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## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

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

**[Docket No. FAA-2006-24785; Directorate Identifier 2006-NE-20-AD; Amendment 39-14778; AD 2006-20-09]**

**RIN 2120-AA64**

**Airworthiness Directives; Lycoming Engines (L)O-360, (L)IO-360, AEIO-360, O-540, IO-540, AEIO-540, (L)TIO-540, IO-580, and IO-720 Series Reciprocating Engines.**

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

**ACTION:** Final rule.

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**SUMMARY:** The FAA is adopting a new airworthiness directive (AD) for certain Lycoming Engines (L)O-360, (L)IO-360, AEIO-360, O-540, IO-540, AEIO-540, (L)TIO-540, IO-580, and IO-720 series reciprocating engines. This AD requires replacing certain crankshafts. This AD results from reports of 23 confirmed failures of similar crankshafts in Lycoming Engines 360 and 540 series reciprocating engines. We are issuing this AD to prevent failure of the crankshaft, which will result in total engine power loss, in-flight engine failure, and possible loss of the aircraft.

**DATES:** This AD becomes effective November 3, 2006. The Director of the Federal Register approved the incorporation by reference of certain publications listed in the regulations as of November 3, 2006.

**ADDRESSES:** You can get the service information identified in this ad from Lycoming, 652 Oliver Street, Williamsport, PA 17701; telephone (570) 323-6181; fax (570) 327-7101, or on the internet at <http://www.Lycoming.Textron.com>.

You may examine the AD docket on the Internet at <http://dms.dot.gov> or in Room PL-401 on the plaza level of the Nassif Building, 400 Seventh Street, SW., Washington, DC.

**FOR FURTHER INFORMATION CONTACT:** Norm Perenson, Aerospace Engineer, New York Aircraft Certification Office, FAA, Engine & Propeller Directorate, 1600 Stewart Avenue, Suite 410, Westbury, NY 11590; telephone (516) 228-7337; fax (516) 794-5531.

**SUPPLEMENTARY INFORMATION:** The FAA proposed to amend 14 CFR part 39 with a proposed airworthiness directive (AD). The proposed AD applies to certain Lycoming Engines (L)O-360, (L)IO-360, AEIO-360, O-540, IO-540, AEIO-540, (L)TIO-540, IO-580, AEIO-580, and IO-720 series reciprocating engines. We published the proposed AD in the Federal Register on May 25, 2006 (71 FR 30078, May 19, 2006). That action proposed to require replacing certain crankshafts.

### **Examining the AD Docket**

You may examine the docket that contains the AD, any comments received, and any final disposition in person at the Docket Management Facility Docket Office between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The Docket Office (telephone (800) 647-5227) is located on the plaza level of the Department of Transportation Nassif Building at the street address stated in ADDRESSES. Comments will be available in the AD docket shortly after the DMS receives them.

### **Comments**

We provided the public the opportunity to participate in the development of this AD. We have considered the comments received.

### **Suggest to Only Reference 360-Series Engines**

One private citizen suggests that since Lycoming Mandatory Service Bulletin (MSB) No. 569A, referenced in the proposed AD, only applies to 360-series engines with counterweighted crankshafts, the AD should do the same.

We agree. The commenter is correct that MSB No. 569A refers only to counterweighted (L)O-360 engines. We changed paragraph (c) to limit the applicability of this AD to only those engines listed in the tables in Lycoming MSB No. 569A. The MSB lists the specific engine models and serial numbers (SNs) for engines that have a suspect crankshaft. The MSB also lists the specific crankshaft SNs installed on engines after the engine entered service. We have made this change to limit the AD's applicability to only those engines with a suspect crankshaft.

### **Need To Correct the Table of Engine Models and Aircraft**

One private citizen states that we need to correct the table in paragraph (c), "Applicability." The Lycoming O-540-J3C5D engine listed is actually used in the normally-aspirated Cessna R182, not the turbocharged TR182, as currently listed. The engine in the TR182 is the O-540-L3C5D.

We agree, and have corrected the table. We need to note, however, that the table is provided for information only and does not control whether the AD applies to a listed engine/aircraft combination. As we have noted in paragraph (c), the affected engines may or may not be installed in the listed aircraft models.

