

Federal Aviation Agency

Cancelled See 32A

AC NO: AC 20-32

AIRCRAFT

EFFECTIVE :

1/22/65



ADVISORY CIRCULAR

SUBJECT : CARBON MONOXIDE (CO) CONTAMINATION IN AIRCRAFT -
DETECTION AND PREVENTION

1. **PURPOSE.** This advisory circular informs aircraft owners, operators, maintenance personnel, and pilots of the potential dangers of carbon monoxide contamination from cabin heaters (exhaust gas heat exchangers). It also discusses means of detection and procedures to follow when contamination is suspicioned.
2. **CANCELLATION.** Flight Standards Service Release No. 428, Danger of Carbon Monoxide Poisoning in Aircraft with Exhaust Gas Type Heat Exchanger, is canceled.
3. **GENERAL.** Carbon monoxide (CO) is the product of incomplete combustion and is found in varying degrees in all smoke and fumes from burning carbonaceous substances. Stoves, furnaces, and the exhaust gases from internal combustion engines are prime sources of the deadly gas. It is a colorless, odorless, and tasteless gas and has long been suspected as the cause of some past aircraft accidents.

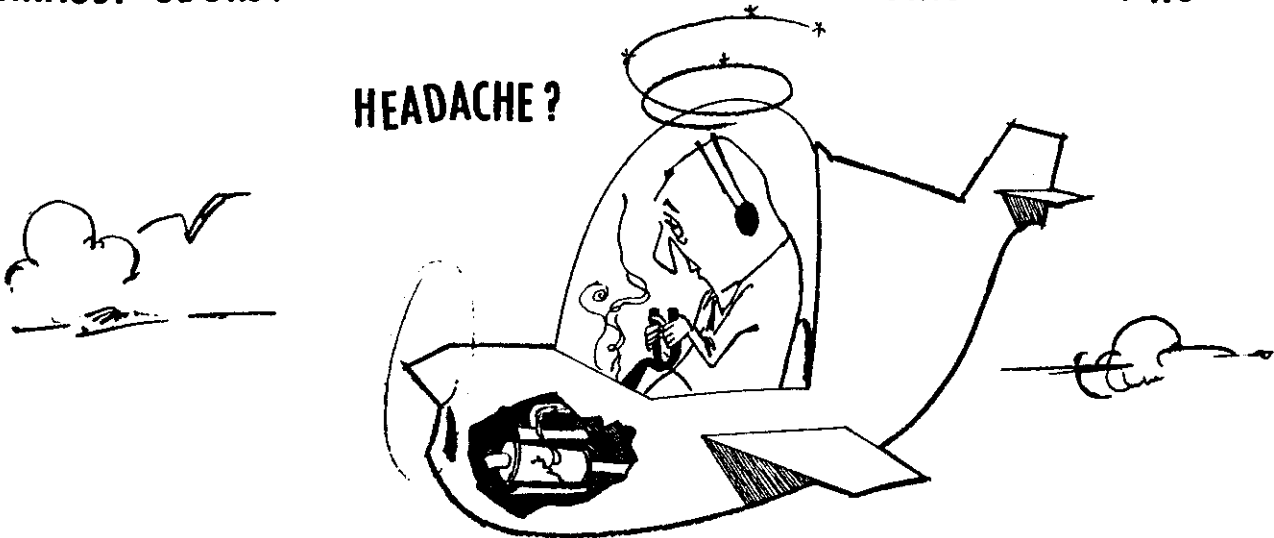
Most light aircraft heating systems utilize a jacket around the engine exhaust as a heat source. A defect in either the heating or exhaust systems may allow carbon monoxide to enter the cockpit or cabin. The danger is greatest during winter months when cold weather requires the operation of the aircraft exhaust source heating system and windows and vents are closed. Carbon monoxide may also enter the cabin through various openings in the firewall or fairings in the area of the exhaust system.

A CO concentration of 0.06 percent causes unconsciousness within two hours. 0.1 percent will bring death in as little a time period as one hour depending on the physical condition of the man; i.e., heavy smoker, respiratory disease, etc.

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4. **SYMPTOMS.** Early symptoms of carbon monoxide poisoning may be indicated by exhaust odors, feeling sluggish, too warm, and usually a tightness across the forehead. More intense headaches usually follow the "early symptoms," with a throbbing in the temples. This may be followed by severe headaches, a general weakness, dizziness, and a dimming of vision. These symptoms can be followed by a loss of muscular power, vomiting, convulsions, and coma. Then the pulse gradually weakens, the respiratory rate slows, and --- DEATH! Air with a CO concentration of 0.005 percent is acceptable. Primary (early) symptoms may be expected at a CO concentration of 0.01 percent.

Susceptibility to carbon monoxide poisoning increases with altitude. As altitude increases, air pressure decreases and the body has difficulty getting enough oxygen. Add carbon monoxide, which further deprives the body of oxygen, and the situation can become critical. Inhalation of cigarette smoke introduces CO into the body in substantial and significant quantities.

