

[4910-13-P]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 94-ANE-26; Amendment 39-9062; AD 94-22-12]

Airworthiness Directives; Hamilton Standard 14RF, 247F, 14SF, and 6/5500/F Series Propellers

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment supersedes an existing airworthiness directive (AD), applicable to Hamilton Standard 14RF, 247F, 14SF, and 6/5500/F (formerly Hamilton Standard/British Aerospace 6/5500/F) series propellers, that currently requires initial and repetitive inspections of the propeller control unit (PCU) servo ballscrew internal spline (BIS) teeth for wear, and replacement, if necessary, of PCU servo BIS assemblies. This amendment increases the repetitive inspection interval from 500 to 1,500 hours time in service (TIS) since last inspection for propellers that have a ballscrew quill damper installed. This amendment is prompted by the availability of improved hardware that restricts quill motion and enhances the lubrication of the BIS and significantly reduces BIS wear. The actions specified by this AD are intended to prevent inability to control the propeller blade angle due to tooth wear in the PCU servo BIS assembly.

DATES: Effective [Insert date 30 days after date of publication in the **Federal Register**].

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of [Insert date 30 days after date of publication in the **Federal Register**].

ADDRESSES: The service information referenced in this AD may be obtained from Hamilton Standard, One Hamilton Road, Windsor Locks, CT 06096-1010. This information may be examined at the Federal Aviation Administration (FAA), New England Region, Office of the Assistant Chief Counsel, 12 New England Executive Park, Burlington, MA 01803-5299; or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

FOR FURTHER INFORMATION CONTACT: Frank Walsh, Aerospace Engineer, Boston Aircraft Certification Office, FAA, Engine and Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803-5299; telephone (617) 238-7158, fax (617) 238-7199.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) by superseding AD 93-16-02, Amendment 39-8659 (58 FR 44441, August 23, 1993), which is applicable to Hamilton Standard 14RF, 247F, 14SF, and 6/5500/F (formerly Hamilton Standard/British Aerospace 6/5500/F) series propellers, was

published in the **Federal Register** on May 27, 1994 (59 FR 27510). That action proposed to increase the repetitive inspection interval from 500 to 1,500 hours time in service (TIS) since last inspection for propellers that have a ballscrew quill damper installed.

Interested persons have been afforded an opportunity to participate in the making of this amendment. Due consideration has been given to the comments received.

Seven commenters concur with the rule as proposed.

One commenter concurs with the proposal to extend the repetitive inspection interval from 500 to 1,500 hours TIS, but also states that paragraph (a)(5) of the NPRM requires inspection at 1,500 hours TIS if a damper is installed, but previously "new" PCU's were not required to be inspected until 1,800 hours TIS since new. The commenter further states that this interval is not consistent since it is a decrease of 300 hours with the improved hardware, and recommends the interval to be extended to 1,800 hours TIS for new PCU's. The FAA concurs and has revised this final rule accordingly.

The commenter also recommends the following changes to Appendix 1 of the NPRM:

The commenter states that the date of the damper installation should not be required since those receiving a "new" PCU or one from a repair station where the damper was

installed may not have access to the actual installation date. What should be required is an answer to the question, "Damper installed?" (answer either "Yes" or "No"), and if "Yes", and the indication of whether it was installed "at this inspection" or "previously." The FAA concurs and has revised this final rule accordingly.

The commenter states that the requirement to list the aircraft model is not required provided the PCU part number is complete with the dash or "A" number. The FAA concurs and has revised this final rule accordingly.

The commenter states that blanks are not needed for the items "Estimated Time on PCU" and "Actual Time on PCU." What is needed is an indication as to which one of those statements applies to the following: "Time Since New (hours)" and "Time Since Last Ballscrew Inspection/Repair (hours)." The FAA concurs and has revised this final rule accordingly.

The commenter states that there is no requirement to indicate (a reminder to complete) completion of the "pull check" of the PCU quill after it is reinstalled. The FAA concurs and has added this item to Appendix 1 of this final rule.

