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Appendix 4

ADWKS Stg 14 SWG.doc
4/18/03

Revised July 8,1998

Aircraft Certification Service AD PROPOSAL WORKSHEET

DOCKET NUMBER: *03-NE-18*
TECH WRITER:

2003 SEP 21 A 10:27
LIST OF IMPLEMENTATION
DOCKETS

PROPOSED ACTION:

- Telegraphic AD
- Priority Letter
- Immediately Adopted AD
- Federal Register version of Telegraphic AD or Priority Letter
- Final Rule after NPRM (*See Note on next page)
- Notice of Proposed Rulemaking
- Other _____

FAA-04-19144-3

Is this proposed action one of the following? (Check if applicable):

Supercedure of an AD Revision of an AD Supplemental NPRM

1. Product Manufacturer.

General Electric Company

2. Applies to (models, serial numbers or references, installations, part numbers, as applicable).

General Electric Company CF6-80C2 stage 11-14 spool shafts part numbers 9380M30G07/G08/G09/G10/G12, 1509M71G02/G03/G04/G05, 1531M21G01/G02/G04, 1509M71G06/G07/G08/G11/G12, and 1703M74G01/G03 that have been repaired in the stage 14 seal wire groove using a circumferential cut. CF6-80C2 series turbofan engines are installed on Airbus Industrie A300 and A310, and Boeing 747, 767 and MD-11 series airplanes.

Also affected are:

All General Electric Company CF6-80E1 stage 11-14 spool shafts part numbers 1644M99G03, 1509M71G11/G12/G13, and 1703M74G01/G03 which have been repaired in the stage 14 seal wire groove using a circumferential cut. GE CF6-80E1 series turbofan engines are installed on Airbus Industrie A330 series airplanes.

3. ACO project engineer.

Name/Title/Branch: Karen Curtis, Aerospace Engineer, ANE-141
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4. Directorate Project Officer (if applicable) and title.

Name/Title/Branch: Karen Grant, ANE-110

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5. If this action is a Final Rule after NPRM, list the docket number and the number of public comments received. Fill out the "AD Proposal Worksheet Attachment: Disposition of Comments."

Docket No.:

Number of comments received:

***NOTE: For Final Rules after NPRM, if any of the following requested information (in Questions 6 through 23) is unchanged from the NPRM, you may so indicate this in the space provided, rather than repeat the information.)**

6a. Describe the unsafe condition.

The actions specified by this AD are intended to prevent failure of certain high pressure compressor (HPC) rotor stage 14 disks, which could result in an uncontained engine failure and damage to the airplane.

6b. Describe the cause of the unsafe condition.

Low-cycle fatigue failure of the HPC rotor stage 14 disk that could result in an uncontained engine failure

6c. Describe the occurrences that prompted this proposed AD action.

A circumferential cut repair was developed in 1996 to remove damaged material from the seal wire groove in the outer rim of certain CF6-80C2 and CF6-80E1 engine HPC stage 14 disks of the 11-14 spool shaft, due to seal wire wear from engine operation. At the time of the development of the repair geometry, analysis showed there was no impact on spool shaft life. An updated stress analysis in 1999 showed that, in fact, the circumferential cut geometry resulted in a stress concentration. This high stress concentration could result in a service life for the stage 14 disk below the published life of the 11-14 spool shaft, depending on the part number and the location of the repair.

6d. How many such occurrences have been reported?

GE reports that as many as 128 CF6-80C2 HPC 11-14 spool shafts and 40 CF6-80E1 HPC 11-14 spool shafts have had this rework.

6e. On what date did the FAA become aware of the situation?

February 8, 2002

7. Was this proposed action prompted by a manufacturer's quality control (QC) problem? If so, is a reporting requirement needed in the AD to determine the scope of the problem? *(If yes to either of these questions, coordinate with cognizant MIDO.)*

No.

8. Was this proposed action prompted by the use of suspected unapproved parts (SUP)?

No.

