

# *Safety & Emergencies at Sea*



Fire is the ultimate disaster on any boat. If you are prepared for its eventuality, you may have a chance to contain it and extinguish it. Most of us ignore, the real danger of fire on our boats. We install the prescribed fire extinguishers, but that is not enough. In the long run, it is far easier and just another aspect of good seamanship, to understand the potential fire hazards that exist on a boat and, through good boat keeping habits eliminate the possibility of disaster.

## What Makes A Fire?

Four components are required to start a fire and keep it alive;

- Fuel -the material that burns.
- Heat -the element that raises the temperatures of the fuel to the point at which it will ignite.
- Oxygen -the gas consumed in the burning process.
- An uninhibited chemical chain reaction that converts fuel to ashes and smoke.

When any one of these four components is absent a fire cannot start. Fires have been divided into three categories.

- Class “A” fires are those in which the fuel is solid, such as wood, paper, textiles, bedding and other ordinary materials.
- Class “B” fires, the fuel is a liquid such as petrol, paint or fat.
- Class “C” fires are electrical in origin and occur in wiring, appli-

ances and switches.

Class “A” Fires: A Class A fire starts when a heat source comes in contact with a solid that will burn. On a moving boat, an ashtray with a smoldering cigarette can slide off the table onto a settee. A box of matches can tumble out of a locker and fall onto the stove. Curtains can ignite if the flame comes too close. These are all situations involving ordinary materials where simply keeping a heat source away from any potential fuel will prevent a fire.

Class “B” Fires: Class B, liquid fires are more insidious. Nearly every boat carries fuel for stoves, engines and perhaps heaters. In our lockers we store cleaners, paints, solvents and other similar products. These liquids are made up of molecules that are tightly packed together. But at the surface of the liquid they can escape and mix with air to form vapour. The odour of such liquids as petrol, perfume and coffee are caused by their molecules evaporating, mixing with air and reaching our noses. The amount of vapour that escapes depends in part on temperature. The warmer it gets, the more vapour escapes. Some vapours will burn if they come into contact with a heat source. When a liquid burns, it is the vapour molecules that provide fuel for the fire. These are heavier than air and tend to collect and settle in lower areas where the trail of vapours can spread far from the liquid itself. If this vapour trail contacts a heat source such as a hot surface, an open flame or sparks from static electricity, the resulting fire can flash back to the source of the vapours. Flash-

back and fire can occur even though the liquid and the ignition source are far apart.

The lowest temperature at which a liquid releases enough vapour to start burning is called the flash point, which is used to classify the relative fire hazards of liquids. Those classified as “flammable” have flash points below 100 degrees Fahrenheit. Such liquids will release enough vapours to form burnable mixtures at air temperatures below 100 degrees Fahrenheit. Examples of flammable liquids include petrol, acetone, lacquer, thinner and turpentine. Liquids classified as “combustible” have flash points above 100 degrees Fahrenheit. They include diesel oil, kerosene, mineral oil and hydraulic fluid. Such products must reach temperatures above 100 degrees Fahrenheit before they will release enough vapour to form a burnable mixture.

It becomes obvious then that, at normal room temperatures, flammable liquids present a far greater fire hazard than non-combustible liquids.

The rule therefore is. Never use a flammable liquid if a non-combustible liquid will do the job.

Many fires on boats (especially power boats) are caused by petrol. It is a familiar fuel that we use daily in our cars. But cars are out in the open. If a fuel leak exists, the petrol spills on the ground and rarely causes a problem. On a boat it is a different story. The engine is below as are the tanks and fuel lines. If a leak occurs anywhere in the system, the petrol is trapped in the bilges where it vaporises, mixes with air and creates a time bomb waiting to explode.

When one considers that fumes from one cup of petrol has the explosive power of 11 sticks of dynamite, it is easy to see just how dangerous a petrol spill can be.

Inboard petrol engines demand meticulous maintenance. Fuel lines and connections should be checked frequently to make sure that there are no loose connections or wet spots around the tanks. If there is even a faint odour of petrol, the source must be immediately tracked down, the leak repaired and the bilge cleaned and ventilated. Be careful though, and sniff the bilge before switching on the bilge blower. Sparks from the blower can ignite the vapour.

