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SERVICE INSTRUCTION

DATE: July 29, 2020

Service Instruction No. 1014N
(Supersedes Service Instruction No. SI-1014M)
Engineering Aspects are
FAA Approved

SUBJECT: Lubricating Oil Recommendations

MODELS AFFECTED: All Lycoming opposed series aircraft engines

TIME OF COMPLIANCE: When preservation oil is removed or when lubricating oil is changed or added

REASON FOR REVISION: Updated lubrication oils and temperature ranges

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 recommended lubricating oils for use in Lycoming opposed series aircraft engines.

SAE J1966 and SAE J1899 are specifications which establish the requirements for lubricating oils to be used in four-stroke piston aircraft engines. SAE J1966 applies to Non-Dispersant Mineral Oil and covers the same requirements as the former military specification MIL-L-6082. SAE J1899 applies to Ashless Dispersant Oils and covers the same requirements as the former military specification MIL-L-22851. Any brand name lubricating oil in accordance with these specifications is acceptable for use within the guidelines indicated by Lycoming literature; proof of such conformity is the responsibility of the lubricating oil manufacturer.

PART I - LUBRICATING OIL RECOMMENDATIONS

Average Ambient Air Temperature at Startup		SAE J1966 Non-Dispersant Grades	SAE J1899 Ashless Dispersant Grades
(°F)	(°C)		
All Temperatures	All Temperatures	SAE 20W-50	SAE 15W-50, SAE 20W-50, or 25W-60
Above 80 °F	Above 26°C	SAE 60	SAE 60
Above 60 °F	Above 15°C	SAE 50	SAE 40 or SAE 50
30 °F to 90 °F	0°C to +32°C	SAE 40	SAE 40
0 °F to 70 °F	-18 °C to +20°C	SAE 30	SAE 30 or SAE 40
0 °F to 90 °F	-18 °C to +32°C	SAE 20W-50	SAE 20W-50 or SAE 15W-50
Below 10 °F	Below -12°C	SAE 20W-50	SAE 30

Table 1: Lycoming Engines' recommendations for lubricating oil grade choice as a function of starting temperature.



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SAE Grade	Commercial Grades	Military Grades
60	120	1120
50	100	1100
40	80	1080
30	65	1065
20	55	1040
Multigrade	none	none

Table 2: Cross reference for SAE, Commercial, and Military lubricating oil grade nomenclature.

A. **MULTIGRADE OILS** – Multigrade oils, also known as multi-weight oils, are recommended for aircraft engines subjected to wide variations of ambient temperature, particularly for turbocharged engines that use engine oil to activate various turbo controllers. Multigrade oils exist as both non-dispersant and ashless dispersant types. Multigrade oils contain additives in order for the oil to maintain its viscosity through a broader range of operating temperatures than straight weight oils. The additives in multigrade oil extend operating temperature range, improve cold-weather starting, and provide superior lubrication of the engine during the critical warm-up period. Multigrade oil allows flight through wider ranges of climatic changes without the need to change oil. Do not assume that multigrade oils will alleviate all problems encountered in extremely cold environments. At temperatures below +10°F (-12°C), Lycoming recommends pre-heating the engine and oil supply tank regardless of the type of oil used. Refer to the latest revision of Lycoming Engines’ Service Instruction No. 1505 for further information regarding pre-heating the engine.

B. **AVERAGE TEMPERATURES** - The ambient ground air temperatures listed in Table 1 are meant only as a guide. **A great deal of personal judgement must be used when selecting the seasonal grade of oil to put into the engines. For example, if an aircraft is to be flown into an area which is much warmer or colder than its departure point, only personal judgement on the part of the operator can determine what grade oil to use. Selecting a higher viscosity straight weight oil due to high daytime ambient temperatures may exceed the low temperature range of the oil during colder, early morning engine starts.** When oil inlet temperatures approach the maximum allowable during operation, it is a good indication that a higher viscosity oil should be considered. **Multigrade oils are recommended for aircraft engines subjected to wide variations of ambient temperature, particularly for turbocharged engines that use engine oil to activate various turbo controllers. See Table 1.**

C. **VISCOSITY GRADES** – Viscosity refers to the resistance of a liquid to flow. Oil thins as it warms and thickens as it cools. Multigrade oils are identified with two numbers, the first number is the viscosity grade at cold temperatures, the second is the viscosity grade at warmer temperatures. Historically, straight weight oils were identified by military or commercial grades which may still be used in product marketing or literature. Multigrade oils do not have an equivalent commercial or military grade. **It is important that pilots and mechanics be familiar with how the oil brand of their choice is labeled and marketed to be certain the correct viscosity is being used. See Tables 1 and 2.**

D. **NON-DISPERSANT MINERAL** - Included in this classification are aviation-grade, non-dispersant mineral lubricating oils.

E. **ASHLESS DISPERSANT** – Ashless dispersant oils contain additives, also called detergents, that help prevent the buildup of deposits on critical engine components. Unlike automotive detergent oils that contain metallic additives, aviation oils must be ashless. While both non-dispersant and ashless dispersant may be mineral-based, only ashless-dispersant can also be semi-synthetic.

