



# Notification of a Proposal to issue an Airworthiness Directive

**PAD No.: 19-019**

**Issued: 08 February 2019**

Note: This Proposed Airworthiness Directive (PAD) is issued by EASA, acting in accordance with Regulation (EU) 2018/1139 on behalf of the European Union, its Member States and of the European third countries that participate in the activities of EASA under Article 129 of that Regulation.

In accordance with the EASA Continuing Airworthiness Procedures, the Executive Director is proposing the issuance of an EASA Airworthiness Directive (AD), applicable to the aeronautical product(s) identified below.

All interested persons may send their comments, referencing the PAD Number above, to the e-mail address specified in the 'Remarks' section, prior to the consultation date indicated.

**Design Approval Holder's Name:**

ROLLS-ROYCE plc

**Type/Model designation(s):**

Trent 1000 engines

**Effective Date:** [TBD - standard: 14 days after Final AD issue date]

**TCDS Number(s):** EASA.E.036

**Foreign AD:** Not applicable

**Supersedure:** This AD supersedes EASA AD 2018-0167R2 dated 16 October 2018.

## ATA 72 – Engine – Intermediate Pressure Compressor Blades / Shafts – Inspection

**Manufacturer(s):**

Rolls-Royce plc (RR)

**Applicability:**

Trent 1000-A, Trent 1000-AE, Trent 1000-C, Trent 1000-CE, Trent 1000-D, Trent 1000-E, Trent 1000-G, and Trent 1000-H engines, all serial numbers.

These engines are known to be installed on, but not limited to, Boeing 787 aeroplanes.

**Definitions:**

For the purpose of this AD, the following definitions apply:

Where, in this AD, reference is made to an RR Non-Modification Service Bulletin (NMSB) with an 'A' (Alert) in the number, it should be recognised that an earlier or later revision may not have that 'A'. This kind of change does not effectively alter the publication references for the purpose of this AD.

**The NMSB:** RR Alert NMSB TRENT 1000 72-AK130 Revision 3.



**Affected part:** Intermediate Pressure Compressor (IPC) Stage 1 rotor (Rotor 1) blades, Part Number (P/N) FW61601 and P/N KH16052, IPC Stage 2 rotor (Rotor 2) blades, P/N FW61602 and P/N KH16053, and IPC Shaft Stage 1-8 Rotor assemblies P/N FW58316 and P/N FW75680.

**Groups:**

Group 1 IPC modules are those that have not embodied RR NMSB TRENT 1000 72-K132.

Group 3 and Group 4 IPC modules are those that have embodied RR NMSB TRENT 1000 72-K132, Part B or Part C, respectively.

Group 5 and Group 6 IPC modules are those that have embodied RR NMSB TRENT 1000 72-K132, work package Part D or Part E, respectively.

For further details, refer to Table 1 (for IPC Rotor 1 blades front face) and Table 2 (for IPC Rotor 2 blades front and rear face and IPC Shaft Stage 2 dovetail posts) of the NMSB.

**The applicable NMSB:** RR NMSB TRENT 1000 72-K099 (for IPC Rotor 1 blades), NMSB TRENT 1000 72-K100 (for IPC Rotor 2 blades front face and IPC Shaft Stage 2 dovetail posts) and NMSB TRENT 1000 72-K129 (for IPC Rotor 2 blades rear face), as applicable.

**Asymmetric power conditions:** Operation of the aeroplane, either with reduced power on one engine, or with single engine in-flight shut-down (IFSD), if sustained for more than 30 minutes below 25 000 feet.

**Reason:**

Occurrences were reported on RR Trent 1000 'Pack B' engines, where some IPC Rotor 1 and Rotor 2 blades were found cracked.

This condition, if not detected and corrected, could lead to in-flight blade release, possibly resulting in reduced control of the aeroplane.

To address this potential unsafe condition, RR issued NMSB TRENT 1000 72-AK130 and the applicable NMSB to provide instructions to inspect IPC Rotor 1 blades, IPC Rotor 2 blades (front and rear face) and IPC shaft Stage 2 dovetail posts. Consequently, EASA issued AD 2018-0128 (later revised) to require a one-time inspection of the affected parts and, depending on findings, accomplishment of applicable corrective action(s).

After EASA AD 2018-0128R1 was issued, it was determined that repetitive borescope inspections are necessary on all engines to ensure fleet-wide continued safe operation. Consequently, RR revised NMSB TRENT 1000 72-AK130 (Revision 2), introducing three different Group definitions (four more Groups are reserved) of IPC modules. Consequently, EASA issued AD 2018-0167 (later revised), retaining the requirements of EASA AD 2018-0128R1, which was superseded, to require repetitive on-wing borescope inspections of the affected Rotor 1 parts and affected Rotor 2 blades and shaft, and depending on findings, removal from service of the engine for corrective action. That AD also introduced specific inspection requirements following operation in asymmetric power conditions, and provided an alternative in-shop inspection method.

