

Beech on a Budget

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By Mike Caban



Strut Rebuild – Low Cost and Simple

As of this writing the Polar Vortex has struck again, bringing air temperatures in the northern Midwestern states into the sub-zero zone. A few years back I was in Appleton, Wisconsin (KATW) with my 1965 B55 in the FBO's community hangar when another of these Polar Vortex monsters came through. During my weekend visit to the hangar to check on the plane I was shocked to see one of the main struts had gone completely flat. They are the original factory units and I could find no record in the logs of them being "rebuilt" or the O-rings being changed.

You can imagine my anxiety of being away from my favorite mechanic, and the tools and workspace at my home base. All I could think of was: *How much labor was an inexperienced mechanic going to charge me to make this repair, and what if any of the components I need to buy are at exorbitant AOG (Aircraft On Ground) prices?*

Fortunately my fears were unfounded. The mechanics at MaxAir went about the repair by simply re-servicing the strut with 5606 fluid and nitrogen. Whatever had caused the strut collapse had "fixed itself." Seven years later, that strut has only required minor nitrogen servicing at a couple of annuals. Knowing full well that the nearly 50-year-old moving parts within the struts had really given great service, I began making a plan to rebuild them. Other, more pressing projects took priority and the existing struts kept hanging in there, literally. Meanwhile I was able to secure from ABS Member Kevin O'Halloran, at a very attractive price, a pair of late-model Baron main gear legs, which have been sitting in my hangar for at least two years now. At the 2014 annual, my IA and I noted increased pitting of the lower shocks' chrome plating. I knew it was time to get busy on my main strut rebuild.

My IA suggested that our best approach would be to remove the cylinder from the airframe without disturbing the bolts holding the support frame in the wing, and replace it with the rebuilt low-time serviceable unit. **Figure 1** shows the serviceable unit removed from the support frame.

The first order of business is to relieve the strut of its nitrogen gas pressure by applying a tire pressure chuck or other suitable tool to the Schrader valve in the top of the strut. Wear suitable eye protection in the event any 5606 gets ejected at high speed. Unscrew the body of the valve and remove as much of the old 5606 fluid as possible into a suitable container for later disposal.

Next, remove the scissors from the shock and cylinder. They are held in place by floating pins that are secured in place by clevis pins and cotter pins. **Figure 2** shows the pieces laid out on the bench. When reassembling your scissor section to the base of the cylinder, be sure to remember to properly configure the stop, which prevents the pin from sliding out (**Figure 3**).



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FIGURE 1



FIGURE 2

Then it was a good time to remove the old scraper seal at the base of the cylinder. **Figure 4** shows a new scraper seal for installation. I grabbed the old scraper seal at its protruding inner lip and began to maneuver the seal out. The scraper seal for my particular aircraft SN is P/N 504271. Beechcraft is sure to have it, or it can be sourced from www.kscdirect.com for around \$10.50 each.



FIGURE 3



FIGURE 4

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FIGURE 5



FIGURE 6

Next I removed the old retaining ring at the base of the bronze section of the cylinder (**Figures 5 & 6**).

Moving to the top of the cylinder, I removed a similar retaining ring that holds the perforated tube in the cylinder. This allows the tube to be pulled out of the cylinder, which exposes the top O-ring that will need to be replaced (**Figure 7**). This is also a good time to replace the Schrader valve core through which you will service the unit with nitrogen, and remove the old O-ring and position your new one.

