

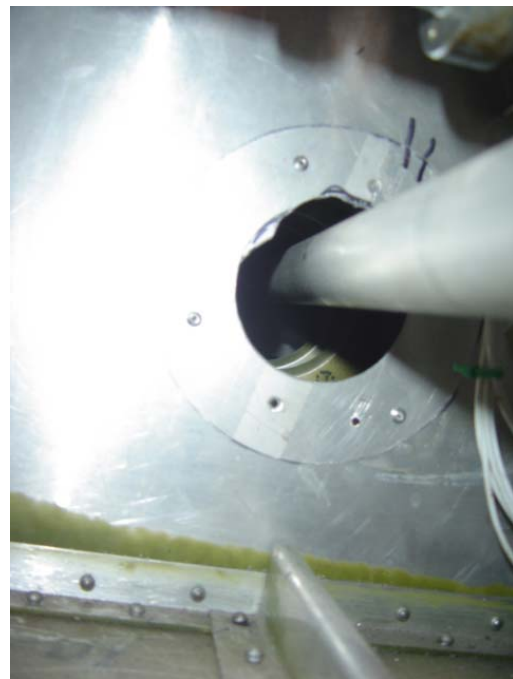
I Installed Push Rods by Bill Phillips

I decided to remove the aileron cables that I made and installed in my XL and replace them with push/pull rods. My hope is that in doing this I will increase control, responsiveness, safety and make my airplane more valuable and sellable.

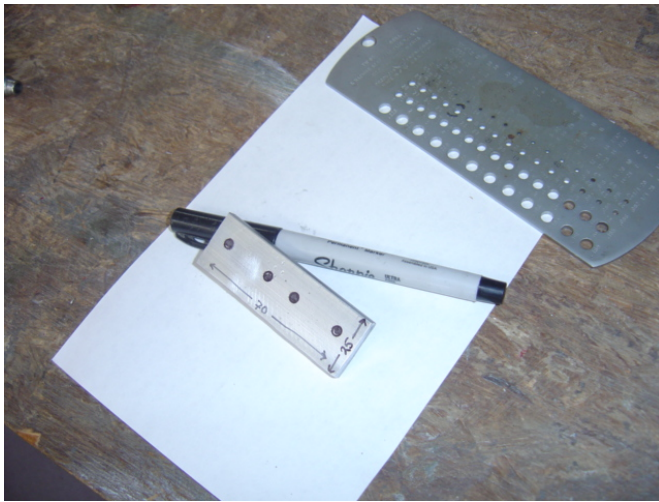
I first had to remove the cables that had served me for 135 hours. To do this I unceremoniously took my bolt cutters and snipped the cables and pulled them out. I saved every bolt and carter key to weigh them once removed. This was painful as I never like having my plane down for anything.



I then took a 2 inch hole saw for making door knob holes in wooden doors and drilled out the hole in the inside of the fuselage. As the bit guide I used the hole in the fairlead that the cable ran through. I then drilled out of .25 T6 aluminum a doe nut to reinforce the edge of the hole. I drilled it and pull riveted it to the fuselage.

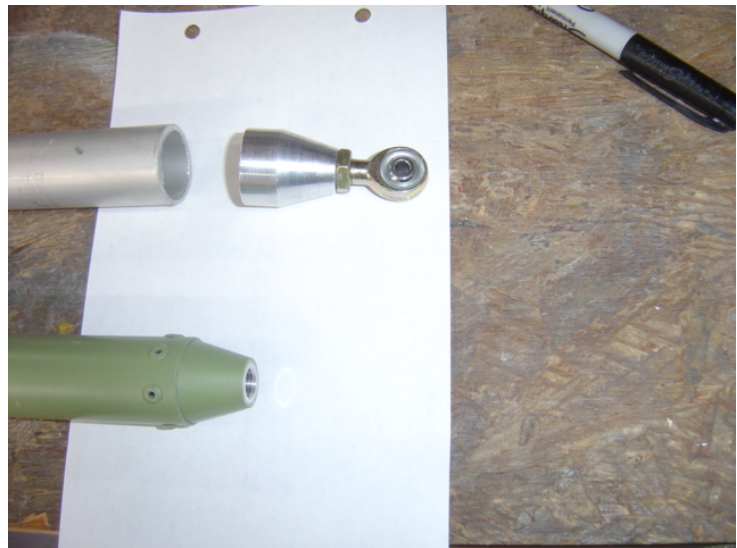


I then took a 3x5 card and taped it on the control foot. I took a fine line ink pin and marked the holes already there for the cable clevis forks had bolted on. Because the push rod Male Rod End Bearing bolts required more distance apart then the existing holes I had to make and add a bracket..



