installation. It must be shown that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote (probability less than 10^{-7} per Engine flight hour). CS-E 135 requires that any components, modules, equipment and accessories that are susceptible to or are potential sources of static discharges or currents from electrical Faults, must be designed and constructed so as to be grounded to the main Engine earth, as necessary to minimise the accumulation of electro-static or electrical charge that would cause: - Unintentional ignition in areas where flammable fluids or vapours could be present,

(g) Except to the extent necessary to provide electrical connection to the oxygen systems components the EWIS must be designed and installed with adequate physical separation from oxygen lines and other oxygen system components, such that an EWIS component failure will not create a hazardous condition.	N	Not applicable to engine certification	Oxygen systems are not installed on engines.
(h) Except to the extent necessary to provide electrical connection to the water/waste systems components the EWIS must be designed and installed with adequate physical separation from water/waste lines and other water/waste system components, such that (1) An EWIS component failure will not create a hazardous condition, and (2) Water/waste leakage onto EWIS components will not create a hazardous condition.	N	Not applicable to engine certification	Water/waste systems are not installed on engines.
(i) Electrical wiring interconnection systems must be designed and installed with adequate physical separation between the EWIS and flight or other mechanical control systems cables, and associated system components such that: (1) Chafing, jamming, or other interference are prevented, and (2) An EWIS component failure will not create a hazardous condition, and (3) Failure of any flight or other mechanical control systems cables or systems components will not damage EWIS and create a hazardous condition.	N	Not applicable to engine certification	Flight or other mechanical control systems cables and associated system components are not installed on engines.

(j) Electrical wiring interconnection systems must be designed and installed with adequate physical separation between the EWIS components and heated equipment, hot air ducts, and lines such that: (1) An EWIS component failure will not create a hazardous condition, and (2) Hot air leakage or heat generated onto EWIS components will not create a hazardous condition.	Y	CS-E50 Engine Control Systems (c)(3) CS-E510 Safety Analysis	CS-E 50 (c) (3) requires that a single failure of an EWIS component should not result in a hazardous engine effect. An analysis of the Engine, including the control system, must be carried out in order to assess the likely consequence of all failures that can reasonably be expected to occur. This analysis must take account of: Aircraft-level devices and procedures assumed to be associated with the installation. It must be shown that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote (probability less than 10^{-7} per Engine flight hour). The engine safety analysis must assess the likely consequences of EWIS failures with respect heated equipment, hot air ducts and lines that can reasonably be expected to occur in an engine installation.

(k) For systems for which redundancy is required either by specific certification rules, operating rules, or by CS 25.1709, each applicable EWIS must be designed and installed with adequate physical separation.	Y	CS-E510 Safety Analysis	If redundancy is required for compliance, or to prevent a hazardous effect, the safety analysis of CS-E 510 prevents a design where inadequate separation could result in a single failure leading to the failure of both redundant systems.
(l) Each EWIS must be designed and installed so there is adequate physical separation between it and other aeroplane components and structure, and so that the EWIS is protected from sharp edges and corners, in order to minimise potential for abrasion/chafing, vibration damage, and other types of mechanical damage.	Y	CS-E50 Engine Control Systems (c)(3)(4) CS-E650 Vibration Surveys	CS-E 50 requires that foreseeable failures or malfunctions leading to local events in the intended aircraft installation, such as failures leading to damage to Engine Control System components, must not result in a Hazardous Engine Effect due to Engine Control System Failures or malfunctions. Furthermore CS-E 650 requires assessment of the effects of vibration on susceptible engine components.