Two commenters indicate that the installation of the damper had merit and should reduce the PCU's vulnerability to wear. However, the commenters believe that the inspection interval should not be extended to 1,500 hours TIS for the following reasons:

The first commenter states that the root cause or single reason for the ballscrew internal spline wear has not been identified. The Original Equipment Manufacturer (OEM) bench test of the modified ballscrew internal spline quill installation does not demonstrate a test that duplicates actual operation; e.g., there is retaining wire wear due to axial preload from the damper. Also, currently there is inadequate scientific basis for reliance on the test data as there is insufficient field experience data.

The second commenter also states that the specific cause of wear has not been positively identified. The proposed modification does not correct the negative failure modes in the PCU should a wear induced failure occur. Finally, this commenter expresses concern that the field data used to justify the increased inspection interval is being collected only from a small percentage of units in operation.

The FAA does not concur with these comments. The FAA has researched these issues and reviewed the data from numerous tests and investigations that have been conducted to determine the cause of extreme wear when it occurs on a

very small number of splines in service. The FAA has determined that by these tests and investigations a number of factors contribute to how or if the spline joint will wear. These factors include:

Magnitude and direction of vibratory environment.

How well the spline joint is lubricated.

Motion of elements within the joint due to stack up of clearances.

Thickness of chrome plating on spline teeth.

The FAA has therefore determined that there is no single factor for wear of this complex joint. However, the major contributors of the listed factors have been found to be lubrication and axial motion. Laboratory tests and controlled field service data has proven the damper reduces the wear factor by well over 20 times the rate before its installation.

The retaining wire wear is not a phenomenon associated with the damper introduction. The retaining wires generally show some degree of marking (mainly dents in the wire) from the flat end of the ballscrew spline teeth bearing on the round wire. This marking occurs on retaining wires on PCU's with and without dampers installed. After an initial "Seating" of the parts, the retaining wire continues to operate without distress.

Currently, the FAA has reported data from high time controlled field service units in multiple model installations to have accumulated over 2,138 hours TIS with the same damper installed. In addition, the damper modification has been available to operators since January 1, 1994. The manufacturer has shipped over 2,800 modification kits and has conservatively estimated that over 300,000 hours of field time has been logged by operators with the modification installed.

Based on the investigative reports, satisfactory field inspection data, and improved wear factors resulting from the installed damper modification, the FAA has determined that a negative failure mode should not occur within the new inspection interval of 1,500 hours TIS. The FAA has therefore adopted the inspection interval stated in the NPRM.

After careful review of the available data, including the comments noted above, the FAA has determined that air safety and the public interest require the adoption of the rule with the changes described previously. The FAA has determined that these changes will neither increase the economic burden on any operator nor increase the scope of the AD.

There are approximately 2,506 propellers of the affected design in the worldwide fleet. The FAA estimates that 1,150 propellers installed on aircraft of U.S. registry will be affected by this AD, that it will take approximately 1.5 work hours per propeller to accomplish the required actions, and that the average labor rate is \$55 per work hour. Based on these figures, and on the average utilization rate of 2,000 hours TIS per year equating to 4 inspections, the total cost impact of the current AD per year on U.S. operators is estimated to be \$379,500. However, based on an average utilization rate of 2,000 hours TIS per year, this superseding AD will eliminate 2.7 inspections per year per propeller, resulting in an approximate yearly cost savings to U.S. operators of \$256,163.

The regulations adopted herein will not have substantial direct effects 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. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

For the reasons discussed above, I certify that this action (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); 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. A final evaluation has been prepared for this action and it is contained in the Rules Docket. A copy of it may be obtained from the Rules Docket at the location provided under the caption "ADDRESSES."

List of Subjects in 14 CFR Part 39

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

Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration amends part 39 of the Federal Aviation Regulations (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. App. 1354(a), 1421 and 1423; 49 U.S.C. 106(g); and 14 CFR 11.89.

§39.13 - [AMENDED]

2. Section 39.13 is amended by removing Amendment 39-8659 (58 FR 44441, August 23, 1993) and by adding a new airworthiness directive, Amendment 39-9062, to read as follows:

94-22-12 **Hamilton Standard:** Amendment 39-9062. Docket 94-ANE-26. Supersedes AD 93-16-02, Amendment 39-8659.