Since EASA AD 2018-0167R2 was issued, workscope packages D and E were added to NMSB TRENT 1000 72-K132 (Revision 1) and it was determined that inspections are required to ensure an



acceptable level of safety for engines with that refurbishment embodied. Consequently, RR revised NMSB TRENT 1000 72-AK130 (Revision 3) accordingly, adding Groups 5 and 6 IPC modules.

For the reason described above, this AD retains the requirements of EASA AD 2018-0167R2, which is superseded, and requires repetitive inspections of certain engines in post-NMSB TRENT 1000 72-K132 Revision 1 (refurbishment work D or E) configuration and, depending on findings, accomplishment of applicable corrective action(s).

This AD is still considered an interim action and further AD action may follow.

#### **Required Action(s) and Compliance Time(s):**

Required as indicated, unless accomplished previously:

#### **On-Wing Inspection:**

- (1) For Group 1, Group 3 and Group 4 modules: Except as required by paragraph (2) of this AD, before exceeding the applicable threshold as specified in Table 1 of the NMSB, or within 15 days after 11 August 2018 [the effective date of EASA AD 2018-0167], whichever occurs later, and, thereafter, at intervals not to exceed the applicable value as specified in Table 1 of the NMSB, inspect the front face of the affected IPC Rotor 1 blades in accordance with the instructions of the applicable NMSB.
- (2) For an engine having a Group 1, Group 3 or Group 4 module installed where, during the latest inspection in accordance with RR NMSB TRENT 1000 72-AK130 original issue or Revision 1 or Revision 2, as applicable, no crack was found on the front faces of IPC Rotor 1 blades, accomplish the initial inspection as required by paragraph (1) of this AD within the compliance time specified in Table 1 of this AD, as applicable.

Note 1: Unless specified otherwise, the engine flight cycles (EFC) indicated in Table 1 and Table 2 of this AD are those accumulated by the Group 1, Group 3 or Group 4 module, as applicable, since the latest inspection or equivalent inspection in accordance with RR NMSB TRENT 1000 72-AK130 (original issue or any later revision).

Table 1 – Initial Inspection of uncracked front face of IPC Rotor 1 blades (see Note 1 of this AD)

<b>EFC Accumulated</b>	<b>Compliance Time</b>
More than 400 EFC	Within 15 days after 11 August 2018 [the effective date of EASA AD 2018-0167]
More than 200 EFC, but not more than 400 EFC	Within 45 days after 11 August 2018 [the effective date of EASA AD 2018-0167]
Not more than 200 EFC	Before exceeding 200 EFC, or within 45 days after 11 August 2018 [the effective date of EASA AD 2018-0167], whichever occurs later

- (3) For Group 1, Group 3 and Group 4 modules: Except as required by paragraph (4) of this AD, before exceeding the applicable threshold as specified in Table 2 of the NMSB, or within 15 days after 11 August 2018 [the effective date of the original issue of this AD], whichever



occurs later, and, thereafter, at intervals not to exceed the applicable value as specified in Table 2 of the NMSB, inspect the front and rear face of the affected IPC Rotor 2 blades and the IPC shaft Stage 2 dovetail posts in accordance with the instructions of the applicable NMSB.

- (4) For an engine having a Group 1, Group 3 or Group 4 module installed where, during the latest inspection in accordance with RR NMSB TRENT 1000 72-AK130 original issue or Revision 1 or Revision 2, as applicable, no crack was found on the front and rear faces of the affected IPC Rotor 2 blades, and the IPC shaft Stage 2 dovetail posts, accomplish the initial inspection as required by paragraph (3) of this AD within the compliance time specified in Table 2 of this AD, as applicable.

Table 2 – Initial Inspection of uncracked front and rear face of the affected IPC Rotor 2 blades, and uncracked IPC shaft Stage 2 dovetail posts (see Note 1 of this AD)

<b>EFC Accumulated</b>	<b>Compliance Time</b>
More than 200 EFC	Within 15 days after 11 August 2018 [the effective date of EASA AD 2018-0167]
More than 100 EFC, but not more than 200 EFC	Within 45 days after 11 August 2018 [the effective date of EASA AD 2018-0167]
Not more than 100 EFC	Before exceeding the applicable interval as specified in Table 2 of the NMSB, or within 45 days after 11 August 2018 [the effective date of EASA AD 2018-0167], whichever occurs later

- (5) For Group 5 and Group 6 modules: Before exceeding the applicable threshold as specified in Table 1 or Table 2 of the NMSB, as applicable, or within 30 days after the effective date of this AD, whichever occurs later, and, thereafter, at intervals not to exceed the applicable value as specified in Table 1 or Table 2 of the NMSB, as applicable, inspect the front face of the affected IPC Rotor 1 blades, and front and rear face of the affected IPC Rotor 2 blades and the IPC shaft Stage 2 dovetail posts, in accordance with the instructions of the applicable NMSB.

