Airworthiness Directive

AD No.: 2018-0084

Issued: 13 April 2018

Note: This Airworthiness Directive (AD) is issued by EASA, acting in accordance with Regulation (EC) 216/2008 on behalf of the European Union, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation.

This AD is issued in accordance with Regulation (EU) 748/2012, Part 21.A.3B. In accordance with Regulation (EU) 1321/2014 Annex I, Part M.A.301, the continuing airworthiness of an aircraft shall be ensured by accomplishing any applicable ADs. Consequently, no person may operate an aircraft to which an AD applies, except in accordance with the requirements of that AD, unless otherwise specified by the Agency [Regulation (EU) 1321/2014 Annex I, Part M.A.303] or agreed with the Authority of the State of Registry [Regulation (EC) 216/2008, Article 14(4) exemption].

Design Approval Holder's Name:
ROLLS-ROYCE plc

Type/Model designation(s):
Trent 1000 engines

Effective Date: 20 April 2018

TCDS Number(s): EASA.E.036

Foreign AD: Not applicable

Supersedure: This AD supersedes EASA AD 2018-0073 dated 30 March 2018.

ATA 72 – Engine – Intermediate Pressure Compressor Blades / Shaft – Inspection

---

Manufacturer(s):
Rolls-Royce plc (RR)

Applicability:
Trent 1000-A2, Trent 1000-AE2, Trent 1000-C2, Trent 1000-CE2, Trent 1000-D2, Trent 1000-E2, Trent 1000-G2, Trent 1000-H2, Trent 1000-J2, Trent 1000-K2 and Trent 1000-L2 engines, all serial numbers.

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

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

The NMSB: RR Alert Non-Modification Service Bulletin (NMSB) TRENT 1000 72-AK060 original issue dated 13 April 2018, which refers to Alert NMSB TRENT 1000 72-AJ814 (for affected Rotor 1 parts) and Alert NMSB TRENT 1000 72-AJ819 (for affected Rotor 2 parts). Where, in this AD, reference is made to any 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.

Affected Rotor 1 parts: Intermediate Pressure Compressor (IPC) Stage (Rotor) 1 blades Part Number (P/N) KH25729.

Affected Rotor 2 parts: IPC Rotor 2 blades P/N KH25730, and IPC Shaft Stage 1-8 Rotor assemblies P/N FW89043.

Groups: For the purpose of Table 1 of this AD, Group 2 engines are those have passed an affected Rotor 1 parts inspection (no cracks identified) in accordance with the instructions of RR Technical Variance (TV) TV176758 or TV177125, or RR NMSB TRENT 1000 72-AJ814 (any issue), or NMSB TRENT 1000 72-J744 (any issue), as applicable. Group 1 engines are those have not been subject to any of those inspections.

ETOPS: Extended-range Twin-engine Operational Performance Standards (ETOPS) refers to engines installed on twin-engine aeroplanes that operate on routes which, at some point, are more than 60 minutes flying time away from the nearest airport suitable for emergency landing.

Reason:

Occurrences were reported on RR Trent 1000 'Pack C' 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 initially issued Alert NMSB TRENT 1000 72-AJ814 and 72-AJ819 to provide inspection instructions for IPC Rotor 1 blades, and IPC Rotor 2 blades and IPC shaft Stage 2 dovetail posts, respectively. RR also issued NMSB TRENT 1000 72-J871 to provide rework instructions for the affected parts, and Alert NMSB TRENT 1000 72-AJ869 to inspect those post-rework parts. Consequently, EASA issued AD 2017-0248 to require repetitive inspections of the affected IPC Rotor blades and IPC shaft Stage 2 dovetail posts and, depending on findings, removal from service of the engine for corrective action.

After that AD was issued, prompted by further analysis, it was determined that, for certain engines, the front face of IPC Rotor 2 Blades and the dovetail posts of the IPC Shaft Stage 2 Rotor assembly needed to be inspected earlier. RR issued Alert NMSB TRENT 1000 72-AK058 to provide instructions for a one-time on-wing inspection. Consequently, EASA issued AD 2018-0073, retaining the requirements of EASA AD 2017-0248, which was superseded, to require an additional borescope inspection of certain engines and, depending on findings, removal from service of the engine for corrective action.