9. Is this action related to an NTSB safety recommendation? If yes, attach a copy of that recommendation and the FAA response.

No.

10. If this proposed action will revise, supersede, or withdraw an existing AD, please provide the following information about the existing AD.

Not applicable

11a. What are the proposed types of corrective actions (i.e., one-time inspections, recurring inspections, terminating actions, modifications, operational restrictions, etc.) **AND** What are the corresponding compliance times?

(See attached "SAMPLE: ProposeError! Bookmark not defined.d Corrective Action" for an example of how this information should be provided.)

§ Have you considered all of the aspects of what you are proposing, such as overlapping requirements, the effect these actions will have on other existing requirements, and other sensitive issues? *(Be as specific as possible.)*

[Note to Word users: The area below is formatted as a "Table." It allows you to insert as much information as needed into each cell. To move to the next cell, use the Tab key.]

SERVICE INFORMATION (Attach 2 copies)	ACTION	INITIAL COMPLIANCE THRESHOLD	REPETITIVE INTERVAL (if any)	TERMINATING ACTION (if any)
CF6-80C2 S/B 72-1052, original release dated October 14, 2002	Inspect for circumferential repair cuts in the stage 14 disk in accordance with Paragraph 3.A.(1). Determine if the spool is repairable in accordance with paragraph 3.A.(2)(a) and (b).	At piece part level, not to exceed the service caps in Table 1.	None.	If not repairable, replace with a serviceable part. If repairs allowed, repair in accordance with Paragraph 3.B.
	OR			
	Inspect for circumferential repair cuts in the stage 14 disk in accordance with Paragraph 3.A.(1). Determine location of cut. Remove and replace spool with serviceable part.	At piece part level, not to exceed the service caps in Table 2.	None.	Replace with serviceable part.
CF6-80E1 S/B 72-0232, original release dated October 14, 2002	Inspect for circumferential repair cuts in the stage 14 disk in accordance with Paragraph 3.A.(1). Determine if spool is repairable in accordance with paragraph 3.A.(2)(a) and (b).	At piece part level, not to exceed the service cap in Table 3.	None.	If not repairable, replace with a serviceable part. If repairs allowed, repair in accordance with Paragraph 3.B.

Table 1: CF6-80C2 Compliance Time for removal to allow inspection and repair or replacement of HPC 11-14 spool shafts with circumferential cut repairs in the stage 14 seal wire grooves:

Forging Group	Location of Cut in the stage 14 disk rim	Remove, Inspect and Repair, if repairable, before the following Cycles-since-Repair (CSR)
Group 1	Aft	3,600
Group 1	Forward	7,100
Group 2	Aft	13,700

Table 2: CF6-80C2 Compliance Time for removal in order to inspect and replace, if necessary, HPC 11-14 spool shafts with circumferential cut repairs in the stage 14 seal wire grooves:

Forging Group	Location of Cut in the stage 14 disk rim	Remove, Inspect and Replace before the following Cycles-since-Repair (CSR)
Group 1	Aft	4,200
Group 1	Forward	7,100
Group 2	Aft	13,700

For Group 2 spool shafts with circumferential cut repairs in the Forward location, remove from service at published part life limit. No repair is required.

If cuts exist in the area around the load lug slots (Area X of Figure 1 of SB 72-1052), the spool shaft is not repairable, and must be replaced.

If the location of the repair is unknown, then the spool shaft must be removed for inspection before exceeding the lowest applicable limit in Table 2 (4,200 CSR for Group1, 13,700 CSR for Group 2).

Spools that exceed the service cap in Table 2 are not repairable. Spools that exceed the service cap in Table 1 or Table 2 on the effective date of the AD must be removed and replaced with a serviceable spool within 420 cycles in service after the effective date of this AD, or by the published part life limit, which ever occurs first.

