



Control Wheel Play Elimination

Note: You must have the assistance of a licensed AMT (A&P mechanic) to complete this procedure. A logbook entry is required.

Description: There have been Seabees that have an inordinate amount of up-and-down play in the control wheels. The movement is noticed when the Control Tube is held while the Control Wheel is lifted up and down. If you notice excessive "play" the three bolts holding the Control Wheel Housing (RPN 1211) may have elongated the holes in the Control Wheel Tube (RPN 1218 or 1441 depending on A/C serial number) running through the instrument panel. Although not a safety hazard unless the three bolts come completely out of the tube, too much play in any flight control system is never good and will only get worse with time. If you notice unwanted play in the control wheels this procedure may help.

If there is no "play" in the Control Wheel, but there is when the Control Wheel is moved up and down without holding the Control Tube, the bushings on the forward end of the Control Tube may be worn. This article addresses only the "play" from the Control Tube to Control Wheel Housing.

Procedure: The three bolts holding the Control Wheel Housing to the Control Wheel Tube should be 1/4-28 Filister head bolts (drilled head) or equivalent and should be safetied together. There are a few ways you can try to repair this unwanted movement:

Option 1 – Take the Control Wheel Housing off (as explained below) and coat the inside of the bolt threads on the Control Wheel Tube with JB Weld or equivalent. Allow to dry and tap the 1/4-28 threads again using a Bottoming Tap. There is no guarantee this will last and the "play" will most likely return.

Option 2 – After removing the Control Wheel Housing, clean the three bolts and threads inside the Control Tube thoroughly with lacquer thinner and let dry then, coat the bolts with Locktite #271 (Red) or Locktite #242 (Blue), install the bolts and allow to dry. The Red Locktite may make a permanent bond and the bolts may not come out again unless the whole assembly is heated to 500°F (so says Locktite). If the Control Wheel Tube needs to be removed at a later date this could be problematic. Locktite Blue is more forgiving and the bolts can be removed later using standard tools. The Blue Locktite would be the better option and has worked well in the past. If the threads in the Control Tube are stripped you must use option 3 below.

Option 3 – With the Control Wheel Tube removed, drill and tap the three holes to the next larger size (5/16-24). This requires complete disassembly of the Control Wheel Tube/Rod assembly, which is a very complex procedure, explained below. This seems like the best solution and there is plenty of material on the Control Wheel Housing and Tube to accomplish this safely. This procedure follows:

- ☐ Remove the copilot's control wheel and stow it
- ☐ Remove the eight (8) screws holding the Control Wheel Arm Cover (RPN 1212)
- ☐ Remove the cover
- ☐ Remove the safety wire from the Control Wheel Chain (RPN 1208) turnbuckle
- ☐ Unscrew the turnbuckle barrel and remove the chain taking care removing it around the center sprocket



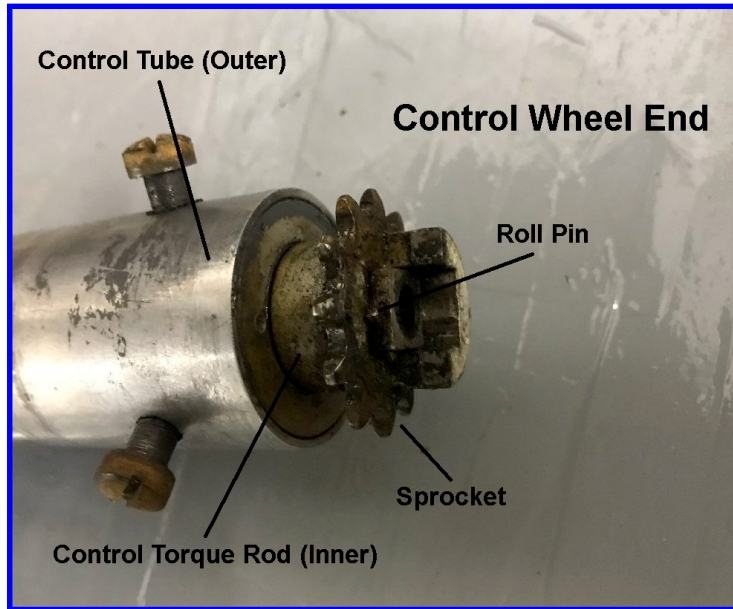
Control Arm cover removed showing turnbuckle and chain.
Safety wire removed.



Turnbuckle and chain safety wire installed.
THIS IS REQUIRED!

