Airworthiness Directive

AD No.: 2019-0261

Issued: 18 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: 01 November 2019

TCDS Number(s): EASA.E.036

Foreign AD: Not applicable

Supersedure: This AD supersedes EASA AD 2019-0135 dated 11 June 2019.

ATA 72 – Engine – Intermediate Pressure Turbine Blades – Replacement

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Manufacturer(s):
Rolls-Royce plc

Applicability:
Trent 1000-A, Trent 1000-A2, Trent 1000-AE, Trent 1000-AE2, Trent 1000-AE3, Trent 1000-C, Trent 1000-C2, Trent 1000-CE, Trent 1000-CE2, Trent 1000-CE3, Trent 1000-D, Trent 1000-D2, Trent 1000-D3, Trent 1000-E, Trent 1000-E2, Trent 1000-G, Trent 1000-G2, Trent 1000-G3, Trent 1000-H, Trent 1000-H2, Trent 1000-H3, Trent 1000-J2, Trent 1000-J3, Trent 1000-K2, Trent 1000-K3, Trent 1000-L2, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3 and Trent 1000-R3 engines, serial numbers (ESN) as listed in Appendix 1 and 2 of the NMSB, except those that have embodied Rolls-Royce modification (mod) 72-H818 or mod 72-J559 in production, or have embodied the applicable SB in service.

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 a Rolls-Royce mod, Service Bulletin (SB) or Non-Modification SB (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: Rolls-Royce Alert NMSB TRENT 1000 72-AK186 Revision 3. Appendix 1 of the NMSB contains the applicable time limit of each ESN for removal from service and replacement of intermediate pressure turbine blades (IPTB). Appendix 2 contains a list of ESN that, at the time of NMSB issuance, were known to be either stored, in-shop, or otherwise not operational.

Affected IPTB: IPTB, having Part Number (P/N) KH30773 or P/N KH44898.

The applicable SB: Rolls-Royce SB TRENT 1000 72-H818, introducing IPTB P/N KH11808; or SB TRENT 1000 72-J559, introducing IPTB P/N KH71526, as applicable.

Groups: Group 1 engines are those that are in operational use, which includes those engines identified by ESN in Appendix 1 of the NMSB.
Group 2 engines are those that are either stored, in-shop, or otherwise not in operational use, which includes those identified by ESN in Appendix 2 of the NMSB.

Reason:
Occurrences were reported of IPTB shank cracking. Analysis shows that this kind of failure is due to sulphidation corrosion.

This condition, if not corrected, could lead to IPTB shank release, possibly resulting in engine in-flight shut-down (IFSD) and consequent reduced control of the aeroplane.

Prompted by these events, Rolls-Royce identified engines with a high level of sulphidation exposure using a corrosion fatigue life (CFL) model. Consequently, EASA issued AD 2017-0056 to require removal from service of certain engines, to be corrected in shop. In addition, to reduce the risk of dual IFSD, it was decided to introduce a new cyclic life limit to certain engines, determining when an engine can no longer be installed on an aeroplane in combination with certain other engines. Consequently, EASA issued Emergency AD 2017-0253-E, AD 2018-0086, and finally AD 2018-0139, each next AD superseding the previous one, to require de-pairing of the affected engines.

After EASA AD 2018-0139 was issued, prompted by further analyses of data provided by operators, Rolls-Royce developed an updated service management approach to minimise the risk of IPTB release and issued the NMSB, identifying those ESN at highest risk, and providing the corresponding cyclic limits for in-shop IPTB replacement. Consequently, EASA issued AD 2018-0257, superseding EASA AD 2017-0056 and AD 2018-0139, removing the de-pairing requirements, to require removal from service of certain engines, to be corrected in shop. The AD also retained the optional terminating action as previously provided by EASA AD 2018-0139. For engines having service-used material (SUM) IPTB installed, that AD required introduction of IPTB cyclic limits.

After EASA AD 2018-0257 was issued, it was determined that, unless mod/SB 72-H818 or mod/SB 72-J559 is embodied, each engine must remain subject to service management to minimise the risk of IPTB release. Rolls-Royce mod/SB 72-J559 applies to the Trent 1000 TEN engine standard, introducing IPTB P/N KH71526 and additional IPTB coating. Consequently, EASA issued AD 2019-0135, retaining the requirements of EASA AD 2018-0257, which was superseded, expanded the Applicability by including Trent 1000 TEN engine models, and included reference to NMSB TRENT 1000 72-AK186 Revision 2.

Since that AD was issued, it has been decided to reduce the IPTB life limits for the remaining in-service pre-mod engines. It was also determined that installation of affected SUM IPTB is no longer allowed. Rolls-Royce issued the NMSB, as defined in this AD, accordingly, to provide the new limits and instructions.

For the reason described above, this AD retains the requirements of EASA AD 2019-0135, which is superseded, but reduces the IPTB life limits. For engines that are not operational, this AD requires replacement of the affected IPTB before release to service of the engine. This AD also prohibits installation of affected SUM IPTB on any engine.

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

Required as indicated, unless accomplished previously:

Removal from Service:

(1) For Group 1 engines: Within the applicable flight cycle (FC) limit as specified in Table 1 of this AD, remove the affected engine from service.

Table 1 – Engine Removal from Service (see Notes 1 and 2 of this AD)

FC Accumulated	Compliance Time
More than 140 FC over the limit, and those engines not listed in Appendix 1 of the NMSB	Within 25 FC after the effective date of this AD
Between 50 FC below the limit and not more than 140 FC over the limit	Within 50 FC after the effective date of this AD
More than 50 FC below the limit	Before exceeding the affected IPTB FC limit as specified in Appendix 1 of the NMSB, as applicable to ESN

Note 1: Unless indicated otherwise, the number of FC specified in Table 1 of this AD are those which an engine has accumulated, on the effective date of this AD, in relation to the FC limit as specified in Appendix 1 of the NMSB, as applicable to ESN.

Note 2: Where the NMSB refers to the date of 05 September 2019 to determine the FC accumulated by the engine, this AD requires the use of the effective date for that purpose.

Replacement:

(2) After removing a Group 1 engine from service as required by paragraph (1) of this AD, before release to service of that engine, replace the affected IPTB in accordance with the instructions of the applicable SB, as defined in this AD.

(3) For Group 2 engines: Before release or return to service of the engine, replace the affected IPTB in accordance with the instructions of the applicable SB, as defined in this AD.

Parts Installation:

(4) Do not install on any engine affected IPTB, as defined in this AD, as required by paragraph (4.1) or (4.2) of this AD, as applicable.

(4.1) For Group 1 engines: After replacement of the affected IPTB as required by paragraph (2) of this AD.

(4.2) For Group 2 engines: From the effective date of this AD.

Ref. Publications:

Rolls-Royce Alert NMSB TRENT 1000 72-AK186 Revision 3 dated 19 September 2019.

Rolls-Royce SB TRENT 1000 72-H818 original issue dated 14 November 2016.

Rolls-Royce SB TRENT 1000 72-J559 original issue dated 27 November 2017.

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 19-180 on 25 September 2019 for consultation until 09 October 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 Information 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.

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**.