

**THE LUSCOMBE ENDOWMENT, Inc.**

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**SERVICE INFORMATION for the FUSELAGE TANK AND GAUGE SYSTEMS**

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Various questions have arisen on the telephone and Luscombe List during the past 6 months which need further explanation to Luscombe owners and mechanics.

Question #1: I have a fuel smell in the cockpit when the fuselage tank is filled, even during flight. Is it possible that the fuel gauge is leaking?

Question #2 I think my fuel gauge is leaking, leaving a smell in the cockpit, how can I stop the leak?

Question #3 I cannot read my fuselage tank fuel gauge. How can that be repaired?

Question #4 My fuselage tank gauge does not move- can this be repaired?

Question #5 How do I tell what kind of fuel gauge is in my Luscombe fuel tank?

**These, and other questions will be answered in this article.**

As always, we will advocate doing the repairs properly, safely, and completing the job so that the airplane is returned to service with a sealed tank, and an accurate fuel gauge that may be used by the pilot to confirm the fuel remaining with his time aloft calculations..

**Question #1: I have a fuel smell in the cockpit when the fuselage tank is filled, even during flight. Is it possible that the fuel gauge is leaking?**

Answer #1: It is possible that the gauge leaks, but this "fuel smell" in the cockpit problem is common in Luscombes, especially those with the fuselage tanks. Some of this can be due to overfilling of the tank, which then spills into the fuselage or wing area, but most of this problem is due to a funky construction issue in the original tanks.

All Luscombe fuel tanks were originally constructed with a small aluminum filler neck that was then RIVETED to a steel filler bung that fit over this small neck, on to which the vented fuel caps screwed.

Sealing between the bung and the aluminum neck was almost non-existent, leaving a vent space that would allow the pressure cap to vent past the neck and in to the interior of the airplane.



This un-intended ventilation will / does siphon vaporized fuel (and fuel odor), into the cockpit both on the ground and in the air.

On all tanks that we repair, overhaul, or have built, the Luscombe Endowment and Classic Aero removes the old filler neck assembly, and we weld a new aluminum female bung into the hole, creating an air-tight tank seal which retains the vent vapors into the tank.



This welded joint prevents the pressurized vent air from flowing into the vented tank, and past the riveted bung attachment, and carrying with it fuel vapors from the tank vent space into the cockpit.

The same kind of filler attachment is on the wing tanks, and can contribute to a fuel smell in the cockpit, but usually the ventilation in the wing takes the vapor overboard through the wings, rather than into the cockpit.

Also when overhauling and repairing tanks we replace any corroded aluminum skins, the drain attachment or drain well. The aluminum used by Luscombe was 3003, this alloy tends to corrode where left in contact with alcohol and water internally, causing the skins to pit from the inside. This pitting causes pinhole leaks, so when you repair one hole, usually another shows shortly thereafter, because the pitting is likely to occur in several areas.

After discovering this phenomena on the first set of tanks I attempted to repair, I adopted the philosophy that the tank must be opened for a full internal inspection, then the removed skin replaced with new skin, and re-welded at the joints upon re-assembly. This effort creates a "good as new", or "better than new" assembly for the customer. Unfortunately this all takes time; and time is paid labor. FWIW the proper welding of aluminum does not come cheap (about \$80-90 per hour here)

**Question #2, #3, #4 & #5 are answered below.**

**I think my fuel gauge is leaking, leaving a smell in the cockpit, how can I stop the leak?**

There are two types of fuel gauges that were installed on the Luscombe airplane fuselage tanks, One is the Ford style gauge- Luscombe PN28625, the other is a Harding gauge. Their positioning is similar in the tank, about 3/5 of the way up the front side of the tank, retained by a large jamb nut, inside a welded bung on the front of the fuselage tank.

The **Ford style** Luscombe gauge is similar to the Ford model 'A' installation.



Attachment is by a 12 point threaded nut, against the gauge, with brass slip ring, against a cork or neoprene gasket that seals against the welded bung.

