LYCOMING
A Textron Company

652 Oliver Street
Williamsport, PA. 17701 U.S.A.

Tel. 570-323-6181
Fax. 570-327-7101
www.lycoming.textron.com

SERVICE INSTRUCTION

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Service Instruction No. 1290F
(Supersedes Service Instruction No. 1290E)
Engineering Aspects are
FAA DER Approved

SUBJECT: Repair of Oil Leakage at Crankcase Thru-Stud Locations; Assembled and Unassembled Engines.

MODELS AFFECTED: All Lycoming wide cylinder flange engines identified by the suffix "A" or "E" after the engine serial number and incorporating body-fit thru-studs such as:

O, IO, AIO, AEIO and LIO-320 series engines

O, IO, AIO, AEIO, HIO, LIO, TO and TIO-360 series engines

O, IO, AEIO, TIO and LTIO-540 series engines

TIO-541 and TIGO-541 series engines

IO-720 series engines

NOTE

Engines incorporating body-fit thru-studs can be identified by the presence of spacers and 1/2-20 nuts securing the thru-studs just forward of the no. 2 cylinder location.

TIME OF COMPLIANCE: As required.

Engines listed in the MODELS AFFECTED section of this publication achieve crankcase alignment thru the interference fit of the body-fit thru-studs and the crankcase thru-stud bores located in the main bearing webs. This interference fit is illustrated in Figure 1 which shows a section through the crankcase at a thru-stud location; note the two halves of the crankcase are supported at the parting surface by the body of the stud. Evidence of oil on the crankcase or cylinder mounting flange which can be traced to a thru-stud location indicates that the seal formed by the interference fit between the stud and the crankcase is incomplete. This can be the result of an oversized bore or a groove traced in the bore during installation of the thru-stud.

This publication is divided into 3 sections to fully separate and explain the approved methods of repairing an oil leak at a body-fit thru-stud location. For example, oil leaks at a body-fit thru-stud can be repaired by either installing a .001 or .002 inch oversize stud in the original factory thru-stud bore, or reaming the thru-stud bore to accept a .005 or .010 inch oversize thru-stud or by installing a Lycoming P/N 72075 oil seal, around the thru-stud at the main bearing web parting surface.

See PART I for the installation of an oversize body-fit thru-stud on an assembled engine.

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See PART II for the installation of a P/N 72075 oil seal. This action can only be accomplished when the engine is disassembled.

See PART III for the installation of a .005 or .010 inch oversize thru-stud in a thru-stud bore that also incorporates a P/N 72075 oil seal. This action can only be accomplished when the engine is disassembled.

See the latest revision of Service Instruction No. 1123 for an additional repair procedure for body-fit thru-stud bores that have become worn or damaged to the extent that a .010 inch oversize body-fit thru-stud will not maintain a .0000 inch (line to line) to .0035 inch tight fit. The repair requires the installation of a P/N 75302 dowel.

CAUTION

DO NOT ATTEMPT TO INSTALL A .005 OR .010 INCH OVERSIZED THRU-STUD IN A THRU-STUD BORE THAT IS NOT REAMED TO THE CORRECT DIAMETER. TO DO SO MAY CAUSE THE AFFECTED BEARING SUPPORT WEB TO CRACK.

CAUTION

STANDARD SIZE DRIVE-THRU BODY-FIT THRU-STUDS MUST BE USED IN ALL THRU-STUD BORES THAT ARE FITTED WITH P/N 75302 DOWELS.

PART I – INSTALLATION OF AN OVERSIZE THRU-STUD; ASSEMBLED ENGINE

The following procedure is used to repair oil leaks at body-fit thru-stud locations on assembled engines. .001 and .002 inch oversize thru-studs can be installed in the original bore provided the bore is clean and smooth and no STD-2013 "O"rings or P/N 75302 dowels are installed. The thru-stud bore can also be reamed to accept a .005 or .010 inch oversize thru-stud if required.

