

Continental Motors® PMA Aircraft Engine Products
SERVICE INFORMATION LETTER

CATEGORY 5
SIL011

Contains Useful Information Pertaining to Your Aircraft Engine

SUBJECT: Replacement PMA Crankcases, (P/N AEL65460)

PURPOSE: To provide installation eligibility, procedures, and specifications for adding oil drain provisions when using a solid or hollow main journal that does not have a pierced rear oil plug.

To illustrate leak suppressing (anti-wicking) grooves and thrust washer installation instructions.

COMPLIANCE: At engine assembly, engine overhaul, or whenever the engine crankcase is disassembled.

MODELS

AFFECTED: Lycoming®¹ engines (listed in Table 1) fitted with Continental Motors (CMI) replacement parts manufactured under PMA. Lycoming® O320-E2D, E3D, and O360-A4M, -C4P crankshafts used in Lycoming® engines without oil tubes or drain holes in the front main bearing journal.

I. GENERAL INFORMATION

Continental Motors, Inc. has received PMA approval of 4-cylinder crankcases for a number of Lycoming® 320 and 360 series engines. This service instruction details the features, options and the continuing airworthiness for Continental Motors crankcases installed on Lycoming® 320/360 series engines.

II. BACKGROUND

CAUTION: All tolerances not specifically documented herein must use the appropriate Lycoming® overhaul manual and table of limits.

The long front main bearing (P/N AEL13884) used-in Lycoming® 4-cylinder 320 and 360 engines is comprised of two bearing surfaces separated by a 1.12" wide annular groove which does not support the crankshaft. This groove is used as part of the propeller governor oil pressure circuit in engines having constant speed propellers.

However, engines with *fixed pitch propellers* require an oil drain provision in order to ensure specified oil flow.

Oil from the bearing is normally drained through a radial tube in the crankshaft main bearing, and then, through the crankshaft front main bearing journal lightening hole into the crankcase interior (see Figure 1).

1. Lycoming® is a registered trademark of Textron Innovations Inc. Continental® is not connected to, affiliated with, sponsored by, or endorsed by Textron Innovations Inc. or Lycoming® Engines, a Division of Avco Corporation, or any of their related or affiliate companies.

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If the crankshaft does not have oil drain provisions (no lightening hole), or if an unpierced rear plug is installed, a provision must be machined to drain oil flow into the crankcase interior by drilling a single hole between the bearing dowels in the front main bearing saddle of the left crankcase half (see Figure 2, 2-4 cylinder side).

“Solid” crankshafts have no drain hole, oil tube, pierced rear plug, or lightening hole through the front main journal ID (per Lycoming® Service Instruction, SI1435).

Fixed pitch operation requires crankcase drain provision if:

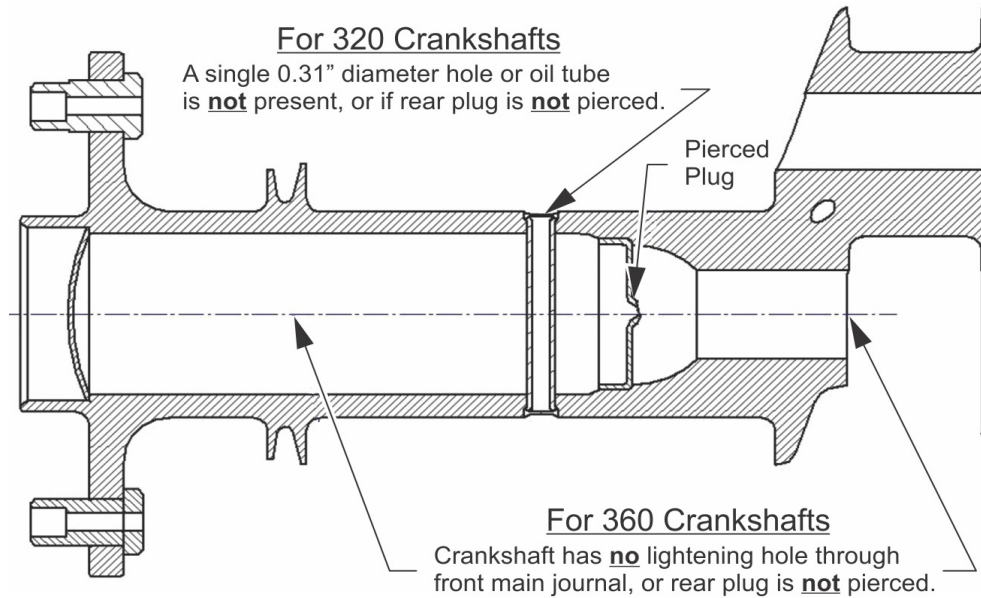


Figure 1. Crankshaft Applicability (per Lycoming® Service Instruction SI1435)

III. OVERHAUL REQUIREMENTS

WARNING

Crankshafts may only be repaired by an approved FAA Part 145 Repair Stations. Do not attempt crankshaft repair without the required FAA certification.

CAUTION: Do not attempt to repair a scored or overheated crankshaft. Discard and replace ALL scored or scorched crankshafts.

The replacement crankcase is a cast 355 aluminum alloy. All crankcase overhaul repairs must be performed by an FAA Part 145 Repair Station certified to perform crankcase repair using methods approved by the Federal Aviation Administration. The repaired crankcase must meet the dimensional limits specified in the primary Instructions for Continued Airworthiness.

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IV. ELIGIBILITY

Table 1. Replacement Crankcases for Lycoming® Eligible Engines

CMI Part Number	Lycoming® Part Number	Lycoming® Engine Models Affected
AEL65460-03	1.Dynafoal Type 1 Engine Mount 2.Machined for high-crush (AEL16711) main bearings 3.Anti-wicking grooves machined along backbone to prevent oil seepage from upper rib	O-320-D1A, D1B, D1C, D1D, D2A, D2B, D2C, D2G, D2H, D3G, E1A, E1B, E1C, E2A, E2B, E2C, E2D, E2G, E2H, E3D, E3H IO-320-D1A, F1A
AEL65460-04	1.Machined for 646288 thrust washer to reduce wear at the crankshaft/crankcase thrust surface interface 2.Dynafoal Type 1 Engine Mount 3.Machined for high-crush (AEL16711) main bearings 4.Anti-wicking grooves machined along backbone to prevent oil seepage from upper rib	O-360-A1A, A1D, A1F, A1F6, A1G, A1G6, A2A, A2D, A2F, A2G, A3A, A3D, A4A, A4D, A4G, A4J, A4K, A4M, A4P, B1A, B1B, B2A, B2B, B2C IO-360-A1A, A1B, A1B6, A1C, A1D, A2A, A2B, A2C, A3B6, B1B, B1D, B1E, B1F, B1F6, B2E, B2F, B2F6, B4A, C1A, C1B, C1C, C1C6, C1D6, C1F, F1A, L2A TIO-360-A1A, A1B, A3B6 AEIO-360-A1A, A1B, A1B6, A1C, A1D, A2A, A2B, A2C, B1B, B1D, B1E, B1F, B1F6, B1G6, B2F, B2F6, B4A
AEL65460-11	1.Conical Engine Mount 2.Machined for high-crush (AEL16711) main bearings 3.Anti-wicking grooves machined along backbone to prevent oil seepage from upper rib	O-320- A1A, A1B, A2B, A2C, A2D, A3A, A3B, B1B, B2B, B2C, B2D, B3B, C1B, C2B, C2C, C3B IO-320-E1A, E1B, E2A, E2B AEIO-320-E1A, E1B, E2A, E2B
AEL65460-12	1.Machined for 646288 thrust washer to reduce wear at the crankshaft/crankcase thrust surface interface 2.Conical Engine Mount 3.Machined for high-crush (AEL16711) main bearings 4.Anti-wicking grooves machined along backbone to prevent oil seepage from upper rib	O-360-C1A, C1C, C1E, C1F, C2A, C2B, C2C, C2E, C4F, C4P, D1A, D2A, J2A HO-360-C1A IO-360-K2A HIO-360-A1A, A1B, B1A, B1B, D1A AEIO-360-H1A

