

TOP80 Reduction gearbox overhaul by [M.Kubisch](#) - 18th Feb 2008

Introduction

This is not something you will have to do very often, probably only after 250hrs or more. Just as well as it's a gooey dirty job involving extremes of temperature and clouting things with a big hammer. Appendages ARE at risk! Having said that, it's a straightforward operation and inexpensive to boot. (At least for the grease version described here, where the 4 bearing replacement set comes to R120 inclusive. The oil version bearings cost much more for some odd reason). This sequence is for the grease filled version and may be similar for the oil version as well as for other similar reduction boxes e.g. The ROS125, where this can be used as a rough guide.

Symptoms of potential problems

Excessive leakage at the seals – This is one of the reasons I did this overhaul, although more of a nuisance factor than anything dangerous, you don't want leaked grease to accumulate in the clutch housing and get on the clutch!

Excessive play at prop tips – This was the main reason why I did the overhaul, which turned out to not have been necessary after all! I will explain later. If you have play at the prop tips, *first check the prop hub to shaft fit*. There should be no play here whatsoever! When fitting the prop hub, the mating splines should be spotless and at least one non-deforming large flat thick stainless washer (I use three) used to distribute the load from the fixing screw. I even smeared the splines liberally with red locking compound the first time round, although I would suggest NOT doing this as I nearly destroyed the aluminum prop hub with a gear puller and heat, trying to get it off again!! It also took a further hour just to clean the gunk off the splines and get them spotless again. You don't want to run the motor with a loose prop hub, the steel shaft splines will chew up the aluminum hub in no time. What can cause this is if the washers are too few/thin, they become dished under the force of the bolt, the bolt loosens, and the hub starts rocking and loosening on the shaft. This is BAD and will cost a new hub if allowed to continue!

Having gotten this important check out of the way, if you feel that the prop tip play is excessive, feel free to follow this guide. What is excessive? I had about 5mm in the 6/12 o'clock prop position and 2mm in the 3/9 o'clock position. I attributed this to more force in the 6/12 o'clock position due to the motor pitching while running for takeoff. I haven't got my head round the fact that this pitching should be manifesting itself as wear in the 3/9 o'clock position due to gyroscopic precession, so ignoring the facts, lets continue on blindly. I thought this play was excessive but guess what? After the overhaul, I ended up with 5mm ALL round!! I was quite disappointed in this and blamed the back prop-shaft bearing which did seem a bit looser than the others when I put it in. Turns out to be not such a big deal after all. Diego, the Top80 manufacturer says that some play is normal and 2-3mm play at the prop tip equates to so much less at the bearing itself due to the multiplier effect of the prop length. Well, I have flown about

5 hrs with this play on the new bearings and the box is running smooth as ever, so I guess the play a non-issue *in this case*.

Strange noises – Any clicking or grinding is a *bad thing* obviously! Check and eliminate the clutch first (you are going to expose the clutch while removing the gearbox anyway). With the gearbox off the motor, check for grease oozing out between the clutch bell and the housing, try to turn and rock the clutch bell to check for play or roughness. Do the same for the output (prop) shaft. Any of the above is a good reason to get down and dirty with the ‘box.

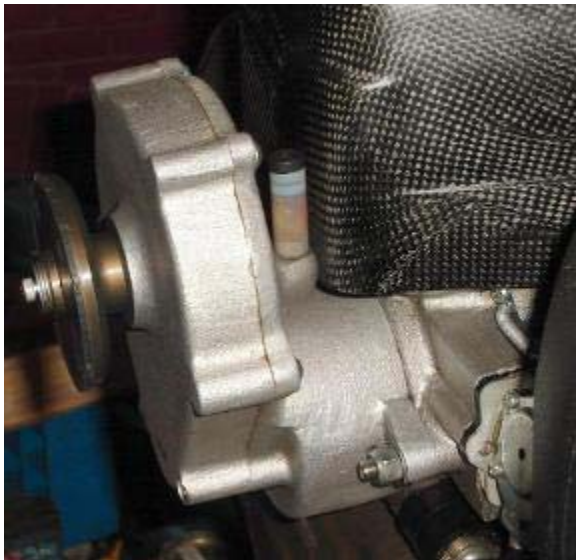
Parts required

- 1) Bearings (all RS – rubber sealed both sides):
 - 1 X 6003
 - 1 X 6202
 - 2 X 6002
- 2) Gasket sealant.
- 3) LM Grease.
- 4) Assorted tools, pullers, drifts, hammers etc.
- 5) Long bolts to fit casing for separation only.
- 6) Mini blow torch/oven and freezer.
- 7) Cleaning rags (plenty).
- 8) Thread-locking compound.

