TEXTRON Lycoming

652 Oliver Street
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717/323-6181

MANDATORY

SERVICE BULLETIN

DATE: **February 18, 1977**

Service Bulletin No. 301B
(Supersedes Service Bulletin No. 301A)
Engineering Aspects are
FAA (DEER) Approved

SUBJECT: Maintenance Procedures and Service Limitations for Valves

MODELS AFFECTED: All Avco Lycoming opposed series aircraft engines.

TIME OF COMPLIANCE: During periodic maintenance and when intake and exhaust valves are removed from cylinders.

Valves used in Avco Lycoming aircraft engines are made from various steel alloys and in a variety of designs, each dependent on the requirements for the particular engine model in which it is employed. Regardless of varieties, all of these valves have identical functions, serve the same purposes and are subject to the same service maintenance.

Of all of the forces that act on the valves to create maintenance problems, perhaps heat is the most destructive. Heat, generated in the cylinder, is conducted to the heads of the valves, and in addition, hot gas flowing at high velocity across them combine to make valve corrosion and distortion an ever-present likelihood. For these reasons, it is necessary that all maintenance involving the valves, valve seats, and valve guides, be carried out with the utmost care.

The following outline is provided to serve as a standard for all valve maintenance procedures on Avco Lycoming engines.

1. VALVE INSPECTION (400 Hour Maintenance Inspection). During each 400 hour engine maintenance check, the following procedure shall be conducted:

a. Remove rocker box covers and inspect inside of covers for evidence of wear; then make a visual inspection inside the rocker box area for possible damage, paying particular attention to the valve springs, valve keys and rockers, valves and guides.

b. Rotate the engine by hand and check to determine that all cylinders have normal valve lift and that rocker arms operate freely.

NOTE

O-235-C and O-290-D models have mechanical tappets, and it is necessary to check clearance between valve tip and rocker every 100 hours. However, all other models have hydraulic valve lifters and consequently, periodic clearance check is not necessary.

c. If any parts in the rocker box area (including the cover) are broken, cracked or show any signs of unusual wear, the cylinder and related parts should be disassembled and inspected.

2. VALVE INSPECTION (Cylinder Removed from Engine). If cylinder has been removed from engine, or if engine has been disassembled for overhaul, valves should be inspected in the following manner.

a. Remove valves from cylinder and clean to remove carbon and examine visually for physical damage, damage due to face burning or excessive corrosion in stem to head fillet area. Valves that indicate damage of this nature must not be reused. Do not reuse valves in which stem diameters midway of valve measure less than that measured at key end; excepting inconel valves which may be .002 undersize on stem diameter as shown in figure 1.

NOTE

Exhaust valve should not be reused unless they had been recently installed and are satisfactory in respect to these inspection requirements, 2 a. thru f.

b. If valves require refacing, remove only enough metal to provide a smooth surface.

c. After refacing, check runout of valve face. See figure 2. Total runout must not exceed .0015 inch. Do not reuse any valves that exceed this limit.

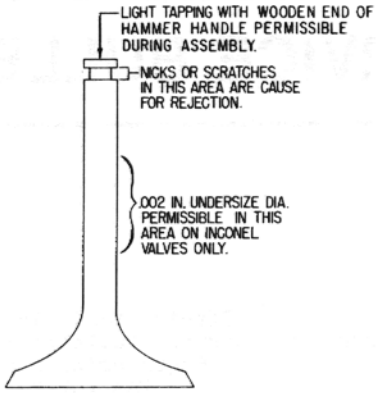

Figure 1. Diagram of Valve Showing Area for Inspection

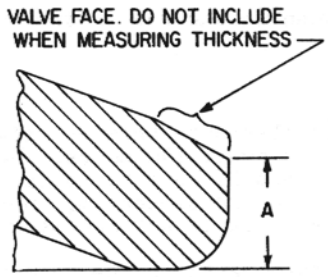

Figure 2. Valve Showing Locations for Checking Runout and Section for Measuring Edge Thickness

d. Measure edge thickness of intake valve heads. See figure 2. If, after refacing, "A" is less than the limit shown in the following chart, the valve must not be reused.