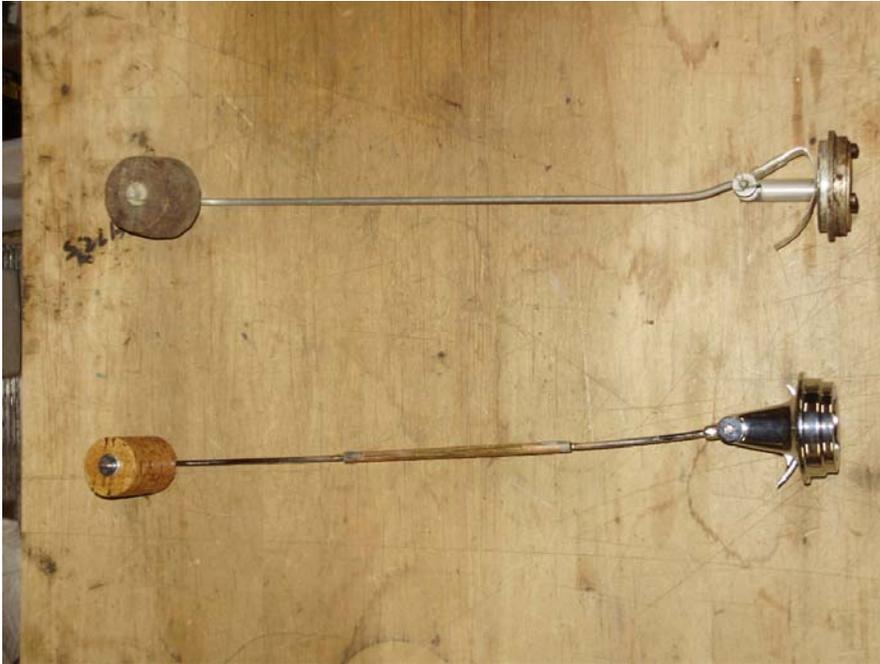


A special external (aluminum) wrench is used to tighten the retainer nut, while an internal wrench is used in the sight glass to hold the gauge vertical to the tank.



A standard Ford gauge can be installed to plug the hole in the tank, but it will not be accurate as to fuel on-board. It will only be accurate for about 30 minutes at  $\frac{1}{2}$  full, while remaining in the FULL position for about 1:20 minutes, and in the EMPTY position for about an hour.

The properly modified gauge to meet the Luscombe print requires a template extension of the float arm to make the indicator arm longer. The use of a properly modified gauge will then give fairly accurate fuel indications, though I still would rely upon a clock, and consider the gauge nothing more than a plug to keep fuel out of the cockpit. Both Classic Aero and Univair have the properly modified fuel gauges for the fuselage tanks for about \$90.



THE TOP GAUGE IS A HARDING UNIT- side view;  
THE BOTTOM UNIT IS A MODIFIED FORD STYLE GAUGE.

Simply installing an un-modified indicator will only plug the hole in the side of the tank, and results in no accurate gauge readings because the short arm shows full for about 1.1 hours, and empty for about 1.3 hours, and is accurate at  $\frac{1}{2}$  tank for about 30-45 minutes of flight. Properly modified and accurate gauges built to the Luscombe prints dimensionally, can be obtained from Classic Aero at 480-650-0883. (A similar FORD style indicator is used in the very early 11.5 gallon wing tanks, except in that wing installation the float arm is shortened considerably to match the tank profile.)

We are aware that poor reproduction FORD style gauges are available to Luscombe owners cheaply through WAG Aero and others, and that the machining is not good, and that the threads are not good either. The best quality units should be procured (read \$\$), and they should be properly modified to the print before use in an airplane, otherwise it is an illegal part installed in a critical/essential system. I am sure that Univair must do some re-work to the threads of the nuts and gauges to make the reproductions fit, however I have always had a good fit into the bungs, with the biggest problem being holding the gauge on-center with vertical orientation.

### **HARDING FUEL GAUGES**

The second style of fuselage tank gauge is the "Harding" gauge which can be identified easily by the three small screws in the gauge face-plate. These screws retain the face plate into the gauge body.