Vapours also can find their way below when refuelling, so be sure to close all hatches and ports before filling the tanks. And if you must transfer petrol or other flammable liquid from one container to another, always do so on

the deck. The static electricity that may be created during the operation can ignite the vapours and start a fire.

Extra fuel should be stored in approved plastic containers and carried on deck or in a sealed compartment that has a drain overboard. This includes fuel for an outboard, and the outboard itself one of the most dangerous items on a cruising boat

Most cruising sailboats have diesel auxiliaries and diesel is a combustible and consequently, a much safer liquid. Even so, it is best to store diesel in heavy plastic containers approved for flammables.

Cooking fuels too must be handled with care. Alcohol stoves are still in many boats. They are inexpensive and theoretically at least, easy to use. But alcohol has a way of leaking excessive amounts into the drip pans of the stove. Because it is colourless, it is hard to see just how much fuel has leaked. When the stove is lit, any excess alcohol will flame up to cause burns or a fire or both. Keep a fire blanket handy to cover the burner and contain the flame until it burns itself out. Never pour water on a Class B fire, for water will cause flames to spread and flare up.

Kerosene is a combustible liquid that can be carried safely aboard a boat. However, both kerosene and alcohol are sold in either metal cans that can rust, or in flimsy plastic bottles that can puncture. Here too, it is prudent to transfer the fuel into heavy plastic containers for storage.

In recent years, barbecues have become very popular. Some are fuelled with charcoal, others with propane or butane. Charcoal can ignite by spontaneous combustion, particularly when it comes in contact with seawater. If you must take it aboard have it in a sealed container as it must stay completely dry. If it should get damp or wet get rid of it immediately.

Propane for barbecues must be handled in the same manner as the stove. LPG, either propane or butane, is such a highly efficient galley fuel that most boats use it. But with a flame propagation rate of 3.000 feet per second, if ignited, it explodes. The key to a safe system is proper equipment and installation.

No one can afford to be casual when using an LPG stove. For instance, one should never turn on a burner, then find the matches. Take one out of the box, strike it and then turn on the burner. In the time that elapses, gas will escape and settle in the bilge.

Other LPG appliances frequently found on boats include cabin heaters,



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- It's light and the two of us can pull her up the beach, easy.
- Light also means she gets up on the plane easy. The OCT also has a much bigger planing area so planes at lower speeds.
- Easy to get out the water after snorkeling.
- Easy to keep clean.
- Lyn has no problem driving this tender.



water heaters and refrigerators. These are considered “Unattended” appliances, as opposed to cook-stoves which, conversely, are called “Attended” Some unattended LPG appliances have a continuously lighted pilot flame or, preferably, a energised glow plug for operation. Buy your LPG appliances only from a reputable marine dealer. Those designed for caravans are not safe aboard a boat.

Used or dirty solvents, cleaning liquids and rags or paper soaked with flammable or combustible liquids often are not treated with the respect they deserve because they have served their purpose are no longer needed.

Keep such materials in tightly closed containers, preferably on deck, until they can properly disposed of on land.

With the increased popularity of electrical equipment and electronics on yachts comes the increased danger of electrical fires. Make certain that all electrical connections are tight, that the wires are of adequate size to carry the current and that all equipment is protected by circuit breakers or fuses.

Batteries should be enclosed in battery boxes to prevent any object from coming in contact with the terminals and secured so they cannot tip over in a rough sea. Anyone using an alternator controller to bypass the voltage regulator when charging the batteries must keep an eye on the voltage meter to prevent overcharging. Overcharging causes boiling in batteries and the release of explosive gases.

