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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2010-0068; Directorate Identifier 2010-NE-05-AD; Amendment 39-16930; AD 2012-02-07]

RIN 2120-AA64

Airworthiness Directives; General Electric Company Turbofan Engines

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: We are superseding two existing airworthiness directives (ADs) for General Electric Company (GE) CF6-45 and CF6-50 series turbofan engines with certain low-pressure turbine (LPT) rotor stage 3 disks installed. The existing ADs currently require inspections of high-pressure turbine (HPT) and LPT rotors, engine checks, and vibration surveys. This new AD retains the requirements of the two ADs being superseded, adds an optional LPT rotor stage 3 disk removal after a failed HPT blade borescope inspection (BSI) or a failed engine core vibration survey, establishes a new lower life limit for the affected LPT rotor stage 3 disks, and requires removing these disks from service at times determined by a drawdown plan. This AD was prompted by the determination that a new lower life limit for the LPT rotor stage 3 disks is necessary. We are issuing this AD to prevent critical life-limited rotating engine part failure, which could result in an uncontained engine failure and damage to the airplane.

DATES: This AD is effective March 6, 2012.

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of February 22, 2011 (76 FR 6323, February 4, 2011).

ADDRESSES: For service information identified in this AD, contact General Electric Company, GE-Aviation, Room 285, 1 Neumann Way, Cincinnati, OH 45215, phone: (513) 552-3272; email: geae.aoc@ge.com. 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: Tomasz Rakowski, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: (781) 238-7735; fax: (781) 238-7199; email: tomasz.rakowski@faa.gov.

SUPPLEMENTARY INFORMATION:

Discussion

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to supersede AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) and AD 2011-18-01, Amendment 39-16783 (76 FR 52213, August 22, 2011). Those ADs apply to the specified products. The NPRM published in the Federal Register on October 19, 2011 (76 FR 64844). That NPRM proposed to retain the requirements of AD 2011-02-07 and AD 2011-18-01, except that reporting to the FAA would no longer be required and there would be an optional LPT rotor stage 3 disk removal after a failed HPT blade BSI or a failed engine core vibration survey. That NPRM also proposed to establish a new lower life limit for the LPT rotor stage 3 disk part numbers listed in Table 1 of the proposed AD, and proposed to require removing these disks from service at times determined by a drawdown plan.

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.

Support for the NPRM as Written

One commenter, The Boeing Company, supports the NPRM (76 FR 64844, October 19, 2011) as written.

Request To Allow Credit for Vibration Surveys Performed in a Test Cell

One commenter, MTU Maintenance Hannover GmbH, requested that we add a paragraph that allows credit for performing vibration surveys in a test cell, as meeting the AD vibration survey requirements.

We agree. We added paragraph (k)(8) to the AD, which states "Vibration surveys carried out in an engine test cell as part of an engine manual performance run fulfill the vibration survey requirements of paragraphs (k)(2) through (k)(3) of this AD."

Request To Add a Requirement for Raw Exhaust Gas Temperature (EGT) Trend Data Point Exceedance

One commenter, Evergreen International Airlines, requested that we add a requirement that two consecutive raw EGT trend data point exceedances must be confirmed by a corresponding shift of other engine parameters to trigger the HPT blade BSI.

We partially agree. We agree that EGT system error should not force a BSI of turbine blades. But we disagree with troubleshooting the EGT raw data points once the EGT system error was ruled out. We added paragraph (o)(4) to the AD to state that, for the purposes of this AD, a raw EGT trend data point above the smoothed average is a confirmed temperature reading over the rolling average of EGT readings that is not a result of EGT system error. We also rearranged the wording in paragraph (iv) in Table 2 of the AD for clarification.

Correction to Engine Model CF6-50-E2D

Since we issued the NPRM (76 FR 67844, October 19, 2011), we discovered that, in applicability paragraph (c), engine model CF6-50-E2D was incorrect. We corrected it to read CF6-50E2B in 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. We have determined that these minor changes:

Are consistent with the intent that was proposed in the NPRM (76 FR 64844, October 19, 2011) for correcting the unsafe condition; and

Do not add any additional burden upon the public than was already proposed in the NPRM.

