



## Airworthiness Directive

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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39 [61 FR 29271 NO. 112 06/10/96]

[Docket No. 93-ANE-48; Amendment 39-9586; AD **96-09-10**]

RIN 2120-AA64

Airworthiness Directives; Textron Lycoming Reciprocating Engines

**PDF Copy (If Available):**

#### ▼ Preamble Information

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

**SUMMARY:** This amendment supersedes an existing airworthiness directive (AD), applicable to certain Textron Lycoming reciprocating engines, that currently requires replacement of sintered iron impellers in oil pumps. This amendment continues to require replacement of sintered iron impellers, but also requires replacement of aluminum impellers. This amendment is prompted by reports of additional oil pump failures caused by aluminum impellers, which do not have the reliability of the hardened steel impellers. The actions specified by this AD are intended to prevent an oil pump failure due to impeller failure, which could result in an engine failure.

**DATES:** Effective July 15, 1996.

The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of July 15, 1996.

**ADDRESSES:** The service information referenced in this AD may be obtained from any Textron Lycoming Distributor or Textron Lycoming, Reciprocating Engine Division, 652 Oliver St., Williamsport, PA 17701; telephone (717) 327-7278, fax (717) 327-7022. 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:** Richard Fiesel, Aerospace Engineer, New York Aircraft Certification Office, FAA, Engine and Propeller Directorate, 10 Fifth Street, Valley Stream, NY 11581; telephone (516) 256-7504, fax (516) 568-2716.

**SUPPLEMENTARY INFORMATION:** On August 14, 1981, the Federal Aviation Administration (FAA) issued airworthiness directive (AD) 81-18-04, Amendment 39-4199 (46 FR 43134, August 27, 1981), to require replacement of sintered iron oil pump impellers and oil pump shafts with impellers and shafts made of aluminum or hardened steel in certain Textron Lycoming reciprocating engines. That action was prompted by reports of oil pump failures. Subsequent to the publication of AD 81-18-04, the FAA issued two revisions to AD 81-18-04; they are: 81-18-04 R1, Amendment 39-4258 (46 FR 56157, November 16, 1981), effective November 19, 1981, and AD 81-18-04 R2, Amendment 39-4395 (47 FR 23691, June 1, 1982), effective June 7, 1982.

A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) by superseding AD 81-18-04 R2 was published in the Federal Register on January 3, 1994 (59 FR 35). That action proposed to require replacing sintered iron and aluminum impellers and shafts with hardened steel impellers and shafts, in accordance with Avco Lycoming Division Service Bulletin (SB) No. 381C, dated November 7, 1975; Avco Lycoming Textron SB No. 385C, dated October 3, 1975; Avco Lycoming Textron SB No. 454 B, dated January 2, 1987; Avco Lycoming Textron SB No. 455 D, dated January 2, 1987; and Textron Lycoming SB No. 456 F, dated February 8, 1993.

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

Several commenters state that it is not necessary to replace the aluminum impeller with a steel impeller, as they consider the aluminum impeller's reliability to be adequate. The FAA does not concur. The FAA's analysis of seven years of Service Difficulty Reports indicates that the aluminum impeller does not have the reliability of the hardened steel impeller and is only slightly more reliable than the sintered iron impeller. Based on that analysis the FAA has issued Safety Recommendation 92.052 that recommends replacement of the aluminum impeller within 100 hours time in service (TIS).

Several commenters state that the aluminum impeller should be replaced at overhaul rather than at 750 hours TIS because of the difficulty of accomplishing the modification without engine disassembly and thereby possibly introducing maintenance errors with resultant engine failure. The FAA concurs. The FAA has revised the compliance time for replacement of the aluminum impeller from within 750 hours after the effective date of the AD to the next overhaul. However, the FAA has included a calendar end-date of five years after the effective date of this AD. Considering the low time accumulation rate for the types of aircraft involved, a large percentage will reach 500-750 hours TIS within five years.

Some commenters question the accuracy of 4,000 as the number of affected engines. The FAA concurs.

The 4,000 number was carried over from AD 81-18-04 and represented the number of engines that incorporated the sintered iron impeller. The number of aluminum impellers, Part Number LW-13775, installed in engines is much greater. The FAA estimates 45,000 aluminum impellers in service. The FAA has therefore revised the economic analysis to account for this greater number.

One commenter states that the AD omits a required modification of older pump housings, as referenced in SB's 1164 and 1341. The FAA does not concur. The earlier configuration incorporates a fixed shaft and cotter pin with a different aluminum impeller. That configuration is not affected by this AD. The FAA has clarified the applicability of this AD to state that only aluminum impellers, P/N LW 13775, are affected.

Some commenters state that only aluminum impellers, P/N LW 13775, should be affected by this AD. The FAA concurs and has revised this AD accordingly.

One commenter states that the AD addresses three different categories of engines as indicated in SB's 454, 455, and 456, and therefore should address each engine type separately. The FAA does not concur. The NPRM combined the engines that are affected by SB 454 and SB 455 because these engines have a similar design, are affected by the same unsafe condition, and have the same compliance requirements. The FAA has determined that combining the engine types eliminates redundancy and makes for easier reading. Textron Lycoming is in the process of issuing a new SB to replace SB's 454, 455, and 456.

