

CONTINENTAL AIRCRAFT ENGINE

MAINTENANCE MANUAL

**STANDARD PRACTICE
FOR SPARK IGNITED ENGINES**



Technical Portions Accepted by the Federal Aviation Administration

Publication M-0

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CHANGE 4

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Supersedure Notice

This manual incorporates maintenance and service information contained in Continental Motors Service Documents common to the horizontally opposed, spark ignition, AvGas aircraft engines conforming to Type Certificate held by Continental Motors. This document is supplemental to the Instructions for Continued Airworthiness provided in the manuals listed in Section 1-1.1. Instructions contained in the Service Documents listed in Section 1-2.4 are superseded by instructions in this manual upon release, except for those Mandatory Service Bulletins (MSBs) and Critical Service Bulletins (CSBs).

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Chapter 1. Introduction

1-1. Scope and Purpose of This Manual

This manual provides maintenance instructions for spark ignition, Standard Practices operating on aviation gasoline (AvGas). These Instructions for Continued Airworthiness (ICA) are supplied to the owner with the engine. Instructions in this manual are standard practices, with differences identified by model, for A-65, A-75, C-75, C-85, C-90, C-125, C-145, E-165, E-185, E-225, O-200, GO-300, O-300, IO-240, IOF-240, IO-346, IO-360, LTSIO-360, TSIO-360, O-470, IO-470, TSIO-470, GTSIO-520, IO-520, LTSIO-520, TSIO-520, IO-550, IOF-550, TSIO-550, TSIOF-550, TSIOL-550 and TIARA (6-285 and 6-320) series aircraft engines. For information specific to the Continental Motors engine series, accessories, or the airplane, refer to the appropriate manual. For the specific instructions regarding the electronic equipment on FADEC engines, or for unlisted engine models, refer to the primary ICA.

A list of tools for all applicable engines is provided in Chapter 2. Consumables items, such as lubricants, sealants, and adhesives are listed in Chapter 3. Airworthiness limitations are in Chapter 4. Chapter 5 contains generic installation instructions applicable to our engines. Chapter 6 provides schedule inspection and service intervals and instructions, as well as unscheduled maintenance instructions. Chapter 7 contains general engine operating instructions, applicable to all models. Chapter 8 contains engine troubleshooting instructions. Engine preservation and storage instructions are in Chapter 9. Non-overhaul engine part replacement instructions are in Chapter 10. Chapter 11 contains Non-Destructive Inspection guidelines. Chapter 12 contains part cleaning instructions. Appendix A contains a glossary of common terms and acronyms used throughout the manual; Appendix B provides torque specifications, and Appendix C contains maintenance standards.

1-1.1. Instructions for Continued Airworthiness

Continental Motors Part No. M-0, is supplemental, as defined by Title 14 CFR§33.4, to the maintenance and overhaul manuals listed below. Together, this manual and those listed below comprise the instructions for continued airworthiness for applicable engines. This manual, and the overhaul manuals and component service manuals (as applicable to engine specification) listed below are delivered to the customer with the engine. Service documents and Airworthiness Directives may also affect ICAs. Refer to Section 1-2.5 for instructions to check current publication status.

Part No.	Title	Applicability
M-2	Maintenance and Overhaul Manual	O-200-D, X
M-6	Maintenance and Overhaul Manual	IO-240
M-7	Maintenance and Overhaul Manual	IO-360
M-11	Maintenance Manual	IO-520 Permold
M-16	Maintenance and Overhaul Manual	IO-550 Permold
M-18	Maintenance and Overhaul Manual	TSIO-550 Permold



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M-22	Maintenance and Overhaul Manual	IOF-240
M-24	Maintenance Manual	IOF-550-A, B, C, G, N, P & R
M-26	Maintenance and Overhaul Manual	TSIOF-550
OH-15	Overhaul Manual	TSIOL-550-C
OH-24	Overhaul Manual	IOF-550
OMI-15	Operation, Maintenance and Installation Manual	TSIOL-550-C
X30008	Overhaul Manual	A-65, A-75
X30010	Overhaul Manual	C-75, C,85, C90, O-200-A, B
X30013	Overhaul Manual	C-125, C-145, O-300
X30016	Overhaul Manual	E-165, E-185, E-225
X30019	Overhaul Manual	GO-300
X30027	Overhaul Manual	IO-346
X30033	Overhaul Manual	TSIO-470
X30039	Overhaul Manual	IO-520
X30045	Overhaul Manual	GTSIO-520
X30144	Overhaul Manual	TIARA 6-285 and 6-320
X30531	Alternator Service Instructions	Continental alternators
X30571	Maintenance and Operator's Manual	TSIO-360-LB
X30574	Overhaul Manual	TSIO-520-B, BB, BE, D, DB, DB, E, EB, J, JB, K, KB, L, LB, N, NB, U, UB, VB, WB Permold series
X30575	Overhaul Manual	LTSIO-520-AE TSIO-520-C, CE, G, H, M, P, R, T, AE, AF Sandcast series
X30586	Overhaul Manual	O-470-A, B, E, G, J, K, L, M R, S, U
X30588	Overhaul Manual	IO-470-C, D, E, F, G, H, J, K, L, M, N, P, R, S, U, V, VO
X30592	Starter Service Instructions	Energizer® starters
X30596	Overhaul Manual	LTSIO-360-EB, KB & RB, TSIO-360-A, AB, B, C, CB, D, DB, E, EB, F, FB, G, GB, H, HB, J, JB, K & KB, LB, MB, SB



X30596S1	Overhaul Manual	LTSIO-360-RB, TSIO-360-RB
X30600	Overhaul Manual	TSIOL-550-A
X30601	Maintenance and Operator's Manual	TSIOL-550-A
X30605	Maintenance Manual	IO-550-D, E, F & L
X30607	Overhaul Manual	IO-550-D, E, F & L
X30645	Maintenance Manual	LTSIO-360-RB TSIO-360-RB
X30672	Maintenance Manual	TSIO-360-MB, SB

1-1.2. Advisories

This manual utilizes three types of advisories; defined as follows:

WARNING

A warning emphasizes information which, if disregarded, could result in severe injury to personnel or equipment failure.

CAUTION: Emphasizes certain information or instructions, which if disregarded, may result in damage to the engine or accessories.

NOTE: Provides special interest information, which may facilitate performance of a procedure or operation of equipment.

Warnings and cautions precede the steps to which they apply; notes are placed in the manner which provides the greatest clarity. Warnings, cautions, and notes do not impose undue restrictions. Failure to heed advisories will likely result in the undesirable or unsafe conditions the advisory was intended to prevent. Advisories are inserted to ensure maximum safety, efficiency, and performance. Abuse, misuse, or neglect of equipment can cause eventual engine malfunction or failure.

1-1.3. Effectivity Symbols

Variations in engine configuration may require specific instructions or illustrations. When information pertains to only a subset of the applicable engine models, an effectivity symbol will precede the information. Effectivity symbols found in this publication are:

FWD Forward Mounted Gear Driven Alternator

AFT Aft Mounted Gear Driven Alternator

EZR Energizer Starter

SKY SkyTec Starter



1-1.4. Using this Manual

This manual, the primary engine ICA listed in Section 1-1.1, applicable FAA ADs and Continental Motors service documents, the accessory manuals listed in Table 1-2, and all changes incorporated in the ICAs as revisions constitute the Instructions for Continued Airworthiness (ICAs) prepared by Continental Motors and accepted by the FAA. We prepared this manual in a user-friendly format suited equally for electronic viewing and print. Illustrations in this manual are for reference only, depicting the most prominent configuration in the engine series. Consult the electronic illustrated parts catalog for engine model-specific illustrated parts breakdowns. The current information available from Continental Motors must be used to perform engine service, repair or overhaul.

Continental Motors provides Instructions for Continued Airworthiness based on the design, testing, and certification of engines and parts for which Continental Motors is the holder of the Type Certificate (TC) or Parts Manufacture Approval (PMA) issued by the Federal Aviation Administration (FAA).

WARNING

Continental Motors Instructions for Continued Airworthiness are applicable *only* to Continental Motors engines conforming to the approved, type certified engine model configuration. Continental Motors ICAs *must not* be used for aftermarket parts or products modified by Supplemental Type Certificate.

Installation of aftermarket parts on a Continental Motors engine constitutes a deviation from type-design criteria. Continental Motors has not participated in design, test, or certification of any aftermarket parts. Continental Motors does not provide product manufacturing specifications to aftermarket parts manufacturers and accepts no liability for the suitability, durability, longevity, or safety of such parts installed on Continental Motors engines. Installation of aftermarket parts on a Continental Motors engine must be performed using Instructions for Continued Airworthiness prepared by the manufacturer and approved by the FAA for the subject installation. For work with the engine installed in the aircraft, the aircraft maintenance manual may also be required to gain access to, perform maintenance, or install some items. Use only the current information from the aircraft manufacturer.

Exploded assembly illustrations accompany instructions throughout the manual. Parts in illustrations (Figure 1-1) are identified with either alpha or numerical callouts (indexes). Corresponding parts listings follow the illustrations for reference. The first time instructions refer to an illustration, the figure number is identified in parentheses, followed by the callout. In subsequent parts references, only the callout will be specified unless the referenced illustration changes.



1-2.4.1. Service Documents Incorporated in this Manual

Applicable technical maintenance and service information contained in the Service Documents listed below, relevant to the engine models covered by this engine manual, have been incorporated in this M-0 Standard Practice Maintenance Manual. This manual supersedes and retires these older Service Documents (where applicable) excluding Mandatory Service Bulletins (MSBs) and Critical Service Bulletins (CSBs) identified with an asterisk below.

The full content of active Continental Motors Service Documents is available at www.continentalmotors.aero. Refer Section 1-3, “Contact Information” for Continental Motors web site details.

