

Williamsport Plant

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SERVICE INSTRUCTION

Service Instruction No. 1425A
(Supersedes Service Instruction No. 1425)
Engineering Aspects are
FAA Approved

DATE: January 19, 1988

SUBJECT: Suggested Maintenance Procedures to Reduce the Possibility of Valve Sticking.

MODELS AFFECTED: All Textron Lycoming Reciprocating Engines.

TIME OF COMPLIANCE: As required.

Field experience has shown that engine oil contamination increases the possibility of sticking and/or stuck valves. This situation occurs when the contaminants in the engine lubrication oil become deposited on the valve stems, restricting the valve movement, and resulting in intermittent engine hesitation or miss. If corrective action is not taken to remove the deposits, a valve could become stuck causing engine damage.

Since the rate of oil contaminant accumulation is increased by high ambient temperatures, slow flight with reduced cooling, and high lead content of fuel, owners and operators experiencing these conditions are encouraged to consider the following suggestions for operation and maintenance if they have experienced valve sticking.

PART I OIL AND FILTER CHANGES

The prime cause of valve sticking is the accumulation of harmful contaminants in the oil and oil filter. Textron Lycoming recommends 50-hour interval oil change and filter replacement for all engines using full-flow filtration system and 25-hour intervals for oil change and screen cleaning for pressure screen systems. Operating the engine with a clean air filter is

also important for keeping dirt from accumulating in the oil supply. Therefore, the entire air induction system should be well sealed to prevent the entry of unfiltered air.

It is also important that the cooling air baffles and baffle strips be in good condition to prevent localized overheating problems.

When the aircraft cannot be flown frequently, the oil should be changed even sooner than the 50-hour interval. The oil should then be changed every 25 hours to eliminate moisture and acids that collect in the oil of an inactive engine. For aircraft that are not flown for long periods of time, the oil should be changed every four (4) months, if the aircraft is not flown at least 25 hours within this 4-month period. Short ground runs should be avoided.

Exposing the engine to sudden cool down, as in a rapid descent with the power reduced, or shutting the engine down before it has sufficiently cooled down can also induce valve sticking.

PART II

Investigations have shown that exhaust valve



sticking occurs more frequently during hot ambient conditions. The lead salts that accumulate in the lubricating oil from the use of leaded fuels contribute to the deposit build up in the valve guides. They are mostly eliminated each time the oil and filter are changed. Depending on the amount of deposits, sticking between the valve stem and guide can restrict the valve movement. This condition is often identified by an intermittent engine hesitation or miss.

Operating with any of the following conditions present can promote deposit build-up reducing valve guide clearance and result in valve sticking.

- a. High ambient temperatures
- b. Slow flight with reduced cooling
- c. High lead content of fuel

If any of the above is present or hesitation is observed, then inspection and cleaning is recommended (Refer to Part III of this instruction). Inspection and cleaning intervals can only be determined as a function of individual operating conditions.

PART III CLEANING PROCEDURE

1. Remove all spark plugs and/or exhaust manifold. If compressed air is to be used to reseat valve, the exhaust manifold should not be removed.

2. Remove rocker box cover and gasket from cylinder.

3. On all engines except the 76 series, push out rocker shaft to remove exhaust rocker and rotator cap. On 76 series engines, remove rocker box covers, rocker arm retaining nuts, rocker arm fulcrums, spacer washers, and rocker arms.

CAUTION

Physically separate and identify by cylinder and valve location, the valve train components as they are disassembled, so that each part may be reinstalled in exactly

the same location from which it was removed. Pay particular attention to valve stem keys. These tend to wear in uniform distinctive patterns, and should be returned to the same position as they were before removal.

4. Position crankshaft just after bottom center on the intake stroke.

5. Insert about 8 feet of 3/8 inch nylon rope through the spark plug hole; then turn the crankshaft until the piston moves the rope snugly against the exhaust valve.

(a) An alternate technique for holding the valve in position is with air pressure using shop air and a compression check fitting.

CAUTION

The piston is held at bottom dead center by firmly holding the propeller to prevent the engine from turning when air pressure is applied through the differential compression device to the combustion chamber.

Use gloves or rags to protect the hands while holding the propeller blade. Also, before attaching the compression tester, check the air supply regulator to make sure the air pressure to the cylinder is not excessive.

6. Compress the exhaust valve spring and remove valve keys. (The rope or air pressure inserted in the combustion chamber in the preceding step provides a base to support the valve in the event the keys tend to stick.)

7. Remove the nylon rope or bleed off the air pressure and insert light through the upper spark plug hole. Then start pushing the valve from its guide. Before the valve stem is free from the guide, secure it from falling into the cylinder with mechanical pickup fingers, working through the spark plug holes and/or exhaust port. As shown in Fig. 1.