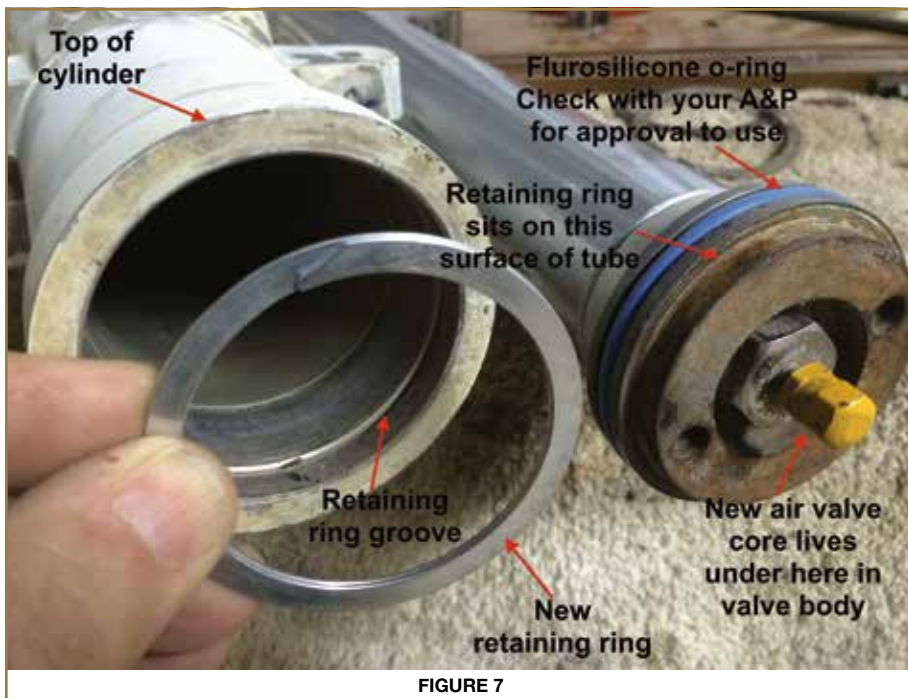


FIGURE 7



FIGURE 8

I then moved to the other end of the cylinder to attack the felt at its seam (**Figure 8**). With a long screwdriver, I carefully (without scratching any of the cylinder barrel) picked at the felt seam to lift a corner section such that a needle nose plier could be employed to grab the felt corner to twist and pull it out of the cylinder (**Figures 9 & 10**). New Beechcraft felt for my SN is P/N 35-815247-9 (**Figure 11**). With your mechanic's approval, one of these lower-cost felt

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After prying felt seam up with blunt tool, grasp with needle nose or similar, twist and pull

FIGURE 9



Twist and pull felt from cylinder

FIGURE 10



-35-815247-9
Order 7850633
Lot-147
01/07/08

New Beechcraft Felt

Old Felt

FIGURE 11

options from WW Grainger might be viable: P/N 2FHG2 or 2DAH9 (SAE Grade F1, which is highest wiping grade), which looks to be about \$12 for a 12" x 12" sheet. Depending on your mechanic's opinion of your felt's condition, you may not need to replace it. But personally, I'd like to see these go another 50 years before

they need to be touched again, so I replaced mine. Use of 10W-30 oil is noted in the manual for soaking the new felt prior to reinsertion. Don't over-soak the felt or you risk it swelling, and that would be problematic. I gauged the amount of oil on the old one and soaked to approximately that level.

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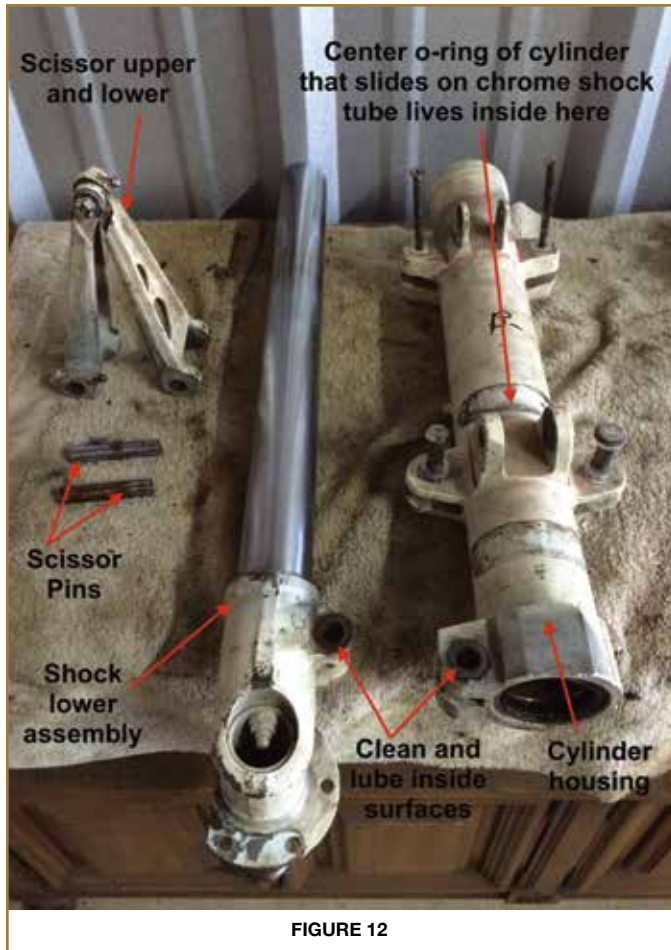


