

## **Proposed Special Condition to Composite Wing and Fuel Tank Fire Protection**

### **Applicable to B787**

#### **Introductory note:**

The following Special Condition has been classified as an important Special Condition and as such shall be subject to public consultation, in accordance with EASA Management Board decision 02/04 dated 30 March 2004, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

#### **Statement of Issue**

The Boeing 787-8 model 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 adequate or appropriate to set post-crash fire safety and performance standards for the wing fuel tanks constructed using composite materials.

Note : The FAA has published a special condition applicable to the Boeing model 787-8 aircraft which addresses the required level of safety during post crash fires with respect to composite fuel tanks. The EASA special condition defined in this document is intended to be harmonized with the proposed FAA SC to the maximum extent possible.

### **B787 – Special Condition to Composite Wing and Fuel Tank Fire Protection**

Conventional aircraft with aluminium skin and structure provide a well understood level of safety during post-crash fire scenarios with respect to fuel tanks. This is based on service history and extensive full scale fire testing. Composite material may or may not have capabilities equivalent to aluminium, and current regulations do not provide objective performance requirements for wing and fuel tank structure with respect to post-crash fire safety. Because the use of composite structure is new and novel compared to the designs envisioned when the applicable regulations were written, additional substantiation by test and analysis will be required to show that the B787 provides an acceptable level of safety with respect to the performance of the wings and fuel tanks during an external fuel-fed fire. The objective of this special condition is that the use of composite structure does not decrease the level of safety established by current requirements for flammability and fire protection of aircraft structure.

In that perspective, Boeing must demonstrate that the B787 has sufficient post-crash 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 ground personnel to rescue occupants. FAA AC20-135 indicates that when aluminium is used for fuel tanks, the tank should withstand the effect of fire for five minutes without failure. Therefore to be consistent with existing capability and related requirements, the B787 fuel tanks must be capable of resisting a post crash fire for at least five minutes. In demonstrating compliance Boeing must address a range of fuel loads from minimum to maximum as well as any other critical fuel load.

In addition to complying with CS-25 requirements for fire-safety performance of fuel tanks, wings and nacelles, the B787 must demonstrate acceptable post-crash survivability in the event that the wings are exposed to a large fuel-fed ground fire. Boeing must demonstrate that the wing and fuel tank design, including all access panels, can endure an external fuel-fed pool fire for at least five minutes. This shall be demonstrated for minimum fuel loads (not less than reserve fuel levels) and maximum fuel loads (maximum range fuel quantities) and other identified critical fuel loads. Consideration shall include fuel tank flammability, burn through resistance, wing structural strength retention properties and auto-ignition threats during a ground fire event for the required duration.