The bracket material is 6061 T6 .183 thick. 70 mm long and 25 mm wide. I drilled four holes. The two middle ones are for the control foot from the 3x5 card template and the outer two holes are 50 mm apart. I under drilled the holes and then used a reamer to 3/16 for the AN3 bolt. Remember, when you ream a hole you only do it in one direction. Stop the drill to withdraw the reamer for correct hole size.

I then made the rods. I ordered 6061 T6 tube from Spruce. 1 1/8 inch at .49 thick walls. I built the rods for my RV-8a a few months ago so I did it the same way only that tube had .35 walls.



I ordered four rod ends from Van's (VA-111 Threaded Rod Ends & M 361 M Rod End Bearing) and machined them down with a file until they fit tight in the tube ends. Your source for the tube ends may vary or you might get Dave Nixon to make you some as he did for his plane.

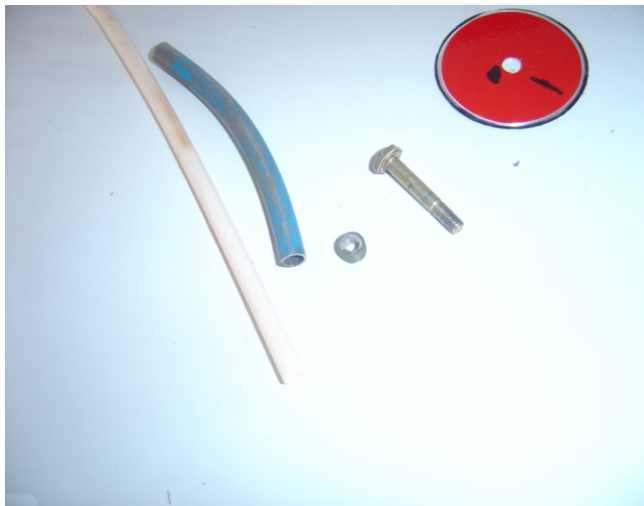
I primed with Zinc Chromate, drilled the six holes, clecoing each and the used MSP-42 (1/8) Blind Rivets to hold the inserted plug in the tube.

Now I had to cut a hole in the wing tip to insert the rods. The holes in the last rib are offset from the large inboard holes so it is important to drill where shown. The center hole point is 80 mm along the skin up from the bottom edge and 75 mm forward from the rear edge. I cut a 1 1/2 inch



hole with the door knob hole saw or you could use a fly cutter.

After the rods were finished and installed I made a dimpled back plate, dimpled the skin, installed 3 nut-plates to close the holes when completed and flush. I had to stick a broom handle in the hole to the underside bellcrank access hole and tape the cover to it at pull it up to the hole to screw on.

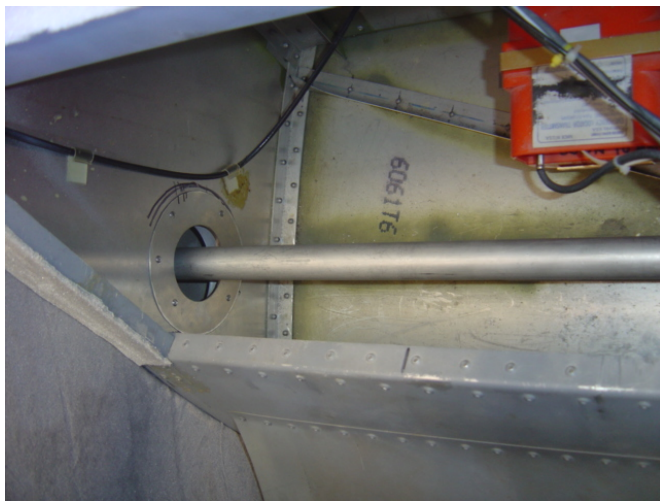


I attached the rods to the control foot bracket using AN3-11a bolts, washer and nut. I made four spacers, one for each Eye Bearing bolt so that they could spin completely free. If mounted flush their twist is reduced greatly.

I made the spacer out of steel tube which just happened to be the old dip stick tube for a 289 ci Ford engine I replaced out of my son's 1965 Mustang.

I inserted a piece of nylon brake line left over from building the XL's brakes and then reamed the tubing to 3/16. I used a Drimmel cut off blade to cut the tubing to 4 mm then a belt sander to flush the face.



