Safety Matters

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# CARBON MONOXIDE the Silent Killer

## A Summary from the Registry

- Carbon monoxide poisoning has the potential to significantly impair flight crew performance and has been linked to recent fatal accidents.
- Readily available and low cost 'carry-on' active carbon monoxide detection and alerting tools can save lives.

## IOMAR Recommendation

**The IOMAR strongly encourages operators and owners of piston-engine aircraft to install a carbon monoxide detector with an active warning to alert pilots to the presence of elevated levels of carbon monoxide in the cabin. Where one is not fitted, pilots are encouraged to carry a personal carbon monoxide detector.**

## Background

Piston engine aircraft produce high concentrations of carbon monoxide that are conveyed away from the aircraft though the exhaust system.

Cracks in aircraft exhausts and holes in the firewall are very likely to allow carbon monoxide to enter the aircraft cabin. Carbon monoxide poisoning can also be brought about by the gas escaping from combustion heaters or their associated exhaust systems.

Carbon monoxide is a colourless, odourless gas that can cause damage to the brain, heart and nervous system.

- A pilot's ability to control an aircraft is likely to be significantly degraded due to carbon monoxide exposure;
- Symptoms of exposure include; headache, fatigue, sleepiness, breathlessness, degradation in performance. Continued exposure to elevated concentrations can cause unconsciousness and death.

# Recent Fatal Accidents

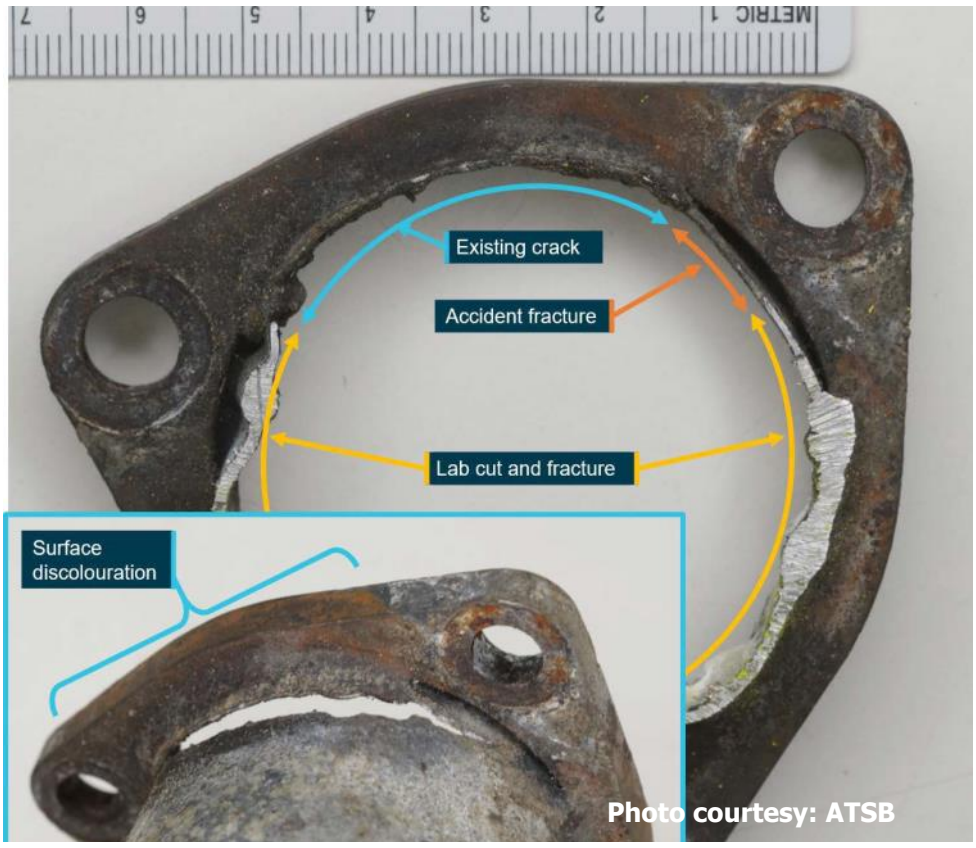
The potential dangers of carbon monoxide exposure have been highlighted by the UK Air Accidents Investigation Branch (AAIB).

