Fuel, unreliable gauges, the CAA – and what to do about it

by Rufus Heald

THE obvious difference between an aeroplane and a glider is that the aeroplane has some form of mechanical propulsion. So, unless you want to fly a glider – and there is nothing wrong with glider flying - it is as well to keep the engine running.

To do this we MUST have fuel.

Normally this is AvGas LL, which is simply the shorthand name for Aviation Gasoline - Low Lead, and is by far the most widely used aviation petrol. Some aircraft use MoGas, or Motor Gasoline, but whichever fuel your aircraft uses, unless you have enough, your engine will stop and you will find yourself flying a glider.

So how do you know if you have enough? In your car I expect you look at the fuel gauge and when it gets near zero then you call into a nearby garage to fill up. Unfortunately you can't do that in a light aircraft.

Why? Because most fuel gauges in them either grossly over- or under-read. And some simply read zero all the time. Whichever, it is not safe to trust the gauge. Just recently the Civil Aviation Authority has been hammering pilots who inadvertently run out of fuel. Probably intended to be a good way to encourage the rest of us!

In many aircraft it is possible to either look into the tank or use a dip stick to measure how much there is. Both are excellent ways of finding out how much fuel you have at the start of a flight. The trouble is that the fuel consumption is only approximate and can vary by a factor of about three!

Not a lot of use if the range is critical! Naturally, every pilot should know how to fly his – or her – aircraft to get the best range but just think what it would be like if you had no fuel gauge on cars. People would be running out of fuel all over the place, and I am sure that the Government would soon introduce legislation requiring all motor vehicles to carry an accurate fuel gauge. Yet, for some reason, this doesn't happen with aircraft. We are left to assume that our calculations are accurate and if, for some reason, our aircraft is a particularly thirsty one, then if we run out it is our fault and not the manufacturer's!

The other thing about fuel is that, since we have to carry it with us, we have to know its weight. Even with the best will in the world, if our aircraft gauges are wildly inaccurate and we can't dip the tanks, we are legally required to KNOW the weight and to use it in calculating aircraft weight.

Just to help us, the pumps sell the fuel in litres, although nearly all the fuel gauges are calibrated in US gallons, or sometimes in Imperial gallons - but never ever in pounds or kilograms. Yet that is the figure we are required to know!

So even if the gauges did work properly, they would involve us in an assumption of the specific gravity of that particular load of fuel, and then a calculation of how heavy it is. Not really conducive to accurate fuel weight, is it? In the real world, the only time I really KNOW how much fuel there is in my aircraft is when the tanks are full to the top, or when they are empty!

Unsatisfactory

But with, full tanks, I will be over the maximum take-off weight if all seats are occupied! This means that I will have to take off with a part fuel load, which I have estimated to consist of 'x' gallons or litres and which I have then converted to pounds or kilograms. I will then have to estimate how much my fuel burn will be and divide this into the estimated fuel state to see if I can get to my destination with sufficient reserves. Not really very satisfactory, is it? If I happen to have estimated wrongly then the CAA will be down on me like a ton of bricks and there is a fair chance that I will be prosecuted.

OK, that's the down side. So what can we do to help ourselves? Perhaps we should work backwards. First we need to calculate how much time it will take us to get to our destination. Then, using the flight manual, we have to calculate how much fuel we will need for such a flight, but only if we set the engine up correctly for minimum fuel burn.

An accurate as possible fuel check is vital before every flight - but how can the pilot be sure of the readings, when fuel gauges are so often inaccurate?

Next, we have to convert this to pounds or kilograms to see how much available payload we have, then we have to estimate how full the tank is and add sufficient fuel to bring it up to our calculated figure. Then we have to add some contingency reserves, and make an allowance for having probably 'guestimated' the wrong figures. And *then,* we can go flying.

Mark you, if we still get it wrong, the CAA will be happy to prosecute us for negligence, although I must admit, I am a bit puzzled to know where we have been negligent. I consider that if an individual has worked it all out to the very best of his ability then it is simply a lack of skill, not a lack of care. When one considers the many variables which are assumed it is a wonder we ever get it correct.

If you fly a particular aircraft for 100 miles, the amount of fuel used can vary immensely. If the engine is correctly set up it will burn a certain amount of fuel. But if we have set the pitch a little too fine, or the manifold pressure a little too high or the fuel flow a touch too rich, or the aircraft is covered in dead flies or mud, or the rudder trim is set slightly cross controlled, or the propeller is heavily grass stained and has had several small nicks removed, or any or all of these, then the fuel consumption will be higher than we have calculated.

And we are now getting near the situation where we don't have enough for the flight. We are all cowards at heart, so I am sure we will all have added extra fuel 'just in case'. So the aircraft is carrying unnecessary weight, we have our hard earned money tied up in fuel that we are not going to use (we hope), limited our pay load and reduced the aircraft's performance.

All because the aircraft manufacturer has seen fit not to bother with an accurate fuel gauge and to provide an engine which requires several manual adjustments to give the optimum performance.

They do it with cars

Car manufacturers are able to produce accurate fuel gauges – together with a warning light for when the fuel is getting low. They produce engines that need no manual adjustment of anything.

In my car, I get the correct fuel flow for all conditions including altitude and density, so I get the designed fuel performance and I know if I can get to my destination. So I have no excuse for running out of fuel - I would roll to a stop and go and get some more.

In an aeroplane it matters a lot if you run out of fuel. You are unlikely to be able to glide to a nearby airfield to refuel, so you have to be careful about having significantly more than enough. I have several times very nearly run out of fuel in aircraft with very accurate fuel gauges. I ran out only once, but that was an aircraft whose gauges were both over-reading by about 40 gallons. (a new aircraft which had been incorrectly calibrated).

I have never run out in a car. And I have driven far, far more hours in cars than I have flown in aircraft.

I wonder how much money and time is wasted in a year carrying extra fuel in every light aircraft, just because the technology which is available, is not used to prevent this problem.

It's time we all made a fuss about being exposed to this danger.

Really accurate fuel gauges and accurate fuel flow indicators calibrated in pounds or kilograms per hour, plus an engine management system that automatically sets the optimum flow, would eliminate most of the inherent risk.

Then the CAA would be justified in prosecuting those who would still manage to run out of fuel, because then it really would be negligent.

Happy (fuel in tank) landings!