Airworthiness Directive

AD No.: 2019-0248

Issued: 09 October 2019

Note: This Airworthiness Directive (AD) 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.

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 (EU) 2018/1139, Article 71 exemption].

Design Approval Holder's Name:
ROLLS-ROYCE DEUTSCHLAND Ltd & Co KG

Type/Model designation(s):
Trent 1000 engines

Effective Date: 23 October 2019

TCDS Number(s): EASA.E.036

Foreign AD: Not applicable

Supersedure: This AD supersedes EASA AD 2018-0084R2 dated 17 January 2019.

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

Manufacturer(s):
Rolls-Royce plc

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, except those that have Rolls-Royce modification (mod) 72-J941 embodied in production.

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: Rolls-Royce Alert Non-Modification Service Bulletin (NMSB) TRENT 1000 72-AK060 Revision 4 dated 22 August 2019, which refers to Alert NMSB TRENT 1000 72-AJ814 (for affected Rotor 1 parts), Alert NMSB TRENT 1000 72-AJ819 (for affected Rotor 2 blades front face and shaft) and Alert NMSB TRENT 1000 72-AK092 (for affected Rotor 2 blades rear face). 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.

The modification SB: Rolls-Royce Service Bulletin (SB) TRENT 1000 72-J941.

CANCELLED

An agency of the European Union

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

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

Affected Rotor 2 blades and shaft: 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 that have passed an affected Rotor 1 parts inspection (no cracks identified) in accordance with the instructions of Rolls-Royce Technical Variance (TV) TV176758 or TV177125, or Rolls-Royce NMSB TRENT 1000 72-AJ814 (any issue), or NMSB TRENT 1000 72-J744 (any issue), as applicable. Group 1 engines are those that 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.

Asymmetric power conditions: Operation of the aeroplane at an altitude of less than 28 000 feet, either single engine take-off, engine fault (reduced power on one engine), or single engine in-flight shut-down (IFSD), which includes execution of any non-normal checklist procedure.

Reason:

Occurrences were reported on Rolls-Royce 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, Rolls-Royce 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. Rolls-Royce 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 needed to be inspected earlier. Rolls-Royce 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.

After that AD was issued, it was determined that repetitive borescope inspections were necessary on all engines to ensure fleet-wide continued safe operation. Consequently, Rolls-Royce revised Alert NMSB TRENT 1000 72-AJ869, Alert NMSB TRENT 1000 72-AJ814, Alert NMSB TRENT 1000

CANCELLED

An agency of the European Union

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

72-AJ819 and NMSB TRENT 1000 72-J871, and issued the NMSB to consolidate all inspection instructions.

Prompted by these developments, EASA issued AD 2018-0084 (later revised), retaining the requirements of EASA AD 2018-0073, which was superseded, and requiring 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 requirements for engines installed on aeroplanes involved in ETOPS, and inspection following operation in asymmetric power conditions. Rolls-Royce later developed mod 72-J941, installing improved IPC Stage 1 and Stage 2 rotor blades, and issued the modification SB, providing the necessary instructions for in-service application. Consequently, AD 2018-0084R1 was revised again, reducing the Applicability by excluding post-mod 72-J941 engines, and introducing the modification SB as terminating action for the repetitive inspections as required by that AD.

Since EASA AD 2018-0084R2 was issued, Rolls-Royce issued the NMSB, as defined in this AD, amending the asymmetric power conditions for engine inspection and introducing cabin depressurisation as an event to trigger engine inspection(s).

For the reason described above, this AD retains the requirements of EASA AD 2018-0084R2, which is superseded, and adds the new requirements as outlined in the NMSB.

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

Table 1 – Affected Rotor 1 Parts 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 Repetitive Inspections of affected Rotor 1 parts:

(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 Rolls-Royce NMSB TRENT 1000 72-J871, before exceeding the threshold, and, thereafter, at

CANCELLED

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

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.

Repetitive Inspections of affected Rotor 2 blades and shaft:

(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 blades and shaft in accordance with the instructions of the NMSB.

Table 2 – Affected Rotor 2 Blades and Shaft Initial Inspection (see Note 2 of this AD)

FC Accumulated	Compliance Time
Less than 300 FC	**Non-ETOPS**: Before exceeding 300 FC, or within 50 days after 20 April 2018 [the effective date of the original issue of EASA AD 2018-0084], whichever occurs later
	ETOPS: Before exceeding 300 FC, or before the next ETOPS flight after 20 April 2018 [the effective date of the original issue of EASA AD 2018-0084], whichever occurs later
300 FC or more, or unknown	**Non-ETOPS**: Within 50 days after 20 April 2018 [the effective date of the original issue of EASA AD 2018-0084], or within 80 FC since the last inspection in accordance with the instructions of Rolls-Royce 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 20 April 2018 [the effective date of the original issue of EASA AD 2018-0084], or within 80 FC since the last inspection in accordance with the instructions of Rolls-Royce NMSB TRENT 1000 72-AJ819 (any issue), or NMSB TRENT 1000 72-AJ869 (any issue), as applicable, whichever occurs later

Note 2: Unless specified otherwise, the FC indicated in Table 2 of this AD are those accumulated by the affected Rotor 2 blades or shaft since new (first installation on an engine), or since installation after refurbishment in accordance with the instructions of Rolls-Royce NMSB TRENT 1000 72-J871 (any issue).

(4) For engines involved in ETOPS operations, from 20 April 2018 [the effective date of the original issue of EASA AD 2018-0084], 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 following Asymmetric Power Operation:

(5) From the effective date of this AD, within 5 FC after each operation in asymmetric power conditions, as defined in this AD, accomplish an on-wing borescope inspection of the affected Rotor 1 parts and affected Rotor 2 parts of the not-affected engine (no power reduction, no IFSD) installed on the aeroplane, in accordance with the instructions of Section 3.A, 3.B and 3.C of the NMSB.