Table 1-1. Service Documents Incorporated in Manual

Service Document	Subject	Affected Chapter
M67-12, Overboost of Turbocharged Engines	Unscheduled Maintenance	6
M72-17R1, Maximum Weight Difference Between Connecting Rods and Pistons in the Same Engine	Parts Replacement	10
M76-4, Propeller Shaft or Crankshaft Oil Seal Replacement	Unscheduled Maintenance	10
M76-8, Intake Valve Change	Unscheduled Maintenance	10
M77-3, Use of Alternate Fuels in Engines Originally Certified for 80/87, 91/96 and 100/130 Grade Fuels	Engine Operation	7
M84-5, Gear Driven Alternator Inspection Procedure	Alternator Replacement	10
M85-10, Cylinder Hold Down Nuts	Cylinder Replacement	10
M87-15, Alternator Ground Strap	Alternator Replacement	10
M88-9, Lightning Strikes	Unscheduled Maintenance	6
M88-10, Contaminated Fuels	Unscheduled Maintenance	6
M89-7R1, Engine Operation after Cylinder Replacement and/or Major Overhaul	Unscheduled Maintenance	7
M89-9, Excessive Crankcase Pressure	Unscheduled Maintenance	8
M90-17, Crankcase Inspection Criteria	Scheduled Maintenance	6
SIL93-11B, Service Document Format	Service Documents	1
SIL93-15, General Practices for Installation of Lock Wire, Tab Washers, and Cotter Pins	Standard Practices	Appendix C
* MSB94-8D, Magneto to Engine Timing	Scheduled Maintenance	6
SB95-2, Inspection and Maintenance of Engine Control Cables and Linkage	Inspection	6
SB95-3B, Alternator/Generator Drive Coupling	Alternator Maintenance	6, 10
SIL95-5, Hose and Tubing Installation	Hose and Tubing installation	Appendix C
SB96-7D, Torque Limits	Fastener Torque	Appendix B
* MSB96-10B, Crankshaft Ultrasonic Inspection	Engine Overhaul or Crankshaft Repair	10



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Table 1-1. Service Documents Incorporated in Manual

Service Document	Subject	Affected Chapter
SB96-11B, Propeller Strikes and Hydraulic Lock	Unscheduled Inspection	6
SB96-12, Cylinder Continued Airworthiness	Scheduled Inspection	6 & 10
SID97-2B, Design, Operation Maintenance and Warranty of Cylinders	Engine Maintenance	6
SID97-3G, Continuous Flow Fuel Injection Systems Adjustment Specifications and Instructions	Operational Checks and Adjustments	6
SID97-4F, Cylinder Bore and Piston Fit Specifications	Overhaul & Service Limits	10
SB97-6B, Mandatory Replacement Parts	Engine Inspection & Assembly	Appendix C
SIL98-9E, Time Between Overhaul Periods	Scheduled Maintenance	6
SIL99-1, Engine Preservation for Active and Stored Aircraft	Engine Preservation and Recovery	9
SIL99-2C, Sealants, Lubricants and Adhesives Authorized by CMI	Materials	3
SB00-3A, Crankshaft, Counterweight and Connecting Rod Repair Information	Repair Specifications	10
SIL00-9A, Engine Data Plates	Data Plate Replacement	Appendix C
SIL00-11B, Release of new Cylinder Induction Port Drain Connector	Cylinder Assembly	10
SIL03-1, Cold Weather Operation - Engine Preheating	Engine Operation	7
SIL03-2C, Currently Active Approved Spark Plug Application	Spark Plugs	6
SB03-3, Differential Pressure Test and Borescope Inspection	Inspection Criteria	6
SIL04-12A, Authorized Engine Adjustments, Component Replacement and Repositioning	Engine Specification	5
SB05-2, Overspeed Limitations	Unscheduled Maintenance	6
* CSB08-3C, Throttle & Mixture Control Levers	Fuel Injection System Assembly	6
SB08-13, Induction System Hose and Clamp Installation	Induction System Inspection & Assembly	6
SB11-3, Alternator and Drive Coupling Installation	Alternator Replacement	6, 10
SIL13-2A, Alternator Instructions for Continued Airworthiness	Alternator Replacement	6, 10
SB14-8, Exhaust Flange to Cylinder Installation	Exhaust System Installation	10
SB16-3, Turbocharger Check Valve Inspection and Cleaning	Exhaust System Inspection	6

* Documents remain active in the service bulletin set.



Table 3-4. Sealants

CM Part Number	Type	Application	Remarks
654663	Loctite 30516 Gasket Sealant (with P/N 641543 Silk Thread)	Crankcase parting face	Apply according to assembly instructions
		Starter adapter to accessory case	
		Accessory drive adapter	
		Pressure oil pump covers Pressure scavenge pump covers	
657042	Loctite 565 Adhesive Sealant	Use on all pipe threads to oil coolers and other oil sources	All models (use sparingly on male threads only)
N/A	Miller-Stephenson MS-122AD	Ignition harness terminals at magneto block end & spark plug / ECU terminals	All models
N/A	Loctite 592 Teflon PS/T Pipe Sealant	Use on all pipe threads except as noted elsewhere All pressure relief valve housing threads Permold 2 studs engine mount 1-3-5 side bottom	All models, where applicable
		All threaded fasteners installed in a stud hole through to an oil source	Apply before installing threaded fastener

Table 3-5. Lubricants

CM Part Number	Type	Application	Remarks
646943	Loctite 76732 Anti-Seize Lubricant	Fuel injector nozzles (at cylinder head)	See Figure 3-1
		Mechanical tachometer drive housing threads not connected through to an oil source.	At engine assembly
		Exhaust studs (applied to nut end before torque), exhaust slip joints	All except TS10L550
		Vernatherm plug	At engine assembly
		All 0.3125 and larger studs unless otherwise noted	At engine assembly At engine assembly
		Throttle body air reference fittings	Where applicable
		Oil sump return fitting	IO360ES3B, 14B, & IO360HB9B
654468	Shell #5 MIL-G-3545-C Grease	Fuel injection linkages	At engine assembly
		Throttle & mixture control linkages	Apply at pivot points during assembly and periodic maintenance
654514	CRC 336 Rust Preventative Compound	Spray exhaust end of turbocharger	After engine test
654561	Shell Gadus S2 V220 2 formerly Shell Alvania # 2	Light coat at contact point between nut seat and ignition lead ferrule	All models, where applicable
		Apply to oil seal lip only (alternator seal)	LTSIO360E, EB, RB; TSIO360E, EB, F, FB, GB, KB, LB
		Apply to crankshaft nose oil seal lip	All models



Table 3-5. Lubricants

CM Part Number	Type	Application	Remarks		
656817	Super Molyshield Grease	Starter worm gear & bevel gear teeth	All models during engine assembly		
		Needle bearings and ball bearings			
		Valve stems			
				Accessory drive splines and couplings	Where applicable
				Idler gear and pin	470, 520, 550
				Magneto rubber drive bushings	All models
				Oil seal lips only	
				Fuel injection controls, o-rings, springs, shafts, and bushings	Except 360, TSIO520D, GTSIO520K, which use 50W motor oil
				Oil pumps (pressure & scavenge)	Coat gear cavity during pump assembly
		Adapter (tach reduction)	TSIO & LTSIO360		
N/A	Use only manufacturer's recommended spark plug thread lubricant	Spark plugs	All models		
N/A	Chesterton #995 Release Agent or WD-40	Induction system hoses and flex duct connections, pipe plugs in throttle body units	All models		
N/A	Dow Corning No. 4	Rubber oil seal of spin-on oil filters. Do not apply to oil filter P/N 658753, 658754, or 658755 filters with anti-stick coating on seal.	All models where applicable		
		Governor pad gaskets (both sides)			
		Starter adapter cover o-rings			
N/A	Dow Corning G-N Paste	Camshaft lobes and tappet faces	During engine assembly		
N/A	LPS 2	Throttle and Mixture Control Valves Linkages	Apply at pivot points during maintenance		
N/A	Lubriplate 630 AA (optional)	Throttle and Mixture Control Valves Linkages	Apply at pivot points during assembly		
N/A	Lubriplate 930 AA	O.D. of valve guides	All models during valve guide installation		
N/A	Mouse Milk	Wastegate butterfly and linkage	Carbon solvent used on turbocharged engines during preventive maintenance		
N/A	SAE J1966 Grade 50 Aviation Oil	Quill Shaft Springs	GTSIO520		
		Crankshaft bearings	During engine assembly		
		Connecting rod bearings			
		Prop driver, driven gears & bearings			
		Camshaft bearings			
		Tachometer gears & adapters			
		Accessory spur gear teeth			
		Prop governor transfer collar & sleeve			
		Starter cone, bushing & nut			
Starter clutch spring (ID & OD)					



Table 6-4. Fuel System Adjustment Values

Idle and FULL POWER Fuel Pressures and Flows						
Engine ¹	Prop. RPM	Manifold Absolute Pressure (MAP)	Unmetered Pump PSI ²	Metered Nozzle PSI ³	Fuel (lbs/hr) ⁴	Fuel (gal/hr) ⁴
TSIO-520-BE	600 2600	- 38.0	5.5 - 7.0 25.0 - 28.0	- 12.7 - 14.1	- 214 - 224	- 36.5 - 38.2
TSIO-520-C, H	600 2700	- 32.5	5.5 - 7.0 29.0 - 32.0	- 15.3 - 17.2	- 160 - 170	- 27.3 - 29.0
TSIO-520-CE	600 2700	- 37.0	5.5 - 6.5 33.0 - 36.0	- 16.2 - 18.0	- 215 - 225	- 36.6 - 38.3
TSIO-520-D, DB	600 2700	- 32.5	5.5 - 7.0 29.0 - 32.0	- 13.3 - 15.1	- 160 - 170	- 27.3 - 29.0
TSIO-520-E, EB	600 2700	- 34.5	5.5 - 6.5 31.0 - 34.0	- 15.6 - 17.7	- 175 - 185	- 29.8 - 31.5
TSIO-520-G	600 2700	- 35.0	5.5 - 6.5 31.0 - 34.0	- 15.8 - 17.6	- 181 - 191	- 30.8 - 32.5
TSIO-520-J, JB	600 2700	- 36.0	5.5 - 6.5 31.0 - 34.0	- 16.9 - 18.7	- 170 - 178	- 29.0 - 30.3
TSIO-520-K, KB	600 2700	- 33.0	5.5 - 7.0 29.0 - 32.0	- 15.1 - 17.4	- 163 - 175	- 27.8 - 29.8
TSIO-520-L, LB	600 2700	- 38.0	25 Minimum 45.0 - 55.0	MFG ¹⁰	- 180 - 190	- 30.7 - 32.4
TSIO-520-M, R	600 2700	- 36.5	5.5 - 6.5 33.0 - 37.0	- 16.9 - 19.9	- 170 - 186	- 29.0 - 31.7
TSIO-520-N, NB	600 2700	- 38.0	5.5 - 6.5 32.0 - 35.0	- 16.9 - 19.9	- 170 - 186	- 28.9 - 31.7
TSIO-520-P	600 2700	- 36.5	5.5 - 6.5 33.0 - 37.0	- 18.4 - 19.9	- 180 - 186	- 30.7 - 31.7
TSIO-520-T	600 2700	- 39.5	5.5 - 6.5 33.0 - 37.0	- 16.3 - 18.1	- 185 - 195	- 31.5 - 33.2
TSIO-520-UB	600 2700	- 36.0	5.5 - 6.5 33.0 - 37.0	- 14.4 - 16.0	- 195 - 205	- 33.2 - 34.9
TSIO-520-VB	600 2700	- 40.5	5.6 - 6.5 36.0 - 39.5	- 16.9 - 18.7	- 200 - 210	- 34.1 - 35.8
TSIO-520-WB	600 2700	- 39.5	25 Minimum 45.0 - 55.0	- MFG ¹¹	- 190 - 200	- 32.4 - 34.1
GTSIO-520-C	525 2400	- 34.5	4.0 - 7.0 30.0 - 33.0	- 16.5 - 17.5	- 215 - 225	- 36.6 - 38.3
GTSIO-520-D, H	467 2267	- 39.5	4.0 - 7.0 30.5 - 35.0	- 15.7 - 17.3	- 250 - 260	- 42.6 - 44.3
GTSIO-520-F, K ¹¹	600 2267	- 44.5	6.75 - 7.25 38.0 - 41.0	- 17.4 - 18.8	- 300 - 310	- 51.1 - 52.8
GTSIO-520-L, N ¹¹ GTSIO-520-M	467 2234	39.0 40.0	4.0 - 7.0 29.5 - 35.0	- 16.4 - 17.9	- 255 - 265	- 43.4 - 45.1
GIO-550-A	600 2267	-	25 Minimum 45 - 55	- MFG ¹¹	- 175 - 185	- 29.8 - 31.5
IO-550-A ⁶	600 2700	- -	8.0 - 10.0 32.0 - 36.0	- 17.7 - 20.0	- 142 - 150	- 24.2 - 25.6
IO-550-B ⁶	600 2700	- -	8.0 - 10.0 29.2 - 36.2	- 16.5 - 18.4	- 146 - 156	- 24.9 - 26.6