Table 3: CF6-80E1 Compliance Time for removal to allow inspection and repair or replacement of HPC 11-14 spool shafts with circumferential cut repairs in the stage 14 seal wire grooves:

Location of Cut in the stage 14 disk rim	Remove, Inspect and Repair or replace, if necessary, before the following Cycles-since-Repair (CSR)
Aft	11,600

For spool shafts with circumferential cut repairs in the Forward location, remove from service at published part life limit. No repair is required.

If cuts exist in the area around the locking lug slots (Area X of Figure 1 of SB 72-0232) in the Forward or Aft location, the spool shaft is not repairable, and must be replaced.

If the location of the repair is unknown, then the spool shaft must be removed for inspection before exceeding 11,600 CSR.

Spools that exceed the service cap in Table 3 on the effective date of the AD must be removed and replaced with a serviceable spool within 420 cycles in service after the effective date of this AD, or by the published part life limit, which ever occurs first.

Definitions of forging Group for CF6-80C2 engines :

Forging Group	Grain Size	Stage 11-14 Spool Shaft Part Numbers
Group 1	Coarse	9380M30G07/G08/G09/G10/G12 and 1509M71G02/G03/G04/G05
Group 2	Fine	1531M21G01/G02/G04, 1509M71G06/G07/G08/G11/G12, and 1703M74G01/G03

Definitions of Piece part:

For the purpose of this AD, piece part exposure of the 11-14 Spool Shaft is disassembly and removal of the 11-14 Spool Shaft from the any part of the HPC rotor structure, regardless of whether any blades, blade retainers, locking lugs, bolts, nuts, bolt retainers, balance weights, wear strips or seals remain assembled to the spool shaft.

Definition of Location of Cut:

For the purpose of this AD, if a spool shaft has the circumferential cut in the stage 14 disk rim on either side of the seal wire groove on the forward disk rim (forward of the installed blades), the circumferential cut is in the location called Forward.

If a spool shaft has the circumferential cut in the stage 14 disk rim on either side of the seal wire groove on the aft disk rim (aft of the installed blades), the cut is in the location called Aft.

Definition of cycles since repair (CSR):

For the purpose of this AD, CSR is defined as the difference between the current cycles since new (CSN) and the CSN at the time of the prior circumferential cut repair.

11b. How was the compliance time(s) established?

The compliance times were established using low cycle fatigue life analysis.

11c. Has the manufacturer issued relevant service information? If so, attach 2 copies. (Copies must be legible and of very good quality. Originals are preferred.)

CF6-80C2 S/B 72-1052, original release dated October 14, 2002

CF6-80E1 S/B 72-0232, original release dated October 14, 2002

11d. If this action relates to a non-U.S. product, has the foreign civil airworthiness authority (FCAA) issued a parallel AD? If yes, please provide the following information:

No.

11e. Are there any differences between the manufacturer's service information referenced above, other AD's (foreign or U.S.), and the requirements of this AD? (For example, does the compliance time of this AD action differ significantly from that recommended in the referenced service information?) If so, explain these differences and the reasons for each.

Yes. The GE SB's recommend that spools that are beyond the service cap on the release date of the SB be replaced prior to exceeding 6 months from the release date of the SB, which would be

April 14, 2003. The NPRM proposes prior to exceeding 420 cycles in service after the effective date of the AD or prior to exceeding the published life limit, which ever is sooner.

11f. Are notes, drawings, or diagrams needed in the AD to explain procedures or differences from the service instructions? (If so, please explain below or attach a copy.)

No.

12. Number of aircraft/products that will be affected? (Use numerical figures).

-80C2	128 total	24 domestic	104 foreign
-80E1	40 total	0 domestic	40 foreign

13. Provide the number of work hours/associated costs per aircraft/product for **EACH** proposed corrective action (i.e., inspection, modification, etc.) in the table below.

FOR THE PROPOSED AD.

