Certification Authorities for Large Transport Aircraft (CATA)

CATA Worklist Item (CWI) EASA-002 – 2D Nacelle Fire Resistance

Date Raised:	<05 April 2018>	Status:	Closed
Subject:	**CS/FAR 25.867 Fire Protection: other components – 2D Nacelle**		
Related Issue(s): (Identify Discussion Paper number, if any)	N/A		

Description of Issue(s):
(Give a brief background of issue(s)

The intent of the rule FAR/CS 25.867 “Fire protection: other components” is to ensure that a fire adjacent to the engine will not be hazardous for the airplane and to prevent catastrophic damage. § 25.867 is based upon the assumption that fire will escape from the engine nacelle. Interpretation and guidance to show compliance with these requirements is not harmonized between FAA and EASA. The following CATA Worklist Items will focus on the deviations and address the main topics for discussions.

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Background:

In relation to the rule 25.867, there is no existing EASA AMC, or FAA AC. EASA had released an interpretative material and acceptable means of compliance (extract in Annex 2) via CRI at project level. FAA on its side had produced a FAA Issue Paper (IP) (extract in Annex 3).
Today, there is no known IM / MoC material from ENAC/TCCA.

The main deviations in interpretation and compliance strategy of CS/FAR 25.867 can be analysed and classified following three distinct aspects:

- Fire resistance definition
- The 2D Nacelle Area
- Aircraft configurations in normal operation

1- Deviation on interpretation regarding Fire resistance definition:

	EASA	FAA	Reference
Regulation definition	CS 25-867 – EASA refers to aluminium fire withstanding equivalency	FAR 25-867- FAA refers to fire resistant	Annex 1
Standard test for fire resistance and interpretation	ISO 2685	AC 20.135	Annex 4
Reference to object different than surfaces (e.g.Seals, components -Flaps and slats not fully retracted)	Interpretative material (Seals included in the compliance demonstration)	Issue Paper (Non-critical aerodynamics seals and fairing not included)	Annex 2, 3

In regard to Fire Resistance, some identified differences in existing regulatory and guidance material in CS/FAR 25 as well as differences in terms of Fire tests requirements, remained unsolved.

2- 2D Nacelle Area

In order to show compliance with § 25.867, the applicant must demonstrate the fire resistant/Fire resistant equivalency characteristics surfaces in a zone that usually begins at a given point. The applicant must identify surfaces (component) within the extent of the zone that represents the volume of threat considered.

The main differences identified between FAA/EASA are listed below: (Ref. Annex 2 &3)

General definition of the 2D nacelle area:

- dimension/size,
- shape (Cylindrical/Rectangular prism)
- referencing points
- conditions for relief:
  - define interpretation of the rear to cope with rule wording "…to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle…")
  - define applicability/non applicability of rule (i.e., presence / non presence of flammable fluids, components, systems, seals, landing gear,…)

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Example of differences between FAA and EASA

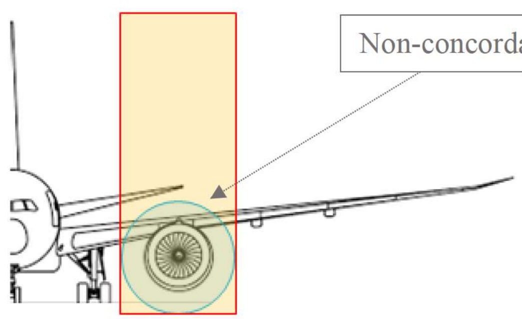

Figure 1
EASA(blue, cylindrical) and FAA(red, cuboid) approach to 2D area

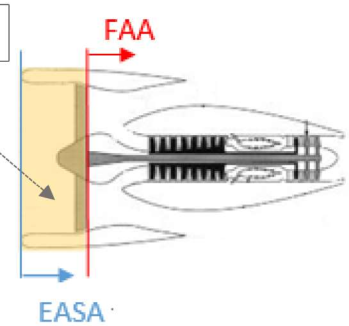

Figure 2
EASA(blue) and FAA(red) approach to 2D area

Figure 1, 2 display the zones, indicating the difference in area and consequential volume between FAA FAR 25.867(a) and EASA CS 25.867(a). The deviations in requirement lie within the inlet lip, based on the reasoning that fire might exit the inlet in zero- or tailwind conditions. FAR requirement is also more likely to consider landing gear components. EASA has accepted relief for the air inlet from the starting point definition provided that no flammable fluid are present neither in the air inlet nor in the volume defined with air inlet considered.

3- Aircraft configuration(s) and flight phase

EASA and FAA have the same interpretation regarding the scope of applicability. However, historically, applicants focused on only the cruise flight phase, in which the wing is in **clean** configuration. Existing acceptable compliance methods for **"non-clean"** wing configurations are complex and additional guidance should be developed.

It is EASA's position that "all normal flight conditions" are understood as any flight condition that an aircraft can encounter within its flight envelope. Including ground and flight phases, such as but not limited to: taxi, T/O, climb, descent approach and landing where slats and flaps (or any other surfaces within the 2D zone) could be partially and/or fully extended thus exposing components/surfaces hidden by surfaces during a cruise phase (so called clean wing configurations). Airworthiness Authorities should agree on criteria to be applied on non- protected components.

Proposed Prioritization:

(Per CATA Technical Issues List Prioritization schema, SME proposes along with authority CATA members)

Question	**Answer**
1. Is there an active working group related to this issue?	No
2. In which documents are there deviations amongst the authorities?	EASA CS 25.867 (Certification Review Items) and FAA FAR 25.867 (Issue Papers)
3. Was this issue raised by or at the CMT?	No
4. What is the level of impact on projects in the future (i.e. minor, major, critical)?	Major
5. How many authorities does the issue impact?	All
6. What is the approximate technical complexity of the issue (i.e. low, medium, high)?	Medium

Reference Point

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Recommendation:

(SME proposes expected resolution of the issue)

It is expected that a team of specialists from all authorities remove any ambiguity, harmonize and extend FAA FAR 25.867 and EASA CS 25.867 as well as ANAC/TCCA similar requirements with regard to the following points:

- General definitions: 2D Nacelle area, dimension, volume, conditions of fire, and surfaces (discussion on seals, components, landing gear)
- Reference point/ starting point
- Fire resistance requirements – Equivalency to aluminium vs Fire resistant
- Aircraft configuration (Guidance on non-clean configurations to be developed)
- Flight phase (Possible introduction of segregation of ground and flight phase)
- Means of compliance (with regard to non-clean wing configuration, extended landing gear, acceptable fire test, acceptance of material properties)

SME Recommendation:

(Recommendations from SME Working Group; may contain links and/or embedded documents)

The SME team recommends the issuance of the guidance paper shown in Annex 5.
The guidance paper does not supersede regulatory requirements or existing policies.

Final CATA Position:

(Explain agreement, dissent or conclusion on this CWI)

The CATA accept the SME team's recommendation and proposed guidance paper. The guidance paper is appended directly to this CWI. Refer to Annex 5.

The CWI represents an agreement that the guidance paper is harmonized and accepted by all CMT authorities.
The CWI form, including the appended paper, document a CMT member authority agreement that member authorities may reference when they are acting as the certificating authority (CA). Following CA endorsement for a particular project, the other CMT member authorities, when acting as validating authority, will accept the approach.
If any member-authority under CATA becomes aware of circumstances that make it apparent that following the guidance paper would not result in compliance with the member-authority's applicable airworthiness standards, then the use of this guidance paper is non-binding, and the member-authority may require additional substantiation or design changes as a basis for finding compliance.