1. Remove the applicable thru-stud using thru-stud puller P/N ST-271.
2. Using a 4x boroscope with a 70° angle of view (maximum diameter 1/2 inch) or similar internal examining device, check the bore for any trace of a trough or groove. Also, check for the presence of a dowel. To check for a dowel, insert a pencil or pocket magnet (maximum diameter 5/16 inch) approximately 4-1/2 to 5 inches into the center of the thru-stud bore. If the magnet is drawn to the side of the bore, a dowel is present in the crankcase.

CAUTION

STANDARD SIZE DRIVE-THRU BODY-FIT THRU-STUDS MUST BE USED IN ALL THRU-STUD BORES THAT ARE FITTED WITH P/N 75302 DOWELS.

3. If the thru-stud bore is damaged, or it is determined that the bore is oversize and cannot be repaired as described in PART II and no dowel is present, a .005 or .010 inch oversize thru-stud may be installed. Remove the applicable cylinders and install P/N ST-222 hold down plates in place of them. Only one-thru stud bore may be reamed at a time. All remaining thru-studs must be tightened to the required engine assembly torque limits. Refer to the applicable Table of Limits.

CAUTION

DO NOT ATTEMPT TO INSTALL A .005 OR .010 INCH OVERSIZED THRU-STUD IN A THRU-STUD BORE THAT IS NOT REAMED TO THE CORRECT DIAMETER. TO DO SO MAY CAUSE THE AFFECTED BEARING SUPPORT WEB TO CRACK.

4. Using piloted reamer, ST-366-5 (.005 inch oversize diameter), proceed to ream the thru-stud bore in the crankcase. Use kerosene or cutting oil for a lubricant. Check reamed hole to insure diameter is .503/.505 inch.

5. Using a cylindrical brush and compressed air, clean the reamed bore of all traces of chips or other particles that may be in the bore.

6. Using a 4x boroscope with a 70° angle of view (maximum diameter 1/2 inch) or equivalent internal examining device, check the newly reamed bore to determine if any trace of the trough or groove which caused the leak still remains. Also, check for cleanliness. If the bore is not perfectly smooth and clean, again ream the bore, this time using ST-366-1 reamer (.010 inch oversize diameter). Check reamed hole to insure diameter is .508/.510 inch. Repeat the cleaning and boroscopic inspection procedures. If the bore is not clean and smooth at this time, refer to PART II of this publication. If the bore appears clean and smooth, continue with step 7.

7. Install a P5 or P10 oversize thru-stud, as applicable, in the newly reamed bore using engine oil in the hole and on the stud prior to its installation. Use driver, P/N ST-316 or ST-317 as required, to drive the stud to its correct location.

8. Remove the ST-222 torque hold down plate and on the cylinder mounting pad, near the new stud, stamp the oversize designation, P1, P2, P5 or P10. Also stamp the opposite pad. Use a small abrasive stone to smooth off any raised edges of the stamped designation.

9. Install and torque the cylinders as described in the applicable overhaul manual or the latest revision of Service Instruction No. 1029.

PART II – INSTALLATION OF P/N 72075 OIL SEAL AT THRU-STUD BORE LOCATIONS; DISASSEMBLED ENGINE

NOTE

Refer to the latest revision of Service Bulletin No. 472 for body-fit thru-stud removal instructions.

An optional repair procedure for an oil leak at the interference fit of a body-fit thru-stud and crankcase thru-stud bore is to modify the crankcase to include a recess, in the right crankcase half, for a P/N 72075 oil seal. These seals can be added to any bearing web that is supported by a drive-thru body-fit thru-stud except crankcases that have been modified to include thru-studs dowels. Refer to the latest revision of Service Instruction No. 1123 for installation of P/N STD-2013 "O"ring seals at doweled thru-stud locations. This repair procedure can only be accomplished when the crankcase halves are separated. Field maintenance experience and engine maintenance records must be used to determine when this repair procedure is required on any disassembled engine.

NOTE

The crankcase must be inspected and deemed otherwise serviceable prior to this or any other major repair work being accomplished. Refer to the applicable Lycoming Overhaul Manual or Maintenance and Overhaul Manual for inspection procedures.

