

# MANDATORY

# SERVICE BULLETIN

DATE: January 30, 2003

Service Bulletin No. 475C  
(Supersedes Service Bulletin No. 475B)  
Engineering Aspects are  
FAA Approved

SUBJECT: Crankshaft Gear Modification and Assembly Procedures

MODELS AFFECTED: All Lycoming direct drive piston aircraft engines (including VO-360 and IVO-360; excepting O-320-H, O-360-E, LO-360-E, TO-360-E, LTO-360-E, and TIO-541 series engines).

TIME OF COMPLIANCE: During overhaul, after a propeller strike, or whenever crankshaft gear removal is required.

Damage to the crankshaft gear and the counterbored recess in the rear of the crankshaft, as well as badly worn or broken gear alignment dowels are the result of improper assembly techniques or the reuse of worn or damaged parts during reassembly. Since a failure of the gear or the gear attaching parts would result in complete engine stoppage, the proper inspection and reassembly of these parts is very important. The procedures described in the following steps are mandatory.

## CAUTION

PRIOR TO MAKING ANY REPAIRS TO THE CRANKSHAFT, INSURE THAT THE COUNTERBORED GEAR MOUNTING FACE OF THE CRANKSHAFT IS UNDAMAGED BY FRETTING OR GALLING. DAMAGE OF THIS NATURE IS UNREPAIRABLE.

1. Examine the threads in the gear retaining bolt hole of the crankshaft. Insure that the tapped hole is clean and the threads are undamaged. The threads can be cleaned by running a tap through them. Use a standard .3125-24NF3 (P.D. .2854/.2878) tap for 5/16 inch threads. Use a standard .500-20NF3 (P.D. .4675/.4701) tap for 1/2 inch threads. Check the depth of the thread by threading a gear retaining bolt to the bottom of the hole and comparing the exposed length of the bolt with the thickness of the gear and lockplate.

## CAUTION

USE EXTREME CARE WHEN CLEANING THREADS WITH TAP.

2. Check the condition of the dowel in the end of the crankshaft. It should be perfectly smooth with no indication of nicks or deformation. If it is out of round, it should be removed and replaced with a new one. Replacement instructions are in paragraph 4. If dowel condition is acceptable, insure that it is installed as shown in Figure 2 or 3.

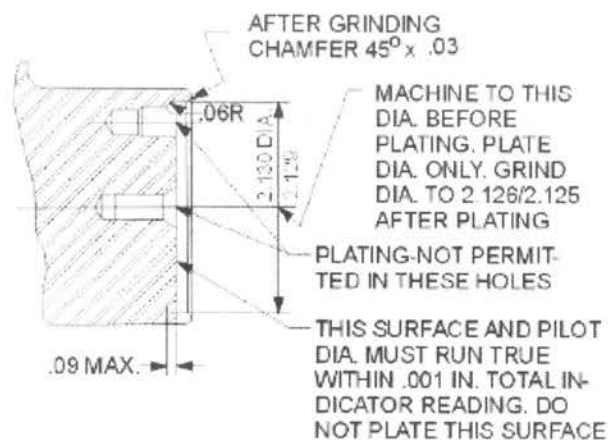


Figure 1. Details for Repairing Pilot Diameter of Crankshaft

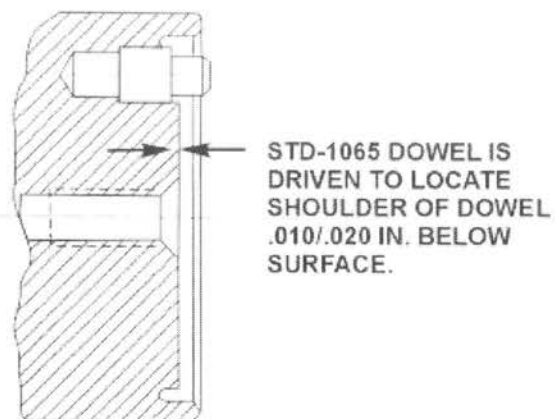


Figure 2. Section Thru End of Crankshaft Showing Driven Height of STD-1065 Dowel

#### CAUTION

IF THE DOWEL MUST BE REMOVED, IT IS VERY IMPORTANT TO DO SO WITHOUT DAMAGING THE HOLE IN THE CRANKSHAFT. A SATISFACTORY METHOD CONSISTS OF DRILLING A 1/8 IN. DIA. HOLE THROUGH THE CENTER OF THE DOWEL; THEN FILL THE HOLE WITH OIL AND INSERT A PIECE OF 1/8 IN. DIA. DRILL ROD IN THE HOLE. STRIKE THE END OF THE DRILL ROD A SHARP BLOW WITH A HAMMER. HYDRAULIC PRESSURE OF THE OIL WILL FORCE THE DOWEL FROM THE CRANKSHAFT.