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CATA Signatures:

CATA Representative	Name	Signature	Date
ANAC	Daniel Pessoa Marcelo Leite	Daniel Pessoa Martins Cunha Assinado de forma digital por Daniel Pessoa Martins Cunha DN: dc=br, dc=gov, dc=anac, ou=ANAC, ou=SAR, ou=USUARIOS, cn=Daniel Pessoa Martins Cunha Dados: 2024.07.08 16:55:34 -03'00' Marcelo Henrique Morales Leite Assinado de forma digital por Marcelo Henrique Morales Leite DN: dc=br, dc=gov, dc=anac, ou=ANAC, ou=SAR, ou=USUARIOS, cn=Marcelo Henrique Morales Leite Dados: 2024.07.09 21:01:10 -03'00'	
EASA	Mathilde Labatut Israel Navarro	P.A.	July 5, 2024
FAA	Hung Cao James Wilborn	Digitally signed by HUNG T CAO Date: 2024.07.10 08:00:31 -04'00' JAMES E WILBORN Digitally signed by JAMES E WILBORN Date: 2024.08.05 09:09:45 -07'00'	
TCCA	Canh Nham André Celere	Nham, Canh Digitally signed by Nham, Canh DN: C=CA, O=GC, OU=TC-TC, CN="Nham, Canh" Reason: I am the author of this document Location: Date: 2024.08.06 09:02:46 -04'00' Foxit PDF Editor Version: 13.0.1	2024.08.06

ANNEX 1. Supporting Materials

Certification Authorities for Large Transport Aircraft (CATA)

CATA Worklist Item (CWI) EASA-002 - 2D Nacelle Fire Resistance

CS 25.867 Fire protection: other components
(a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centreline, must be constructed of materials **at least equivalent in resistance to fire as aluminium alloy in dimensions appropriate for the purpose for which they are used.**
(b) Sub-paragraph (a) of this paragraph does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.

FAR 25.867 Fire protection: other components.
(a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, **must be at least fire-resistant.**
(b) Paragraph (a) of this section does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.

	EASA- Interpretative material via CRI at project level	FAA- Issue Paper
Definitions		
Nacelle diameter	Maximum external dimension of the cowlings (in the y-z engine/nacelle plan) surrounding the engine (air inlet or thrust reverser cowling, fan cowlings, exhaust...). When the shape is circular, it is a diameter. When the shape of the nacelle is not circular (i.e. ovoid), this maximum dimension (D) is the maximum external dimension of the cowling (in the y-z engine/nacelle plan).	The diameter is measured from the outside surface of the outermost designated fire zone.
2D Nacelle	Is a fictive surface of $\frac{1}{4}\pi(2D)^2$.	Twice the appropriate nacelle diameter
Reference Point	The Reference point on the nacelle is the most forward point (into the aircraft nose direction) of the nacelle along the engine/nacelle x axis.	The reference point starts at the forward point of the engine fire zone (typically the fan case). The forward side of the prism is defined as the most forward portion of any engine flammable leakage zone or fire zone. This may include the inlet if the inlet cavity contains flammable fluids.
2D Volume	Fictive volume around the x engine/nacelle axis, starting from the reference point and projecting the section made by the 2-D area rearwards along the engine/nacelle x-axis towards the aircraft tail. Volume is usually symmetrically positioned around the x engine/nacelle axis. Most common volume (for circular nacelle cowlings) is **a cylinder with diameter 2D.**	The zone is a **rectangular prism with six sides** containing the engine nacelle and adjacent airplane surfaces: The forward side of the prism is defined as the most forward portion of any engine flammable leakage zone or fire zone. This may include the inlet if the inlet cavity contains flammable fluids. […] Ref. Annex 2.Extract from issue paper.
Surface	Aircraft surfaces within the volume of threat considered	
Fire resistance		
	• Surface shall have an equivalent fire withstanding capability as **aluminium** surfaces. - Comparative testing had been accepted (Composite vs Aluminium panel) • Per CS-Definitions, this capability is assumed to be equivalent to sustain the effect of a standard flame (temperature =1100°C / Heat Flux = 116 KW / m²) for 5min. This is defined as being fire resistant. • Fire threat corresponds to engine fuel fed	Surfaces to be at least fire-resistant, per FAA AC 20-135, **regardless material or function**. At least fire-resistant means: Material component will function and maintain its integrity for a minimum of 5 minutes when exposed to a 2000°F (1093 °C) flame temperature.
Fire Testing Method	ISO2685	AC 20-135

ANNEX 2. EASA- Interpretative Material (extract)

Interpretative Material E-13
2D Engine Nacelle Area

The means of compliance described in this document is intended to provide guidance to supplement the engineering and operational judgment that must form the basis of any compliance findings relative to the protection of surfaces in a volume around the engine/nacelle.

1 DEFINITIONS.

For the purposes of this interpretative material, the following definitions should be used.

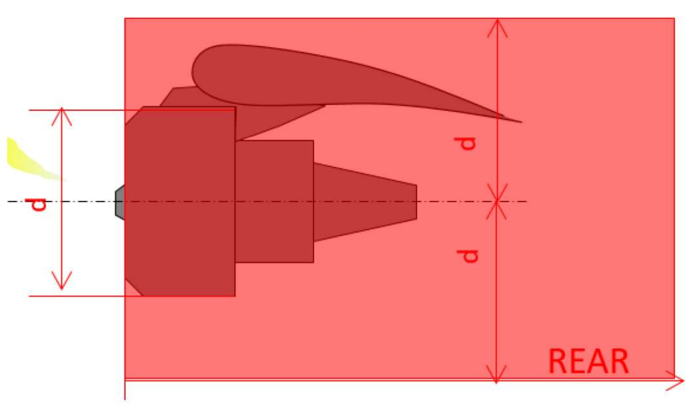
a. Nacelle Diameter (D): represents the maximum external dimension of the cowlings (in the y-z engine/nacelle plan) surrounding the engine (air inlet or thrust reverser cowling, fan cowlings, exhaust,..). When the shape is circular, it is a diameter. When the shape of the nacelle is not circular (i.e. ovoid), this maximum dimension (D) is the maximum external dimension of the cowling (in the y-z engine/nacelle plan).

b. 2D-Area: is a fictive surface of ¼ π $(2D)^2$.

c. Reference point: Since the requirement is applicable to surfaces to the rear of the nacelle, it is important to define from where surfaces are to be considered rearward of the nacelle. The Reference point on the nacelle is the most forward point (into the aircraft nose direction) of the nacelle along the engine/nacelle x axis. Any surfaces, rearward of the most forward point of the nacelle, in the direction of aircraft tail, are situated in the rear of the nacelle. Example of most forward nacelle point is for a turbofan, the air inlet lip point of airflow separation.

d. 2D -Volume: fictive volume around the x engine/nacelle axis, starting from the reference point and projecting the section made by the 2-D area rearwards along the engine/nacelle x-axis towards the aircraft tail. Volume is usually symmetrically positioned around the x engine/nacelle axis. Most common volume (for circular nacelle cowlings) is a cylinder with diameter 2 x D

e. Surface: These are aircraft surfaces within the volume of threat considered. As examples, but not limited to, these surfaces are : pylon fairings, wing upper surface, wing lower surface, wing leading edge, wing trailing edge, slats, flaps, flap track fairings, ailerons, spoilers, fuselage, cargo door, passenger doors, windows, access doors, venting grid, air scoop, seals, horizontal tailplane surface, elevators, fin, rudder,...



