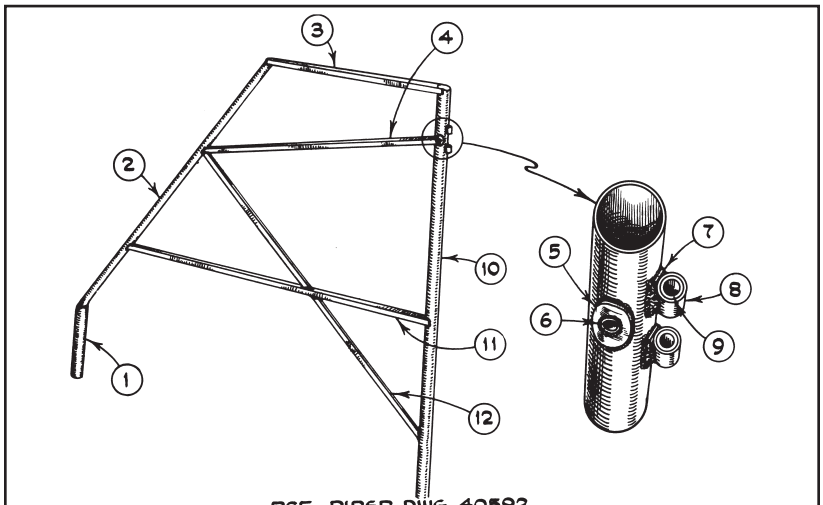
rear post. Also adjust the front post vertically into its mating bracket just aft of the trim jackscrew location, to allow a nice parallel clearance of about 1/2" across the top of the vertical fin rib and the rudder counterbalance rib. I would definitely check the rudder before doing this to make sure that the counterbalance lower rib forms a 90 degree angle with the rudder main spar tube. Once the vertical fin is jigged into position, drill the front attachment hole ONE SIDE AT A TIME, then install the bolt. Now, drill the front portion of the rear attachment hole, temporarily install the very tip of a bolt to keep the fin from dropping down, then remove the rudder frame, and finally drill the rear portion of the attachment hole installing the AN3-11A bolt from the back to front. This is done so the nut and the exposed threaded end of the bolt is hidden inside the fabric and won't foul the rudder movement. Some of the very old models had the rear bolt mounted installed sideways, and made it very difficult to install the rear stabilizer cover plates or "kidney" plates due to the lump on both sides of the fabric. I would go ahead and drill a new hole about 1/2" above the old one in this case and install the bolt from back to front. Remember to use the rudder, again, as a locating fixture. All these tubes were mild steel and were relatively thin wall materials, so be careful and use good sense when tightening the two mounting bolts so as not to crush the tubes at these areas. If any electrical lighting is to be used on top the rudder, you might want to preplan your wire routing and drill any required holes in the vertical fin, touch up any paint damage and install rubber grommets in the fin ribs.

One important item to note is rigging of the fin. If you stand behind the fuselage frame, the top of the fin should be twisted to the left, so an imaginary centerline through the top fin rib should point at a location 1-1/2" to the left of the centerline of the fuselage at the top of the windshield. This is due to "P" factor of the propeller. Just forcefully twist the top of the fin frame. It's not hard, but be careful. It's best to do this before the fabric is installed, but it can be done with somewhat more difficulty afterward. Also make sure the rear post is straight vertically. Only the upper rib of the fin should be twisted. Good luck.



REF. PIPER DWG. 40592

PARTS LIST
FIN ASSEMBLY

Figure 45

REFERENCE: PIPER DRAWING 40592.

REFERENCE NO.	PIPER PART NO.	NAME	SIZE	MATERIAL	NO. PER ASSEMBLY
1	40592-3	FRONT ATTACHMENT TUBE.	5/8"-.035"	1025 STL.	1
2	40592-4	LEADING EDGE TUBE.	1/2"-.028"	1025 STL.	1
3	40562-10	RIB	1/2"x3/4"x.032"	1025 STL.	1
4	41391	UPPER BRACE	3/8"x3/8"x.020"	1010 C.R.STL.	1
5	80122-24	WASHER	5/8"x1/4"x.032"	1025 STL.	2
6	80012-8	BUSHING	1/4"x3/16"-13/16"	1025 STL.	1
7	80042-15	SHIM	3/8"x5/16"x1/16"	1025 STL.	2
8	80022-22	BUSHING	1/2"x3/8"x3/8"	1025 STL.	2
9	80022-45	BUSHING	3/8"x1/4"x3/8"	1025 STL.	2
10	40592-2	FIN POST	3/4"-.035"	4130 STL.	1
11	40562-11	RIB	3/8"x3/4"x.020"	H.R. STL.	1
12	41401	LOWER BRACE	3/8"x3/8"x.020"	1010 C.R. STL.	1

CONSTRUCTION & MAINTENANCE

Propeller Strikes And Dialing A Crankshaft

Recently the FAA, Teledyne Continental and Textron Lycoming issued revised Service Bulletins addressing propeller strikes and hydraulic locks.

