



# Notification of a Proposal to issue an Airworthiness Directive

**PAD No.: 20-149**

**Issued: 29 September 2020**

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 DEUTSCHLAND Ltd & Co KG

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

Trent 1000 engines

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

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

**Foreign AD:** Not applicable

**Supersedure:** This AD supersedes EASA AD 2019-0248 and AD 2019-0250, both dated 09 October 2019.

## ATA 72 – Engine – Intermediate Pressure Compressor Blade Kits – Introduction

**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.

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:

**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.



**The NMSB:** Rolls-Royce Alert Non-Modification Service Bulletin (NMSB) TRENT 1000 72-AK313 Revision 1, which refers to Alert NMSB TRENT 1000 72-AJ814 Revision 5 (for affected Rotor 1 parts), Alert NMSB TRENT 1000 72-AJ819 Revision 4 (for affected Rotor 2 blades front face and shaft) and Alert NMSB TRENT 1000 72-AK092 Revision 4 (for affected Rotor 2 blades rear face).

Where, in this AD, reference is made to any mod, Service Bulletin (SB) or 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 in this AD.

**The modification SB:** Rolls-Royce SB TRENT 1000 72-AK430.

**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.

**Qualified shop visit:** M32-IPC Module rework level of Module Serviceability, Module Check and Repair, Module Refurbishment, Module Overhaul, Engine Refurbishment, or Engine Check and Repair.

#### 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, 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 are 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 72-AJ819 and NMSB TRENT 1000 72-J871, and issued NMSB TRENT 1000 72-AK060 to consolidate all inspection instructions. Consequently, 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 parts 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 then introduced NMSB Trent 1000 72-AK092 to provide inspections for the rear face of the Rotor 2 blades and NMSB TRENT 1000 72-AK060 was revised (R1) accordingly. Later, Rolls-Royce 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. EASA issued AD 2018-0084R2 to exclude post-mod 72-J941 engines from the Applicability and introducing the modification SB as terminating action for the repetitive inspections as required by that AD.

After that AD was issued, Rolls-Royce issued NMSB TRENT 1000 72-AK313 and revised Alert NMSB TRENT 1000 72-AJ814, 72-AJ819 and 72-AK092 to introduce new inspections, new thresholds and new intervals, depending on engine configuration. These inspections are for all operations, ETOPS and non-ETOPS. The latest revision of the NMSB also amended the asymmetric power conditions for engine inspection and introduced cabin depressurisation as an event to trigger engine inspection(s). Consequently, EASA issued AD 2019-0250 to require introduction of the new inspections, replacing those previously imposed by EASA AD 2018-0084R2 (through NMSB TRENT 1000 72-AK060), and removes the references to Engine Health Monitoring messages and ETOPS-related requirements.

Since that AD was issued, it was discovered that the manufacturing distribution of the individual blade frequencies could differ from the assumed values during certification of the SB TRENT 1000 72-J941, which means there may not be sufficient margin to prevent the blades from experiencing high vibration levels. Prompted by these findings, Rolls-Royce issued the modification SB to provide blade kitting instructions.

For the reasons described above, this AD partially retains the requirements of EASA AD 2019-0250, which is superseded, cancels EASA AD 2019-0248, which has become redundant, and introduces new IPC blade kits.

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

Required as indicated, unless accomplished previously:

#### **Repetitive Inspections of Affected Rotor 1 Parts:**

- (1) From 15 December 2019 [the effective date of EASA AD 2019-0250], before exceeding the applicable threshold and, thereafter, at intervals not to exceed the applicable value(s) as specified in Table 1 of the NMSB, inspect the affected Rotor 1 parts in accordance with the instructions of Rolls-Royce NMSB TRENT 1000 72-AJ814 Revision 5.