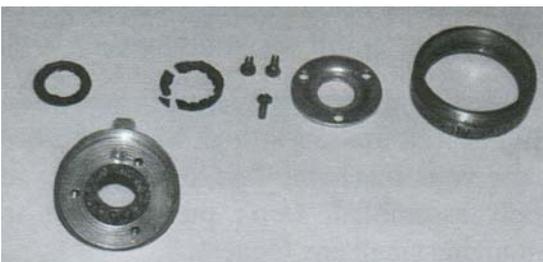
**PICTURE IS A TYPICAL HARDING GAUGE-  
NOTE THE STAINED AND CHIPPED PLASTIC FACEPLATE**

The operation of the Harding unit is similar to the Ford style, but installing that gauge is more complex, there are fewer / no parts, and very little support to repair the gauges. If one intends to use this gauge, it will be necessary to fabricate all of the gaskets AND a new faceplate to make repairs. Generally one is better to replace the Harding gauge with a Ford style gauge of better quality, which is readily supported, and more versatile.

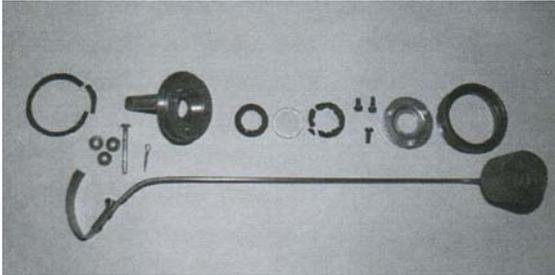
UN-fortunately, the fuel tank welded boss used for the Harding installation is about .040" LESS deep than the welded bosses used for the FORD style indicators. This sometimes (50%), causes the indicator face plate to contact the rear of the boss inside the tank, thereby preventing full movement of the gauge throughout its range.

When I overhaul/repair/install the FORD style gauges, I use compressed air INTO the filler neck, and a long pear shaped die to remove some of the boss on the interior of the tank. In this fashion, the chips blow OUT the tank gauge hole, and flushing of the tank for leftover parts and bits becomes minimal.

Similar to the FORD gauge, the Harding gauge is held in with an external nut that is rotated by two spanner pins, or more often, a vice grip or a medium sized plumbers pipe wrench.



When removed, the Harding gauge displays many more parts, most of them fragile and or worn out.



Because ALL of the Harding parts are of poor quality, No one has elected to support or to re-sully them, because of the cost, versus benefit & risk of repairing a marginal system while the Ford system components are available and cheap, with proper drawings for their use, and nothing of that sort exists for the Harding gauges.

Should you need tools or supplies for the Harding gauges, please contact Doug or Donna to see what they can offer in the way of further support. It is likely that a cache of bits for these components might exist SOMEWHERE, and if we can find part numbers or sub-part numbers, we could find them for you and supply the owner restoration of the component. Otherwise, as Al Dyer and Dan MacNeel pointed out in their discussion of the subject 'you are really on your own'.

#### **FUSELAGE TANK FAILURES.**

In the FWIW category, I would like to point out that the cables and hardware restraining your fuselage tank (and 86# of fuel), are not regularly removed and inspected, and that they are imbedded in felt that retains water, where those cables and hardware corrode. We have seen two non-flying airplanes where these cables were nearly rusted through. This is an area to check once or twice each 50 years, so we suggest an inspection, and if you need cables, or other hardware, be advised that Classic Aero LLC and Univair can provide these for installing the fuselage tanks, as well as the mounting felt, and the former board in the fuselage.

SIMILARLY, we have recently had requests to repair a number of fuselage tanks that appeared fine, except for "seepage". Once we removed the rear section of tank, the internal pitting in the drain well area and rear wall became VERY apparent. We replaced all the damaged metal and welded it all back up with great results, and happy customers.

As always, you can contact the Luscombe Endowment for further information on this and other Luscombe maintenance subjects, or if you need to procure a WIN ME raffle ticket (or three). The Endowment has sold about 75% of the tickets, and we are looking forward to completing the drawing very near term for the 2011 airplane.

For the Luscombe Endowment by  
Doug Combs

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The Luscombe Endowment