A propeller strike is now defined as: (1) any incident, whether or not the engine is operating, that requires repair to the propeller other than minor dressing of the blades set forth by the manufacturer or, (2) any incident while the engine is operating in which the propeller makes contact with any object that results in a loss of engine RPM. Propeller strikes against the ground or any object, can cause engine and component damage even though the propeller may continue to rotate. This damage can result in catastrophic engine failure.

If a propeller strike has occurred, a complete engine disassembly and inspection is mandatory and must be accomplished prior to further operation.

Dialing The Crankshaft

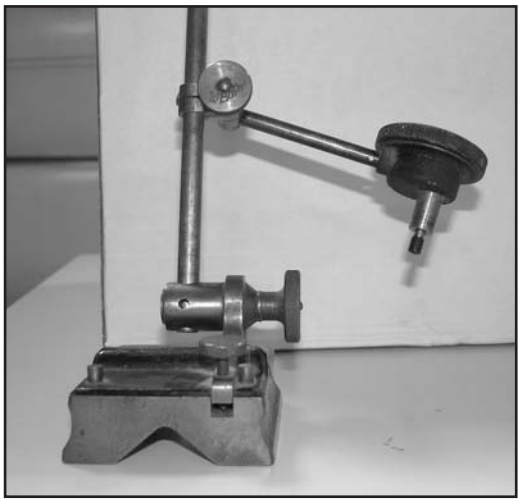
There are three times when it is especially wise to dial the crankshaft of your airplane engine:
1.) Should you experience a propeller strike and desire to make an initial determination of strike caused engine damage.
2.) If you are in the process of purchasing an used engine and

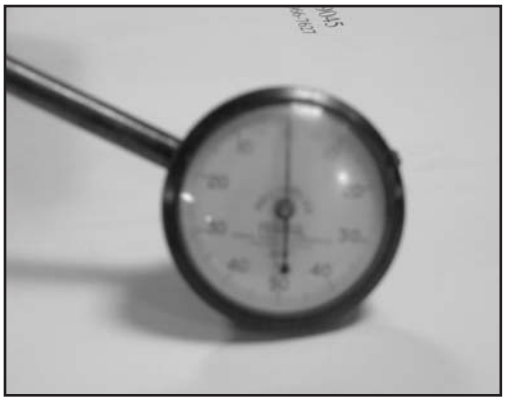
want to make an initial check of the engine to help determine if it might have been involved in a prop strike in its previous life. 3.) When overhauling your aircraft engine.

For the purpose of this article, we'll focus on items #1 & #2 above. Also, I've used a runout Lycoming O-235 engine for photo and demonstration purposes.

Dialing a crankshaft is not as difficult or foreboding as it may seem. However, you will need access to a good dial indicator and surface plate to accomplish the task.

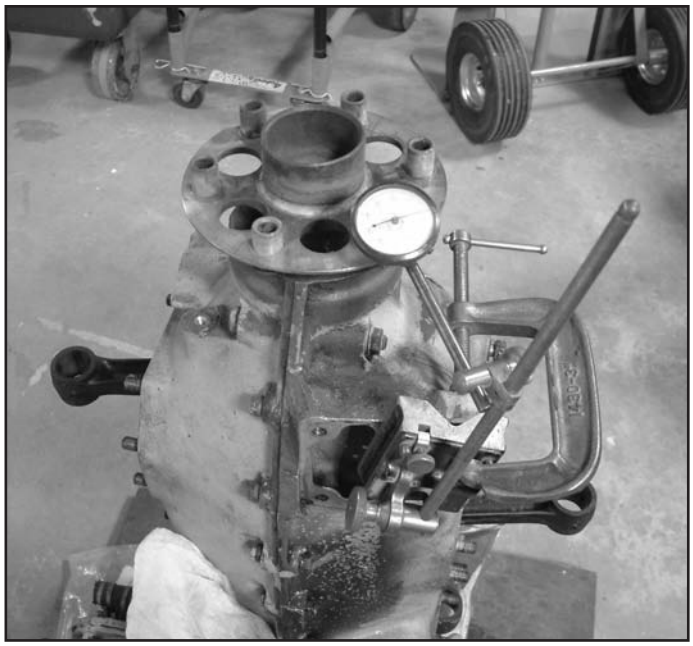
There are three components making up the dial indicator. The base, at left, which attaches to some stable part of the engine.



