

# Guidance for the Care of Aeronca Oleos

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**Abstract** – This article provides suggested guidance for the routine inspection and maintenance of standard oleo struts on Aeronca Champs and Chiefs.

Along with the engine, wings, and propeller, the landing gear ranks high on the list of essential components of a safe and reliable aircraft. During annual inspections, significant time and effort are devoted to the inspection and maintenance of the engine, propeller, and wings. Yet, a similar effort often is not devoted to inspecting and maintaining the landing gear in general and the oleos specifically.

If one walks down the flight line at an Aeronca event, it is relatively easy to spot the subtle signs indicating that the aircraft's oleo struts have not recently, if ever, been removed for inspection or maintenance. The upper end of the oleo is held in the oleo case frame by an AN4-23A bolt, as shown on the left hand end of the figure 1 below. It is not uncommon to see this bolt covered either with paint or sometimes even fabric, indicating that the bolt has not been removed since the aircraft was restored.

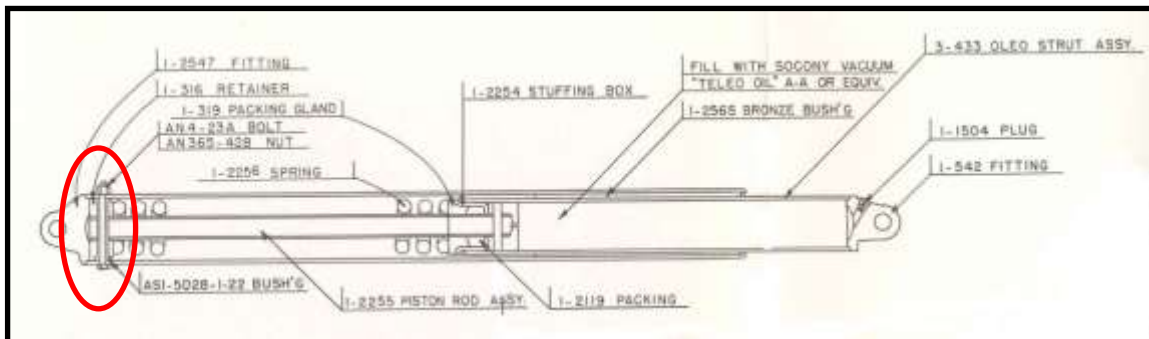


Figure 1

Why is it that during annual inspections we devote so much attention to some devices such as the engine while devoting so little attention to other devices such as the oleos? A couple reasons may be that we are not aware of the importance and complexity of the oleo with respect to the safe operation of the aircraft. Another may be that we are not aware of some relatively simple and straight forward procedures for inspecting and maintain the oleo struts. When properly maintained, the oleo should provide years of safe and reliable operation.

This article will differ from other articles on oleo struts in that we will focus specifically on routine inspection and maintenance techniques that can and should be performed during each annual or 100 hour inspection to assure long term safe and reliable operation of your oleo struts.

In order to properly inspect the oleos, they must be removed from the oleo case frame.

This is a relatively easy task that can most efficiently be performed at the same time as the wheel bearings and brakes are being inspected and maintained.



The first step is to lift the aircraft landing gear off the ground. While there are a number of safe methods for doing this, we used an engine hoist attached to the upper firewall engine mount attachment point as shown in the photo. In this photo the lower bolt attaching the oleo to the axle has already been removed. Depending upon whether or not the wheel is removed when inspecting the oleo will determine how high the aircraft must be lifted to

allow the oleo to swing past the tire, brake drum, or other obstructions.

With the oleo loose from the axle, check the fit of the oleo in the oleo case frame. There is a brass sleeve inside the oleo case frame that the lower end of the oleo slides up and down in. The clearance between the bushing and the oleo for new components is from 0.002" to 0.009". This means that there should be very little wiggle room between the oleo and the oleo case frame. If the oleo rattles around in your case frame you need to inspect the brass bushing in the oleo case frame very closely once the oleo has been removed. Replacement of the oleo case frame bushing is a relatively complex task that should not be undertaken without the proper tools and knowledge.



Next, the AN4 bolt at the top of the oleo case frame must be removed. (Shown in the red circle on the photo).

With the upper bolt removed, the oleo "should" just slide out the end of the oleo case frame. However, if you have not removed the oleo in a while, you may need to apply a bit of persuasion. As shown in



the photo on the left, insert a properly sized pin punch or bolt into the lower oleo attachment fitting and tap on it with an appropriately sized hammer, until the oleo eventually slides out the oleo case frame.

Once the oleo has been removed from the oleo case frame, it should be cleaned with varsol or other grease remover. The oleo should resemble the one shown in the photo below. The oleo body should be smooth and scratch free, indicating that it was properly lubricated and moved freely in the case frame brass bushing. The spring should not have any signs of rubbing on the case frame. One important detail to look for is the clearance between the packing gland and the top of the stuffing box. This is the gap shown in the yellow circle on the photo. The



spring pushes on the packing gland which in turn squeezes the packing in the stuffing box to create a seal between the

case and the piston rod. When the packing wears, the packing gland will gradually move closer to the stuffing box. When the two touch, the packing gland can no longer exert force on the packing and the oleo will begin leaking fluid. Without fluid, the oleo cannot function as a shock absorber and the oleo and landing gear will beat itself to



pieces. This next photo shows an oleo in which the packing gland has just come in contact with the stuffing box. When the fluid in this oleo was replaced, the fluid leaked pass the packing. If you have an oleo that is leaking fluid, this is the first place you should look. If the gap no longer exists, you need to either replace or add packing. This is a relatively easy task that can be performed in the average workshop.

