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# SERVICE INSTRUCTION

DATE: April 18, 2008

Service Instruction No. 1070P  
(Supersedes Service Instruction No. 1070N)  
Engineering Aspects are  
FAA Approved

SUBJECT: Specified Fuels

MODELS AFFECTED: Lycoming horizontally opposed series aircraft engines.

TIME OF COMPLIANCE: When refueling aircraft.

A low lead content fuel, currently designated "100LL" has been available since the discontinuance of leaded commercial grades 91/96 and 115/145 fuels and the limited availability of 80/87 grade in U.S. as well as overseas countries.

The colorless unleaded fuel, designated "AVGAS 91/96 UL" is a trade name fuel produced by Hjelmcö Oil Inc of Sollentuna, Sweden and stated by the company to conform to ASTM D910 specifications except for the lead content and colorant. Specification of Hjelmcö AVGAS 91/96UL (or any other brand / trade name) does not constitute a commercial endorsement by Lycoming.

Fuels currently designated B91/115 and B95/130 are available for use in the Commonwealth of Independent States (CIS). Fuel currently designated 91 is available for use in the Ukraine. A summary of current grades as well as the previous fuel designations is shown in the following list.

## FUEL GRADE LIST

| Original Fuel Grades<br>(ASTM-D910) |        |                             | Current Fuel Grades<br>(ASTM-D910) |       |                             | Foreign Fuel Grades |        |                             |
|-------------------------------------|--------|-----------------------------|------------------------------------|-------|-----------------------------|---------------------|--------|-----------------------------|
| Grade                               | Color  | Max. TEL<br>Ml/U.S.<br>gal. | Grade                              | Color | Max. TEL<br>Ml/U.S.<br>gal. | Grade               | Color  | Max. TEL<br>Ml/U.S.<br>gal. |
| 80/87                               | Red    | 0.5                         | 80                                 | Red   | 0.5                         | AVGAS<br>91/96UL    | None   | 0                           |
| 91/96                               | Blue   | 2.0                         | *100LL                             | Blue  | 2.0                         | φB91/115            | Green  | φ                           |
| 100/130                             | Green  | **3.0                       | 100                                | Green | **3.0                       | φ91                 | Yellow | φ                           |
| 115/145                             | Purple | 4.6                         |                                    |       |                             | φB95/130            | Amber  | φ                           |

\* - Grade 100LL fuel in some overseas countries is colored green and designated as "100L".

\*\* - Commercial fuel grades 100 and 100/130 having Tetraethyl Lead (TEL) content of up to 4ml/U.S. gallons are approved for use in all engines certified for use with grade 100/130 fuel.

φ - B91/115 and B95/130 are specified by GOST1012-72. Max. TEL content is 2.5g/kg (B91/115) and 3.1g/kg (B95/130). Ukrainian 91 is specified by TU38.5901481-96. Max. TEL content is 2.5g/kg.



General Aviation  
Manufacturers Association

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The importance of using the fuel specified for a specific model Lycoming engine has always been stressed in Lycoming service publications. However, if the specified fuel is not available, a higher grade fuel may be used, subject in some instances to the restrictions described in the footnotes to the following Table of Specified Fuels. The chart showing specified and alternate fuels that can be safely used in no instance permits use of fuels of lower grade than that which is specified. Also, it is not permissible in any instance to use automotive fuel in aircraft engines, regardless of octane or advertised features because of the corrosive effect of its chlorine content and because of vapor lock that could result due to its high vapor pressure. Any fuel used in Lycoming engines must conform with Specifications ASTM-D910 or MIL-G-5572F.

#### NOTE

Isopropyl alcohol in amounts not to exceed 1% by volume may be added to the fuel to prevent ice formation in fuel lines and tanks. Although approved for use in Lycoming engines, do not use isopropyl alcohol in the aircraft fuel systems unless recommended by the aircraft manufacturer.