3. Check the pilot diameter of the counterbore on the end of the crankshaft for size and evidence of damage. This diameter should not exceed 2.1262 inches when measured at any location. If found to be oversize, the crankshaft may be repaired as described in the following steps. Do not attempt to reuse a crankshaft with an oversize pilot diameter.
  - a. After removing the dowel, machine the pilot diameter in the end of the crankshaft to 2.129/2.130 inch as shown in the illustration. See Figure 1. Also, cut the .09 deep x .06R undercut as shown.
  - b. Chrome or nickel plate the surface of the pilot diameter with a firmly bonded deposit that is free of pin holes, blisters and any other imperfections that could impair the function of the parts.
  - c. After plating, stress relieve the shaft by baking at 390° to 410°F for 3 to 5 hours.
  - d. Grind the plated pilot diameter surface to 2.125/2.126 inch. Note that the diameter must run true with rear main journal within .001 inch total indicator reading.

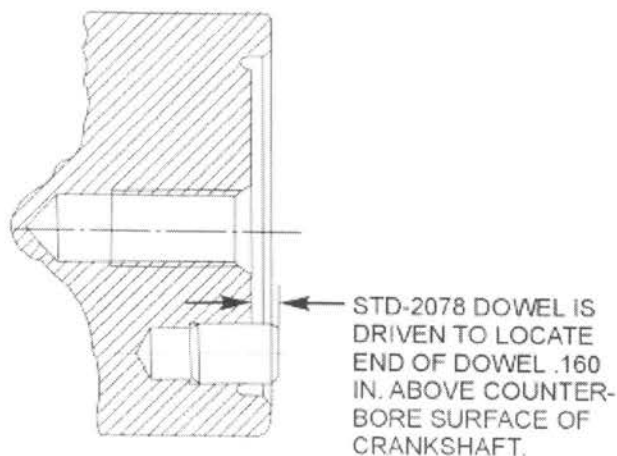


Figure 3. Section Thru End of Crankshaft Showing Driven Height of STD-2078 Dowel

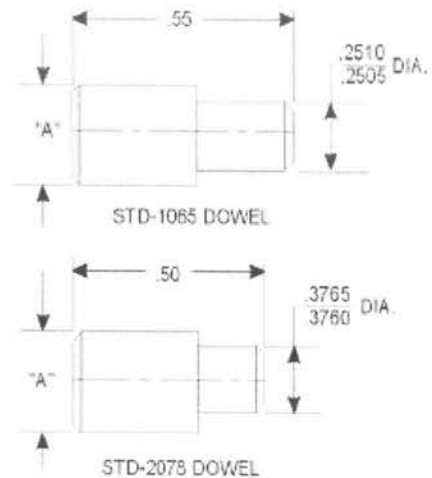


Figure 4. Details of Crankshaft Dowel

#### CAUTION

THE CRANKSHAFT COUNTERBORED GEAR MOUNTING FACE SHOULD BE CHECKED FOR DAMAGE. IF THE SURFACE REQUIRES REPAIR OTHER THAN SPECIFIED IN "CAUTION" ON PAGE 1, THE CRANKSHAFT SHOULD FIRST BE MEASURED AS SHOWN IN FIGURE 7. IF THE CRANKSHAFT MEASURES MORE THAN THE MINIMUM DIMENSION SHOWN IN FIGURE 7, THE SURFACE MAY BE REWORKED DOWN TO THE DIMENSIONS SHOWN. (DO NOT PLATE THIS SURFACE.) THE SURFACE MUST BE TRUE WITHIN .001 IN. TOTAL INDICATOR READING TO REAR MAIN BEARING AND THE SURFACE FINISH MUST BE HELD TO 45 TO 90 MICROINCHES.