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 will affect 387 CF6-45 and CF6-50 series turbofan engines installed on airplanes of U.S. registry. We also estimate that it will take about 8 work-hours to perform the HPT blade inspection, 6 work-hours to perform a vibration survey, 4 work-hours to perform an ultrasonic inspection, 2 work-hours to perform an EGT resistance check, 1 work-hour to perform an EGT thermocouple inspection, and 7 work-hours to clean and perform an fluorescent-penetrant inspection of the LPT rotor stage 3 disk for each engine. The average labor rate is $85 per work-hour. The cost estimate for the work just described was covered in the two ADs we are superseding. For this AD, we estimate that a replacement LPT rotor stage 3 disk prorated part cost is $75,000. Based on these figures, we estimate the total cost of this AD to U.S. operators to be $29,025,000.

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 have 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 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]

The FAA amends § 39.13 by removing airworthiness directive (AD) 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) and AD 2011-18-01, Amendment 39-16783 (76 FR 52213, August 22, 2011), and adding the following new AD:

2012-02-07 General Electric Company: Amendment 39-16930; Docket No. FAA-2010-0068; Directorate Identifier 2010-NE-05-AD.

(a) Effective Date

This airworthiness directive (AD) is effective March 6, 2012.

(b) Affected ADs

This AD supersedes AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) and AD 2011-18-01, Amendment 39-16783 (76 FR 52213, August 22, 2011).

(c) Applicability

This AD applies to General Electric Company (GE) CF6-45A, CF6-45A2, CF6-50A, CF6-50C, CF6-50CA, CF6-50C1, CF6-50C2, CF6-50C2B, CF6-50C2D, CF6-50E, CF6-50E1, CF6-50E2, and CF6-50E2B turbofan engines, including engines marked on the engine data plate as CF6-50C2-F and CF6-50C2-R, with any of the low-pressure turbine (LPT) rotor stage 3 disk part numbers listed in Table 1 of this AD installed.

Table 1–Applicable LPT Rotor Stage 3 Disk Part Numbers

9061M23P06	9061M23P07	9061M23P08	9061M23P09	9224M75P01
9061M23P10	1473M90P01	1473M90P02	1473M90P03	1473M90P04
9061M23P12	9061M23P14	9061M23P15	9061M23P16	1479M75P01
1479M75P02	1479M75P03	1479M75P04	1479M75P05	1479M75P06
1479M75P07	1479M75P08	1479M75P09	1479M75P11	1479M75P13
1479M75P14	N/A	N/A	N/A	N/A

(d) Unsafe Condition

This AD was prompted by the determination that a new lower life limit for the LPT rotor stage 3 disks listed in Table 1 of this AD is necessary. We are issuing this AD to prevent critical life-limited rotating engine part failure, which could result in an uncontained engine failure and damage to the airplane.

(e) Compliance

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

(f) Borescope Inspections (BSI) of High-Pressure Turbine (HPT) Rotor Stage 1 and Stage 2 Blades

For the BSIs required by paragraphs (f)(1), (f)(2), and (f)(3) of this AD, inspect the blades from the forward and aft directions. Inspect all areas of the blade airfoil. Your inspection must include blade leading and trailing edges and their convex and concave airfoil surfaces. Inspect for signs of impact, cracking, burning, damage, or distress.

(1) Perform an initial BSI of the HPT rotor stage 1 and stage 2 blades within 10 cycles after the effective date of this AD.

(2) Thereafter, repeat the BSI of the HPT rotor stage 1 and stage 2 blades within every 75 cycles since last inspection (CSLI).

(3) Borescope-inspect the HPT rotor stage 1 and stage 2 blades within the cycle limits after the engine has experienced any of the events specified in Table 2 of this AD.

(4) Remove any engine from service before further flight if the engine fails any of the BSIs required by this AD.

Table 2–Conditional BSI Criteria

If the engine has experienced:	Then borescope-inspect:
(i) An exhaust gas temperature (EGT) above redline.	Within 10 cycles.
(ii) A shift in the smoothed EGT trending data that exceeds 18 °F (10 °C), but is less than or equal to 36 °F (20 °C).	Within 10 cycles.
(iii) A shift in the smoothed EGT trending data that exceeds 36 °F (20 °C)	Before further flight.
(iv) Two consecutive raw EGT trend data points that exceed 18 °F (10 °C), but is less than or equal to 36 °F (20 °C), above the smoothed average.	Within 10 cycles.
(v) Two consecutive raw EGT trend data points that exceed 36 °F (20 °C) above the smoothed average	Before further flight.

(g) Actions Required for Engines With Damaged HPT Rotor Blades

For those engines that fail any BSI requirements of this AD, before returning the engine to service:

(1) Remove the LPT rotor stage 3 disk from service; or

(2) Perform a fluorescent-penetrant inspection (FPI) of the inner diameter surface forward cone body (forward spacer arm) of the LPT rotor stage 3 disk as specified in paragraphs (l)(1)(i) through (l)(1)(iii) of this AD.

