

## A silent killer

Back in the dim distant days of military flying training, the CO could be a daunting prospect, a fact I'm sure club members Chris Brady and Dave Kerr would agree with. The CO's name on the flying program board next to yours usually meant a bit of extra pressure on a flight test or, if you were bumping along on the bottom of the "acceptable performance" curve, a dreaded "scrub ride" and the possible end of your ambition to be a military pilot.

But an even more daunting CO is the one with that chemical symbol – the one that creeps into the cockpit from a leaky exhaust. Carbon monoxide is a by-product of combustion of anything containing carbon, including of course the hydrocarbons that power our aircraft. It's often referred to as a "silent killer" or a "hidden menace" or words to that effect, because it's colourless and odourless, so you can be unaware of it until you start developing symptoms of poisoning. Fortunately, because it's associated with combustion, you may suspect it because there are other combustion products that do have odour and colour, and if you smell or see them in your cabin you can take precautions.

It's well-known that if air for your cabin heater gets warm by being routed past your exhaust manifold, and if you turn your heater on when you have a leak in the exhaust, you can expect to get CO in the cabin. However, consider the ATSB report into the crash of a DHC-2 Beaver into the Hawkesbury River in Sydney on 31<sup>st</sup> December 2017, which found that carbon monoxide exposure was the main cause. Being NYE in Sydney, it's a pretty safe bet that the heater wasn't on, but the aircraft had cracks in the exhaust, which allowed exhaust gas into the engine bay, and three missing bolts in the firewall, which then allowed that gas into the cabin.

The US FAA considers that non-fatal CO poisoning in aviation is more common than reported. In many cases symptoms that may have been put down to fatigue or hypoxia or airsickness may in fact have been due to CO, but because no incident occurred, it was not investigated.

### How it hurts you

CO has a much higher affinity for haemoglobin than oxygen does. What that means is that the haemoglobin molecules in your blood whose job it is to pick up oxygen from your lungs and cart it around your body, if given a choice between an oxygen molecule and a carbon monoxide molecule, will pick up the CO molecule and carry it around. The result is toxic hypoxia, which is hypoxia caused not by lack of oxygen but by a toxin that stops the oxygen from getting to all the parts of your body that need it.

### Symptoms

The symptoms depend on what percentage of your haemoglobin is binding with CO rather than oxygen. They include:

- Less than 10 – no symptoms;
- 10 to 20 – slight headache;
- 20 to 40 – headache, faster breathing rate, drowsiness, blurred vision;
- 40 to 50 – pounding headache, confusion, shortness of breath, drowsiness, more blurred vision;
- 50 plus – unconsciousness, and death if you're not removed from the source of CO.

## What to do if it happens

If you're aware of the symptoms, then any unusual smell in the cabin or any hint of incapacitation means you'll start troubleshooting. For instance, if you're at 4000 feet and you start feeling light-headed, you know it's not hypoxia (unless you're a 2-packet a day smoker, in which case you shouldn't have a medical in the first place), so you can take steps to deal with carbon monoxide:

- Turn the cabin heat off;
- Ventilate the cabin – cabin air control and vents fully open;
- Open the windows if possible;
- Land as soon as practical;
- Get medical attention once you've landed;
- Have the aircraft inspected by a LAME before it flies again.

## How to avoid it

As with all potential killers, the first step is awareness, including knowing the symptoms. The other key factor is having the aircraft in good order. Obviously that means the exhaust and ventilation, but it also means the firewall being in good order and stopping anything from the engine (apart from the noise) getting into the cabin. That's a key element of a 100-hourly. In the case of the Beaver crash, heater or no heater, the aircraft defects alone were enough.

The CO detectors that change colour are useful, but only if you look at them. How often do you check your oil T's and P's, amps and suction gauge in flight? If your honest answer is "not often enough", what's the chance you're going to notice a CO detector turning brown? As with any other warning system, an audible one is better because it will get your attention regardless of where you're looking.

Happy flying, and remember CO<sub>2</sub> in the cabin is good – that means you're alive and breathing – but CO is not.