V. INSPECTION AND REWORK INSTRUCTIONS

When preparing to assemble crankcases in the referenced 320 and 360 Lycoming® engines intended for fixed pitch propeller operation, customers must make an assessment of the oil drain provisions for the crankcase/crankshaft combination.

1. If the crankshaft already has oil drain provision, no further action is required.

CAUTION: Do not confuse the crankshaft oil drain hole with the angled 0.375" governor oil passage in the right crankcase half!

CAUTION: Drill through bearing housing only. Do not drill through crankcase outer wall.

2. If the crankshaft has no oil drain provision as described above, this provision must be added to the crankcase by drilling a single drain hole in the left crankcase half (2-4 cylinder side), as described in the following instructions:
 - a. Mount the left crankcase half securely on the table of a suitable drill press or vertical milling machine in order to ensure accurate positioning and perpendicularity.
 - b. Drill a hole 0.005-0.015 inch (drilled as shown Figure 2) and de-burr the edges. Thoroughly inspect the crankcase to ensure that all metal chips have been removed.

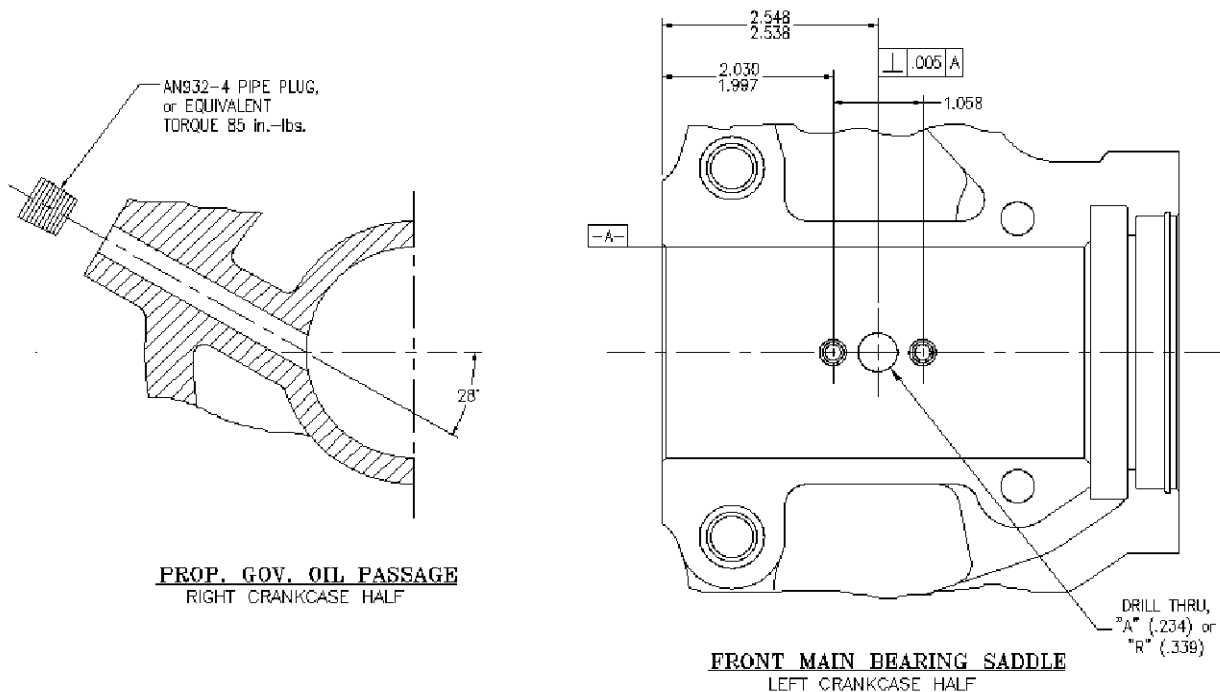


Figure 2. Crankcase Oil Drain Provision (fixed pitch operation)

