# FUEL FOR THOUGHT

The runway behind you, the air above you, and the fuel you left behind…

## Vivid recollections and advice from a number of high-flying Kiwis showed why you can't afford to have your head in the clouds where fuel is involved.

Attendees of AvKiwi Safety Seminar 2017, "*Fuel For Thought*" were confronted with a worrying statistic – 40 per cent of engine failures are caused by fuel exhaustion, starvation, or contamination.

Of that 40 per cent, starvation occurrences are the most common. The fact that the majority of those likely resulted from pilot error illustrates the need to improve pre-planning, inflight fuel monitoring, and aircraft knowledge.

Almost 1900 people at 32 seminars from Invercargill to Kerikeri have received a masterclass on fuelling considerations, while also gaining early access to an app we believe is a world first.

Each section of the safety seminar was illustrated by an occurrence from the CAA files. We've provided snippets from the case study on contamination, but you also need to check out the *Fuel for Thought* online course at www.caa.govt.nz/avkiwi. It's loaded with facts and videos from folk who have volunteered their stories so that you can benefit from their experience.

### Contamination

When asked to give examples of fuel contamination, AvKiwi crowds often responded first and foremost with "water".

The following account, involving CAA Flight Examiner, Marc Brogan, shows that contamination isn't always that straight forward.

"Around May 2005," begins Marc, "a young CPL student decided to lease an aircraft from down south to build his CPL hours.

"When he and a PPL mate picked up the aeroplane, they were told that at lower altitudes, the aircraft could run rough. If that happened, they were to just lean it out. Apparently that was the approved 'fix'.

"They headed for home, and on the way found that the aircraft was no well-oiled machine.

"The two pilots stopped for fuel and did a bit of a logic check on what was wrong. A local engineer assured them it was carb icing, as did a senior instructor at the aero club where they had also stopped."

They eventually reached home base without further drama, and a day or so later, the CPL student suggested to Marc, that the two of them go for a fly.

"Sure enough, at low level, approximately 1500 feet, it needed to be leaned out," continues Marc.

"But it seemed to perform fine and there were no further issues. We did what we needed to then headed back to the aerodrome. On arriving back we decided to do a touch and go, but passing 200 feet after climbing out, the engine started to run alarmingly roughly."

As there were very light winds and no traffic, Marc called the tower and requested they be allowed a dumbbell turn, landing back on the runway.

After a safe landing, Marc committed the machine to a thorough inspection before any more flying was done.

The duty engineers stripped the engine down. A piece of hose clamp 4.3 cm long was lodged in the carburettor throat, meaning there wasn't enough air getting in, hence the need to lean the mixture out.

There was no logical explanation as to how it had got there but it had obviously been there for a significant period of time to cause that rough running.


This hose clamp was found lodged in a carburettor throat, giving new meaning to the words, 'fuel contamination'.

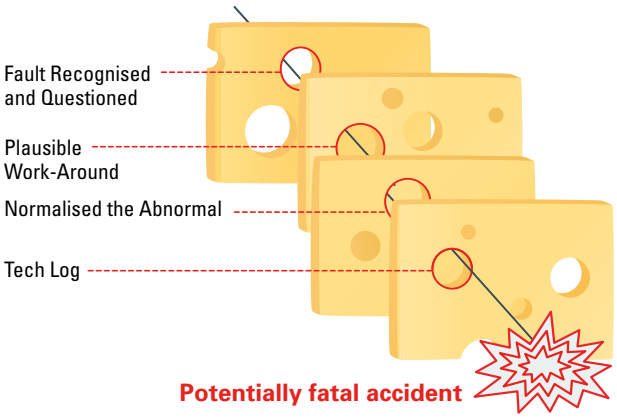
## Lessons

The main lesson from this occurrence surrounds the danger of normalising the abnormal, and over a period of time, developing a 'she'll be right' attitude.

"Over a period of time," says Marc, "this organisation got used to the fact that this engine was running rough. They'd never thought why it might be running rough, they just came up with an immediate solution which was quite a long way from normal practice. That risk then shifted onto the next operator using the machine.

"When we found out what was wrong, it was something that could have been remedied quite quickly with the correct technical knowledge – just thinking about it logically."

## The Swiss Cheese Model




In Professor James Reason's Swiss cheese model of accident causation, an organisation's defences against failure are represented as slices of cheese. The holes in the cheese represent weaknesses in the system. When those weaknesses line up, a hazard passes through the holes, leading to an accident.

***Fault Recognised and Questioned?***

Was this fault ever properly recognised as a reportable fault or even a fuel issue? It doesn't seem so.

***Work-Around Plausible?***

The work-around seemed reasonable and plausible, and was implemented without too many questions being raised. It also seemed to fix the problem.

We all use work-arounds, such as knowing the aerodrome gate sticks and you 'need to lift it when you open it'. But when the work-arounds concern the primary systems of your aircraft, they deserve more thought:

» Why is a work-around needed?

» Who suggested the work-around?

» How long has it been in place?

» How long is it planned to be in place?

» Is there any remaining risk?

***Normalised the Abnormal***

This fault became normal. It was simply accepted that in this aeroplane the pilot needed to lean the mixture at 1500 feet, and then everything was fine.

***Tech Log***

If this defect had been entered in the Tech Log, the fault would have been investigated, isolated, and rectified, removing the risk. ■

## "You Could Well have Saved Someone's Bacon"

One of the key lessons promoted in *Fuel For Thought* was to know your dipstick.

A pilot who attended the seminar wrote in with his feedback.

"You will be happy to know that our dipstick was recalibrated and found to be eight litres out (on one side). That's nearly 24 per cent. I couldn't believe it. You could well have saved someone's bacon!"

The dipstick has now been engraved with useable fuel and the aircraft registration. Most importantly, it reads accurately.

## Know Your Aircraft App

To help you understand more about the fuel system in your aircraft, we've created the ***Know Your Aircraft*** app. You might think you know your aircraft, but when you begin to work through a series of questions, helping you build a mental picture of your fuel system, it can be surprising to find out how much you rely on the aircraft's flight manual to fill in the blanks.

Using the user-friendly drag and drop tool, you will be able to build a schematic picture which you can print out and email to yourself, and others who might be using your aircraft.

The app allows pilots to collect, understand, and retain data on all of their aircraft's fuel-based needs, ranging from how many fuel tanks and vents the aircraft has, to how much fuel is required to climb to a certain height.

It's also handy for those who are undertaking a new type rating, ensuring their knowledge is sufficient for any situation.

Give it a try and if you have any feedback, let us know. It's available, free, on the Apple App Store and Google Play. This is a planning tool and not available to download on your phone. It is for tablets (including iPad) only.