NOTE

The edge of intake valve heads are generally formed as shown in figure 3. The thickness "A" can best be measured with an optical comparator; however, it can be measured with sufficient accuracy by means of a dial indicator and a surface plate, as shown in figure 4.

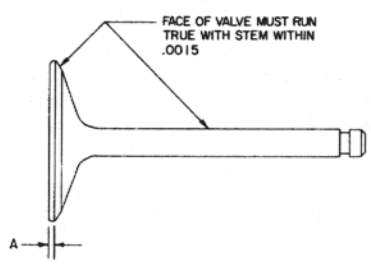

Figure 3. Section Thru Edge of Valve

e. Using an optical magnifier, examine exhaust valves in the stem area and the tip for evidence of cracks, nicks, tool marks, or other indications of damage. Damage of this nature seriously weakens the valve, making it liable to failure. Any exhaust valve having a nick, with ragged edges and more than 1/16 inch in length should not be reused. A nick or tool mark of any sort in the keeper groove of an exhaust valve is sufficient reason for not reusing the valve.

f. If superficial nicks and scratches on the valve indicate that the valve might be cracked, it should be inspected by the magnetic or dye penetrant method. Dye penetrant procedures should be carried out strictly within the recommendations of the manufacturer of the penetrant.

3. VALVE REPAIR. Repairs to valves are limited to removal of carbon, regrinding the face, and polishing superficial scratches. Bending processes, to straighten and puddling to restore the face must not be attempted.

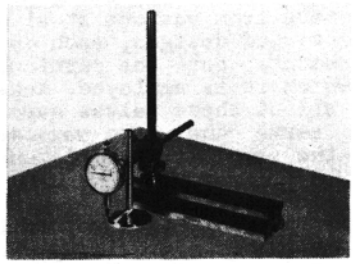

Figure 4. Method of Checking Valve Edge Thickness with Dial Indicator

4. VALVE INSTALLATION. Prior to valve installation, inspection of the valve guides and seats should be made in accordance with instructions in the applicable overhaul manual. Do not install either new or used valves in cylinders with excessively worn or damaged valve guides or valve seats. Be sure to pre-lubricate valves before assembly; see Service Instruction No. 1059. Also, replace valve keys when installing new exhaust valves.

a. Valve keys tend to wear in uniform, distinctive patterns and therefore if they are to be reinstalled in the cylinder, they should be returned to the same position as they were before removal; that is, they must not be installed up-side-down at a different valve location.

b. If valve seats have been properly ground, the valve should seat without lapping. However, if lapping is used, care must be exercised to keep lapping compound away from the valve stem and guide. Be sure all traces of lapping compound are removed from the cylinder parts before they are assembled.

CAUTION

Do not directly tap end of valve with any object; the tip of the valve could be damaged. Instead, place the wooden end of a hammer against the end of the valve and strike the head of the hammer with the palm of the hand.

Intake Valve Part No.	Minimum Permissible Edge Thickness "A"
60037 66429 LW-11901	.040 inch
67905	.050 inch
72625 73938 LW-15314	.060 inch
73129 LW-13622	.075 inch
67518 72612 73117 73876 78671 LW-12949 LW-13087 LW-13262	.085 inch

NOTE: Revision "B" changes paragraph 1, a, c; Caution note on page 3; table on page 3. Paragraph 4 revised to add step a.

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MANDATORY
SERVICE BULLETIN

DATE: April 13, 2005

Service Bulletin No. 480E
(Supersedes Service Bulletin No. 480D)

SUBJECT: I. Oil and Filter Change and Screen Cleaning
II. Oil Filter/Screen Content Inspection

MODELS AFFECTED: All Lycoming direct drive and TIGO-541 Piston engines.

TIME OF COMPLIANCE: As required by subject bulletin.

