

AIRWORTHINESS DIRECTIVE

released by DIRECTION GENERALE DE L'AVIATION CIVILE

Inspection and/or modifications described below are mandatory. No person may operate a product to which this Airworthiness Directive applies except in accordance with the requirements of this Airworthiness Directive.

Translation of 'Consigne de Navigabilité' ref. : 2000-448-053(B) R2
In case of any difficulty, reference should be made to the French original issue.

ATR

ATR 72 aircraft

Take-off after use of type II or IV fluids - Appendix to the Flight Manual (ATA 04)

1. APPLICABILITY:

ATR 72 aircraft models -101, -102, -201, -202,- 211, -212, -212A.

2. REASONS:

The aim of Revision 1 is to clarify the reasons for the issuance of the original Airworthiness Directive (AD).

The aim of Revision 2 is to introduce an Alternative Mean Of Compliance to this AD.

INTRODUCTION:

The experience of ground de-icing/anti-icing fluids use, accumulated by the world wide transport aircraft fleet, has led to the issuance by the Joint Aviation Authorities of the "JAR OPS temporary guidance leaflet No. 4". This document highlights the characteristics of de-icing/anti-icing fluids, and precautions to be taken to make use of these fluids. This document indicates that specific precautions or procedures may be needed on some aircraft types and then be part of training and briefing.

Increased pitch control forces have been experienced during rotation on ATR aircraft, after using type II or type IV fluids. The magnitude of these control force increase was such, in some cases, that the crew made a late decision to abort the take-off.

The ATR manufacturer has published an appendix to the flight manual which prescribes either an increase in required runway lengths, or an application of the assisted rotation procedure (with an associated increase of Take Off Distance) in case of use of type II or IV fluids.

DGAC, after review of the in-service experience and of the tests and analyses performed by the manufacturer, considered that under some specific conditions, use of type II or type IV fluids could lead to excessive control forces during rotation, which could increase the take-off distance, or lead the crew to decide to abort take-off after V1.

DGAC determined that the proposed appendix (dated September 2001) to the flight manual did provide an additional margin against the risk of increased take-off distance, or late abort take-off decision, and decided to render mandatory either the application of this increase in required runway lengths or the take-off with assisted rotation (with an associated increase of Take Off Distance), in order to prevent an unsafe condition from developing when using type II or IV on ATR aircraft.

n/GH

September 19, 2001

ATR
ATR 72 aircraft

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DISCUSSION :

Tests performed by ATR, with use of type II or IV fluids, have shown that, in the worst cases (most severe fluid application combined with forward CG), pitch control forces up to 60 daN could be encountered during rotation. This level of control forces exceeds significantly the value of 75lbs provided in JAR 25.143 as the maximum control forces for short term application in pitch. However, it has been demonstrated that an "average" pilot, if specially trained to face such situation, could cope with such force levels and continue take-off, with possibly a lower than nominal rotation rate.

ATR simulators were modified, to simulate the effect of type II/IV fluids on pitch control forces during rotation, and operators should introduce the demonstration of this effect in their crew training programs.

Procedure for application of type II/IV fluids on ATR should follow accurately the recommendations of the aircraft and of the fluid manufacturers, in order to get efficient de/anti-icing, and to limit the increased control forces during rotation at an acceptable level. In case the recommendations of the manufacturers are not properly followed, significant increase in pitch control forces could be encountered.

5 cases of aborted take-off after V1, after use of type II or IV fluids have been reported to the manufacturer between 1991 and 1998.

Analysis of in-service experience has shown that the application of inadequate procedures for use and application of type II/IV fluid could lead to high control forces during rotation.

Combined with lack of crew awareness or insufficient crew training, and possibly marginal pilot physical strength these increased control forces could lead to delayed rotation and significantly lower rotation rates, and in some cases, decision of the crew to abort the take-off after V1.

DGAC considered that it could not assume that all operators would be able to always maintain the highest standards for use of type II/IV fluids, and for crew training when using such fluids, and concluded that the combination of factors mentioned above which led to aborted take-off after V1 or can lead to delayed rotation is not extremely improbable.

DGAC considers that an aborted take-off after V1 can lead to a hazardous or catastrophic situation on limited runways.

Therefore DGAC decided, that, in order to prevent an unsafe condition, it was necessary to mandate either an increase in required runway length (compliance method No. 1) or the assisted rotation procedure at take-off with an associated increase of Take Off Distance (compliance method No. 2).

Method of Compliance No. 1 (here after described as compliance method No. 1):

This compliance method consists in an increase in required runway length, in order to provide the necessary margins in case of late rotation, or aborted take-off after V1.