### **12-Year Overhaul Limit Not in Lycoming Engines Service Instruction (SI) No. 1009AR**

One private citizen states that the 12-year overhaul limit referred to in the proposed rule is not in Lycoming Engines SI No. 1009AR, as we stated.

We do not agree. The Lycoming Engines service instruction states that engines that do not reach the recommended overhaul hours specified in that publication should be overhauled in the twelfth year. We note that this AD does not require an engine overhaul. We have incorporated Lycoming Engines SI No. 1009AS, dated May 25, 2006, only for the purpose of providing a maximum time by which crankshaft replacement must occur, if the engine has not required earlier maintenance that

involves separating the crankcase. Therefore, crankshaft removal must occur at the earliest of maintenance involving crankcase separation, the time-in-service specified in Lycoming Engines SI No. 1009AS for engine overhaul, or 12 years from the time the crankshaft first entered service. For clarification, we have added to the AD new sub-paragraphs (j)(3) and (k)(3) that now directly specify the 12-year compliance end time for crankshaft removal.

### **Engine Model Included in Error in MSB**

One commenter, Lycoming Engines, states that engine model TIO-540-U2A, SN L-4641-61A, was included in MSB No. 569A in error and it is not affected by the MSB and should not be included in this AD. We agree and added new paragraph (i) in the AD that states that no action is required for this engine model. We have also added a new sub-paragraph (f)(5) to clarify that if the AD applies to an engine, but no action is required because the crankshaft on that engine is not identified as one needing replacement, the owner or operator of the aircraft may make an entry in the AD status log required by 14 CFR 91.417(a)(2)(v) that the AD required no action.

### **Engine Model Included in Error in Proposed AD**

Since we issued the proposed AD, we have identified the engine model AEIO-580 as not type certified for operation in the United States. Although this engine is listed in Table 3 of MSB No. 569A, we have removed this engine model from the AD applicability.

### **Consider an Additional 100 Hours Operation**

One private citizen suggests that for aircraft that are already beyond Lycoming's time-between-overhaul (TBO) that we provide an additional 100 hours of operation from the effective date of the AD, as this would give people time to get new crankshafts or overhauls lined up.

We do not agree. This final rule will not become effective until 35 days after it is published in the Federal Register. That should be ample time to prepare for compliance with the AD for those operators with engines that have operated past the Lycoming recommended TBO. If an operator needs additional time, that operator may request an alternative method of compliance (AMOC), using the procedures found in 14 CFR 39.19. We note that the AD does not require an engine overhaul, but only replacement of an identified crankshaft.

### **Deadline for Crankshaft Replacement Needs To Be at the Next Overhaul**

One private citizen, states that the deadline for crankshaft replacement needs to be at the next overhaul.

We do not agree. The AD requires replacement of identified crankshafts at the earliest of the next time maintenance requires splitting the crankcase, or the time specified for the next engine overhaul listed in Lycoming Engines SI No. 1009AS, or 12 years from when the crankshaft entered service. An operator may request additional time through a request for an AMOC using the procedures found in 14 CFR 39.19. Note that the AD does not require the engine to be overhauled. It only requires replacing the affected crankshaft, which can be done with other maintenance.

### **Remove Calendar Time Compliance**

One commenter, Cessna Pilots Association, states that there should be no calendar time mandated, and that compliance should be determined by the appropriate Federal Aviation Regulations for the type of operations for which the aircraft is used.

Another commenter, Aircraft Owners and Pilots Association, states that aircraft owners should be allowed to continue to operate their engine until reaching time-for-overhaul based on hours without any calendar end time.

We do not agree. We re-evaluated the risk that this unsafe condition presents to aircraft and have determined that adequate risk mitigation can only be achieved by establishing an end limit for crankshaft removal based on years since a crankshaft enters service. The variability of the size and orientation of the metallurgical anomalies present in the identified crankshafts, results in variation in the operating times at which failures could occur. Therefore, while we stated in the proposal that the unsafe condition was unrelated to calendar time, a compliance end-time is necessary to minimize the probability of a crankshaft failure at operating times less than the specified overhaul interval. The 12-year calendar end time was selected to provide the necessary risk mitigation while minimizing the burden on owners and operators. We fully expect that few crankshafts will be replaced solely because of the 12-year calendar end time because crankshafts must be replaced earlier if maintenance requires splitting the crankcase or operations accumulate enough hours to meet the engine TBO.