2 BACKGROUND.

a. Although design precautions are taken to contain fire within the engine designated fire zones (per CS 25.1181), there are situations of fire such as a tailpipe fire, or uncontained fire in the nacelle following loss of firewall/cowling integrity where further precautions have to be taken at aircraft surface level. Therefore CS25.867 requires aircraft surfaces within a limited volume around the engine nacelle to be able to withstand effect of fire.

3 FIRE RESISTANCE

- Surface shall have an equivalent fire withstanding capability as aluminium surfaces.
- Per CS-Definitions, this capability is assumed to be equivalent to sustain the effect of a standard flame (temperature =1100°C / Heat Flux = 116 KW / m²) for 5min. This is defined as being fire resistant.
- Fire threat correspond to engine fuel fed fire.

4 COMPLIANCE STRATEGY

- Identification of affected volume

Applicant shall identify the 2D-volume by presenting the relative positioning of the engine/nacelle versus the aircraft. Dimensions (diameter / maximum external dimension and reference point) of the volume shall be agreed with EASA.

- Identification of aircraft surfaces within the volume.

Applicant shall present the list of surfaces within the affected volume. It does include seals, access doors, scoop, grids, doors, F/CTL surfaces, Belly Fairing, Landing gear doors....

CS 25.867b is offering the possibility to exclude surfaces sufficiently away from the threat source. Applicant shall provide appropriate rationales to justify the non-applicability of the requirement. As an example, for an aircraft with engine pod wing mounted, provided there is sufficient distance in between, the tailplane surfaces might be excluded.

- Proposal of Mean of Compliance for each surface to show the fire resistance. Typical Mean Of Compliance are Material properties (MoC1), reconciliation from past testing data (MoC2 + MoC4) and testing (MoC4). Mean Of Compliance shall be agreed with EASA.

5 COMPLIANCE DEMONSTRATION BY TEST

For compliance demonstration by testing, EASA accepts the ISO 2685 standard.

Applicant shall verify that testing includes the appropriate:

- representative environmental conditions such as loads (i.e. aerodynamic loads, seal compression,...) and vibrations. Prior to beginning the compliance process, applicants should submit their proposed certification method to EASA for approval.
- fire conditions representative of a fuel fed fire. A test with gas burner is not representative of an engine fire, unless the engine is supplied with gas.

With regards to the intend of the requirement, a surface is declared compliance with the requirement when there is no burnthrough with a standard flame (1100°C – 116 KW / m²) applied through a burner placed at a distance in accordance with the ISO2685 during 5mn.

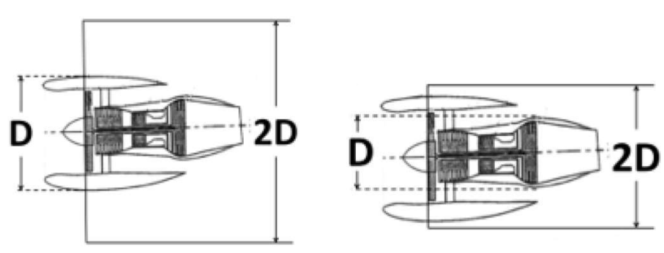
ANNEX 3. FAA – Issue Paper (extract)

The zone is a rectangular prism with six sides containing the engine nacelle and adjacent airplane surfaces:

- The forward side of the prism is defined as the most forward portion of any engine flammable leakage zone or fire zone. This may include the inlet if the inlet cavity contains flammable fluids. See Figure 1.
- The inboard and outboard sides of the prism are one nacelle diameter from the nacelle centerline, where the diameter is measured from the outside surface of the outermost designated fire zone. For example, an engine that has fan case mounted accessories will have its fan compartment considered a designated fire zone; therefore the outside of the fan cowl would be used for the nacelle diameter measurement. For an engine with core-mounted accessories, the core compartment is the only designated fire zone therefore the outside core cowl diameter would be used. See Figure 1.
- The top, bottom, and aft sides of the prism are at a distance from the engine that cannot be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle. Conditions that must be addressed include in-flight and ground operations. The demonstration of fire resistance should include a showing that any composite control surfaces such as elevators or flaps will retain structural integrity and aerodynamic capabilities necessary to perform their intended function. For wing-mounted engines, the upper and lower surfaces of the wing must be fire resistant unless the applicant can show that those surfaces could not be readily affected. Tail sections to the rear of wing-mounted engines are generally considered to be of sufficient distance away and do not need not be shown as fire resistant. Surfaces of a horizontal stabilizer close-coupled to aft-fuselage mounted engines must be fire resistant unless the applicant can show that those surfaces could not be readily affected. See Figure 2.

Aerodynamic seals or fairings are not required to be fire resistant if the applicant provides an analysis substantiating that failure of the component will not result in a hazard. For example, if airplane systems such as wiring, flight controls (including surfaces), or structural mounting are located in an area where fire could enter because of a failed non-fire resistant seal, the applicant must show there are no hazardous effects.

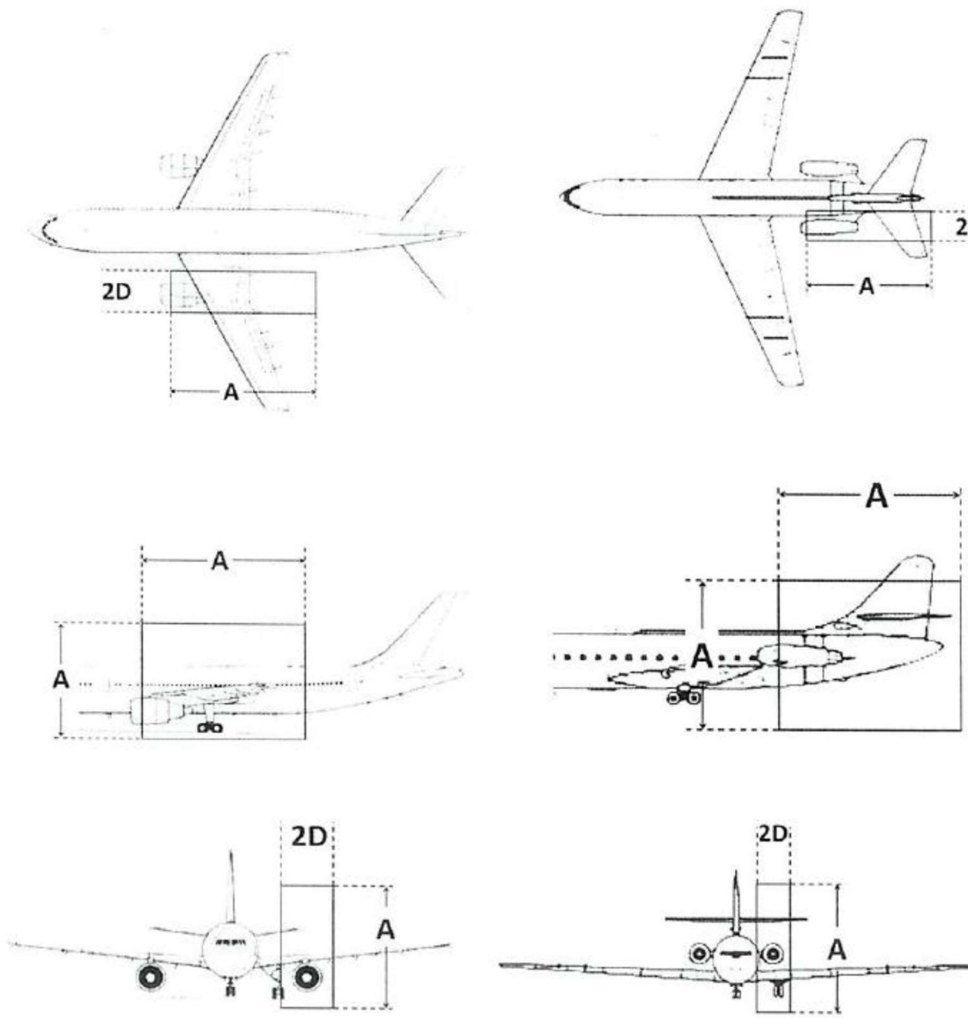
Figure 1: Examples for Determining 2D Dimension