Applicability: Hamilton Standard Models 14RF-9, 14RF-19, 14RF-21, and 14RF-23; 247F-1; 14SF-5, 14SF-7, 14SF-11, 14SFL11, 14SF-15, 14SF-17, 14SF-19, 14SF-23; and 6/5500/F propellers installed on but not limited to Embraer EMB-120 and EMB-120RT; SAAB-SCANIA SF340B; Aerospatiale ATR42-100, ATR42-300, ATR42-320, ATR72, ATR72-210; DeHavilland DHC-8-100 series, DHC-8-300; Construcciones Aeronauticas SA (CASA) CN-235 and CN-235-100; Canadair CL215T and CL415; and British Aerospace ATP airplanes.

Compliance: Required as indicated, unless accomplished previously.

To prevent the inability to control the propeller blade angle due to tooth wear in the propeller control unit (PCU) servo ballscrew internal spline (BIS) assembly, accomplish the following:

(a) Inspect the PCU servo BIS assembly for tooth wear in accordance with the Accomplishment Instructions of the following Hamilton Standard Alert Service Bulletins (ASB), all dated April 7, 1994, as applicable: No. 14RF-9-61-A53,

Revision 5; No. 14RF-19-61-A25, Revision 4; No. 14RF-21-61-A38, Revision 4; No. 247F-61-A3, Revision 3; No. 14SF-61-A59, Revision 4; and No. 6/5500/F-61-A11, Revision 4; as follows:

(1) For a PCU with unknown time in service (TIS), and unknown TIS since the last inspection, on the effective date of this airworthiness directive (AD), and that does not have a ballscrew quill damper installed, inspect within 200 hours TIS after the effective date of this AD.

(2) For a PCU with 1,800 or more hours TIS or unknown TIS on the effective date of this AD, and either has not been inspected, or has been inspected more than 500 hours prior to the effective date of this AD, in accordance with the applicable Hamilton Standard ASB listed in paragraph (a) of this AD; and that does not have a ballscrew quill damper installed; inspect within 200 hours TIS after the effective date of this AD.

(3) For a PCU with 1,800 or more hours TIS or unknown TIS on the effective date of this AD, and that has been inspected within the previous 500 hours TIS in accordance with the applicable Hamilton Standard ASB listed in paragraph (a) of this AD, and that does not have a ballscrew quill damper installed, inspect within 500 hours TIS since the last inspection in accordance with the applicable Hamilton Standard ASB listed in paragraph (a) of this AD.

(4) For a PCU with less than 1,800 hours TIS on the effective date of this AD, and that does not have a ballscrew quill damper installed, inspect prior to accumulating 1,800 hours TIS, or within 300 hours TIS after the effective date of this AD, whichever occurs later.

(5) For a PCU that has a ballscrew quill damper installed in accordance with the following applicable Hamilton Standard Service Bulletins (SB), or previous revisions: No. 14SF-61-67, Revision 2, dated September 27, 1994; No. 14RF-9-61-61, Revision 1, dated September 27, 1994; No. 14RF-19-61-29, Revision 2, dated September 27, 1994; No. 14RF-21-61-48, Revision 2, dated September 27, 1994; No. 247F-61-6, Revision 2, dated September 27, 1994; and No. 6/5500/F-61-19, Revision 2, dated September 27, 1994; inspect within 1,500 hours TIS since installation of the ballscrew quill damper.

(6) Thereafter, inspect at intervals described as follows:

(i) For propellers that have a ballscrew quill damper installed in accordance with the applicable Hamilton Standard SB listed in paragraph (a)(5) of this AD, or previous revisions, inspect at intervals not to exceed 1,500 hours TIS since the last inspection required by this AD.

(ii) For propellers that do not have a ballscrew quill damper installed in accordance with the applicable Hamilton Standard SB listed in paragraph (a)(5) of this AD, inspect at intervals not to exceed 500 hours TIS since the last inspection required by this AD.

(7) If PCU servo BIS teeth are worn beyond the limits specified in the Accomplishment Instructions of the applicable ASB's listed in paragraph (a) of this AD, prior to further flight, replace the PCU with a serviceable assembly in accordance with the Accomplishment Instructions of the applicable ASB's listed in paragraph (a) of this AD, and thereafter reinspect in accordance with paragraphs (a)(6) and (a)(7) of this AD.