Published on 14th August 2019, Special Bulletin S2/2019 concerns a fatal accident involving a Piper Malibu.

A toxicology report on the passenger identified potentially fatal levels of carbon monoxide exposure.


On 29 January 2021 the Australian Transportation Safety Board (ATSB) published its final report into a fatal accident involving a float plane aircraft in the Hawkesbury River estuary near Sydney on 31 December 2017.

After a very lengthy investigation, the accident has been largely attributed to elevated levels of carbon monoxide in the aircraft cabin.



# Detectors

Passive detectors are the 'spot type' that change colour when exposed to carbon monoxide. They are small, light, cheap and easy to fit, but they have a limited declared life, often 3 months. They therefore need to be replaced regularly for continued effectiveness. Whilst better than no detector, the clear disadvantage of these components is that they lack attention-getting capability.

Active detectors provide audible, visible and/or vibration warnings when predetermined carbon monoxide levels are exceeded. These detectors have the clear advantage of actively engaging the occupant's attention and are therefore far more likely to be effective than passive measures. Depending on the type, they can be either portable and therefore 'carried on' to the aircraft or permanently 'installed' in a suitable position on the aircraft.

Commercially available portable motorhome, caravan or boat-compatible units from a reliable source, a known manufacturer, are notably more effective at alerting.

Installed detectors are subject to Form 35 modification application and Isle of Man Aircraft Registry approval.

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# Prevention

Exhaust system failures and/or poor sealing of the bulkhead between the engine compartment and the cockpit can cause carbon monoxide to enter the aircraft. Ingestion into the cockpit can also occur through routes other than the firewall; there is usually a stream of exhaust gas flowing down the outside of the fuselage and poorly fitting cabin doors, access panels, wing root fairings and hatches can provide an entry path into the cabin.

To minimise the likelihood of carbon monoxide contamination during flight, aircraft maintainers are reminded to ensure that aircraft exhaust and associated systems are maintained in accordance with the applicable maintenance data. These can include physical inspection, physical inspection with partial dis-assembly, internal inspection, NDT and pressure testing.

Fitment of oversize nozzles to combustion heaters will increase the concentration of carbon monoxide in the exhaust gases and may cause operating difficulties with the heater. Therefore it is imperative that only nozzles of the type quoted by the manufacturer are fitted and that servicing, overhaul and inspection standards of combustion heaters and their associated exhaust systems are maintained at a high level.


# Recommended Reading

The following sources contain useful information concerning the nature and effects of carbon monoxide, the causes of contamination and means by which the likelihood of exposure can be reduced:

- UK CAA Safety Notice 2020/003 'Carbon Monoxide Contamination Minimisation & Detection in General Aviation Aircraft', March 2020;
- LAA 'Light Aviation' magazine article 'The Canary & the Silent Killer', July 2017;
- FAA report DOT/FAA/AR-09/49 'Detection and Prevention of Carbon Monoxide Exposure in General Aviation Aircraft', 2009;
- EASA Safety Information Bulletins 2010-19 'Exhaust Mufflers Inspection for piston engine Helicopters and Aeroplanes', and 2020-01 'Carbon Monoxide (CO) Risk in Small Aeroplanes and Helicopters';
- Transport Canada Airworthiness Directive CF-90-03R2 'Exhaust Type Cabin and Cockpit Heaters', August 1992 and associated Civil Aviation Safety Alert (CASA) 2019-07;
- CAA Publication (CAP) 562 'Civil Aircraft Airworthiness Information and Procedures' CAAIPS Leaflet B-190 'CO contamination' which provides generic expectations for maintenance-related measures to minimise the likelihood of contamination;
- FAA AC-43-13-1B Section 3 paragraphs 8-45 to 8-52 which provides information on typical failures, hazards, descriptions and inspections including pressure checks, repairs and replacement recommendations;
- CAA Publication CAP 747 'Mandatory Requirements for Airworthiness' Generic Requirement (GR) 11 which covers servicing and overhaul requirements for combustion heaters intended to prevent carbon monoxide contamination.

Photo: www.flyer.co.uk