Designated fire zone in the fan compartment

Only designated fire zone in the core compartment

Figure 2: Determination of Zone for Wing-Mounted & Aft-Fuselage Mounted Engines



2D = twice the appropriate nacelle diameter

A = distance from the engine that can be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle

ANNEX 4. FIRE RESISTANCE

Following Interpretative Material is provided by EASA as part of CRIs on the 2D Nacelle requirement:

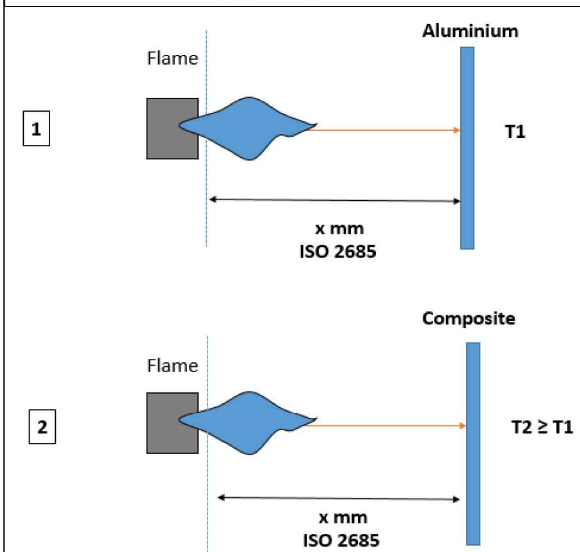
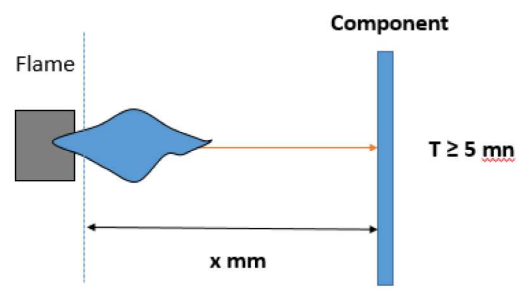
- Surface shall have an equivalent fire withstanding capability as aluminium surfaces.
    - Comparative testing had been accepted (Composite vs Aluminium panel)
- Per CS-Definitions, this capability is assumed to be equivalent to sustain the effect of a standard flame (temperature =1100°C / Heat Flux = 116 KW / m²) for 5min. This is defined as being fire resistant.
- Fire threat corresponds to engine fuel fed
- ISO2685 is used for fire testing

The FAA demands surfaces to be at least fire-resistant, per FAA AC 20-135, regardless material or function.

E.g. various test methods, standards or guides are used to assess the fire behaviour of various components used in fire zones:
AC 20.135: Guidance to demonstrate the compliance with the powerplant fire protection requirements of the FAR (materials & components used in engines & APU installations and in areas adjacent to fire zones).

ISO 2685: Test procedure for airborne equipments to assess the fire resistance of components, equipments & structures located in "fire zones".

Various tests on components used in fire zones:

EASA- ISO 2685	FAA - AC 20.135
	

ANNEX 5: Subject Matter Expert Panel Guidance – 2D Nacelle Fire Resistance

1. PURPOSE

This document provides guidance for demonstrating compliance with the certification requirements for surfaces to the rear of the engine nacelles / auxiliary power units (APU) under 14 CFR § 25.867, CS 25.867, AWM 525.867 and RBAC 25.867, *Fire Protection: other components*. This document contains specific criteria for defining the geometric surfaces of the airplane and flight conditions that are considered when substantiating compliance to the requirements of § 25.867[(1)].

2. APPLICABILITY

2.1. The guidance in this document applies to airplane manufacturers, modifiers, and certifying authorities for demonstrating compliance with the requirements for the fire protection of surfaces to the rear of the engine nacelles and APU of transport / large transport category airplanes (title 14, Code of Federal Regulations (14 CFR) part 25, Certification Specification (CS) 25, Chapter 525 of the Airworthiness Manual (AWM), and Regulamentos Brasileiros da Aviação Civil (RBAC) 25.) Supplemental guidance for electric motor or fuel cell powered propulsion and power systems should be obtained from the regulatory authority. This guidance is applicable for which a new, amended, or supplemental type certificate is requested.

2.2. The regulatory mechanism of several certification codes does not differentiate a powerplant installation from an APU installation. Issue papers (IP) or special condition (SC) have been issued to record an acceptable method of compliance to § 25.867 when applied to the APU installation. Review of in-service events that prompted release of an issue paper or special condition, is the grounds for this document to detail the interpretation for the § 25.867 applicability to the APU installation and the associated acceptable methods of compliance.

[(1)] For reading simplification, when text refers to a certification requirement in a general manner, the detailed coding of the rule is simplified to a requirement identification number. Example: 14 CFR § 25.867, CS 25.867, AWM 525.867 and RBAC 25.867 are abbreviated to "§ 25.867."

3. RULE TEXT

EASA, FAA, TCCA and ANAC requirements are slightly different –

CS 25.867 (Amdt Initial – no text evolution since then. Text originating from JAR)	**14 CFR 25.867 (Amdt 25-23 – no text evolution since initial FAR in 1964 only recoding (25.1205))**	**TCCA AWM 525.867 Fire Protection: Other Components**	**RBAC 25.867 [Amdt. 25–23, 35 FR 5676, Apr. 8, 1970]**	**Comparison**
CS 25.867 Fire protection: other Components (a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, must be constructed of materials at least equivalent in resistance to fire as aluminum alloy in dimensions appropriate for the purpose for which they are used.	**Sec. 25.867 Fire protection: other components**. (a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, must be at least fire-resistant.	**525.867 Fire Protection: Other Components** (a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, must be at least fire-resistant.	**§ 25.867 Fire protection: other components.** (a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, must be at least fire-resistant.	EASA: equivalent fire resistance to aluminum alloys in dimensions appropriate for the purpose for which they are used. FAA: fire resistance only TCCA: fire resistance only ANAC: fire resistance only
(b) Sub-paragraph (a) of this paragraph does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.	(b) Paragraph (a) of this section does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle	(b) Paragraph (a) of this section does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames or sparks coming from a designated fire zone or engine compartment of any nacelle.	(b) Paragraph (a) of this section does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.	No difference

4. INTENT OF THE RULE

The intent of § 25.867 is to prevent hazards to airplane external surfaces exposed to heat, flames or sparks originating from or adjacent to engines/APU. While there are separate powerplant fire protection regulations intended to prevent a fire escaping from the engine nacelle (e.g., § 25.1193/ CS 25J1193), § 25.867 is based upon the assumption that fire will escape the engine nacelle or occur outside of the engine or APU.

5. HISTORICAL BACKGROUND

The intent of the EASA and FAA/TCCA/ANAC rule is the same. However, the rule text difference in § 25.867(a) implies some different acceptable methods of compliance.

For background review, the TCCA AWM and ANAC RBAC followed the FAA 14 CFR text and EASA CAS originated from the Joint Aviation Authorities (JAA). The JAA requirement itself had origins from the FAA 14 CFR text. The historical background of the rule is limited to the FAA regulatory history and differences (between EASA and FAA/TCCA/ANAC).

