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Fire Emergency

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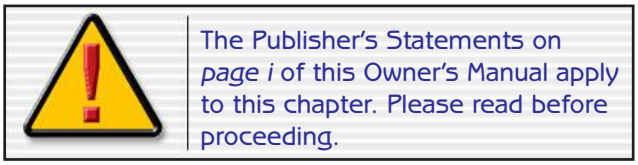


This chapter describes the Sea-Fire equipment on board to extinguish fire. Procedures to follow in the event of a fire or false alarm are detailed. Also, some tips to avoid fire hazard.

Major Topics:

Fire Countermeasures

A Sea-Fire 'Total Flooding' fire extinguishing system is installed in the engine room and lazarette. Portable chemical extinguishers are in cupboards for use on small local fires.

The Sea-Fire FG bottles in the engine room (photo 1) and lazarette (photo 2) contain FM-200 heptafluoropropane gas pressurized with nitrogen at 240 psi. This an environmentally-friendly gas, with zero ozone depletion potential, approved for occupied areas.

A heat-sensitive valve V at the top of the bottles opens at 165°F to discharge the gas. At the same time the engine room system energizes remote relays to shut down the engine room blowers and BOTH engines. (Running engines would consume the gas; engine room blowers would expel the gas). Engine shutdown occurs only if the engine room bottle discharges, not if the lazarette bottle goes off.

When either bottle goes off a Sea-Fire alarm horn H on BOTH steering consoles sounds loudly to attract your attention. If the lazarette goes the normal glowing green light G on the embossed disc will be dark D. If the engine room system goes, on the main Sea-Fire panel the normal green light N dims and the red light glows brightly R.

You must quickly determine if it is a false alarm or a real fire. If engines have shut down look overboard for smoke or flame coming out engine room air intakes, or for black engine exhaust. If the engines did NOT shut down and if the generator was on, look at the lazarette air intake. Fires often originate electrically and the lazarette has high amperage connections. Electrical fire always has visible smoke from burning insulation. *Try to turn off the relevant power source* (not easy to determine). If the generator is running shut it down.

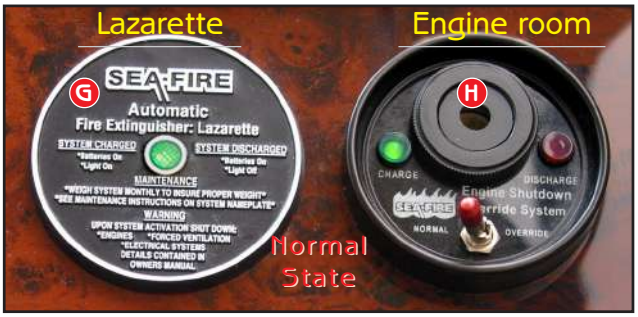
Check instruments:- The voltmeter on the main switch panel may indicate an electrical fire. Engine instrumentation might indicated something abnormal in the engine room.

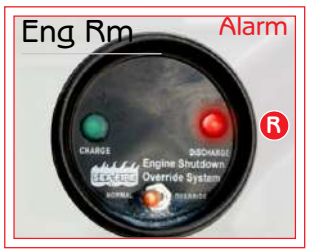
Check the hatches for engine room and lazarette. DO NOT OPEN – first determine: Are they hot? Is smoke seeping from either hatch. Do you smell burning.?

If smoke is visible from air intakes or either hatch is hot, DO NOT LIFT THE HATCH. A sudden rush of oxygen-rich air into the space can cause flashback, and a serious escalation of the fire.

If you suspect the fire may still be active, call the Coast Guard. Report there is a fire aboard and that the bottle in the engine room or lazarette has discharged.

While looking for the cause of the alarm state, you must ensure the vessel is not in danger of grounding or hitting other vessels. If the engines are shut down, remember you can probably use the bow thruster to direct the bow and help move the vessel out of harm's way.





If a fire did occur...

If there *was* a fire and it *was* extinguished by the installed extinguisher, wait 15 minutes to *make sure* the fire is well and truly out. Then open the hatches to let the spaces vent. The interaction of the fire suppressing gas and whatever started the fire can be toxic until the area is vented.

Depending on the extent of damage and if the Coast Guard was aboard, once it is safe to do so go into the engine room or lazarette and see what caused the fire. Take a portable extinguisher with you.

If it was a false alarm, or the fire is out *and you are sure it is safe to start the engines*, you must first bypass the Sea-Fire alarm to allow the blowers and engines to run when the ignition switch is turned ON. To activate bypass lift gently on the red toggle and move it right to OVERRIDE. Now you can start the engines.

