The Unseen Killer

By Wayne Canning

Recently while watching the evening news they ran a short segment about a young man whole died of carbon monoxide poisoning while boating. This story reminded me of a friend who died several years ago while sleeping on his boat with a kerosene heater running. As a marine surveyor one of my main concerns is for the safety and well being of my customers and other boaters so I thought I would have a closer look at this subject. What I found surprised me and made me more aware of just how much of a problem carbon monoxide poisoning is in the boating community.

What is carbon monoxide or CO? Simply put it is a colorless, odorless, and tasteless gas created by the burning of fossil fuels such as gasoline, diesel, oil, wood, propane, and natural gas. Poorly maintained and malfunctioning stoves and heaters, and gasoline and diesel engines are all sources of CO on boats. Diesel engines do not in general release as much CO as gasoline engines, and due to the odor of diesel exhaust CO poisoning is less likely but not unheard of.

How does it affect us? Our blood uses a substance called hemoglobin to carry the oxygen we breathe to different parts of our bodies. Unfortunately hemoglobin carries CO more readily than it does oxygen. The result is that when we breathe in CO it replaces the oxygen in our blood and we begin to suffocate. One other problem with CO is that even when we are removed from the source it remains in our blood for many hours causing long term effects. People have been known to become sick and even lose consciousness hours after exposure.

What are the symptoms? Here's the sneaky part of CO poisoning on boats, the symptoms are often confused with sea sickness. Dizziness, headaches, drowsiness, and nausea are all symptoms of CO poisoning. Problem is these are also symptoms of seasickness. As CO poisoning progresses the victim may lose consciousness and collapse.

The primary source of carbon monoxide poisoning resulting in fatalities on boats is from gasoline engines used in propulsion and as generators. But other sources such as heaters, stoves and diesel engines have also contributed to the death toll.

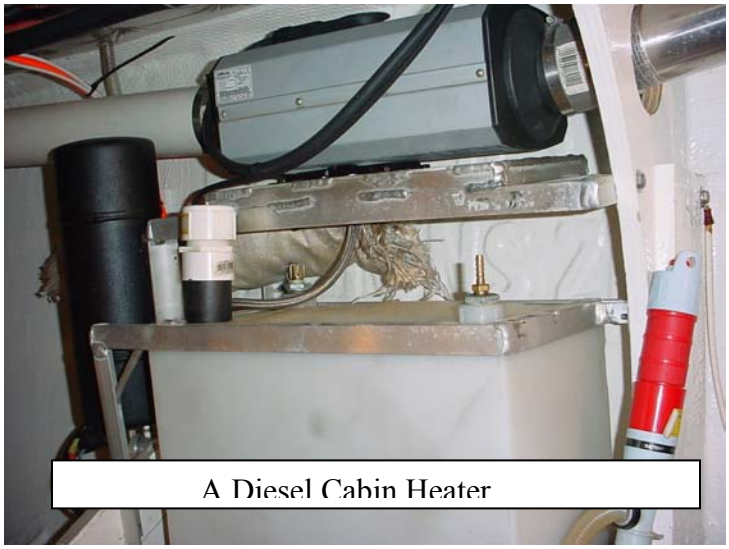
Open air exposure is perhaps one of the most surprising types of CO poisoning. We tend to feel safer and less exposed to CO when out in an open cockpit or swim platform. The truth is that more deaths are occurring in this environment than in enclosed cabins. This is partly due to the advent of economical CO detectors for use in cabins and partly due to the increased use of fiberglass swim platforms. In the past swim platforms were constructed mainly of teak and were of a very open design. By design fiberglass swim platforms trimmed with teak are less open and as a result will trap a greater quantity of CO gases. Many people are aware of the "station wagon effect" were exhaust gases are trapped by the reverse air flow around the transom of a boat but they may be surprised to learn that this effect can occur on even the small transom of a ski boat.

"Teak Surfing" is where a person or group of people hang onto the swim platform of a boat while it is in low speed operation in an effort to ride the wave produced has proved a deadly form of entertainment. The "surfers" have their faces right down next the exhaust, and to make matters worse the poisonous gases are trapped and concentrated under the swim platform. As the boat proceeds the swimmer is inhaling a concentrated mixture of exhaust gases containing as much as 30,000 PPM of CO. With this concentration a swimmer can quickly lose consciousness (sometimes in less than a minute) and quickly drown. Even just sitting or standing on a swim platform with the boat idling can result in CO poisoning.

