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SERVICE LETTER

Service Letter No. L185B
(Supersedes Service Letter No. L185A)
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TO: All Owners and Operators of Textron Lycoming Aircraft Engines

SUBJECT: The Use of Higher Octane Aviation Fuel, 100LL Blue or 100 Green, for Engines Rated for 80/87 Octane Fuel

We have received many inquiries from the field expressing concern over the limited availability of 80/87 grade fuel and associated questions from use of higher leaded fuel in engines rated for grade 80/87 fuel. The leading fuel suppliers indicate that in some areas 80/87 grade aviation fuel is not available. It is further indicated that the trend is toward phase out of 80/87 aviation grade fuel. The low lead 100LL Avgas, blue in color, which is limited to 2ml tetraethyl lead per gallon and the higher 100 aviation fuel, color green, with a maximum of 4.0ml tetraethyl lead per gallon are available. Whenever 80/87 is not available you should use the lowest lead 100 grade fuel available. Automotive fuels should never be used as a substitute for aviation fuel in aircraft engines.

The continuous use, more than 25% of the operating time, with the higher leaded fuels can result in increased engine deposits both in the combustion chamber and in the engine oil. It may require increased spark plug maintenance and more frequent oil changes. The frequency of spark plug maintenance and oil drain periods will be governed by the amount of lead per gallon and the type of operation. Operation at full rich mixture requires more frequent maintenance periods; therefore it is important to use proper approved mixture leaning procedures.

To reduce or keep engine deposits at a minimum when using the higher leaded fuels, 100LL Avgas, blue or 100, green, it is essential that the following four conditions of operation and maintenance are applied.

- A. Fuel management required in all modes of flight operation. (See A. GENERAL RULES.)
- B. Prior to engine shutdown run up to 1800 RPM for one minute to clean out any unburned fuel after taxiing in. (See B. ENGINE GROUND OPERATION.)
- C. Replace lubricating oil and filter each 50 hours of operation, under normal environmental conditions. (See C. LUBRICATION RECOMMENDATIONS.) Reference latest edition of Service Bulletin No. 480.
- D. Proper selection of spark plug types and good maintenance are necessary. (See D. SPARK PLUGS.)

The use of economy cruise engine leaning whenever possible will keep deposits to a minimum. Pertinent portions of the manual leaning procedures as recommended in the latest edition of Textron Lycoming Service Instruction No. 1094 are reprinted here for reference.

A. GENERAL RULES.

1. Never lean the mixture from full rich during take-off, climb or high performance cruise operation unless the airplane owners manual advises otherwise. However, during take-off from high elevation airports or during climb at higher altitudes, roughness or reduction of power may occur at full rich mixture. In such a case the mixture may be adjusted only enough to obtain smooth engine operation. Careful observation of temperature instruments should be practiced.
2. Operate the engine at maximum power mixture for performance cruise powers and at best economy mixture for economy cruise power; unless otherwise specified in the airplane owners manual.
3. Always return the mixture to full rich before increasing power settings.
4. During let-down and reduced power flight operations it may be necessary to manually lean or leave mixture setting at cruise position prior to landing. During the landing sequence the mixture control should then be placed in the full rich position, unless landing at high elevation fields where leaning may be necessary.
5. Methods for manually setting maximum power or best economy mixture.
 - a. **Engine Tachometer – Airspeed Indicator Method:** The tachometer and/or the airspeed indicator may be used to locate, approximately, maximum power and best economy mixture ranges. When a fixed pitch propeller is used, either or both instruments are useful indicators. When the airplane uses a constant speed propeller, the airspeed indicator is useful. Regardless of the propeller type, set the controls for the desired cruise power as shown in the owners manual. Gradually lean the mixture from full rich until either the tachometer or the airspeed indicator are reading peaks. At peak indication the engine is operating in the maximum power range.
 - b. **For Cruise Powers:** Where best economy operation is allowed, by the manufacturer, the mixture is first leaned from full rich to maximum power, then leaning is slowly continued until engine operation becomes rough or until engine power is rapidly diminishing as noted by an undesirable decrease in airspeed. When either condition occurs, enrich the mixture sufficiently to obtain an evenly firing engine or to regain most of the lost airspeed or engine RPM. Some slight engine power and airspeed must be sacrificed to gain a best economy mixture setting.
 - c. **Exhaust Gas Temperature Method – (EGT):** Refer to latest edition of Service Instruction No. 1094 for procedure.

Recommended fuel management, manual leaning, will not only result in less engine deposits and reduced maintenance cost but will provide more economic operation and fuel saving.

B. ENGINE GROUND OPERATION.

The engine ground operation greatly influences formation of lead salt deposits on spark plugs and exhaust valve stems. Proper operation of the engine on the ground (warm-up, landing, taxi and engine shut-down) can greatly reduce the deposition rate and deposit formation which cause spark plug fouling and exhaust valve sticking.

1. Proper adjustment of the idle speed (600 to 650 RPM) fuel mixture and maintenance of the induction air system will ensure engine operation and eliminate excessively rich fuel/air mixtures at idle speeds. This will minimize the separation of the non-volatile components of the high leaded aviation fuels greatly retarding the deposition rate.

2. The engine should be operated at engine speeds between 1000 and 1200 RPM after starting and during the initial warm-up period. Avoid prolonged closed throttle idle engine speed operation (when possible). At engine speeds from 1000 to 1200 RPM, the spark plug core temperatures are hot enough to activate the lead scavenging agents contained in the fuel which retards the formation of the lead salt deposits on the spark plugs and exhaust valve stems. Avoid rapid engine speed changes after start-up and use only the power settings required to taxi.
3. Rapid engine cool down from low power altitude changes, low power landing approach and/or engine shut-down too soon after landing or ground runs should be avoided.
4. Prior to the engine shut-down, the engine speed should be maintained between 1000 and 1200 RPM until the operating temperatures have stabilized. At this time the engine should be increased to approximately 1800 RPM for 15 to 20 seconds, then reduced to 1000-1200 RPM and shut-down immediately using the mixture control.

C. LUBRICATION RECOMMENDATIONS.

Many of the engine deposits formed, regardless of the lead content of fuel used, are in suspension within the engine oil and are not removed by a full flow filter. When sufficient amounts of these contaminants in the oil reach high temperature areas of the engine they can be baked out, resulting in possible malfunctions such as in exhaust valve guides, causing sticking valves. The recommended periods of 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 must be followed. If the occurrences of valve sticking is noted, all guides should be reamed using the procedures as stated in latest editions of Service Instruction No. 1116 and/or Service Instruction No. 1425, and a reduction in oil drain periods and oil filter replacement used.

D. SPARK PLUGS.

Spark plugs should be rotated from top to bottom on a 50-hour basis and serviced on a 100-hour basis. If excessive spark plug lead fouling occurs the selection of a hotter plug, from the approved list in the latest edition of Service Instruction No. 1042 may be necessary; however, depending on the type of lead deposit formed, a colder plug from the approved list may better resolve the problem. Depending on the lead content of the fuel and the type of operation, more frequent cleaning of the spark plugs may be necessary. Where the majority of operation is at low power, such as patrol, a hotter plug would be advantageous. Where the majority of operation is at high cruise powers a colder plug is recommended.

NOTE: Revision "B" – Text revised to include lubrication recommendations and engine ground operations.