- e. Chamfer edge of pilot diameter  $45^\circ \times .03$  as shown in Figure 1.
4. If the dowel has been removed, check the condition of the dowel hole in the crankshaft. If out of round or oversize, ream as required for installation of an oversize dowel. Available oversize dowels and the corresponding size for reamed holes are shown in Table 1.
5. Install a new dowel in the crankshaft as shown in Figures 2 and 3. Insure that the correct dowel is installed.

**TABLE 1 – DOWELS AND DOWEL HOLES**

| Dowel Part No. | Size Code on Dowel | Diameter of Dowel "A"<br>(Figure 4) | Diameter of Dowel Hole<br>in Crankshaft |
|----------------|--------------------|-------------------------------------|-----------------------------------------|
| STD-1065       | None               | .3095/.3100                         | .3085/.3095                             |
| STD-1065-P02   | P02                | .3115/.3120                         | .3105/.3115                             |
| STD-1065-P05   | P05                | .3145/.3150                         | .3135/.3145                             |
| STD-1065-P10   | P10                | .3195/.3200                         | .3185/.3195                             |
| STD-1065-P15   | P15                | .3245/.3250                         | .3235/.3245                             |
| STD-2078       | None               | .3760/.3765                         | .3750/.3760                             |
| STD-2078-P02   | P02                | .3780/.3785                         | .3770/.3780                             |
| STD-2078-P05   | P05                | .3810/.3815                         | .3800/.3810                             |
| STD-2078-P10   | P10                | .3860/.3865                         | .3850/.3860                             |
| STD-2078-P15   | P15                | .3910/.3915                         | .3900/.3910                             |

## CAUTION

CRANKSHAFT GEARS FOR APPLICABLE ENGINES ARE NOW MANUFACTURED WITH THREE 3/4 INCH RADIUS SCALLOPS CUT INTO THE O.D. OF THE PILOT FLANGE AND A COUNTERBORE ON THE BACK SIDE OF THE GEAR. THESE ENLARGED SCALLOPS HAVE BEEN ADDED TO ALLOW INSPECTION OF THE GEAR AND CRANKSHAFT ASSEMBLY. SERVICEABLE GEARS MUST BE MODIFIED AS SHOWN IN FIGURE 5. PRIOR TO BEING REASSEMBLED ON THE CRANKSHAFT, OR A NEW GEAR THAT HAS BEEN MANUFACTURED TO THIS CONFIGURATION MUST BE INSTALLED. BEFORE MODIFYING THE GEAR, MEASURE THE DIAMETER OF THE PILOT FLANGE. IF IT IS LESS THAN 2.1245 INCH, IT SHOULD NOT BE RESUED. THE ORIGINAL 2.1250/2.1255 DIMENSION OF THE CRANKSHAFT GEAR MUST BE RESTORED WITH A FLASH COPPER PLATE OF UP TO .0005 INCH MAX.

TABLE 2 – CRANKSHAFT GEAR AND ATTACHING PARTS

| New Crankshaft Gear Part No. | Superseded Crankshaft Gear Part No. | Lockplate Part No. | New Bolt Part No. | Superseded Bolt Part No. | Dowel Part No.              |
|------------------------------|-------------------------------------|--------------------|-------------------|--------------------------|-----------------------------|
| 13S19646                     | 61155                               | LW-18639           | STD-2246          | STD-2213                 | STD-1065<br>(5/16 in. dia.) |
| 13S19647                     | 67514                               | LW-18638           | STD-2247          | STD-2209                 |                             |
| 13S19648                     | 76786                               | LW-18638           | STD-2247          | STD-2209                 |                             |
| 13S19757                     | 72348                               | 72353              | STD-2245          | STD-2234                 |                             |
| 13S19649                     | LW-10284                            | LW-10332           | AN8-14A           | -----                    | STD-2078<br>(3/8 in. dia.)  |

## CAUTION

SOME OLD CRANKSHAFT GEARS ARE CARBORIZED ALL OVER. IF CARBORIZED, THEY WILL NOT NICK WHEN A FILE IS USED ON SCALLOP. IF CARBORIZED ALL OVER, GEAR SHOULD NOT BE REWORKED.