The following steps describe the modification of the right crankcase half for installation of P/N 72075 oil seals, using Service Tool Kit, P/N ST-463. Refer to the Special Service Tools section of this publication for a description of Tool Kit P/N ST-463.

CAUTION

ANCHORED THRU-STUDS, SIMILAR TO THE STUDS USED WITH STANDARD CYLINDER FLANGE ENGINES, WERE USED ON WIDE CYLINDER FLANGE ENGINES DURING THE EARLY DEVELOPMENT STAGES OF THIS TYPE CRANKCASE. HOWEVER THE DRIVE-THRU BODY-FIT THRU-STUD THAT IS NOW USED ON ALL WIDE CYLINDER FLANGE ENGINES PROVED TO BE A MORE EFFECTIVE METHOD OF CONTROLLING CRANKCASE FRETTING AND OIL LEAKS. A FEW CRANKCASES THAT WERE MACHINED TO ACCEPT THESE ANCHORED THRU-STUDS HAVE BEEN MODIFIED TO INCORPORATE THE DRIVE-THRU BODY-FIT THRU-STUD BORES. THESE BUSHINGS DO NOT AFFECT THE PERFORMANCE OR RELIABILITY OF THE CRANKCASE, HOWEVER, IF A CRANKCASE THAT INCORPORATES THESE BUSHINGS IS TO BE MODIFIED TO INCORPORATE "O" RING SEALS AS DESCRIBED IN THE FOLLOWING STEPS, CAREFUL ATTENTION MUST BE PAID TO THE SECTION OF BUSHING THAT REMAINS AROUND THE O.D. OF THE "O" RING RECESS. THESE BUSHINGS ARE PRESSED INTO A BORE THAT IS REAMED TO A DIAMETER OF .7030 INCH. AS CAN BE SEEN IN FIGURE 1, THE DIAMETER OF THE "O" RING RECESS IS .6875 INCH, THIS LEAVES A BUSHING WALL THICKNESS OF APPROXIMATELY .007 TO .008 INCH AROUND THE RECESS. IF THIS THIN SECTION OF BUSHING REMAINS INTACT AFTER THE "O" RING RECESS IS CUT, IT CAN REMAIN IN THE CRANKCASE, BUT IF IT APPEARS DAMAGED, TORN OR CRACKED, IT MUST BE REMOVED. REMOVING THIS SECTION OF METAL FROM THE RECESS WILL NOT AFFECT THE SEALING CAPABILITIES OF THE "O" RING SEAL.

NOTE

It is recommended that the Tool Kit, P/N ST-463, be used with a drill press. However, if necessary, the tool can be used with a hand held variable speed electric drill turned at a low to medium speed. Turning the tool too fast will cause it to chatter.

1. Mount the right crankcase half on the bed of a drill press.

2. Select the applicable pilot, either the standard bore pilot ST-463-2, the .005 inch oversize ST-463-3 or the .010 inch oversize ST-463-4 and assemble it in the ST-463-1 counterbore. Tighten the allen head set screw to secure the pilot.

3. Assemble the P/N ST-463-5 stop collar on the ST-463-1 counterbore. Set the stop collar to allow the counterbore to cut to a depth of .063/.070 inch. Refer to Figure 1.

4. Using a liberal amount of kerosene or cutting oil to clear the flutes of the counterbore and prevent the stop collar or chips from scoring or marking the bearing web parting surface, proceed to cut the recess.

5. Clean the seal recess and thru-stud bore of all chips and shavings. Use a small abrasive stone to smooth the edge of the recess.

6. Measure the depth of the recess with a depth micrometer. Insure the depth is within the dimensions specified in step 3 and illustrated in Figure 1.

7. Using steel stamps, with letters approximately 1/8 inch high, stamp the letters "OR" on the cylinder mounting pad of the crankcase near the affected thru-stud bore. Use a small abrasive stone to smooth off the raised edges of the stamped letters. Also, make an entry in the engine logbook specifying that a P/N 72075 oil seal has been installed and at what location it was installed.

EXAMPLE:

P/N 72075 oil seal installed at no. 3 cylinder lower front thru-stud location. Reference Service Instruction No. 1290F.

