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## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 39**

**[Docket No. FAA-2011-0278; Directorate Identifier 2010-NE-10-AD; Amendment 39-16901; AD 2011-26-11]**

**RIN 2120-AA64**

### **Airworthiness Directives; General Electric Company (GE) GE90-110B1 and GE90-115B Turbofan Engines**

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

**ACTION:** Final rule.

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**SUMMARY:** We are adopting a new airworthiness directive (AD) for the products listed above, with certain part number (P/N) high-pressure compressor (HPC) stages 2-5 spools installed. This AD was prompted by an aborted takeoff caused by liberation of small pieces from the HPC stages 1-2 seal teeth and two shop findings of cracks in the seal teeth. This AD requires eddy current inspection (ECI) or spot fluorescent penetrant inspection (FPI) of the stages 1-2 seal teeth of the HPC stages 2-5 spool for cracks. This AD only allows installation of either HPC stator stage 1 interstage seals that are pregrooved or previously worn seals with acceptable wear marks to prevent heavy rubs. We are issuing this AD to detect cracks in the HPC stages 1-2 seal teeth due to heavy rubs that could result in failure of the seal of the HPC stages 2-5 spool, uncontained engine failure, and damage to the airplane.

**DATES:** This AD is effective February 3, 2012.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in the AD as of February 3, 2012.

**ADDRESSES:** For service information identified in this proposed AD, contact General Electric, GE-Aviation, Room 285, 1 Neumann Way, Cincinnati, Ohio 45215; email: geae.aoc@ge.com; phone: (513) 552-3272; fax: (513) 552-3329. You may review copies of the referenced service information at the FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA. For information on the availability of this material at the FAA, call (781) 238-7125.

## **Examining the AD Docket**

You may examine the AD docket on the Internet at <http://www.regulations.gov>; or in person at the Docket Management Facility 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 address for the Docket Office (phone: (800) 647-5527) is Document Management Facility, 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:** Jason Yang, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: (781) 238-7747; fax: (781) 238-7199; email: [jason.yang@faa.gov](mailto:jason.yang@faa.gov).

## **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 published in the Federal Register on May 26, 2011 (76 FR 30573). That NPRM proposed to require ECI or spot FPI of the stages 1-2 seal teeth of the HPC stages 2-5 spool for cracks and to prohibit installation of HPC stator stage 1 interstage seals that are not pregrooved to prevent heavy rubs.

### **Comments**

We gave the public the opportunity to participate in developing this AD. The following presents the comments received on the proposal and the FAA's response to each comment.

### **Remove Reference to "Uncontained Engine Failure and Damage to the Airplane"**

Two commenters, Boeing Company (Boeing) and GE, wanted us to remove the reference to "uncontained engine failure, and damage to the airplane" from the Summary and Unsafe Condition paragraphs. GE claimed that all instances to date of material liberation have been contained. The commenters further stated that it has been demonstrated that once the crack reaches the aft tooth, it turns circumferentially, which minimizes the amount of material liberated.

We disagree. While all of the fractures to date have resulted in small pieces that are contained by the engine case, the direction that the crack will propagate cannot be determined with great certainty. Cracks propagating into the seal will result in a more substantial failure of the HPC stages 1-2 seal. Historical experience has shown that catastrophic failure of critical rotating engine parts can result in an uncontained engine failure that can damage the airplane. We did not change the AD based on this comment.

### **Request Change to Service Bulletin Reference**

Two commenters, Boeing and GE, requested that we change the "Previous Credit" section by replacing "SB GE90-100 S/B 72-0320, Revision 01, dated May 11, 2010 or earlier revision" with "SB GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010, or earlier version." The commenters indicated that the NPRM (76 FR 30573, May 26, 2011) mandates accomplishment of GE Service Bulletin (SB) GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010, and therefore it would be consistent to provide credit for accomplishment of GE SB GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010, or an earlier revision.

We agree. We changed the reference in the service bulletin to Revision 02 in the Previous Credit paragraph.

### **Request To Allow Reinstallation of Previously Worn Seals**

Three commenters, FedEx, Japan Airlines and All Nippon Airways, requested that the FAA allow the installation of previously worn seals. Use of these seals is allowed by GE SB GE90-100 S/B 72-0360.

We agree. We replaced the Installation Prohibition paragraph in the AD with a new paragraph called "Installation of HPC Stator Stage 1 Interstage Seals" to allow for the installation of previously worn seals. Refer to GE SB GE90-100 S/B 72-360, Revision 04, dated November 7, 2011, for seals eligible for installation.

### **Request Change in Installation Prohibition Section**

FedEx requested that wording in the "Installation Prohibition" section that states "do not install any HPC forward case unless it has an HPC stator stage 1 interstage seals, P/N 351-109-503-0" be changed to "allow the installation of previously worn seals and/or potential future (post-SB 72-0358) interstage seal configurations." FedEx indicated that the current wording unnecessarily prohibits the installation of any forthcoming design improvements to the interstage seals that GE might develop.

We partially agree. We agree with use of a previously worn interstage seal because a worn interstage seal could prevent the HPC stages 2-5 spool from cracking. We disagree with use of the phrase "potential future (post-SB 72-0358) interstage seal configurations" because the AD compliance section can only mandate the use of currently approved designs. We added a new paragraph called "Installation of HPC Stator Stage 1 Interstage Seals," which allows for the installation of previously worn seals.

### **Remove Reference to Pregrooved Seals**

GE stated that the AD requires the HPC module be reassembled with pregrooved seals. GE indicated that this requirement to use pregrooved seals is beyond the inspection requirements in GE90-100 S/B 72-0320. GE said that the inclusion of pregrooved seal references would cause disagreement with the "Relevant Service Information" and "Previous Credit" paragraphs which refer only to the inspection requirement in GE90-100 S/B 72-0320.