Lycoming recommends the following:

I. Oil and Filter Change and Screen Cleaning.

A. At 25 hours after the first replacement/screen cleaning – oil change, filter replacement or pressure screen cleaning and oil sump suction screen check for new, remanufactured or newly overhauled engines and for engines with any newly installed cylinders.

B. 25-Hour interval – oil change, pressure screen cleaning, and oil sump suction screen check for all engines employing a pressure screen system.

C. 50-Hour interval – oil change and oil filter replacement and suction screen check for all engines using full-flow filtration system (except for engine models TIO-540-AF1A and -AF1B, which require 25 hour interval changes).

D. A total of four (4) months maximum between changes for systems listed under “A”, “B” and “C”.

E. All turbocharged engines must be broken-in and operated with ashless dispersant oil. (Refer to latest revision of Service Instruction No. 1014.)

II. Oil Filter/Screen Content Inspection.

A. Using the following methods, check for premature or excessive engine component wear, indicated by the presence of metal particles, shavings, or flakes in the oil filter element or screens.

1. Oil Filter.

a. Using approved method (eg., for full-flow, spin-on filters, use Champion Tool CT-470 or Airwolf Cutter AFC-470), open the filter.

b. Check condition of the oil from the filter for signs of metal contamination.

c. Remove the paper element from the filter.

d. Carefully unfold the paper element and examine the material trapped in the filter.

2. Pressure Screen.

If engine employs a pressure screen system, check the screen for metal particles.

3. Oil Sump Suction Screen.

After draining oil, remove the suction screen from the oil sump and check for metal particles.

B. If examination of the used oil filter or pressure screen and the oil sump suction screen indicates abnormal metal content, additional service may be required to determine the source and possible need for corrective maintenance.

NOTE

Lycoming encourages the use of spectrograph oil analysis to monitor engine component wear rates. Refer to the latest revision of Service Letter No. L171.

NOTE: Revision “E” deletes 10 hour requirements.

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SERVICE INSTRUCTION

DATE: February 1, 2017

Service Instruction No. 1009AZ
(Supersedes Service Instruction No. 1009AY)
Engineering Aspects are
FAA Approved

SUBJECT: Required Time Between Overhaul (TBO) Schedule

MODELS AFFECTED: Lycoming engines that meet defined criteria herein

REASON FOR REVISION: Added IO-360-N and IO-390-C engine models

NOTICE: Incomplete review of all the information in this document can cause errors. Read the entire Service Instruction to make sure you have a complete understanding of the requirements.

This Service Instruction identifies the required Time Between Overhaul (TBO) for certified Lycoming engine models maintained and compliant with all applicable Lycoming Service Bulletins and FAA Airworthiness Directives.

The TBOs stated in this Service Instruction do not apply to engines that:

a) Do not conform to the original engine model type certificate configuration.

b) Have been assembled, repaired or overhauled with FAA-PMA parts, where the FAA-PMA parts have not been approved for use by Lycoming. Consult the applicable FAA-PMA instructions and FAA Airworthiness Directives for the FAA-PMA components.

c) Have been maintained or overhauled using methods other than Lycoming approved procedures.

The information in this revision of Service Instruction No. SI-1009 is approved by the FAA as an Alternative Method of Compliance (AMOC) for compliance with AD-2012-19-01, paragraphs (f)(1)(i) and (f)(2)(i).

The TBOs take into account service experience, variations in operating conditions, and frequency of operation. **However, because of variations in the manner in which engines are operated and maintained, Lycoming Engines cannot give assurance that any individual operator will achieve the TBOs identified herein.**

Continuous service assumes that the aircraft will not be out of service for more than 30 consecutive days. If the aircraft is to be out of service for more than 30 consecutive days, refer to the latest revision of Service Letter L180.

General Aviation Manufacturers Association

ISSUED			REVISED			PAGE NO.	REVISION
MO	DAY	YEAR	MO	DAY	YEAR	1 of 7	AZ
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Engine deterioration in the form of corrosion (rust) and the drying out and hardening of composition materials such as gaskets, seals, flexible hoses and fuel pump diaphragms can occur if an engine is out of service for an extended period of time. Due to the loss of a protective oil film after an extended period of inactivity, abnormal wear on soft metal bearing surfaces can occur during engine start. Therefore, all engines that do not accumulate the hourly period of TBO specified in this publication are recommended to be overhauled in the twelfth year.