Note: This is a great time to inspect the chain for wear. Clean the chain thoroughly in mineral spirits. The chain should not have any movement in the individual links when pulled lengthwise. Check for excessive wear on the links where the sprockets mate with the chain. If all is well, lubricate the chain by soaking it in oil. If replacement is necessary, the chain is available from a number of suppliers. (i.e.: McMaster-Carr.com)

- ☐ Remove the safety wire securing the three 1/4-28 Housing Bolts
- ☐ Remove the three bolts
- ☐ Pull the Pilot's Control Wheel and Control Wheel Housing straight aft to remove it. This will expose the sprocket and the three threaded holes on the Control Wheel Tube that need attention.



Control Wheel End of Control Tube removed. Note 1/16" roll pin.

Note: There is a Torque Rod inside the Control Tube that is very close to the inner side of the Tube. Care must be taken if you are using option 1 or 2 to keep the Locktite or JB Weld away from the torque rod. Using JB Weld, Apply **ONLY** to the hole threads. Using Locktite apply to the first two threads on the bolts only.

If **option 1** is your preference, you need not go further in this procedure. Allow the JB Weld to dry thoroughly and re-tap with a 1/4-28 Bottoming Tap. Reassemble the Control Wheel and be sure the ailerons are neutral and the Control Wheel is neutral then safety the chain turnbuckle! Be sure there is no binding in the ailerons before installing the Control Wheel Arm Cover (see photo on page 6).

If **option 2** is your preference, you need not go further in this procedure. Clean the threads on the bolts and in the Control Wheel Tube with lacquer thinner. Coat the three threaded holes with Locktite #271 (Red) or Locktite #242 (Blue) **ON THE BOLT THREADS ONLY!** Install the Control Wheel Housing using the three bolts, preferably new bolts, and allow to dry thoroughly (24 hours). Install the control chain and be sure the ailerons are neutral and the control wheel is neutral before safetying the chain turnbuckle. Make sure there is no binding of the chain before installing the Control Wheel Arm Cover.

Regardless of the options used, be sure to safety the turnbuckle and the three bolts. Normally the three bolts are safetied using one piece of .032" safety wire so that all three bolt heads are safetied together.

If you decide on **option 3**, continue the procedure below:

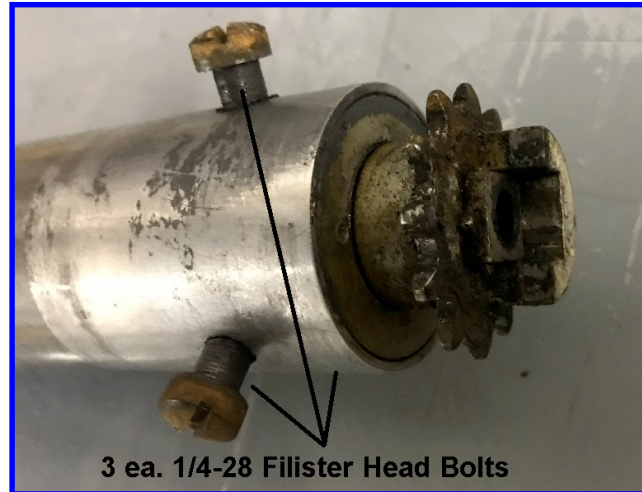
- ☐ Remove any covers over the top of the instrument panel to expose the Control Wheel Tube.
- ☐ Remove the two forward pivot bolts on the Control Wheel Column Tube Bracket (RPN 1217)
- ☐ Remove the pulley locking bolt
- ☐ Slide the Control Rod aft removing it from the pulley then forward over the aileron pulley assembly
- ☐ Carefully pull the Control Rod forward clear of the instrument panel
- ☐ Take the Control Wheel Tube to the workbench
- ☐ Mark the sprocket and square drive end so the orientation of the sprocket can be maintained on reassembly

Note: This may be a good time to replace the phenolic Control Wheel Tube Bearing (RPN 1163) that supports the Tube. There is Teflon replacement bearings available that make the Control Tube slide effortlessly through the instrument panel. No lubrication is needed nor wanted. You should also polish the Control Tube to a mirror finish that will reduce the effort required to pull the controls aft plus, it really looks good when you are done.

