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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2010-0821; Directorate Identifier 2010-NE-30-AD; Amendment 39-16657; AD 2011-08-07]

RIN 2120-AA64

Airworthiness Directives; Rolls-Royce plc (RR) RB211-Trent 875-17, RB211-Trent 877-17, RB211-Trent 884-17, RB211-Trent 884B-17, RB211-Trent 892-17, RB211-Trent 892B-17, and RB211-Trent 895-17 Turbofan Engines

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are adopting a new airworthiness directive (AD) for the products listed above. This AD results from mandatory continuing airworthiness information (MCAI) issued by an aviation authority of another country to identify and correct an unsafe condition on an aviation product. The MCAI describes the unsafe condition as:

> In January 2009 a Trent 895 powered Boeing 777-200 aircraft experienced release of a low pressure (LP) compressor blade which failed due to fatigue cracking in the root section of the blade. The released blade (undercut root standard) had received a part life processing to apply a compression layer to the blade root (Service Bulletin SB 72-D672–Introduction of Laser Shock Peening (LSP)) and also a part life upgrade to the retention feature lubrication system. Investigation has revealed that the effectiveness of this upgraded blade root lubrication coating system may be reduced dependant on the extent of previous running with the earlier standard, leading to increased blade root stress levels. In the specific case of the released blade, a review of its in-service modification history has shown that it operated for a relatively high number of flight cycles prior to the compression layer processing and the new retention feature lubrication system. A review of the Engine Health Monitoring data has also identified it operated at high N1 speeds compared to the Trent 800 fleet average N1 speeds. The combination of these factors has resulted in increased fatigue life usage which is considered to have led to crack initiation and propagation prior to reaching the blades declared life limit. A review of all in-service undercut/LSP standard Trent 800 LP compressor blades has identified specific blades that carry a similar increased susceptibility to cracking.

> This AD is issued to mitigate the risk of possible multiple fan blades failure affecting those blades identified as described above which could lead to high energy non contained debris from the engine.

We are issuing this AD to prevent LP compressor blades from failing due to blade root cracks, which could lead to uncontained engine failure and damage to the airplane.

DATES: This AD becomes effective June 7, 2011. The Director of the Federal Register approved the incorporation by reference of certain publications listed in this AD as of June 7, 2011.

ADDRESSES: The Docket Operations office is located at Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12-140, Washington, DC 20590-0001.

FOR FURTHER INFORMATION CONTACT: Alan Strom, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; e-mail: alan.strom@faa.gov; telephone (781) 238-7143; fax (781) 238-7199.

SUPPLEMENTARY INFORMATION:

Discussion

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to include an AD that would apply to the specified products. That NPRM was published in the Federal Register on January 14, 2011 (76 FR 2605). That NPRM proposed to correct an unsafe condition for the specified products. The MCAI states that:

> In January 2009 a Trent 895 powered Boeing 777-200 aircraft experienced release of a low pressure (LP) compressor blade which failed due to fatigue cracking in the root section of the blade. The released blade (undercut root standard) had received a part life processing to apply a compression layer to the blade root (Service Bulletin SB 72-D672–Introduction of Laser Shock Peening (LSP)) and also a part life upgrade to the retention feature lubrication system. Investigation has revealed that the effectiveness of this upgraded blade root lubrication coating system may be reduced dependant on the extent of previous running with the earlier standard, leading to increased blade root stress levels. In the specific case of the released blade, a review of its in-service modification history has shown that it operated for a relatively high number of flight cycles prior to the compression layer processing and the new retention feature lubrication system. A review of the Engine Health Monitoring data has also identified it operated at high N1 speeds compared to the Trent 800 fleet average N1 speeds. The combination of these factors has resulted in increased fatigue life usage which is considered to have led to crack initiation and propagation prior to reaching the blades declared life limit. A review of all in-service undercut/LSP standard Trent 800 LP compressor blades has identified specific blades that carry a similar increased susceptibility to cracking.
>
> This AD is issued to mitigate the risk of possible multiple fan blades failure affecting those blades identified as described above which could lead to high energy non contained debris from the engine.

Comments

We gave the public the opportunity to participate in developing this AD. We considered the comments received.