- c. Install an AN932-4 steel plug in the right crankcase half using Loctite 592 pipe sealant and torque to 85 in-lbs.
- d. Enter the following statement in appropriate engine maintenance logbook:
"Drilled oil drain hole in left crankcase half and installed plug in right crankcase half per Continental Motors SIL011."

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VI. CONVERSION TO CONSTANT SPEED

Crankcases reworked in accordance with this Service Document may subsequently be converted for operation with constant speed propellers, if desired, by exchanging crankshaft and reconfiguration of the crankcase oil passages in accordance with Figure 3. Proceed as follows:

1. Mount the left crankcase half securely and squarely on the table of a suitable drill press or vertical milling machine and center the spindle with the hole. Install the tap in a drill chuck or collet in order to begin tapping the threads perpendicular to the main bearing saddle surface as required. Use a tapping lubricant or cutting fluid suitable for aluminum.
2. Tap threads in the drain hole of the left crankcase half. If the hole is 0.234", use a 1/16-27 NPT tap. If the hole is 0.339", use a 1/8-27 NPT tap.
3. After the tap has started squarely four or five turns, loosen the chuck or collet and continue tapping by hand using a T-handle. Clear chips from the flutes of the tap periodically. Run tap in approximately 60% of its flute length, remove and clear all chips.
4. Position the plug to be installed in the tapped hole. If tap is 1/16-27 NPT, use AN932-1 steel plug. If tap is 1/8-27 NPT, use AN932-2 steel plug.

NOTE: Note position of the plug relative to the surface of the crankcase main bearing saddle. If plug protrudes above the bearing saddle surface, remove and continue tapping in increments until the plug can be seated 0.01"-0.06 below the bearing saddle surface when torqued to 40 in-lbs.

5. Remove the plug, de-burr the edge of the tapped hole, and clean all metal chips from the crankcase half.
6. Lubricate the plug threads with clean engine oil and torque plug to 40 in-lbs.

CAUTION: No portion of the plug or edge of the tapped hole may protrude above the surface of the main bearing saddle when finished. Use a small straightedge to verify. Trial fit the AEL13884 bearing halves in the left crankcase half to ensure that there is no interference.

7. Remove the AN932-4 steel plug from the governor oil passage in the right crankcase half and install MS20822-6 steel elbow using Loctite 592 pipe sealant sparingly on the threads and torque to 85 in-lbs.

NOTE: For tapered (NPT/NPTF) fittings that must be oriented to a specific angle (clocked) for mating with another fitting or hose, screw the fitting into the port finger-tight. Wrench tighten additional 2-3 turns until the fitting is oriented at the desired angle. Do not loosen the fitting to achieve proper alignment.

NOTE: For additional information on propeller governor oil supply lines, clamping and routing, refer to Lycoming® Service Instruction 1435 with Supplement 1, Lycoming® Service Bulletin 488A with Supplement 1, and FAA Airworthiness Directive 90-04-06 R1, or superseding publications, as revised.

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8. Enter the following statement in appropriate engine maintenance records:

“Plugged oil drain hole in left crankcase half and installed governor oil supply elbow in right crankcase half, per Continental Motors SIL011.”