Table 6-4. Fuel System Adjustment Values

Idle and FULL POWER Fuel Pressures and Flows						
Engine ¹	Prop. RPM	Manifold Absolute Pressure (MAP)	Unmetered Pump PSI ²	Metered Nozzle PSI ³	Fuel (lbs/hr) ⁴	Fuel (gal/hr) ⁴
IO-550-C ⁶	600 2700	- -	8.0 - 10.0 31.6 - 37.8	- 17.6 - 19.6	- 152 - 160	- 25.9 - 27.3
IO-550-D, E, F, L ⁶	600 2700	- -	8.0 - 10.0 32.0 - 36.0	- 17.2 - 20.0	- 143 - 155	- 24.4 - 26.4
IO-550-G	600 2500	- -	8.0 - 10.0 22.0 - 26.0	- 14.7 - 16.0	- 125 - 130	- 21.3 - 22.1
IO-550-N, P, R	600 2700	- -	8.0 - 10.0 28.0 - 30.0	- 19.0 - 21.3	- 150 - 160	- 25.6 - 27.3
TSIO-550-B	600 2700	- 38.0	7.0 - 9.0 32.0 - 36.0	- 15.3 - 16.9	- 241 - 252	- 41.0 - 42.9
TSIO-550-C	600 2600	- 35.5	7.0 - 9.0 26.0 - 29.0	- 12.7 - 13.9	- 212 - 224	- 36.1 - 38.1
TSIO-550-E	600 2700	- 38.5	7.0 - 9.0 32.0 - 36.0	- 15.3 - 16.9	- 244 - 254	- 41.5 - 43.3
TSIO-550-G	600 2700	- 34.0	7.0 - 9.0 20.5 - 28.5	- 12.4 - 13.6	- 201 - 211	- 35.2 - 35.9
TSIO-550-G MOONEY ¹²	600 2500	- 33.5	7.0 - 9.0 20.0 - 23.0	- 10.4 - 11.6	- 177 - 180	- 30.0 - 30.7
TSIO-550-K, N	600 2500	- 37.5	7.0 - 9.0 20.5 - 28.5	- 14.2 - 14.8	- 210 - 220	- 35.8 - 37.5
TSIOL-550-A	600 2600	- 35.0	5.5 - 6.5 32.5 - 35.5	- 17.0 - 19.0	- 170 - 180	- 29.0 - 30.7
TSIOL-550-B	600 2700	- 35.0	6.0 - 8.0 36.0 - 40.0	- 20.0 - 22.5	- 175 - 185	- 29.8 - 31.5
TSIOL-550-C	600 2600	- 39.5	6.0 - 8.0 37.0 - 40.0	- 15.0 - 16.5	- 204 - 216	- 34.8 - 36.8

- The setup procedures contained in this bulletin are only for use on engines that have not been modified from their original configuration as shipped from the factory by Continental Motors. Engines which have been modified by the installation of aftermarket components such as turbo-normalizing systems, turbocharging systems, intercoolers, after-coolers, fuel nozzles, etc., whether by STC or field approval, must use the instructions provided by the STC holder or installer. CM will not accept responsibility or liability for any modified engine set up according to the instructions contained in these instructions.
- FULL POWER unmetered fuel pump pressure limits are provided for reference only. Use metered fuel pressure specifications for adjustments at full power.
- Use for full power, maximum RPM adjustment only. All other parameters for reference only, Footnote 2 applies.
- May be determined using a calibrated in-line flow measuring device. Otherwise use metered fuel pressure specifications. Refer to Aircraft Manufacturer's Maintenance Manual for method of verifying accuracy of fuel flow indicator.
- IO-360-DB engine model specifications equipped with altitude compensating fuel pumps; Flight Test (Section 7-2.4.2) required after fuel system adjustment.
- Engine model equipped with altitude compensating fuel pump; Flight Test (Section 7-2.4.2) required after fuel system adjustment.
- This engine is installed in Cirrus SR20 aircraft. IO-360-ES engines has been derated by Cirrus from original 210 HP at 2800 RPM to 200 HP at 2700 RPM. Engine data plate reflects original CM data of 210 HP at 2800 RPM. Refer to Cirrus SR20 Maintenance Manual and POH.
- Engine model certified for five minute rated takeoff power at 2800 RPM. Max. continuous power is 2600 rpm.
- Refer to the aircraft manufacturer's instructions for adjustment procedures.
- Refer to the aircraft manufacturer's instructions for adjustment procedures.
- Refer to the aircraft manufacturer's instructions for adjustment procedures.
- TSIO-550-G installed in Mooney aircraft has been rated to a power level that is less than the approved Type Certificate Data Sheet. Refer to the Mooney Aircraft Maintenance Manual for setup instructions.



6-4.7.5. Magneto RPM Drop Check

WARNING

Absence of RPM drop during magneto check may be an indication of a faulty ignition circuit (Hot Magneto). Should the propeller be turned by hand (as in during preflight), the engine could inadvertently start and cause personal injury or death. Flight is prohibited until the condition is corrected.

CAUTION: When operating on single ignition, some RPM drop and slight engine roughness as each magneto is switched off should be noted. Excessive (greater than 150 RPM) RPM drop may indicate a faulty magneto or fouled spark plugs.

NOTE: If the engine runs roughly after single magneto operation, increase engine speed to 2200 RPM in the BOTH position and lean the mixture control until the RPM peaks for ten seconds before returning to the full rich position to clear the spark plugs and smooth operation before returning to single magneto operation.

Procedure

1. Start the engine according to the “Engine Start” instructions in Section 7-3.2.
RESULT: No defects noted. Allow the engine oil to warm to normal (100°F (38°C) for turbocharged engines or 75°F (24°C) operating temperature.

CAUTION: Avoid prolonged single magneto operation to preclude spark plug fouling.

NOTE: In the instructions below, the term “Magneto Switch” applies to the method the aircraft manufacturer uses to control the magnetos. Some manufacturers use a wafer switch to control the starter with four additional positions for magneto control, labeled OFF, L, R and BOTH. Toggle switches may be used to accomplish the same action. Adjust instructions according to the available aircraft controls.

2. Throttle..... 1700 RPM
3. Magneto Switch R
RESULT: RPM drop does not exceed 150 RPM; record Left Magneto channel drop result. Maximum allowable RPM drop spread between magneto channels is 50 RPM.
4. Magneto Switch BOTH
5. Magneto Switch L
RESULT: RPM drop does not exceed 150 RPM; record Right Magneto channel drop result. Maximum allowable RPM spread between magneto channels is 50 RPM.
6. Magneto Switch BOTH
7. Throttle..... Reduce to IDLE
8. If no further checks are required, proceed to “Engine Shutdown” on page 32.



6-4.7.6. Engine Shutdown

Procedure

1. Perform a normal engine shutdown according to the “Engine Shutdown” instructions in Section 7-3.4.
2. Remove installed test equipment.
 - a. Disconnect the metered fuel pressure test hose from the aircraft fittings.
 - b. Disconnect the unmetered fuel pressure test hose from between the fuel pump and the fuel control assembly.
 - c. Remove any fittings added to adapt the plumbing to the test equipment.
3. Reconnect and torque the fuel system hoses to Appendix B specifications.
 - a. Connect the unmetered pressure hose between the fuel pump and the fuel control assembly.

CAUTION: Use only P/N 639494 cap on the tee fitting. Installation of a pipe thread cap on the flared fitting may damage the fitting.

- b. Install the protective caps (P/N 639494) (or airframe-installed fitting to cockpit metered pressure gauge) on the fuel manifold valve (metered pressure) or throttle body inlet tee (metered pressure) fittings, if equipped, and torque the cap to standard torque for a #4 steel fitting in Table B-8.
4. Leak Check
 - a. Master Power Switch ON
 - b. Mixture..... FULL RICH
 - c. Boost Pump Switch (if equipped)..... ON
 - d. Throttle..... WIDE OPEN
 - e. Check for leaks in the following areas and correct any discrepancies before releasing the engine for flight:
 - 1) Induction System
 - 2) Exhaust System
 - 3) Fuel System
 - 4) Lubrication System
 - f. Boost Pump..... OFF
 - g. Throttle..... IDLE
 - h. Mixture..... IDLE CUT-OFF
 - i. Master Power Switch OFF



6-4.8.2. Oil Change

Perform an oil change within 30 minutes of engine shutdown (to obtain a useful oil sample) according to the oil changes intervals specified in Section 6-2.

NOTE: More frequent oil changes are recommended under extreme usage (flight training, shuttle service, or crop dusting) or adverse (desert or arctic climates) weather conditions.

Procedure

1. Place a catch basin, approved for collecting oil, beneath the oil sump. Remove the oil sump drain plug (Figure 6-7 through Figure 6-22), or quick drain fitting, and drain the oil into the catch basin.
2. Collect an oil sample according to the “Oil Sample Collection” instructions in Section 6-4.8.4. Inspect the oil sump drain plug for evidence of wear material. Metal fragments on the drain plug may indicate excessive wear or part disintegration. Evidence of bronze in the oil sump suggests piston pin bushing loss. Remove the cylinders and inspect the piston pin bushings for proper installation according to instructions in Section 10-10.