Request To Ensure Cyclic Requirements Are Equivalent to Calendar-Based Requirements

Two commenters, the Boeing Company and American Airlines, request that we ensure that the cyclic requirements in the AD are equivalent to the calendar-based requirements in the MCAI and Alert Service Bulletin (ASB) No. RB.211-72-AG244, Revision 1, dated January 26, 2010. American Airlines' engine serial number (S/N) 51137 is identified as having an allowable inspection threshold of 1,680 cycles from the effective date of the proposed AD. Based on American Airlines' cyclic usage, the FAA AD would allow the blades to operate until March 1, 2014, while the RR ASB would only allow the blades to operate until January 1, 2013. The proposed AD appears to be less conservative for the blades in engine S/N 51137.

We agree. We moved engine S/N 51137 from being listed with the 1,680 cycles threshold, to being listed with a 1,027 cycles threshold in row 3C of Table 1 of the AD.

Recommendation To Retain Compliance Calendar Date Format

One commenter, RR, recommends that the FAA retain the calendar date format as specified in the referenced ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010 for compliance, rather than converting to cycles for the inspection threshold for the sub-population of fan sets. At the request of the National Transportation Safety Board, RR analyzed the modification and installation data for each fan set using both hours and cycles. For some operators, the highest risk value was based on hours and for others it was cycles. Whichever gave the highest risk value, together with the average utilization, was then used to determine the dates at which the blades need to have their initial inspection. Therefore, converting to cycles may not be correct for some operators. Rolls-Royce states that it will monitor N1 speed usage. A higher N1 speed usage could result in the risk values being affected and result in RR ASB No. RB.211-72-AG244, being revised and re-issued. Any change to that ASB would necessitate changing the FAA AD. By retaining the date format and the FAA AD referencing that SB then any future changes to the dates in the Appendices of the SB will not affect the AD. The SB is clear and simple, making it easy for the operators to monitor their affected fan blades. Monitoring a number of fan blades using cycles would make the monitoring more difficult for the operator.

We do not agree. We determined the cycles listed in Table 1 of the AD based on projected operator usage, from the calendar dates in the RR ASB. The SB dates were developed based on the logic given in the first justification paragraph above. The cyclic requirements in the AD are inherently consistent with each operator's risk values. We did not change the AD.

Request for Clarification of Incorporation by Reference Requirements

One commenter, Delta Airlines, states that the proposed AD requires use of Appendix 1 of RR ASB No. RB.211-72-AG244 to determine whether blades should be rejected after inspection. Appendix 1 only applies to blades that have been removed from the engine. Delta Airlines requests that the AD be changed so it is clear that the blades can be inspected either in or out of the engine, with appropriate rejection criteria for each method.

We agree. Our intent is not to restrict the inspections to blades removed from the engine. We added Appendix 2 to the incorporation by reference, to include blades not removed.

Delta Airlines also requests that we change the incorporation-by-reference requirement, to state that when re-applying dry film lubricant (DFL) to the fan blades after inspection, either Aircraft Maintenance Manual (AMM) task 72-31-11-400-801-R00, or RR SB No. RB.211-72-D347, may be

used. The commenter states that the latest information from RR SB No. RB.211-72-D347 is already in AMM task 72-31-11-400-801-R00.

We partially agree. We agree with specifying in the AD, that blades that pass inspection need to have DFL applied before installing the blades. We do not agree that the AMM or RR No. RB.211-72-D347 need to be incorporated by reference in this AD, as this equates to standard maintenance. Under paragraph (e)(3), we added a paragraph that states, for blades that pass inspection, re-apply dry film lubricant, and install all blades in their original position.

Request for Previous Credit

Delta Airlines requests that we give previous credit for previous accomplishments of inspections using the original issue of RR ASB No. RB.211-72-AG244, before the effective date of the AD.

We agree. We changed the AD to add previous credit for that ASB.

Request To Eliminate Reporting Requirements

Delta Airlines requests that we eliminate the reporting requirements from the AD, which were required by default since the proposed AD required using all of paragraph 3 of RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010, and all of Appendix 1, of that AD. The commenter states that these are administrative tasks that do not need to be part of the AD. Each operator is required to document maintenance and AD compliance per the applicable regulations, and each has their own approved processes for doing so.