#### **In-Shop Inspection:**

- (6) An engine or module in-shop inspection in accordance with the instructions of Sections 3.A.2, 3.B.2 and 3.C.2 of the NMSB may be substituted for an on-wing inspection as required by paragraph (1), (2), (3) or (4) of this AD, as applicable, provided the applicable threshold and intervals are not exceeded.

In-shop inspection (at piece-part level) of Rotor 1 or Rotor 2 blades and IPC shaft stage 2 dovetail posts, during refurbishment in accordance with the instructions of RR TRENT 1000 NMSB 72-K132 (at any revision), is an acceptable alternative method of compliance to substitute any on-wing inspection as required by this AD.

#### **Inspection following Asymmetric Power Operation:**

- (7) From 11 August 2018 [the effective date of EASA AD 2018-0167], before next flight after each operation in asymmetric power conditions, as defined in this AD, accomplish an on-wing borescope inspection, as defined in Section 1.D.(4) of the NMSB, of the Rotor 1 blades, Rotor 2 blades and the IPC shaft Stage 2 dovetail posts installed on the not-affected engine (no



power reduction, no IFSD) installed on the aeroplane, in accordance with the instructions of Section 3.D of the NMSB.

**Corrective Action(s):**

- (8) If, during any on-wing inspection as required by paragraph (1), (2), (3), (4), (5) or (6) of this AD, as applicable, any discrepancies or crack indications are detected, before next flight, remove the engine from service, contact RR for approved repair instructions and accomplish those instructions accordingly. A single ferry flight of up to three flight cycles is permitted to move the aeroplane to a location where the engine can be removed from service.
- (9) If, during any in-shop inspection as specified in paragraph (6) of this AD, any discrepancies or crack indications are detected, before release to service of the engine, or before installation of the module on an engine, as applicable, contact RR for approved repair instructions and accomplish those instructions accordingly.

**Credit:**

- (10) Any action(s) on an engine, accomplished before the effective date of this AD in accordance with the instructions of RR NMSB TRENT 1000 72-AK130 original issue, or Revision 1, or Revision 2, as applicable, is acceptable to comply with the initial corresponding action(s) as required by this AD for that engine.

**Terminating Action:**

- (11) None.

**Parts Installation:**

- (12) From 11 August 2018 [the effective date of EASA AD 2018-0167], it is allowed to install a Group 1, Group 3 or Group 4 module on an engine, provided that the affected parts installed on that module have passed an inspection (no defects found) in accordance with the instructions of the applicable NMSB, or the module has been corrected as required by paragraph (8) or (9) of this AD, as applicable.

**Ref. Publications:**

RR Alert NMSB TRENT 1000 72-AK130 original issue dated 11 June 2018, or Revision 1 dated 29 June 2018, or Revision 2 dated 26 July 2018, and Revision 3 dated 10 January 2019.

RR NMSB TRENT 1000 72-K099 original issue dated 11 June 2018, or Revision 1 dated 03 July 2018, or Revision 2 dated 27 September 2018.

RR NMSB TRENT 1000 72-K100 original issue dated 11 June 2018.

RR NMSB TRENT 1000 72-K129 original issue dated 11 June 2018, or Revision 1 dated 02 July 2018.

RR NMSB TRENT 1000 72-K132 original issue dated 29 June 2018, or Revision 1 dated 10 January 2019.

The use of later approved revisions of the above-mentioned documents, is acceptable for compliance with the requirements of this AD.



**Remarks:**

1. This Proposed AD will be closed for consultation on 08 March 2019.
2. Enquiries regarding this PAD should be referred to the EASA Safety Information Section, Certification Directorate. E-mail: [ADs@easa.europa.eu](mailto:ADs@easa.europa.eu).
3. Information about any failures, malfunctions, defects or other occurrences, which may be similar to the unsafe condition addressed by this PAD, and which may occur, or have occurred on a product, part or appliance not affected by this PAD, can be reported to the [EU aviation safety reporting system](#).
4. For any question concerning the technical content of the requirements in this PAD, please contact your designated Rolls-Royce representative, or download the publication from your Rolls Royce Care account at <https://customers.rolls-royce.com>.

If you do not have a designated representative or Rolls Royce Care account, please contact **Corporate Communications** at **Rolls-Royce plc**, P.O. Box 31, Derby, DE24 8BJ, United Kingdom Telephone +44 (0)1332 242424,

or send an email through [http://www.rolls-royce.com/contact/civil\\_team.jsp](http://www.rolls-royce.com/contact/civil_team.jsp) identifying the correspondence as being related to **Airworthiness Directives**.