CAUTION: Dispose of used engine oil in accordance with local environmental standards.

NOTE: Continental Motors recommends customers submit a sample of the oil drained during each oil change, or if engine trouble is suspected, for spectrographic oil analysis. The first three samples establish the oil analysis trend baseline.

The amount of wear material present in new, rebuilt, or overhauled engines is typically greater during the engine break-in period, tapering off during subsequent oil changes. If the amount of wear material does not decrease during subsequent oil changes, note the wear material characteristics (refer to Section 6-4.8.5, “Oil Trend Monitoring and Spectrographic Oil Analysis”) and troubleshoot the engine according to instructions in Chapter 8.

3. Oil Filter or Integral Screen Change

Engines covered in this manual are equipped with either a screw-on, disposable oil filter or an integral screen (Figure 6-23). Maintenance pertaining to the filter media is listed in the “Engine Inspection and Maintenance Schedule” in Section 6-2. To change disposable filters, follow the instructions in step a; for the integral screen, follow the instructions in step b.

- a. Remove the oil filter (Figure 6-8 through Figure 6-22). Cut the oil filter in two parts using an Oil Filter Can Cutter (P/N CT-923 (Table 2-1, “Special Tools List”)).
 - 1) Inspect the oil filter element for metal debris trapped within the filter to assess the engine condition. If debris is found, wash the filter media in a clean glass container to determine content. Use a magnet to differentiate the ferrous materials from non-ferrous particulate.



- 2) New, rebuilt, or overhauled engines exhibit more wear material during the break-in period; material found in the filter media will diminish over time. If wear material in the oil filter does not diminish, or increases, note the characteristics of the wear material (Section 6-4.8.5, “Oil Trend Monitoring and Spectrographic Oil Analysis”) and troubleshoot the engine according to instructions in Chapter 8.

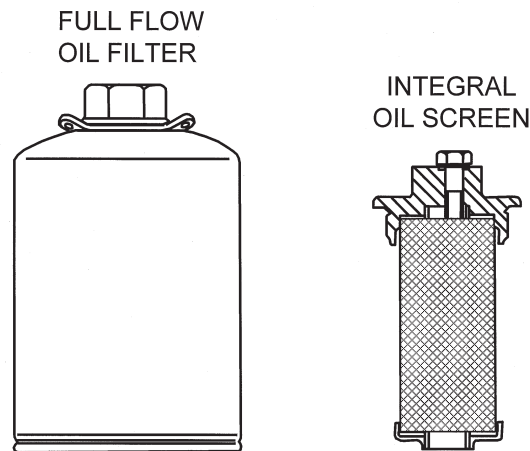


Figure 6-23. Disposable Oil Filter and Integral Screen

- b. If the engine is equipped with an integral oil screen (Figure 6-23), cut the safety wire from the oil screen and remove the fastening hardware. The integral screen is not disposable, rinse the integral screen with mineral spirits over filter paper to clean the media. Use a magnet to differentiate the ferrous materials from non-ferrous particulate.
4. Install the oil filter or screen. For disposable filters, follow the instructions in step a; for the integral screen, follow the instructions in step b.

NOTE: Spin-on oil filters are available with an anti-stick coating on the gasket. Part numbers 658753, 658754, and 658755 oil filters feature a dry graphite coating and are designed to be installed *dry*. Before applying any lubricant to the oil filter gasket, read the manufacturer’s instructions (Figure 6-23.1) on the oil filter. Application of any form of lubricant to the gasket of the anti-stick spin-on oil filter will defeat the anti-stick properties.

- a. Read the oil filter label to determine the gasket type and proceed with installation according to the filter manufacturer’s instructions. Install the new oil filter; torque the filter to Appendix B specifications and safety wire the filter according to instructions in Appendix C-3.
- b. After thorough cleaning, install a new copper gasket on the oil screen flange and install the oil screen in the oil pump, or oil screen adapter. Place a new copper gasket on the plug (or oil temperature sensor provided by aircraft manufacturer) and thread the screen (or plug) into the housing. Torque to Appendix B specifications and safety wire according to instructions in Appendix C-3.



5. Reinstall the oil drain plug with a new crush washer (gasket) according to instructions in Appendix C-10.1; torque the drain plug to Appendix B specifications and safety wire the drain plug according to instructions in Appendix C-3.
6. Add fresh oil and check the oil level according to instructions in Section 6-4.8.1.
7. Check for oil leaks according to instructions in Section 6-4.8.3.



Figure 6-23.1. Oil Filter with Anti-Stick Gasket Label (typical)



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Table 7-1. Aviation Fuel Specifications

Fuel Specification	Fuel Grades	Color
ASTM D910 - Standard Specification for Aviation Gasolines	100 (100/130 ¹)	Green
	100LL	Blue
	100VLL	Blue
	80 (80/87 ¹)	Red
	91 (91/96 ¹)	Brown
ASTM D7547 - Standard Specification for Hydrocarbon Unleaded Aviation Gasoline	UL91	Colorless
	UL94 ²	Colorless
GOST 1012 - Aviation Petrol Russian Federation of States	B95/130	Amber
	B91/115	Green
GB 1787 - Aviation Piston Engine Fuels People's Republic of China	95 (RH95/130)	Saffron
	100 (RH100/130)	

1. Inactive - consult the latest revision of ASTM D910.
2. ASTM 7547/UL94 is acceptable for use on aircraft and engines certificated for operation with ASTM 7592/UL94 - reference FAA SAIB HQ-16-05

NOTE: All certified Continental Motors engines previously certified for operation with 91/96 octane or grade 100/130 aviation gasoline will operate satisfactorily on Grade 100LL. It is recommended that Grade 100LL be used in these engines because of the reduction in combustion chamber deposits realized with the lower tetraethyl lead content.

Table 7-2. Authorized Fuels by Engine Model

Engine Model	Certified Fuel on Type Certificate	Current Alternate Authorization
NOTE: Engine operation with RH95/130 and UL94 fuel may limit engine performance, operating ceiling, and/or maximum recommended cruise power. Consult the engine specifications and operating limits section of the primary ICA for amplification.		
A-65, A-75	80/87	100LL
C-75, C-85, C-90, C-125, C-145	80/87	100LL
E-165, E-185, E-225	80/87	100LL
O-200-A, B	80/87	100LL
O-200-D, X	100/100LL, RH100/130	N/A
IO-240-A, B	100/100LL, B95/130, RH95/130	N/A
IOF-240-B	100/100LL, B95/130, RH95/130	N/A
O-300, GO-300	80/87	100LL
IO-360-A, AB, C, CB, D, DB, E, ES, G, GB, H, HB, J, JB, K, KB	100/100LL, B95/130, RH95/130	N/A
IO-360-B	80/87	100/100LL



Table 7-2. Authorized Fuels by Engine Model

Engine Model	Certified Fuel on Type Certificate	Current Alternate Authorization
NOTE: Engine operation with RH95/130 and UL94 fuel may limit engine performance, operating ceiling, and/or maximum recommended cruise power. Consult the engine specifications and operating limits section of the primary ICA for amplification.		
IO-360-AF	100/100LL/100VLL, UL91, UL94, B95/130, RH95/130	N/A
TSIO-360-A, AB, B, BB, C, CB, D, DB, E, EB, F, FB, G, GB, H, HB, JB, KB, LB, MB, NB, PB, SB; LTSIO-360-E, EB, KB	100/100LL	N/A
TSIO-360-RB; LTSIO-360-RB	100/100LL, B95/130, RH95/130	N/A
IO-346	91/96	100/100LL
O-470-4, 11, 13, 15	80/87	100LL
O-470-A, F, J, K, L, R & S	80/87	100LL
O-470-B, G, H, M, N & P	91/96	100/100LL
O-470-T & U	100LL	100/100LL
LIO-470, IO-470-A, C, G, P & T	91/96	100/100LL
IO-470-D, E, F, H, L, M, N, S, U, V & VO GIO-470; TSIO-470	100/130	100/100LL
IO-520-A, B, BA, BB, C, CB, J, M, MB,	100/100LL, RH95/130, or B95/130	N/A
IO-520-D, E, F, K, L, N, NB	100/100LL, B95/130	N/A
GTSIO-520	100/130	100/100LL
LIO-520	100/100LL, B95/130	N/A
TSIO-520	100/130	100/100LL
TIARA 6-285, 6-320	100/130	100/100LL
IO-550-A, B, C, G, N, P & R; IOF-550-A, B, C, G, N, P & R	100/100LL, RH95/130, or B95/130	N/A
IO-550-D, E, F, L; IOF-550-D, E, F, L;	100/100LL, RH95/130, or B95/130	N/A
TSIO-550-A	100/100LL	N/A
TSIO-550-B	100/100LL, RH95/130, or B95/130	N/A
TSIO-550-C, E, G, N	100/100LL, RH95/130, or B95/130	N/A
TSIO-550-K	100/100LL, RH95/130, or B95/130, UL94	N/A



Table 7-2. Authorized Fuels by Engine Model

Engine Model	Certified Fuel on Type Certificate	Current Alternate Authorization
NOTE: Engine operation with RH95/130 and UL94 fuel may limit engine performance, operating ceiling, and/or maximum recommended cruise power. Consult the engine specifications and operating limits section of the primary ICA for amplification.		
TSIOF-550-D, J, K & P	100/100LL, RH95/130, or B95/130	N/A
TSIOL-550-A, B, C	100/100LL	N/A

Some older engine models, originally certified for use with 80/87 grade fuels, particularly low compression ratio engines may experience lead build-up or spark plug fouling as a result of the higher octane and lead content of 100/100LL. Engines most affected by the higher octane include the A-65, A-75, C-75, C-85, C-90, C-125, C-145, O-200, O-300 and GO-300 engine series. Compliance with the instructions in Section 10-6.10 on these engines will improve engine operation with the higher grade fuels.

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 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 burn off of deposits accumulated during descent and taxiing. Mixture cutoff should be accomplished at this RPM without returning to idle.

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.

Refer to the mixture leaning procedures in the AFM/POH to limit lead accumulation on low compression engines originally certified for 80/87 octane fuel.



7-2.3. Engine Operation after Cylinder Replacement and/or Major Overhaul

NOTE: Instructions within this section apply to steel, nitrided, through-hardened, or chrome plated cylinders. For engine operating instructions with nickel silicon carbide (NiC3) plating, refer to the operating instructions in the latest revision of SB15-6.