 CAUTION

TO INSURE THE P/N 72075 OIL SEAL REMAINS IN PLACE IN THE RECESS DURING ASSEMBLY OF THE CRANKCASE HALVES, THE SEAL MUST BE LIBERALLY COATED WITH GREASE PRIOR TO BEING PLACED IN THE RECESS. USE FEL-PRO FOOD GRADE AA ANTI-SEIZE LUBRICANT P/N 51168 OR AN EQUIVALENT. COAT THE TAPERED SHOULDERS AND BODY OF THE THRU-STUD WITH ENGINE OIL. THIS WILL AID IN EXPANDING THE SEAL OVER THE STUD AND INTO THE RECESS.

PART III – INSTALLATION OF AN OVERSIZE THRU-STUD IN A THRU-STUD BORE MODIFIED TO INCLUDE THE P/N 72075 OIL SEAL; DISASSEMBLED ENGINE

It must be remembered that crankcase alignment is provided by the interference fit of the thru-stud and the thru-stud bore of the crankcase. Loose body-fit thru-studs can allow movement between the crankcase halves causing fretting of the bearing web parting surfaces. Always use a thru-stud that will provide a .000 (line to line) to .0035 tight fit. If examination shows that the thru-stud bore must be reamed and an oversize thru-stud installed in the same location that will also incorporate a P/N 72075 oil seal, the reaming procedure must be accomplished prior to final assembly of the engine. The procedure for reaming a thru-stud bore on a disassembled engine is as follows:

1. Assemble the crankcase halves, without the crankshaft and main bearings, using all thru-studs, bolts and nuts that support the main bearing webs except the thru-stud at the location to be reworked. Only one thru-stud bore may be reworked at a time. All other attaching parts must be installed and properly torqued.

2. Install P/N ST-222 hold down plates on each cylinder mounting pad. The P/N ST-222 plates will simulate the thickness of the cylinder flange and protect the pad.

3. Torque all 1/2-20 thru-stud nuts to 42 ft. lbs. Torque all 3/8-24 bolts and nuts to 25 ft. lbs. This reduced torque is sufficient for crankcases assembled without the crankshaft and main bearings. Use standard torque on peripheral attaching hardware.

4. Ream the bore to the required oversize dimension as described in PART I, step 4. Clean and inspect the reamed bore as described in PART I, steps 5 and 6. Identify the oversized bore as described.

If it is determined at overhaul that an oversize thru-stud must be installed to maintain the .0000 (line to line) to .0035 inch tight fit and the crankcase is not, and will not be, modified to accept P/N 72075 oil seal, the reaming procedure can be delayed and completed when the engine is reassembled as specified in PART I.

PARTS DATA:

QTY*	PART NO.	DESCRIPTION	MODELS AFFECTED**
AR	76220-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	All 4, 6 and 8 cyl. wide cyl. flange engines
AR	74888-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIO-541 and TIGO-541
AR	75170-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIO-541 and TIGO-541
AR	75712-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIGO-541
AR	75713-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIGO-541
AR	75714-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIGO-541
AR	75782-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIGO-541
AR	75799-P1, -P2, -P5 or P10	Crankcase thru-stud with .001, .002, .005 or .010 inch oversize body diameter	TIGO-541
AR	72075	Seal, oil	All Models

*AR = As Required
** Models affected: Affected models listed in this service instruction only.

SPECIAL TOOLS:

QTY	PART NO.	DESCRIPTION	MODELS AFFECTED
AR	ST-222	Plate, Torque Hold-Down	All Models
1	ST-271	Thru-stud puller (to remove thru-studs in crankcase)	All Models
AR	ST-316	Driver, crankcase thru-stud	TIO-541 and TIGO-541
AR	ST-317	Driver, crankcase thru-stud	All 4, 6 and 8 cyl. wide cyl. flange engines
1	ST-366-5	Piloted reamer (to ream thru-stud hole in crankcase .005 inch over-size)	All Models
1	ST-366-1	Piloted reamer (to ream thru-stud hole in crankcase .010 inch over-size)	All Models
1	ST-463	Kit, counterbore, pilot and stop collar. Contains 1 each ST-463-1 counterbore; 1 each ST-463-2, ST-463-3, ST-463-4 pilots; 1 each ST-463-5 stop collar (to ream recess in crankcase for P/N 72075 oil seal)	All Models