However, if an owner (or) operator has data to justify an extension of the hourly limit and (or) the calendar end-limit, the owner (or) operator can request an AMOC using the procedures found in 14 CFR 39.19.

Determining crankshaft removal times by the type of operation would impose an overly complex record-keeping requirement on owners and operators. The identified crankshafts are installed in engines that are engaged in multiple types of operations ranging from personal use to commercial operations. We note that for some commercial operators the recommended TBO times may be mandated as a necessary component of their approved maintenance programs. For these operators, then, crankshaft replacement will be a part of the required engine overhaul unless earlier maintenance requires splitting the crankcase.

### **Evidence for AD Is Not Convincing Enough**

One private citizen states that the evidence used to justify the proposed AD is not convincing enough to require parts replacement, and the lengthy compliance time (12 years) implies crankshaft replacement is not urgent, and, if it is urgent, the crankshafts should be replaced in a shorter time.

We do not agree. While we determined that the risk to safety of flight was not urgent enough to warrant publishing an emergency AD that would become effective immediately upon publication, we have sufficient data on which to conclude that an unsafe condition exists and that it is likely to exist or develop on other products of the same type design. We selected the compliance times in this AD because:

- The same metallurgical flaw that was found in 23 confirmed crankshaft failures in different groups of Lycoming 360 and 540 engines has been found in the crankshafts in this group of engines; and
- Because of the presence of the flaw, this group of crankshafts has a higher potential for failure than other crankshaft groups that do not have the flaw, and it may only take longer to fail; and
- The overhaul may be the first opportunity that the crankshaft is removed from the engine and the first opportunity to replace the crankshaft. As previously stated in another comment, we do not have the data to support an hourly or calendar time extension beyond the hourly times contained in Lycoming Engines SI No. 1009AS, or the 12-year compliance end-time.

### **Suggest Crankshaft Fractures Noted Are From an As-Yet Unidentified Cause**

Three private citizens suggest that the 23 crankshaft fractures noted are from an as-yet unidentified cause, or causes, within the engine, which results in crankshaft fracture.

We do not agree. The proposal referred to 23 confirmed failures of similar crankshafts in Lycoming 360 and 540 series reciprocating engines. These are 23 crankshafts that exhibited the same, subsurface material flaw that progress to a fatigue failure. There were several other crankshaft

failures that exhibited most of the same failure characteristics as the 23 confirmed failures, but the fracture surface was too badly damaged for a complete examination to confirm that they were the same. The two examples of crankshaft failures mentioned by the commenters were not examined by the Lycoming Materials Laboratory, or any of the other Materials Laboratories that participated in this investigation.

One is an Australian Transport Safety Bureau report of a Lycoming O-540 crankshaft failure, that is known to the FAA, but was not included in the 23 confirmed failures. The other example is the failure of a crankshaft identified as being from a Lycoming O-360 series engine. However, the laboratory failure report did not identify the engine model or SN. This crankshaft failed in two locations and neither of the locations are the same as the single failure location of the crankshafts in this investigation (the 23 confirmed failures and the unconfirmed failures all failed in the same location.) In addition, the report does not contain the engine type, type of engine operation, crankshaft part number, serial number, heat code, overhaul rework data, or overhaul assembly data. This makes it impossible to determine if the crankshaft was a Lycoming part or a PMA part, when the part was manufactured, or if the crankshaft was installed in an aerobatic engine and operated at a higher than certified horsepower. Based on the above, we cannot accept these examples as data to support their position that we have inadequate data on which to conclude that an unsafe condition exists and that it is likely to either exist or develop on other products of the same type design.

### **No Reason To Change Lycoming Engines Current Compliance Conditions**

One commenter, Lycoming Engines, sees no reason to change its current compliance conditions, as there is no data to suggest any adjustment to the compliance terms.