FIGURE 12

The time had come for what seemed to me to be the toughest part of this rebuild: the removal of the O-ring that lies about midway in the center of the cylinder (**Figure 12**).

To accomplish this, a special tool with significant rigidity and a “duckbill” end needed to be fabricated to allow for the extraction of the O-ring from within its groove down in the barrel. **Figures 13** and **14** show the tool that was fabricated from approximately 24" length of 1/4" diameter steel rod. Pounding the end of the rod into submission with a short-handled sledgehammer formed the “duckbill” shape and angle necessary. The 1/4" rod is rigid enough to allow you to get onto the old O-ring and pull up on it to extract it. Smaller diameters just bent when trying to pry the O-ring up and out. **Figure 15** shows what appears to be a crack in the old O-ring and the makings of current difficulties or difficulties in the near future. The new O-ring is helped into place with a wooden dowel to avoid any scratching of the inner barrel.

Given the good experience we have had with fluoro-silicone O-rings in other applications, my mechanic approved for use the fluoro-silicone versions of the two O-rings for each of the struts (**Figure 16**). The



FIGURE 13

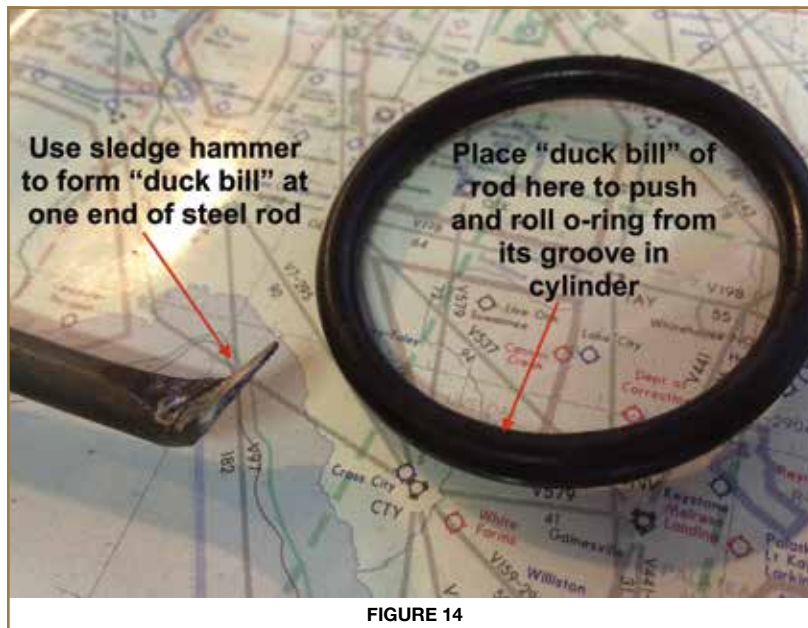


FIGURE 14

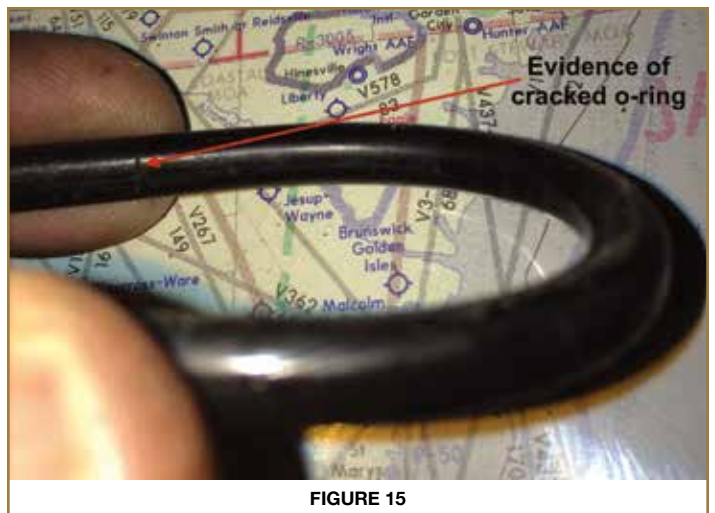


FIGURE 15

fluorosilicone O-ring prefix designation is M25988/1-XXX where "XXX" is the O-ring size designation.

After insertion of the new center O-ring and felt, the tube, cylinder, and shock components can be re-assembled. After ensuring that all is back together properly (this is where your mechanic evaluates the fully assembled strut and pronounces it ready to be serviced with hydraulic fluid and nitrogen), you're ready to follow the servicing procedure from the maintenance manual, which requires that the strut body be filled with 5606 (or the low flammability Military equivalent Mil-H-83282) fluid with 1/4" of chrome showing on the shock. Filling the strut through a tube connected to the top of the fill valve (with the Schrader valve removed) will allow for cycling of the shock up and down a couple times to remove any air bubbles. Once satisfied that the air has been removed, place the Schrader valve core back in the valve body and service with about 125 psi of nitrogen for starters. After placing the strut back in the airframe and putting weight on the wheels, the final pressure adjustment can be made for your preferred strut stance.