Proper operation of the engine following cylinder replacement or major overhaul is extremely important. The following procedures should be followed to ensure that adequate lubrication is being provided to newly installed components and that the piston ring seating will occur as soon as possible.

1. Operation After Major Overhaul Utilizing an Engine Test Cell
 - a. Servicing and Pre-starting Procedures
 - 1) Service the lubricating system with mineral oil of the appropriate grade depending on ambient temperature (Section 3-1).
 - 2) Rotate the propeller by hand through several cycles with the spark plugs removed.
 - 3) Pre-oil the lubrication system using an external pre-oiling pressure system according to the instructions in Section 5-2.9. Spark plugs are installed during the pre-oiling instructions.
 - b. Test Cell Operational Procedure
 - 1) Perform the Post-Overhaul testing according to the instructions in the engine primary ICA (**Ref: Section 1-1.1**).
2. Operation After Major Overhaul Utilizing The Aircraft in Lieu of an Engine Test Cell.
 - a. The aircraft can be considered a suitable test stand for running-in overhauled engines contingent on the following conditions.
 - 1) Install Engine Cowling
 - 2) Each cylinder should be equipped with a temperature sensing device to monitor the head temperature. If the aircraft cylinder head temperature gauge monitors one cylinder, the following precaution must be adhered to:
During ground runs do not permit monitored head temperatures to exceed 400°F or oil temperature to exceed 200°F.
 - 3) The flight propeller may be used contingent on careful observation of cylinder temperatures. Head the aircraft into the wind for this test.
 - 4) Calibration of the aircraft engine instruments must be performed.
3. Engine Operation After Cylinder Overhaul or New Cylinder Installation
 - a. Engine Starting and Ground Operation

CAUTION: Corrosion preventive mineral oil MIL-C-6529 can be used but must not be used after the first 25 hours, or six months, whichever occurs first as this oil can cause coking with extended use.



CAUTION: Piston ring reinstallation is not recommended. If the piston rings are removed for any reason, discard the removed piston rings and install a new set of piston rings, with end gaps adjusted for the destination cylinder.

12. Remove the piston pin and piston from the connecting rod. Inspect the piston and piston pin according to the instructions in the primary ICA. If piston ring removal is required, discard the piston rings and obtain, gap and install a new set of piston rings according to the instructions in the primary ICA.
13. Remove the cylinder o-ring (or packing). Wrap the old cylinder base o-ring (or packing) in a figure 8 pattern (Figure 10-14) around four of the crankcase studs and stretch the two vertical segments of the packing over the connecting rod to secure it.

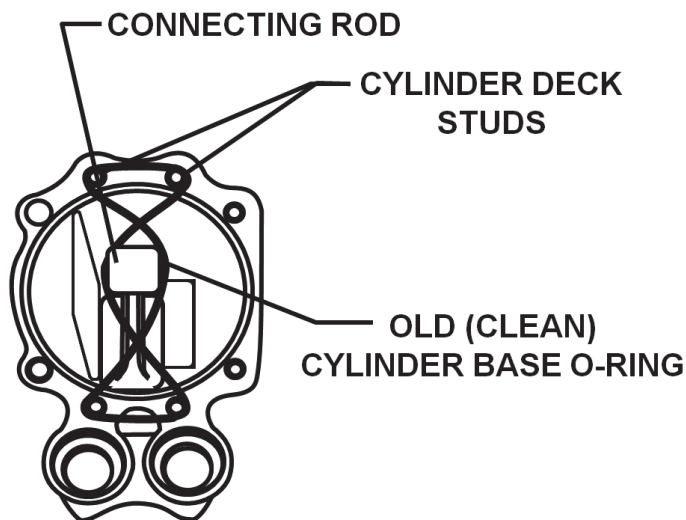


Figure 10-14. Cylinder Base O-Ring supporting Connecting Rods

14. Before commencing any cylinder repairs, perform a static leak check on the cylinder:

CAUTION: Do not allow the fiber drift to contact the valve spring retainer or rotocoil.

 - a. Place a fiber drift on the rocker arm directly over the valve stem.
 - b. Tap the drift several times with a hammer to dislodge any debris that may be between the valve face and seat.
 - c. Invert the removed cylinder with the spark plugs installed.
 - d. Fill the inverted cylinder bore with nonflammable solvent.
15. Look for leaks in the cylinder head to barrel junction. If the cylinder head and barrel seal is leaking, discard the cylinder. If the intake or exhaust seat seals or the spark plug seals are leaking, note the discrepancy and repair according to the instructions in the primary ICA.
16. Disassemble, clean, inspect, and make appropriate repairs to return the cylinder to the published service limits according to the instructions in the primary ICA.



10-6.1.2. Cylinder Installation

Replace worn or out of tolerance components based on the following criteria:

- Only allow parts that meet the *service limits* may remain in service.
- If a part has reached a service limit tolerance, it must be replaced with a part that conforms to the specified new part tolerances or service limits.
- Clean cylinders and pistons according to the instructions in the primary ICA.
- Perform fluorescent penetrant, magnetic particle inspections according to instructions in Section 11-2 and dimensional inspections on specified cylinder and piston parts according to instructions in the primary ICA.
- Install serviceable lifters in the same location from which they were removed.
- Assemble cylinders which meet the inspection criteria and service limits according to the instructions in the primary ICA with serviceable pistons and new piston rings.

WARNING

Do not apply any form of sealant to the crankcase cylinder deck, chamfer, cylinder mounting flange, cylinder base O-ring, or cylinder fastener threads. The use of RTV silicone, Gasket Maker or any or other sealant on the areas listed above during engine assembly will cause a loss of cylinder deck stud or through-bolt torque. Subsequent loss of cylinder attachment load, loss of main bearing crush or fretting of the crankcase parting surfaces will occur. The result will be cylinder separation, main bearing movement, or oil starvation and catastrophic engine failure. USE ONLY CLEAN 50 WEIGHT AVIATION ENGINE OIL ON SURFACES LISTED.

1. Inspect a new cylinder base o-ring (or packing) for cracks or deformities. If serviceable, lubricate the new cylinder base o-ring (9) with clean 50-weight aviation engine oil.
2. Install the new cylinder base O-ring (or packing), lubricated with clean 50-weight aviation engine oil on the cylinder base flange; verify the O-ring is not twisted on the cylinder base flange after installation.
3. Lubricate cylinder through bolt and deck stud threads using clean 50 weight aviation engine oil.
4. Install a serviceable piston, fitted with new piston rings, and piston pin partially in the cylinder bore.
5. Carefully rotate the crankshaft, placing the connecting rod of the cylinder being installed in the outermost position. Remove the packing that was installed for connecting rod support.
6. Line the piston up with the connecting rod and slide the piston pin into the connecting rod.
7. Using a ring compressor, compress the piston rings and push the cylinder until the fourth piston ring is positioned inside the cylinder barrel.



8. Remove the ring compressor and push the cylinder assembly against the crankcase cylinder deck with the stud holes aligned.

CAUTION: Engine crankcases featuring the seventh stud and associated hardware use beveled seat brackets, part numbers 646297 and 646298 in combination with a self-aligning nut, part number 646312. The spherical flange nut and the beveled seat bracket work together to align the brackets on the seventh stud. Cylinder flange hold down nuts and crankcase through-bolt nuts feature a flat seat to evenly distribute fastener torque to the cylinder mating flange.

9. While supporting the cylinder, install, but do not torque, the cylinder base fasteners.
 - a. Install the cylinder base flange nuts on the cylinder base studs.
 - b. Install flanged through-bolt nuts at the through-bolts.
 - c. For engines featuring the seventh stud, position the cylinder hold down brackets on the seventh stud to overlap the cylinder base flange and secure with the self-aligning, spherical nut.

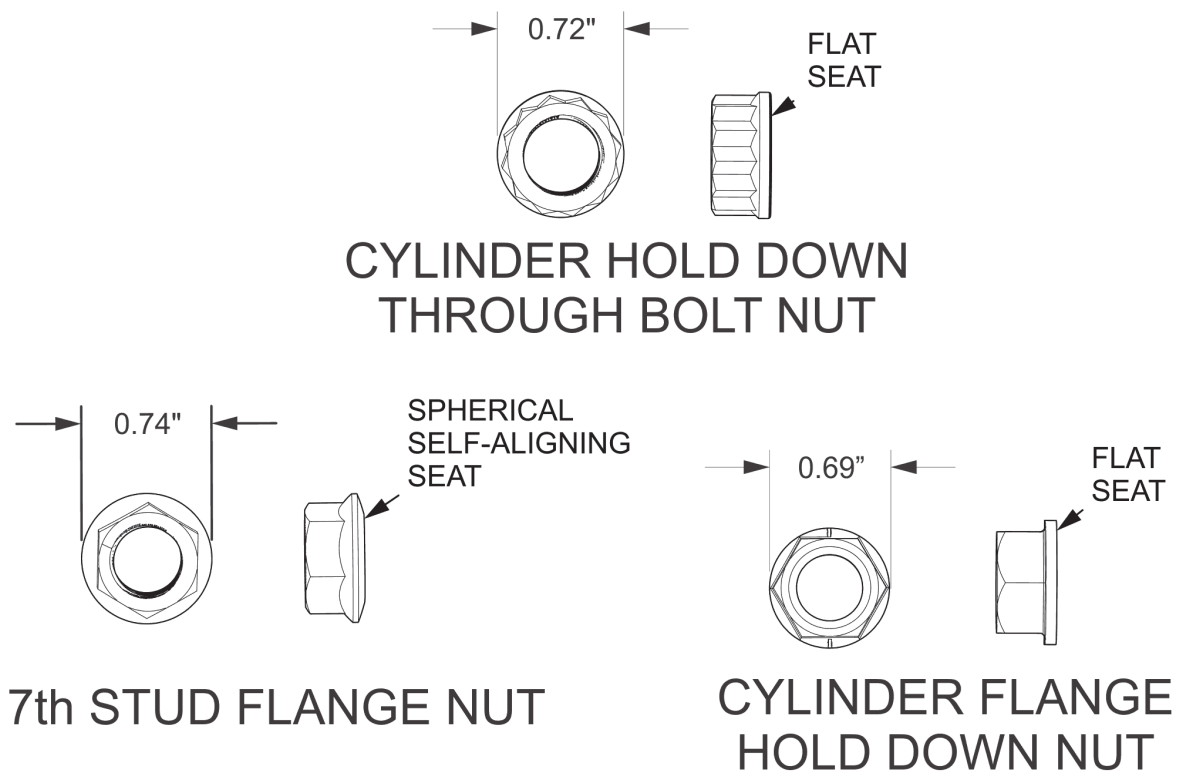


Figure 10-14.1. Cylinder Flange Fasteners

10. For cylinder replacement, torque the cylinder fastening hardware according to the “Cylinder Torque” instructions in Section 10-6.1.3.
11. Rotate the crankshaft through multiple revolutions to verify smooth rotation of the crankshaft. If rotation is not smooth or binding is evident, disassemble the engine to



determine the cause. Verify crankshaft end play (end clearance) is within the tolerance specified in the primary ICA. If no end play is present, disassemble the engine to determine the cause.

12. Install the valve train and pushrods according to the instructions in the primary ICA.
13. Install cylinder baffles and baffle supports (if equipped), as required by the instructions in the primary ICA.
14. Connect cylinder drains, if equipped, according to primary ICA instructions.
15. Install fuel injectors and connect the fuel injection lines according to the instructions in the primary ICA.
16. Install the induction and exhaust system according to the primary ICA instructions.

CAUTION: Service the engine with SAE J1966 mineral oil for engine break-in.

17. Service the engine with mineral oil according to instructions in Section 6-4.8.
18. Perform a leak check on the fuel injection system according to the instructions in the primary ICA.
19. Install the spark plugs and ignition harness according to the instructions in the primary ICA.
20. Perform an initial engine run according to the instructions in the primary ICA.
21. Install the aircraft cowling and aircraft-supplied accessories according to the aircraft manufacturer's instructions.
22. Perform an "Engine Operational Check" and adjust engine fuel system to meet engine model specifications according to the instructions in Section 6-4.7.
23. Perform a "Flight Check" according to the instructions in Section 7-2.4 prior to release to normal operation.
24. Follow the "Engine Break-In" instructions in Section 7-2.4.1 for the first 25 hours of operation.
25. Perform an "25-Hour Initial Operation Inspection" in Section 6-4.2 after the first 25 hours of engine operation. When oil consumption has stabilized, replace the mineral oil with ashless dispersant aviation engine oil according to Section 6-4.8.



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10-6.1.3. Cylinder Torque

CAUTION: This cylinder torque procedure is for individual cylinder installation. For complete engine assembly and torque, refer to instructions in the primary ICA.

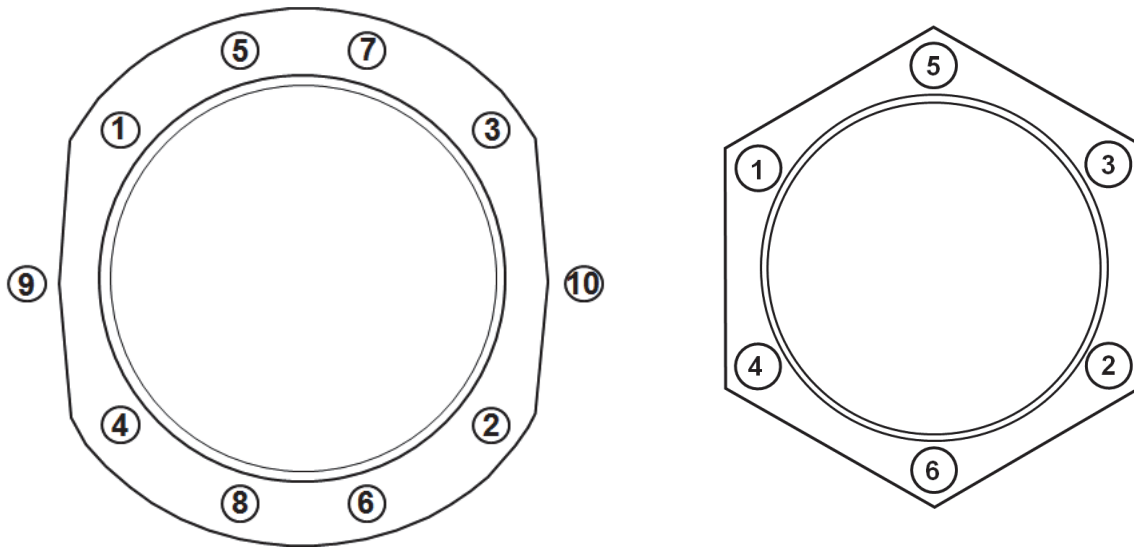
1. Lubricate the cylinder base stud threads, through-bolt threads and nut threads **on BOTH sides** of the engine with clean, 50-weight aviation oil.

WARNING

Failure to torque through-bolt nuts on both sides of the engine may result in a loss of main bearing crush, main bearing shift, crankshaft fracture, and engine failure.

2. Install and torque the through-bolt nuts and cylinder base nuts to one half of the final torque value specified in Appendix B in the sequence shown in Figure 10-15.
3. Torque the through-bolt nuts and cylinder base nuts to the full final torque value specified in Appendix B in the sequence shown in Figure 10-15. Torque the through-bolt nuts on both sides of the engine (even if only one cylinder is being installed).

NOTE: Seventh studs are not used on all installations. For single cylinder torque, the seventh stud locations are torqued last at each cylinder location.



Eight Bolt Flange

Six Bolt Flange

Figure 10-15. Cylinder Torque Sequence



7. Remove the crankshaft nose oil seal, reinforcing ring (if used), and spring as shown in Figure 10-44). Gentle force may be required to remove the nose oil seal parts from the counterbore.
8. Inspect the propeller mounting flange carefully to insure that no nicks, burrs or sharp edges are present which could damage the oil seal surface during installation.
9. Clean surfaces thoroughly making certain that no foreign material remains on the shaft or in the seal counterbore. Wash oil seal counterbore area with acetone. To remove the Gasket Maker residue out of the counterbore recess using a chlorinated solvent such as Loctite Chisel[®] or methylene chloride followed by a naptha solvent such as Loctite ODC-Free Cleaner and Degreaser. Remove all residue and debris from the bore.

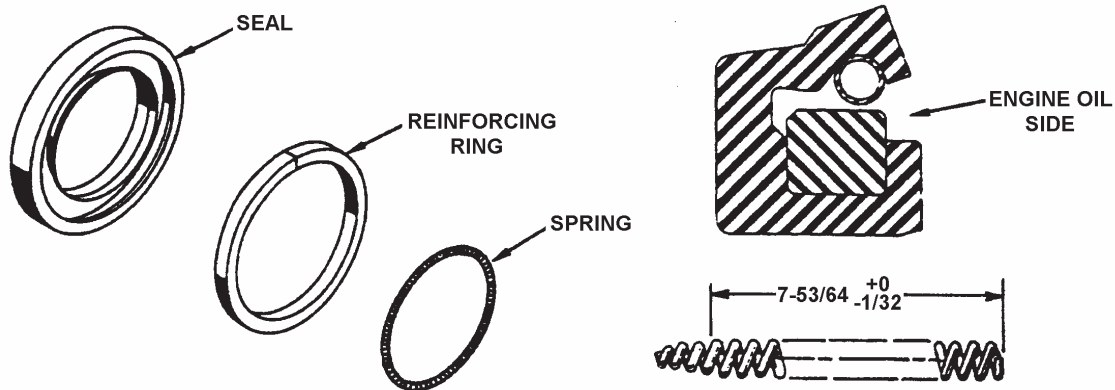


Figure 10-44. Crankshaft Nose Oil Seal Parts

10. Prepare the exposed portion of the crankshaft according to the instructions in Section 10-9.3.

10-10.2. Solid Nose Oil Seal Installation

WARNING

Turn the Ignition Switch OFF and disconnect engine electrical power before commencing maintenance or inspections. Confirm continuity between the magneto capacitor and aircraft ground to prevent accidental engine start during maintenance. Do not stand or place equipment within the arc of the propeller.

1. Prepare the exposed portion of the crankshaft with a fresh helix pattern according to instructions in Section 10-9.3.
2. Remove the spring and reinforcing ring from the crankshaft nose oil seal.
3. Unhook the spring ends using an unwinding motion.
4. Verify the seal spring length is 7.80" to 7.83" as illustrated in Figure 10-44. If the spring length is not within this tolerance, replace it.
5. Place the spring around the crankshaft in the helix area.



Non-Overhaul Repair and Replacement

6. Turn the spring ends in a winding direction and allow one end to wind into the other end.
7. Apply Part No. 654561 Grease to the lip of the new seal and the propeller flange.
8. Squeeze the seal until it is egg shaped and install it on the crankshaft, groove side in, starting from the bottom of the propeller flange using the Crankshaft Oil Seal Installer Tool (Chapter 3, Kent-Moore Part No. 5209).
9. After the oil seal is installed on the crankshaft, wipe the grease from the oil seal and crankshaft. Verify the outer diameter of the oil seal is clean and dry.
10. Press the reinforcing ring into the oil seal recess in both directions from the split. Ensure the reinforcing ring is in the deepest part of the recess all the way around.
11. Install the spring in the oil seal cavity.
12. Spray a thin film of Part No. 653692 Primer on the oil seal counterbore and allow it to dry for 1 to 2 minutes.
13. Apply a translucent coat of Gasket Maker (Part No. 646942) to the oil seal counterbore. Refer to Gasket Maker application instructions in Appendix C.
14. Apply Gasket Sealant (Part No. 654663) to the outside diameter of the oil seal.
15. Using thumb pressure, work the seal into the crankcase counterbore.
16. After the seal is in place, wipe any remaining sealant from the seal and crankshaft.
17. Spray the exposed portion of the lightly scratched crisscross area with aluminum paint and allow it to dry.
18. Apply Part No. 653693, General Purpose Primer, to the crankcase oil seal retainer screw holes.
19. Apply Part No. 646941, High Strength Adhesive Sealant, to the oil seal retainer screws.
20. Install the crankshaft nose oil seal retainer plates and secure them with the nose oil seal retainer screws. Torque the screws to Appendix B specifications.
21. Inspect the propeller according to the propeller manufacturer's and aircraft manufacturer's instructions.
22. Install the propeller, if serviceable, according to the propeller manufacturer's and aircraft manufacturer's instructions.
23. Perform a normal "Engine Start" (Section 7-3.2) and "Ground Run-up" (Section 7-3.3). Run the engine for a minimum of five minutes to reach normal operating temperatures. Shut down the engine according to the "Engine Shutdown" (Section 7-3.4) instructions and inspect the Crankcase Nose Oil Seal area for leaks.



10-10.3. Split Nose Oil Seal Removal

Follow same procedures listed for stretch type oil seals except it is not necessary to remove the propeller. With the propeller installed, any removal of plating or blending of the 1” area referred to in Section 10-10.1 will have to be accomplished manually without engine rotation.

NOTE: On left hand rotating engines (LTSIO360) the helix must be applied in the opposite direction as shown in Figure 10-41. Stroke the strip of emery cloth outward toward the flange in the direction of rotation (CW toward you using maximum hand pressure.).