We do not agree. Crankshafts from the group listed in Lycoming Engines MSB No. 569A have been found to have the same material flaws as those in the groups that were addressed by previous Lycoming Engines MSBs and FAA ADs. We selected a crankshaft replacement schedule that minimizes the burden on owners and operators by requiring replacement of the crankshaft only when accessible during engine maintenance or overhaul, but contains a compliance end-time of 12 years after the crankshaft enters service to provide the necessary risk mitigation. There is no current data to support an accelerated removal of the crankshafts, so we determined that the crankshafts can continue in service until the next engine overhaul as specified in Lycoming Engines SI No. 1009AS. However, if new data becomes available at a later date, we will re-evaluate our conclusion.

### **Lycoming Engines Should Pay Regardless of Calendar Time**

Six commenters, the Cessna Pilots Association, the Aircraft Owners and Pilots Association, and four private citizens state that Lycoming Engines should pay for the complete replacement cost or extend the \$2,000 crankshaft kit price, regardless of when an owner replaces the crankshaft required to be removed to comply with this AD.

We view this comment as beyond the scope of this rulemaking. We have no authority to regulate when or by how much a manufacturer reimburses an owner for actions required as a result of compliance with an AD.

### **Update to Lycoming Engines SI No. 1009AR**

We updated the references of Lycoming Engines SI No. 1009AR, dated June 22, 2004, to Lycoming Engines SI No. 1009AS, dated May 25, 2006, in this AD.

## **Conclusion**

We have carefully reviewed the available data, including 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 changes will neither increase the economic burden on any operator nor increase the scope of the AD.

## **Costs of Compliance**

We estimate that this AD will affect 3,774 engines installed on airplanes of U.S. registry. Because the AD compliance interval coincides with engine overhaul or other engine maintenance, we estimate no additional labor hours will be needed to comply with this AD. Parts will cost about \$16,000 per engine. Based on these figures, we estimate the total cost of the AD to be \$60,384,000. Lycoming said it may provide the parts for \$2,000, until February 21, 2009, but will not extend the parts price beyond that date. In addition, since we issued the NPRM, Lycoming Engines has provided additional information on their Web site, explaining that engines affected by MSB No. 569 or MSB No. 569A, which get overhauled at the Lycoming factory at any time within the FAA mandated 12-year limit, will receive a replacement crankshaft during overhaul at no additional charge.

## **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); 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.

We prepared a summary of the costs to comply with this AD and placed it in the AD Docket. You may get a copy of this summary at the address listed under ADDRESSES.

## **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 Federal Aviation Administration 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:

# AIRWORTHINESS DIRECTIVE

[www.faa.gov/aircraft/safety/alerts/](http://www.faa.gov/aircraft/safety/alerts/)  
[www.gpoaccess.gov/fr/advanced.html](http://www.gpoaccess.gov/fr/advanced.html)

U.S. Department  
of Transportation  
**Federal Aviation  
Administration**



**2006-20-09 Lycoming Engines (formerly Textron Lycoming):** Amendment 39-14778. Docket No. FAA-2006-24785; Directorate Identifier 2006-NE-20-AD.

## Effective Date

(a) This airworthiness directive (AD) becomes effective November 3, 2006.

## Affected ADs

(b) None.

## Applicability

(c) This AD applies to those Lycoming Engines (L)O-360, (L)IO-360, AEIO-360, O-540, IO-540, AEIO-540, (L)TIO-540, IO-580, and IO-720 series reciprocating engines listed by engine model number and serial number in Table 1, Table 2, Table 3, or Table 4 of Lycoming Mandatory Service Bulletin (MSB) 569A, dated April 11, 2006, and those engines with crankshafts listed by crankshaft serial number in Table 5 of Lycoming MSB 569A, dated April 11, 2006. These applicable engines are manufactured new or rebuilt, overhauled, or had a crankshaft installed after March 1, 1997. These engines are installed on, but not limited to, the following aircraft:

