Replacing Tail Wheel Donuts and Aluminum Spacers

(by Steve Mestler)

This article explains how to remove the entire tail wheel assembly on the Republic Seabee. Replacement of the shock donuts and spacers ONLY can be accomplished without removing the tail wheel barrel and the inner workings of the tail wheel mechanism as described below. Once the tail wheel is disconnected from the piston and the 8 tail wheel collar clevis bolts are removed, simply pull all the donuts and spacers out and replace them with your new ones. Reassemble the tail wheel collar and steering mechanism checking the trailing angle as described below.

Before you begin, make sure you have an adequate support system for the tail of your Seabee. I use a standard 2-ton jack with a 4x4 block of wood modified to fit the jack "jaws" on the jack side and a ½" slot cut in the top for the keel side. This allows for a strong supporting system that will not slip and slide. Jack stands with a wood block would also do the trick. It is most important that the Seabee does not move. Chock the main wheels as well. It's a good idea to take pictures of the tail wheel linkages inside and out before you begin so you know how it goes back together. During this procedure, the tail wheel must be retracted and extended stopping in mid positions many times to get the darn thing apart. Two people make this job much easier and safer. Put a drop-light inside the hull to light up the area before beginning.

WARNING: Use the MANUAL hydraulic pump handle to retract the tail wheel for this procedure! NEVER USE THE ELECTRIC PUMP FOR THIS, as your Seabee will most definitely be sitting on the hangar floor on its hull! Using the manual pump handle will retract the tail wheel only allowing for various alignments (as noted below) to take place.

With your Seabee jacked up along the aft bulkhead (in front of the tail wheel assembly)…

1- Remove power (Circuit Breaker or Master switch OFF) from the electric hydraulic pump if installed. If you have to, remove the battery cables from the battery.
2- If you have a steerable tail wheel, remove the steering cable clevis pins and save them for later re-assembly.
3- Remove the right-hand steering pulley on the tail wheel collar (if installed).
4- Remove the shock plunger/piston clevis pin (going through the center of the piston tube).
5- Remove the pivot bolt holding the tail wheel onto the tail wheel collar (mine is a BIG AN6-60)
6- Remove the tail wheel assembly from the collar.
7- Put the tail wheel you just removed in a safe place until re-assembly.
8- Open the two (left and right) round access panels to gain access to the tail wheel barrel retaining collar on the front of the tail wheel barrel.
9- Remove the large spring on the left-hand side. Remember which way it goes back in!
10- Going through the right-hand side, remove the tail wheel micro-switch assembly and carefully swing it to the aft portion of the bulkhead keeping it clear of the forward work area being careful not to crimp or strain the wiring.
11- Remove the cotter pin and washers from the barrel actuating rod that is connected to the tail wheel actuator (the hydraulic cylinder).

    Note: To ensure there is no undue force applied to the barrel pin (1/4" diameter is very small), remove the upper linkage (connected to the horizontal support above the actuator) and the lower clevis bolt connecting the arm to the forward barrel collar control horn. (This is the arm that has a pivot point in the middle that provides the over-center locking capability) There should be a hole in the forward barrel support bulkhead to allow the clevis pin to be removed from the rear of the actuating arm/collar control horn. Pumping the tail wheel up and down slowly and manually will align the hole with the clevis bolt.

12- Keep the actuating arm in a safe place until needed for re-assembly.
13- With a LONG (more than 24") slotted head screwdriver and a 7/16" small ¼" drive socket, remove the four clevis bolts (AN24's) holding the actuating collar on the front of the barrel.

Note: you will need to manually pump the tail wheel up and down SLOWLY to get the right alignment to get the screwdriver on the retaining clevis bolts. Stopping at the correct location requires trial and error until the head of the bolt is lined up with the round access holes. Two people make this easy but if you are alone many trips to the hydraulic pump handle will be required. Using the LONG slot-head screwdriver inserted into the access hole and engaged into the clevis bolt head, keep the handle of the screwdriver outside the fuselage and, with one hand on the screwdriver handle and one hand inside the access hole, remove the 7/16" nut and washer with the ¼" drive socket (ratchet handle). The "Braille Method" will be required to feel for the nut end. You must reposition the tail wheel four times (alternating left-to-right) as there are four clevis bolts holding the forward actuating collar on the front of the barrel. Access is easier from one side or the other depending on which clevis bolt you are removing. Move the manual hydraulic pump handle only enough to get the alignment you need and no more! The tail wheel will safely go all the way up and all the way down using the manual pump handle. But don't pump it any more than you need to!