(b) Report the results of the initial and repetitive inspections required by paragraph (a) of this AD by utilizing Appendix 1, "Ballscrew Inspection Data," within 7 days of the inspection to the Manager, Boston Aircraft Certification Office, Engine and Propeller Directorate, Aircraft Certification Service, FAA, 12 New England Executive Park, Burlington, MA 01803-5299; fax (617) 238-7199. The reporting requirements of this AD terminate on December 31, 1995. Information collection requirements contained in this regulation have been approved by the Office of Management and Budget (OMB) under the provision of the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.) and have been assigned OMB Control Number 2120-0056.

APPENDIX 1
BALLSCREW INSPECTION DATA

The following information must be reported and sent as soon as possible but no later than 7 days after inspection to:

Manager, Boston Aircraft Certification Office
Engine and Propeller Directorate
Aircraft Certification Service
Federal Aviation Administration
12 New England Executive Park
Burlington, MA 01803-5299
Fax: (617) 238-7199

Operator/Repair Station _____

Date of Inspection _____

PCU Part Number _____

PCU Serial Number _____ Date Damper Installed _____

Damper Installed (please circle one): YES NO

If "YES," please circle one: This inspection Previously

Aircraft Serial Number _____

Position (please check one): Left Engine ___ Right Engine ___

PCU Times (please circle one): Estimated Actual

Time Since New (Hours) _____

Time Since Last Ballscrew Inspection/Repair (Hours) _____

Inspection (please check one): Accepted ___ *Rejected ___
*Please indicate in comments if unit was rejected as part of the functional check.

No. of left side teeth with steps _____
No. of right side teeth with steps _____

Comments: _____
Ballscrew Quill Pull Check Completed (please circle one):

YES NO

(c) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Boston Aircraft Certification Office. The request should be forwarded through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Boston Aircraft Certification Office.

NOTE: Information concerning the existence of approved alternative method of compliance with this AD, if any, may be obtained from the Boston Aircraft Certification Office.

(d) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the aircraft to a location where the requirements of this AD can be accomplished.

(e) The requirements of this AD shall be done in accordance with the following Hamilton Standard service documents:

| <u>Document No.</u> | <u>Pages</u> | <u>Revision</u> | <u>Date</u> |
|---------------------|--------------|-----------------|---------------|
| ASB No. | | | |
| 14RF-9-61-A53 | 1 | 5 | April 7, 1994 |
| | 2-7 | 4 | March 1, 1994 |
| | 8 | 3 | July 28, 1993 |
| | 9 | 5 | April 7, 1994 |
| | 10-12 | 4 | March 1, 1994 |
| | 13 | 5 | April 7, 1994 |
| | 14-20 | 4 | March 1, 1994 |
| | 21 | 5 | April 7, 1994 |

Total pages: 21.

| | | | |
|--------------|-------|----------|--------------------|
| SB No. | | | |
| 14RF-9-61-61 | 1-2 | 1 | September 27, 1994 |
| | 3-10 | Original | December 9, 1993 |
| | 11 | 1 | September 27, 1994 |
| | 12-14 | Original | December 9, 1993 |

Total pages: 14.

| | | | |
|----------------|-------|---|---------------|
| ASB No. | | | |
| 14RF-19-61-A25 | 1 | 4 | April 7, 1994 |
| | 2-7 | 3 | March 1, 1994 |
| | 8 | 2 | July 28, 1993 |
| | 9 | 4 | April 7, 1994 |
| | 10 | 3 | March 1, 1994 |
| | 11 | 4 | April 7, 1994 |
| | 12-20 | 3 | March 1, 1994 |
| | 21 | 4 | April 7, 1994 |

Total pages: 21.

| | | | |
|---------------|-------|----------|--------------------|
| SB No. | | | |
| 14RF-19-61-29 | 1 | 2 | September 27, 1994 |
| | 2 | 1 | May 6, 1994 |
| | 3-10 | Original | December 9, 1993 |
| | 11 | 2 | September 27, 1994 |
| | 12-13 | Original | December 9, 1993 |
| | 14 | 1 | May 6, 1994 |

Total pages: 14.

