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of the Marine Safety Council

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Contents

Features

Departments

Cover

Leaking badly and with the engine room flooded, the Tahiti-bound, 62-foot schooner Manuiwa approaches a pump parachute dropped within yards by a Coast Guard plane. Placed in operation on board the schooner 5 minutes later, the pump enabled the vessel to proceed to Kailua-Kona for repairs. (U.S. Coast Guard photo)

The Shock of Your Life

building a temporary lightning protection system

An unusual boating accident occurred several years ago in which a fashionable person cruising in an open boat received the shock of his life. The victim, sporting a large metal necklace, was out for an afternoon cruise. During a violent thunderstorm, the boat was struck by a large bolt of lightning. All that remained of the victim were molten pieces of the necklace.

Most of the available information concerning lightning protection of boats recommends providing a well-grounded vertical conductor, such as a mast, which will act as a lightning rod. The electrical force in a lightning bolt will shatter nonconductors of electricity, such as trees, but a well-grounded aluminum mast on a sailboat acts as a lightning rod and diverts the electrical charge away from the boat structure to ground -- in this case, the water in which the boat is floating.

A lightning protection system creates a "cone of protection." Under the "cone of protection" principle, any grounded object throws a protective shadow over any object below it. Lightning will usually stay out of the shadow area. The apex of the "cone of protection" on a sailboat, for example, is the top of the mast. Its protective shadow extends from the top of the mast to the waterline.

According to "Recommended Practices and Standards Covering Lightning Protection" published by the American Boat and Yacht Council (ABYC), on a boat with a mast which is less than 50 feet in height, the bottom of the "cone of protection" is a circle with a radius equal to the height of the mast. A 30-foot sailboat with a well-grounded 30-foot aluminum mast is virtually guaranteed protection from lightning. The circle at the bottom of its "cone of protection" would cover an area from 30 feet forward of the mast to 30 feet aft of the mast.

Taken from the Coast Guard's Boating Safety Circular No. 66, April 1988.

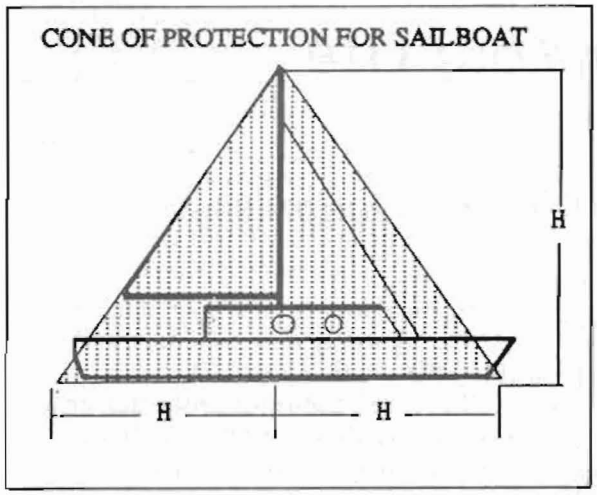
A lightning protection system must be located so that lightning makes contact with it rather than with another part of the boat structure. Providing lightning protection on a sailboat or cabin cruiser is relatively simple because on these boats it is easy to place the apex of the cone at a sufficient height to guard against damage to lower portions of the boat structure. Although a mast would appear to be impractical on a small open boat, many mariners needlessly expose themselves to the danger of being struck by lightning. The solution on a small open boat is to build a lightning protection system which can be temporarily installed and raised when lightning storms are in the vicinity.

Building a temporary lightning protection system. Normally the components in a lightning protection system would consist of a lightning rod, a conductor, and a lightning ground plate. For a temporary lightning protection system, all three components can be combined into one.

The first requirement is an electrically conductive material. Any metal can be used, but aluminum will work best for the most reasons: suitability for a marine environment, availability, workability, etc.

The second requirement for a lightning protection system is sufficient vertical height above the boat to provide a "cone of protection." Again, on a boat with a mast which is less than 50 feet in height, the bottom of the "cone of protection" is a circle with a radius equal to the height of the mast. If the mast is raised amidships, the circle at the bottom of the "cone of protection" will cover an area from the height of the mast forward to the same distance aft of amidships.