Engine Model	Manufacturer	Aircraft Model
AEIO-360-A1B6	Moravan	Z242L Zlin
	Scottish Avia	Bulldog
	Valmet	Leko 70
AEIO-360-A1E6	Integrated Systems	Omega
IO-360-A1B6	Aircraft Manufacturing Factory	Mushshak
	Beech	C-24R Sierra or 200 Sierra
	Cessna	R-G Cardinal
	Korean Air	Chang Gong-91
	Partenavia	P-68C
	Saab	MFI-15 Safari, MFI-17 Supporter
	Scottish Avia	Bulldog
IO-360-A1B6D	Cessna	R-6 Cardinal
	Siai Marchetti	S-205

IO-360-A3B6	Mod Works	Trophy 212 Conversion
IO-360-A3B6D	Mooney	M20J-201
IO-360-B1G6	American	Blimp Spector 42
IO-360-C1C6	Piper Aircraft Ruschmeyer	PA-28-200R Arrow IV MF-85
IO-360-C1D6	M.B.B. Rockwell	Flamingo 223 112
IO-360-C1E6	Piper	PA-34-200 Seneca I
IO-360-C1G6	Zeppelin	NT
IO-360-X178	Ly-Con	STC
(L)O-360-A1G6D	Beech	76 Duchess
(L)O-360-A1H6	Piper	PA-44 Seminole
O-360-A1F6	Cessna	177 Cardinal
O-360-A1F6D	Cessna Teal III	177 Cardinal TSC 1A3
O-360-A1G6D	Beech	76 Duchess
O-360-A1H6	Piper	PA-44 Seminole
O-360-E1A6D	Piper	PA-44-180 Seminole
O-360-F1A6	Cessna	C-172RG Cutlass RG
AEIO-540-D4A5	Christen H.A.L. Siai-Marchetti Slingsby	Pitts S-2S, S-2B HPT-32 SF-260 T3A Firefly
AEIO-540-L1B5	Extra-Flugzeugbau F.F.A.	Extra 300 FFA-2000 Eurotrainer
AEIO-540-L1D5	Apex	Apex
IO-540-AA1A5	Piper	602P Sequoia
IO-540-AB1A5	Cessna	C-182 Skylane
IO-540-AC1A5	Cessna	C-206 Stationair
IO-540-AE1A5	Robinson	R44

IO-540-C4B5	Aerofab	250 Renegade
	Avions Pierre Robin	HR100/250
	Bellanca	T-250 Aries
	Piper	Aztec C PA-23 “250”, Aztec F
	Wassmer	WA4-21
IO-540-C4D5	S.O.C.A.T.A.	TB-20
IO-540-C4D5D	S.O.C.A.T.A.	TB-20 Trinidad
IO-540-D4A5	Piper	PA-24 260 Comanche
	Siai-Marchetti	SF-260
IO-540-D4B5	Cerva	CF-34 Guepard
IO-540-E1A5	Aero Commander	500-E
IO-540-E1B5	Aero Commander	500-U
	Poeschel	P-300
	Shrike	500-S
IO-540-J4A5	Piper	Aztec PA-23 “250”
IO-540-K1A5	Aeronautica Agricola Mexicana	Quail
	Celair	Eagle
	Embraer	EMB-720 Minuano, EMB-721 Sertanejo
	Piper	PA-32-300 Cherokee Six
IO-540-K1A5D	Piper	PA-32-300
IO-540-K1B5	Evangel-Air	Evangel-Air
	Pilotus Britton-Norman	BN-2B Islander
	Transavara	T-300 Skyfarmer
IO-540-K1E5	Bellanca	Bellanca
IO-540-K1F5	Ted Smith	Aerostar 600
IO-540-K1G5	Embraer	EMB-720 Minuano
	Piper	Saratoga PA-32-300, Brave 300
IO-540-K1G5D	Embraer	EMB-721 Sertanejo
	Piper	PA-32-300R Lance, SP PA-32-300R Saratoga
IO-540-K1H5	Seawind	Seawind
IO-540-K1J5	Piper	600A Aerostar
IO-540-K1J5D	Embraer	EMB-201 Ipanema
IO-540-K1K5	Piper	T35

