Proposed Equivalent Safety Finding on CS 29.1305 (a) (25), CS29.1309(c)
Applicable to AgustaWestland AW189 Helicopter

INTRODUCTION

The hereby presented Equivalent safety Finding (ESF) has been classified as an important ESF and as such shall be subject to public consultation, in accordance with EASA Management Board Decision 2/2007, dated 11 September 2007. Article 3(2) 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

The AW189 helicopter incorporates a 30 seconds/2 minutes Main Gear Box power rating structure. In addition an automatic control to prevent the Main Gear Box 30 second limit exceedance is also implemented.

Two different counters have been implemented for this feature: the EECU (Electronic Engine Control Unit) counter, based on which automatic engine power reduction is activated, and the CDS counter, whose time count-down is displayed on both the MFD and the Power Index (PI) of the PFD, in order to give indication to the pilot of the time remaining until expiration of the 30" and 2,5min OEI MGB ratings.

Depending on the use of the 30" power rating, the two counters could become de-synchronised. In fact, the engine EECU counter is designed so that, once the 30" OEI MGB rating is entered, it completes the 30 seconds count-down cycle regardless of the actual duration of the excursion spend into the 30'' power rating. Thus, potentially leading to a mismatch between the system behaviour and the information displayed to the flight crew.

In particular, the following cases are identified where the misalignment of the two counters could lead to misleading information to the flight crew.

Case A. The 30" power rating is exited and re-entered before completion of a full 30 seconds period. In this case, the automatic engine power reduction may occur without any relevant cue displayed to the flight crew as the CDS counter will still continue to display some remaining time available for the 30" power rating.

Case B. The 30" power rating is exited before completion of a full 30 seconds time and the pilot would need torque increase to re-enter into the 30" power rating after the automatic power reduction has occurred. In this case, the CDS gives a wrong information that still some time is left available, although the automatic engine power reduction is already effective. Since no cues are given to the pilot of the automatic engine power reduction activation, when he wants to enter the 30" power rating again, the TQ is topped at 155%, and therefore he will experience an NR droop. The counters will both reset and the 30" OEI MGB rating will become available again only when NR has dropped down to 95% or TQ is reduced below 135%.

Due to possible lack of synchronisation between the CDS and EECU counters, the AW189 proposed design is not compliant with CS 29.1305(a)(25) and CS29.1309(c).

EQUIVALENT SAFETY FINDING

Demonstration of an Equivalent Safety Finding to the requirements of CS 29.1305 (a) (25) and CS 29.1309 (c) is accepted by EASA on the basis of the following compensating factors:

1. In case A, activation of the automatic engine power reduction can be immediately recognised by the pilot due to induced NR droop, as the NR is the main parameter monitored by the pilot while flying an OEI manoeuvre. It has been observed during flight tests that this NR droop is very limited (about 2% in 5 seconds), so that the helicopter is not put in any additional hazard condition.
2. In case B, the second power request made by the pilot to re-enter in the 30" power rating, since the TQ is limited at 155%, is accompanied by a possible NR droop down to 95% and all counters reset. Also this case was extensively tested in flight: the helicopter demonstrated to be fully controllable (minimum NR in OEI is 90%) without exceptional piloting skill or awareness and no additional hazards were identified, while the 30" power rating is again fully available almost immediately.
3. RFM emergency procedures for CAT A require to make full use of the 30"power rating, hence excluding any partial use of this rating and possible counters de-synchronisation to occur. In addition, even Cat B and H-V envelopes have been developed in order to provide specific emergency procedures that require the full use of the 30" power rating.
4. The following CAUTION is added in Section 1 - LIMITATION of the RFM.

CAUTION
Automatic Power Reduction will reduce available Torque (TQ) to 155% after 30 seconds from first application of 30" power rating.

   This RFM Caution adequately draws attention of the pilot that the EECU will trigger anyway the automatic engine power reduction after 30 seconds from the first time the 30" power rating is entered. Therefore it makes the flight crew fully aware of the system behaviour, even in case of EECU and CDS counters non-synchronised condition.
5. In case of full use of the 30" power rating (synchronised condition), flashing of the last 10 seconds of the CDS 30s counters display provides adequate cues to the pilot that the automatic engine power reduction is triggered.
6. The automatic engine power reduction will always be active in order to protect MGB transmission from exceeding this rating, therefore excluding any additional hazard condition.

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