From the FAA history, § 25.867 has been included in the requirements for transport category airplanes since 1945 (e.g., FAA Civil Airworthiness Regulations (CAR) 04-0, effective November 9, 1945 with 04.493). At that time, engines were primarily mounted forward of the wing such that fires from the engine could impinge on upper and lower wing and flight control surfaces. The early versions of this regulation used the text stating “within one nacelle diameter **on either side**” or “within one nacelle diameter **on both sides**” of the nacelle centerline. When the rule was rewritten from the FAA CAR 4b to 14 CFR part 25, the reference to “both sides” of the nacelle centerline was removed, leading to various interpretations of how to define areas of the airplane that are within one nacelle diameter of the nacelle centerline. The intent of the original wording was to define a lateral distance on each side of the engine that must be shown to be fire resistant.

At recodification of FAA CAR 4.b and introduction of the 14 CFR part 25 (1964), the requirement was recodified under *§* 25.1205. This evolved with Notice of Proposed Rulemaking (NPRM) 68-18, however evolution is solely on the coding as the contents did not evolve:

> *The proposal would require fire protection requirements for other components now specified in § 25.1205 to a new § 25.867 in order that the requirements would be in logical sequence.*

There has been no FAA amendment to § 25.867 since then.

The CS 25.867 rule introduced at the initial CS release has not been amended since then. From the initial CS release, as a carry-over of the JAR, the history can be traced up to JAR25 Amendment 14 (May 27, 1994) that shows the same text. Prior to JAR25 Amendment 14, the text was as such (Amendment 13, dated October 5, 1989):

> **JAR 25.867 Fire protection: other components**
> (a) Surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centreline, must be at least fire-resistant.
> (b) Sub-paragraph (a) of this paragraph does not apply to tail surfaces to the rear of the nacelles that could not be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.

The former text of subparagraph (a) was aligned with the current FAA rule (at Amendment 25-23) and the text changed with Notice of Proposed Amendment (NPA) 25D-181. It is also noted that with the same JAR revision, JAR 25.1181(b) evolved by adding cross reference to §§ 25.867 and 25.869, arising from 14 CFR part 25, Amendment 25-72. It is suspected that it originates from the difference of the CS-Definition vs 14 CFR part 1 definition for fire resistance/fire proofness.

More recently certification review items (CRI) and issue papers (IP) have been released to provide guidance for volume definitions, rule applicability and acceptable methods of compliance. These guidance materials were not necessarily harmonized. Note that in some instances IPs were applied to the APU installation for its compliance to § 25.867.

6. RELATED FIRE PROTECTION REGULATIONS

While there are separate powerplant/APU fire protection regulations intended to prevent a fire escaping from the engine nacelle, such as § 25.1193/ CS 25J1193 *Cowling and Nacelle Skin*, the requirements of § 25.867 are based upon the assumption that fire will escape the nacelle and fire zones defined by § 25.1191/CS 25J1191 *Firewalls*, or occur from flammable fluids that are ignited outside of the fire zones. The definition of "fire resistant," as defined in Paragraph 8.1 of this document, is based upon the capabilities of powerplant/APU installation components to resist fire at least as well as aluminum alloy in dimensions appropriate for the purpose for which they are used. The certifying authorities adopted specific fire resistance requirements for other regions of the airplane, including § 25.963(e) for fuel tank access panels and § 25.856 for thermal acoustic insulation to inhibit fuselage burn-through. The introduction of composite wing fuel tanks resulted in the certifying authorities applying special conditions to recent certification projects to require demonstrating the fuel tanks provide equivalent fire resistance to that of aluminum. The extensive use of composites in flight control surfaces, and other critical components in close proximity to the engines, has resulted in additional considerations when demonstrating compliance to § 25.867.

7. EXPERIENCE

There are a wide variety of experienced scenarios for which the rule has provided benefits in protecting the aircraft:

- Uncontained engine rotor failure (UERF) / fan blade off (FBO)
- Hard landing with partial detachment of engine and severed flammable fluid line
- Engine mounting system damage
- Post crash fire
- Pylon or wing fuel leak running onto engine/nacelle hot surfaces
- Lightning strike and loss of designated fire zone (DFZ) integrity
- Engine/APU tailpipe fire

- Cowl loss, some with fire initiation
- Inability to shut-off flammable fluids
- Large uncontrolled fuel leak that exceeded the flammable fluid drain capacity resulting in fluid migration outside the engine/nacelle, where it ignited
- Clogging of flammable fluid drain resulting in migration of fluids where fire occurs near the engine
- Engine oil system failure releasing oil that is ignited

8. DEFINITIONS

8.1. FIRE RESISTANCE

Fire resistance is defined by:

- CS-Definition.
- 14 CFR-1,
- RBAC 01, and
- TCCA CAR Chapter 500 – General (500.02 Interpretations)

8.2. CONTINUED SAFE FLIGHT AND LANDING (CSFL)

Continued safe flight and landing is the capability for continued controlled flight and safe landing at an airport, possibly using emergency procedures, but without requiring exceptional pilot skill or strength.

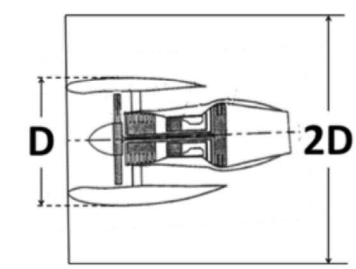
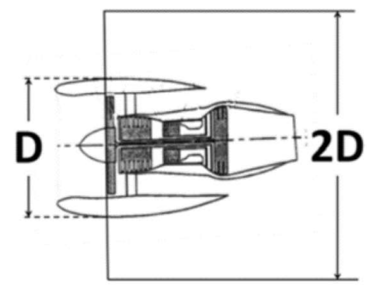
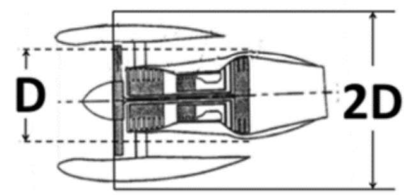
8.3. CRITICAL COMPONENT / SYSTEM / STRUCTURE

Component, system, or structures are understood to include, but are not limited to, a line replaceable unit (LRU), wiring, and structural part and assemblies. Compliance with § 25.867 is required for a surface protecting a component, system or structure that is either critical for CSFL or can jeopardize CSFL if the component, system or structure fails under the assumed fire scenario.

8.4. ENGINE NACELLE VOLUME (2D)

The 2D volume is a rectangular prism with six sides containing the engine nacelle and adjacent airplane surfaces. The forward side of the prism is defined as the most forward portion of any engine flammable leakage zone or designated fire zone. This may include the inlet if the inlet cavity contains flammable fluids. See Figure 1 and 2.