One commenter states that the AD should address only Textron Lycoming impellers, P/N LW 13775, because impellers manufactured by other companies under a FAA Parts Manufacturer Approval (PMA) have excellent reliability. The FAA does not concur. The FAA's analysis of the Service Difficulty Reports and Accident/Incident reports does not support distinguishing between impellers manufactured by Textron and impellers manufactured by other companies. The Service Difficulty Reports do not always list the P/N, or manufacturer, of the failed impeller. Some are simply referred to as "aluminum impeller." Also, the format of the Accident/Incident Reports does not include P/N. Therefore, unless it can be shown by reliability data that a PMA part has a significantly better failure rate than does Textron P/N LW 13775, the FAA must include all similar aluminum impellers in the AD.

One commenter states that all sintered iron impellers should be removed within 25 hours TIS. The FAA does not concur. This AD reduces the compliance time from 2,000 hours TIS to 100 hours TIS for engines affected by SB 456. The FAA has determined that a further reduction to 25 hours TIS is not justified, and would cause an undue hardship to operators.

Since publication of the NPRM, the FAA has reviewed and approved the technical contents of Textron Lycoming SB No. 524, dated September 1, 1995, that combines the requirements of, and supersedes Service Bulletin 381, 385, 454, 455, and 456; and SI No. 1009AJ, dated July 1, 1992, that describes established time between overhaul (TBO) for Textron Lycoming reciprocating engines.

In addition, this final rule reduces the original time of compliance of certain engines from 2,000 hours, required by paragraph (c) of AD 81-18-04 to 100 hours TIS after the effective date of this AD.

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 not increase the scope of the AD.

There are approximately 45,000 oil pumps of the affected design installed in Textron Lycoming reciprocating engines in the worldwide fleet. The FAA estimates that 29,000 oil pumps installed on aircraft of U.S. registry will be affected by this AD, that it will take approximately 4.5 work hours per oil pump to accomplish the required actions, and that the average labor rate is \$60 per work hour. Required parts will cost approximately \$270. Based on these figures, the total cost impact of the AD on U.S. operators is estimated to be \$15,660,000.

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.

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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 USC 106(g), 40113, 44701.

#### **§39.13 - [AMENDED]**

2. Section 39.13 is amended by removing Amendment 39-4199 (46 FR 43134, August 27, 1981) and by adding a new airworthiness directive, Amendment 39-9586, to read as follows:

### **▼ Regulatory Information**

**96-09-10 Textron Lycoming:** Amendment 39-9586. Docket 93-ANE-48. Supersedes AD 81-18-04 R2, Amendment 39-4395.

Applicability: Textron Lycoming O-235, O-290, O-320, IO-320, AIO-320, AEIO-320, LIO-320, O-340, O-360, IO-360, LIO-360, AIO-360, HO-360, HIO-360, LO-360, LIO-360, TIO-360, TO-360, LTO-360, VO-360, IVO-360, O-540, and IO-540 series reciprocating engines, except for the following models: O-320-H2AD, O-360-E1A6D, LO-360-E1A6D, TO-360-E1A6D, LTO-360-E1A6D, IO-540-P1A5, IO-540-R1A5, IO-540-S1A5, and O-540 and IO-540 series engines built with large capacity oil pumps and dual magnetos designated with "5D" in the model suffix; for example, IO-540-K1A5D. These engines are installed on but not limited to the following aircraft: various models of single and twin engine powered Cessna, Piper, Mooney, Beech, Gulfstream American, Maule, and Socata. NOTE 1: This AD may not contain an exhaustive list of aircraft that utilize the affected engines because other aircraft may have an affected engine installed through, for example, approvals made by Supplemental Type Certificate, or FAA Form 337, "Major Repair and Alteration." It is the responsibility of each aircraft owner, operator, and person returning that aircraft to service to determine if that aircraft has an affected engine. NOTE 2: This AD applies to each engine identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For engines that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must use the authority provided in paragraph (f) to request approval from the FAA. This approval may address either no action, if the current configuration eliminates the unsafe condition, or different actions necessary to address the unsafe condition described in this AD. Such a request should include an assessment of the effect of the changed configuration on the unsafe condition addressed by this AD. In no case does the presence of any modification, alteration, or repair remove any engine from the applicability of this AD.

Compliance: Required as indicated, unless accomplished previously.

To prevent oil pump failure due to impeller failure, which could result in an engine failure, accomplish the following:

(a) For Textron Lycoming Model HIO-360-D1A, -E1AD, -E1BD, and -F1AD engines with serial numbers (S/N) of L-22579-51A or prior, except for the following: S/N L-22311-51A through L-22313-51A, L-22396-51A, L-22397-51A, L-22416-51A, L-22546-51A through L-22549-51A, L-22563-51A, L-22568-51A through L-22571-51A; for Textron Lycoming Model HIO-360-D1A, -E1AD, -E1BD, and -F1AD engines that were overhauled in the field or remanufactured prior to April 1, 1981, regardless of S/N; and for engines listed by S/N in Textron Lycoming Service Bulletin (SB) No. 455D, dated January 2, 1987; accomplish the following:

(1) Replace the sintered iron oil pump impeller and shaft with a hardened steel impeller and shaft in accordance with Avco Lycoming Textron SB No. 454B, dated January 2, 1987, or Avco Lycoming Textron SB No. 455D, dated January 2, 1987, as applicable, or Textron Lycoming SB No. 524, dated September 1, 1995, within 25 hours time in service (TIS) after the effective date of this AD.