25.1709 System safety; EWIS **(See AMC 25.1709)**			
EWIS must be designed and installed so that:			
(a) Each catastrophic failure condition: (1) Is extremely improbable; and (2) does not result from a single failure; and	Y	CS-E50(c)3. Control Systems CS-E510(a)(1)(ii), (iii) and (a)(3) Safety Analysis	CS-E 50(c)3 requires that single failures of Engine Control System components do not result in a Hazardous Engine Effect. CS-E 510 requires that the Safety Analysis takes account of secondary, dormant and multiple failures, and that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote.
(b) Each hazardous failure condition is extremely remote.	Y	CS-E510(a)(3) Safety Analysis	CS-E 510 requires that Hazardous Engine Effects are predicted to occur at a rate not in excess of that defined as Extremely Remote.
25.1711 Component identification; EWIS **(See AMC 25.1711)**			
(a) EWIS components must be labelled or otherwise identified using a consistent method that facilitates identification of the EWIS component, its function, and its design limitations, if any.	Y	CS-E120(a) Identification	CS-E 120(a) requires all engine components to be suitably identified in accordance with Part 21A.801 Identification of products.

(b) For systems for which redundancy is required either by specific certification requirements, operating rules or by CS 25.1709, concerned EWIS components must be particularly identified with its component part number, function, and separation requirement for bundles: (1) The identification must be placed along the wire, cable, or wire bundles at appropriate intervals and in areas of the aeroplane so they are readily visible to maintenance, repair, or alteration personnel. (2) If an EWIS component cannot be marked physically, then other means of identification must be provided.	Y	CS-E120 Identification	The original engine type design, and any changes to the type design, defines the routing and segregation of Engine EWIS components, necessary to achieve the objectives defined in the CS-E Safety Analysis requirements. Modification of engine EWIS components by third parties is very uncommon, and would need to address the same safety analysis requirements applied to the type design. The identification requirements of CS-E 120 are therefore considered adequate for engine EWIS components.
(c) The identifying markings required by subparagraphs (a) and (b) must remain legible throughout the expected service life of the EWIS component.	Y	CS-E110 Drawings and Marking of Parts — Assembly of Parts CS-E80	CS-E 110 (b) requires each engine EWIS component part to be suitably marked so that it can be identified with the drawing to which it was made. CS-E 80 (AMC E 80) includes the testing required to demonstrate legibility of labelling and long term performance of the part.
(d) The means used for identifying each EWIS component as required by this paragraph must not have an adverse effect on the performance of that component throughout its expected service life.	Y	CS-E110 Drawings and Marking of Parts — Assembly of Parts CS-E80	CS-E 110 (b) requires each engine EWIS component part to be suitably marked. CS-E 80 (AMC E 80) includes the testing required to demonstrate legibility of labelling and long term performance of the part.
(e) Identification for EWIS modifications to the type design must be consistent with the identification scheme of the original type design.	Y	CS-E110 Drawings and Marking of Parts — Assembly of Parts	CS-E 110 (b) requires each engine EWIS component part to be suitably marked. This applies equally to changes to the type design.

25.1713 Fire protection; EWIS **(See AMC 25.1713)**			
(a) All EWIS components must meet the applicable fire and smoke protection requirements of CS 25.831(c) and CS 25.863.	Y	CS-E 130 Fire protection CS-E 510 Safety Assessment	CS 25.831(c) requires that the effect of EWIS component combustion on cabin air quality should be taken into account for reasonable probable failures or malfunctioning of the ventilating, heating, pressurisation or other systems and equipment. The Safety Assessment of CS-E 510 needs to address or exclude potential combustion of engine EWIS components contaminating the pressurised aircraft cabin bleed supply. CS 25.863 requires that, in each area where flammable fluids or vapours might escape by leakage of a fluid system, there must be means to minimise the probability of ignition of the fluids and vapours, and the resultant hazards if ignition does occur. CS-E 130 addresses this by requiring that the design and construction of the Engine and the materials used must minimise the probability of the occurrence and spread of fire during normal operation and Failure conditions and must minimise the effects of such a fire.