Figure 1: Examples for Determining 2D Dimension

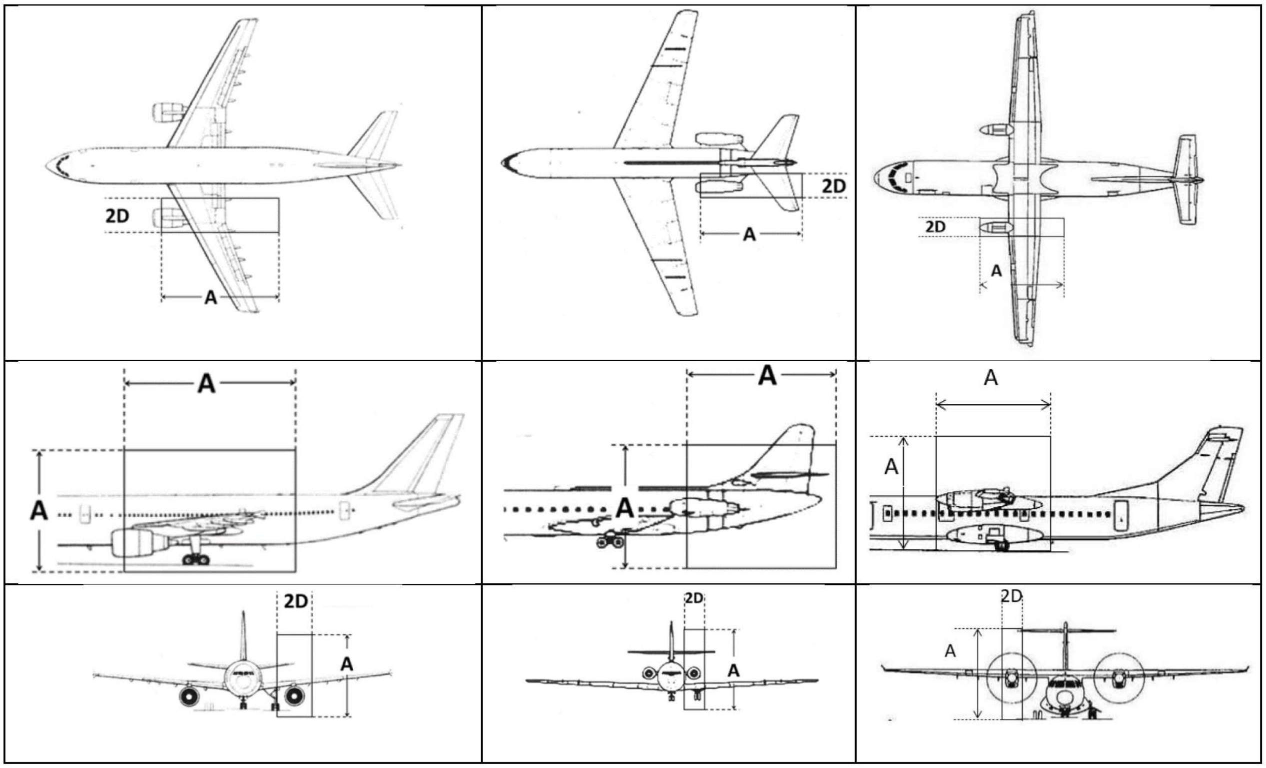
		
Inlet cavity with flammable fluids and designated fire zone in the fan compartment	Designated fire zone with flammable fluids in the fan compartment and no flammable fluid in inlet cavity	Only designated fire zone in the core compartment and no flammable fluid either in the inlet cavity or in the fan compartment

Note: A designated fire zone, even if accepted as a flammable fluid leakage zone (FFLZ) containing flammable fluids when compensating factors are shown under an equivalent level of safety, is considered under the applicability of the rule.

The inboard and outboard sides of the prism are one nacelle diameter from the nacelle centerline, where the diameter is measured from the outside surface of the outermost designated fire zone or flammable leakage zone. For example, an engine that has fan case mounted accessories will have its fan compartment considered a designated fire zone, therefore the outside of the fan cowl would be used for the nacelle diameter measurement. For an engine with core-mounted accessories, the core compartment is the only designated fire zone, provided there is no flammable fluid in other zones (e.g., inlet, fan, etc.), and the outside core cowl diameter would be used. See Figure 1.

The top, bottom, and aft sides of the prism are at a distance from the engine that cannot be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle. Conditions that must be addressed include in-flight and ground operations. Tail sections to the rear of wing-mounted engines are generally considered to be of sufficient distance away and need not be shown to be as fire resistant. Surfaces of a horizontal stabilizer close-coupled to rear-fuselage mounted engines must be fire resistant unless it can be shown that those surfaces could not be readily affected. See Figure 2.

Figure 2: Determination of volume for Wing-Mounted, Aft-Fuselage Mounted Engines and Turbopropeller



2D = Twice the appropriate nacelle diameter (in § 25.867(a))
A = Distance from the engine that can be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle. Unless otherwise justified, "A" is at minimum 2D in vertical but could be greater depending on the relative positioning of the engine onto the aircraft. On the horizontal axis, the "A" distance starts at the most forward point of the zone (designated fire zone or flammable fluid leakage zone) and continues out to the substantiated distance by the applicant. On the vertical axis, it is centered on the engine nacelle center line (in § 25.867(a) and (b)).

8.5. APU VOLUME

Requirement 25.867 applies to surfaces adjacent to auxiliary power units. Service experience has shown unburned fuel, sprayed from the exhaust of an APU during failed start attempts, has ignited on tail surfaces. In one instance, a fire caused damage to the composite control surfaces near the exhaust. The hot start and tailpipe fire self-extinguished without the flight crew being aware of possible fire and damage, and the flight departed normally. The flight crew experienced airplane controllability problems due to delamination of the composite flight control surface and returned to land.

There is no 2D prism volume defined for APU installation as there is for the engine/nacelle installation. The variety of APU design installations (e.g., empennage aft tailcone, engine pod, wheel well or upper wing/fuselage areas) does not allow consideration of a standard geometry to define this volume. While compliance demonstration with § 25.867 for engines/nacelle assumes that fire will escape from the engine nacelle, for APU installation, the fire threat is based on scenarios that could result in spraying and leaking of unburned fuel outside the APU compartment (including paths via cooling inlet/outlet, APU air supply inlet, APU exhaust). The applicant should provide an analysis establishing the surfaces that could be affected by a fire occurring outside the APU installation and the associated justification for the defined surfaces that must meet the fire resistance requirement around the APU installation.

8.6. SURFACES ADJACENT TO ENGINE NACELLE (2D)

These are aircraft surfaces within the volume of threat considered, in any configuration (i.e., different phases of flight) of the aircraft. Those surfaces are panels and skins that may be plain but also incorporate openings or gaps/seals in between them. As examples, but not limited to, these surfaces are: fuel tanks, pylon fairings, wing upper surface, wing lower surface, wing leading edge, wing trailing edge, slats, flaps, flap track fairings, ailerons, spoilers, fuselage, cargo door, passenger doors, landing gear door, windows, access doors/panels, venting grid, air scoop, seals, horizontal tail-plane surface, elevators, fin, rudder, APU cooling inlet/outlet, APU air supply inlet and APU exhaust.

8.7. SURFACES ADJACENT TO APU

As there is no defined 2D prism volume for the APU installation (Paragraph 8.5), the applicant should provide an analysis establishing the surfaces that could be affected by a fire occurring outside the APU installation.

List of surfaces identified in Paragraph 8.6 for the engine nacelle may be regarded for the APU installation assessment. Depending on identified surfaces, considerations of Paragraphs 9, 10.1.4 and 10.1.5 may become relevant for APU installation.

9. APPLICABILITY

9.1. SURFACES

Surfaces (Paragraphs 8.6 and 8.7) that are within the defined volume (Paragraphs 8.4 and 8.5) are protecting the aircraft against an external engine/APU fire and shall demonstrate a fire withstanding capability (fire resistant (5min) or equivalency to aluminum).

