

## Altitude Bearing Mods on the 30 by Jim Fitch

I didn't have the 30 long before noticing that something was not right about the altitude pointing. The mirror box would climb up one side of the rocker box and then suddenly "fall" sideways to the other side of the rocker box with a thump. I could see where someone had sanded the rocker box arc between the Teflon pads, to gain clearance under the bearing. There still was not enough clearance to install the Servocat drive wire. The true nature of the problem turned out to be the bearings themselves. The bearing surfaces were not a single radius of curvature. They were warped. I priced new bearings - expensive and no guarantee of a single radius of curvature.

My solution was to true the radius on a jig in the shop. I secured the bearing in a jig. The jig could rotate around an axis that was set at the center of the top of the bearing. I made an adjustable jig for a belt-sander and mounted it so I could rotate the bearing against it.



The photo on the left shows the jig that held the bearing. You can see the pivot bolt recessed in the jig. This pivot determines the center of the radius of curvature of the bearing. I took some time to position the bearing in the jig as precisely as possible.

The bottom of the jig has Teflon feet. The Teflon feet slide on a piece of glass-board, just like a rocker box and ground board work in a Dob. The belt sander can be seen in the right photo. It also has a pivot bolt. A "C" clamp is used to secure it at each new location as its pivoted against the bearing.

I would set the belt-sander to touch a high spot on the bearing, lock the sander on at high speed, manually rotate the bearing past the sander several times. Then adjust the sander a little tighter against the bearing, lock it down and rotate the bearing across the sander again. This process was continued until I had a uniform radius of curvature.

Both bearings were warped. Fortunately the warp in the second bearing was removed at the same time its radius of curvature matched the first bearing's radius. I now had a matched set. One concern I had was all the dust this was going to create. I opened all the shop doors, but I still didn't want to breathe all that dust. I set up a shop vac with the nose near the contact point between the belt-sander and the bearing. I also wore a respirator, hearing protection, safety glasses, and a couple of long sleeved shirts and gloves. The photos below show the dust control and safety equipment.



I knew that truing the bearing surface would involve sanding through the “relief angle” that is part of the sand casting processes. You can see this angle in the photo below on the left. The bottom of the bearing makes contact with the belt-sander while there is a gap between the two at the top. Removing this relief angle meant the whole surface had to be trued. There was no way to just remove the high spots.

The photo on the right shows how the sanding proceeded from the bottom to the top. You can also see that the bearing is not making contact evenly, as some places are sanded through to the aluminum while other areas are just beginning to make contact with the belt. In fact, the relief angle is already gone on one area to the right while the glass-board laminate has barely been touched on the area to the left.



The photo on the right below shows the warp in the bearing. There are two areas of strong contact with an area of minimal contact between. In fact the two areas of contact are high spots with low spots on either side of each of them. The motors on the jig are being used as counter weights to make sure the jig does not tip or tilt. The bearing is rotated away from the belt-sander for the photo. In action it rotates against the blue belt.

The photo on the right shows what the bearings looked like after way too many hours on the jig. All shiny with a flat bearing surface and a matched, single radius of curvature.



New glass-board could be applied once the bearings were trued. I epoxied over sized strips on the bearing surface. The strips were then held in place with ratcheting straps as shown in the left photo below. This held the glass-board very tightly against the bearing. After a couple of days curing time I used a trim router to cut away the extra glass-board. It was a messy job, as seen in the photo below right.



I decided to paint the modified bearings as an indicator that they are no longer “stock”. I would have painted the top of them any way as part of the baffling system. I like the way they look on the mirror box!



I've used the scope since making these mods. The bearings work great. I do not see any way, nor do I see a need to improve on them. My attempt to install a ServoCat system before the mod was a failure. After the mods things are working great with good to excellent pointing and tracking.