Figure 1. View Through Exhaust Port Showing Mechanical Fingers Holding Valve Stem

8. Move the valve (secured by the mechanical fingers) completely out of the guide and position it away from the guide to avoid interference when the guide is reamed. See figure 2.

NOTE

Refer to Textron Lycoming, Service Table of Limits and Torque Value Recommendations, SSP1776 or latest revision thereof, for valve guide dimensions when selecting a reamer. See special tools section of this instruction for reamer part numbers.

9. Place ordinary cup grease on the flutes of the reamer, so the deposits will be removed with the reamer.

10. Work the reamer by hand and make sure cutting position has gone through entire length of guide. The one-inch pilot should be completely visible through the exhaust port or through spark plug hole using a dental mirror.

11. Wash the guide with Varsol or equivalent solvent and blow out with compressed air. Check the ID of the valve guide using the correct plug gage. Inspect the reamed hole to determine if the reamer has cut all the way to the exhaust port end of the guide; if it has not, and the exhaust port end of the hole appears dark colored it is evident the guide is bell-mouthed and should be replaced. Lubricate valve guide.



Figure 2. View Through Exhaust Port Showing Mechanical Fingers Supporting Exhaust Valve Away From Guide

12. Using a magnetic pencil (reference Special Tool List) and flexible mechanical rings, position tip of valve in guide and very carefully work the valve back into its guide. Extreme caution should be exercised during this operation, making sure the valve is placed within the guide and not cocked, as damage could be done to the guide or valve.

CAUTION

Never use the piston to push the valve through the guide.

13. Install valve springs and valve spring seats in same position as removed. Compress valve spring and install keys in their respective position. In some cases it has been found that when the valve spring is compressed, the valve slides down the guide, making it impossible to install the keys. If this condition exists, reinsert the nylon rope (steps 4 & 5) to hold valve firmly on its seat while installing valve keys.

14. Remove hydraulic lifter and clean free of all oil, inspect for any malfunction. Clean ID of cam follower reinstall hydraulic lifter.

15. Install push rod, then rotating cap, rocker arm and shaft.

16. Install rocker box cover and new gasket.

CAUTION

During reassembly valve train components must be replaced in their original location. On 76 series engines, give special attention during reassembly to alignment of rocker arms, spacers and rocker arm fulcrums with the rocker arm retaining stud. All parts must be in pro

per alignment to assure correct dry tappet clearance. Misalignment could result in engine damage.

17. Make sure all flashlights, ropes, etc. have been removed from within the cylinder before proceeding to the next cylinder.

18. Install spark plugs (Install exhaust manifold after all exhaust valve guides are cleaned).

NOTE

Any available reamer that is of the correct dimension can be used for this valve guide cleaning procedure. The following special tools section lists all Textron Lycoming valve guide reamers along with the reamer dimensions and corresponding plug gage. Reamers are manufactured with cutting tips made from various materials to ream valve guides made from different materials. Always consult Textron Lycoming Tool Catalog SSP-578, or the latest revision thereof, for the correct reamer when finish reaming a newly installed valve guide.

SPECIAL TOOLS REQUIRED:

Lycoming P/N	Nomenclature	Plug Gage
64684	Reamer .4040/.4050 Finished ID	64514
ST-27	Reamer .4370/.4380 Finished ID	ST-26
64900	Reamer .4375/.4385 Finished ID	64901
ST-113-1	Reamer (Ni-Resist) .4985/.4995 Finished ID	64927
ST-113-2	Reamer (Ni-Resist) .4985/.4995 Finished ID	64927
ST-143-1	Reamer (Ni-Resist) .4995/.5005 Finished ID	ST-155
ST-143-2	Reamer (Ni-Resist) .4995/.5005 Finished ID	ST-155
ST-309-1	Reamer (Ni-Resist) .5000/.5010 Finished ID	ST-314
ST-309-2	Reamer (Ni-Resist) .5000/.5010 Finished ID	ST-314
ST-315	Reamer (Bronze) .5000/.5010 Finished ID	ST-314
ST-338	Reamer (Hand Expansion) .5000/.5010 Finished ID	ST-314
ST-25	Compressor, Valve Spring and Bar (all engines except 76 series and TIO-541)	
ST-266	Compressor, Valve Spring and Bar (TIO/TIGO-541)	
ST-419	Compressor, Valve Spring and Bar (76 Series)	
	A Flexible Two-Prong Mechanical Finger	
	A (pencil) Magnet (Maximum diameter 3/8") capable of reaching a minimum of 4"	

NOTE: Revision "A" adds changes for oil and filter recommendations.