(h) EGT Thermocouple Probe Inspections

(1) Inspect the EGT thermocouple probe for damage within 50 cycles after the effective date of this AD or before accumulating 750 CSLI, whichever occurs later.

(2) Thereafter, re-inspect the EGT thermocouple probe for damage within every 750 CSLI.

(3) If any EGT thermocouple probe shows wear through the thermocouple guide sleeve, remove and replace the EGT thermocouple probe before further flight, and ensure the turbine mid-frame liner does not contact the EGT thermocouple probe.

(i) EGT System Resistance Check Inspections

(1) Perform an EGT system resistance check within 50 cycles from the effective date of this AD or before accumulating 750 cycles since the last resistance check on the EGT system, whichever occurs later.

(2) Thereafter, repeat the EGT system resistance check within every 750 cycles since the last resistance check.

(3) Remove and replace, or repair any EGT system component that fails the resistance system check before further flight.

(j) Ultrasonic Inspection (UI) of the LPT Rotor Stage 3 Disk Forward Spacer Arm

Within 75 cycles after the effective date of this AD, perform a UI of the forward spacer arm of the LPT rotor stage 3 disk. Use Appendix A of GE Service Bulletin (SB) No. CF6-50 S/B 72-1312, Revision 1, dated October 18, 2010, paragraph 4. except for paragraph 4.(12), to do the UI.

(k) Engine Core Vibration Survey

(1) Within 75 cycles after the effective date of this AD, perform an initial engine core vibration survey.

(2) Use about a one-minute acceleration and a one-minute deceleration of the engine between ground idle and 84% N2 (about 8,250 rpm) to perform the engine core vibration survey.

(3) Use a spectral/trim balance analyzer or equivalent to measure the N2 rotor vibration.

(4) If the vibration level is above 5 mils Double Amplitude then, before further flight, remove the engine from service.

(5) For those engines that fail any engine core vibration survey requirements of this AD, then before returning the engine to service:

(i) Remove the LPT rotor stage 3 disk from service; or

(ii) Perform an FPI of the inner diameter surface forward spacer arm of the LPT rotor stage 3 disk as specified in paragraphs (l)(1)(i) through (l)(1)(iii) of this AD.

(6) Thereafter, within every 350 cycles since the last engine core vibration survey, perform the engine core vibration survey as required in paragraphs (k)(1) through (k)(5) of this AD.

(7) If the engine has experienced any vibration reported by maintenance or flight crew that is suspected to be caused by the engine core (N2), perform the engine core vibration survey as required in paragraphs (k)(1) through (k)(5) of this AD within 10 cycles after the report.

(8) Vibration surveys carried out in an engine test cell as part of an engine manual performance run fulfill the vibration survey requirements of paragraphs (k)(2) through (k)(3) of this AD.

(l) Initial and Repetitive FPI of LPT Rotor Stage 3 Disks

(1) At the next shop visit after the effective date of this AD:

(i) Clean the LPT rotor stage 3 disk forward spacer arm, including the use of a wet-abrasive blast, to eliminate residual or background fluorescence.

(ii) Perform an FPI of the LPT rotor stage 3 disk forward spacer arm for cracks and for a band of fluorescence. Include all areas of the disk forward spacer arm and the inner diameter surface forward spacer arm of the LPT rotor stage 3 disk.

(iii) Remove the disk from service before further flight if a crack or a band of fluorescence is present.

(2) Thereafter, clean and perform an FPI of the LPT rotor stage 3 disk forward spacer arm, as specified in paragraphs (l)(1)(i) through (l)(1)(iii) of this AD, at each engine shop visit that occurs after 1,000 cycles since the last FPI of the LPT rotor stage 3 disk forward spacer arm.

(m) Removal of LPT Rotor Stage 3 Disks

Remove LPT rotor stage 3 disks listed in Table 1 from service as follows:

(1) For disks that have fewer than 3,200 flight cycles since new (CSN) on the effective date of this AD, remove the disk from service before exceeding 6,200 CSN.

(2) For disks that have 3,200 CSN or more on the effective date of this AD, do the following:

(i) If the engine has a shop visit before the disk exceeds 6,200 CSN, remove the disk from service before exceeding 6,200 CSN.

(ii) If the engine does not have a shop visit before the disk exceeds 6,200 CSN, remove the disk from service at the next shop visit after 6,200 CSN, not to exceed 3,000 cycles from the effective date of this AD.