Since that AD was issued, it was determined that repetitive borescope inspections are necessary on all engines to ensure fleet-wide continued safe operation. Consequently, RR revised Alert NMSB TRENT 1000 72-AJ869, Alert NMSB TRENT 1000 72-AJ814, Alert NMSB TRENT 1000 72-AJ819 and NMSB TRENT 1000 72-J871, and issued the NMSB to consolidate all inspection instructions.

For the reason described above, this AD retains the requirements of EASA AD 2018-0073, which is superseded, and requires repetitive on-wing borescope inspections of the affected Rotor 1 and Rotor 2 parts and, depending on findings, removal from service of the engine for corrective action. This AD also introduces specific requirements for engines installed on aeroplanes involved in ETOPS, and inspection following operation in asymmetric power conditions.

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:

Pre-NMSB TRENT 1000 72-J871 Repetitive Inspections of affected Rotor 1 parts:

(1) From 27 December 2017 [the effective date of EASA AD 2017-0248], following receipt of an alert engine health monitoring (EHM) notification (see Note 1 of this AD and example shown in Figure 1 of this AD) from the RR Operational Service Desk (OSD), within the compliance time specified in Table 1 of this AD, as applicable, and, thereafter, at intervals not to exceed 200 flight cycles (FC), inspect the affected Rotor 1 parts in accordance with the instructions of the NMSB.

Note 1: RR OSD manages the EHM process and will send an Alert EHM notification containing the wording as shown in Figure 1 of this AD. The EHM Alert is only provided for the initial inspection (threshold), not for subsequent repeat inspections.

Figure 1 – Example Alert EHM Notification

Engine: **#2/10ad4** on aircraft **cV-Fjc**

Symptoms: Possible cracking of Rotor 1 in accordance with NMSB 72-AK060 Part A

Diagnosis: Risk of IP Compressor Rotor 1 Cracking

Please be advised that we have observed IP Compressor Rotor 1: Crack inspection required. The recommended fault isolation process for Risk of IP Compressor Rotor Cracks states:

Possible Causes: The above engine is identified as being at increased risk of cracking on the IP Compressor Rotor 1.

Reaction Time: 80 flight cycles or 200FC since last inspection, whichever is later.

Table 1 – Initial Inspection

Group	Compliance Time
1	Within 80 FC, or within the reaction time specified in the EHM Alert, whichever occurs first after receiving the EHM Alert
2	Within 200 FC after the last inspection

Post-NMSB TRENT 1000 72-J871 Rotor 1 Repetitive Inspections:

(2) For an engine, subject to inspections as required by paragraph (1) of this AD, after in-shop replacement of the affected Rotor 1 parts on that engine in accordance with the instructions of RR NMSB TRENT 1000 72-J871, or NMSB TRENT 1000 72-J744 (see Note 2 of this AD), as applicable, before exceeding the threshold, and, thereafter, at intervals not exceeding the values as specified in Part A of the NMSB, inspect the affected Rotor 1 parts in accordance with the instructions of the NMSB.

Note 2: Replacement of all affected Rotor 1 parts with new parts on an engine, in accordance with the instructions of RR NMSB TRENT 1000 72-J744 (any issue), effectively makes that engine a post-NMSB TRENT 1000 72-J871 engine, subject to inspections as required by paragraph (2) of this AD.

Repetitive Inspections of affected Rotor 2 parts:

(3) Within the compliance time specified in Table 2 of this AD, as applicable, and, thereafter, at intervals not to exceed 80 FC, accomplish an inspection of the affected Rotor 2 parts in accordance with the instructions of the NMSB.

