



Notification of a proposal to issue an Airworthiness Directive

PAD No.: 16-127

Issued: 05 September 2016

Note: This Proposed Airworthiness Directive (PAD) 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.

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):

RB211 Trent 900 Engines

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

TCDS Number(s): EASA.E.012

Foreign AD: Not applicable

Supersedure: This AD supersedes AD 2012-0220R2 issued 27 August 2015.

ATA 72 – Engine – Low Pressure Turbine Disc Seal Fins and Interstage Seals – Inspection / Replacement

Manufacturer(s):

Rolls-Royce plc (RR)

Applicability:

RB211 Trent 970-84, 970B-84, 972-84, 972B-84, 977-84, 977B-84 and 980-84 engines, all serial numbers.

These engines are known to be installed on, but not limited to, Airbus A380 aeroplanes.

Reason:

Following a revenue service flight, a Trent 900 engine experienced increased low pressure vibration. The vibration did not exceed any engine limits, and the engine was not shut down during flight. Upon post-flight inspection of the engine, debris was found in the exhaust tail pipe and the engine was removed. The results of a subsequent strip inspection revealed that the stage 2 Low Pressure Turbine (LPT) disc had suffered material loss from a portion of the rear disc seal fin area of the disc, with impact damage to downstream LPT stages. All debris was contained within the engine casings.



Preliminary findings showed that the rear disc seal fins had rubbed into the stage 3 Interstage Seal (ISS) honeycomb seal, which overheated and cracked, finally resulting in releasing a portion of the seal fin area of the disc.

This condition, if not detected and corrected, could lead to LPT stage 2 disc cracks, possibly resulting in an uncontained engine failure and subsequent damage to the aeroplane.

To address this potential unsafe condition, EASA issued AD 2012-0220 (later revised twice) to require on-wing inspections of LPT disc seal fins and interstage seals, each time it has been determined that the Engine Health Monitoring (EHM) vibratory levels have been exceeded in flight, and in-shop inspections of the LPT disc seal fins and interstage seals, to detect cracks or damage and, depending on findings, the accomplishment of applicable corrections action(s).

After EASA AD 2012-0220R2 was issued, another Trent 900 engine experienced increased LP vibration during climb. The pilot commanded an engine shutdown, performed an air turnback, and landed without further incident. The subsequent strip inspection of the engine revealed separation between the stage 1 and 2, and between the stage 2 and 3 LPT discs, as well as missing LPT blades and vanes. There was no release of high energy debris through the engine casings. It is believed that, during this occurrence, the rear stage 2 disc seal fins rubbed into the stage 3 ISS honeycomb seal, which overheated and cracked, finally resulting in the separation between stage 2 and 3 LPT discs.

At this time, no clear cause has been identified for the ISS rub which resulted in the material release or disc separation. Nevertheless, a review of all the potential causes of an ISS rub did identify that some of these could be linked to activities which take place during an overhaul shop visit. To protect against all actions during the shop visit which could lead to an undesired heavy ISS rub, RR has revised Alert Non-Modification Service Bulletin (NMSB) RB.211-72-AH054 (now at Revision 2) to introduce an inspection, to be done after each pass-off test. In addition, following further review of hardware inspection results, RR has introduced additional criteria for inspection of the stage 2, 3 and 4 LPT disc seal fins and interstage seals, and removed the requirement to inspect stage 5 LPT disc seal fins and interstage seal.

For the reasons described above, this AD partially retains the requirements of EASA AD 2012-0220R2, which is superseded, introduces the requirement to inspect the LPT disc seal fins and interstage seals following pass-off test, and changes certain inspection requirements.

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

Required as indicated, unless accomplished previously:

Note 1: Where, in this AD, reference is made to a RR Mod, 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 for the purpose of this AD.