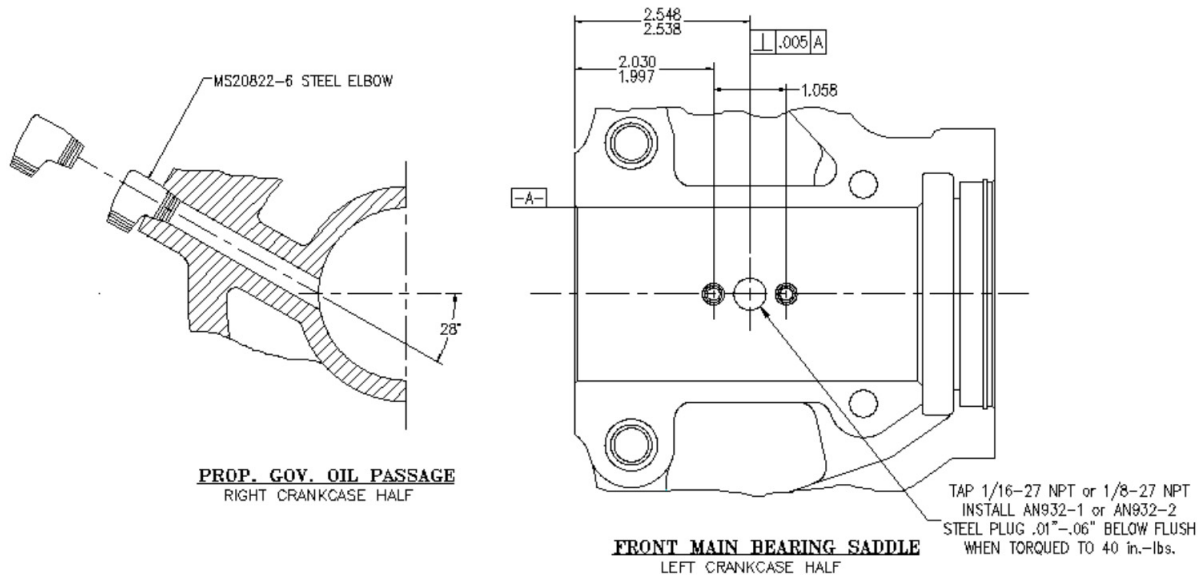


Figure 3. Crankcase Oil Drain Provision (constant pitch operation)

VII. LEAK PREVENTION

Leak suppressing (anti-wicking) grooves are machined into new and repaired PMA crankcases in accordance with FAA approved data operating specifications. The airworthiness of these grooves has been established through FAA Certification testing to CAR 13.154 and FAR Part 33.49. This minor alteration is applicable to crankcases of all aircraft with opposed engines.

WARNING

Crankcases may only be repaired by an approved FAA Part 145 Repair Stations. Do not attempt crankcase repairs without the required FAA certification.

CAUTION: All tolerances not specifically documented herein must use the appropriate Lycoming® overhaul manual and table of limits. The recommended overhaul period for this crankcase is the same as the Lycoming® crankcase it replaces.

Repair or overhaul of crankcases generally includes machining the crankcase parting line so that the main bearing bosses can be re-machined to new tolerances ($\pm.0005$ typical tolerance on the diameter). The amount of material that can be safely removed from the parting line is much less than the depth of the anti-wicking grooves, so no additional machining to the grooves is necessary to maintain effectiveness.

Crankcases repaired or overhauled by FAA Authorized Repair Stations with the proper operating specifications may return the crankcases to service with the anti-wicking grooves intact and without additional rework after ensuring that bearing bosses are within new crankcase tolerances.

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Reference Figures 4 and 5 for typical locations of machined anti-wicking grooves on Lycoming® engines.

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 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.