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|----------------|-------|---|---------------|
| ASB No. | | | |
| 14RF-21-61-A38 | 1 | 4 | April 7, 1994 |
| | 2-7 | 3 | March 1, 1994 |
| | 8 | 2 | July 28, 1993 |
| | 9-10 | 4 | April 4, 1994 |
| | 11-20 | 3 | March 1, 1994 |
| | 21 | 4 | April 7, 1994 |

Total pages: 21.

| | | | |
|---------------|-------|----------|--------------------|
| SB No. | | | |
| 14RF-21-61-48 | 1-4 | 2 | September 27, 1994 |
| | 5-10 | Original | December 9, 1993 |
| | 11 | 2 | September 27, 1994 |
| | 12-13 | Original | December 9, 1993 |
| | 14 | 1 | May 6, 1994 |

Total pages: 14.

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|------------|-------|---|---------------|
| ASB No. | | | |
| 247F-61-A3 | 1 | 3 | April 7, 1994 |
| | 2-7 | 2 | March 1, 1994 |
| | 8 | 1 | July 28, 1993 |
| | 9-10 | 3 | April 7, 1994 |
| | 11-19 | 2 | March 1, 1994 |
| | 20 | 3 | April 7, 1994 |

Total pages: 20.

| | | | |
|-----------|-------|----------|--------------------|
| SB No. | | | |
| 247F-61-6 | 1-4 | 2 | September 27, 1994 |
| | 5-10 | Original | December 9, 1993 |
| | 11 | 2 | September 27, 1994 |
| | 12-13 | Original | December 9, 1993 |
| | 14 | 1 | May 6, 1994 |

Total pages: 14.

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|-------------|-------|---|---------------|
| ASB No. | | | |
| 14SF-61-A59 | 1 | 4 | April 7, 1994 |
| | 2-7 | 3 | March 1, 1994 |
| | 8 | 2 | July 28, 1993 |
| | 9-10 | 4 | April 7, 1994 |
| | 11-20 | 3 | March 1, 1994 |
| | 21 | 4 | April 7, 1994 |

Total pages: 21.

| | | | |
|------------|-------|----------|--------------------|
| SB No. | | | |
| 14SF-61-67 | 1 | 2 | September 27, 1994 |
| | 2 | 1 | May 6, 1994 |
| | 3-9 | Original | December 9, 1993 |
| | 10 | 1 | May 6, 1994 |
| | 11 | Original | December 9, 1993 |
| | 12 | 2 | September 27, 1994 |
| | 13-15 | Original | December 9, 1993 |
| | 16 | 1 | May 6, 1994 |

Total pages: 16.

| | | | |
|-----------------|-------|---|---------------|
| ASB No. | | | |
| 6/5500/F-61-A11 | 1 | 4 | April 7, 1994 |
| | 2-9 | 3 | March 1, 1994 |
| | 10-11 | 4 | April 7, 1994 |
| | 12 | 2 | July 28, 1993 |
| | 13 | 3 | March 1, 1994 |
| | 14 | 2 | July 28, 1993 |
| | 15-20 | 3 | March 1, 1994 |
| | 21 | 4 | April 7, 1994 |

Total pages: 21.

| | | | |
|----------------|-------|----------|--------------------|
| SB No. | | | |
| 6/5500/F-61-19 | 1 | 2 | September 27, 1994 |
| | 2 | 1 | May 6, 1994 |
| | 3-10 | Original | December 6, 1993 |
| | 11 | 2 | September 27, 1994 |
| | 12 | Original | December 6, 1993 |
| | 13-14 | 1 | May 6, 1994 |

Total pages: 14.

This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from Hamilton Standard, One Hamilton Road, Windsor Locks, CT 06096-1010. Copies may be inspected at the FAA, New England Region, Office of the Assistant Chief Counsel, 12 New England Executive Park, Burlington, MA; or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(f) This amendment becomes effective on [Insert date 30 days after date of publication in the **Federal Register**].
 Issued in Burlington, Massachusetts, on October 26, 1994.



 James C. Jones,
 Acting Manager, Engine and Propeller Directorate,
 Aircraft Certification Service.