(2) No action is required if engines have complied with AD 81-18-04, 81-18-04 R1, or 81-18-04 R2, and have incorporated oil pumps with a hardened steel impeller and shaft. Engines that incorporate oil pumps fitted with an aluminum impeller and shaft must comply with paragraph (c) of this AD.

(b) For engines listed by S/N in Textron Lycoming SB No. 456F, dated February 8, 1993, or Textron Lycoming SB No. 524, dated September 1, 1995, that incorporate a sintered iron impeller, accomplish the following:

(1) Replace any sintered iron oil pump impeller and shaft with a hardened steel impeller and shaft in accordance with Textron Lycoming SB No. 456F, dated February 8, 1993, or Textron Lycoming SB No. 524, dated September 1, 1995, within 100 hours TIS after the effective date of this AD, or one year after the effective date of this AD, whichever occurs first. Total time on the sintered iron impeller must not exceed 2,000 hours TIS since new or overhaul, whichever occurs later

(2) No action is required if engines have complied with AD 81-18-04, 81-18-04 R1, or 81-18-04 R2, and have incorporated oil pumps with a hardened steel impeller and shaft. Engines that incorporate oil pumps fitted with an aluminum impeller and shaft must comply with paragraph (c) of this AD.

(c) For all other affected engines, replace any aluminum oil pump impeller and shaft assembly with a hardened steel impeller and shaft assembly in accordance with Avco Lycoming Textron SB No. 455D, dated January 2, 1987, or Textron Lycoming SB No. 456F, dated February 8, 1993, or Textron Lycoming SB No. 524, dated September 1, 1995, as applicable, as follows:

(1) Replace at next engine overhaul (not to exceed the hours specified, for the particular engine model, in Textron Lycoming Service Instruction 1009AJ, dated July 1, 1992), at next oil pump removal, or 5 years after the effective date of this AD, whichever occurs first.

(2) No action is required if engines have complied with AD 81-18-04, 81-18-04 R1, or 81-18-04 R2, and have incorporated oil pumps with a hardened steel impeller and shaft. NOTE: Engines originally manufactured prior to 1970 did not incorporate sintered iron impellers. For further information, refer to engine maintenance/overhaul logbook records, Lycoming build records, and the following SB's provide additional guidance: Avco Lycoming Division SB No. 381C, dated November 7, 1975, and Avco Lycoming Textron SB No. 385C, dated October 3, 1975, describe a method for determining if the early design oil pump with aluminum/steel impellers are installed. Avco Lycoming SB No. 455A, dated August 18, 1981, and Textron Lycoming SB No. 455B, dated January 2, 1987, and Avco Lycoming SB No. 456, dated August 21, 1981, introduced steel driving impeller, P/N 60746, and aluminum driven impeller, P/N LW13775. Textron Lycoming SB No. 524 includes information regarding engines which may incorporate aluminum impellers.

(d) Engines that are subject to AD 75-08-09 must have incorporated AD 75-08-09 before this AD can be accomplished.

(e) Sintered iron and aluminum impellers approved under FAA Parts Manufacturer Approval (PMA) are replacements for affected part numbers of Lycoming impellers and must also be replaced in accordance with paragraphs (a), (b), or (c), as applicable, of this AD.

(f) 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, New York Aircraft Certification

Office. The request should be forwarded through an appropriate FAA Maintenance Inspector, who may add comments and then send it to the Manager, New York Aircraft Certification Office.

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

(g) 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.

(h) The actions required by this AD shall be done in accordance with the following service bulletins:

<b>Document No.</b>	<b>Pages</b>	<b>Date</b>
Avco Lycoming Division SB No. 381C	1-4	November 7, 1975
Total pages: 4.		
Avco Lycoming Textron SB No. 385C	1-4	October 3, 1975
Supplement No. 1	1	March 18, 1977
Total pages: 5.		
Avco Lycoming Textron SB No. 454B	1-3	January 2, 1987
Total pages: 3.		
Avco Lycoming Textron SB No. 455D	1-3	January 2, 1987
Total pages: 3.		
Textron Lycoming SB No. 456F	1-3	February 8, 1993
Total pages: 3.		
Textron Lycoming SB No. 524 Attachment	1-3 1-4	September 1, 1995
Total pages: 9.		
Textron Lycoming SI No. 1009AJ	1-3	July 1, 1992
Total pages: 3.		

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 Textron Lycoming, Reciprocating Engine Division, 652 Oliver St., Williamsport, PA 17701; telephone (717) 327-7278, fax (717) 327-7022. 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.

(i) This amendment becomes effective on July 15, 1996.

 **Footer Information**

 **Comments**