10-10.4. Split Type Nose Oil Seal Installation

1. Prepare the exposed portion of the crankshaft with a fresh helix pattern according to the instructions in Section 10-9.3.
2. Use appropriate split type nose oil seal depending on engine model (refer to illustrated parts catalog).
3. Remove the spring (Figure 10-45) from the new crankshaft nose oil seal assembly and unhook the spring ends.
4. Verify the seal spring length is 7.53” to 7.59” as illustrated in Figure 10-45. If the spring length is not within this tolerance, replace it.
5. Place the spring around the crankshaft in the helix area and connect the ends of the spring.
6. Apply Part No. 654561 Grease to the lip of the new oil seal and the crankshaft propeller flange.
7. Install a new oil seal on the crankshaft outboard of the spring with the opening facing the crankcase.

CAUTION: The nose oil seal split line must not align with the crankcase mating flanges.

8. Position the split line of the crankshaft nose oil seal at the 2:00 or 4:00 o'clock position of the crankcase.
9. Position the spring hooks 180° away from the split line of the nose oil seal and install the spring in the oil seal cavity.
10. After the seal is positioned on the crankshaft, wipe the grease from the oil seal and crankshaft. Verify the outer diameter of the oil seal is clean and dry.
11. Mask the crankshaft where it exits the crankcase. Spray a thin film of Part No. 653692, Primer, on the oil seal counterbore and allow it to dry for one to two minutes.
12. Apply Part No. 646942, Gasket Maker to the crankcase oil seal counterbore. Remove the masking tape from the crankshaft.
13. Apply a translucent coat of Part No. 654663 Gasket Sealant on the outer diameter of the oil seal.



Non-Overhaul Repair and Replacement

- Using thumb pressure, work the seal and spring into the crankcase counterbore. Ensure the seal is in the deepest part of the recess all the way around.

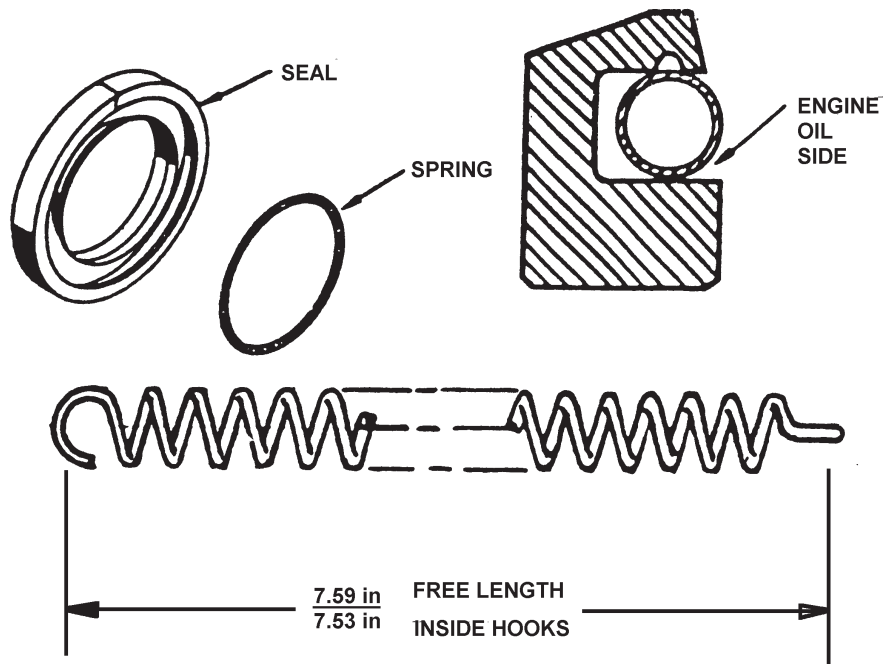


Figure 10-45. Split Nose Oil Seal Parts

- After the seal is in place, wipe any remaining sealant from the seal and crankshaft.
- Spray the exposed portion of the lightly scratched crisscross area with aluminum paint and allow it to dry.

NOTE: The following steps apply only to engines utilizing oil seal retainer plates.
- Apply Part No. 653693, General Purpose Primer, to the crankcase oil seal retainer screw holes.
- Apply Part No. 646941, High Strength Adhesive Sealant, to the oil seal retainer screws.
- Install the crankshaft nose oil seal retainer plates and secure them with screws. Torque the screws to the value specified in Appendix B.
- Perform a normal “Engine Start” (Section 7-3.2) and “Ground Run-up” (Section 7-3.3). Run the engine for a minimum of five minutes to reach normal operating temperatures. Shut down the engine according to the “Engine Shutdown” (Section 7-3.4) instructions and inspect the Crankcase Nose Oil Seal area for leaks.



Table B-2. Component Specific Torque Specifications

Size	Fastener	Torque Value		Models Affected (Non-standard, see General Torque Specification)
		In.-Lbs.	Ft.-Lbs.	
.44-20	Nut, Cylinder to Crankcase Through Studs	400-450	33.3-37.5	A Series, C-75, C-85 & C-90
.44-20	Nut, Front & Rear Crankcase Bearing Through Studs	490-510	40.8-42.5	O-200
.44-20	Nut, Through Bolt at Cadmium Plated Washer	440-460	36.7-38.3	All Models (AR)
.44-20	Nut, Through Bolt at Cylinder Flange	490-510	40.8-42.5	All (AR) EXCEPT IO-240, IOF-240, & 360
.44-20	Nut, Through Bolt at Cylinder Flange	590-610	49.2-50.8	All IO-240, IOF-240, & 360
.44-20	Nut, Through Bolt at Front Mount Belt-Driven Alternator	490-510	40.8-42.5	All Models (AR)
.44-20	Nut, Tie Bolts at Nose and Prop Shaft Cages	340-360	28.3-30.0	GO-300
.50-20	Nut, Crankcase Through Bolt at Cadmium Plated Washer	615-635	51.2-52.9	IO-346, O-470, IO-470, TSIO-470, GTSIO-520, IO-520, L/TSIO-520, IO-550, IOF-550, TSIO-550, & TSIOF-550
.50-20	Nut, Crankcase Through Bolt at Cylinder Flange, P/N 634505 (6 point/0.33" tall)	690-710	57.5-59.2	All IO-346, All 470, All 520 & All 550 EXCEPT TSIOL-550
.50-20	Nut, Crankcase Through Bolt at Cylinder Flange, P/N 652541 (12 point)	790-810	65.8-67.5	All IO-346, All 470, All 520 & All 550 EXCEPT TSIOL-550
.50-20	Nut, Crankcase Through Bolt at Cylinder Flange, P/N 649496 (6 point/0.43" tall)	790-810	65.8-67.5	TSIOL-550
.50-20	Nut, Crankcase-Nose Tie Bolts	640-660	53.3-55.0	All Models (AR)
.50-20	Nut, Through Bolt at Cadmium Plated Washer	690-710	57.5-59.2	TSIOL-550
.62-18	Plug, (using crush washer)	190-210	15.8-17.5	All Models (AR)
Gears				
.25-28	Bolt, Gear to Camshaft	140-160	11.7-13.3	A, C & E Series, O-200, O-300, O-470, IO-240, & IOF-240
.25-28	Bolt, Gear to Crankshaft (P/N 22532) ¹	140-160	11.7-13.3	A, & C Series, O-200, O-300, GO-300, IO-240 & IOF-240
.25-28	Bolt, Gear to Crankshaft (P/N 534904) ¹	170-175	14.2-14.6	E Series, O-470 Numerical, O-470-A & E
.31-24	Bolt, Gear to Camshaft	240-260	20.0-21.7	E Series, IO-360, L/TSIO-360, IO-346, O-470, IO-470, TSIO-470, GTSIO-520, IO-520, L/TSIO-520, IO-550, IOF-550, TSIO-550, TSIOF-550, & TSIOL-550
.31-24	Bolt, Gear to Crankshaft (Lower Hardness Identified with Green Dykem) ¹	240-260	20.0-21.7	E Series, IO-360, L/TSIO-360, IO-346



Torque Specifications

Table B-2. Component Specific Torque Specifications

Size	Fastener	Torque Value		Models Affected (Non-standard, see General Torque Specification)
		In.-Lbs.	Ft.-Lbs.	
.31-24	Bolt, Gear to Crankshaft (Bolt Hardness RC 38-42) ¹	380-420	31.7-35.0	O-470, IO-470, TSIO-470, IO-520, L/TSIO-520, GTSIO-520, IO-550, IOF-550, TSIO-550, TSIOF-550, & TSIOL-550
.31-24	Bolt, Face Gear to Crankshaft	140-150	11.7-12.5	IO-346, GTSIO-520, IO-520, TSIO-520 (AR), IO-550, IOF-550, TSIO-550, & TSIOL-550
.31-24	Nut, Generator or Alternator Gear	175-200	14.6-16.7	A, C & E Series, O-200, IO-240, O-300, GO-300, IO-360, & L/TSIO-360
.31-24	Nut, Generator Gear (531231) w/washer (401507)	175-195	14.6-16.3	E Series
.38-24	Bolt, Vacuum & Fuel Pump Gear to Camshaft	275-325	22.9-27.1	IO-240 & IOF-240
.38-24	Nut, Slick Mag Gear to Magneto Shaft	120-180	10.0-15.0	O-200 & O-300
Connecting Rods				
.38-24	Nut, Connecting Rod (nuts 24804 or 626140 w/bolt P/N 530213) ^{2, 3, 4}	400-475	33.3-39.6	A & C Series, O-200, O-240, IO-240, IOF-240, O-300, GO-300, IO-360 & L/TSIO-360
.38-24	Nut, Connecting Rod (Spirallock nut P/N 654487 w/bolt P/N 655960)	400-475	33.3-39.6	E-Series O-470, IO-470, with 654796 Connecting Rod
.38-24	Nut, Connecting Rod (nut P/N 626140 w/bolt P/N 35972) ^{2, 3, 5}	400-475	33.3-39.6	E-185, E-205, E-225, IO-346, O-470 Numbered and Lettered Engines IO-470, TSIO-470, with 628751 Connecting Rod
.38-24	Nut, Connecting Rod (Spirallock nut P/N 654487 w/bolt P/N 654693) ⁵	490-510	40.8-42.5	O-200, O-240, IO-240, IOF-240, O-300, IO-360, L/TSIO-360, O-470, IO-470, TSIO-470
.38-24	Nut, Connecting Rod (Spirallock nut P/N 654487 w/bolt P/N 655959)	490-510	40.8-42.5	O-200, O-240, IO-240, IOF-240, O-300, IO-360, L/TSIO-360, O-470, IO-470, TSIO-470
.44-20	Nut, Connecting Rod (Spirallock nut P/N 643215 w/bolt P/N 643112)	550-600	45.8-50.0	O-470, IO-470, IO-520, L/TSIO-520-AE & CE, IO-550, IOF-550, TSIO-550, TSIOF-550 & TSIOL-550
.44-20	Nut, Connecting Rod (Spirallock nut P/N 654490 w/bolts P/N 643112 or P/N 655958)	690-710	57.5-59.2	O-470, IO-470, GTSIO-520, IO-520, L/TSIO-520, IO-550, IOF-550, TSIO-550, TSIOF-550 & TSIOL-550
.44-28	Nut, Connecting Rod (rod P/N 646476 w/bolts P/N 629340 and nut 628109) ²	475-525	39.6-43.8	IO-346, O-470, IO-470, TSIO-470, IO-520 & TSIO-520 (EXCEPT L/TSIO-520-AE & CE)
.44-28	Nut, Connecting Rod (rod P/N 646474 w/bolts P/N 631794 and nut 631554) ²	550-575	45.8-47.9	GTSIO-520



C-2.4. Mandatory Overhaul Replacement Parts

In addition to the items listed in Section C-2.3, mandatory replacement parts must be discarded and replaced with new parts during engine overhaul.

