

A novice's approach to engine repair

I thought some you may find this story somewhat interesting if you have never tried tearing down your favorite engine. It really isn't that bad and is certainly a learning experience.



It started with the old Saito 65 I installed in my new Ford Flivver blowing oil out through the front bearing. I gave Chunky a call and he told me the crankcase breather nipple was plugged, or the front bearing was bad. As I guessed the bearing was bad. So late one night I jumped on Horizon Hobby's web site and ordered up a bunch of parts and a new engine since I was sure I'd screw this one up. After cleaning off the bench here is how it went.

Armed with a Saito repair book from RCM the tear down started. The first hurdle is to get the drive flange off the front of the engine. The flange is the piece that the prop bolts against. On many OS engines the crank shaft is keyed and the flange pulls right off. With Saitos, they use a split collet under the flange which requires a gear puller to remove. Advance Auto sells a cheap puller for about \$4.00 that works great.

How to figure out top dead center. I went ahead and unbolted and removed the carburetor and the crankcase back cover. After removing the valve covers the rocker arms were visible as well as the crank shaft. There are two top dead centers. Firing and non-firing. To find the firing

TDC you rotate the crank until the piston is at the top of the cylinder head. Rock the crank back and forth. If the rockers move, that is the non-firing TDC. If they don't, it is the firing TDC. In firing TDC you can remove the rocker arm pins, rocker arms and the rocker push rods from their tubes.

Now, off with the head. The book warns about screw removal and tightening. Remember we are dealing with aluminum parts and steel screws. The screws always win. Always tighten and loosen screws in the crisscross pattern. With the four screws removed from the cylinder head, it pulls straight off exposing the piston. The piston connecting rod can then be removed from the crank. Note the position of the connecting rod. There is a front and back. Remove the push rod tubes if they haven't fallen onto the table already.

Off to the cam gear housing. Remove the four screws and it pulls straight up. You may have to tap it a time or two if it is stuck on the gasket. Loosen the set screw on the front of the housing and push the gear pin out. Watch for two small teflon or steel washers. There is one on each end of the gear. You can now push out the two valve lifter pins. Actually, if you can talk the lifter pins out you don't have to remove the gear.

Now take a wood or rubber mallet and tap the end of the crank shaft. The easiest and probably the safest way is to hold the crank case in one hand and the mallet in the other. The hand makes a great shock absorber. The crank case is cast aluminum so don't get crazy with the mallet. With a couple of taps, the crank shaft should slide out of the back of the case.

Whew! Now for what we came for. The bearings. Cut a piece of dowel rod about 6" long that is small enough to fit through the rear bearing. Gently tap the dowel rod. *Note: on some older Saitos the pinion gear and spacer stay captive between the two bearing so you may need a varied selection of dowel rods for the right fit.* If the front bearing doesn't look like it is moving, STOP!. Take the crank case to the kitchen and put it in the oven. Turn the oven to 350 degrees. After it reaches temperature wait 5 minutes and pull it out. While it is heating be looking for your gloves. You can also boil the crank case, but it is a little messier than the oven route. Now try driving the bearing

out again. It should pop right out. Now take the dowel through the front of the engine and drive the rear bearing out. If the bearings are really stuck you may have to heat it longer.

If you compare the old bearings with the new bearings, you will notice the new bearings have shields on them. For the rear bearing, remove at least one shield. For maximum lubrication remove both shields. To remove the shields, take a sharp awl or dental pick and pierce the shield at the edge and lift it out. If you get a new Saito front bearing, most likely it is a sealed bearing. *See photo.* If they are metal then remove a shield from one side only. Put the bearings in a baggy and toss them in the freezer. Now take a break for an hour while the bearings freeze.

With the frozen bearings, set the crank case on the bench with the front point up. Position the front bearing and press it into the case. If you removed a shield from the bearing, the exposed bearing point to the inside of the engine. You may need to gently tap the bearing with the mallet. This is the most critical step in the process. If you force the bearing, you will crack the case and get to buy more parts. If the bearing doesn't act it is going to go, put the bearing back in the freezer and heat the case in the oven and try again.

With the front bearing in place, slide the rear bearing on the crank shaft into place. Now put the crank shaft back in the engine. The front bearing acts like an alignment tool. Take a dowel rod and put it in hole in the back of the crank shaft and tap the rear bearing into place. In most cases the bearing will not be completely flush with the front of the housing.

Reassemble the cam housing if you took it apart and leave the lifters out. You will notice the cam gear has a hole in it. That is the timing mark. With the front of the cam housing facing you, put a drill bit that will just fit down the right tube. Apply slight pressure to the bit and turn the cam gear. The bit should lock it into place with timing mark at the bottom. Put the cam housing gasket on the crank case and turn the shaft until the arm is at the top as if the piston was at TDC. Now put the cam gear assembly back in place while holding the gear in place with the bit. It should engage the pinion gear on the shaft and the shaft should remain at TDC. Install the screws and put the valve lifters back in the cam assembly.

Connect the piston to the crank shaft in the same direction it came off. Slide the head onto the piston. You will probably have use your finger tips to compress the piston ring. With

your third hand be holding the pushrod tubes in place as you slide the head onto the case. Install the cylinder head screws. Drop the pushrods down the tubes, the tapered end pointing up to the rocker arms. Install the rocker arms.

Put the engine back to the firing TDC position. Now check the valve adjustment. Using a .004mm feeler gauge insert it in between the rocker arm and the top of the valve. Adjust the tappet screw on the rocker arm until it is a snug but not tight fit. Do this to both arms and tighten the lock nuts on the tappets. Recheck the adjustment. Now rotate the crank 180 degrees and rock it back and forth. One arm should come up as the other goes down in equal distances. This ensures the timing it right. Install the valve covers, crank case back plate and carburetor.

Finally finished! The whole process sounds like it would take an afternoon, but it only takes about an hour of bench time. On this particular engine I replaced the piston ring, valves, and devarnished all the parts, but those procedures are whole articles in themselves. After putting the engine back in the plane, it fired up without a hitch.

***“Flying is done largely with
the imagination.”***

Wolfgang Langewiesche