The third requirement for a temporary lightning protection system is sufficient contact of the conductor with the ground, in this case the water in which the boat is floating. According to the ABYC standard, a lightning-to-ground connection for a boat may consist of any



metalsurface which is submerged in the water and which has an area of at least one square foot.

The fourth requirement is a means for attaching the mast vertically to the outboard side of the boat. The attachment must be secure enough to keep the mast upright if a sea is running.

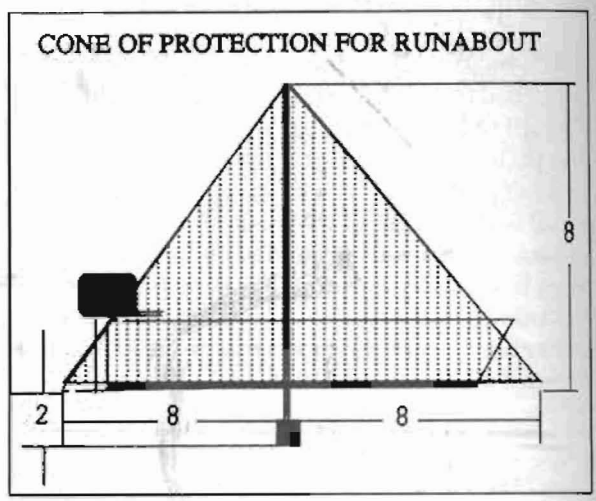
One way to make a bare minimum, temporary lightning protection device for a 16-foot boat, for example, is to cut a 10-foot length of 2-inch diameter hollow aluminum tubing. Using a metal file, piece of waterproof tape, etc., make a mark on the aluminum tubing 2 feet from one end. When the temporary mast is raised, the mark at the 2-foot end should be even with the surface of the water. With the 8-foot section of tubing extending overhead, the circle at the bottom of the "cone of protection" will cover an area from 8 feet forward of amidships to 8 feet aft of amidships -- the length of a 16-foot boat. Because the mast is hollow, the inside and outside surfaces of the remaining 2 feet of tubing submerged in the water will be sufficient to provide the necessary 1 square foot of connection to ground.

The only remaining requirement is to find a suitable means for lashing the temporary mast vertically at amidships. The mast should be easy to put up and easy to take down. One way to make lashing the temporary mast easier is to drill two holes in the aluminum tubing: one at the height of the gunwales and the other close to the bottom. Insert a pin in each hole. The pins will make it easier to tie knots on the tubing which will not slip. With the tubing lashed to the boat at the height of the gunwale, tie a small mushroom anchor or other weight to the 2-foot end of tubing submerged in the water.

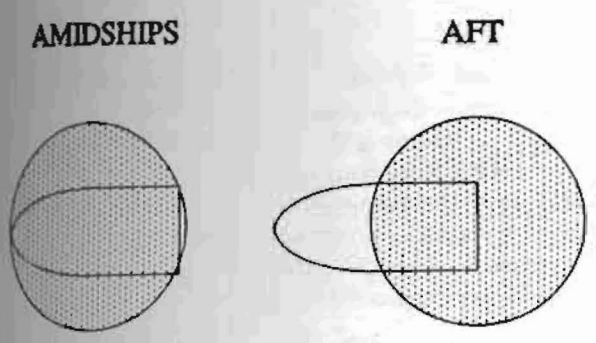
Most boat owners carry a hollow aluminum boat hook; few a 10-foot boat hook. But is is possible to make an aluminum extension that will slide over the end of a boat hook, provided there is a tight connection of the conductors (aluminum to aluminum) between the two. Thus, a temporary lightning protection device for a 16-foot boat might require only a 4- or 5-foot length of aluminum tubing in addition to a boat hook and a means for lashing the device vertically amidships.