IO-540-L1C5	Swearingen	SX300
IO-540-M1A5	Piper	PA-31-300 Navajo
IO-540-M1C5	King Engineering	Angel
IO-540-S1A5	Piper	601B Aerostar, 601P Aerostar
IO-540-T4A5D	General Aviation	Model 114
IO-540-T4B5	Commander	114B
IO-540-T4B5D	Rockwell	114
IO-540-V4A5	Aircraft Manufacturing Factory	Aircraft Manufacturing Factory
	Maule	MT-7-260, M-7-260
IO-540-W1A5	Maule	MX-7-235, MT-7-235, M7-235
IO-540-X160	Airship Management	Airship Management
IO-540-X170	Robinson	Robinson
O-540-A1A5	Helio	Military H-250
O-540-A1B5	Piper	PA-32 "250" Aztec, PA-24 "250" Comanche
O-540-A1C5	Piper	PA-24 "250" Comanche
O-540-A1D5	Piper	PA-24 "250" Comanche
O-540-A4D5	American Champion	American Champion
	Gomozig	Gomozig
	Avipro	Bearhawk
O-540-B1A5	Piper	PA-23 "235" Apache
O-540-B2B5	S.O.C.A.T.A.	235CA Rallye.
O-540-B2C5	Piper	PA-24 "235" Pawnee
O-540-B4B5	Embraer	EMB-710 Corioca
	Maule	MX-7-235 Star Rocket, M-6-235 Super Rocket, M-7-235 Super Rocket
	Piper	PA-28 "235" Cherokee
	S.O.C.A.T.A.	235GT Rallye, 235C Rallye
O-540-E4A5	Aviamilano	F-250 Flamingo
	Piper	PA-24 "260" Comanche
	Siai-Marchetti	SF-260, SF-208
O-540-E4B5	Britton-Norman	BN-2
	Piper	PA-32 "260" Cherokee Six

O-540-E4C5	Pilotus Britton-Norman	BN-2A-26 Islander; BN-2A-27 Islander; BN-2B-26 Islander II; BN-2A-21 Islander; BN-2A-Mark III-2 Trislander
O-540-F1B5	Robinson	R-44
O-540-G1A5	Piper	PA-25 "260" Pawnee
O-540-J1A5D	Maule	MX-7-235 Star Rocket, M-6-235 Super Rocket, M-7-235 Super Rocket
O-540-J3A5	Robin	R-3000/235
O-540-J3A5D	Piper	PA-28-236 Dakota
O-540-J3C5D	Cessna	R-182 Skylane
O-540-L3C5D	Cessna	TR-182 Turbo Skylane
TIO-540-AA1AD	Aerofab Inc	270 Turbo Renegade
TIO-540-AB1AD	S.O.C.A.T.A.	TC TB-21 Trinidad
TIO-540-AE2A	Piper	PA-46-350P Mirage
TIO-540-AF1B	Mooney	TLS M20M
TIO-540-AG1A	Commander Aircraft	112TC
TIO-540-AH1A	Piper	TC PA-32-301T TurboSaratoga
TIO-540-AK1A	Cessna	T182T Turbo Skylane
TIO-540-C1A	Piper	PA-23-250 Turbo Aztec
TIO-540-J2B	Piper	T-1020
TIO-540-U2A	Piper	700P Aerostar
TIO-540-W2A	Aero Mercantil	Gavilan
TIO-540-X136	Schweizer	Schweizer
TIO-540-X155	Cessna	T182 (AK1A)
IO-720-D1B	Embraer	EMB-400 Ipanema, IAR-821
	Nauchang	N5
IO-720-D1C	Piper	PA-36-375 Brave

### Unsafe Condition

(d) This AD results from reports of 23 confirmed failures of similar crankshafts in Lycoming Engines 360 and 540 series reciprocating engines. We are issuing this AD to prevent failure of the crankshaft, which will result in total engine power loss, in-flight engine failure, and possible loss of the aircraft.

## Compliance

(e) You are responsible for having the actions required by this AD performed within the compliance times specified unless the actions have already been done.