If the vessel can be moved under its own power run it to the nearest marina and get professional help to determine the cause and how to repair it. The Sea-Fire bypass is only intended to get you to the nearest harbour. In bypass mode safety systems for starting etc. are inactive.

A likely cause of false alarm...

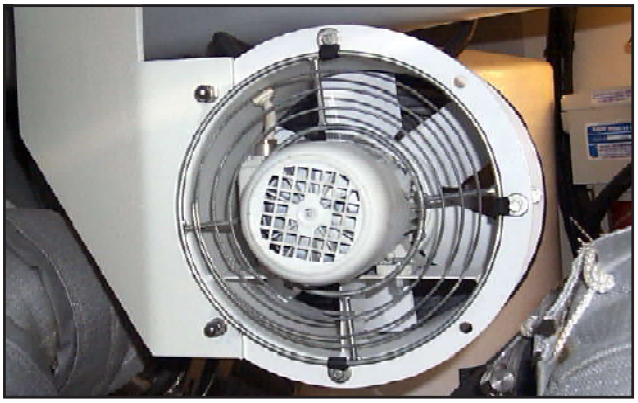
A false engine shutdown could happen if a wire from the bottle to the relay box came loose even for a moment. The usual indication of this condition is that the green light on the alarm stays lit, and the audible alarm did not sound. The engines may possibly be restarted after a short delay, without switching to OVERRIDE. However, do your checks as outlined opposite and if there is no sign of fire look at the pressure gauge on top of each bottle. If it is on green (normal) an electrical problem is indicated.

Start the engines, and to prevent further false shutdowns, switch the Sea-Fire bypass switch to OVERRIDE, and run the vessel to the nearest port.

Troubleshooting a fault in the wiring is difficult. The problem may be in the wires (C, previous page) that lead from the top of the Sea-Fire bottle to the engine shutdown solenoid. A poorly crimped wire can cause a brief loss of continuity which can shut down both engines. Check wires and connections thoroughly.

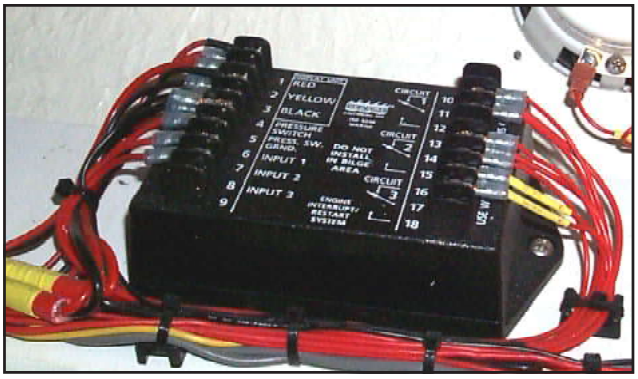
Vibration in the engine room as the engines speed up and down can move a loose NEGATIVE wire or connection causing an intermittent discontinuity.

In a severe thunderstorm, to avoid a possibility of fire, disconnect shore power; use DC only or the generator.



Engine room extractor fans.

These two blowers will shut off if the engines are shut down by the Sea-Fire safety system.



Sea-Fire connection block

A loose screw in any of these connections can cause both engines to shut down prematurely.Block is under helm console – access via stb stateroom, above ceiling.

Potential for fire in lazarette

High temperatures, high amperage, and the presence of fuel are typical conditions for outbreak of fire on any vessel. Though systems are designed for safety, component failure, vibration, or poor maintenance yield potential for fire in the generator, generator exhaust, battery boxes, and high amperage distribution boxes in the lazarette and engine room. Be vigilant!

Further Fire Countermeasures

Manual triggering of Sea-Fire system

There are two reasons you might want to manually trigger either of the Sea-Fire bottles using the remote cable pulls D in the service locker, starboard cockpit:

1. The bottle may fail to discharge automatically (very unlikely); or
2. You may realize there is a fire before it reaches the Sea-Fire sensor.

If the fire source were on the opposite side of the compartment from the Sea-Fire bottle. By the time heat built up to activate the heat sensitive valve B (at 165°F), fire could take hold and become a major problem.

Don't be tempted to tackle a significant engine room or lazarette fire with a portable extinguisher – it's a Bad Idea to enter a confined space with an active fire. Use the Sea-Fire! Also, a portable extinguisher can only deal with a small fire and only if the fire source is visible. By contrast, the FM-200 gas in the Sea-Fire bottles penetrates hidden areas as long as there is air in the space.

