EASA	CERTIFICATION MEMORANDUM
	EASA CM No.: EASA CM - PIFS – 001 Issue: 01 **Issue Date: 19th of December 2011** **Issued by: Powerplant section** **Approved by: Head of Certification Experts Department** **Regulatory Requirement(s): CS Definitions, CS-25**

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Large transport aircraft:

Fire withstanding capabilities of composite wing containing fuel tank

Log of Issues

Issue	Issue date	Change description
01	19.12.2011	First issue.

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The purpose of **this** Certification Memorandum is to provide specific guidance for the integral fuel tanks within wing structure primarily made of composite material, regarding the ability of the tank structure to sustain fire.

1.2. REGULATORY REFERENCES & REQUIREMENTS

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

Reference	Title	Code	Issue	Date
---	Certification Specifications for Large Aeroplanes	CS-25	n/a	n/a
---	CS Definitions	---	n/a	n/a

1.3. ABBREVIATIONS

The following abbreviations are used in this Certification Memorandum:

Abbreviation	Meaning
BCAR	**B**ritish **C**ivil **A**viation **R**equirement
CM	**C**ertification **M**emorandum
CS	**C**ertification **S**pecification
EASA	**E**uropean **A**viation **S**afety **A**gency
FAR	**F**ederal **A**viation **R**equirement
JAR	**J**oint **A**viation **R**equirement

1.4. DEFINITIONS

The following definitions are used in this Certification Memorandum:

Definition	Meaning
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2. BACKGROUND

On the latest large transport aeroplanes, the wing, including the fuel tanks, is constructed primarily from composite material, which differs from traditional metallic construction as envisioned and applied by current airworthiness standards.

The existing CS requirements are not considered explicit enough regarding post-crash fire safety and performance standards for the wing fuel tanks constructed using composite materials. This document clarifies the EASA interpretation in this respect.

2.1. CURRENT CS-25 RULES INTERPRETATION

CS-25 (and its ancestors, including FAR 25, JAR-25, BCAR, etc.) were established when large transport aeroplanes were built exclusively form light alloys based upon aluminium. The in-service experience of classic configuration based on light alloy structures being satisfactory no explicit regulation was issued requiring fire withstanding capabilities of wing fuel tanks. However a global review of the rules, including CS Definition, has highlighted current regulations rely on the assumptions aluminium wings have some inherent capabilities resulting from the physical characteristics of the light alloys used to manufacture them, regarding fire withstanding capabilities.

Composite material may or may not have capabilities equivalent to aluminium alloys, and current regulations do not provide objective performance requirements for wing and fuel tank structure with respect to post-crash fire safety. Additional substantiation by test and analysis might be needed to show that composite structure provides an acceptable level of safety with respect to the performance of the wings and fuel tanks during a fire. The objective is that the use of composite structure for the wing does not decrease the level of safety established by current large transport aircraft designs for flammability and fire protection of aircraft wing tank structure.

2.2. DISCUSSION

Applicants can demonstrate that a composite wing is equivalent to an aluminium wing. However this requires establishing the structure of a theoretical metallic wing structure for the sole purpose of showing compliance, and might therefore be considered as impractical.

Alternatively, in order to provide the same level of safety as exists with conventional aeroplane construction, applicants can also demonstrate that their product has sufficient survivability, in the event that the wings are exposed to a large fuel-fed ground fire, to enable occupants to safely evacuate. Factors in fuel tank survivability are the structural integrity of the wing and tank, flammability of the tank, burnthrough resistance of the wing skin and the presence of auto-ignition threats during exposure to a fire. Studies have shown that following a survivable accident, prevention of fuselage burnthrough for approximately five minutes can significantly enhance survivability. (Ref. FAA reports DOT/FAA/AR-99/57 and DOT/FAA/AR-02/49). Beyond five minutes there is little benefit due to the effects of the fuel fire itself. That assessment was carried out based on accidents involving aeroplanes with conventional fuel tanks, and considering the ability of aircraft occupants to evacuate the aeroplane and of the ground personnel to rescue occupants.

CS Definitions, defines fire resistant as follows: "Fire-resistant. … For materials this may be considered to be equivalent to the capability of withstanding a fire at least as well as aluminium alloy in dimensions appropriate for the purposes for which they are used." It is noteworthy that aluminium alloy is identified as the performance standard for fire resistance, though no thickness or heat intensities are defined. Therefore, and despite the absence of an explicit requirement for fire-resistant wing fuel tanks, it has been considered that the intent of CS-25 will be met if the applicant demonstrates that the composite structure is able to withstand a fire for five minutes.

Therefore to be consistent with existing capability and related requirements, composite fuel tanks should be capable of resisting a post-crash fire for at least five minutes. In demonstrating compliance applicants should address a range of fuel loads from minimum to maximum as well as any other critical fuel load.

3. EASA CERTIFICATION POLICY

3.1. EASA Policy

Applicants should show that the use of composite materials for the fuel tank structure does not reduce the level of safety relative to existing experience with metallic structure. This could be achieved by showing that:

- from a fire withstanding capability, the composite wing is at least equivalent to a similar wing manufactured of light alloy,

or

- the composite wing and the fuel tank design, including all access panels, can endure an external fuel fed fire for at least five minutes.

The assessment should be performed evaluating all relevant parameters, including fuel loading. Considerations to be taken into account include fuel tank flammability, burn through resistance, fuel retaining capability of the wing, wing structural strength retention properties and auto-ignition threats.

3.2. Who this Certification Memorandum Affects

Applicants with a design featuring structural fuel tanks in wings made primarily of composite material.

4. REMARKS

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Planning Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu or fax +49 (0) 221 89990 4459.
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