Type of Corrective Action	Number of Workhours per Engine	Number of U.S. engines Affected	Parts Costs per Aircraft
Inspect for location of prior circumferential repairs at piece part exposure and determine the number of CSR	1	24	-
If repairable, repair in accordance with the accomplishment instructions of the applicable SB	5	21	-
If non-repairable, replace with a serviceable spool shaft	-	3	\$423,070

A total of 24 HPC Stage 11-14 spool shafts are expected to be installed in US registered aircraft. It will take approximately 1 hour to perform the inspections to determine if the spool is repairable for a cost of 1 hr/spool x \$60/hr x 24 spools = \$1400.

21 of the 24 spools are expected to be repairable and it will take approximately 5 hours to perform the repair for a cost of 5 hrs/spool x \$60/hr x 21 spools = \$6300.

3 spools are expected to be determined to be non-repairable and will therefore require replacement with a serviceable spool for a cost of 3 spools x \$423,070 = \$1,269,210. (There is no additional labor cost associated with this replacement because the cost to install the replacement is the same as would have been incurred to re-install the original spool. The inspections are triggered at piece-part exposure so no cost is included for disassembly or reassembly of the HPC rotor.)

The total program cost is estimated to be \$1,276,950.

FOR THE EXISTING AD (i.e., the one to be superseded or revised), **if applicable.**

Type of Corrective Action	Number of Workhours per Engine	Number of U.S. Aircraft Affected	Parts Costs per Aircraft
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Not applicable

14. If parts are **required**, are they available for all aircraft?

Yes. Although GE no longer produces the HPC stage 11-14 spool shaft, used serviceable spool shafts may be available or the newer HPC stage 10-14 spool shaft (new or used) can be installed. The new part cost listed above is for a new HPC stage 10-14 spool shaft.

15. If known, please indicate the number of affected engines that are already in compliance with the proposed inspection, modification, installation, or replacement, etc.

Unknown

16. Should a special flight permit be:

- Permitted
 Permitted with limitations (*List the limitations on a separate sheet.*)
 Prohibited

17. In general, how is the product utilized (i.e., air carrier, general aviation, commuter, military, agri-business, training, etc.)?

Commercial air carriers

18a. If this proposed AD would revise or supersede an existing AD, have alternative methods of compliance (AMOC) been approved for the existing AD?

Not applicable.

18b. If yes, should those AMOC's continue to be considered approved for all or any portion of the proposed AD?

Not applicable.

18c. If yes, state for what portions of the proposed AD the previously approved AMOC's should continue to be considered approved.

Not applicable.

19. With whom outside the FAA has this proposal been discussed (i.e., ATA, NBAA, RAA, AOPA, ALPA, GAMA, etc.)? (*A separate record may need to be submitted to the Rules Docket. See paragraph 3, "Ex parte Contacts," of the AD Manual.*)

NOTE: This item should be completed prior to submission of the AD Proposal Worksheet.

Organization	Person Contacted	Date	Reaction
GE	D. Shoemaker, M. Dann	February, March 2003	Supportive

20. Are there any special considerations or concerns that need to be taken into account in the drafting of this proposal? (Use a separate sheet to detail these items, if necessary.)

No.

21. Do you have reason to believe that this action would be considered "sensitive?" (See Section 15 of the AD Manual for a definition of "sensitive".) If yes, please explain below.

No.

22. Please indicate Yes or No to the following questions:

No Is this considered interim action?

No Do you know of any optional or alternative methods of accomplishing the proposed action?

Yes Have you considered any alternatives to an AD action?

No Are other Directorates involved in any similar actions?

Yes Does this action affect the Presidential fleet?

No Does this action affect the FAA fleet?

N/A Have the proposed procedures been verified (i.e., by MIDO, AEG, ACDO, FSDO)?

23. Check the category that best describes the cause of the unsafe condition addressed by this AD:

Design Problem Quality Control Problem

Operational Maintenance Unapproved Parts

Other (specify):