

Proposed Equivalent Safety Finding on “Fire Extinguishing Agent Concentration”

Applicable to Airbus A350-941

Introductory Note:

The hereby presented Equivalent Safety Finding has been classified as an important Equivalent Safety Finding and as such shall be subject to public consultation, in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, 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:

CS 25.1195(c) requires that a nacelle fire extinguishing system be able to simultaneously protect each zone of the nacelle for which protection is provided. Associated Interpretative Material is giving information on the required agent concentration to be maintained as well as the required presence time of this concentration (see AMC 25.1195 (b) that calls AC 20 100).

Airbus A350-941 – Equivalent Safety Finding to CS CS 25.1195(c)

– Fire Extinguishing Agent Concentration –

Design Proposal:

The Rolls-Royce Trent XWB engine that will be installed on the A350 features three Designated Fire Zones (DFZ). Each DFZ is physically separated from the other by firewalls (CS 25.1191)

For this engine, fire extinguishing protection will be provided for all DFZ.

Justification:

Considering the following items:

1. Over the complete life of their products, Airbus has not seen in-service any fire propagating from one nacelle zone to another.
2. Tests conducted in the past for fire characterization and development of concentration criteria's (AC 20-100) showed that:
 - a. A key parameter in extinguishing fires is the homogeneity of agent diffusion in the considered nacelle radial section and the rapidity to achieve this diffusion. The AC 20-100 0.5s criterion is particularly meaningful in characterizing this parameter.
 - b. A fire ignited in a section never went through a firewall inducing a fire into another section. This supports the Airbus statement recorded under item 1.

3. In the frame of those tests, FAA stated that [...] *'each fire zone may be treated individually with respect to the "simultaneous" requirement'* [...] (ref to report FAA DS 70-3).

The proposed Equivalent Safety Finding criteria have been defined,

The fire extinguishing protection will be simultaneous in the sense that extinguishing agent will flow to each DFZ as a result of the same unique action. However the extinguishing system will be constructed so that the required minimum agent concentration may not be present during 0.5s (as indicated in the AC 20-100) across all areas of all DFZ. The 0.5 s criterion will be met in each DFZ separately.

Safety Equivalency Demonstration:

The engine fire extinguishing system as defined for the A350 is considered to meet the intent of CS 25.1195(c) and to provide the necessary level of safety for the reasons detailed hereafter:

1. There will be a unique agent discharge action that will ensure flowing of the agent towards all three nacelles zones.
2. Each DFZ, individually considered, will have all its portions simultaneously protected as per the AC 20-100 0.5s minimum agent concentration presence time criterion.
3. The DFZ will be separated by firewall constructions demonstrated compliant to CS 25.1191(b) ensuring no hazardous quantity of fluid, air or flame can pass from the compartment to other zone. This shall be demonstrated to EASA by design description, nacelle inspection and drainage flight testing. An acceptable pass-fail criterion for this flight testing is: cross-contamination between different zones is limited to isolated droplets (fluid dribbles) and limited continuous thin lines of fluid (fluid trickles); continuous fluid path from a fire zone to another is not acceptable
4. Maintenance instructions will be defined and provided to the operators, as part of the Instructions for Continued Airworthiness (ICA), with the objective to ensure that the firewall integrity is maintained throughout the operational life of the nacelle.