#### **Repetitive Inspections of Affected Rotor 2 Blades and Shaft:**

- (2) From 15 December 2019 [the effective date of EASA AD 2019-0250], before exceeding the applicable threshold and, thereafter, at intervals not to exceed the applicable value(s) as



specified in Table 2 of the NMSB, inspect the affected Rotor 2 (front and rear face) parts in accordance with the instructions of Rolls-Royce NMSB TRENT 1000 72-AJ819 Revision 4 and NMSB TRENT 1000 72-AK092 Revision 4, as applicable.

**Inspection following Asymmetric Power Operation:**

- (3) From 15 December 2019 [the effective date of EASA AD 2019-0250], within 5 flight cycles (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.

**Inspection following a Depressurisation Event:**

- (4) From 15 December 2019 [the effective date of EASA AD 2019-0250], within 5 FC after each aeroplane depressurisation event, inspect the affected Rotor 1 parts and affected Rotor 2 parts installed on 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):**

- (5) If, during any inspection as required by this AD, 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.

- (6) For an engine not previously subject to repetitive inspections as required by paragraph (1) or (2) of this AD, as applicable, which passes (no deficiencies detected) an inspection as required by paragraph (3) or (4) 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.
- (7) For an engine subject to repetitive inspections as required by paragraph (1) or (2) of this AD, as applicable, which passes (no deficiencies detected) an inspection as required by paragraph (3) or (4) of this AD, as applicable, thereafter, continue inspecting the engine as required by this AD.

**Reporting:**

- (8) Within 30 days after any inspection as required by this AD, report the inspection results (including no findings) to Rolls-Royce. Appendix 2 of Rolls-Royce NMSB TRENT 1000 72-AJ814 Revision 5, or Appendix 1 of Rolls-Royce NMSB TRENT 1000 72-AJ819 Revision 4, or Appendix 1 of NMSB TRENT 1000 72-AK092 Revision 4, as applicable, can be used for this reporting requirement.

**Modification:**

- (9) During the next qualified shop visit (as defined in this AD) after the effective date of this AD, modify the engine in accordance with the instructions of the modification SB.



**Credit:**

- (10) 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-AJ814 at Revision 4 or earlier; or Alert NMSB TRENT 1000 72-AJ819 at Revision 3 or earlier; or Alert NMSB TRENT 1000 72-AK092 at Revision 3, or earlier; or Alert NMSB TRENT 1000 72-AK313 original issue, as applicable, are acceptable to comply with the initial requirements of this AD for that engine.
- (11) The number of FC accumulated since installation on an engine, before 15 December 2019 [the effective date of EASA AD 2019-0250], of new or SUM (service used material, having been refurbished) affected Rotor 1 parts, or affected Rotor 2 parts, as applicable, in accordance with the instructions of Rolls-Royce NMSB TRENT 1000 72-J871 Revision 6 or earlier, as applicable, can be used to determine the time for the first inspection as required by paragraph (1) or (2) of this AD, as applicable, for that engine.
- (12) Modification of an engine, before the effective date of this AD in accordance with the instructions of Rolls-Royce SB TRENT 1000 72-J941 original issue or Revision 1, is an acceptable method to comply with the requirements of paragraph (9) of this AD for that engine.

**Terminating Action:**

- (13) Modification of an engine as required by paragraph (9) of this AD 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.

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 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 Alert NMSB TRENT 1000 72-AK313 original issue dated 02 May 2019, or Revision 1 dated 22 August 2019.

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, or Revision 6 dated 12 December 2019.

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



Rolls-Royce SB TRENT 1000 72-AK430 original issue dated 17 August 2020.

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 27 October 2020.
2. Enquiries regarding this PAD should be referred to the EASA Programming and Continued Airworthiness 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](#). This may include reporting on the same or similar components, other than those covered by the design to which this PAD applies, if the same unsafe condition can exist or may develop on an aircraft with those components installed. Such components may be installed under an FAA Parts Manufacturer Approval (PMA), Supplemental Type Certificate (STC) or other modification.
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 <https://www.rolls-royce.com/contact-us/civil-aerospace.aspx> identifying the correspondence as being related to **Airworthiness Directives**.