Table 1 identifies the TBOs for Lycoming engine models used in fixed wing aircraft. Table 2 contains the TBOs for Lycoming engine models used on rotary wing aircraft.

NOTICE: The recommended TBOs identified in Tables 1 and 2 do not apply to engines used for crop dusting or other aircraft used for chemical application. The TBO for engines in these applications is a maximum of 1500 hours, or at recommended TBO, whichever is lower.

Engine accessories and propellers could require overhaul prior to engine overhaul. Complete the overhaul of these components in accordance with the accessory manufacturer's recommendation.

Reliability and average service life cannot be predicted when an engine has undergone any modification not approved by Lycoming Engines. The TBOs shown in Tables 1 and 2 are recommendations for engines as manufactured, without considering any modifications that could alter the life of the engine. Refer to notes shown after Tables 1 and 2 and identified by number in Tables 1 and 2 for additional specific details.

Table 1
Fixed Wing Aircraft
Recommended Time Between Overhaul Periods

Engine Models	See Note	Hours
O-235 Series (except -F, -G, -J)	12	2400
O-235-F, -G, -J	13	2000
O-290-D	--------	2000
O-290-D2	--------	1500
O-320 Series (except O-320-H)	1,10,11	2000
O-320-H	11	2000
IO-320-A, -E	1,10,11	2000
IO-320-B, -D, -F	4,6,10,11	2000
IO-320-C	2,4,10,11	1800
AIO-320 (160 HP)	6	1600
AEIO-320 Series	6	1600
O-340 Series	1	2000
O-360 Series (except O-360-E, -J2A)	1,4,10,11	2000
O-360-E	4,11	2000
IO-360-L2A	11	2000
IO-360-A, -C, -D, -J (200 HP)	4,5,6,10,11	2000
IO-360-B, -E, -F, -M, -N (180 HP)	1,4,10,11	2000
TO-360-C, -F; TIO-360-C	3,11	1800
TO-360-E (180 HP)	3,4,11	1800
AIO-360 (200 HP)	6	1400

Table 1 (Cont.)
Fixed Wing Aircraft
Recommended Time Between Overhaul Periods

Engine Models	See Note	Hours
TIO-360-A Series	3,11	1200
AEIO-360 Series (180 HP)	6	1600
AEIO-360 Series (200 HP)	6	1400
IO-390-A	11	2000
AEIO-390-A	6	1400
IO-390-C Series	11	2200
O-435; GO-435	--------	1200
GO, GSO-480; IGSO-480	1	1400
O-540-A, -B, -E4A5	1,10	2000
O-540-E4B5, -E4C5	1,11	2000
O-540-G, -H, -J	10,11	2000
O-540-L3C5D	2,11	2000
IO-540-A, -B (290 HP)	1,10,11	1400
IO-540-AG1A5	--------	1800
IO-540-C	1,10, 11	2000
IO-540-D	1,10	2000
IO-540-E, -G, -P	1,10,11	1600
IO-540-S, -AA	2,10	1800
IO-540-J, -R	2,10	1800
IO-540-J4A5	10	2000
IO-540-AB1A5, -AC1A5, -AF1A5	11	2000
IO-540-K, -L, -M, -N, -T, -V, -W	10,11	2000
AEIO-540 Series	6	1400
IGO & IGSO-540 Series	--------	1200
TIO-540-V, -W, -AE	3,4,11	2000
TIO-540-C, -AA, -AB, -AF, -AG, -AH, -AJ, -AK	3,4,7,11	2000
TIO-540-A, -F, -J, -N, -R, -S, -U	3,4,11,14	1800
TIO-541-A (320 HP)	3	1300
TIO-541-E (380 HP)	3,9	1600
TIGO-541 (425 HP)	3	1200
IO-580-B1A	11	2000
AEIO-580-B1A	6	1400
IO-720 Series	11	1800