When I came across this problem with the oleo shown in the photo, I called Bill Pancake to discuss the options for repair. Bill suggested that rather than replacing the packing, it is much easier to just add additional packing on top of the packing already in the oleo. Over time the existing packing has been form fit to the oleo and there is really no reason to disturb it. Therefore the following procedure and photos show the process used for adding packing to this oleo. The first step is to remove the spring from the oleo. There

are a number of ways that this could be done. The method I chose was to use a standard pipe bar clamp and compress the oleo to remove the pressure from the hollow



pin and cap on this next photo. Use a 5/16" pin punch to drive the hollow pin from the cap. You may notice that this oleo has a 1/4" brass bushing on the end of the spring. The bushing was previously added to this oleo to help level the plane and is otherwise not related to this article. Once the hollow pin is removed, the clamp is loosened and the oleo is removed. This allows the



cap and spring to be removed from the oleo piston rod. With the spring removed, you should be able to move the piston rod in and out and hear the fluid rush through the orifice in the internal assembly. It is now time to drain all the fluid from the oleo. To do this remove the 1/8" plug from the base of the oleo. Holding the oleo vertically, place the drain hole in a container. "Slowly" move the piston rod to push the fluid out of the oleo. Depending upon how often the oleo has been serviced the fluid may range from nice clean red brake fluid to black gunk. Caution that if you move the piston rod to fast the fluid will squirt all over everything. Once the fluid has been removed, slide the piston all the way down to the drain hole. With a flashlight, look in the drain hole



and verify that the oleo has an aluminum rather than micarta piston. You should never reinstall an oleo that has a micarta piston. The piston should be replaced. That again is a job that is beyond the scope of this article. Once the fluid has been removed from the oleo, extend the piston rod and inspect the surface. It should be smooth and shiny for the first 3 inches near the packing gland. If it isn't, the packing will not seal against the shaft. The piston rod can be replaced, but again that is a task that is beyond the scope



of this article. Now the packing gland can be slid back from the stuffing box as shown in this photo. The packing gland fits very loosely in the stuffing box so it should be easy to slide. If the packing gland is damaged, they are available from Univair.



With the packing gland slid back, you should now be able to view the existing packing in the oleo as shown in this photo. If the existing packing appears to be in good condition as the packing in this photo does, there is no need to remove it. Additional packing can be added on top of it. Graphite faucet stem string packing is available from most hardware stores and plumbing shops. My local hardware store carried "Do It" brand packing. The



container was labeled as 3/32" X 24" (#402254). The intent is to add enough packing so that when it is totally compressed it will result in about a 1/8" gap between the packing gland and the face of the stuffing box. It is somewhat trial and error to get an adequate amount of packing added. The



photo on the right shows the uncompressed position of the packing gland after the first two wraps of packing were added. Note the red wheel bearing grease on the piston rod that was added to help lubricate the new packing. After this

After this

packing was compressed with the spring, the packing gland was again slid back and an additional wrap of packing was added. It would be easy to say that now all you need to do is reinstall the spring over the piston rod, install the cap and the hollow pin, but the task isn't quite that easy. In order to reinstall the cap, the spring must be compressed and the piston rod must be pulled up through the spring. I asked Bill how he did this and



of course the answer was that he had a custom jig that he had designed and built many years ago when he was doing a lot of oleo repairs. Not having a jig, I fell back on a method that John Baker described in his article on oleo repair in which the spring is

compressed and safety wire is used to hold it in the compressed position while it is



installed on the oleo. The spring is compressed about an inch in the bar clamp and .040 safety wire is fed from end to end on the spring and tightened to hold the spring in the compressed position. Three loops of safety wire are equally spaced around the spring to hold it straight. A single piece of safety wire is then attached to the end of the piston rod and is used to pull the piston rod through the spring. The cap and hollow pin are then replaced in the end of the piston rod. The oleo is again placed in the bar clamp



to compress the spring and remove the tension from the safety wire. With the wire tension relieved, the safety wire can be removed. The photo above shows the oleo reassembled. Note the gap between the stuffing box and the packing gland.

The last step is to refill the oleo with fluid. I use Aeroshell #41 red brake fluid in my oleos. There are other approved fluids available. I use a small pumper oil can with a plastic tube on the end to fill the oleo. I stand the oleo on end with the filler hole at the top and pump in fluid until the unit is completely full. I then tap and shake the oleo a bit to get the air bubbles out and top it off again. After the oleo is full, the fill plug is reinstalled. Installation of the oleo is basically the reverse of the process used for removing it. The upper hollow pin in the oleo is aligned vertical and the oleo is slid back into the oleo frame. It should slide in very easily. You may need to wiggle it around a bit if the packing gland hangs up on the oleo frame bushing. A small pin punch or small screwdriver should be placed in the upper hole on the oleo frame so that you can tell when the oleo comes in contact with the pin or screwdriver.



The pin or screwdriver is then removed and the oleo is inserted another 3/8" or so until the hollow pin aligns with the holes in the oleo frame. Make absolutely certain that the AN4 bolt actually passes through the hollow pin in the upper end of the oleo. Once the upper bolt has been reinstalled, the oleo can be swung down and the bolt between the lower end of the oleo and the axle can be reinstalled. A cotter pin should be installed in the oleo to axle bolt and if appropriate, the fill plug should be safety wired. The plane can then be lowered. The plane can be rocked back and forth and no fluid should be leaking from the oleo. Three or four pumps of grease should be applied to the grease zerk on the oleo. It is important to

remember that all inspection, maintenance, alterations, and documentation should be done in accordance with Part 43 of the Federal Aviation Regulations (FAR).