To deploy the Sea-Fire...

To use the remote discharge, doors and hatches must be closed in the space where the bottle (and fire) are located.

PULL THE SAFETY PIN FOR THE BOTTLE YOU WANT TO DISCHARGE, THEN PULL THE HANDLE.

The Sea-Fire helm alarm will sound and the red light will come on.

If the engine room bottle is discharged, blowers and engines will stop at once (if they were running). If only the lazarette bottle is discharged the Sea-Fire alarm will sound, generator and lazarette blowers will stop, but engines and engine room blowers will not shut down.

Pull the service locker fuel valves F that supply engines or generator, as appropriate, after they have shut down.

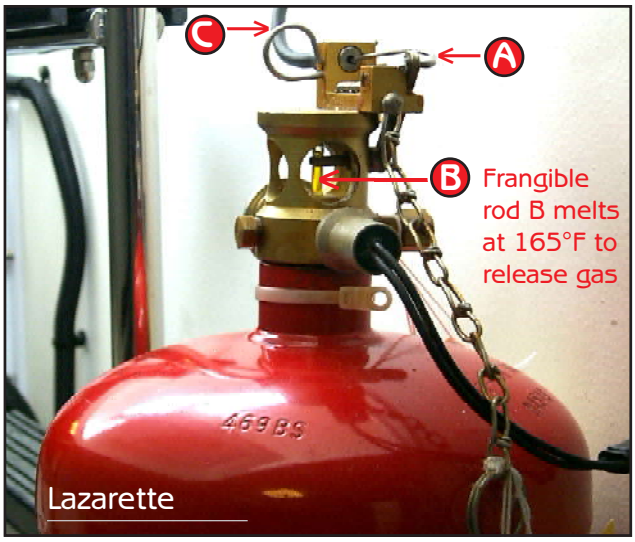
After discharge...

DO NOT enter the space until you are sure the fire is out – no smoke, no flames, no arcing sounds, no hot hatches. If it is not out, better call the Coast Guard!

It should be emphasized, however, the Sea-Fire system is *very effective* at extinguishing fires.

After a discharge, the bottle must be refilled as soon as possible. The Sea-Fire alarm will remain in the alarm state and in override position until the bottle is refilled.

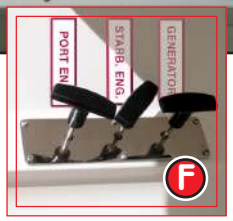
If all is safe, use the Sea-Fire bypass to start the engines.



Sea-Fire actuator

At the top of the bottle, a push/pull cable C attaches to a lever A that when pulled breaks the glass rod B to discharge the gas.

Push/pull cable C leads to stb service locker triggers D.



Fuel shut-offs, F

Pull appropriate valve handle <u>after</u> a Sea-Fire discharge.

Some Causes of Fire

A great advantage of diesel oil is that it is not highly flammable. Though it burns readily if exposed to high temperatures, it will not normally explode.

A leak from a fuel hose that is under pressure can spray fuel oil a long way. If it gets into very hot parts of the engine, particularly the turbocharger T, or into the air filter E, a fire will surely start.

Fuel not under pressure but leaking from a fuel filter F might land on hot exhaust hose, or the hottest part H of the engine. In either case there may be enough heat for a fuel fire to start.

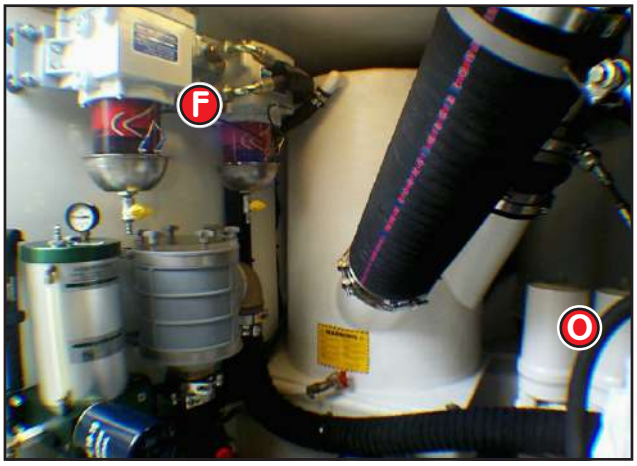
Working on a hot engine with exposed diesel oil is hazardous – another reason to use an experienced certified mechanic. If a fire should start when someone is in the engine room it puts them at great risk – both from the fire and from the Sea-Fire extinguisher, which smothers fire by displacing oxygen.

