
AIRWORTHINESS DIRECTIVE

For the reasons set out in the background section, the CASA delegate whose signature appears below issues the following Airworthiness Directive (AD) under subregulation 39.001(1) of CASR 1998. The AD requires that the action set out in the requirement section (being action that the delegate considers necessary to correct the unsafe condition) be taken in relation to the aircraft or aeronautical product mentioned in the applicability section: (a) in the circumstances mentioned in the requirement section; and (b) in accordance with the instructions set out in the requirement section; and (c) at the time mentioned in the compliance section.

Avions de Transport Regional ATR 42 Series Aeroplanes**AD/ATR 42/27****Multi Purpose Computer with Aircraft
Performance Monitoring Function****11/2009**

Applicability: Model ATR 42-200, 42-300 and 42-320 aeroplanes that are not already equipped with Multi Purpose Computer / Aircraft Performance Monitoring (MPC/APM) per ATR Mod 08420 (Service Bulletin (SB) ATR42-31-0071), and Model ATR42-400 and 42-500 aeroplanes that are not already equipped with MPC/APM per ATR Mod 05567 or by retrofit through SB ATR42-31-0068.

Requirement: Unless previously accomplished, install a Multi Purpose Computer (MPC) with Aircraft Performance Monitoring (APM) in accordance with the accomplishment instructions of:

- SB ATR42-31-0071 Revision 07 dated 7 February 2008 (Mod 008420) for ATR42-200/300/320 aeroplanes.
- SB ATR42-31-0068 Revision 07 dated 15 January 2009 (Mod 05567) for ATR42-400/500 aeroplanes.

Installation of a MPC/APM accomplished before the effective date of this Directive in accordance with earlier revisions of the aforementioned SBs, satisfy the requirements of this Directive.

Later revisions of the aforementioned SBs approved by the European Aviation Safety Agency (EASA) are acceptable for compliance with this Directive.

Note 1: Mod 05567 was factory-incorporated onto ATR 42-500 aeroplanes from Manufacturer Serial Number (MSN) 641.

Note 2: At the effective date of this Directive, Appendix 15 to the Aircraft Flight Manual (AFM) which describes the specific procedures associated with the APM is included in the following Normal Revision of the applicable AFM:

- *AFM 42-200/300/320 Normal Revision 27 dated April 2008.*
- *AFM 42-400/500 Normal Revision 13 dated October 2008.*

Note 3: EASA AD 2009-0170 refers.

Avions de Transport Regional ATR 42 Series Aeroplanes

AD/ATR 42/27 (continued)

Compliance: Not later than the second “C” check or within 72 months, whichever occurs first after the effective date of this Directive.

This Airworthiness Directive becomes effective on 22 October 2009.

Background: This Directive is intended to minimize hazards on ATR42 aeroplanes associated with the inadvertent encounter of severe icing conditions (which are beyond current certification envelope requisites for Part 25 aeroplanes) by providing the flight crew with measurable and objective evidence and timely alert when such severe ice conditions are encountered.

The accumulated experience on the worldwide fleet of commuter aeroplanes together with recently reported ATR42/72 in-flight incidents, show that a long exposure to severe icing conditions, outside the certification envelope, can result in “unsafe conditions”. This could lead to rapid performance degradation resulting in sudden stall of the lifting/controlling aerodynamic surfaces and subsequent loss of control of the aeroplane.

Prolonged exposures to these severe icing conditions are due to the lack of crew awareness of these extreme environmental conditions leading to their late detection and/or untimely or incorrect application of the existing AFM procedures, which require the flight crew to actively monitor the encountered icing conditions and to leave them as soon as they are recognised as severe.

Current ATR42 AFM emergency procedures for the encounter of severe icing conditions remain valid and must be applied by the flight crew. However, their application is based on the detection of such severe icing conditions by means of flight crew subjective interpretation of:

- an unexpected decrease of the aeroplane speed and/or rate of climb and/or;
- a set of very different visual cues like ice covering unheated portion of either forward side windows, possibly associated with water splashing and streaming on the windshield and/or;
- several secondary indications based on visual observation of ice accretion on different parts of the airframe.

All these together require the flight crew to perform a final qualitative judgement based upon its experience to fly icing conditions, and which could be different depending on the specific circumstances of each case where other concurrent environmental factors like poor light conditions, night operations, etc., can impair the decision-making process.

Avions de Transport Regional ATR 42 Series Aeroplanes

AD/ATR 42/27 (continued)

In addition, even if the severe icing conditions are quickly identified by the crew and the escape manoeuvre promptly initiated, it may still take a few minutes for the aircraft to exit these conditions.

In order to improve flight crew situation awareness in icing conditions, ATR developed a new function called Aircraft Performance Monitoring (APM) that is available on ATR aeroplanes with Multi Purpose Computer (MPC) installed.

The APM processes a collection of different parameters (among them the aeroplane take-off weight as selected by the crew on a specific rotary selector), and in particular computes and compares the actual drag on the current flying path with the theoretical/expected value. From the comparison, a measurable and objective determination of the performance degradation possibly due to abnormal ice accretion can be calculated. When the performance degradation passes given thresholds, the APM annunciates warning signals by triggering up to two different levels of alerts while on climb/descent and three levels of alerts on cruise to the flight crew to make them aware of potential severe icing conditions degrading the aircraft performance.

It is recognised that, although the ice protection system of the aeroplane is compliant with the current certification envelope for flight into known-icing conditions, the possible unsafe condition originating from a prolonged exposure to severe icing environment will be annunciated by the alert(s) provided by the APM, which has proved to be reliable during its in-service experience.

Because the APM warning will only indicate the significant aerodynamic penalties, the current AFM Emergency Procedures for severe icing remain totally valid and applicable. No relief to the pilot procedures concerning the current visual cues to detect severe icing conditions can result from this Directive because APM function provides flight crews with objective indications which complement and enhance the situation awareness.



James Coyne
Delegate of the Civil Aviation Safety Authority

2 September 2009