Table C-1. Mandatory Overhaul Replacement Parts

REPLACEMENT ITEMS	SPECIAL CONDITIONS	100% REPLACEMENT	MANDATORY REPLACEMENT AT ENGINE OVERHAUL
Accessories, Engine Mounted ¹	Replace On Condition		X
Air-conditioning Drive Belts	Replace On Condition		X
Alternators <ul style="list-style-type: none"> • Drive Belts • Rubber Drive Bushings 	Replace On Condition		X X
Baffles (see Engine Baffles)	Repairable		X
Bearings: connecting rod, crankshaft main and thrust, needle, ball, and roller			X
Bushings: used in bearing applications (subject to wear) - reference disassembly/assembly instructions			X
Camshaft Gears: <ul style="list-style-type: none"> • Replace P/Ns 535934, or 535660, or 656037 (O470J, K, L, R, S, U; IO346A; IO470J, K) with 656913, or subsequent part number, at overhaul. • Replace P/Ns 537432 or 656038 (O470G, GCI, M; IO470C, D, E, F, H, L, M, N, S; TSIO470B, C, D; GTSIO520C, D, H, K, L, M, N, R) with 656914, or subsequent part number, at overhaul. • Replace P/Ns 631845, or 655516, or 656031 (IO470U, V; IO520A, B, BA, BB, C, CB, D, E, F, J, K, L, M, MB, N, NB, P, R; LIO520P; L/TSIO520ALL; IO550A, B, C, D, E, F, G, L, N, P, R; IOF550ALL; TSIO550A, B, C, E; TSIO550A, B, C), or 655430 (IO550A, B, C, D, E, F, G, L, N) with P/N 656818 or subsequent part number) 	Design Change	X	
Camshaft Gear Bolts			X
Cold Start Primer Diverter Valves			X
Connecting Rods (must be inspected for serviceable condition during Overhaul) <ul style="list-style-type: none"> • Connecting Rods (P/N 626119, 646320, and 646321 must be replaced with current part number)² See Section 10-9.1 for engine applicability • Connecting Rods (with beam widths less than 0.625 inches must be replaced with current part number)² • Connecting Rod Bolts • Connecting Rod Nuts 	Inspection Required Design Change Design Change	X X X	X
Cotter Pins		X	
Counterweight <ul style="list-style-type: none"> • Counterweights (P/N 631810 must be replaced with P/N 652833)³ • Counterweight Pins • Retainer Plates • Retaining (Snap) Rings 	Design Change	X X	X X X
Crankcase Through Bolts			X
Crankshaft Gears <ul style="list-style-type: none"> • Crankshaft Gear (P/Ns 536421 or 653631 must be replaced with P/N 657175, or subsequent)³ • Crankshaft Cluster Gear (P/Ns 641906 or 656272 must be replaced with P/N 656072, or subsequent)⁴ • Crankshaft Gear, large (P/N 656991 Rev B must be replaced with P/N 656991 Rev.C, or subsequent)⁵ • Crankshaft Gear Bolts 	Design Change Design Change Design Change	X X X	X



Maintenance Standards

Table C-1. Mandatory Overhaul Replacement Parts

REPLACEMENT ITEMS	SPECIAL CONDITIONS	100% REPLACEMENT	MANDATORY REPLACEMENT AT ENGINE OVERHAUL
Crankshaft Gears, continued <ul style="list-style-type: none"> • Crankshaft Alternator Face Gear Bolts • Crankshaft Alternator Face Gear Lock Plates 		X	X
Cylinder Deck Stud Nuts and Through Bolt Nuts			X
Engine Baffles (see Baffles)	Repairable		X
Engine Mounted Accessories ¹	Replace On Condition		X
Exhaust Nuts		X	
Exhaust Valves and Rotocoils			X
FADEC <ul style="list-style-type: none"> • Electronic Control Units • Engine Low Voltage Harness (including EGT and CHT sensors) • Fuel Filter • Fuel Injectors • Fuel Pressure Sensors • Manifold Air Pressure Sensors • Oil Pressure Sensor, if equipped • Oil Temperature Sensor, if equipped • Signal Conditioner, if equipped • Speed Sensor • Turbine Inlet Temperature Sensor(s), if equipped 			X X X X X X X X X X X
Filters, replaceable (air, oil, fuel, magneto), if equipped	Replace On Condition		X
Flexible Baffle Seal		X	
Fuel Systems			X
Fuel Pump Drive Coupling (P/N 631263 must be replaced with P/N 653359, or subsequent part number) ⁶ on all IO520B, BA, BB, C, CB, M, MB, N, NB; TSIO520B, BB, BE, D, DB, E, EB, J, JB, K, KB, L, LB, N, NB, UB, VB, WB; IO550A, B, C, G, N, P, R; TSIO550A, B, C, E; TSIOL550A, B, C	Design Change	X	
Gaskets		X	
Hoses	Replace On Condition		X
Hydraulic Lifters (tappets)			X
Ignition System Harness			X
Intake Valves	Replace On Condition		
Lock Washers		X	
Magnetos <ul style="list-style-type: none"> • Magneto Rubber Drive Bushings 			X X
“O” Rings		X	
Oil Pump Gears (O-300, IO-360, TSIO-360 and LTSIO-360 Series) ⁷	Design Change	X	
Oil Suction Screens (360 series P/Ns 649470, 649471, 652669, 652670 must be replaced with current part number) ⁷	Design Change	X	
Oil Suction Screens (C-125, C-145 and O-300 series P/N 633272 must be replaced with current part number) ⁷	Design Change	X	
Packings		X	
Pistons <ul style="list-style-type: none"> • Pins • Rings 			X X X



C-9. Gasket Maker® Application

Gasket Maker is an easily workable tacky gel which can be applied onto one side of a flange surface from a tube and evenly spread.

WARNING

Apply Gasket Maker only as directed. The improper use of sealants may cause engine malfunction or failure. Do not apply any form of sealant to the crankcase cylinder deck, chamfer, cylinder mounting flange, cylinder base O-ring, main bearing bosses, or cylinder fastener threads. The use of RTV, silicone, Gasket Maker or any other sealant on the areas listed above during engine assembly will cause a loss of cylinder deck stud or through-bolt torque. Subsequent loss of cylinder attachment load, loss of main bearing crush and/or fretting of the crankcase parting surfaces will occur. The result will be cylinder separation, main bearing movement, oil starvation and catastrophic engine failure. USE ONLY CLEAN 50 WEIGHT AVIATION ENGINE OIL ON SURFACES LISTED.

1. Verify the surface where the sealant will be applied is clean and free of nicks, burrs, oil, and grit.
2. For the engine nose seal, apply Part No. 653692 General Purpose Primer to prepare the sealant surface before applying Gasket Maker at the engine nose seal area.
3. Apply and spread a thin, translucent coat of Part No. 646942 Gasket Maker (not to exceed 0.010 inches in thickness) to the surface directly from the tube. For small parts, use a polyester urethane sponge or a short nap roller saturated with Gasket Maker to apply the sealant to the part.
4. Once Gasket Maker has been applied, evenly torque the assembly into place.
5. Wipe away excess sealant with chlorinated solvent.
6. To remove Gasket Maker from your hands, apply waterless mechanics hand soap followed by soap and water.



C-10. Gasket Installation

WARNING

Apply Gasket Maker only as directed. The improper use of sealants may cause engine malfunction or failure. Do not apply **any** form of sealant to the crankcase cylinder deck, chamfer, cylinder mounting flange, cylinder base O-ring, main bearing bosses, or cylinder fastener threads. The use of RTV, silicone, Gasket Maker or **any** other sealant on the areas listed above during engine assembly will cause a loss of cylinder deck stud or through-bolt torque. Subsequent loss of cylinder attachment load, loss of main bearing crush and/or fretting of the crankcase parting surfaces will occur. The result will be cylinder separation, main bearing movement, oil starvation and catastrophic engine failure. **USE ONLY CLEAN 50 WEIGHT AVIATION ENGINE OIL ON SURFACES LISTED.**

Gaskets and components must be properly positioned with the hardware torqued and safety wired, as required, during assembly to prevent oil loss.

Install only new gaskets. If the gasket material is age-sensitive (package or gasket is stamped with a date code), verify the use by date has not passed. Inspect each gasket for brittleness, cracks, wrinkles, damage, or deformities prior to installation. Do not use a gasket with obvious defects, even if new; replace with a new manufacturer-specified gasket. Verify that gasket surfaces are clean and free of nicks, burrs, oil, and grit.

CAUTION: Do not install brittle, dirty, cracked, or wrinkled gaskets. Never reuse a gasket removed during disassembly.

1. Apply a thin coat of Part No. 642188 Gasket Sealant to both sides of the gasket unless otherwise specified.
2. Install the gasket, following the contour of the mating surface.
3. Install the assembly and evenly torque the hardware to Appendix B specifications to prevent damage to the gasket.
4. Safety wire the hardware where indicated.

C-10.1. Crush Washer Installation

Crush washers are commonly used at spark plug and oil sump plug bosses. The copper material is soft and readily conforms to the two mating surfaces to form a tight seal.

1. Crush washers are one-time use items. Discard the crush washer during disassembly and obtain a new crush washer for re-assembly.
2. If the crush washer exhibits a split line on one side, install the split line toward the non-moving surface to avoid distortion. For example, at the oil sump, install the split line against the oil sump boss rather than the plug.
3. Torque the fastener to the value specified in Appendix B; over-torquing risks stripped threads.