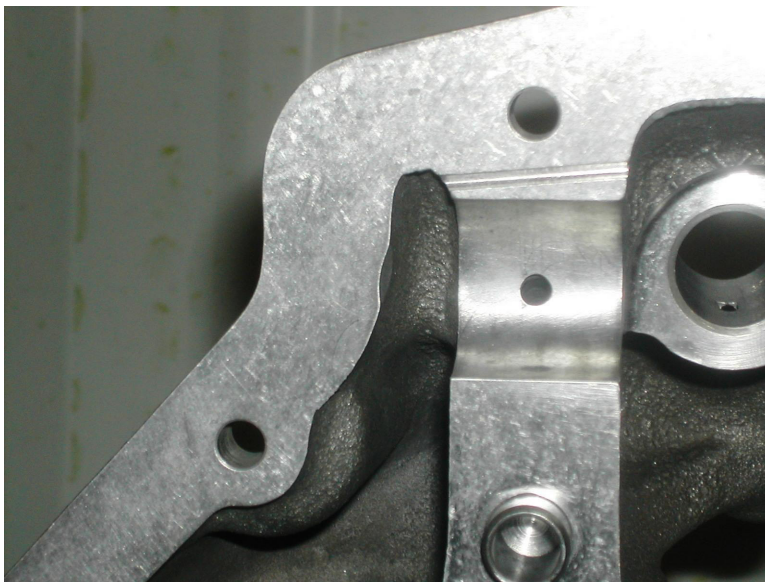


Figure 4. Anti-Wicking Groove (Front Cam Bearing Boss), *typical*



Figure 5. Anti-Wicking Groove (Rear Main), *typical*

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VIII. THRUST WASHER MODIFICATION

Crankcases with thrust washer modification (AEL65460-04 and AEL65460-12), must have P/N 646288 (or equivalent approved replacement) installed in order to meet clearance requirements. The thrust washer design also helps to reduce wear directly on the crankcase thrust face surface and helps reduce costs at overhaul.

CAUTION: Thrust washers must be installed in pairs.

Thrust washers shall be used during assembly to meet clearance requirements or at anytime the thrust face is damaged on any applicable crankcase.

Thrust washers are a mandatory replacement part and must be discarded and replaced with new parts during engine overhaul. Thrust washers should **not be reused** in subsequent overhauls even if the bearing surface is flat and smooth with no galling or radial wear marks in evidence.

Consult the CMI Illustrated Parts Catalog (IPC) to order the appropriate thrust washers (varying thicknesses). Append the OEM Instructions for Continued Airworthiness (ICAs) to maintain crankshaft end-play overhaul limits.

CAUTION: Prior to reassembling the engine, install the thrust bearing washer and check crankshaft end-clearance as described in the appropriate Lycoming® overhaul manuals and ICAs. Always use the most current version of the referenced ICA.