- (1) From 05 November 2012 [the effective date of EASA AD 2012-0220 at original issue], accomplish the following actions:



- (1.1) Within 10 engine flight cycles (EFC) following receipt of an Engine Health Monitoring (EHM) notification for N1 vibration levels exceeding the alert limits during flight (see Note 2 of this AD), perform trouble shooting to determine vibration indication fault or high vibration, in accordance with the Airbus A380 Trouble Shooting Manual (TSM) Task 77-00-00-810-803-A, paragraph 2 - Fault Confirmation.

If it cannot be confirmed that the vibration increase has been caused by an indication fault, and if acceptable vibration levels have not been restored through applicable corrective actions (see Note 3 of this AD), inspect the LPT disc seal fins and interstage seals in accordance with the instructions of section 3.B of RR Alert NMSB RB.211-72-AH054 Revision 2.

Note 2: RR Operational Service Desk (OSD) automatically receives, monitors and analyses EHM data, and will send a notification containing the wording as shown in Figure 1 of this AD. The RR OSD will close out the alert when confirmation is received from the operator that the actions required in paragraph (1.1) of this AD have been carried out by the operator.

Figure 1 – Alert Notification

This alert is the subject of an EASA AD, and inspection of the LPT interstage seals may be required.

Note 3: Vibration levels caused by LP compressor unbalance following maintenance may be restored through corrective actions defined in the Airbus A380 AMM.

- (1.2) For operators who are not using the RR EHM service, within 200 EFC after the effective date of this AD and, thereafter, at intervals not to exceed 200 EFC, inspect the LPT disc seal fins and interstage seals in accordance with the instructions of section 3.B of RR Alert NMSB RB.211-72-AH054 Revision 2.
- (2) If, during any inspection as required by paragraph (1.1) or (1.2) of this AD, as applicable, any crack or material loss from the disc seal fin is found, before next flight, remove the engine from the aeroplane and, before release to service of the engine, replace the affected parts with serviceable parts.
- (3) Inspections and corrective actions on an engine, accomplished before the effective date of this AD in accordance with the instructions of Rolls-Royce Technical Variance (TV) TV125060, or TV125658, or RR Alert NMSB RB.211-72-AH054 original issue, or Revision 1, as applicable, are acceptable to comply with the initial requirements of paragraphs (1) and (2) of this AD for that engine.

New Requirements of this AD

- (4) From the effective date of this AD, each time a pass off test is performed on the engine after induction into a Repair and Overhaul Shop, following that test, inspect the LPT disc seal fins and interstage seals in accordance with the instructions of section 3.C of RR Alert NMSB RB.211-72-AH054 Revision 2. If, during this inspection, any crack or material loss from the disc seal fin is found, before release to service of the engine, replace the affected parts with serviceable parts.



- (5) Inspections as defined in paragraph (4) of this AD are not required when the engine is inducted into a Repair or Overhaul Shop where, due to the level of work performed, a pass-off test is not necessary.
- (6) Corrective actions on an engine, as required by paragraphs (2) or (4) of this AD, as applicable, do not constitute terminating action for the repetitive inspections required by paragraphs (1) and (4) of this AD for that engine.

Ref. Publications:

Airbus A380 AMM and TSM.

Rolls-Royce Trent 900 Generic EMP, currently at issue 25, dated 12 May 2016.

Rolls-Royce Alert NMSB RB.211-72-AH054 dated 14 September 2012, or Revision 1 dated 05 November 2012, or Revision 2 dated 24 August 2016.

Rolls-Royce TV125060 issue 1, dated 27 July 2012, or issue 2 dated 30 January 2013.

Rolls-Royce TV125658 issue 2, dated 14 August 2012.

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

Remarks:

1. This Proposed AD will be closed for consultation on 19 September 2016.
2. Enquiries regarding this PAD should be referred to the EASA Safety Information Section, Certification Directorate. E-mail: ADs@easa.europa.eu.
3. 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 identifying the correspondence as being related to **Airworthiness Directives**.