Sequence

Here is a pictorial guide of what to do:

- 1) This is what the reduction box looks like prior to removal. Note the 3 thick washers under the prop hub hold down bolt. Remove the bolt and washers. Remove the nuts on either side of the clutch housing and take the whole re-drive unit off.



- 2) Use a puller to remove the prop flange.



- 3) Here you can see the undamaged mating surfaces between hub and shaft. The red flakes around the shaft are thread-lock shavings, which had to be meticulously cleaned off. I don't recommend applying thread-lock in this way unless you have a badly fitting hub due to previous wear. Note my initials on the box, just in case I forget whose it is!! I think having to mark my schoolbooks and lunchboxes may have affected me for life!!



- 4) Here we are fitting the four long bolts, which will allow us to separate the two halves of the case. Note the excessive grease oozing past the clutch bell, one of the reasons why I decided to change out the bearings. The double set of clutch bell side bearings contained rubber seals on one of the bearings only (the outermost one). I'm leaving all seals in place to stop this leakage on the new clutch shaft bearings. There should not be a problem doing this, as the bearings are supposedly pre-lubed for life. Any leakage out of the clutch bell side should be matched by leakage in from the gearbox side, resisted by four seals rather than just two. Time will tell if this is an improvement. Oh look! I see that video cameras are much cheaper than in days gone by, time to upgrade my old SVHS!!



- 5) The four bolts in place, screwed in as far as possible for maximum thread contact. Don't force them in too far and strip the threads though. Supporting the box by the clutch (i.e. Suspending the lower part of the box in the air) tap down successively on each of the four bolts gently to break the seal and separate the case. This should pop apart fairly easily once the seal is broken.



- 6) Here, the bolts have been tapped through to their maximum extent and can be removed. The old grease can be seen, still fairly clean, to be expected on a low hours box. Looks like a blue silicone based sealant was used previously see the stringy bit still clinging on between each half of the case. It did the job; I had no leaks along the join.



- 7) Using two large screwdrivers as levers, the main gear can be levered out. Be careful not to damage the mating surfaces with the screwdrivers. It should pop out fairly easily. If not, make sure that the force is applied evenly to each side and use pieces of wood to lever against to protect the case.



- 8) The fun part, cleaning out all the old grease! Remove the circlip from the small pinion so long.



- 9) Scribe a line along the top of the clutch bell against the casing. This will indicate how far the bell/shaft needs to be driven in on reassembly. Note the small groove in the lower casing flange to let the excess grease ooze out. It will be an easy inspection point to monitor the new bearing's grease retention in future too.



- 10) Here are two parts I had to modify (using a small angle grinder) to allow removal of the small pinion. The top part is the end of a valve removal tool; the lower is a coach bolt with its head removed.



11) Here is the custom tool in action. Make sure to remove the circlip first! Before doing it this way, I had tried to lever the pinion off but without success. Your mileage may vary so perhaps try levering it off first, just don't damage the soft aluminum mating surfaces. Now drive the shaft out through the two supporting bearings being careful to support the edges of the clutch housing but allow room for the bell to exit the housing. This was quite tight and took many blows with the large hammer. I really thought I was going to break something, but that casing is tougher than it looks.