Oil leaks from various oil filters O or hyraulic hoses are certainly an environmental hazard - you can be fined for discharging oily bilge. And though lubricating and hydraulic oil is not quick to ignite its presence in any fire situation will add to the intensity and smoke.

Proper planned maintenance is the key to preventing equipment problems that could lead to a possible fire or engine failure.

Careful procedure can minimize fuel handling risks. For example, never overfill the tanks until fuel comes out of the tank vent on the hull. After refueling always run the engine room extractor fans (blowers) at least 4 minutes before starting the engines. This is to ensure that any fumes have been dissipated. Open the door to the Salon while venting the engine room.

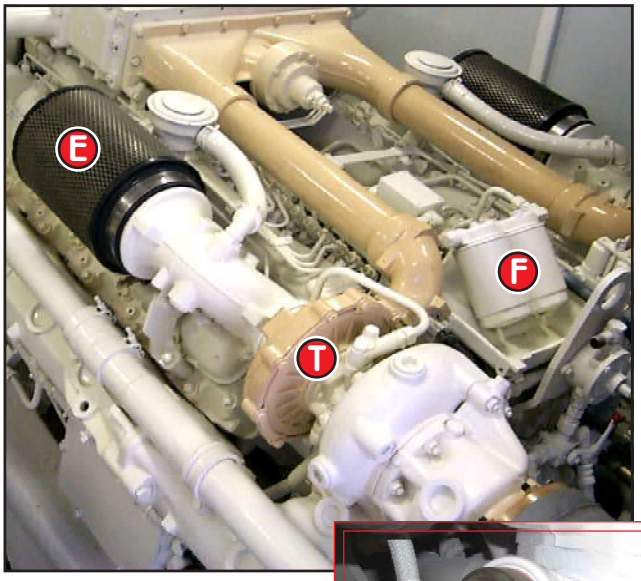
It is a good idea to install Carbon Monoxide fume detectors in the main and lower deck. There are excellent ones on the market today, and the battery powered ones can be easily installed anywhere. However detectors intended for household use should not be used in a boat, as they and susceptible to vibration and might give false alarms.



Potential sources of fuel leakage

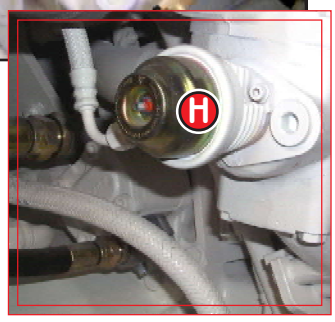
Hatches

Keep engine room & lazarette hatches closed when underway.



Engine hot spots

Leaking fuel contacting these hot spots can burst into flame.



Never store oily rags or flammable liquids in the engine room. Leave free access at all times.

Despite precautions, fire is always a possibility

This is true at home or on the water. At sea you must have a plan for the safety of all aboard. Discuss a fire fighting plan with your local Coast Guard, they are experts in this field.

Instruct crew and guests how to use the dry chemical extinguishers and how to aim at the base of the fire. It is a good idea to place additional portable extinguishers where there is space. With fire, speed of response is critical, the first few minutes count.

All aboard should know extinguishers are installed in all living areas, typically in cupboards. A small red sticker at the lower right corner of a cabinet or locker door indicates where they are located. Instruct passengers to go on deck in the event of a fire. Note emergency escape exit E.

Classes of fire: A, B, C

Class A fires:– wood, cloth, paper, rubber and plastics. Lacking an extinguisher, a bucket of water works for small Class A fires.

Class B fires:– flammable liquids: paint, diesel fuel, oil, grease etc. such as might occur in the engine room. Never use water in there. The small portable chemical extinguishers are suitable for class A, B, & C small fires.

Class C fires:– electrical equipment. The non conducting feature of a dry chemical extinguisher is of prime importance. Also, immediately shut off power to the electrical equipment that is the source of the fire.

Portable extinguishers

The portable extinguishers on board are of type ABC. If they are used, clean up the chemical residue as soon as possible, or corrosion may occur. REPLACE used extinguishers as soon as possible with the same size unit or larger. Check pressure gauges monthly to ensure they are on green and will work when needed. Yearly, remove each unit from its bracket and give it a good shake to loosen internal materials. Always ensure free access to extinguishers.

