

**Proposed Equivalent Safety Finding on CS 25.865 : Fire protection of flight controls,
engine mounts, and other flight structure.**

Applicable to Boeing 737-7 / -8 / -9

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:

The 737 -7/-8/-9, ("MAX") type design change includes the same APU (Honeywell Model 131-9[B]) as the 737-600/-700/-800/-900.

The APU mount attach points would normally be covered by TSO C-77b and CS-APU for a new APU, but the 131-9[B] was approved in the early 1990s to TSO C-77a and JAR-APU at amendment 2, which did not have a rule about fire proof engine mounts.

So for the 737-8, the APU attach points, as well as the aircraft side APU engine mounts, are being addressed under 25.865 which addresses the integrity of the engine mounts and aircraft structure in the event of a fire in the designated fire zone.

However, it was found that the fourth APU engine mount (in left forward position), not required for any mount or load regulation compliance, cannot be shown to be fireproof.

Therefore, Boeing intends to show an equivalent level of safety for 25.865 as the APU is fully retained in position in the event of any foreseeable fire in the APU fire zone by means of the three other mounts.

Boeing 737-7 / -8 / -9 – Equivalent Safety Finding to CS 25.865 Fire protection of flight controls, engine mounts, and other flight structure – J-03/MAX

Design description:

As part of the design changes for the 737-8 relative to the 737-800 the APU mount attachments have been reviewed and the following changes have been made:

- 1 The three mount isolators are changed from Titanium to Steel.
- 2 The APU aft mount attach brackets have recently been changed from Titanium to Inconel (as a cost reduction change on the 737-800 but will be mandatory on the 737-8.)
- 3 The front right hand mount will have an insulation blanket added as part of the installation into the 737-8 airplane. With this blanket installed it will be shown that the aluminum APU scroll case will carry the loads during a fire condition.

These include all the primary mount points of the APU and will be shown to meet the fireproof requirement. These primary mount points carry all the loads and fully retain the APU in position for all flight conditions.

However, there is one additional mount attach point on the 131-9[B] APU as installed in the 737-800 and as will be installed in the 737-8. The left forward mount point, added during development of the 737-700 for an added level of safety due to the tight fit of the 131-9[B] APU into the space, uses a slotted link so that it does not normally carry any load. It is intended to limit the deflection of the APU in the event of a failure of one of the primary mount paths.

This fourth mount also attaches to the aluminum APU load compressor scroll case. It is very closely surrounded by the external pipe work on the APU. With the current APU configuration it is not possible to install insulation to shield this attach point from a fire.

Justification:

It will be shown that the APU is fully retained in position in the event of any foreseeable fire in the APU fire zone. All of the primary mounts will be shown to be fireproof.

The left forward mount point, while not shown able to withstand the effects of a directly impinging fire, is not within the engine rotor failure or combustor burn through threat area. In the event of an engine rotor failure or burn through damaging the APU case near one of the primary aft mounts, it would still be able to act as an alternate load path due to the distance and shielding of the APU inlet plenum from the combustor area. Both front mounts are adjacent to the load compressor rotor failure threat area.

The APU gearbox (the mount attaches to the aft side of the gear box) has been shown to withstand a fire for 15 minutes without spilling the oil from the sump. The left forward mount is slotted and unable to carry any load unless at least one of the primary mounts is already failed.

The left forward mount provides additional safety from other potential mount failure conditions such as uncontained rotor failure or maintenance error.

Safety Equivalency Demonstration:

The 737-8 APU mount system will be shown capable of withstanding the effects of fire.

This could easily be shown by eliminating the left forward mount. However the functional redundancy of this mount, for other than the fire conditions, provide additional safety benefits.

With greater than 56 million flight cycles, the reliability of the 131-9[B] APU in the 737NG fleet provides the strongest possible evidence that the existing APU is meeting the intended safety level of the part 25 regulations.

The 737-8 will benefit from this commonality with the 737-800 and the ongoing reliability improvements to the 131-9[B] APU and 737 installation. This includes many APU level modifications and reliability improvements through the last 17 years. The 737-8/-9/-7 will incorporate installation of all the latest modifications of the 131-9[B] APU.