We agree and eliminated the reporting requirements by specifying only the paragraphs needed to perform the inspections in the AD.

Concern That AD Compliance May Be Misinterpreted

Delta Airlines requests that we revise the AD to state that after the effective date of this AD, blade serial numbers that are listed in RR No. RB.211-72-AG244, which have reached or are within 100 cycles of the initial inspection thresholds of Table 1 of the proposed AD, may only be installed as replacement blades in other engines if they have been successfully inspected per paragraph (e)(3) of this AD before installation. However, they may be removed and reinstalled in the same engine without paragraph (e)(3) inspections provided they do not exceed the initial and repetitive inspection intervals of paragraphs (e)(1) and (e)(2).

Also, Delta Airlines requests that we revise the AD to state that blades that have been ultrasonically inspected prior to the AD effective date, but which have not yet reached Table 1 thresholds, should be considered not yet "initially inspected," and thus not subject to the repetitive inspection requirements of paragraph (e)(2) until they reach the Table 1 inspection thresholds. On the same subject, American Airlines requests that the AD include a note similar to the SB to the same effect as the above recommendation. Delta Airlines and American Airlines are concerned that the AD might be interpreted that serviceable spare blades in stock (or blades being swapped from one engine to another) with serial numbers listed in RR ASB No. RB.211-72-AG244, must have ultrasonic inspection (UI) accomplished before being installed even if they do not require initial inspection for thousands of cycles into the future. Delta Airlines also states that the existing UI requirements in the AD may lead to confusion as to whether the paragraph (e)(2) repetitive requirements apply to blades that have been inspected for other reasons prior to the Table 1 threshold.

We agree with the comments that the AD could be more clear as to when the inspections must start, and whether UI for other reasons prior to the thresholds in Table 1 would trigger the repetitive inspection requirements of paragraph (e)(2). We do not agree with the wording of the proposed change because it is simpler to define the phrase, "affected blade." The requirement of paragraph (e)(5) of the proposed AD, does not require inspections more often than every 100 cycles for any affected blade, since proposed AD paragraph (e)(5) refers to paragraph (e)(2) (repetitive UIs required

by this AD). We added a definition to the AD compliance to state for the purpose of this AD, an affected blade is a blade listed in Table 1 of this AD that has accumulated cycles within 100 cycles, of the initial inspection thresholds in Table 1 of this AD.

Engine Serial Numbers Are for Reference Only

Delta Airlines and American Airlines request that we add a statement to the AD, stating that the engine serial numbers in Table 1 of the proposed AD are for reference only, and that the AD requirements apply to the blade serial numbers, not the engine serial numbers. The Table 1 listing of engine serial numbers could imply the engine requires initial and repetitive inspections even if blades were replaced with non-affected blades.

We agree. We intend for the AD to apply to the specific fan blade serial numbers listed in RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010. The engine serial numbers are listed for convenience only. We changed Table 1 to state that engine serial numbers are provided for reference only.

Request To Correct Table 1

American Airlines states that engine serial number 51280 appears to be in the wrong row of Table 1 of the proposed AD. They request that we correct the Table by moving the serial number from the top of row 3E to the bottom of row 3D, in that table.

We partially agree. We reviewed the proposed AD, as published in the Federal Register, and found it to be correct. We reviewed the proposed AD version in the FAA Regulatory Library (RGL), and found that Table 1 had the error you found. We contacted the staff that oversees the RGL, and they corrected Table 1.

Request That All Thresholds Be Given the Same Index

Delta Airlines requests that all thresholds in Table 1 of the proposed AD be the same for a given index. Delta Airlines noticed that most fan blade serial numbers being used in their engines were singled out with a lower threshold than the rest of the blades listed in corresponding appendices of the SB.

We do not agree. We changed the inspection requirements in the proposed AD from calendar-based requirements to cycle-based requirements. Because the intent of the AD is to have the same level of safety as the EASA AD, the cyclic usage of each operator was taken into account when converting from calendar to cyclic thresholds. The intent is for the number of cycles quoted to equate to the calendar times shown in the EASA AD. Since operators fly on different routes and have different procedures, the number of cycles accumulated in a given calendar period will vary as a consequence. We did not change the AD.

Request To Verify Row Identifiers in Table 1

American Airlines requests that the FAA verify that the row identifiers in Table 1 of the AD, correspond to the Appendix identifiers in RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010, to ensure that operators properly understand the AD requirements.

We partially agree. We agree with ensuring that Table 1 is clearly understood, to avoid operators from having problems complying with the AD. We do not agree with changing the AD, because Table 1 of the AD provides sufficient clarity in defining the compliance time criteria and what the appropriate sections of the ASB are, to be used. The row identifiers in Table 1 of the AD do correspond to the Appendix identifiers in RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010. We did not change the AD.

Conclusion

We reviewed the available data, including the comments received, and determined that air safety and the public interest require adopting the AD with the changes described previously. We determined that these changes will not increase the economic burden on any operator or increase the scope of the AD.

Costs of Compliance

Based on the service information, we estimate that this AD will affect about 20 engines installed on airplanes of U.S. registry. We also estimate that it will take about 18 work-hours per engine to perform the inspections in one year's time. The average labor rate is $85 per work-hour. We estimate that one LP compressor blade per year will need replacement, at a cost of about $82,000. Based on these figures, we estimate the annual cost of the AD on U.S. operators to be $112,600. Our cost estimate is exclusive of possible warranty coverage.

Authority for This Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. "Subtitle VII: Aviation Programs," describes in more detail the scope of the Agency's authority.

We are issuing this rulemaking under the authority described in "Subtitle VII, Part A, Subpart III, Section 44701: General requirements." Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

We determined that this AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify this AD:

1. Is not a "significant regulatory action" under Executive Order 12866;

2. Is not a "significant rule" under the DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and

3. Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

We prepared a regulatory evaluation of the estimated costs to comply with this AD and placed it in the AD docket.

Examining the AD Docket

You may examine the AD docket on the Internet at http://www.regulations.gov; or in person at the Docket Operations office between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the regulatory evaluation, any comments received, and other information. The street address for the Docket Operations office (phone (800) 647-5527) is provided in the ADDRESSES section. Comments will be available in the AD docket shortly after receipt.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

Adoption of the Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39–AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new AD:

2011-08-07 Rolls-Royce plc: Amendment 39-16657. Docket No. FAA-2010-0821; Directorate Identifier 2010-NE-30-AD.

Effective Date

(a) This airworthiness directive (AD) becomes effective June 7, 2011.

Affected ADs

(b) None.

Applicability

(c) This AD applies to Rolls-Royce plc (RR) RB211-Trent 875-17, RB211-Trent 877-17, RB211-Trent 884-17, RB211-Trent 884B-17, RB211-Trent 892-17, RB211-Trent 892B-17, and RB211-Trent 895-17 turbofan engines.

Reason

(d) This AD results from mandatory continuing airworthiness information (MCAI) issued by an aviation authority of another country to identify and correct an unsafe condition on an aviation product. We are issuing this AD to prevent low-pressure (LP) compressor blades from failing due to blade root cracks, which could lead to uncontained engine failure and damage to the airplane.

Actions and Compliance

(e) Unless already done, do the following actions.

(1) Using the corresponding compliance threshold in Table 1 of this AD, perform an initial ultrasonic inspection (UI) of the affected LP compressor blades identified by serial number (S/N) in Appendices 3A through 3F of RR Alert Service Bulletin (ASB) No. RB.211-72-AG244, Revision 1, dated January 26, 2010.

Table 1–Initial Inspection Thresholds

Appendix Number of RR ASB No. RB.211-72-AG244, Revision 1, that Identifies Affected LP Compressor Blades by S/N	**Initial Inspection Threshold (Engine Serial Numbers (ESN) Are For Reference Only)**
3A	120 flight cycles after the effective date of this AD.
3B	Blades shown in RR ASB No. RB.211-72-AG244, Revision 1 as fitted to ESN 51039 - 802 flight cycles after the effective date of this AD. ESNs 51146, 51177, 51145, and 51149 – 380 flight cycles after the effective date of this AD.