This AD should not be interpreted as a reconsideration of the concept of V1 as a decision speed, or as an incentive to abort take-off after V1. DGAC still believes that crews should be trained to continue take-off after V1, even in case of increased pitch control forces.

However, despite the published procedures and training, the possibility that a crew would consider that the pitch control forces are so high that take-off is impossible, and decide to abort take-off after V1, cannot be totally excluded. In such a case, the proposed AFM appendix would provide an additional margin for accelerate-stop distance.

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Alternative Method of Compliance (here after described as compliance method No. 2):

DGAC after review of the flight simulations performed by the manufacturer, considered that an alternative method of compliance, which provides an equivalent level of safety, was to allow an "assisted rotation at take-off" when the crew encounters increased pitch control forces leading in difficulties to rotate.

This procedure, which is described in the applicable Airplane Flight Manuals, has some effects on performances (increase of TOD).

Note: This compliance method can only be applied if the crew has been properly trained to apply the relevant procedure.

Aeronautical Authorities may consider Alternative Means Of Compliance depending to the operational context specific to each operator. It is expected that the above mentioned background information and discussion can be useful when deciding on the most appropriate means to implement this AD with each operator.

3. **ACTIONS:**

In order to take into account the effect of use of type II/IV de-icing/anti-icing fluids on ATR pitch control forces during rotation, and subsequent impact on take-off performance, the following measures are rendered mandatory from the effective date of this AD:

Within 15 days after the effective date of this AD at Revision 2, if not already performed, accomplish the following:

Revise the approved Flight Manual by incorporating the following appendix. This may be accomplished by inserting a copy of this Airworthiness Directive in the Aircraft Flight Manual.

In the Appendices and Supplements chapter:

Quote

Take-off after use of fluids type II or IV

This appendix applies only to aircraft de/anti iced before take-off, using fluids type II or IV.

These type of fluids may lead to an increase in control forces necessary to rotate, and then to a modification of take-off performances.

Therefore this flight manual must be modified as follows:

COMPLIANCE METHOD No. 1

1. GENERAL

The general information in Section 1 are applicable.

2. LIMITATIONS

The limitations in Section 2 are applicable.

3. NORMAL PROCEDURES

The normal procedures in Section 3 are applicable.

4. EMERGENCY PROCEDURES

The emergency procedures in Section 4 are applicable.

5. PROCEDURES FOLLOWING FAILURES

The procedures following failures in Section 5 are applicable.

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6. PERFORMANCES

The performances in Section 6 for dry runways and in Section 7.03 for non dry runways (advisory materials) are applicable with the addition of the following for take-off computations:

- Determine VR for the lowest available V2,
- Assume V1=VR,
- Increase TOR, TOD, ASD by 25%.

7. APPENDICES AND SUPPLEMENTS

Data of Section 7 are applicable by adding what follows:

For the dispatch cases:

- Apply take-off penalties due to the system failure,
- Then apply take-off penalties due to the use of fluids type II or IV.

Dispatch is not authorized in the following cases:

- Ferry flight with pitch elevators disconnected,
- Take-off with flaps retracted."

COMPLIANCE METHOD No. 2 **CREW TRAINING REQUIRED**

1. GENERAL

The general information in Section 1 are applicable.

2. LIMITATIONS

The limitations in Section 2 are applicable.

3. NORMAL PROCEDURES

The normal procedures in Section 3 are applicable with the addition of the following :

The Captain must be the pilot flying and the pre-take-off briefing must include the following take-off procedure (refer to point 5).

4. EMERGENCY PROCEDURES

The emergency procedures in Section 4 are applicable.

5. PROCEDURES FOLLOWING FAILURES

The procedures following failures in Section 5 are applicable with the addition of the following :

TAKE OFF SEQUENCE

In case of difficulties to rotate, the Captain should require the non flying pilot assistance.

In that case, on CPT order, PNF pulls the control column until 5° pitch attitude is reached, then PNF releases the controls.

6. PERFORMANCES

The performances in Section 6 for dry runways and in Section 7.03 for non dry runways (advisory materials) are applicable with the addition of the following for take-off computations :

- Increase TOD by 70 m

7. APPENDICES AND SUPPLEMENTS

Data of Section 7 are applicable with addition of the following :

For the dispatch cases :

- Apply take-off penalties due the system failure,
- Then apply take-off penalties due the use of fluids type II or IV.

Dispatch is not authorized in the following cases :

- Ferry flight with pitch elevators disconnected,
- Take-off with flaps retracted

Unquote

REF.: Approved Flight Manual.

| This Revision 2 replaces AD 2000-448-053(B) R1 dated December 27, 2000.

EFFECTIVE DATES :

| **Original AD and Revision 1 : Upon receipt of original
issue from OCTOBER 31, 2000**
Revision 2 : SEPTEMBER 29, 2001