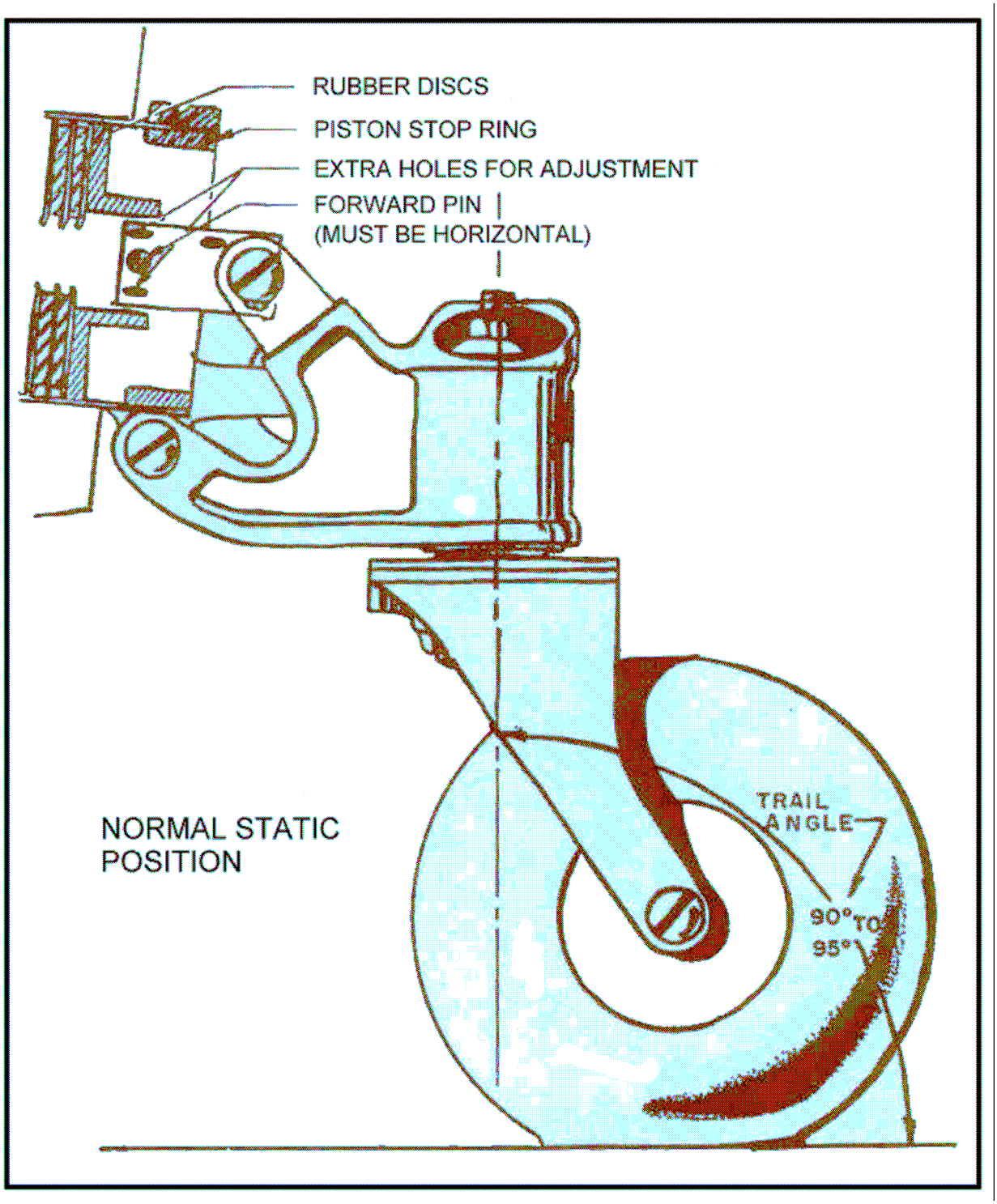
14- Remove the barrel actuating collar. Remember which side is forward!
15- Going to the rear of the Seabee, remove the barrel assembly. You may have to twist it back and forth to get it out.
16- With the barrel removed, take it to your work bench and, with a 4x4 block of wood, support the barrel on the forward end on the wood block. The actuating pin will hang over the edge of the wood making the barrel easier work on and more stable putting no strain on the ¼" actuating pin.
17- Push in on the center piston to see if the donuts are under tension. If they are, a hydraulic press may be required to push down slightly on the piston as you remove the collar retaining clevis bolts. There are eight bolts holding the collar in place. (on mine they are: 6 ea. - AN25-13A and 2 ea. – AN26-13A)
18- Remove the center piston and its piston stop-ring. Remember which way the piston stop-ring goes in! The holes in the stop-ring are located closer to one edge of the ring than the other and if reassembled wrong the tail wheel shock will not work correctly. Mine had the smaller dimension toward the rear of the airplane.
19- If necessary, gently tap on the collar (working your way around it gradually) with a rubber mallet to remove it from the barrel. It should be a tight fit but not so tight that it won't come off with a tap or two from a rubber mallet.
20- Back on the work bench, support the barrel as described above and remove the donuts and spacers.
21- Clean out the barrel and paint it inside if necessary. Remember, the inside of that barrel gets wet when you are on the water so painting (or at least priming) the inside is very cheap insurance against corrosion.
22- Install the new aluminum spacers and donuts using the same quantity of each that were removed. (approximately 22 to 23 - 3/8" donuts) There should be, starting from the bottom of the barrel, a spacer (with the flanged edge UP)-donut-spacer-donut-spacer-donut, etc. and ending with a spacer (flanged edge DOWN) adjacent to the center piston. So, when assembly is complete, the piston will be pushing on an aluminum spacer and NOT a donut. Do not lubricate the donuts! Grease or oil will cause the donuts to "squeeze" out into the donut holes. Don't ask me how I know.
23- Re-install the center piston and piston stop-ring with two or more collar retaining clevis bolts. Again, a hydraulic press may be required to "squash" the donuts enough for re-assembly.
24- With the partially assembled barrel, insert it into the tail making sure it is fully seated.
25- Reinstall the tail wheel assembly so the proper "trailing angle" can be seen. (see Republic Seabee Newsletter #19 or drawing below for proper angle). Don't worry, with the barrel fully inserted the tail wheel won't go anywhere when the weight is put on it. Keep the jack and block slightly below the keel just in case.
26- If necessary, add more or less donuts to get the correct "trailing angle". Some Seabees have adjustment holes in the center piston tube to allow for minor adjustments to the angle. Make sure the pin holding the center tube to the piston on the tail wheel assembly is horizontal. Unfortunately, the collar must be removed to add/remove donuts. (This is why the assembly was done with just two or three collar retaining clevis bolts).