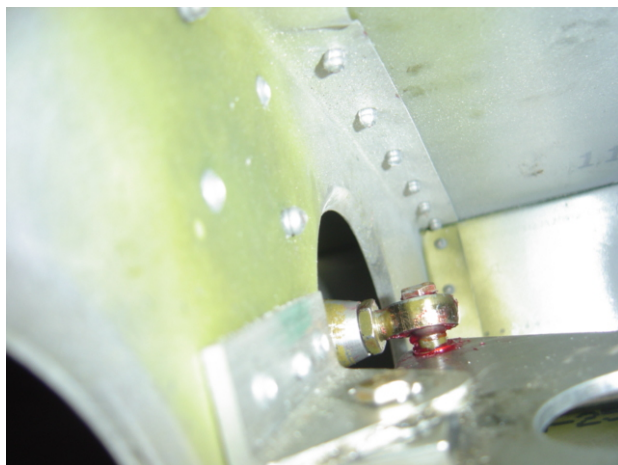
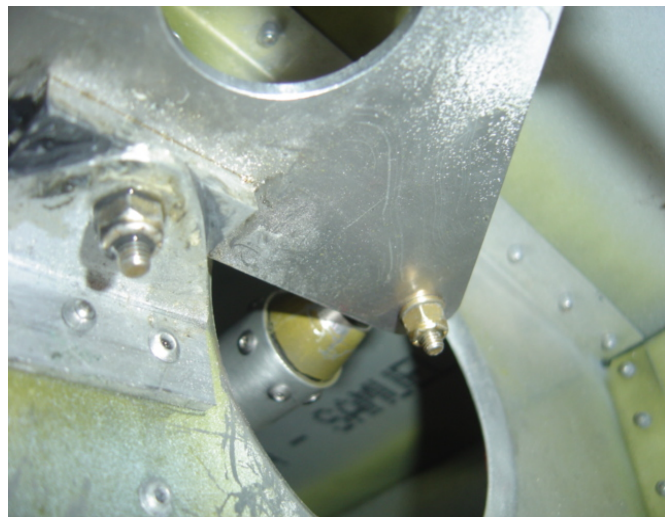


Once I attached the inboard bolts through the Eye Bearing bolts into the foot, I placed a brace support under each aileron to flush it with the flap.

I then tied the control stick to center point in the cockpit.



I then bolted the outboard Eye Bearing bolts with the insert screwed on to the top of the bellcrank using a AN3-11a bolt with spacer and washer. I laid the insert against the tube and marked for final cut. My push rod tubes finished were each 2300 mm long without insert plugs and eyebolts. I ordered them at 94 inches from Spruce and cut off the difference. Yours will probably not be the same length.



I removed the marked rods from the wings, trimmed to the correct length, installed the second pair of insert plugs, drilled and riveted as before.

REMEMBER, before the final installation of the rods insure you add a jam nut to each Eye Bearing bolt end. Ask me how I know to do this. I bolted everything together and torque the nuts to 25 inch pounds. Wig wag'ed the ailerons to make sure they don't rub anywhere and have plenty of clearance in the rib holes and rudder and elevator cables, etc. Flashlight and eyeball time.

The whole thing cost me about \$100. and took most of my weekend to complete. Also, I weighed everything I removed and added and the rod system was 14.2 ounces heavier then the cables.

I made this modification for my personal use only and I describe what I did here strictly for educational and entertainment purposes and not so that a bunch of you guys can do it the way I did it. Further, if you do get the wrong impression and emulate my work, go flying, screw up and kill yourself I'm not responsible so tell your wives, kids and sweethearts. Fact is you probably screwed up something else anyway and hopefully when you hit you were alone and nobody but the cat was at home. How's that for a disclaimer?



I'm not "selling" push rods for XLs. I did fly to Tennessee this last weekend and the weather slammed me and "BabeDoll" around something fierce. I never flew in a snow storm before. It Sucked!. And coming back home the wind and turbulence beat the snot out of me for over 2 hours. When I came in to land the wind was 16 k gusting to 23 k. It was so hard I could not turn base across the wind. Took three tries to finally turn base and a couple more to turn final. I was pulling the stick with two hands and the rods held up. I was greatly impressed. Scared speechless, but impressed. Our XLs are tough little birds! Lastly, I hope nobody reads this, thinks it's a grand idea and replaces the cables in their XLs with push rods as I have described. I think sloth and inactivity on your part will continue to make my plane the safest flying 601 XL in the world !!!