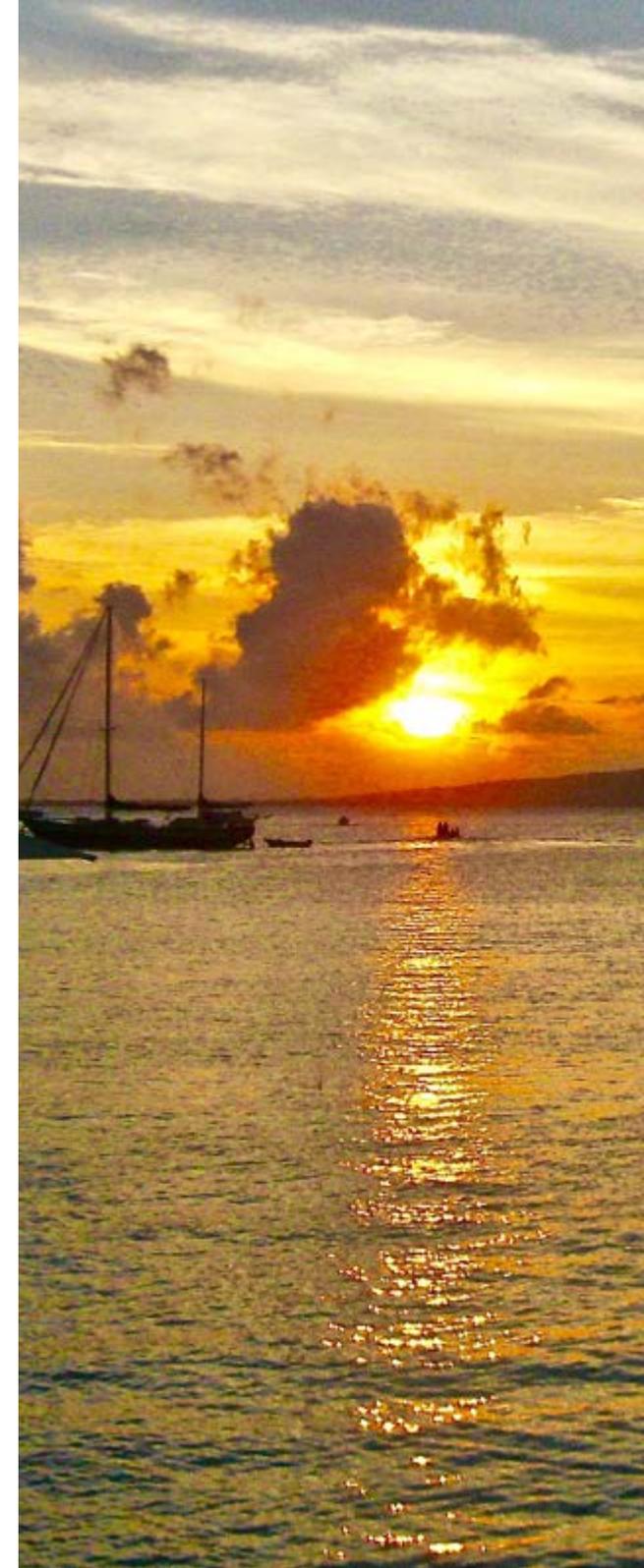
## Extinguishing Fires

It is far simpler to prevent a fire than to deal with one but, if a fire does occur aboard your boat, you should know how to fight it.

Fire extinguishers are required on all boats.

Class “A” fires are best extinguished with water, which eliminates the heat component with its cooling effect. To some degree, it also smothers the fire by eliminating some of the oxygen available to it. If water is used, a lot of water is needed. On a boat away from the dock, that usually means hauling buckets of seawater, a time consuming process that may give the fire time to spread. Never use a blanket to smother a fire unless you are absolutely certain that the blanket is 100% wool. Most blankets now contain man made materials which can be highly flammable and will only make matters worse.

Multipurpose extinguishers are available for use on all fires. It is a good idea



to have at least one of these onboard. A small Class A fire can be quickly brought under control by means of such an extinguisher, and water then

can be used to finish the job, particularly if the fire is in a bunk area where it can smoulder and spread. Moreover, multipurpose extinguishers can be used on any fire and, in a panic situation, you must know what type of fire you are dealing with.

Class "B" Water never can be used to extinguish a Class B fire.

The water will spread the flames or cause them to flare up. There are three types of Class B extinguishers commonly used on boats, carbon dioxide, dry chemical and Halon.