- Assemble the gear to the crankshaft **using both a new lockplate and bolt**. Refer to Figure 6. The correct bolt, lockplate and dowel for each gear are shown in Table 2. Tighten the bolt to 125 in.-lbs. torque, then with a hammer and brass drift, tap lightly around the pilot flange of the gear and listen for sharp solid sounds from the hammer blows that would indicate that the gear is seated against the crankshaft. As a check on the seating against the crankshaft, attempt to insert a pointed .001 inch thick feeler gage or shim stock between the gear and crankshaft at each of the three scallops. The .001 feeler gage, or any smaller feeler gage, must **NOT** fit between the two surfaces at any location. (.001 feeler gage is used as an indicator, however, there must be no clearance between crankshaft and gear.) Retighten the gear attaching bolt to the proper torque. Tighten the 5/16 inch bolt to 204 in.-lbs. torque or the 1/2 inch bolt to 660 in.-lbs. torque. Measure the clearance between the O.D. of the gear flange and the pilot I.D. of the crankshaft. There should not be more than .0005 inch clearance at any point.
- Bend the lockplate against the bolt head.
- A logbook entry, specifying the final bolt torque, verifying that the lockplate was properly bent in place against the bolt head and that the inspections and rework required by Lycoming Service Bulletin No. 475C were accomplished, should be made and signed by an authorized inspection representative.