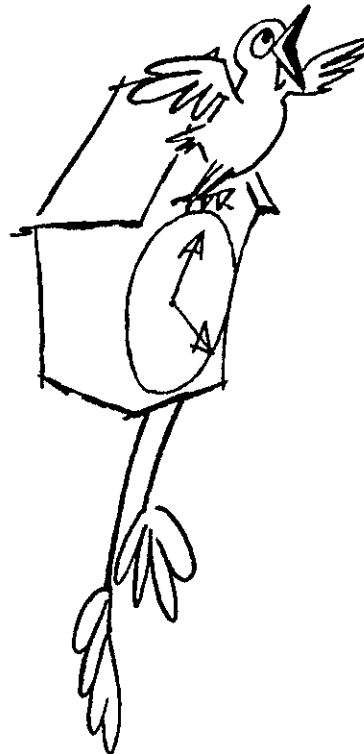
EXHAUST ODORS?**FEEL DROWSY?****FINGER TIPS TINGLE?****HEADACHE?****DON'T IGNORE CO SYMPTOMS !!**

5. WHAT TO DO ABOUT SYMPTOMS. The best protection against carbon monoxide is alertness to its symptoms. If you begin to feel headachy, drowsy, or sluggish, you should immediately assume carbon monoxide is present and take the following precautions:
- a. Immediately shut off the cabin air heater and any other opening that might connect the engine compartment air to the cabin.
 - b. Open a window and any other fresh air source immediately.
 - c. Avoid smoking of cigarettes.
 - d. Breathe 100 percent oxygen if available.
 - e. Land at the first opportunity and insure that any effects from CO are gone before further flight. Initiate investigation to insure that no CO is being allowed to enter the cabin because of a defective exhaust, unsealed openings, or other factors.



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BE AWARE

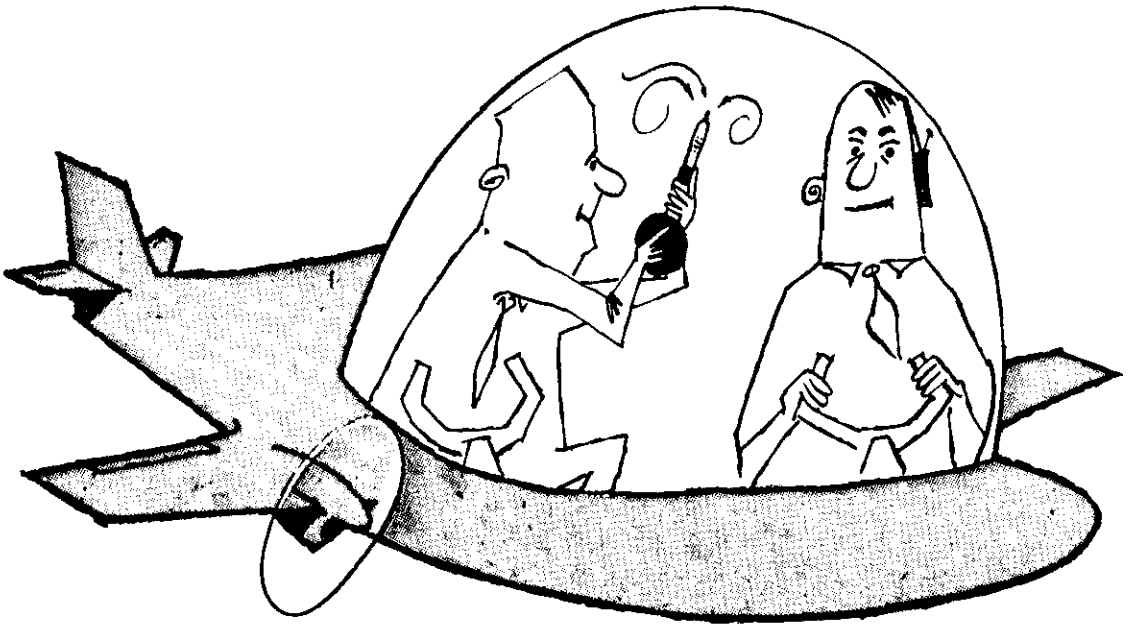
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6. IS YOUR AIRCRAFT A DEATHTRAP? A physical inspection of the exhaust manifold and heater assembly should be conducted at regular intervals and whenever CO contamination is suspected. This should be included in the periodic inspection. Cracks and holes may occur in a relatively short time and supplemental inspections should be conducted. Many aircraft manufacturers recommend that exhaust and heater systems be inspected as often as every 25 hours of flight time. Carbon monoxide sources to the cabin have been traced to worn or defective exhaust stack slip joints, exhaust system cracks or holes, openings in the engine firewall, "blowby" at the engine breather, defective gaskets in the exhaust manifold, defective mufflers, and inadequate sealing or fairing around strut fittings on the fuselage or cabin. Another source of CO contamination comes from following jet aircraft on takeoff, or "ground holding" prior to takeoff. If possible, you should position your aircraft out of the exhaust area of preceding aircraft.