CANCELLED

Inspection following a Depressurisation Event:

(6) From the effective date of this AD, within 5 FC after each aeroplane depressurisation event, inspect the affected Rotor 1 parts and affected Rotor 2 blades and shaft of both engines of the aeroplane in accordance with the instructions of Sections 3.A, 3.B and 3.C of the NMSB.

Corrective Action(s):

(7) If, during any inspection as required by paragraph (1), (2), (3), (4), (5) or (6) of this AD, as applicable, any crack indication is found, before next flight, remove the engine from service, contact Rolls-Royce 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.

(8) For an engine not previously subject to repetitive inspections as required by paragraph (1), (2), (3) or (4) of this AD, as applicable, which passes (no deficiencies detected) an inspection as required by paragraph (5) or (6) of this AD, as applicable, that inspection must be considered the initial (threshold) inspection as required by paragraph (1) and (2) of this AD. Thereafter, continue inspecting the engine as required by this AD.

(9) For an engine subject to repetitive inspections as required by paragraph (1), (2), (3) or (4) of this AD, as applicable, which passes (no deficiencies detected) an inspection as required by paragraph (5) or (6) of this AD, as applicable, thereafter, continue inspecting the engine as required by this AD.

Reporting:

(10) Within 30 days after any inspection as required by this AD, report the inspection result (including no findings) to Rolls-Royce. Appendix 2 of Rolls-Royce NMSB TRENT 1000 72-AJ814, or Appendix 1 of Rolls-Royce NMSB TRENT 1000 72-AJ819, or Appendix 1 of Rolls-Royce NMSB TRENT 1000 72-AK092, as applicable, can be used for this reporting requirement.

Credit:

(11) Inspections and reporting on an engine, accomplished before the effective date of this AD in accordance with the instructions of Rolls-Royce Alert NMSB TRENT 1000 72-AK060 at original issue or Revision 1, or Revision 2, or Revision 3, as applicable, are acceptable to comply with the initial requirements of this AD for that engine.

Terminating Action:

(12) Modification of an engine in accordance with the instructions of the modification SB constitutes terminating action for the repetitive inspections as required by this AD for that engine.

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, or Revision 3 dated 04 July 2018, or Revision 4 dated 28 September 2018, or Revision 5 dated 03 May 2019.

CANCELLED

Rolls-Royce Alert NMSB TRENT 1000 72-AJ819 original issue dated 17 August 2017, or Revision 1 dated 09 October 2017, or Revision 2 dated 12 April 2018, or Revision 3 dated 13 April 2018, or Revision 4 dated 03 May 2019.

Rolls-Royce NMSB TRENT 1000 72-J744 original issue dated 20 June 2017, or Revision 1 dated 18 April 2018.

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, or Revision 4 dated 24 April 2018, or Revision 5 dated 14 June 2018.

Rolls-Royce Alert NMSB TRENT 1000 72-AJ869 original issue dated 19 October 2017, or Revision 1 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, or Revision 1 dated 04 May 2018, or Revision 2 dated 12 June 2018, or Revision 3 dated 09 January 2019, and Revision 4 dated 22 August 2019.

Rolls-Royce Alert NMSB TRENT 1000 72-AK092 original issue dated 04 May 2018, or Revision 1 dated 12 June 2018, or Revision 2 dated 27 September 2018, or Revision 3 dated 28 February 2019, or Revision 4 dated 03 May 2019.

Rolls-Royce SB TRENT 1000 72-J941 original issue dated 06 December 2018, or Revision 1 dated 06 February 2019.

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. This AD was posted as PAD 19-167 on 09 September 2019 for additional consultation until 23 September 2019. The Comment Response Document can be found in the EASA Safety Publications Tool, in the compressed (zipped) file attached to the record for this AD.

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

4. Information about any failures, malfunctions, defects or other occurrences, which may be similar to the unsafe condition addressed by this AD, and which may occur, or have occurred on a product, part or appliance not affected by this AD, can be reported to the EU aviation safety reporting system.

CANCELLED

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

5. 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**.

CANCELLED

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.

Appendix 1 – Example Alert EHM Notification

Engine: **#2/10ad4** on aircraft **cV-Fjc**
Symptoms: IP Compressor Rotor1: Crack Inspection required
Diagnosis: IP Compressor Rotor 1 : Crack inspection required

Please be advised that we have observed IP Compressor Rotor1: Crack Inspection required. The recommended fault isolation process for IP Compressor Rotor 1 : Crack inspection required states:

Applicability

Engines operating under service management in accordance with NMSB 72-AK060.

Note: Engines operating under service management in accordance with NMSB 72-AK313 (supersedes NMSB 72-AK060) are not subject to this alert.

Operators are to confirm applicability status to RR EHM service desk, who will confirm alert closure if not applicable.

If applicable, the engine must be subjected to an Ultrasonic inspection of the IPC Rotor 1 blades.

The NMSBs are subject to an EASA Airworthiness Directive 2018-0084R2 and an FAA Airworthiness Directive 2018-08-02.

Possible Causes

The above engine has been identified as being at increased risk of cracking on the IP Compressor Stage 1 Rotor blades.

Reaction Time

80 flight cycles

Recommended Troubleshooting

It is mandated to perform the following upon receiving this alert:

1. Perform ultrasonic inspection of the IPC rotor 1 blades to the method detailed in NMSB 72-AJ814 and as per NMSB 72-AK060 Part A.

CANCELLED

TE.CAP.00110-009 © European Union Aviation Safety Agency. All rights reserved. ISO9001 Certified.
Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet.