



[4910-13-P]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2020-0293; Project Identifier MCAI-2019-00122-E; Amendment 39-21263; AD 2020-20-07]**

**RIN 2120-AA64**

**Airworthiness Directives; Rolls-Royce Deutschland Ltd & Co KG (Type Certificate previously held by Rolls-Royce plc) Turbofan Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

**SUMMARY:** The FAA is adopting a new airworthiness directive (AD) for all Rolls-Royce Deutschland Ltd & Co KG (RRD) Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3, Trent 7000-72, and Trent 7000-72C model turbofan engines. This AD was prompted by a report of crack findings in the front air seal on the intermediate-pressure compressor (IPC) shaft assembly during the stripping of a flight test engine. This AD requires initial and repetitive borescope inspections (BSIs) or visual inspections of the IPC shaft assembly and, depending on the results of the inspection, replacement of the IPC shaft assembly with a part eligible for installation. The FAA is issuing this AD to address the unsafe condition on these products.

**DATES:** This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For service information identified in this final rule, contact Rolls-Royce Deutschland Ltd. & Co KG, Eschenweg 11, 15827 Blankenfelde-Mahlow, Germany; phone: +49 (0) 33 708 6 0; website: <https://www.rolls-royce.com/contact-us.aspx>. You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA 01803. For information on the availability of this material at the FAA, call 781-238-7759. It is also available on the internet at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2020-0293.

### **Examining the AD Docket**

You may examine the AD docket on the internet at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2020-0293; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, the mandatory continuing airworthiness information (MCAI), any comments received, and other information. The address for Docket Operations is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT:** Stephen Elwin, Aerospace Engineer, ECO Branch, FAA, 1200 District Avenue, Burlington, MA 01803; phone: 781-238-7236; fax: 781-238-7199; email: [stephen.l.elwin@faa.gov](mailto:stephen.l.elwin@faa.gov).

### **SUPPLEMENTARY INFORMATION:**

#### **Background**

The FAA issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to RRD Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, Trent 1000-R3, Trent 7000-72, and Trent 7000-72C model turbofan engines. The NPRM published in the

*Federal Register* on April 2, 2020 (85 FR 18478). The NPRM was prompted by a report of crack findings in the front air seal on the IPC shaft assembly during the stripping of a flight test engine. The NPRM proposed to require initial and repetitive BSIs of the IPC shaft assembly and, depending on the results of the inspection, replacement of the IPC shaft assembly with a part eligible for installation. The FAA is issuing this AD to address the unsafe condition on these products.

The European Union Aviation Safety Agency (EASA), which is the Technical Agent for the Member States of the European Community, has issued EASA AD 2019-0282, dated November 20, 2019 (referred to after this as “the MCAI”), to address the unsafe condition on these products. The MCAI states:

An occurrence was reported of finding cracks in the front air seal of the IPC shaft assembly during stripping of a flight test engine. Follow-up inspections of other in-shop engines revealed two more cracked front air seals of IPC shaft assemblies.

This condition, if not detected and corrected, could lead to IPC shaft failure, possibly resulting in engine in-flight shut-down and consequent reduced control of the aeroplane.

To address this potential unsafe condition, Rolls-Royce developed an inspection method and issued the NMSB, providing those inspection instructions.

For the reason described above, this [EASA] AD requires repetitive on-wing inspections of the front air seal of the affected part at a specific area between the fourth (rearmost) seal fin of the IPC shaft assembly front air seal and the IPC Stage 1 disc and, depending on findings, removal from service of the engine for corrective action(s).

You may obtain further information by examining the MCAI in the AD docket on the internet at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2020-0293.

### **Comments**

The FAA gave the public the opportunity to participate in developing this final rule. The following presents the comments received on the NPRM and the FAA's response to each comment.

#### **Request to Update Methods to Gain Access to the IPC Shaft Assembly**

Delta Air Lines (DAL) requested that paragraph (g)(1), Required Actions, of this AD be updated to specify that gaining access to the front air seal of the IPC shaft assembly to perform the BSI can be accomplished through the engine inlet and low-pressure compressor (LPC) fan blades or through the outlet guide vanes (OGVs) regardless of whether the BSI of the front air seal is performed concurrently with any other inspections.

DAL cited paragraph 3.B.(2)(b) of Rolls-Royce Trent 1000 Alert Non-Modification Service Bulletin (NMSB) 72-AK451, Initial Issue, dated November 14, 2019 ("the NMSB"), that states that accessing the front air seal may be made through the OGVs "if performed concurrently with IP Compressor Stage 1 blade inspections." As a result, inspectors may have less difficulty accessing the inspection area through the OGVs. Further, DAL reasoned that tooling for entry through the OGVs might be more readily available in certain stations where the affected aircraft operate.

The FAA agrees that access to the front air seal of the IPC shaft assembly can be accomplished through the engine inlet and LPC fan blades or through the OGVs regardless of any other inspections occurring at the time. The FAA, however, disagrees with updating paragraph (g)(1) of this AD because this AD does not require a certain method to access the front air seal of the IPC shaft assembly.

### **Request to Remove Engine to Allow for Verification of Cracks**

DAL requested that the FAA update paragraph (g)(3), Required Actions, of this AD to require removal of the engine before further flight and to allow verification of any cracks prior to mandating replacement of the IPC shaft assembly. DAL added that the EASA AD, which states to remove of the engine from service if any crack is detected and to contact RRD for approved corrective actions, allows for the possibility that an engine can be removed from the aircraft and then subsequently cleared for continued service after cleaning and reassessment of a suspected indication.

The FAA disagrees with updating paragraph (g)(3) of this AD to require removal of the engine. While the engine can be removed from the aircraft and subsequently cleared for continued service after cleaning and reassessment, the engine does not need to be removed from the aircraft to verify a crack. According to the Accomplishment Instructions, paragraph 3.B.(2)(e), of the NMSB, if a crack is found, it is permissible to clean the suspected area and then repeat the BSI or visual inspection of the IPC shaft assembly. Therefore, no change to this AD is required.

### **Request to Allow Visual Inspections of the IPC Shaft Assembly During a Shop Visit**

DAL requested that the FAA update paragraph (g)(2), Required Actions, of this AD to allow credit for an IPC shaft assembly that received the BSI using the NMSB or a general visual inspection during an engine shop visit. DAL reasoned that when the IPC shaft assembly is exposed during an engine shop visit, the inspection area can be accessed without a borescope.

The FAA agrees that visual inspections using standard shop procedures would provide an equivalent level of safety as an on-wing BSI if the front air seal of the IPC shaft assembly is exposed. The FAA updated paragraph (g)(2) of this AD to allow a visual inspection using FAA-approved maintenance procedures if the part is exposed.

### **Request to Revise Definition of Part Eligible for Installation**

DAL requested that the FAA update the definition of a “part eligible for installation” be revised to also include a part that has been inspected per standard shop procedures. DAL reasoned that paragraph (h) of the NPRM only defined a part eligible for installation to include a new IPC shaft assembly or an IPC shaft assembly that, before installation, passed an inspection in accordance with referenced service information, which only includes an on-wing BSI and does not allow for inspection during an engine shop visit. Therefore, paragraph (h) of the NPRM, as written, allows only for the reinstallation of the IPC shaft assembly that had been previously inspected on-wing before removal from an engine. Additionally, DAL noted that both the RRD Trent 1000 and Trent 7000 Cleaning, Inspection, and Repair Manuals, Section 72-32-31, provide standard manual procedures for identifying cracks on the IPC shaft assembly.

The FAA agrees and updated the definition of a “part eligible for installation” in paragraph (h)(2) of this AD to include an in-shop BSI and visual inspection using FAA-approved maintenance procedures.

### **Request to Remove Reference to Table of Inspection Intervals**

DAL requested that the FAA update paragraph (g)(2), Required Actions, of this AD to remove the reference to Table 1 to paragraph (g)(1) for inspection intervals. DAL suggested that the FAA mirror the language of the MCAI that states that in-shop inspections “may be substituted for any on-wing BSI as required by paragraph (1) of this [EASA] AD, provided the compliance time is not exceeded.” DAL reasoned that Table 1 to paragraph (g)(1) of the NPRM includes only the initial inspection intervals, and therefore could be interpreted to exclude substitution for repetitive inspections.

The FAA agrees that Table 1 to paragraph (g)(1) of this AD provides the compliance time for the initial inspection, whereas paragraph (g)(1) of this AD requires repetitive inspections at stated intervals. The FAA updated paragraph (g)(2) of this AD from “may be substituted for any on-wing BSI, provided the compliance time specified in

Table 1 to paragraph (g)(1) of this AD is not exceeded” to “may be substituted for any on-wing BSI, provided the compliance time specified in paragraph (g)(1) of this AD is not exceeded.”

### **Support for the AD**

The Boeing Company expressed support for the AD as written.

### **Conclusion**

The FAA reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting this final rule with the changes described previously and minor editorial changes. The FAA has determined that these minor changes:

- Are consistent with the intent that was proposed in the NPRM for addressing the unsafe condition; and
- Do not add any additional burden upon the public than was already proposed in the NPRM.

The FAA has also determined that these changes will not increase the economic burden on any operator or increase the scope of this final rule.

### **Related Service Information under 1 CFR Part 51**

The FAA reviewed Rolls-Royce Trent 1000 Alert NMSB 72-AK451, Initial Issue, dated November 14, 2019. The Alert NMSB describes procedures for initial and repetitive BSIs of the IPC shaft assembly. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in the ADDRESSES section.

### **Costs of Compliance**

The FAA estimates that this AD affects 14 engines installed on airplanes of U.S. registry.

The FAA estimates the following costs to comply with this AD:

### Estimated costs

Action	Labor Cost	Parts Cost	Cost per product	Cost on U.S. operators
BSI or visual inspection of IPC shaft assembly	3.5 work-hours x \$85 per hour = \$297.50	\$0	\$297.50	\$4,165

The FAA estimates the following costs to do any necessary replacement that are required based on the results of the mandated inspection. The FAA has no way of determining the number of engines that might need this replacement:

### On-condition costs

Action	Labor Cost	Parts Cost	Cost per product
Replace IPC shaft assembly	1,080 work-hours x \$85 per hour = \$91,800	\$1,365,219	\$1,457,019

### 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.

The FAA is 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

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) Will not affect intrastate aviation in Alaska, 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.

#### **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 airworthiness directive (AD):

**2020-20-07 Rolls-Royce Deutschland Ltd & Co KG (Type Certificate previously held by Rolls-Royce plc):** Amendment 39-21263; Docket No. FAA-2020-0293; Project Identifier MCAI-2019-00122-E.

#### **(a) Effective Date**

This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

#### **(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to all:

(1) Rolls-Royce Deutschland Ltd & Co KG (RRD) (Type Certificate previously held by Rolls-Royce plc) Trent 1000-AE3, Trent 1000-CE3, Trent 1000-D3, Trent 1000-G3, Trent 1000-H3, Trent 1000-J3, Trent 1000-K3, Trent 1000-L3, Trent 1000-M3, Trent 1000-N3, Trent 1000-P3, Trent 1000-Q3, and Trent 1000-R3 model turbofan engines.

(2) RRD Trent 7000-72 and Trent 7000-72C model turbofan engines.

**(d) Subject**

Joint Aircraft System Component (JASC) Code 7230, Turbine Engine Compressor Section.

**(e) Unsafe Condition**

This AD was prompted by a report of crack findings in the front air seal on the intermediate-pressure compressor (IPC) shaft assembly during the stripping of a flight test engine. The FAA is proposing this AD to prevent failure of the IPC shaft assembly. The unsafe condition, if not addressed, could result in loss of thrust control and reduced control of the airplane.

**(f) Compliance**

Comply with this AD within the compliance times specified, unless already done.

**(g) Required Actions**

(1) Within the compliance times specified in Table 1 to paragraph (g)(1) of this AD, and thereafter, at intervals not to exceed 200 flight cycles (FCs), perform a borescope inspection (BSI) of the IPC shaft assembly, part number KH18436, using the Accomplishment Instructions, paragraph 3.B., of Rolls-Royce (RR) Trent 1000 Alert Non-Modification Service Bulletin (NMSB) 72-AK451, Initial Issue, dated November 14, 2019.

**Table 1 to Paragraph (g)(1) – Initial Inspection of Affected Part**

<b>FCs Accumulated (since new)</b>	<b>Compliance Time</b>
700 FCs or less.	Before exceeding 500 FCs, or within 100 FCs after the effective date of this AD, whichever occurs later
More than 700 FCs up to 1,000 FCs (inclusive).	Within 50 FCs after the effective date of this AD
1,001 FCs or greater.	Within 25 FCs or 30 calendar days, whichever occurs first after the effective date of this AD

(2) An in-shop BSI of the IPC shaft assembly using the Accomplishment Instructions, paragraph 3.A, of RR Trent 1000 Alert NMSB 72-AK451, Initial Issue, dated November 14, 2019, or visual inspection of the IPC shaft assembly using FAA-approved maintenance procedures if the part is exposed, may be substituted for any on-wing BSI, provided the compliance time specified in paragraph (g)(1) of this AD is not exceeded.

(3) If, during any initial or repetitive BSI or visual inspection of the IPC shaft assembly required by paragraph (g)(1) or (2) of this AD, any crack is detected, before further flight, remove the IPC shaft assembly and replace it with a part eligible for installation.

**(h) Definitions**

For the purpose of this AD, a “part eligible for installation” is:

(1) An IPC shaft assembly that is new (not previously installed on an engine);

(2) An IPC shaft assembly that, before (re)installation, has passed a BSI (no crack detected) using the Accomplishment Instructions, paragraph 3.A. or B., of RR Trent 1000 Alert NMSB 72-AK451, Initial Issue, dated November 14, 2019.

(3) An IPC shaft assembly that, before (re)installation, has passed a visual inspection of the exposed part (no crack detected) using FAA-approved maintenance procedures.

**(i) No Reporting Requirement**

The reporting requirements in the Accomplishment Instructions, paragraphs 3.A. and 3.B., of RR Trent 1000 Alert NMSB 72-AK451, Initial Issue, dated November 14, 2019, are not required by this AD.

**(j) Credit for Previous Actions**

You may take credit for the initial BSI of the IPC shaft assembly that is required by paragraph (g)(1) of this AD if you performed the BSI before the effective date of this AD using RR Trent 1000 NMSB 72-K452, Initial Issue, dated October 21, 2019.

**(k) Alternative Methods of Compliance (AMOCs)**

(1) The Manager, ECO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the ECO Branch, send it to the attention of the person identified in paragraph (l)(1) of this AD. You may email your request to: ANE-AD-AMOC@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

**(l) Related Information**

(1) For more information about this AD, contact Stephen Elwin, Aerospace Engineer, ECO Branch, FAA, 1200 District Avenue, Burlington, MA 01803; phone: 781-238-7236; fax: 781-238-7199; email: stephen.l.elwin@faa.gov.

(2) Refer to European Union Aviation Safety Agency (EASA) AD 2019-0282, dated November 20, 2019, for more information. You may examine the EASA AD in the AD docket on the internet at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2020-0293.

**(m) Material Incorporated by Reference**

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) Rolls-Royce (RR) Trent 1000 Alert Non-Modification Service Bulletin 72-AK451, Initial Issue, dated November 14, 2019.

(ii) [Reserved]

(3) For RR service information identified in this AD, contact Rolls-Royce Deutschland Ltd. & Co KG, Eschenweg 11, 15827 Blankenfelde-Mahlow, Germany; phone: +49 (0) 33 708 6 0; website: <https://www.rolls-royce.com/contact-us.aspx>.

(4) You may view this service information at FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA 01803. For information on the availability of this material at the FAA, call 781-238-7759.

(5) You may view this service information that is incorporated by reference at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email: [fedreg.legal@nara.gov](mailto:fedreg.legal@nara.gov), or go to: <https://www.archives.gov/federal-register/cfr/ibr-locations.html>.

Issued on September 22, 2020.

Lance T. Gant, Director,  
Compliance & Airworthiness Division,  
Aircraft Certification Service.

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