#### TABLE OF SPECIFIED FUELS

| Engine Models   | SPECIFIED FUELS<br>ASTM D910       |                                 | Alternate Military<br>and<br>Commercial Grades  |
|---|------------------------------------|---------------------------------|---|
|   | Certificated For Use<br>With Grade | Commercial Grade<br>Designation |   |
| O-235-C, -E, -H; O-290-D; O-435-A, -C   | 80                                 | 80                              | AVGAS 91/96 UL<br>④B91/115<br>or<br>④91<br>or<br>①⑤100LL<br>or<br>⑤②③100<br>or<br>⑤④②③100/130 |
| O-290-D2; O-320-A, -C, -E; IO-320-A, -E; AEIO-320-E; O-340-B; O-360-B, -D; GO-435-C2*; VO-435-A; GO-480-B, -D, -F; O-540-B; VO-540-A, -B  | 80/87                              |                                 |   |
| O-320-B, -D; IO-320-B, -D; LIO-320-B1A; AEIO-320-D; AIO-320-A, -B, -C; O-360-A, -C, -F, -G, -J; IO-360-B, -E, -L, -M; <b>LO-360-A</b> ; AEIO-360-B, -H; VO-360-A, -B; IVO-360-A; HO-360-A, -B, -C; HIO-360-B; O-435-A2; GO-435-C2*; O-480-A; O-540-A, -D, -E, -F, -G, -H; IO-540-C, -D, -E, -N, -T; AEIO-540-D  | 91/96                              | 100LL<br>or<br>100              | AVGAS 91/96UL<br>or<br>④B91/115<br>or<br>④91<br>or<br>④100/130<br>or<br>④115/145              |
| O-235-F, -G, -J, -K, -L; IO-320-C, -F; LIO-320-C1A; IO-360-A, -C, -D, -F; LIO-360-C; AEIO-360-A; AIO-360-A, -B; HIO-360-A, -C, -D, -E; LIO-360-A; VO-435-A, -B; GO-480-C, -G; IGO-480-A; IO-540-A, -B, -E, -G, -J, -K, -L, -M, -P, -R, -S, -U, -V, -W, AB, -AC, -AE; HIO-540-A; VO-540-C; IVO-540-A; IGO-540-A, -B; IO-580-B; IO-720-A, -B, -C, -D; <b>AEIO-580-B</b> | 100/130                            | 100LL<br>or<br>100              | ④100/130<br>or<br>④B95/130<br>or<br>④115/145  |

\* - GO-435-C2 engines with Marvel-Schebler carburetor No. 10-3991 are certificated to use 91/96 fuel.

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| Engine Models   | SPECIFIED FUELS<br>■ ASTM D910 |                    | Alternate Military<br>and<br>Commercial Grades |
|---|--------------------------------|--------------------|--|
|   |                                |                    |  |
| TO-360-A, -C; TIO-360-A; TVO-435-A, -B, -C, -D, -E, -F, -G; GSO-480-A, -B; IGSO-480-A; TIO-540-A, -C, -D, -E, -F, -G, -H, -J, -N, -R, -S, -U, -V, -W, -AA, -AB, -AE, -AF, -AG, -AH, -AJ, -AK; LTIO-540-F, -J, -N, -R, -U, -V; TIVO-540-A; IGSO-540-A, -B; TIO-541-A, -E; TIGO-541-B, -C, -D, -E, -G | 100/130                        | 100LL<br>or<br>100 | ④100/130<br>or<br>④115/145                     |
| O-320-H; O-360-E; LO-360-E; O-540-J, -L   | 100LL or 100                   | 100LL or 100       | ④100/130 or ④115/145                           |

- ① - Grade 100LL or 100L in which the lead content is limited to 2 ml. of TEL per gallon are approved for continuous use in all Lycoming engines listed herein. Inspection procedures described in the following footnotes are not required for engines using this fuel.
- ② - O-235-C, O-290-D, -D2 and O-435-A2, -K1 (O-435-4) engines were built with solid stem exhaust valves. The use of fuels with higher lead content of more than 2 ml. of TEL per U.S. gallon must be limited to 25% of the operating time. If specified fuel is not available and usage with high leaded fuel exceeds 25% of the operating time, inspect the valve stems at every 150 hours of engine operation for erosion or “necking”. This inspection is accomplished by removing the exhaust manifold and visually inspecting the valves through exhaust ports. To determine if an engine has solid stem exhaust valves, remove the rocker cover and look for valve rotor caps which are used with sodium cooled valves but not with solid stem valves in these particular engines. O-235-C and O-290-D models can be converted to use sodium cooled exhaust valves. See latest revision of Service Instruction No. 1246 for procedure.
- ③ - Early production O-320-A, -C, -D; GO-435; VO-435-A and GO-480-B, -D, -F were built with solid stem exhaust valves and their use with fuels having lead content of more than 2 ml. of TEL per U.S. gallon is limited to 25% of the operating time. If specified fuel is not available and usage with high leaded fuel exceeds 25% of the operating time, inspect the valve stems at 150 hours of engine operation for erosion or “necking”. This inspection is accomplished by removing the exhaust manifold and visually inspecting the valves through exhaust ports. To determine if an engine has solid stem exhaust valves, remove the rocker cover and look for valve rotor caps which are used with sodium cooled valves but not with solid stem valves in these particular engines.
- ④ - Continuous use of high lead fuels can result in increased lead deposits both in combustion chambers and spark plugs causing engine roughness and scored cylinder walls. It is recommended that the use of this fuel be limited wherever possible; however, when high lead fuel is used, conduct periodic inspections of combustion chambers, valves and valve ports more frequently and rotate or clean spark plugs whenever lead fouling is experienced. See latest revision of Service Letter No. L192.
- ⑤ - See latest revision of Service Letter No. L185 for operating recommendations.

NOTE: Revision “P” adds engine models LO-360-A and AEIO-580-B and revises text and Notes.

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