KOEHLER KORNER

I recently was asked to look at a Piper Arrow (PA-28R-200) which was marking its territory by leaving a puddle of liquid under the engine area. Yes, I know, you assume it is an oil leak, and most airplane engines leak a little oil. However, this puddle was red, meaning it was from 5606 hydraulic fluid. The only thing in the engine area that had hydraulic fluid in it was the landing gear retraction system. The nose gear actuator on an Arrow is at the back right side of the nose wheel well. I checked it and found red fluid all over.

A simple inspection of the actuator showed it to have two flexible hydraulic hoses attached with B-nuts, one at each end, and the actuating shaft coming out of one end of the cylinder. I initially checked to see that both hydraulic hoses were properly and tightly attached to the actuator by putting a 9/16 open-end wrench on each B-nut and ensuring they were tight. We jacked the plane until all wheels were off the ground and wiped away all the fluid from the actuator. We then did a gear retraction. Several drops of hydraulic fluid spurted from the area where the actuator shaft came out of the cylinder, confirming my initial guess that it was the O-ring for the actuator shaft that had failed.

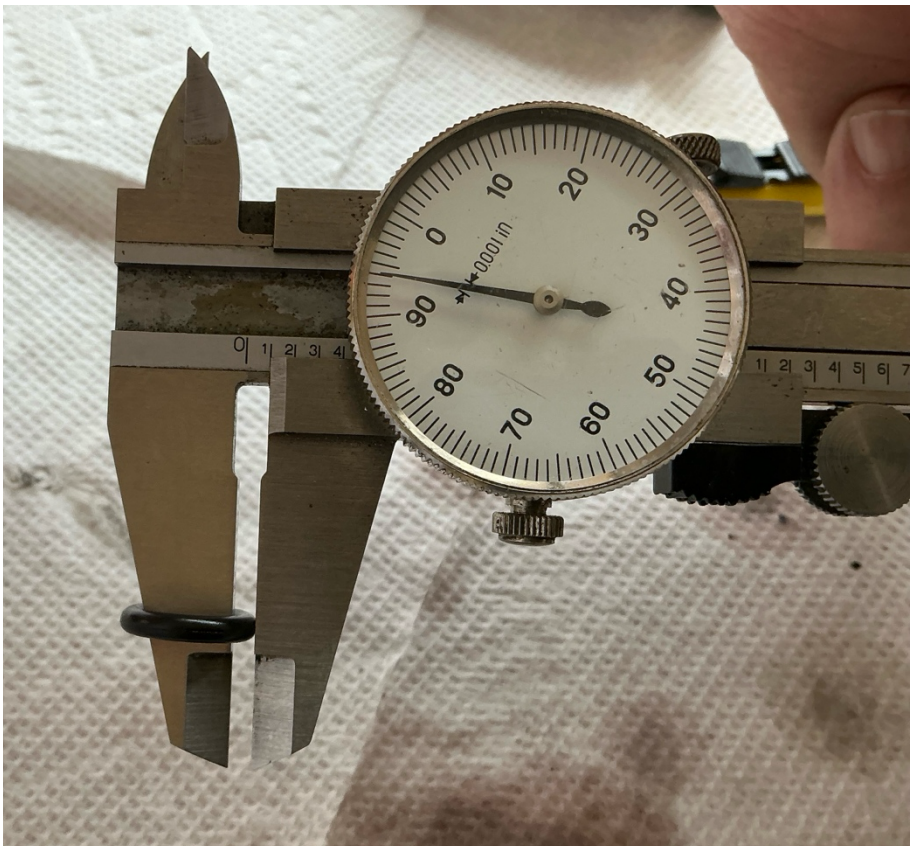
It is not uncommon for this type of shaft O-ring to allow leakage. The actuator shaft rubs over it at every actuation, and upon gear retraction, when the shaft is pulled into the cylinder, dirt, grit, or debris can be pulled in against the O-ring further wearing its inside surface. A simple review of the Arrow Parts Manual showed the replacement O-ring to be an AN6227B-8 or MS28775-110, which we bought from Spruce for $1.07. A simple review of the Arrow Maintenance Manual showed the proper sequence to remove and disassemble the nose gear actuator.

The picture below is of the end plate on the actuator. It is held in the actuator barrel by a circlip and has a sealing O-ring on the outside and the shaft seal O-ring on the inside. The outer sealing O-ring almost never fails, if it is installed correctly since it is in a static environment, but the inner O-ring takes the rubbing wear of the shaft. It is not installed in this pic:

The O-rings are removed and inserted most easily with a dental pick, taking care to not scratch the surfaces of the aluminum end plate.

I measured the thickness of the O-ring in the unworn direction as shown in the picture below at .1035”:

Looking specifically at the worn side of the O-ring, I also used the vernier micrometer to measure the distance from the inner to outer surface as in the picture below at .0940”.



So, the inner edge of the O-ring wore at least .0095”. You could definitely see a flattened and worn face on the inside diameter with the naked eye, but I was unsuccessful in catching it in a photo. Also, the old O-ring was noticably hard and non-pliable compared to the new O-ring.

When you need an O-ring, be sure to buy new, fresh ones. I have a box of O-rings from the auto parts store that is about 20 years old. I would never put them in an aircraft.

We put in the new O-ring, prelubing it with a dab of 5606, reassembled the actuator, and reinstalled it on the plane. Since we had introduced air into the gear retraction system, we did multple retractions and extensions until the operation of the system was smoothe and even. With a double-acting hydraulic system like this, it tends to be self bleeding, as opposed to brake systems that almost always need bleeding after changing out a component.

I hope this little story was entertaining, and gave you some confidence and understanding for chasing leaks in a hydraulic system. Oh, by the way, even though we cycled the gear about eight times, not a drop came out of the repaired nose gear actuator! It was a satisfying result.

Keep building, flying, and maintaining.

Dick

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