Airworthiness Directive

AD No.: 2016-0120

Issued: 17 June 2016

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:	Type/Model designation(s):
ROLLS-ROYCE plc	RB211 Trent 700 engines

Effective Date: 01 July 2016

TCDS Number(s): EASA.E.042

Foreign AD: Not applicable

Supersedure: This AD supersedes EASA AD 2014-0243R1 dated 10 December 2014, including the Correction dated 23 March 2015.

ATA 73 – Engine Fuel & Control – Low Pressure Fuel Tubes and Clips / Fuel Oil Heat Exchanger Mounts – Inspection / Replacement / Modification

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

Applicability:
RB211 Trent 768-60, 772-60, 772B-60 and 772C-60 engines, all serial numbers.

These engines are known to be installed on, but not limited to, Airbus A330 aeroplanes.

Reason:
Engine fuel leaks were reported, caused by damage to sections of the fan case low pressure (LP) fuel tube which runs between the fuel oil heat exchanger (FOHE) and the high pressure (HP) fuel pump. Investigation results showed that low frequency vibration of the LP fuel return pipe (excited by the LP spool system) results in relative movement between the fuel pipe and the retaining P-clips, which in turn causes progressive wear of the P-clip insulating material. Eventually, the rubber insulating material wears to the point where it exposes the metal P-clip band. The resulting metal-to-metal contact between the fuel pipe and P-clip band causes frettage and thinning of the pipe wall. The reduced wall thickness results in rising stress levels to the point of crack initiation,

propagation and fuel leakage. Fuel leak detection and the associated flight crew procedures can be complex, leading to some flight crews failing to detect and/or address such situations.

To address this potential unsafe condition, RR issued Non-Modification Service Bulletin (NMSB) RB.211-73-AH522 to provide instructions to detect and replace deteriorated hardware. Consequently, EASA issued AD 2014-0089 to require repetitive on-wing and in-shop inspections and, depending on findings, replacement of fan case LP fuel tubes, clips and FOHE mounting hardware.

Since that AD was issued, reports were received of a limited number of P-clip tang fractures at clip point 4881 that resulted in frettage and leaks from the LP fuel tube between the FOHE to LP/HP fuel pump, which occurred prior to the next required inspection per RR NMSB RB.211-73-AH522. In all cases, it was reported that the tangs were found broken at the clip point. Prompted by these occurrences, RR published NMSB RB.211-73-AH837 to provide instructions for additional specific visual inspections of the upper P-clip attaching feature and the bracket holding this P-clip to the oil tank, at shorter intervals than those specified in NMSB RB.211-73-AH522.

Consequently, EASA issued AD 2014-0243 (later revised and corrected), retaining the requirements of EASA AD 2014-0089, which was superseded, and adding repetitive on-wing inspections of the uppermost clip-stack (Part Number (P/N) CP4881), on the FOHE to fuel pump LP fuel tube (P/N FW53576) and the relevant associated bracket (P/N FW26692) and, depending on findings, accomplishment of the applicable corrective action(s).

Since EASA AD 2014-0243R1 was issued, in addition to frettage-related fuel leaks, a total of five fuel leaks have occurred, resulting from fractures on the LP fuel return pipe at mid span locations, remote from the fuel pipe securing locations, in the longest unsupported section of the pipe. Of these five occurrences, four were found on fuel pipes with very low operating lives. All of the leaks were detected by either ground inspection or fuel imbalance in flight. Analysis attributed these failures to an increased radial stress on the tube wall, due to excitation of the tube diametrical resonance in the engine running and HP fuel pump pulsing ranges.

This condition, similar to the frettage-related fuel leaks, if not detected and corrected, could lead to a critical fuel imbalance or in-flight fuel starvation, possibly resulting in engine in-flight shut-down and, consequently, reduced control of the aeroplane.

To address this potential unsafe condition, RR developed modification (mod) 73-AJ366, which is available for in-service engines through Alert Service Bulletin (SB) RB.211-73-AJ366, removing both fuel leak modes by replacing the fuel tube assemblies, and introducing improved routing and supporting hardware.

For the reasons described above, this AD retains the requirements of EASA AD 2014-0243R1, which is superseded, and requires a modification, which terminates the repetitive inspections.

Required Action(s) and Compliance Time(s):
Required as indicated, unless accomplished previously:

Note 1: Where in this AD, reference is made to an RR 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.

Note 2: The affected fuel tubes, P/N FW53576, were incorporated through RR mod 73-F343 in production, or by in-service modification in accordance with RR SB RB.211-73-F343.

Re-statement of the requirements of EASA AD 2014-0243R1:

(1) Within the compliance time specified in Table 1 of this AD and, thereafter, at intervals not to exceed 4 000 flight hours (FH), accomplish an on-wing inspection of fan case LP fuel tubes P/N FW53576 and the relevant associated clips, and FOHE mounts and associated hardware in accordance with the instructions of RR NMSB RB.211-73-AH522.

(2) Inspections on an engine, accomplished before 29 April 2014 [the effective date of EASA AD 2014-0089] in accordance with instructions of RR NMSB RB.211-73-G848 (at any Revision), are acceptable in lieu of the initial inspections as required by paragraph (1) of this AD for that engine.