9.2. SYSTEMS / COMPONENTS / STRUCTURE

Systems, components, and structure exposed to fire within the 2D volume in any aircraft configuration approved for flight (i.e., flap position, landing gear down, etc.) are considered an aircraft surface for the purpose of this rule. Some surfaces are movable (in opposition to a static frozen position) and may, under certain configurations, expose components, systems or structure hidden behind those surfaces to the fire threat. The exposed components, systems, or structure must be compliant to § 25.867 when they are required to perform their function for CSFL. When they could jeopardize the CSFL, their integrity (but not necessarily their functionality) should be demonstrated. For example, a hydraulic actuator may not be necessary to operate a flight control surface due to system redundancy (its functioning is not needed for CSFL), but if leaking when submitted to the fire, the fire feeding may jeopardize the CSFL (its integrity is needed for CSFL)).

Without attempting to be exhaustive, for instance, landing gear are considered necessary to conduct a safe landing, and compliance to § 25.867 could be required (dependent if the landing gear is within the 2D volume).

9.3. SEALS

Aerodynamic seals, that are within the defined volume (Paragraphs 8.4 and 8.5), are by default under the applicability of the rule unless it can be demonstrated that a component, system or structure, in an area exposed to a fire scenario by the failure of the non-fire resistant seal, are not critical nor will jeopardize CSFL. When a seal is determined to be critical, considerations of Paragraph 8.3 apply. See also Paragraph 10.1.9 for compliance considerations.

9.4. OPENINGS

Openings (venting grid, air scoop, air vent), that are within the defined volume (Paragraphs 8.4 and 8.5), are by default under the applicability of the rule. Due to their intrinsic design, fire/heat may penetrate within those openings conveying heat and flames possibly downstream. See also Paragraph 10.1.10 for compliance considerations.

10. POLICY

10.1. DEMONSTRATING COMPLIANCE TO FIRE RESISTANCE

An applicant seeking certification must demonstrate fire protection of the airplane surfaces, components, parts and structure to the rear of the engine nacelles and APU under § 25.867. Each designated engine/APU fire zone must meet the requirements of § 25.1191 (CS 25J1191 for APU in EASA CS), *Firewalls*, as well as compliance with § 25.1193 (CS 25J1193 for APU in EASA CS), *Cowling and Nacelle Skin*. Conditions that must be addressed include in-flight and ground operations. See Paragraphs 8.4 and 8.5 of this document for volume definitions and affected surfaces, parts, components and structure (Paragraphs 8.6 and 8.7). Compliance could be based on material properties, testing and/or combination of testing and analysis. Appropriate boundary conditions should be considered.

10.1.1. CONSIDERATION FOR AFFECTED MATERIAL

Any surface within the defined volume must be fire resistant per the definition of fire resistance (Paragraph 8.1), using the test method described in Advisory Circular (AC) 20-135 or ISO2685, or by similarity shown to a previously approved configuration that passed fire resistance test per AC 20-135 or ISO 2685. For example, a solid aluminum panel, in dimensions appropriate for the purpose for which they are used, would meet the definition of fire resistance per Paragraph 8.1 and not need to be fire tested. However, a composite panel such as a honeycomb structure with a thin aluminum face sheet would not fall under the fire resistance definition per Paragraph 8.1. In this case, the applicant should test the composite panel per AC 20-135 or ISO 2685 in order to show fire resistance.

10.1.2. CONTROL SURFACES MADE OF ALUMINUM

The demonstration of fire resistance should include a showing that any control surfaces made of aluminum materials per the definition in Paragraph 8.1, such as elevators, flaps or rudders, will retain their structural integrity and the aerodynamic capabilities necessary to perform their intended function. This demonstration should include consideration of any surface attach points containing non-metallic bushings, etc., that could be affected by fire and an assessment to show aeroelastic stability following exposure to fire. The definition of fire resistant contained in Paragraph 8.1 relates the fire resistant capability of the type design parts to aluminum alloy in dimensions appropriate for the purpose for which they are used.

A showing of compliance using AC 20-135, ISO 2685 or a similar fire test (i.e., showing the equivalence to aluminum) ensures that the structural integrity is maintained sufficiently to prevent fire ingress into internal cavities and shows that the external surfaces are fire resistant as prescriptively required by the regulation.

10.1.3. CONTROL SURFACES MADE OF COMPLEX OR COMPOSITE MATERIAL.

Requirement 25.867 requires composite control surfaces located in the volume to be fire resistant. The demonstration of fire resistance includes demonstrating that any control surfaces made of complex or composite materials, per the guidance provided in AC 20-135 and ISO2685, such as elevators and flaps, retain their structural integrity and the aerodynamic/aeroelastic stability capabilities necessary to perform their intended function after exposure to fire. A proper demonstration for showing that composite control surfaces are equivalent to aluminum typically consists of comparative fire testing of appropriately sized aluminum components (not a composite with an aluminum face sheet) and the composite component, supported by analysis to show comparative aeroelastic stability. AC 20-135 and ISO2685 are published acceptable means to show equivalence to aluminum having complex construction (including composite or metal bond construction). As stated in AC 20-135 and ISO 2685, the definition of fire resistant is that the material or component functions and maintains its integrity during the 5-minute test at 2000 degrees F (1100 degrees C). However, if a demonstration of the composite control surfaces indicates they will perform at least as well as aluminum alloy for those dimensions appropriate and representative of the control surfaces as defined in Paragraph 8.1, then the design is compliant with § 25.867. The assessment needs to include evaluation of control surface actuators and non-metallic bushings that may be damaged by fire.

10.1.4. DAMAGED SURFACE

Damage or loss of flight control surfaces, within the defined volume, due to a fire impingement could result in reduction in airplane aerodynamic performance or flight control surface authority following exposure to fire and would not be compliant to § 25.867. As an example, an applicant may have to show loss of the flap or a portion of the flap does not affect CSFL because landing with the loss of the flap could be accounted for with flight crew procedures.

10.1.5. DEPARTING PART

A part, within the defined volume, that is damaged by fire and departs the aircraft would need assessment along the policy/guidance in place for parts departing aircraft.

10.1.6. UPPER AND LOWER SURFACES OF THE WINGS.

For wing-mounted engines, the volume includes the upper and lower surfaces of the wings and on many airplane types, other surfaces such as inboard and outboard slats and flaps, and inboard and outboard ailerons may be within the volume. The control surfaces and associated control means such as actuators, cables and wiring may be exposed to fire within the volume but must be fire resistant unless the applicant can show that those surfaces are not readily affected by fire.

10.1.7. ELEVATOR AND EMPENNAGE (TAIL) SECTION

10.1.7.1. The elevators and empennage (tail) section to the rear of wing-mounted engines are generally considered to be a sufficient distance away so that they do not need to be shown fire resistant.

10.1.7.2. The surfaces of a horizontal stabilizer close-coupled to rear-fuselage mounted engines must be fire resistant under § 25.867 unless the applicant can show that those surfaces are not readily affected by fire.

10.1.8. TURBO PROPELLER INSTALLATION

Turbo propeller and prop fan engine installations may have flight control and landing gear system components located within the defined volume. For example, the wheel well of the landing gear that is part of the engine pod may be exposed to a fire outside the engine nacelle. Therefore, an applicant seeking certification needs to demonstrate that this area is fire resistant and that no hazard that can result from exposure to fire will prevent CSFL, including conditions when the landing gear is extended for takeoff and landing. Systems and components of the wheel well within the volume that could be exposed to fire need to be included in the compliance demonstration.