(n) Installation Prohibition

(1) After the effective date of this AD, do not install or reinstall in any engine any LPT rotor stage 3 disk that exceeds the new life limit of 6,200 CSN.

(2) Remove from service any LPT rotor stage 3 disk that is installed or re-installed after the effective date of this AD, before the disk exceeds the new life limit of 6,200 CSN.

(o) Definitions

(1) For the purposes of this AD, an EGT above redline is a confirmed over-temperature indication that is not a result of EGT system error.

(2) For the purposes of this AD, a shift in the smoothed EGT trending data is a shift in a rolling average of EGT readings that can be confirmed by a corresponding shift in the trending of fuel flow or fan speed/core speed (N1/N2) relationship. You can find further guidance about evaluating EGT trend data in GE Company Service Rep Tip 373 "Guidelines For Parameter Trend Monitoring."

(3) For the purposes of this AD, an engine shop visit is the induction of an engine into the shop after the effective date of this AD, where the separation of a major engine flange occurs; except the following maintenance actions, or any combination, are not considered engine shop visits:

(i) Induction of an engine into a shop solely for removal of the compressor top or bottom case for airfoil maintenance or variable stator vane bushing replacement.

(ii) Induction of an engine into a shop solely for removal or replacement of the stage 1 fan disk.

(iii) Induction of an engine into a shop solely for replacement of the turbine rear frame.

(iv) Induction of an engine into a shop solely for replacement of the accessory gearbox or transfer gearbox, or both.

(v) Induction of an engine into a shop solely for replacement of the fan forward case.

(4) For the purposes of this AD, a raw EGT trend data point above the smoothed average is a confirmed temperature reading over the rolling average of EGT readings that is not a result of EGT system error.

(p) Previous Credit

(1) A BSI performed before the effective date of this AD using AD 2010-06-15, Amendment 39-16240 (75 FR 12661, March 17, 2010) or AD 2010-12-10, Amendment 39-16331 (75 FR 32649, June 9, 2010) or AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) within the last 75 cycles, satisfies the initial BSI requirement in paragraph (f)(1) of this AD.

(2) A UI performed before the effective date of this AD using AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) or GE SB No. CF6-50 S/B 72-1312, dated August 9, 2010 or GE SB No. CF6-50 S/B 72-1312 Revision 1, dated October 18, 2010, satisfies the inspection requirement in paragraph (j) of this AD.

(3) An engine core vibration survey performed before the effective date of this AD using AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011) or GE SB No. CF6-50 S/B 72-1313, dated August 9, 2010 or GE SB No. CF6-50 S/B 72-1313 Revision 1, dated October 18, 2010, within the last 350 cycles, satisfies the initial survey requirement in paragraphs (k)(1) through (k)(5) of this AD.

(4) An FPI of the LPT rotor stage 3 disk forward spacer arm performed before the effective date of this AD using AD 2011-18-01, Amendment 39-16783 (75 FR 52213, August 22, 2011), within the last 1,000 flight cycles of the LPT rotor stage 3 disk, satisfies the initial inspection requirements in paragraphs (l)(1)(i) through (l)(1)(iii) of this AD.

(q) Alternative Methods of Compliance (AMOCs)

(1) AMOCs previously approved for AD 2010-06-15, Amendment 39-16240 (75 FR 12661, March 17, 2010) are not approved for this AD. However, AMOCs previously approved for AD 2010-12-10, Amendment 39-16331 (75 FR 32649, June 9, 2010), AD 2011-02-07, Amendment 39-16580 (76 FR 6323, February 4, 2011), or AD 2011-18-01, Amendment 39-16783 (76 FR 52213, August 22, 2011) are approved for this AD.

(2) The Manager, Engine Certification Office, may approve alternative methods of compliance for this AD. Use the procedures found in 14 CFR 39.19 to make your request.

(r) Related Information

(1) For more information about this AD, contact Tomasz Rakowski, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: (781) 238-7735; fax: (781) 238-7199; email: tomasz.rakowski@faa.gov.

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

(s) Material Incorporated by Reference

(1) You must use the following service information to do the UIs 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 on July 22, 2011: General Electric Company Service Bulletin No. CF6-50 S/B 72-1312 Revision 1, dated October 18, 2010.

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

(3) You may review copies of the 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 that is 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 January 20, 2012.

Peter A. White,
Manager, Engine & Propeller Directorate,
Aircraft Certification Service.