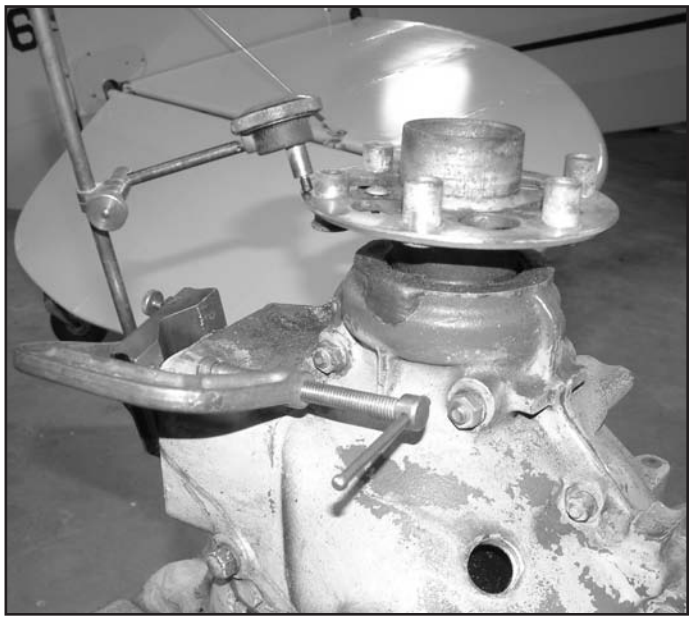


The dial from which accurate readings are made.

The sensitive probe which attaches to the dial.



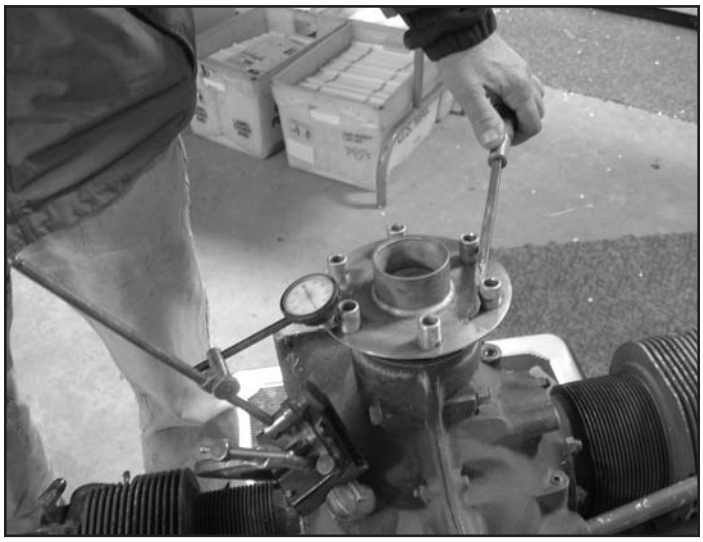
The first step is to attach the surface plate to a stable surface on the engine. For this example we used a "C" clamp and attached the surface plate to the starter mounting boss, which is cast in the engine case half.



After firmly attaching the surface plate to the engine, position the indicator arm so that the sensitive probe comes in contact with the outer edge of the prop flange. It must be positioned so that the six flange bushings do not interfere with the probe while rotating the crankshaft.

NOTE: Prior to positioning the probe on the flange, the flange should be checked and cleaned of all dirt, debris or surface rust. Use something like lacquer thinner and 3M Scotchbrite pads to accomplish this task.

After adjusting the sensitive probe, "Zero" out the dial. Note how the flange surface has been cleaned of all dirt and foreign matter.



With the dial "zeroed" and the probe in position, slowly rotate the crankshaft using a larger screwdriver. As you rotate the crankshaft make careful note of the dial readings, noting the maximum 'plus' and 'negative' readings.

In the case of this particular engine, the maximum 'plus' reading was + .018"

The greatest 'negative' reading was - .004".

This particular engine has a seriously bent crankshaft flange. The total reading is .022" (.018 + .004). The Lycoming O-235 Engine Manual states: measure the run-out from the front face of the flange, near the outer edge. If the total flange run-out does not exceed .018", straightening operations are permissible. In the case of the example engine, the run-out exceeds Lycoming's maximum limits making the crank unusable in an aircraft.

CAUTION: Any attempt to straighten a bent crankshaft will result in rupture of the nitrided surfaces of the bearing journals – a condition that will eventually cause failure of the crankshaft. Crankshafts that have been straightened or have been reground must be renitrided.

NOTE: Remove the six flange bushings before attempting any straightening operations.

When the surface distortion of the flange has been reduced as much as possible, the front face of the flange should then be trued by grinding. This operation is permissible, however, only if the minimum width of the flange after grinding is not less than 0.190" for the O-235-C engines.

Continental Does Not Publish Run-out Limitations

In searching through all of the low horsepower Continental Engine Manuals, no reference was made to any type of maximum run-out limitations. A call was then placed to the Technical Service group supporting Continental. The reply was direct with the technical rep stating, "We don't publish run-out limitations because our crankshafts are very hard. They will break before they bend when a prop strike occurs."

***Editor's Note**: This may be so most of the time but I have a bent crankshaft that came out of a C-90 that had been installed on an early PA-18-95. Some time ago we sent it to an approved engine shop for inspection. They returned it a week later with a "Red Tag". The attached note read: crankshaft is too hard to straighten and can no longer be used in an aircraft engine.*