10.1.9. AERODYNAMIC SEALS, GAPS, FAIRINGS AND EXPOSED SURFACES (STRUCTURE, COMPONENTS, PARTS, SYSTEM)

This paragraph should only be applied to limited areas of the installation where it can be shown it is impractical to provide a fire resistant feature. Examples of these limited areas are aerodynamic seals, fairings or areas that might be exposed when flight control surfaces such as flaps and leading edge slats are deployed. Showing wing and nacelle aerodynamic seals, fairings and exposed surfaces are equivalent in fire resistance capability to their surrounding structure (e.g., representative aluminum panel) is considered an acceptable method of compliance. If these components or surfaces cannot be shown to be fire resistant, this document includes the interpretation that non-critical aerodynamic seals, gaps, and fairings are not required to be fire resistant, if the applicant provides an analysis substantiating failure or degraded performance of the component will not result in reduced airplane performance or detrimentally affect the CSFL. If airplane systems such as wiring, flight controls (including surfaces), or structural mounting are located in an area where fire could enter because of a failed non-fire resistant seal, or exposed when flight control surfaces are extended, the applicant must show there is no loss of CSFL capability.

10.1.9.1. A showing of compliance for gaps in surfaces within the volume will be deemed acceptable if:

- the gaps are sufficiently small in size so there is no path for fire to impinge on critical underlying systems or structure and damage them to an extent that jeopardizes CSFL, or

- a positive pressure differential exists between the cavity and the outside surface for all flight conditions.

10.1.9.2. In the absence of a showing that positive pressure exists, a combination of a fire test under critical conditions and analysis can be utilized to show the fire impinging on critical surfaces or components, or heating of components in areas where fire has passed through the non-fire resistant surface cannot prevent CSFL capability.

Demonstrating a fire within the volume cannot impinge on a surface or enter an area with critical components is also an acceptable method of compliance if shown there is no path for fire to impinge on critical surfaces or components and critical hardware redundancy and separation exist within the area. This analysis is not intended to reduce the applicability of the 2D volume but to address gaps within the 2D volume agreed at an earlier stage. This method of compliance requires showing the airflow pattern would not allow a fire or leaking flammable fluid to impinge or enter areas where non-fire resistant surfaces are present. Computational fluid dynamic (CFD) modelling and surface drainage demonstrations may be used to establish aerodynamic flow fields and flammable fluid leak paths. Use of this method of compliance requires development of a validated CFD model. Validation of the model must include test data from wind tunnel and flight testing. Drainage path assessments should include test substantiation of the drainage paths along surfaces where fluids adhere to surfaces under the airflow boundary layer. Agreement with the certifying authorities for use of this method of compliance should be obtained early in the certification program to ensure sufficient substantiation data is developed during the wind tunnel and flight test phases of the project to support a showing of no loss of CSFL capability.

10.1.10. OPENINGS

Experience has shown surfaces within the volume may include openings (e.g., ventilation inlets or exhaust ports) that could allow fire or heat to enter into compartments containing essential equipment. The certifying authority allows applicants to show that positive pressure gradients exist in all flight conditions or that features are provided in the vent that prevent fire or heat from entering the vent. Alternatively, the effects of fire and its associated heating of a compartment, on critical components and systems located within that compartment must not result in loss of CSFL capability per § 25.867. Applicants should provide test data or analysis supported by test data.

10.1.11. FUEL TANK ACCESS PANEL

Fuel tank access panels are required by § 25.963 to be fire resistant. Fuel tank access panels that are surfaces located within the volume must also be shown to be fire resistant. Compliance may be shown using the fire test methods defined in AC 20-135 or ISO 2685. The pass/fail criteria defined in AC 25.963-1 or Acceptable Means of Compliance (AMC) 25.963(e)(2) is acceptable for showing compliance to § 25.867.

10.1.12. DE-ICING SYSTEMS / BOOTS

When located within the volume, the de-icing systems and boots come under the rule applicability as they are surfaces exposed to the fire threat and they shall be demonstrated fire resistant. Applicants may also use considerations offered by Paragraph 10.1.9.

10.1.13. APU INSTALLATION

With the wide variety of APU installation locations, the above considerations (Paragraphs10.1 and 10.1.1 to 10.1.10) remain valid with regards to surface, components, parts, or structure that are determined to be under the fire resistant requirement in § 25.867.

10.2. GENERAL COMPLIANCE STEPS

Step 1 - Determine volume (Paragraphs 8.4 and 8.5) – Seek certifying authority acceptance.

Step 2 - List surfaces (Paragraphs 8.6 and 8.7) with material, thickness and movable characteristics (fixed, movable).

Step 3 - List components, systems, and structure (Paragraph 8.3) readily affected by the movable surface.

> Step 3a - Identify components, systems, and structure needed for CSFL that should perform their function under fire (Paragraphs 8.3 and 9.2) – Seek certifying authority acceptance.

Step 3b - Identify components not needed for CSFL but could jeopardize CSFL under the fire situation (Paragraphs 8.3 and 9.2) – Seek certifying authority acceptance.

Step 3c - Identify components not needed for CSFL / not jeopardizing CSFL under the fire situation (Paragraphs 8.3 and 9.2) – Seek certifying authority acceptance.

Step 4 – Identify Seals (Paragraph 9.3).

Step 4a – Identify seals under rule applicability.

Step 4b – Identify rationales for seals deemed not under rule applicability and seek certifying authority acceptance.

Step 5 – Identify openings (Paragraph 9.4).

Step 6 - Identify method of compliance for fire withstanding capability for:

- Surfaces of Step 2.
- Components, systems and structure of Step 3a and 3b.
- Seals of Step 4a.
- Openings of Step 5.

Step 7 – Define fire testing plan – Seek certifying authority acceptance as necessary for test conditions (function, integrity, boundary conditions, pass/fail criteria,…) and involvement.

Step 7 – Demonstrate fire withstanding capability.

Step 8 – Produce compliance evidence.

10.3. FIRE TESTING

Fire resistance testing of surfaces, systems, and components to the rear of the nacelles includes, but is not limited, to the guidance contained in FAA AC 20-135 Change 1, *Powerplant Installation and Propulsion System Component Fire Protection Test Methods* and ISO 2685, *Aircraft — Environmental test procedure for airborne equipment — Resistance to fire in designated fire zones*.

Note: that an industry working group is working on defining a powerplant fire testing industry standard (SAE AS6826) that may in the future be introduced into the regulatory referential and lead to a revision of this document.

10.4. AIRCRAFT DISPATCH (Master Minimum Equipment List (MMEL) and/or Component Deviation List)

If any structure, component, part, or system, required to be compliant to § 25.867 within the 2D volume, is included in the MMEL and/or CDL, they must be shown to comply with § 25.867 within the 2D volume with the dispatch relief present due to the potential for single failures leading to fires within the powerplant installation. Examples include, but are not limited to, missing panels and components that expose other components and surfaces.

In the situation where a surface, component, system or structure is considered to be inoperative or absent for aircraft dispatch, the above considerations remain valid. It must be shown that the inoperative or absent surface, component, system or structure will not affect the aircraft capability to conduct a CSFL in the event of a fire adjacent to the engines/APU for compliance with § 25.867.

This includes any surface, component, system or structure impacted by a fire adjacent to the engines/APU, originally assessed as not critical for CSFL due to reliance of the function being maintained by any other surface, component, system, or structure outside of the volume that can be non-operative or absent for aircraft dispatch.

10.5. AIRCRAFT LIMITATIONS

If any limitations are necessary to show compliance, this limitation shall be declared in the relevant documentation (e.g., airplane flight manual (AFM), type certificate datasheet (TCDS), airworthiness limitation section (ALS), or other). It includes any operational limitations introduced to support a demonstration that an inoperative or absent or damaged surface, component, system or structure will not affect the aircraft capability to conduct a CSFL in the event of a fire adjacent to the engines/APU.