Table 2 – Initial Inspection (see Note 3 of this AD)

FC Accumulated	Compliance Time
Less than 300 FC	**Non-ETOPS**: Before exceeding 300 FC, or within 50 days after the effective date of this AD, whichever occurs later
	ETOPS: Before exceeding 300 FC, or before the next ETOPS flight after the effective date of this AD, whichever occurs later
300 FC or more	**Non-ETOPS**: Within 50 days after the effective date of this AD, or within 80 FC since the last inspection in accordance with the instructions of RR NMSB TRENT 1000 72-AJ819 (any issue), or NMSB TRENT 1000 72-AJ869 (any issue), as applicable, whichever occurs later, but not exceeding 200 FC since that last inspection
	ETOPS: Before the next ETOPS flight after the effective date of this AD, or within 80 FC since the last inspection in accordance with the instructions of RR NMSB TRENT 1000 72-AJ819 (any issue), or NMSB TRENT 1000 72-AJ869 (any issue), as applicable, whichever occurs later

Note 3: Unless specified otherwise, the FC indicated in Table 2 of this AD are those accumulated by each affected Rotor 2 part since first installation on an engine. In case the FC accumulated by an affected Rotor 2 part are unknown, the FC accumulated by the engine apply.

(4) For engines involved in ETOPS operations, from the effective date of this AD, concurrently with each repeat inspection of the affected Rotor 2 parts, as required by paragraph (3) of this AD, inspect the rear face of IPC Rotor 2 blades P/N KH25730 in accordance with the instructions of the NMSB.

Inspection of affected Rotor 2 parts following asymmetric power operation:

(5) From the effective date of this AD, before next flight after each occurrence where operation in asymmetric power conditions was sustained for more than 30 minutes at less than 25 000 feet, either resulting from engine power reduction, or from engine in-flight shut-down (IFSD), accomplish an on-wing borescope inspection of the affected Rotor 2 parts of the not-affected engine (no power reduction, no IFSD) installed on the aeroplane, in accordance with the instructions of Part B (non-ETOPS) or Parts B and C (ETOPS) of the NMSB, as applicable.

Corrective Action(s):

(6) If, during any inspection as required by this AD, any crack indication is found, before next flight, remove the engine from service, contact RR for approved corrective action instructions and, before release to service of the engine, accomplish those instructions accordingly.

A single ferry flight (up to 3 FC, non-ETOPS, no passengers) may be accomplished to a location where the engine can be removed from service.

Reporting:

(7) Within 30 days after any inspection as required by this AD, report the inspection result (including no findings) to Rolls-Royce. Appendix 2 of RR NMSB TRENT 1000 72-AJ814, or Appendix 1 of RR NMSB TRENT 1000 72-AJ819, as applicable, can be used for this reporting requirement.

Credit:

(8) Inspections and reporting on an engine, accomplished before the effective date of this AD in accordance with the instructions of RR Alert NMSB TRENT 1000 72-AJ814 at original issue or Revision 1, or Alert NMSB TRENT 1000 72-AK058, as applicable, are acceptable to comply with the initial requirements of this AD for that engine.

Terminating Action:

(9) None.

Ref. Publications:

Rolls-Royce Alert NMSB TRENT 1000 72-AJ814 original issue dated 17 August 2017, or Revision 1 dated 26 September 2017, or Revision 2 dated 12 April 2018.

Rolls-Royce Alert NMSB TRENT 1000 72-AJ819 original issue dated 17 August 2017, or Revision 1 dated 9 October 2017, or Revision 2 dated 12 April 2018.

Rolls-Royce NMSB TRENT 1000 72-J744 original issue dated 20 June 2017.

Rolls-Royce NMSB TRENT 1000 72-J871 original issue dated 19 October 2017, or Revision 1 dated 19 December 2017, or Revision 2 dated 10 April 2018, or Revision 3 dated 12 April 2018.

Rolls-Royce Alert NMSB TRENT 1000 72-AJ869 original issue dated 19 October 2017, and Revision 1 (supersedure) dated 12 April 2018.

Rolls-Royce Alert NMSB TRENT 1000 72-AK058 original issue dated 30 March 2018.

Rolls-Royce Alert NMSB TRENT 1000 72-AK060 original issue dated 13 April 2018.

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

Remarks:

1. If requested and appropriately substantiated, EASA can approve Alternative Methods of Compliance for this AD.

2. Based on the required actions and the compliance time, EASA have decided to issue a Final AD with Request for Comments, postponing the public consultation process until after publication.

3. Enquiries regarding this AD should be referred to the EASA Safety Information Section, Certification Directorate. E-mail: ADs@easa.europa.eu.

4. For any question concerning the technical content of the requirements in this AD, 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 identifying the correspondence as being related to **Airworthiness Directives**.