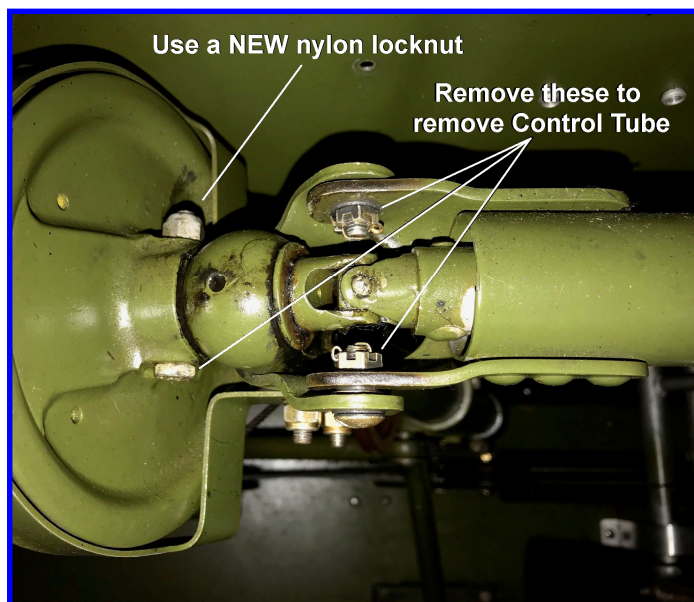


Teflon Control Tube Bearing

- ☐ Remove the roll pin on the sprocket end to allow the sprocket to be removed
- ☐ Remove the sprocket
- ☐ Slide the inner torque tube out toward the forward end. This allows for a clean, unobstructed path for the drilling process.
- ☐ Drill a letter "I" (capital I, .272") hole in all three bolt holes
- ☐ Tap all three holes with a 5/16-24 thread tap. Use plenty of thread lube.
- ☐ Drill 5/16" hole in all three of the Control Wheel Housing bolt holes
- ☐ Clean the holes and tube thoroughly of metal shavings
- ☐ Test the fit of the Housing to the Control Tube with new 5/16-24 bolts. There should be no interference from the bolts on the inner torque tube! Adjust the washer thickness to prevent rubbing on inner torque tube. The three bolts are approximately 1/2" long with a 1/4" grip. An AN5H-4A (Bolt) should work nicely. These are AN bolts with the heads drilled for safety wire.



- ☐ When the fit is satisfactory, reassemble the Control Tube and Torque Rod
- ☐ Oil the inside of the sprocket end of the outer tube where the inner Torque Rod rides
- ☐ Reinstall the sprocket with roll pin lining up with the previous orientation marks
- ☐ Lubricate the "U-joint" (by the pulley) and the sprocket before assembly
- ☐ Install Control Tube through instrument panel taking care not to disrupt wiring or instruments



Control Tube shown in place. Three bolts will allow removal of Control Tube.
USE A NEW NYLON LOCKNUT ON THE AILERON PULLEY!

- ☐ Install the aileron pulley and two pivot bolts on the end of the Control Tube

Warning: Use a NEW elastic stop nut for the aileron pulley bolt

- ☐ Install Control Wheel Housing using new 5/16-24 bolts

Note: If you have the equipment, the holes on the Control Housing are recessed for a flat 1/4" ID washer and should be enlarged for an AN960-516 washer. If no equipment is available you can drill out an AN960-416 washer to 5/16" ID and use the existing recesses.

- ☐ Safety the three bolts together with one piece of .032" safety wire
- ☐ Lubricate the chain and both sprockets (drive end and control wheel end)
- ☐ Neutralize the ailerons and feed the chain through the Housing so that the turnbuckle is on the top and in the center of the Control Arm channel
- ☐ Tighten the turnbuckle just until the slack is taken up in the chain, not too tight! There should be a slight vertical slack in the chain but not enough that the chain could jump off the sprocket



Full Right Aileron

Turnbuckles in correct position
Aileron Centered

Full Left Aileron

- ☐ Move the aileron controls full travel each way and check for accuracy and binding. The turnbuckle should not touch the sprockets.
- ☐ Safety the turnbuckle using .025" safety wire (see photo on page 2)
- ☐ Replace Control Arm Cover
- ☐ Install copilot's control wheel
- ☐ Check that all controls work correctly through their full travel with no binding
- ☐ Replace the forward instrument panel top covers
- ☐ Make a logbook entry

Conclusion: I'm sure Republic never thought the Seabees would last for 70+ years and, for the most part with good maintenance, have been designed very well and have lived up to the Republic reputation. With the Control Wheel Rod securely attached to the Housing our Seabees should last another 75 years.

Abbreviations:

RPN – Republic **P**art **N**umber from Republic Seabee Parts List

A/C – Aircraft

ID – Inside Diameter

AN – Army-Navy hardware designation