(b) EWIS components that are located in designated fire zones and are necessary during emergency procedures must be at least fire resistant.	Y	CS-E130 Fire Protection	CS-E 130(e) requires that engine control system components which are located in a designated fire zone must be at least Fire Resistant.
(c) Insulation on electrical wire and electrical cable, including materials used to provide additional protection for the wire and cable installed in any area of the aeroplane, must be self-extinguishing when tested in accordance with the applicable portions of Part I of Appendix F.	Y	CS-E 130 Fire Protection	Part I Para (a) 3. of Appendix F to CS-25 requires that Insulation on electrical wire or cable installed in any area of the fuselage must be self-extinguishing when subjected to the 60 degree test specified in Part I of this Appendix. The average burn length may not exceed 76 mm (3inches), and the average flame time after removal of the flame source may not exceed 30 seconds. Drippings from the test specimen may not continue to flame for more than an average of 3 seconds after falling. Wires types/specifications installed on engines may be already approved as fulfilling this requirement. These could be, for instance, but not limited to, British Test Standard, EN3475-407:2009, SAE AS 4373 method 801. In case an overbraid is applied, an overbraid made of self-extinguishing material, for instance according standard like NF ISO1210 (UL94 test method), could be acceptable. Where EWIS components forming a part of the engine type design either utilise wiring conforming to approved standards, or have been subjected to specific testing to establish compliance with CS-25 Appendix F, this should be declared in CS-E 130 compliance documentation, and the engine TCDS may be endorsed to indicate that this means of compliance was utilised.

25.1715 Electrical bonding and protection against static electricity; EWIS (See AMC 25.1715)			
(a) EWIS components used for electrical bonding and protection against static electricity must meet the requirements of CS 25.899.	Y	CS-E 135 Electrical Bonding	CS-E-135 requires any components, modules, equipment and accessories that are susceptible to or are potential sources of static discharges or currents from electrical faults, to be designed and constructed so as to be grounded to the main Engine earth, as necessary to minimise the accumulation of electro-static or electrical charge that would cause: - Injury from electrical shock, - Unintentional ignition in areas where flammable fluids or vapours could be present, - Unacceptable interference with electrical or electronic equipment.
(b) Electrical bonding provided by EWIS components must provide an adequate electrical return path under both normal and fault conditions, on aeroplanes having earthed electrical systems (see CS 25.1353(e)).	Y	CS-E 135 Electrical Bonding	CS-E-135 requires any components, modules, equipment and accessories that are susceptible to or are potential sources of static discharges or currents from electrical faults, to be designed and constructed so as to be grounded to the main Engine earth, as necessary to minimise the accumulation of electro-static or electrical charge that would cause: - Injury from electrical shock, - Unintentional ignition in areas where flammable fluids or vapours could be present, - Unacceptable interference with electrical or electronic equipment.

25.1717 Circuit protective devices; EWIS (See AMC 25.1717)			
EWIS components must be designed and installed so they are compatible with the circuit protection devices required by CS 25.1357, so that a fire or smoke hazard cannot be created under temporary or continuous fault conditions.	Y	CS-E 50 Engine Control System	CS-E 50(c)(4) requires that foreseeable Failures or malfunctions leading to local events in the intended aircraft installation, such as fire, overheat, or Failures leading to damage to Engine Control System components, must not result in a Hazardous Engine Effect due to Engine Control System Failures or malfunctions. This is adequate to ensure engine EWIS components are appropriately designed to prevent fire in all foreseeable failure conditions.
25.1719 Accessibility provisions; EWIS (See AMC 25.1719)			
Means must be provided to allow for inspection of EWIS and the replacement of its components as necessary for continued airworthiness.	Y	CS-E 25 Instructions for Continued Airworthiness (AMC E25) (c)	EWIS components are inspectable and replaceable in accordance with applicable engine maintenance manual.

25.1721 Protection of EWIS **(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.	N	Not applicable to engine certification	Airplane level requirement. Not applicable to engine or engine systems.
(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.	Y	CS-E25 Instructions for Continued Airworthiness (AMC E25) (c)	The engine manufacturer is required under CS-E25 to develop Instructions for Continued Airworthiness (ICA) for each engine. Under the requirements of CS-E 25, the ICA must include a detailed description of the engine and its components, systems and installations. It also includes servicing and troubleshooting information, and the tools and equipment for part replacement. The engine ICA also includes the necessary precautions, including protection of the EWIS, during maintenance, repair and/or replacement of engine components.
(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.	N	Not applicable to engine certification	Airplane level requirement. Not applicable to engine or engine systems.