### Engines for Which No Action Is Required

(f) If your engine meets any of the following conditions, and you have not had the crankshaft replaced since meeting the condition, no further action is required:

(1) Engines that are in compliance with Lycoming MSB No. 552 (AD 2002-19-03) or MSB No. 553 (AD 2002-19-03 Table 3 or Table 5); or

(2) Engines that are in compliance with Lycoming MSB No. 566 AD (2005-19-11); or

(3) Engines that are in compliance with Lycoming Supplement No. 1 to MSB No. 566 (AD 2006-06-16); or

(4) Engines that are in compliance with the original issue of Lycoming MSB No. 569, or MSB No. 569A.

(5) For engines identified in paragraphs (f), (g), (h), or (i) of this AD, owners or operators may make an entry in the AD status log required by 14 CFR 91.417(a)(2)(v) that this AD required no action for compliance.

(g) If Lycoming Engines manufactured new, rebuilt, overhauled, or repaired your engine, or replaced the crankshaft in your engine before March 1, 1997, and you have not had the crankshaft replaced, no further action is required.

(h) If Table 1, Table 2, Table 3, or Table 4 of Lycoming MSB No. 569A, dated April 11, 2006, lists your engine serial number (SN), and Table 5 of MSB No. 569A, dated April 11, 2006, does not list your crankshaft SN, no further action is required.

(i) For engine model TIO-540-U2A, SN L-4641-61A, no action is required.

### Engines for Which Action Is Required

(j) If Table 1, Table 2, Table 3, or Table 4 of Lycoming MSB No. 569A, dated April 11, 2006, lists your engine SN, and Table 5 of MSB No. 569A, dated April 11, 2006, lists your crankshaft SN, replace the affected crankshaft with a crankshaft that is not listed in Table 5 of MSB No. 569A at the earliest of the following:

(1) The time of the next engine overhaul as specified in Lycoming Engines Service Instruction No. 1009AS, dated May 25, 2006; or

(2) The next separation of the crankcase; or

(3) No later than 12 years from the time the crankshaft first entered service or was last overhauled, whichever is later.

(k) If Table 1, Table 2, Table 3, or Table 4 of Lycoming MSB No. 569A, dated April 11, 2006, does not list your engine SN, and Table 5 of MSB No. 569A does list your crankshaft SN (an affected crankshaft was installed as a replacement), replace the affected crankshaft with a crankshaft that is not listed in Table 5 of MSB No. 569A at the earliest of the following:

(1) The time of the next engine overhaul as specified in Lycoming Engines Service Instruction No. 1009AS, dated May 25, 2006; or

(2) The next separation of the crankcase; or

(3) No later than 12 years from the time the crankshaft first entered service or was last overhauled, whichever is later.

## Prohibition Against Installing Certain Crankshafts

(l) After the effective date of this AD, do not install any crankshaft that has a SN listed in Table 5 of Lycoming MSB No. 569A, dated April 11, 2006, into any engine.

### Alternative Methods of Compliance

(m) The Manager, New York Aircraft Certification Office, has the authority to approve alternative methods of compliance for this AD if requested using the procedures found in 14 CFR 39.19.

### Material Incorporated by Reference

(n) You must use the service information specified in Table 1 of this AD to perform the actions required by this AD. The Director of the Federal Register approved the incorporation by reference of the documents listed in Table 1 of this AD in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Contact Lycoming, 652 Oliver Street, Williamsport, PA 17701; telephone (570) 323-6181; fax (570) 327-7101, or on the internet at <http://www.Lycoming.Textron.com> for a copy of this service information. You may review copies at the FAA, New England Region, Office of the Regional Counsel, 12 New England Executive Park, Burlington, MA; or 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>.

**Table 1 – Incorporation by Reference**

<b>Service Information</b>	<b>Page</b>	<b>Revision</b>	<b>Date</b>
Lycoming Engines Service Instruction No. 1009AS Total Pages: 4	All	AS	May 25, 2006
Lycoming Engines Mandatory Service Bulletin No. 569A Total Pages: 59	All	A	April 11, 2006

Issued in Burlington, Massachusetts, on September 20, 2006.

Francis A. Favara,

Manager, Engine and Propeller Directorate, Aircraft Certification Service.

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