There are other ways to make a simple and low-cost lightning protection device. The lower unit on an outboard motor will act as a ground plate. Find some way to lash an aluminum boat hook to the outboard motor in such a way that there is metal-to-metal contact between the boat hook and the lower unit. Just remember that with the mast on the motor, the "cone of protection" it provides only extends as far forward as the height of the mast. This means passengers will need to seat themselves farther aft than when a mast is affixed amidships.

Install a fishing rod holder that can also be used to hold up an aluminum boat hook. Clamp a battery cable to the boat hook and trail the battery cable in the water or use an anchor and chain as a ground plate and wrap the chain around the boat hook. If a battery cable is used, the part in the water should be stripped of its insulation to provide a good connection to ground.



CONES OF PROTECTION WITH MAST MOUNTED



Whether a boat is equipped with a lightning protection device or not, there are precautions every mariner should take when a boat is in a lightning storm.

(1) Stay as far inside the boat as possible and never dangle arms or legs in the water.

(2) Do not touch any part of a lightning protection system. If the boat is a sailboat, do not touch the mast or rigging (stays or shrouds) or large metal objects such as winches or centerboards.

(3) Do not touch metal objects such as handrails.

(4) Stay out of the water during a lightning storm.

There is one other precaution to consider. Don't wear large metal necklaces.∎

Chemical of the Month

Bruce A. Patrick

2-Nitropropane

2-Nitropropane is a nitroparaffin (or nitroalkane) having an empirical formula $C_3H_7NO_2$. It is used in commercial industries as a solvent for vinyl and epoxy coating, and as a gasoline additive. The military uses it as a rocket propellant and a jet fuel additive. It is a colorless liquid with a mild, fruity odor made from the reaction of propane with nitric acid under pressure.

2-Nitropropane poses a moderate fire hazard when shipped, but it will decompose when subjected to high temperature and produce a highly toxic gas. 2-Nitropropane fumes will travel to a heat source and then flash back to its origin. If a 2-Nitropropane fire is encountered, alcohol foam, water spray, CO_2, dry chemical, and foam are proper extinguishing agents. Special fire clothing and self-contained breathing apparatus should also be used. If exposure does occur from its vapor, it will cause irritation to eyes, nose, and throat as well as causing headaches, dizziness, coughing, and difficulty in breathing if inhaled. Exposure to 2-Nitropropane liquid will cause skin and eye irritation, and if swallowed will cause nausea and vomiting. Any victim of exposure should seek medical aid as soon as possible to avoid further injury.

When 2-Nitropropane is being shipped, it is labeled as n.o.s. Flammable Liquid with a purity grade of 94+ percent. Storage temperature should be ambient or below, and it should be in a well-vented room. If a spill or leak does occur during shipping, cleanup crews should wear neoprene gloves, plastic aprons or coats, and self-contained breathing apparatus. While providing good ventilation, cover the spill with soda ash and mix and spray with water. Scoop up mixture wash spill site with a soap solution.∎

(Bruce A. Patrick, a U.S. Coast Guard Academy Cadet, wrote this article for LCDR Kichner's class on hazardous materials transportation.)

(continued on page 43)

These procedures include a requirement (except in situations of extreme urgency) for consultation with the following before any intervention actually takes place.

(1) the flag country of the ship involved, and other countries affected by the maritime casualty, through the Department of State;

(2) the U.S. Environmental Protection Agency (EPA); and

(3) other persons, physical or corporate, known to have interests which may reasonably be expected to be affected.

Before taking intervention action, any views received in response to these consultations or notifications will be considered. When the extremity of the situation dictates that measures be taken prior to consultation, notification and consultation shall still be undertaken as soon as possible.

"Intervention" is "any detrimental action taken against the interest of a vessel or its cargo without the consent of the vessel's owner or operator." It could include, but is not limited to, any or all of the following measures, where either no action has been taken by the shipowner or master to prevent a pollution incident, or where actions have been taken but are considered to be unsatisfactory or insufficient:

(1) salvage operations of a vessel or its cargo which are necessary to remove the pollution or pollution threat;

(2) transfer of oil or hazardous substances to other tanks or other ships or barges;

(3) deployment of equipment for containing or dealing with a spillage;

(4) removal or destruction of a vessel;

(5) disposal or destruction of the cargo on board (e.g., burning); and

(6) orders to the master, owner, or operator of a ship.

