CONTINENTAL® AIRCRAFT ENGINE

service bulletin

M77-3
FAA-DER Approved

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TO: Distributors , Dealers, Engine Overhaul Facilities, Owners and Operators of Teledyne Continental Motors' Aircraft Engines

SUBJECT: USE OF ALTERNATE AVIATION GRADE FUELS IN ENGINES ORIGINALLY CERTIFICATED ON 80/87, 91/96, AND 100/130 GRADE FUELS

Gentlemen:

Numerous customer inquiries have been received regarding the use of alternate fuels in TCM engines. The limited availability of 80/87 octane fuel has demanded increased utilization of higher grade fuels.

The American Society for Testing and Materials (ASTM) has recently revised ASTM D910-70, the Standard Specification for Aviation Fuels. The new specification, D910-75, re-identifies the three current grades of aviation fuel as Grade 80, Grade 100, and Grade 100LL (low lead). The three grades replace those fuels commonly known as Grade 80/87 and Grade 100/130.

Although Grade 100 and 100LL have the same anti-knock qualities, they differ in the maximum allowable tetraethyl lead content.

The following table provides a comparison of the current and previous fuel specifications:

SPECIFICATIONS

ASTM D910-70			ASTM D910-75			MIL-G-5572E AMEND. 3		
GRADE	MAX TEL ML/US GAL	COLOR	GRADE	MAX TEL ML/US GAL	COLOR	GRADE	MAX.TEL ML/US GAL	COLOR
80/87	0.50	Red	80	0.50	Red	80/87	0.50	Red
91/96	2.00	Blue	Discontinued					
			100LL	2.00	Blue			
100/130	3.00	Green	100	3.00	Green	100/130	3.00	Green
115/145	4.60	Purple				115/145	4.60	Purple

The amount of tetraethyl lead in these higher grade fuels has increased the lead build up and fouling of spark plugs along with valve erosion incidents reported on some lower compression engines.

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Those TCM engines most affected include the A65, A75, C75, C85, C90, C125, C145, O200, O300 and GO300 series.

The following list of replacement components, by engine series, improves engine reliability when operating on the higher grade alternate fuels. Refer to Service Bulletin M76-8.

ENGINE MODEL	COMPONENT	PART NUMBER
A65 and A75	Intake Valve	639661
	Exhaust Valve	639662
GO-300	Exhaust Valve	631639
	Intake Valve	641792
	Intake Valve Seat	641793
C75,C85,C90,O-200 O-300,C-125,C-145	Intake Valve	641792
	Intake Valve Seat	641793

The valves and valve seat inserts installed in TCM engines E-165, E-185, E-225, O-470, IO-470-J and IO-470-K series engines are compatible with higher grade fuels. These engines were originally certificated on 80/87 octane fuel; however, field service history indicates that operation on Grade 100LL does not adversely affect intake or exhaust valve longevity.

SPARK PLUG LEAD FOULING

Spark plug lead fouling increases when higher leaded fuels are used in engines originally certificated on 80/87 octane fuel. Such fouling can be reduced by more frequent spark plug cleaning and spark plug rotation. Fine wire spark plugs that are FAA approved for use in those TCM engines listed may further alleviate fouling problems. In any case, the rotation of plugs every 50 hours of operation and cleaning/rotation every 100 hours is recommended. A ground run at 800 to 1000 RPM of 60 to 90 seconds duration just prior to shutdown will allow temperature stabilization and burnoff of deposits accumulated during letdown and taxiing. Mixture cutoff should be accomplished at this RPM without returning to idle.

EXHAUST VALVE STICKING

Exhaust valve sticking can result from lead salt (sulfated ash) accumulation in the lubricating oil. It is recommended that regular 50 hour oil changes be implemented to reduce such accumulation. A few stuck exhaust valves have been reported where examination of the cylinder assembly revealed an exhaust leak between the exhaust elbow flange and the exhaust port face. This condition created localized cylinder head overheating and subsequent exhaust valve and guide distress.

The exhaust system should be inspected every 100 hours and leaks corrected prior to continued engine operational service.

RECOMMENDED MIXTURE LEANING PROCEDURES

The TCM Engine Operator's Manual or the Aircraft Manufacturer's Owners Manual should be consulted for the proper leaning procedures applicable to each model engine. Leaning as specified will reduce spark plug fouling.

The following chart identifies the fuels considered acceptable for use in TCM engines provided the foregoing recommendations are implemented.

SERIES	SPECIFIED FUEL	ALTERNATE FUELS
A65, A75, C75, C85, C90, C125 & C145	80/87	+100LL
E165, E185 & E225	80/87	+100LL
O-200, O-300, GO-300	80/87	+100LL
IO-360, TSIO-360 LTSIO-360	100/130	100, 100LL, 115/145
IO-346	91/96	100, 100LL, 115/145
O-470-4, -11, -13, -15; O-470-A, F, J, K, L, R, & S	80/87	+100LL
O470-B, G, H, M, N, & P	91/96	100, 100LL, 115/145
O470-T, & U	100LL	100, 115/145
LIO-470, IO-470-A, C, G, P & T	91/96	100, 100LL, 115/145
IO470-D, E, F, H, L, M, N, S, U, V & VO; GIO470; TSIO470	100/130	100, 100LL, 115/145
IO520, TSIO520, GTSIO520, Tiara 6-285, 6-320 & T6-320	100/130	100, 100LL, 115/145

NOTE: + The use of Grade 100LL is highly recommended when the specified fuel is not available; however, Grade 100 may be used for limited operation when Grade 80 or 100LL is not available.

All TCM engines which were certificated on 91/96 octane or grade 100/130 aviation gasoline will operate satisfactorily on Grade 100LL or military Grade 115/145. It is recommended that Grade 100LL be used in these engines because of the reduction in combustion chamber deposits realized with the lower TEL content.

USE OF AUTOMOTIVE FUEL IN TCM AIRCRAFT ENGINES

TCM does not recommend or authorize the use of automotive fuels in any of their aircraft engines. The engine warranty and pro rata policy will be voided if such fuels are utilized. Fuels must conform to ASTM-D910 or MIL-G-5572E, if satisfactory engine service life is anticipated.

Automotive fuels can contain additives that act as corrosive agents, formulate gum deposits and, therefore, increase combustion chamber deposits. Continued operation on automotive fuel can lead to detonation, pre-ignition and sticking or eroded valves.

The vapor pressure of automotive fuels exceeds that allowable for aviation fuels. This increased vapor pressure increases the tendency to vapor lock at higher altitudes. A vapor lock condition can cause complete power loss.

The use of any fuel that does not conform to the above specifications may cause cylinder assembly, valve, piston and/or piston ring damage/failure.