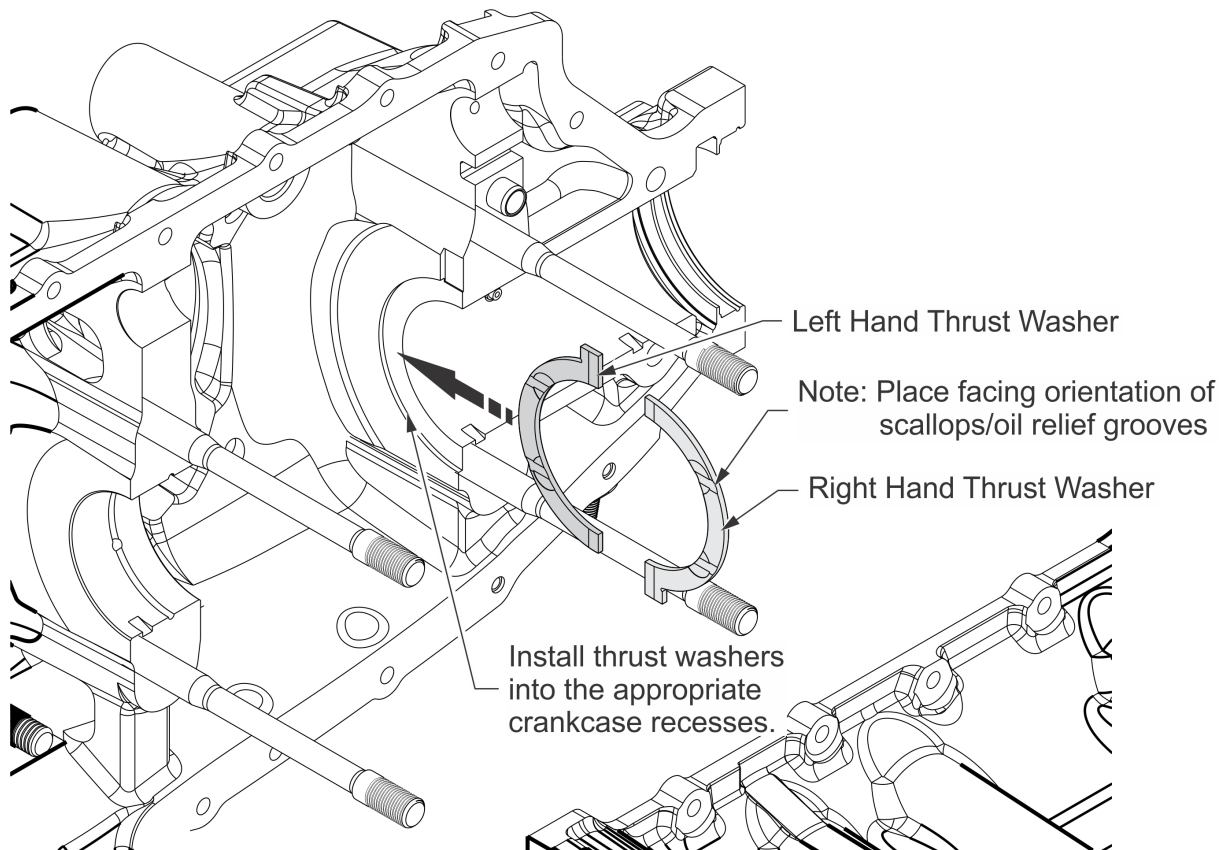


Figure 6. Thrust Washer Installation

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Thrust washers shall be installed with the scallops/oil relief grooves facing towards the crankshaft (reference Figure 6 and Figure 7).

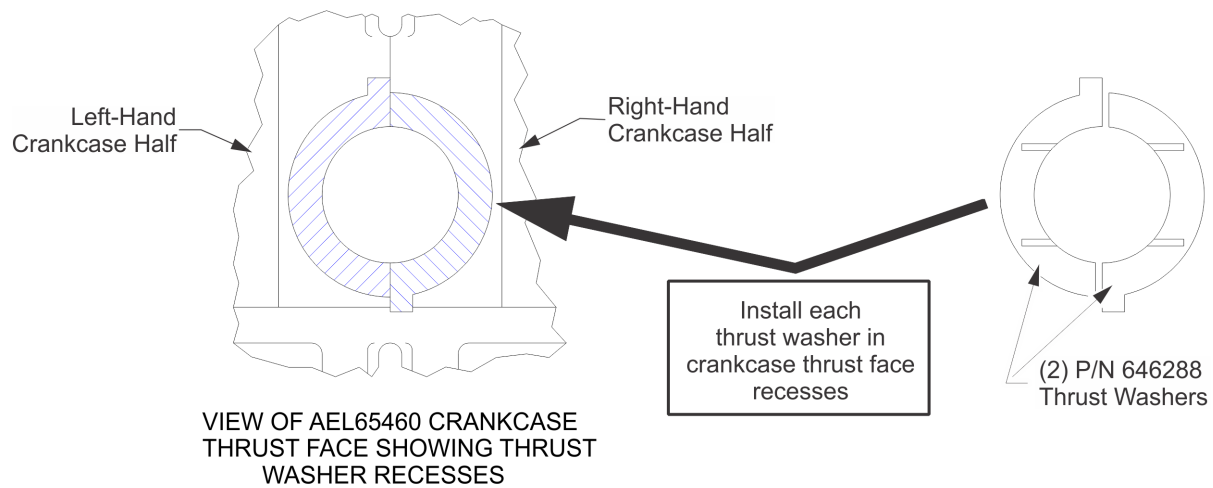


Figure 7. Crankcase with Thrust Washer Modification

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