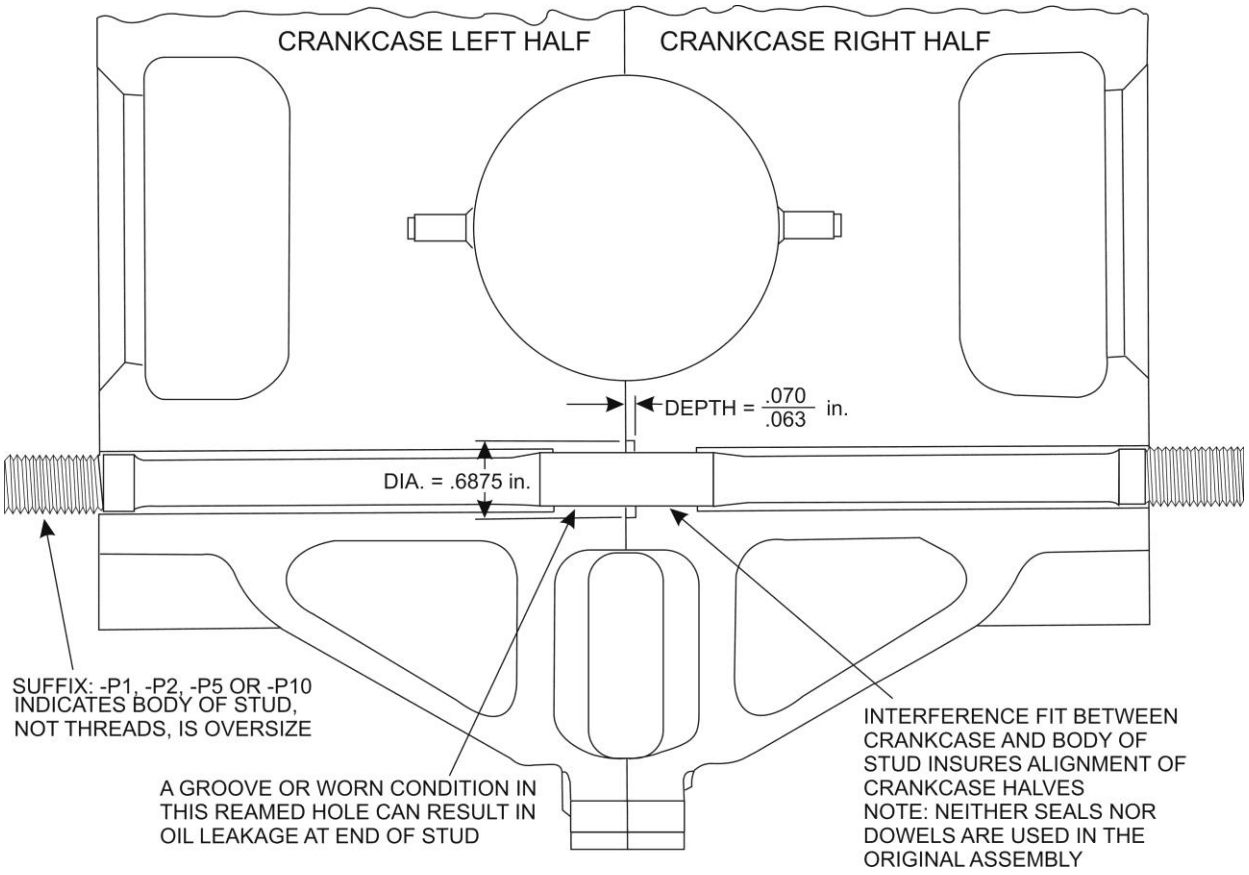

Figure 1. Section Through Crankcase at Thru-Stud Location Showing Dimensions of Recess for the P/N 72075 Oil Seal