Table 2
Rotary Wing Aircraft
Recommended Time Between Overhaul Periods

Engine Models	See Note	Hours
O-320-A2C, -B2C	11	2000
O-320-B2C (Robinson Helicopter only)	15	2200
HO-360-C1A	11	2000
O-360-C2B, -C2D; HO-360 (except –C1A); HIO-360-B	--------	1500
O-360-J2A	11	2000
O-360-J2A (Robinson Helicopter only)	15	2200
HIO-360-A, -C, -D, -E, -F Series	--------	1500
HIO-360-G1A	11	2000
VO-360-A Series	--------	600
VO-360-B; IVO-360	--------	1000
VO-435-A Series	--------	1200
VO-435-B Series	--------	1200
TVO-435 Series	3	1000
O-540-F1B5	11	2000
O-540-F1B5 (Robinson Helicopter only)	11, 15	2200
IO-540-AE1A5	11	2000
IO-540-AE1A5 (Robinson Helicopter only)	15	2200
VO-540 Series	8	1200
IVO-540 Series	--------	600
TVO, TIVO-540 Series	3,8	1200

NOTES

1. Only engines built with 1/2 in. (12.7 mm) dia. exhaust valve stems. Engines of this series with 7/16 in. (11.1 mm) dia. exhaust valves must not exceed 1200 hours between overhauls regardless of the type of operation. New and rebuilt engines built with 1/2 in. (12.7 mm) dia. exhaust valve stems are identified, respectively, by serial numbers and date in the latest revision of Service Instruction No. 1136.
2. These engines are designed to incorporate exhaust turbocharging.
3. Turbochargers could require removal, prior to engine overhaul, for carbon removal and repair.
4. Engines with reverse rotation have same overhaul times as corresponding normal rotation engines.
5. 1200 HOURS: Engines that do not have large main bearing dowels must not be operated more than 1200 hours between overhauls.

   1400 HOURS: Engines that have large main bearing dowels can be operated to 1400 hours between overhauls. These include engines with serial numbers L-7100-51A and up, and L-101-67A and up; engines which are in compliance with the latest revision of Service Bulletin No. 326; and remanufactured engines shipped after January 26, 1970.

2000 HOURS: Engines that have large main bearing dowels and redesigned camshafts can be operated to 2000 hours between overhauls. These include engines with serial numbers L-9762-51A and up; IO-360-C1E6 engines with serial numbers L-9723-51A and up; LIO-360-C1E6 engines with serial numbers L-524-67A and up; engines that are in compliance with the latest revision of Service Bulletin No. 326 and Service Instruction No. 1263. Rebuilt engines shipped after October 1, 1972, can be operated to 2000 hours between overhauls except those with serial numbers L-2349-51A and L-7852-51A which do not have the redesigned camshaft and must not exceed 1400 hours of operating time between overhauls.