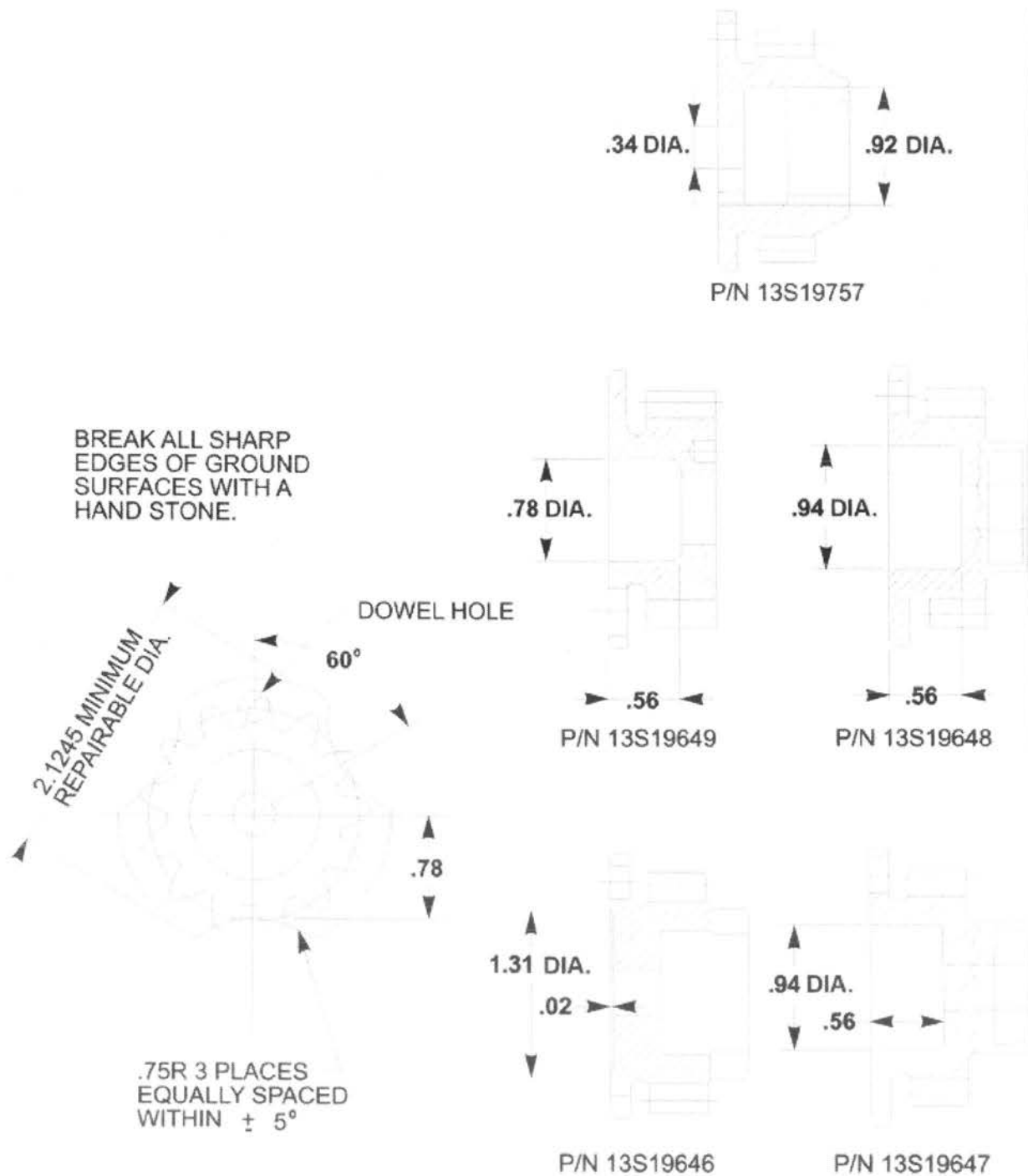


Figure 5. Details for Rework of Crankshaft Gears to Current Configuration

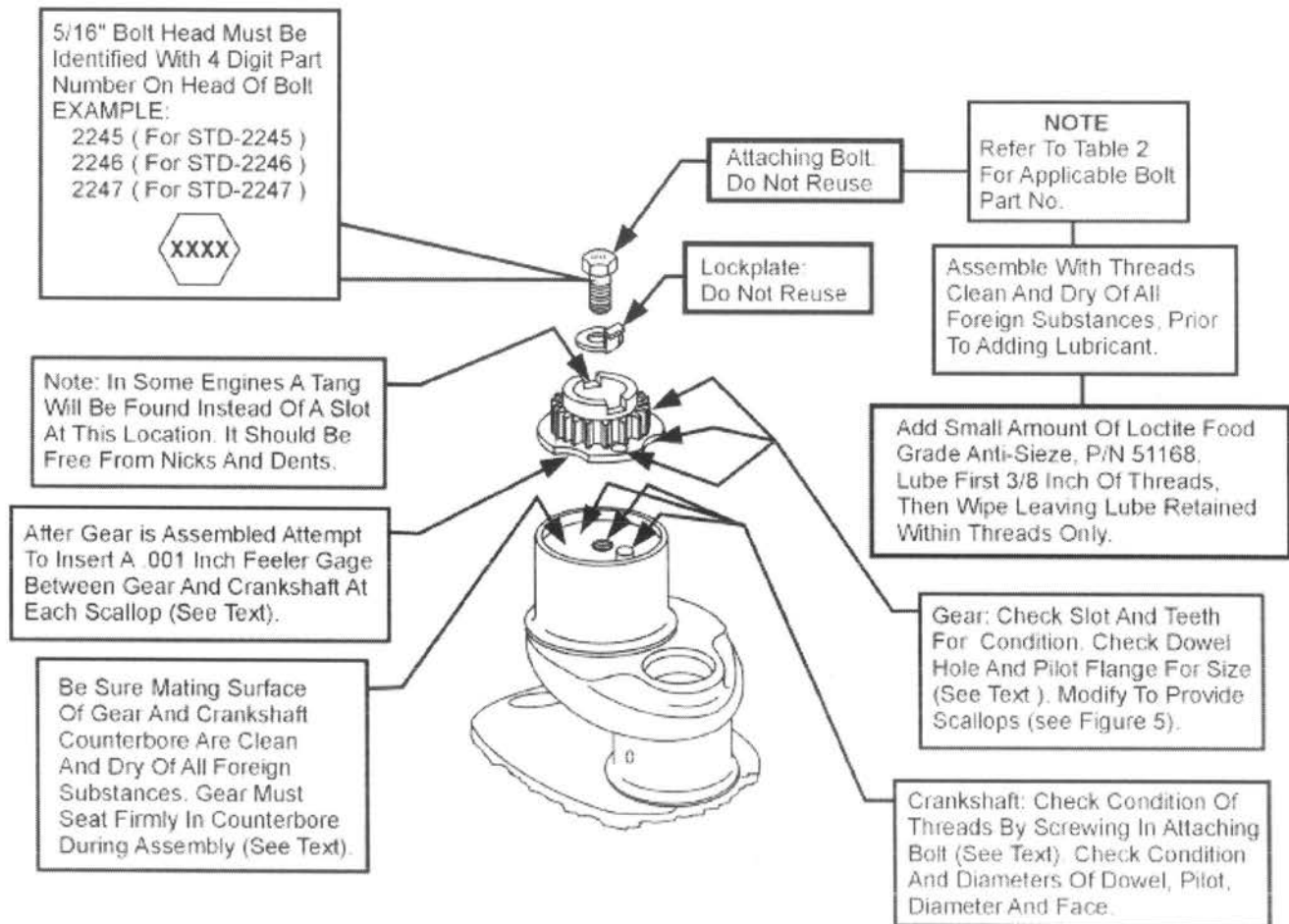
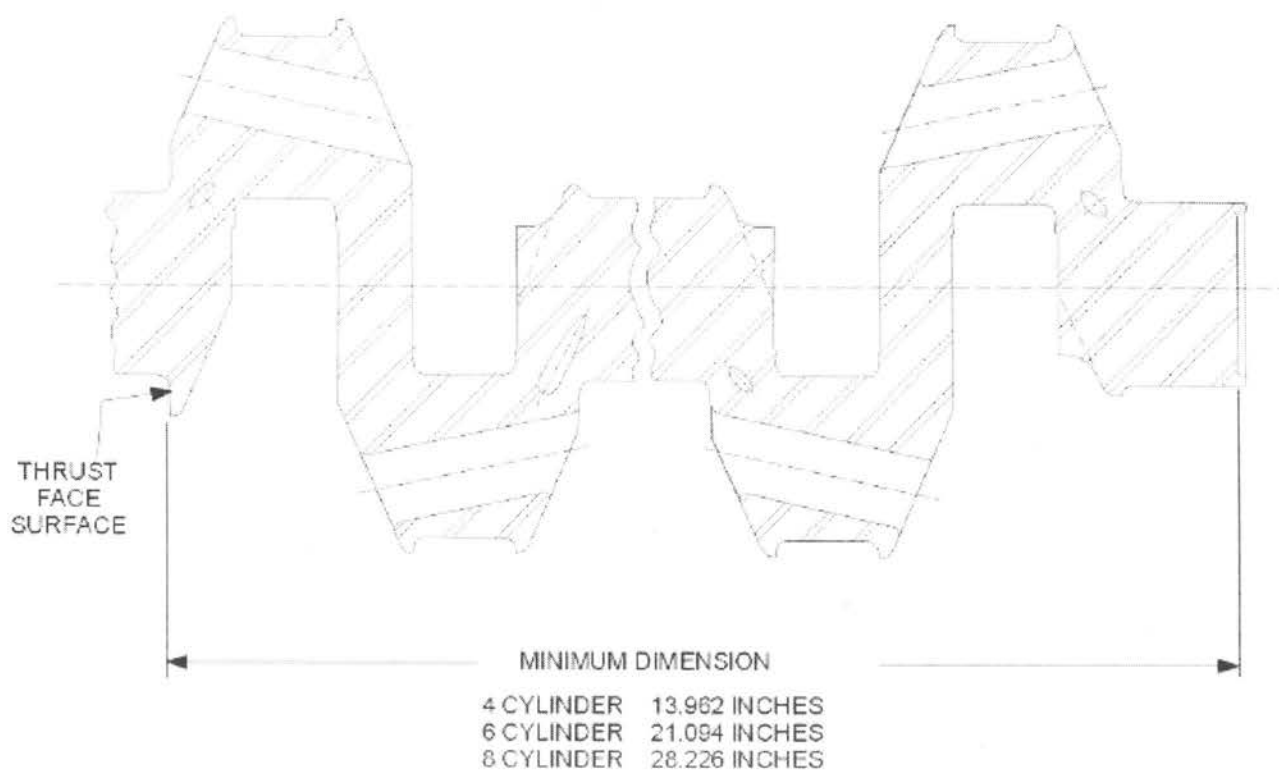


Figure 6. Rear End View of Crankshaft Showing Associated Parts

### CAUTION

NO FIELD REPAIR OF CRANKSHAFT GEAR ATTACHING THREADS IS PERMITTED. CRANKSHAFTS REQUIRING THIS TYPE OF REPAIR **MUST BE** RETURNED TO THE FACTORY THROUGH AN AUTHORIZED LYCOMING DISTRIBUTOR.



CAUTION

INSURE MINIMUM DIMENSION IS MEASURED BETWEEN THRUST FACE SURFACE AND PILOT.

Figure 7. Minimum Dimension of Crankshaft

NOTE: Revision "C" revises Table 2 and Figure 5.