Table 1 – Initial Inspection

FH accumulated by the Engine since new, on 29 April 2014 [the effective date of EASA AD 2014-0089]	**Compliance time**
3 200 FH or more	Within 800 FH after 29 April 2014 [the effective date of EASA AD 2014-0089]
Less than 3 200 FH	Before exceeding 4 000 FH since new

(3) Within 800 FH after 20 November 2014 [the effective date of the original issue of EASA AD 2014-0243] and, thereafter, at intervals not to exceed 800 FH, visually inspect the uppermost clip-stack (P/N CP4881) on the FOHE to fuel pump LP fuel tubes (P/N FW53576) upper section and the relevant associated bracket (P/N FW26692) in accordance with the instructions of RR NMSB RB.211-73-AH837.

(4) From 29 April 2014 [the effective date of EASA AD 2014-0089], during each engine shop visit, inspect the fan case LP fuel tubes P/N FW26589, P/N FW36335, P/N FW26587, P/N FW53576 and P/N FW53577 and the relevant associated clips, and the FOHE mounts and associated hardware, in accordance with the instructions of RR NMSB RB.211-73-AH522.

(5) If, during any inspection as required by paragraph (1) or (4) of this AD, any discrepancies (as defined in RR NMSB RB.211-73-AH522) are detected, within the compliance time(s) specified in RR NMSB RB.211-73-AH522 (for on-wing inspection), or before release to service of the engine (for in-shop inspection), as applicable, replace any damaged fan case LP fuel tube(s) and relevant associated clips, and/or any damaged FOHE mounts and associated hardware, in accordance with the instructions of RR NMSB RB.211-73-AH522.

(6) If, during any inspection as required by paragraph (3) of this AD, any discrepancies (as defined in RR NMSB RB.211-73-AH837) are detected, accomplish the applicable corrective action(s), depending on findings, as specified in paragraph (6.1) or (6.2) of this AD, as applicable.

(6.1) For the clip-stack (P/N CP4881), before next flight, remove the clip, inspect the fuel tube in accordance with the instructions of RR NMSB RB.211-73-AH837, and, depending on condition, replace the affected fan case LP fuel tube and relevant associated clips in accordance with the instructions of RR NMSB RB.211-73-AH837.

(6.2) For the associated bracket (P/N FW26692), within 100 FH after detection of the discrepancy, replace the bracket and inspect the fuel tube in accordance with the instructions of RR NMSB RB.211-73-AH837, and, depending on condition, replace the affected fan case LP fuel tubes and relevant associated clips in accordance with the instructions of RR NMSB RB.211-73-AH837.

(7) An in-shop inspection accomplished in accordance with the instructions of RR NMSB RB.211-73-AH522 is acceptable in lieu of an on-wing inspection as required by paragraph (1) of this AD. An in-shop inspection accomplished in accordance with the instructions of RR NMSB RB.211-73-AH522 is acceptable in lieu of a visual inspection as required by paragraph (3) of this AD.

(8) Replacement of fan case LP fuel tubes and the relevant associated clips or FOHE mounts and associated hardware with serviceable parts, as required by paragraph (5) or (6) of this AD, as applicable, does not constitute terminating action for the repetitive inspections required by paragraphs (1), (3) and (4) of this AD.

New requirements of this AD:

(9) During the next qualified shop visit (see Note 3 of this AD) after the effective date of this AD, modify the engine in accordance with the instructions of Section 3 “Accomplishment Instructions” of RR SB RB.211-73-AJ366.

Note 3: For the purpose of this AD, a qualified shop visit is where engine is undergoing a Non-Modular rework level of Engine Refurbishment, or Engine Check and Repair.

(10) Modification of an engine, as required by paragraph (9) of this AD, constitutes terminating action for the repetitive inspections required by paragraphs (1), (3) and (4) of this AD for that engine.

(11) An engine on which RR mod 73-AJ366 has been embodied, provided it is determined that the engine remains in that configuration, is not affected by the requirements of this AD, except those of paragraph (12) of this AD.

(12) From the effective date of this AD, do not install a Module, as identified in Section 1.A. Effectivity of RR SB RB.211-73-AJ366, on any post-mod 73-AJ366 or post-SB 73-AJ366 engine, unless, prior to installation, the Module has been modified in accordance with the instructions of Section 3 “Accomplishment Instructions” of RR SB RB.211-73-AJ366.

Ref. Publications:
Rolls-Royce NMSB RB.211-73-AH522 dated 20 September 2013, or Revision 1 dated 18 March 2014.

Rolls-Royce SB RB.211-73-F343 dated 08 November 2006, or Revision 1 dated 14 May 2009, or Revision 2 dated 1 July 2009, or Revision 3 dated 15 July 2009, or Revision 4 dated 26 May 2011.

Rolls-Royce NMSB RB.211-73-AH837 dated 09 September 2014.

Rolls-Royce SB RB.211-73-AJ366 dated 03 May 2016.

The use of later approved revisions of these 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 on 10 May 2016 as PAD 16-064 for consultation until 07 June 2016. The Comment Response Document can be found at http://ad.easa.europa.eu.

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**.