27- When the correct "trailing angle" is established, install all collar retaining clevis bolts. Note: The two large (AN26-13A on mine) bolts go on the lower part of the collar.
28- If necessary, paint the barrel and collar assembly. Mask off the bearing surfaces that will ride on the rear seal and the forward bushing of the barrel before painting.
29- Liberally grease the two large barrel bearing (bushing) surfaces inside the hull and on the tail wheel barrel. Use a good water-proof grease.

    Note: While you have this thing apart, check the large tail wheel barrel seal in the very back of the hull. If it shows sign of cracking or if you have noticed the aft compartment leaking more than the other compartments, replace it now. It isn't that hard to replace and they are still available.
    Garlock Klozure 53 x 2630 #21086-2630 or National #455194 (original seal, about $40.00 in 2001)

30- Reinstall the barrel assembly in the reverse order of disassembly. Grease the parts as you assemble them. Some parts do not have grease fittings so now is a great time to lubricate them.
31- Check to see that all bolts and pins are safetied with cotter pins or locking nuts.
32- With the Seabee still on the tail jack, do a retract test using the manual hydraulic pump handle only! Have another person look at the tail wheel mechanism as it retracts and extends to be sure there is no binding. Make sure the micro-switch wiring doesn't crimp during the test and is clear of all potential hang-ups.
33- Check to be sure the green gear-down light works. If necessary, re-adjust the tail wheel micro-switch so that the light illuminates with the tail wheel down completely. Be sure there is a little "play" in the micros-switch plunger when it is fully seated against the actuating arm. Also, be sure the lock nut on the micro-switch is TIGHT! There have been cases of this switch loosening up and jamming against the tail wheel bulkhead preventing tail wheel extension (very embarrassing! Again, don't ask me how I know). The switch body should be parallel to the aft bulkhead and clear of all obstructions.
34- Have you're A&P mechanic inspect it and make the appropriate logbook entry for donut/spacer replacement.

The new donuts and spacers should last you a LONG time. A small amount of settling may occur and an extra donut (perhaps a thinner one – ¼" or so) may be necessary to get the trailing angle correct. Some tail wheel installations have a set of staggered holes in the tail wheel piston. This piston can be rotated to realign the connecting bolt to get the right trailing angle. If you have any questions, contact me at smestler@pbtcomm.net. Thank you for your attention and good luck. It ain't an easy job but is necessary at times.


RUBBER DISCS
PISTON STOP RING
EXTRA HOLES FOR ADJUSTMENT
FORWARD PIN
(MUST BE HORIZONTAL)
NORMAL STATIC
POSITION
TRAIL
ANGLE
90° TO
95°