

**Proposed Special Condition**  
**Applicable to Auxiliary Power Units Providing Mainly Electrical Power**

**Approval of 5-Second Overload Condition**

**Introductory note:**

The Special Condition proposed herein is subject to public consultation in accordance with Article 3 (2) of EASA Management Board Decision 7-2004 dated 30 March 2004, which states:

*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:**

An Applicant for European Technical Standard Order Authorisation (ETSOA) of an auxiliary power unit (APU), which is intended to provide mainly electrical power, has requested approval of a short-duration generator overload condition. The applicable Certification Specification, CS-APU, currently has no provision for such an approval. CS-APU 420, *Endurance Test*, requires that the majority of the test be run at or above Rated Output, which is defined as the maximum output of shaft power and compressor bleed air for which approval is sought.

**Discussion:**

Approval is sought for an overload condition that may last up to 5 seconds. The overload condition may occur as a result of faults in the electrical system of the target installation, which are expected to occur at most three times in the life of any APU. EASA considers that the 5-second overload condition should be included in the Endurance Test but accepts that taking the 5-second overload condition as Rated Output in the Endurance Test is

excessively severe. EASA suggests that an appropriate basis for a modified Endurance Test could be taken from the One Engine Inoperative (OEI) test requirements that are included in the engine Endurance Test of CS-E 740. The proposed endurance test would modify the CS-E OEI test requirements to account for the duration and possible frequency of the 5-second overload condition for which approval is sought.

The Applicant has assessed that the frequency of occurrence of the 5-second overload condition is not greater than the frequency of use of 30-second OEI power, and therefore proposes to base the test requirement on the additional 2-hour test required by CS-E 740(c)(3)(iii) for engines with 30-second OEI ratings, which includes eight periods of 30 seconds at 30-second OEI power. Specifically, the Applicant proposes to run for an additional 2 hours, consisting of 30 minutes at each of Rated Output, 75% Rated Output, 50% Rated Output and 25% Rated Output, with 2 periods of 5 seconds at the 5-second overload condition during each 30-minute period.

EASA finds this proposal acceptable. Furthermore, EASA does not find it necessary to include any of the other requirements applicable to OEI ratings, such as mandatory maintenance, usage monitoring or power assurance, in this Special Condition. These additional requirements stem from critical operational needs that have no counterpart in the APU case. In particular, the consequences of a main propulsion engine failing to deliver 30-second OEI power are potentially much more severe than the consequences of an APU failing to deliver 5-second overload power. This does not preclude the adoption by the Applicant of the measures contained in the additional OEI requirements<sup>1</sup> should the Applicant find that advantageous.

#### **Proposed Special Condition:**

This Special Condition modifies CS-APU 420 as follows.

In CS-APU 420 (a), the last sentence is modified to read “Rated Output as used in this paragraph means maximum output of shaft power and compressor bleed air, *intended for use for periods exceeding five seconds*, for which approval is sought.”

The following is added at the end of CS-APU 420 (b). “*At the conclusion of the twenty periods of seven and one half hours, for approval of 5-second*

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<sup>1</sup> See CS-E 20(f), CS-E 25(b)(2) and CS-E 60(d)

*overload power that exceeds Rated Output, a further two hours of running is required, consisting of thirty minutes at each of Rated Output, 75% Rated Output, 50% Rated Output and 25% Rated Output, with two periods of five seconds at the 5-second overload condition during each thirty-minute period.”*