6. The reliability and service life of engines can be detrimentally affected if they are repeatedly operated at alternating high and low power applications which cause extreme changes in cylinder temperatures. Flight maneuvers which cause engine overspeed also contribute to abnormal wear characteristics that tend to shorten engine life. These factors must be considered to establish TBO of aerobatic engines; therefore it is the responsibility of the operator to determine the percentage of time the engine is used for aerobatics and establish his own TBO. The maximum recommended is the time specified in this instruction.
7. TIO-540-C Series engines with serial numbers L-1754-61 and up, TIO-540-C Series engines that were rebuilt or overhauled at Lycoming Engines, Williamsport, PA after March 1, 1971, and TIO-540-C series engines that have been modified to incorporate large main bearing dowels as described in the latest revision of Service Instruction No. 1225 can be operated to 2000 hours. Engines that do not incorporate this modification must not exceed 1500 hours between overhauls.
8. VO, TVO and TIVO-540 engines built with P/N 77450 connecting rods as described in the latest revision of Service Bulletin No. 371 can be continued in service to 1200 hours. Engines that do not incorporate this new connecting rod are restricted to 1000 hours for VO-540 models and 900 hours for TVO and TIVO-540. See the latest revision of Service Bulletin No. 371 for improved connecting rod assembly.
9. TIO-541-E series engines with serial numbers L-804-59 and up, rebuilt engines shipped after March 1, 1976, and all engines that incorporate the improved crankcases and cylinder assemblies described in the latest revision to Service Bulletin Nos. 334 and 353 can be operated for 1600 hours before overhaul. Engines not in compliance with these requirements are limited to 1200 hours recommended time between overhaul.
10. Some engines in the field have been altered to incorporate an inverted oil system in order to perform aerobatic maneuvers. Whenever this modification is done to an engine, the TBO of the engine must be determined in the same manner listed for AEIO engines of the same model series.
11. If an engine is being used in "frequent" type service and accumulates 40 hours or more per month, and has been so operated consistently since being placed in service, add 200 hours to TBO time. (Engines identified in AD-2012-19-01 are not eligible for this TBO extension.)
12. To qualify for the 2400 hour TBO, high-compression, O-235's must have the increased strength pistons (P/N LW-18729). See the latest revision of Service Letter No. L213.
13. The high-compression O-235-F, -G and -J series do not have the increased-strength pistons (P/N LW-18729); therefore, they do not qualify for the 2400 hour TBO.
14. TIO-540-A series engines with serial numbers L-1880-61 and up, TIO-540-A series engines that were rebuilt or overhauled at Lycoming Engines, Williamsport, PA after March 1, 1971, and TIO-540-A series engines that have been modified to incorporate large main bearing dowels as described in the latest revision of Service Instruction No. 1225 can be operated to 1800 hours. Engines that do not incorporate this modification must not exceed 1500 hours between overhauls.
15. Only engines built to specifications intended for and installed in Robinson Helicopter applications are approved for 2200 hour TBO.

U.S. Department
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FEB 0 1 2017

Ms. Marian Folk
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Subject: Request for Alternate Method of Compliance (AMOC) to Airworthiness Directive (AD) 2012-19-01 (AMOC Log # 17-11)

Dear Ms. Folk,

The Federal Aviation Administration (FAA) has received your email dated January 19, 2017 requesting an AMOC to, paragraph(s) (f)(1)(i) and (f)(2)(i) of AD 2012-19-01 which states: "The time of the next engine overhaul as specified in Lycoming Service Instruction No. 1009AU, dated November 18, 2009, or …"

Lycoming is requesting a global AMOC to allow operators to use the time periods specified in Lycoming SI 1009AZ to define the time of the next overhaul to meet requirement of AD 2012-19-01. SI 1009AY was revised to SI 1009AZ to add the IO-360-N1A engine model and the IO-390-C series engines which were recently certified and are not affected by AD 2012-19-01. This change does not affect the intent of the AD. The 12 year calendar time limit currently in SI 1009 has not changed.

The New York Aircraft Certification Office approves your Global AMOC proposal to paragraph (f)(1)(i) and (f)(2)(i) of AD 2012-19-01 which states: "The time of the next engine overhaul as specified in Lycoming Service Instruction No. 1009AU, dated November 18, 2009, or …" to replace, SI 1009AU with SI 1009AW, titled, "Recommended Time Between Overhaul Periods."

In accordance with FAA Order 8110.103A, the following conditions apply:

1. All provisions of 2012-19-01 that have not been specifically referenced above remain fully applicable and must be complied with accordingly.

2. This approval is transferable with engine(s) to other operators.

3. Before using this AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

4. The NYACO will revoke this AMOC if the NYACO later determines that this AMOC does not provide an acceptable level of safety.

Should you have any questions, please contact this office or Norman Perenson at telephone number 516-228-7337, fax 516-794-5531, or email at norman.perenson@faa.gov.

Sincerely,

James T. Delisio

for: Gaetano Sciortino
Manager, New York
Aircraft Certification Office

cc: James Delisio, ANE-171 (PDF Copy)