Testing>Calibrate fuel gauges

Objectives of this task:

To calibrate the fuel gauges so that they show the amount of fuel remaining correctly and to mark a fuel dipstick at the same time.
In this task you will be working with flammable fuel and you should take precautions such as having a suitable fuel extinguisher close to hand and no naked lights of any kind nearby.
In the task *Post-Paint>Wings>Prepare wings for fitting* you set the empty indication of the fuel gauges, now you must check the other indications: ¼, ½, ¾ and full.
To do this you must have the following:

- A fuel supply of at least 135 litres of clean aviation fuel (AVGAS)
- An accurate means of measuring the fuel as it is dispensed
- Clean, sealable fuel container(s) capable of holding around 135 litres
- 2 metres of fuel grade tubing and a 1 litre container
- A length of clean wood or aluminium about 300mm long to use as a fuel dipstick

Some aircraft refuellers may allow you to use a part of their ramp area for this test provided that you purchase your fuel from them. The calibration process should take less than an hour.

Level the aircraft

Park the aircraft on the level surface and chock the main wheels.
Use a spirit level to check the aircraft for level: laterally level across the bottom of door sills; longitudinally level along the door sills. Pack under the wheels if and as required to level the aircraft. If the surface is exactly level you can measure the distance from each wingtip to the ground as a final check of lateral level, but the spirit level is the best reference.
The rest of this task depends on the aircraft remaining level throughout, so chock it carefully.

Find the zero fuel level

Remove the upper engine cowling.
Disconnect the fuel line in the engine bay at the firewall fitting and run a length of fuel line from the firewall fitting, down and out of the lower cowling and into a clean fuel container.
Turn the fuel tap on the console to the ON position, with the lever facing forwards.
Remove both fuel caps and pour a small amount of fuel into each wing tank. Allow the fuel levels to settle until some fuel runs out into the container. When the fuel no longer runs out of the line the header tank will be full and the wing tanks empty: this is your zero fuel level.

Lock off the fuel lines

Now that you are at the zero fuel level the fuel lines from each wing tank must be locked off be clamping both the front and back fuel pickup lines. Remove the lock wire around the fuel sheathing at the rear of the wing root to expose the fuel lines as they enter the cabin.
Clamping of the fuel lines must be done carefully so as not to stress the fuel line, so use a rounded surface with no sharp edges to bear against the fuel lines and apply just enough clamp pressure to close the line, no more. Medium size spring clamps will excerpt enough pressure to clamp the lines shut.

Calibrate the fuel gauges

Fit the fuel gauge calibration decal around each wing tank gauge opening in the wing root with the Zero indication on the decal placed against the fuel gauge needle – at this point there is no usable fuel in either wing tank.

The process now is to add 10 litres of fuel at a time to each tank in turn and mark carefully what each gauge needle indicates on each decal (use a pencil initially), and at the same time dip your fuel dipstick into each tank and mark carefully where the fuel level is on the dipstick.

If you have installed an engine management EFIS please refer to the documentation supplied with the unit for details of how to calibrate the equipment during this task.

If any fuel runs out of the temporary line from the firewall it indicates that there is not enough clamping pressure on a fuel line, so check carefully for any dribbling when the first fuel is added to each wing tank and make sure that it is corrected before proceeding.

Continue adding fuel in 10 litre increments until each tank is full, noting at each stage the gauge needle position for each tank each and marking the appropriate end and side of the fuel dipstick. Each wing tank will hold approximately 60 litres of fuel.

Once both tanks are full and each decal and each end of the dipstick have all been marked, remove the clamps from the fuel lines and check ***very carefully*** for any sign of weeping or leaking from the part of the fuel lines where the clamps were applied.

Any sign of a leak will require that the fuel be drained from both tanks (otherwise it will cross feed from the full tank to the empty tank) and complete replacement of the leaking fuel line.

Note that fracturing of the fuel lines after clamping is a rare occurrence that is only likely to happen if the fuel lines are very old, for example in a long-delayed build that has sat for many years. If this is the case we strongly recommend that **all** fuel lines be replaced before flight – if one fuel line is weak then the others are very probably in a similar state.

Even if your fuel lines are new you **must** check each line carefully for leaks after clamping.

Once all of the fuel lines have been checked and there are no leaks the protective sheathing can be refitted and lock wired back into place.

Flush all of the quick drains thoroughly – drain at least 500ml of fuel out of each one, more if there is any sign of dirt or debris: flush until the fuel runs clean from each drain.

Now you must drain all but 20 litres from each wing tank in preparation for test flying: use the temporary line from the firewall fitting and let both tank drain down to the 20 litre mark – you can use your new calibrated fuel dipstick to check the fuel level.

If you are using ramp space at the refuellers you may wish to push the aircraft back out of the way for the draining process, which can take some time. You may use the electric fuel pump to speed the draining process up. Record the time taken to fill a 1-litre container both with and without the use of the electric fuel pump and save the result for the *Final inspection checklist*.

Once the draining process is complete, reattach the fuel line from the carburettor to the firewall fitting and tighten the hose clamp and then refit and lock wire the fireproof sheath.

Mark the fuel gauge decals in a permanent manner. Keep your calibrated fuel dipstick in a handy location such as a door pocket and consider making a spare copy, just in case.

This completes the *Testing>Calibrate fuel gauges* task.