Exhaust Outlet Under Swim Platform

Other causes of open air CO poisoning have been caused by sitting in a aft seat of a open cockpit while the boat is at idle or underway at low speed, being in a boat being towed, or for that matter being in the aft cockpit of a boat towing another. Engines produce higher quantities of CO when the engines are loaded or straining particularly at lower RPM's . A towed boat can alter the air flow of the towing vessel making the station wagon effect worse. Problems can also occur after a vessel has been fitted with canvas tops and side curtains. Canvas installations can cause the "station wagon" effect in a boat that may never have had this problem before.

Although many more people are aware of the dangers of CO poisoning in an enclosed space, deaths do still occur every year while in the cabin. Almost all new gasoline powered boats are equipped with CO detectors but it is the operator's responsibility to make sure they are functioning properly. I have seen many CO detectors disabled due to nuisance alarms. These units can be set off by low voltage or fumes from post curing chemicals in a new boat. The owners get tired of false alarms and simply disconnect the unit's power. New boats outfitted with diesels are not required to install CO detectors. True, diesels are safer but if your boat uses propane, natural gas,


A Diesel Cabin Heater

or a heater burning diesel or other fossil fuel the danger still this equipment in enclosed spaces is that as they burn they use oxygen in the air, as the oxygen is depleted they give off more co. So you can see the danger here, even a properly operating and burning unit given time and depleted oxygen supplies will produce CO. This is why space heaters are particularly dangerous, the heater is left burning for a long period of time and the victim is often asleep when the danger is most extreme.

Generators particularly gasoline powered ones are also sources of co. Generators are often operated to run air conditioning units. Care must be taken that no exhaust gases are allowed to enter air in lets. Once again swim platforms can trap CO if the generator exhausts out the transom rather than the side of the boat. A swimmer can be overcome by the fumes even without the main engines operating. Care must also be taken when operating a generator while tied to a dock as the wind can force the exhaust back into the vessel thought any open hatches or engine vents. This can be true not only of a generator on your boat but also for one moored alongside your boat. Particular care must be taken when rafting and running generators as this condition could quickly fill an adjacent vessel with CO.

So what can be done to avoid problems? Well first of all make sure you your crew and your guests all understand the potential risks and problem areas. Avoid swimming with engine and/or generator running; “teak surfing” or even dragging a person within 20 feet of the boat is out, but also avoid any swimming or maintenance while any engine is running. Never swim under the swim platform. Several people have been overcome while trying to clear the props, so always shut down the engines and wait at least 15 minutes for gases to clear before getting in the water. Be aware of the other dangers of open air CO poisoning, such as the “station wagon” effect and the problems associated with towing other vessels. Use extra caution when operating at idle or slow speeds and be aware of any tail winds. Be careful when installing canvas and side curtains, check with the boat manufacture before making any modifications. Consider installing a CO monitor at the helm even if you have an open boat, a little extra protection never hurts. Keep all forward facing windows and vents open when under way even at slow speeds. Always leave a hatch or door open when using fossil fuel burning appliances and make sure you have operating CO monitors in all cabins below decks. The American Boat and Yacht Council standard A-24 lists detector requirements and makes recommendations for there placement. Never sleep with an appliance or generator running. Inspect your exhaust systems at least once a month, look for any signs of blackness or water leaks paying particular attention to joints and connections. And finally if you or your passengers are feeling ill make sure they get fresh air. This will help even if the symptoms are only caused by sea sickness. If in doubt get medical attention as soon as possible. Pay particular attention to young children, older passengers, and to anyone with a history of breathing problems.

As the skipper and operator of a boat it is your responsibility to be aware of potential hazards, and dangers on board and to make your crew and passengers also aware of these hazards. Taking basic precautions and using common sense will help avoid the hazards that can turn boating from fun to tragedy. If you would like more information contact your local Coast Guard Auxiliary or the American Boat and Yacht Council.