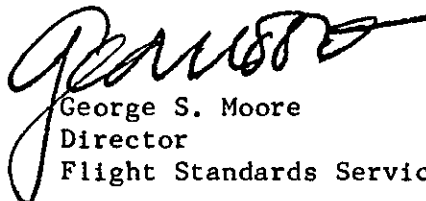
**HAD YOUR EXHAUST SYSTEM
INSPECTED LATELY ?**

7. OPERATIONAL CHECKS. It is a good practice to supplement cabin heating system inspections with periodic operational carbon monoxide detection tests. Carbon monoxide tests are reliable and may be accomplished quickly without any disassembly operations. Tests may be conducted during flight to determine the extent of CO contamination. These tests should be conducted both with the cabin heat "ON" and cabin heat "OFF." CO testing equipment is available. A COLORMETRIC type of test apparatus developed by the National Bureau of Standards is an effective method of detecting the presence of carbon monoxide. In a 9-month test involving approximately 200 aircraft, it was found that 19 percent had a marginal level of CO contamination.

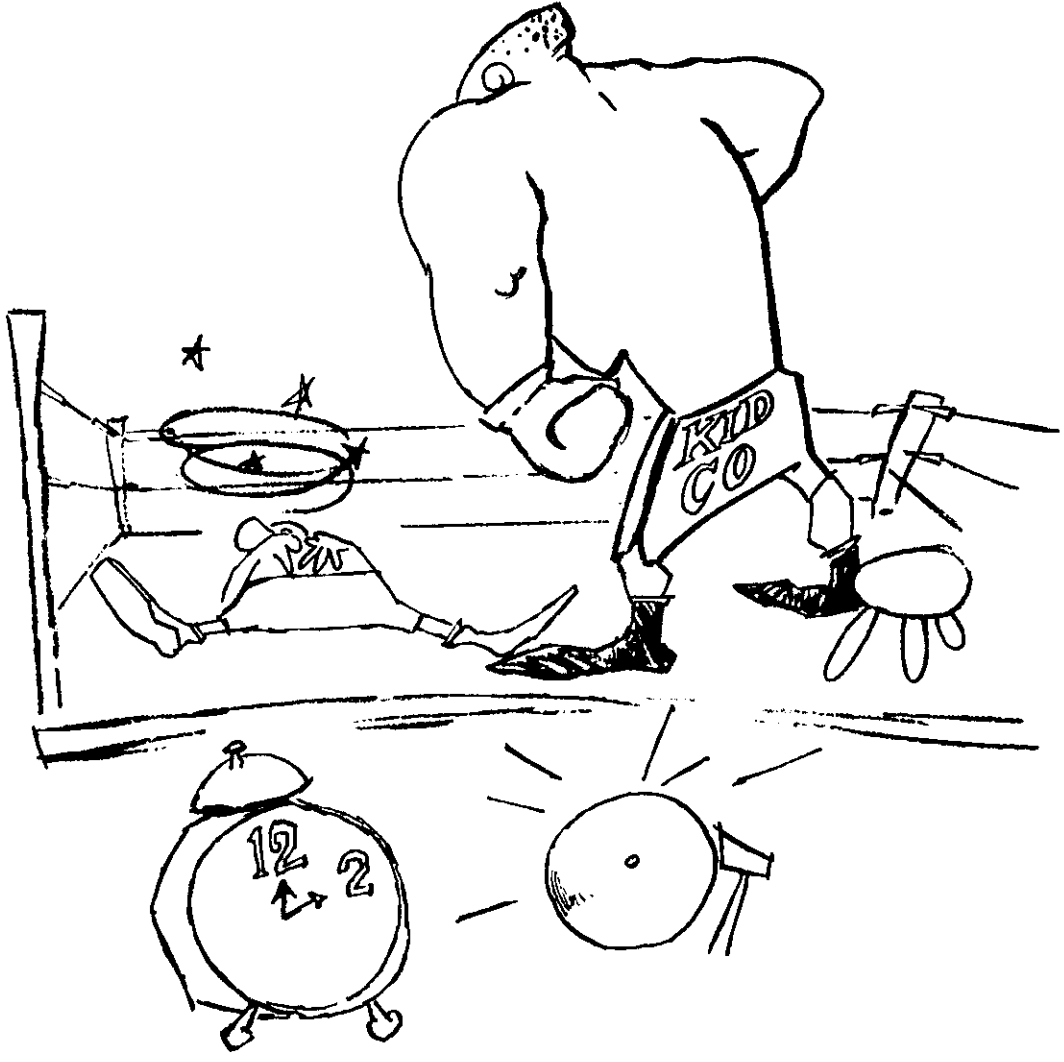


PUT YOUR MIND AT REST WITH A CO TEST .

Further information and assistance may be obtained at any FAA General Aviation District Office.


George S. Moore
Director
Flight Standards Service

DON'T BE



KO'd by CO!