



**European Aviation Safety Agency
Rulemaking Directorate**

EXPLANATORY NOTE

CS-29 Amendment 3

1. GENERAL

Executive Director Decision 2012/022/R amends Decision No 2003/16/RM of 14 November 2003 (CS-29 Initial Issue) as last amended by Executive Director Decision 2008/10/RM of 17 November 2008 (CS-29 Amendment 2). It represents Amendment 3 of CS-29: Large Rotorcraft, and incorporates the output from the following EASA rulemaking task:

| Rulemaking Task No. | TITLE | NPA No. |
|---------------------------------|---|----------------|
| 27&29.002(a) | Damage Tolerance and Fatigue Evaluation of Metallic Rotorcraft Structures | 2010-06 |
| 27&29.002(b) | Damage Tolerance and Fatigue Evaluation of Composite Rotorcraft Structures | 2010-04 |
| RMT.0124 (27&29.019) | Vibration Health Monitoring | 2010-12 |
| RMT.0273 (MDM.071) | Halon – Update of CSs in order to comply with EC regulations | 2011-14 |

The Notice of Proposed Amendments (NPA) has been subject to consultation in accordance with Article 52 of the Basic Regulation¹ and Article 15 of the Rulemaking Procedure established by the Management Board². For detailed information on the proposed changes and their justification please consult the above NPAs which are available on the Agency's website.

The Agency has addressed and responded to the comments received on each of the NPAs. The responses are contained in comment-response documents (CRD) which are also available on the Agency's web-site³.

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).

² EASA MB Decision 01-2012 of 13 March 2012 amending and replacing MB Decision 08-2007 concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ('Rulemaking Procedure').

³ See: <http://easa.europa.eu/rulemaking/r-archives.php>

2. CRD REACTIONS

The Agency did not receive any substantive reactions in response to CRD 2010-04, 2010-06. In response to CRD 2011-14, the Agency received 8 reactions, although none of these were specifically related to proposed changes to CS-29. In response to the CRD 2010-12, the Agency received 2 substantive reactions from the UK CAA, which are reproduced below together with the Agency's responses:

| Reaction to | Reaction | Agency's Response |
|---|--|---|
| <p>AMC 29.1465 e(3): Signal Processing</p> | <p>Comment:</p> <p>Advanced Anomaly Detection (AAD) techniques have been demonstrated to provide enhanced sensitivity to defects <u>and</u> significantly reduced false alert/alarm rates. This technology is presently being voluntarily introduced in the UK North Sea fleet, the main area of HUMS application within Europe. Although it would not be appropriate to insist on AAD for all HUMS applications at this time, it is considered desirable to at least draw attention to it in AMC 29.1465 by the inclusion of an additional note (Note 3) to para. e.(3).</p> <p>Justification:</p> <p>The results of the two UK CAA main rotor gearbox seeded defect test programmes and in-service experience has highlighted aspects of VHM that are in need of improvement. Subsequent research culminated in the development and testing, in service over a period of two years, of a novel analysis technique which can address the shortcomings of 'standard' HUMS VHM data analysis. This has been comprehensively reported in CAA Paper 2011/01 and, at the request of their offshore oil and gas industry customers, the North Sea helicopter operators are voluntarily working towards implementing AAD on their EC225, S92 and AW139 fleets. Implementation on further fleets may follow. Since it is fast becoming best practice within the industry, it is considered appropriate to at least draw attention to it.</p> <p>Proposed Text:</p> <p><u>Note 3:</u> Advanced Anomaly Detection (AAD) techniques have been demonstrated during extended in-service trials to provide enhanced sensitivity to defects and significantly reduced false alert/alarm rates. CAA Paper 2011/01 details the background, development and testing of the application of this technology to helicopter transmission VHM data. AAD is defined as follows:</p> <p><i>"Rotorcraft HUMS Anomaly Detection is an approach that detects abnormalities in rotor drive system components by comparison of multiple downloaded health monitoring parameters with prepared multi-parameter models of normality for these components. It</i></p> | <p>Partially Accepted</p> <p>The Agency agrees that enhanced techniques such as AAD have the potential to provide earlier warnings of incipient failures than conventional techniques with reduced false alarm rates. The Agency therefore accepts that it is appropriate to make reference to such techniques in the AMC for awareness.</p> <p>The proposed text is revised and moved to Section g on Alert Management.</p> |

| Reaction to | Reaction | Agency's Response |
|--|--|------------------------|
| | <p><i>also provides diagnostic information on the monitoring parameters causing abnormal indications. The multi-parameter models of normality represent the statistical dependencies between monitoring parameters and are based on experience across multiple aircraft within a fleet. The approach incorporates methods to ensure that any unknown abnormalities within this experience do not prevent the detection of similar abnormalities. Models are to be periodically refined based on increasing fleet experience."</i></p> | |
| <p>AMC 29.1465 v: Related documents</p> | <p>Comment: Add CAA Paper 2011/01 to the list of related documents.</p> <p>Justification: To support the additional note on Advanced Anomaly Detection at paragraph e.(3).</p> <p>Proposed Text: (3) CAA Paper 2011/01: Intelligent Management of Helicopter Vibration Health Monitoring Data http://www.caa.co.uk/application.aspx?catid=33&page=65&appid=11&mode=detail&id=5040</p> | <p>Accepted</p> |

3. EDITORIAL CORRECTIONS IN CS-29 AMENDMENT 3

Minor editorial errors which have been identified are corrected as follows:

- a) CS 29.955(a)(7): Cross reference to C29.1305(a)(17) is corrected to C29.1305(a)(18).
- b) CS 29.1401: The equation in CS 29.1401(c) and repeated in the table, have been misplaced. A single equation is inserted under point (e).