We disagree. This AD is issued to mitigate a safety issue caused by failure of the HPC stages 2-5 spool stages 1-2 seal. Reassembling the HPC module with a pregrooved seal would prevent the heavy rubs that result in HPC stages 2-5 spool stages 1-2 seal failure. We did not change the AD based on this comment.

### **Request Correction to Address**

GE requested that its address in the Addresses paragraph be revised to correct a missing space. We agree. We corrected the GE address in the Addresses paragraph of the AD.

### **Conclusion**

We reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting the AD with the changes described previously and minor editorial changes. We have determined that these minor changes:

- Are consistent with the intent that was proposed in the NPRM (76 FR 30573, May 26, 2011) for correcting the unsafe condition; and

- Do not add any additional burden upon the public than was already proposed in the NPRM (76 FR 30573, May 26, 2011).

We also determined that these changes will not increase the economic burden on any operator or increase the scope of the AD.

### **Costs of Compliance**

We estimate that this AD affects 19 GE90-110B1 and GE90-115B engines installed on airplanes of U.S. registry. We also estimate that it will take about 2 work-hours per engine to perform the proposed actions, and that the average labor rate is \$85 per work-hour. Required parts will cost about \$9,857 per engine. Based on these figures, we estimate the total cost of this AD to U.S. operators to be \$190,513.

### **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**

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 that this AD:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),
- (3) Will not affect intrastate aviation in Alaska, and
- (4) 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):



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**2011-26-11 General Electric Company:** Amendment 39-16901; Docket No. FAA-2011-0278; Directorate Identifier 2010-NE-10-AD.

**(a) Effective Date**

This AD is effective February 3, 2012.

**(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to General Electric Company (GE) GE90-110B1 and GE90-115B turbofan engines with high-pressure compressor (HPC) stages 2-5 spool, part number (P/Ns) 351-103-106-0, 351-103-107-0, 351-103-108-0, 351-103-109-0, 351-103-141-0, 351-103-142-0, 351-103-143-0, or 351-103-144-0, installed.

**(d) Unsafe Condition**

This AD was prompted by an aborted takeoff caused by liberation of small pieces from HPC stages 1-2 seal teeth and two shop findings of cracks in the seal teeth. We are issuing this AD to detect cracks in the HPC stages 1-2 seal teeth due to heavy rubs that could result in failure of the seal of the HPC stages 2-5 spool, uncontained engine failure, and damage to the airplane.

**(e) Compliance**

Comply with this AD when the HPC forward case half is removed from the engine after the effective date of this AD, unless the actions have already been done.

**(f) Inspection**

Perform an eddy current inspection (ECI) or a fluorescent penetrant inspection (FPI) of the HPC stages 1-2 seal teeth using paragraphs 3.B. or 3.C. of GE Service Bulletin (SB) GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010.

**(g) Remove Cracked Spools**

Remove from service HPC stages 2-5 spool with cracked stages 1-2 seal teeth before further flight.

## **(h) Previous Credit**

An ECI or FPI inspection performed before the effective date of this AD using GE SB GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010, or earlier revision, satisfies the inspection requirement of this AD.

## **(i) Installation of HPC Stator Stage 1 Interstage Seals**

(1) After the effective date of this AD, do not install or reinstall any HPC forward case unless it is equipped with either:

(i) HPC stator stage 1 interstage seals, P/N 351-109-503-0;

(ii) HPC stator stage 1 interstage seals, P/N 351-109-502-0, with the grooves on seals that meet the dimensional requirements defined in paragraph 3.D.(1) of GE SB GE90-100 S/B 72-360, Revision 04, dated November 7, 2011.

(iii) A mixture of the HPC stator stage 1 interstage seals listed in paragraphs (i)(1)(i) and (i)(1)(ii) of this AD.

## **(j) Alternative Methods of Compliance (AMOCs)**

The Manager, Engine Certification Office, may approve AMOCs for this AD. Use the procedures found in 14 CFR 39.19 to make your request.

## **(k) Related Information**

(1) Contact Jason Yang, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: (781) 238-7747; fax: (781) 238-7199; email: jason.yang@faa.gov, for more information about this AD.

(2) GE Service Bulletins GE90-100 S/B 72-0320, Revision 02, dated October 1, 2010, and GE90-100 S/B 72-0360, Revision 04, November 7, 2011, pertain to the subject of this AD. Contact General Electric, GE-Aviation, Room 285, 1 Neumann Way, Cincinnati, Ohio 45215; email: geae.aoc@ge.com; phone: (513) 552-3272; fax: (513) 552-3329; for a copy of this service information.

## **(l) Material Incorporated by Reference**

(1) You must use the following service information to do the actions required by this AD, unless the AD specifies otherwise. The Director of the Federal Register approved the incorporation by reference (IBR) under 5 U.S.C. 552(a) and 1 CFR part 51 of the following service information:

(i) General Electric Company (GE) Service Bulletin (SB) GE90-100 S/B 72-0320, Revision 02, October 1, 2010; and

(ii) GE SB GE90-100 S/B 72-0360, Revision 04, dated November, 7, 2011.

(2) For service information identified in this AD, contact General Electric, GE-Aviation, Room 285, 1 Neumann Way, Cincinnati, Ohio 45215; email: geae.aoc@ge.com; phone: (513) 552-3272; fax: (513) 552-3329.

(3) You may review copies of the referenced service information at the FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA. For information on the availability of this material at the FAA, call (781) 238-7125.

(4) You may also review copies of the service information incorporated by reference 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 December 15, 2011.  
Thomas A. Boudreau,  
Acting Manager, Engine & Propeller Directorate,  
Aircraft Certification Service.