25.1723 Flammable fluid fire protection; EWIS (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.	Y	CS-E80 Equipment CS-E135 Electrical Bonding (AMC E 135)	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. In addition to the Electrical Bonding requirements of CS-E 135, Engine EWIS components are required to comply with CS-E 80, including Section 9 of EUROCAE ED-14 / RTCA Document DO160 or other equivalent approved industry standard, which requires a demonstration that an item of equipment cannot cause an explosion of flammable fluids.
25.1725 Powerplants; EWIS			
(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).	N	Not applicable to engine certification	Each single engine is separated from the other engine and the airplane by its location on the wing or fuselage. The engines are separated from an airplane wing or from the fuselage by the engine struts. The isolation of airplane powerplants as required under CS 25.1725 is addressed through airplane system redundancy requirements and the spatial separation of engine systems including the electrical

			wiring. The engine separation is addressed at the airplane level under 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).	N	Not applicable to engine certification	The aircraft level effects of an engine failure including rotor burst and/or engine fire on the remaining powerplant and airplane systems is addressed as part of the airplane Particular Risk Assessment (PRA) and included in the airplane level EWIS Safety Assessment required under CS 25.1709. Airplane level hazards resulting from engine fire or rotor bust are addressed under CS 25.903(d)(1).
25.1727 Flammable fluid shutoff means; EWIS			
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.	Y	CS-E130 Fire Protection (AMC E130)	CS-E 130(c.) requires tanks which contain flammable fluid and any associated shut-off means and supports, which are part of and attached to the Engine, to be Fireproof either by construction or by protection, unless damage by fire will not cause leakage or spillage of a hazardous quantity of flammable fluid. The airframer-installed EWIS components associated with the engine fuel shutoff valve and engine fire detection systems, located in a fire zone, are fire resistant and are certified under CS 25.1727. The EWIS components that are installed by the engine manufacturer that are associated with fuel shut-off and engine fire protection systems, located in a fire zone are fire resistant and are certified under CS-E 130 and AMC E 130(2)(c)

CS 25.1729 Instructions for Continued Airworthiness; EWIS			
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.	Y	CS-E25 Instructions for Continued Airworthiness	Engine ICA, including EWIS components and installations, should be documented in engine maintenance manuals as required in CS-E 25 and on wing maintenance actions should be incorporated in the aircraft level ICA document.
Appendix H 25.5 Electrical Wiring Interconnection System Instructions for Continued Airworthiness			
The applicant must prepare Instructions for Continued Airworthiness applicable to Electrical Wiring Interconnection System as defined in CS 25.1701. (see AMC Appendix H 25.5)	Y	CS-E25 Instructions for Continued Airworthiness	Engine ICA, which includes the engine EWIS components, is developed in accordance with CS-E 25 and AMC 20-21 and CM-ES-002. Note that the engine manufacturer contributes to the aircraft Maintenance Steering Group-3 analysis (or similar), used to determine the scheduling of maintenance activity.
25.1731 Powerplant and APU fire detector system; EWIS			
(a) EWIS that are part of each fire or overheat detector system in a fire zone must be at least fire resistant.	Y	CS-E130 Fire Protection	Engine type design normallly does not include fire and overheat detection systems, and CS-E requirements do not contain specific requirements addressing these systems. However, where they are included, CS-E 130(e) requires that engine control system components located in a designated fire zone are 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.	N	CS-E170 Engine Systems and Component Verification	In cases where fire and overheat systems, or components of those systems, are included in the engine type design, these must be certified under CS-E requirements. Furthermore, they must be subjected to additional tests or analysis, as required by CS-E 170 Engine Systems and Component Verification, in order to demonstrate that the systems or components are able to perform the intended functions in all declared environmental and operating conditions.