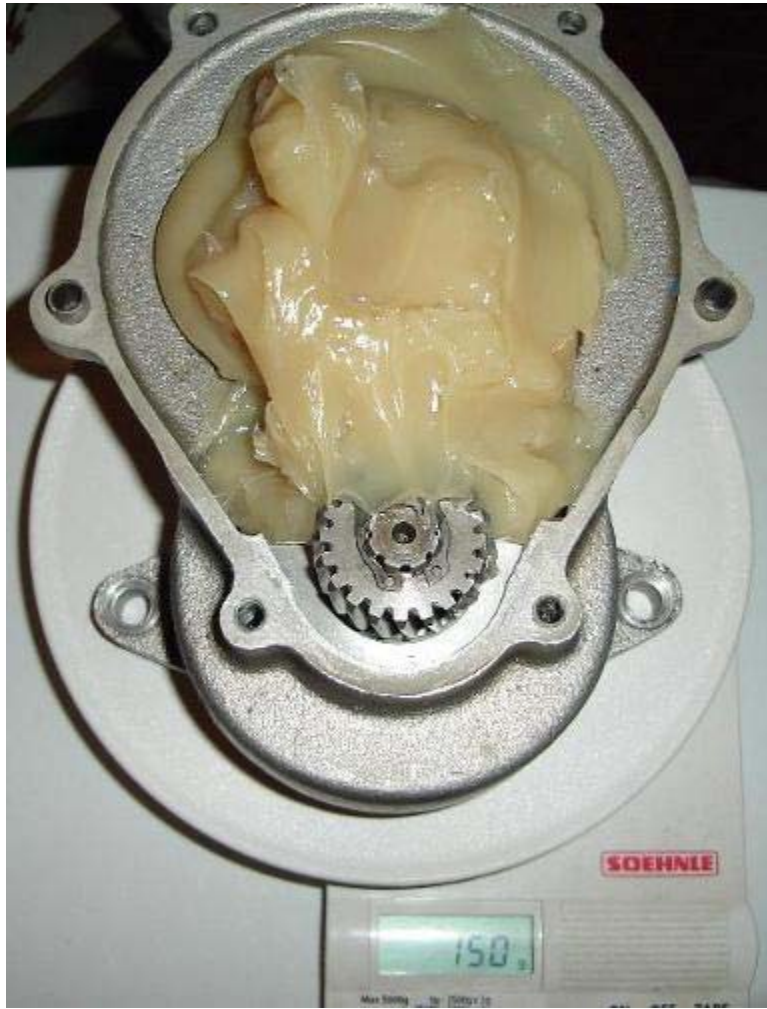


12) Just look at that cool frosty finish on the main gear, makes me want to reach into the fridge for a cool one.... The gear spent an hour or so in the freezer to cool it down. I then warmed the bearing with a mini blowtorch to maximize the temperature differential (and therefore clearance) prior to pulling the bearing off. It was quite tight. I don't think you would be able to lever this one off without the correct tool. Drive a new bearing on

the still chilled shaft using a drift contacting the centre of the bearing only. I seem to remember using a spark plug socket.



- 13) Ok we have jumped ahead a bit here, the old bearings have been removed by heating the case in the oven to 150 degrees C, and then using oven mitts, bang out both the clutch bearings and the single prop shaft bearing onto the kitchen table (protective covering advised). New bearings from the freezer can be popped in at the same time but be sure to keep them cool to avoid damaging the seals. The seals should be removed from the rear prop shaft bearing first. (This is the only one you need to remove seals from). Drive the (chilled) clutch bell/shaft back into place (up to the mark previously scribed in the bell housing) once the bearings have reached room temperature again. Refit the small pinion and circlip. Now measure out 150g of standard lithium based grease (e.g. Castrol LM). I used a scale (see below) zeroed (press Tare button) with the weight of the box on it, then add grease to the 150g mark.



14) Probably unnecessary, but I distributed the grease between the two halves. Don't get it in the bearing seat (right side cover) or it could promote bearing spin in the housing. See the brand of sealant I used in the picture below, it's a black silicone based sealant.



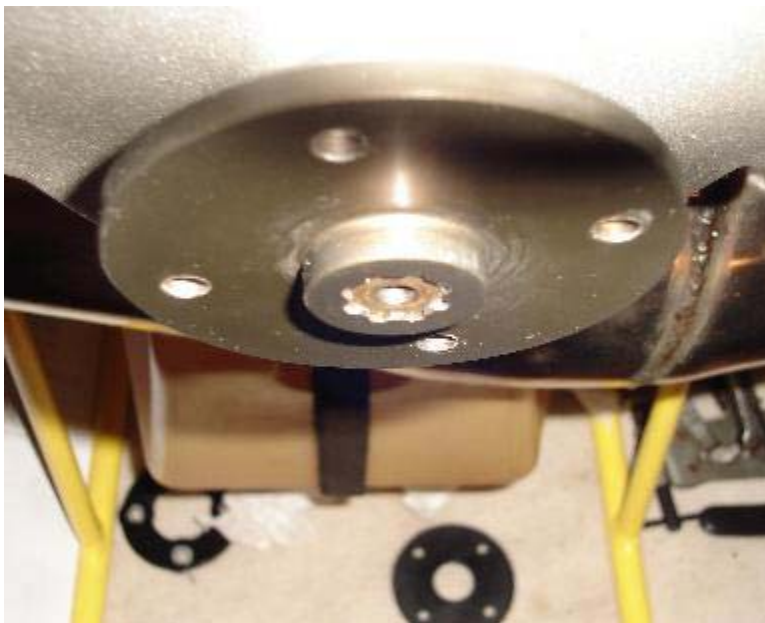
15) A thin bead of sealant has been applied to the mating surfaces and the two halves are brought together. If your prop-shaft output bearing was subject to spinning in it's housing, apply thread-locker compound around the seat area first.



16) Note that the two shorter screws are closer in the picture below. Note the missing black vent cap cover, it melted in the oven, oops!! (I have since procured a toothpaste cap drilled 1.5mm in the centre, hot glued on, which is working admirably so far).



17) Refit the box and drift on the prop hub, making sure the shaft and hub contact surfaces are spotless. There should be no rocking and the shaft should sit in 1-2mm as shown in the picture below to allow the retaining bolt to draw down. Apply a little thread-locking compound to the screw and tighten up, using 2-3 thick washers. Be careful not to bottom the screw if it's too long.



18) Refit the prop and off you go!

HAPPY REDUCTIONS.