3C	Blades shown in RR ASB No. RB.211-72-AG244, Revision 1 as fitted to ESN 51001 and blade S/N RGG16694 - 1,680 flight cycles after the effective date of this AD. ESN 51145, 51149, 51150 and 51204 - 796 flight cycles after the effective date of this AD. ESN 51160 – 1,160 flight cycles after the effective date of this AD. ESN 51137 – 1,027 flight cycles after the effective date of this AD.
3D	Blades shown in RR ASB No. ASB RB.211-72-AG244, Revision 1 as fitted to ESN 51193 and blade S/N RGG20216 – 1,212 flight cycles after the effective date of this AD. ESN 51200 – 1,237 flight cycles after the effective date of this AD. ESN 51280 – 1,551 flight cycles after the effective date of this AD.
3E	Blades shown in RR ASB No. RB.211-72-AG244, Revision 1 as fitted to ESN 51004, "na" and blade S/Ns RGG12590, RGG14081, and RGG15419 - 3,433 flight cycles after the effective date of this AD. ESN 51156 – 1,627 flight cycles after the effective date of this AD.
3F	Blades shown in RR ASB No. RB.211-72-AG244, Revision 1 as fitted to ESN 51175, 51194, 51201, 51205, and 51228 - 2,042 flight cycles after the effective date of this AD. ESN 51264 – 4,309 flight cycles after the effective date of this AD. ESN 51443 – 2,636 flight cycles after the effective date of this AD. Blade S/N RGG15698 – 2,638 flight cycles after the effective date of this AD.

(2) Thereafter, perform repetitive UIs of the affected LP compressor blades within every 100 flight cycles.

(3) Use paragraphs 3.A.(1) through 3.A.(2) of Accomplishment Instructions of RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010, paragraphs 1 through 3.B. of Appendix 1, and paragraphs 1 through 3.C. of Appendix 2, of that ASB, to perform the UIs.

(4) Remove blades from service before further flight that fail the inspection criteria in Appendix 1 of RR ASB No. RB.211-72-AG244, Revision 1, dated January 26, 2010.

(5) For blades that pass inspection, re-apply dry film lubricant, and install all blades in their original position.

(6) After the effective date of this AD, do not install any affected LP compressor blade unless it has passed the initial and repetitive UIs required by this AD.

Previous Credit

(f) An initial UI performed before the effective date of this AD using RR ASB No. RB.211-72-AG244, dated August 7, 2009, satisfies the initial UI requirements of this AD.

FAA AD Differences

(g) This AD differs from European Aviation Safety Agency (EASA) AD 2010-0097, dated May 26, 2010. The EASA AD uses calendar dates for initial inspection thresholds. This AD uses flight cycles.

Alternative Methods of Compliance

(h) The Manager, Engine Certification Office, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19.

Related Information

(i) Refer to EASA AD 2010-0097, dated May 26, 2010, for related information.

(j) Contact Alan Strom, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; e-mail: alan.strom@faa.gov; telephone (781) 238-7143; fax (781) 238-7199.

Definition

(k) For the purpose of this AD, an affected blade is a blade listed in Table 1 of this AD that has accumulated cycles within 100 cycles, of the initial inspection thresholds in Table 1 of this AD.

Material Incorporated by Reference

(l) You must use Rolls-Royce plc Alert Service Bulletin No. RB.211-72-AG244, Revision 1, dated January 26, 2010, Appendix 1, Appendix 2, and Appendices 3A through 3F of that ASB, to do the actions required by this AD.

(1) For service information identified in this AD, contact Rolls-Royce plc, P.O. Box 31, DERBY, DE24 8BJ, UK; telephone 44 1332 242424; fax 44 1332 249936; e-mail: royce.com">tech.help@rolls-royce.com.

(2) You may review copies at the FAA, New England Region, 12 New England Executive Park, Burlington, MA; or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741-6030, or go to: http://www.archives.gov/federal-register/cfr/ibr-locations.html.

Issued in Burlington, Massachusetts, on April 1, 2011.
Peter A. White,
Acting Manager, Engine and Propeller Directorate,
Aircraft Certification Service.