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PART II - OIL RECOMMENDATIONS FOR ENGINE OPERATION AND BREAK-IN

NOTICE: Reference latest revision of Lycoming Engines Service Instruction No. 1427 for more information regarding engine operation for break-in.

A. All turbocharged engines must be broken-in and operated with ashless dispersant oil only.

B. O-320-H; O/LO-360-E series engines may be operated using either non-dispersant mineral oil or ashless dispersant oil. However, if the engine is delivered with ashless dispersant oil, it must remain on ashless dispersant oil. The Lycoming oil additive P/N LW-16702 must be added to the O-320-H and O/LO-360-E engines at airframe installation, and every 50 hours thereafter or at every oil change. This lubrication recommendation supersedes the lubrication recommendations in Service Instruction No. 1392.

NOTICE: If it is determined that a FAA approved lubricating oil being used contains an oil additive equivalent to LW-16702, the provisions of this Service Instruction are met. See latest revision of FAA SAIB (Special Airworthiness Information Bulletin) NE-06-31 for approved additized oils, available at <http://rgl.faa.gov/>.

C. In all IGSO-480 and IGSO-540 series engines equipped with Simmonds fuel injection systems, it is allowable to use SAE50 or SAE60 grade lubricant, provided the engine oil pressure does not exceed the limits set forth in the Operator's Manual.

D. All other engines must be operated on non-dispersant mineral oil during the first 50 hours of operation, or until oil consumption has stabilized. Use of LW-16702, while required for certain engine models as listed in Part B above, could inhibit break-in on other engine models and therefore should not be used during break-in. Reference Service Bulletin No. 446, Service Bulletin No. 471, and/or Service Instruction No. 1409 for additional information. If an ashless dispersant oil is used in a new engine, or a newly overhauled engine, high oil consumption might possibly be experienced. The additives in some of these ashless dispersant oils may retard the break-in of the piston rings and cylinder walls. This condition can be avoided by the use of non-dispersant mineral oil until oil consumption has stabilized and then change to ashless dispersant oil. Non-dispersant mineral oil must also be used following the replacement of one or more cylinders until the oil consumption has stabilized.

⚠ CAUTION AIRCRAFT MANUFACTURERS MAY ADD APPROVED PRESERVATIVE LUBRICATING OIL TO PROTECT NEW ENGINES FROM RUST AND CORROSION AT THE TIME THE AIRCRAFT LEAVES THE FACTORY. THIS PRESERVATIVE OIL MUST BE REMOVED AFTER THE FIRST 25 HOURS OF OPERATION. WHEN ADDING OIL DURING THIS TIME PERIOD, USE ONLY AVIATION-GRADE NON-DISPERSANT MINERAL OIL OR ASHLESS DISPERSANT OIL, AS REQUIRED, OF THE VISCOSITY DESIRED.

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PART III - RECOMMENDATIONS FOR TRANSITIONING FROM NON-DISPERSANT MINERAL OIL TO ASHLESS DISPERSANT OIL AFTER EXTENDED OPERATION WITH NON-DISPERSANT MINERAL OIL

In engines that have been operating on non-dispersant mineral oil for several hundred hours, a change to ashless dispersant oil should be made with a degree of caution, as the cleaning action of some ashless dispersant oils will tend to loosen sludge deposits and cause plugged oil passages. When an engine has been operating on non-dispersant mineral oil for an extended period of time and it is known to be excessively dirty, the switch to ashless dispersant oil should be deferred until after the engine is overhauled.

When changing from non-dispersant mineral oil to ashless dispersant oil, the following precautionary steps should be taken:

1. Do not add ashless dispersant oil to non-dispersant mineral oil. Drain the non-dispersant mineral oil from the engine and fill with ashless dispersant oil.
2. After the first oil change with ashless dispersant, do not operate the engine longer than five hours before the next oil change with ashless dispersant.
3. Check all oil filters and screens for evidence of sludge or plugging. Change oil every ten hours if sludge conditions are evident. Repeat 10-hour checks until clean filters and screens are noted, then change oil at recommended time intervals.

⚠ CAUTION THE TERMS "DETERGENT", "ADDITIVE", "COMPOUNDED" AND "ASHLESS DISPERSANT" USED HEREIN ARE INTENDED TO REFER TO A CLASS OF AVIATION ENGINE LUBRICATING OILS TO WHICH CERTAIN SUBSTANCES HAVE BEEN ADDED, AT THE REFINERY, TO IMPROVE THEM FOR AIRCRAFT USE. THESE TERMS DO NOT REFER TO SUCH MATERIALS COMMONLY KNOWN AS "TOP CYLINDER LUBRICANT", "DOPES", OR "CARBON REMOVER" WHICH ARE SOMETIMES ADDED TO FUEL OR OIL. USE OF THESE PRODUCTS CAN CAUSE DAMAGE TO THE ENGINE (PISTONS, RING STICKING, ETC.) AND WILL VOID THE OWNERS WARRANTY. THE USE OF AUTOMOTIVE OIL COULD CAUSE ENGINE FAILURE AND MUST NOT BE USED IN LYCOMING ENGINES.

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