Special Condition on CS-E 740– Endurance Test 30 second Transient Over-temperature

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 Applicant seeks to clear a overshoot on Exhaust Gas Temperature with a time limit of 30 seconds, which occurs following a fast accel to Take-Off from cold and is a characteristic of the engine.

CS-E 740(f)(4)(iii) addresses a transient over-temperature limit for acceleration with a time limitation of 2 minutes. CS-E 740(f)(4)(iii) requires the over-temperature to be run at all accelerations to Take-Off power. Nominally this amounts to 6 hrs 35 minutes of running at the transient over-temperature limit. CS-E does not recognise shorter periods of over-temperature.

(Note: The above situation does not correspond to the definition of the Maximum Exhaust Gas Overtemperature limit in CS-D because it is not inadvertent. The test of CS-E 870 "Exhaust Gas Over-Temperature Test" is therefore not appropriate to substantiate this limit).

The FAR regulation 33.87(a)(8), by contrast, addresses transient over-temperature which is defined, via AC material (AC no: 33-2B), to be of up to a maximum of 30 seconds duration. 33.87(a)(8) requires that 50% of the accelerations to Take-Off power of the Endurance Test incorporate the over-temperature simulation. This results in 1 hr 18 minutes of running at the elevated temperature for the 30 second case. Separate published policy material (ANE-2000-33.87-R3) addresses the durations of over-temperature greater than 30 seconds and up to 2 minutes, differentiating these from the 30 second requirement, and aligning them with the CS-E requirements as described above.

It is interesting to note that if CS-E requires 6 hrs 35 mins to clear 2 minutes overshoot, proportionately 1hr 18 mins would give 23.5 seconds of overshoot allowance, just 6.5 seconds short of the 30 second target. This slight paradox arises because half of the accels to Take-Off in the Endurance Test schedule are specifically 30 seconds stabilisation only (part 5's), therefore the full over-temperature interval for only the 30 second or less cases can be demonstrated. It is reasonable therefore that 30 second or less cases demand a reduced proportion of the longer Take-Off parts (part 1's).

Applicant's Proposal

The Applicant, in this case having applied for Validation by EASA of their FAA Certificate of Compliance to Part 33 for the subject engine type and has followed Part 33 Endurance Test guidelines, requests agreement to demonstrate equivalent safety to E740 for a 30 second transient over-temperature in accordance with the FAR Part 33.87(a)(8) regulation (as described above: 50% of the accelerations to Take-Off power of the Endurance Test to incorporate the 30 second over-temperature).

EASA Position

EASA agrees that it is not reasonable to impose the CS-E 740(f)(4)(iii) requirement intended for 2 minute overshoots when a maximum of 30 seconds only is required, and that there is no other provision within the CS-E requirements.

Though the principles of FAR approach for 30 seconds or less transient over-temperature are slightly different, EASA acknowledges that this approach possesses significant good pedigree.

Transient over-temperature requirements are not, and historically have not been recognised as a Significant Difference in the requirements of CS-E and FAR Part 33. It is not the intent to change this position by this Special Condition, the FAR Part 33 approach is still considered acceptable. It is however considered necessary to formally recognise the unique way in which 30 second or less transient over-temperature are substantiated to support the limitation that will be specified in the ETCDS.

The EASA team is therefore proposing to apply a Special Condition for demonstration of the 30 second or less transient over-temperature case requiring 50% of the accelerations to Take-Off power of the Endurance Test shall incorporate the 30 second over-temperature (as per the FAR 33.87(a)(8)).