

Proposed ESF on Fire Protection – Engine attachment points

Applicable to Piston Engines

Introductory note:

The hereby presented Equivalent Safety Finding has been classified as an important ESF 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."

Background:

Crankcases of piston engines as well as the brackets fixing the engine mounts are usually made from aluminium. Aluminium is considered to be only fire resistant by definition, depending of the actual design of the parts.

Previously JAR-E initial issue up to amendment 11 did not require fire proof engine attachment points for piston engines. However, by moving the former turbine requirement of JAR-E 530 into the general section – applicable to all engines – of JAR-E amendment 12 piston engines were also required to have fire proof attachment points. The development of CS-E was based on JAR-E amendment 12.

FAR-33 does not include a similar requirement. In AC23-17B, 23.865 "Fire protection of flight controls, engine mounts, and other flight structure" states:

"The intent of the regulations on engine mounts is the engine remains in place with a fire heating an engine mount. We do not intend to cover the case of a general conflagration where the entire engine compartment is burning. Therefore, an applicant should design enough load paths for the engine to remain in place with a localized fire."

EASA want to achieve a comparable safety objective for the piston engine certification.

Statement of Issue

Several new common rail diesel piston engines are in development in Europe intended to be installed on CS-23 aeroplanes.

The engine attachment points are integral parts of these engines. They do not directly comply with CS E 130 (h) (initial issue of CS-E) as the engine attachment points are made from cast aluminium (the crankcase itself is made of cast iron in some cases).

Applicant's Position

The applicants are requesting an equivalent safety finding under the provisions of Part 21 21A.21(c)(2), by showing that non-compliance with CS-E130(h) is compensated for by factors that provide an equivalent level of safety.

Information was provided that engine mount systems on different engine types and variants of conventional design experienced a million flight hours service without any fire related failures in the last 45 years. No cases of engine fires where there was evidence of failure of the piston engine mount system with any piston engine release out of an aircraft were known.

One applicant proposes to show by analysis the capability of the engine mounting system to provide redundant load sustaining paths versus nominal flight loads. In addition it is proposed to demonstrate by fire testing the capability of the attachment points (attachment pads) to be fire resistant.

Another applicant proposes to show by method agreed by the agency that the engine can cope with the loss of the affected engine attachment points and that the remaining ones are still able to hold the engine in its position under consideration of the maximum occurring static and dynamic loads in the relevant flight conditions.

EASA Position

EASA accepts the need for an Equivalent Safety Finding and proposes the following:

Proposed ESF

As an alternative to CS-E 130(h) (initial issue of CS-E) or CS-E 130 (g) (CS-E Amendment. 1), which states that: *“Those features of the Engine which form part of the mounting structure or Engine attachment points must be Fireproof, either by construction or by protection, unless not required for the particular aircraft installation and so declared in accordance with CS-E 30.”*

For Piston Engines only, an equivalent level of safety is acceptable when it is shown that:

(1) Those features of the Engine which form part of the mounting structure or Engine attachment points shall be Fire Resistant. This has to be demonstrated by Test for the most critical feature which has to sustain the limit flight loads (appropriate for a typical aircraft installation) without failure.

For determination of fire tests conditions the guidance of AMC E 130 (4) shall be considered.

(2) After 5 minutes of fire application according to (1) and until the end of 15 minutes, the other features of the engine mounting structure must have sufficient static strength to withstand the maximum load (considered as ultimate load) expected during the completion of the flight.