European Aviation Safety Agency
Rulemaking Directorate

EXPLANATORY NOTE

CS-E Amendment 3

1. GENERAL

Executive Director Decision 2010/015/R amends Decision No 2003/09/RM of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for engines ("CS-E").

The Notice of Proposed Amendment (NPA 2008-01) has been subject to consultation in accordance with Article 52(1)(c) of the Basic Regulation[1] and articles 5(3) and 6 of the Rulemaking Procedure established by the Management Board[2].

2. CRD REACTIONS

In response to the CRD 2008-01, the Agency received the following comment affecting CS-E, which is reproduced below together with the Agency's position.

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1 Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC. (OJ L 79, 19.03.2008, p. 1). Regulation as last amended by Regulation 1108/2009 of the European Parliament and of the Council of 21 October 2009 (OJ L 309, 24.11.2009, p. 51).

2 Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ('Rulemaking Procedure'), EASA MB 08-2007-03, 13.6.2007.

2	Francis Fagegaltier Services	**Page 25 of CRD response to comment #9** In response to comment n°9, the statement "however, the commentator did not propose any revised text" is both right and wrong. Right because in the comment 9 there was no proposal for a revised text, right because the commentator did not propose a complete revised CS-E 1040. Wrong because various pieces for a revised CS-E 1040 were proposed in various comments. To clarify the various comments here is a suggested revised CS-E 1040 integrating all suggested changes. **CS-E 1040 ETOPS** (a) If approval for ETOPS capability is sought, the specifications of CS-E 1040 must be complied with in order to demonstrate that the Engine is capable of achieving an IFSD rate that is compatible with the safety target associated to the maximum flight duration and the longest diversion time for which approval is being sought. (b) A reliability analysis of the Engine type design must be performed. If necessary for achieving the IFSD rate, an ETOPS specific Engine definition may be determined, eventually associated to (1) special limitations, including any limitations associated with the Maximum Approved Diversion Time, and (2) additional markings or placards. (c) The ETOPS specific Engine definition determined under CS-E 1040 (b) and the Maximum Approved	No amendment has been done since the proposed text is already incorporated in CS-E 1040 and AMC 20-6 rev.2 as follows: Paragraph (a): CS-E 1040 Paragraphs (b) and (c): AMC 20-6 rev. 2, chapter II, section 10 (2) Paragraph (c) : AMC 20-6 rev. 2, chapter II, section 8 (8.2) Paragraph (e) : AMC 20-6 rev. 2, Appendix 1, section 2 (b)(2)

		Diversion Time will be reflected in the Engine Type Certification Data Sheet, which must contain directly or by referencing the pertinent information on Engine definition and special limitations. (d) Procedures for an engine condition monitoring process must be defined and validated for ETOPS. (1) This engine condition monitoring process must be able to determine, pre-flight, if an engine is no longer capable of providing, within certified engine operating limits, the maximum thrust required for a single engine aircraft diversion. (2) The effects of additional engine loading demands (e.g., anti-ice, electrical), which may be required during an engine inoperative diversion, must be accounted for. (3) The analysis of CS-E 1040 (b) must determine if additional limits or criteria are necessary to cover the worst case scenario during an ETOPS diversion. (e) Compliance with CS-E 1040 (a) to (d) must be supported by a propulsion system validation Test. The Engine definition for which ETOPS capability approval is being sought should be tested in accordance with the following schedule. The propulsion system for this test should be configured with the aeroplane installation nacelle and engine build-up hardware representative of the type certificate standards. (1) Tests of simulated ETOPS service operation and vibration endurance should consist of 3000 representative service start-stop cycles (take-off,	

		climb, cruise, descent, approach, landing and thrust reverse), plus three simulated diversions at maximum continuous thrust for the Maximum Approved Diversion Time for which ETOPS eligibility is sought. These diversions are to be approximately evenly distributed over the cyclic duration of the test, with the last diversion to be conducted within 100 cycles of the completion of the test. (2) This test must be run with the high speed and low speed main engine rotors unbalanced to generate at least 90 percent of the applicant's recommended maintenance vibration levels. Additionally, for engines with three main engine rotors, the intermediate speed rotor must be unbalanced to generate at least 90 percent of the applicant's recommended acceptance vibration level. The vibration level shall be defined as the peak level seen during a slow accel/decel of the engine across the operating speed range. (3) Each one hertz (60 rpm) bandwidth of the high speed rotor service start-stop cycle speed range (take-off, climb, cruise, descent, approach, landing and thrust reverse) must be subjected to $3x10^6$ vibration cycles. In addition, each one hertz bandwidth of the high speed rotor transient operational speed range between flight idle and cruise must be subjected to $3x10^5$ vibration cycles. (4) At the conclusion of the test, the propulsion system must be: (i) Visually inspected according to on-wing inspection recommendations and limits. (ii) Completely disassembled and the propulsion	

		system hardware must be inspected in accordance with the service limits submitted in compliance with relevant instructions for continued airworthiness. Any potential sources of in-flight shutdown, loss of thrust control, or other power loss encountered during this inspection must be tracked and resolved.	