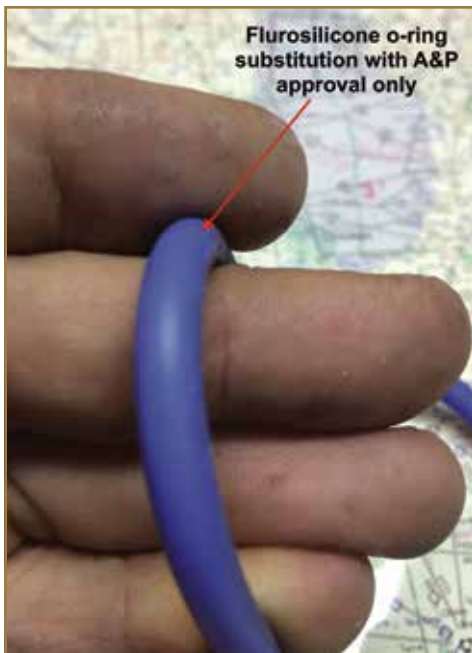


FIGURE 16

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Due to the main gear well cavity cut-out design, it is imperative that the strut fully extend when airborne to prevent the strut from crashing into a portion of the wing. (This is another ingenious benefit of the squat switch, which does not allow the gear to be retracted unless the gear is fully extended and quite possibly the reason that two squat switches were employed in later model airframes.) To ensure that you have no strut binding, jack the plane fully to confirm that there is no restricted movement of the strut in the cylinder body. Performing a gear swing and checking gear clearances would also be good practice after a project such as this.

The following personal maintenance principles applied to this project:

- IA/A&P supervision of all steps of the work and mechanic logging the repair work in the airframe log.
- Shop Manual and Illustrated Parts Catalog on-hand for aircraft model and serial number to identify specific rebuild component parts numbers.
- Good general cleaning and lubrication practices for disassembled pins and bushings.
- General inspection of the main components for any evidence of corrosion or defects.
- Inspection and replacement of any poorly functioning grease zerks.
- Replacement of all hardware, clevis pins, cotter pins, etc., not suitable for reuse.

Since for me this is a repair and not a restoration, my plan is to simply sand the cylinder bodies and apply a coat or two of white epoxy paint to give them a freshened-up cosmetic appearance.

So, if your struts are long in the tooth, it could be an easier project to tackle than you might have thought. My plan is to finish rebuilding my serviceable units over the next couple of months and install them during annual later this year. 



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