Hazardous materials

Do not store used rags or paper towels that have been used for clean up. Make proper provision for clean up items and their disposal. Don't let the engine room or lazarette be used for storage – free access to the equipment there is essential in case of fire or other emergency.

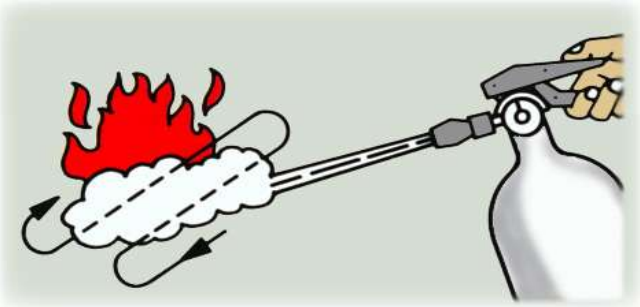
Flammables such as acetone, paint, thinners, etc. should be stored in secure containers and in a safe location away from living areas or electrical equipment.

Living space fire safety

Fires in living areas are often caused by careless smoking, or by candles. Such fires are a typical application for the portable fire extinguishers aboard your vessel (in clothes closets, etc.).

Guests must know where the portable extinguishers are and how to use them. Demonstrate how to release the bottle holding clamp and how to pull the safety pin out of the trigger. Check the gauges monthly to ensure they are fully charged. Check them also before a long voyage.

These extinguishers may be used on all three classes of fire. It's a good idea to keep a 5-10 pound HALOTRON 1 ABC portable extinguisher handy for electrical fires. There is no clean up and they have greater discharge range.



Using a fire extinguisher

Pull the pin. Stand back about 6 feet. Aim at the base of the fire and sweep back and forth. A cloud of powder will obscure the fire shortly after discharge starts. Be prepared for this because you will no longer be able to see the base of the fire.

Discharge is ONLY 13 SECONDS, so keep spare units on the vessel. More than one unit may be needed to put out even a small fire.

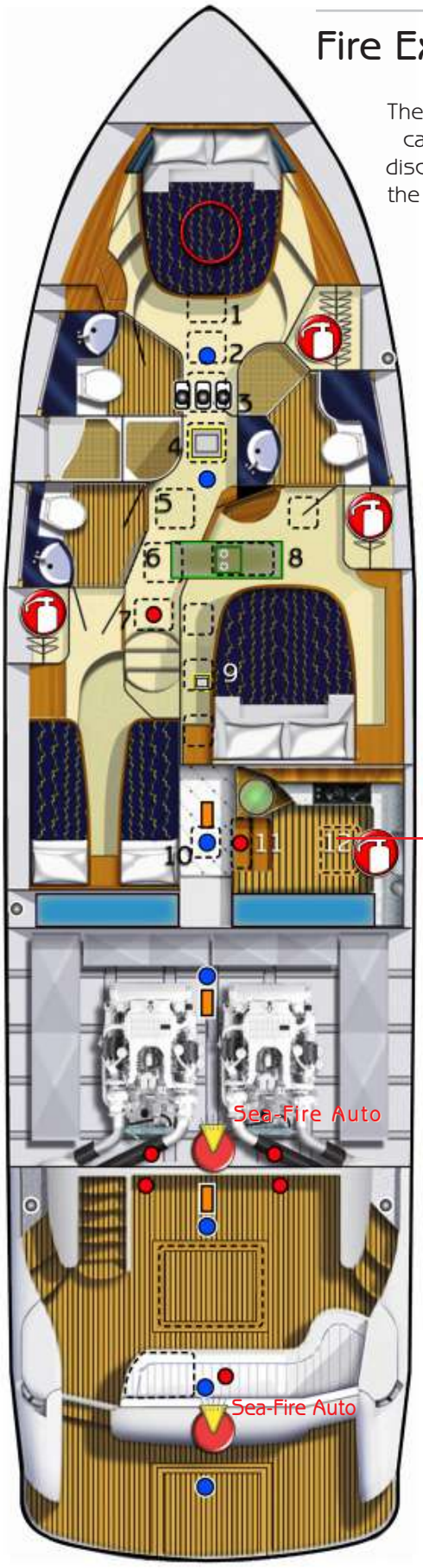
After a fire the residue must be cleaned up as soon as possible. The sodium bicarbonate powder is difficult and tedious to clean up.

Fire Extinguisher Locations

The two Sea-Fire automatic systems can "decide" themselves when to discharge. Crew should be alerted to the location and proper use of hand-held units.

= *Sea-Fire automatic systems*

= *Hand-held units*



Under helm

Under sink