Carbon dioxide is a clean, dry, non-poisonous gas. It is heavier than air so CO2 extinguishers should not be stored in accommodation areas, they extinguish by displacing the oxygen. Its fast expansion enables the gas to penetrate cracks and crevices and reach fires behind obstructions. It will not damage nor contaminate food, and will eventually evaporate without the need for a clean up job. To use this type, first direct the discharge at the edge of the fire as close to the flames as possible, then forward and upward through the flames, moving the nozzle from side to side.

Carbon dioxide has drawbacks. The extinguisher must be discharged no more than six feet from the fire, where the heat is intense. It hovers over the fire and a draft may blow it from the critical area. When used in a confined space, it can rob the operator of oxygen and cause asphyxiation. When using any fire extinguisher to get closer to the seat of the flames the use of a fire blanket, held in front of the operator by another person allows a closer attack.

These extinguishers should be weighed annually and the containers tested electrostatically if there is any sign of rust or corrosion. The gas inside is under great pressure and if the container is damaged, it can explode.

The most common type of extinguisher used on boats is dry chemical. It is inexpensive and available for multipurpose use. Its heat absorption and reflective qualities form a heat shield for the oper-



ator who must approach within 15 feet of the fire. The dry chemical also forces its way into cracks and extinguishes by interrupting the chemical reaction needed to sustain the fire. To use, direct the powder at the base of the flames, moving the nozzle rapidly in side to side motion. The chief disadvantage of dry chemical is that it makes a horrendous mess, damages equipment and contaminates food. As a result, people may hesitate to use it when they should. It also discharges very rapidly. A 2.51b extinguisher is completely discharged in 10 to 12 seconds.

The best type of extinguisher for Class "B" and Class "C" fires is Halon. It is colourless, odourless gas that is non conductive and non corrosive. It works chemically and quickly to halt the combustion process without removing oxygen from the air and leaves no residue to be cleaned up. Halon should be discharged as close to the fire as possible with the agent directed first at the edge of the flames, then through the flames in a sweeping side to side motion. Halon extinguishers are more expensive than the other types, but they do furnish an efficient and clean fire extinguishing method and are worth the additional cost.

Most people have never used a fire extinguisher and yachtsmen are no exception. It is a good idea for every skipper to be acquainted with the procedure by actually discharging an extinguisher. Once a fire has started, you don't want to have to read the instructions. There is no opportunity to experiment. All portable extinguishers discharge in less than a minute. If not properly used, the agent will be spent before the fire is out. Any fire extinguisher is only a "Band-Aid". Once a fire takes hold, it's too late to use an extinguisher. Don't even try. Contain the fire first. Close hatches, vents, doors and ports. Immediately shut off all fuel lines. Maneuver the boat so that the fire is downwind to keep it from spreading and contain the smoke. Stop the boat or reduce speed to decrease any wind effect that can fan the flames. If you can do all that and do it quickly, you may have a chance to douse the fire with extinguishers or keep it under control until help arrives. With care and vigilance, fire is preventable. Yet, as with other potential emergencies aboard, every boat should have a plan of action.

## When a Fire Breaks Out Act quickly.

A fire can be controlled if it is caught when it is small. Give it time to grow and it can easily overwhelm you.

### Eliminate oxygen.

Without oxygen a fire will die, so smother it with an extinguishing agent such as water or CO<sub>2</sub>, and shut off any ventilation blowers that might replenish the air supply.

### Eliminate Fuel.

Without fuel a fire will die. In the case of a Class A" fire, consider throwing burning objects overboard. For "Class B" fires, shut off fuel supply valves. For "Class C" fires turn off the master electrical switch.

### Minimise Heat.

Without heat a fire will die, so spray with water or CO<sub>2</sub>. While water should not be used on Class B fires, it can be used to wet down adjacent flammable material. Shut off all other heat sources, stoves, heaters, lanterns, generators or engines.

### Aim Properly.

When fighting a fire with a portable extinguisher, get as close to the flames as you can, aim the nozzle at their base, and move it steadily back and forth.

### Block the Wind.

Minimise the fanning effect of the wind by holding the boat's stern into the wind if the fire is near the bow, or holding the bow into the wind if the fire is in the stern. Close hatches, vents, ports and doors.

### Have an Evacuation Plan.

Have life-saving devices nearby, liferaft nearby and radio accessible for calls for assistance.