Note: "Cooperation" between the Coast Guard and interested persons such as the master, shipowner, or a salvor, in these or similar pollution abatement measures, would **not** *normally constitute intervention under the Convention. Similarly, action taken by vessel interests, either on their own initiative or on the advice of the Coast Guard are not interventions. Finally, the exercise of other Coast Guard authority, or Coast Guard action under the FWPCA or CERCLA, which does not detrimentally affect the vessel or its cargo, or which is taken with the consent of the vessel's owner or operator, should not be treated as intervention action.*

As the MSO personnel were reviewing the COMDTINST and discussing the situation with the District Office, the Coast Guard Co-Chairman (Chief, Marine Safety Division, Seventh Coast Guard District) of the Caribbean Regional Response Team activated the Team in a limited capacity to solicit views about sinking the hull offshore. The consensus of the group (Department of Interior, Department of Commerce, U.S. EPA Region II, Commonwealth of Puerto Rico, and the U.S. Coast Guard), as well as that of the On Scene Coordinator, was that it would be better to sink the vessel offshore, allowing a greater opportunity for the fuel to disperse at sea.

The area is a nesting area for the endangered hawksbill turtle, and biologists indicated that these turtles were currently in the area. There were also recent sightings of the endangered West Indian manatees.

Working very closely with the Seventh District Marine Safety Division, MSO San Juan personnel quickly gathered together the necessary data to request authority to sink the **Wishing Star** under the auspices of the Intervention on the High Seas Act. The projected landfall area of the vessel was Cayo Icacos, a low-lying coral sand island which is part of a chain of small islands called La Cordillera. These islands are within a Puerto Rico Department of Natural Resources (PRDNR) Natural Reserve. The area is a nesting area for the endangered hawksbill turtle, and PRDNR biologists indicated that these turtles were currently in the area. There were also recent

sightings of the endangered West Indian manatees in the area. The islands themselves are uninhabited, with beautiful beaches which are popular tourist attractions in Puerto Rico.

This information was included in an operational message from the Seventh District Commander to the Commandant (G-M) sent at 1120 local time, formally requesting authority to sink the vessel in the deepest water possible using 20mm gunfire from the cutter **Ocracoke**. At 1314 local time, the Commandant, U.S. Coast Guard, authorized destruction of the vessel.

At 1446 local time, after a brief delay due to clearing vessel traffic in the area, the **Ocracoke** commenced gunnery operations using its 20mm. After about 2 hours firing 500 rounds of 20mm ammunition, the **Ocracoke** secured from gunnery operations and watched the hull begin to sink beneath the surface of the water. At 1714 local time, the **Wishing Star** was reported sunk in approximately 25 fathoms of water at a position roughly 4 miles north of the northeastern tip of Puerto Rico.

The following day, MSO San Juan personnel contacted the Civil Air Patrol and arranged to fly over the area. They observed a light sheen of oil moving westerly from a point above the sunken hull's position. Over the next several days, the Federal Aviation Administration was requested to report to MSO San Juan any pollution sightings observed by pilots departing from San Juan International Airport. No sightings were reported.

What could have been an oil spill of major consequence -- endangering Natural Reserves, wildlife nesting areas, and pristine Caribbean beaches -- was transformed into a relatively harmless oil sheen rapidly dissipated by wind and wave action. The entire event took only 15 hours to resolve and involved personnel at Coast Guard Headquarters in Washington, the Seventh District in Miami, and several units of Commander, Greater Antilles Section -- MSO San Juan, Air Station Borinquen, and Patrol Boat Squadron Two, which includes the Coast Guard cutter **Ocracoke**. It was solid coordination between a multitude of fine Coast Guard professionals who pulled this off so smoothly -- just another day in the life of the U.S. Coast Guard.∎

Lessons from Casualties

Will Your Fixed Fire Extinguishing System Work?

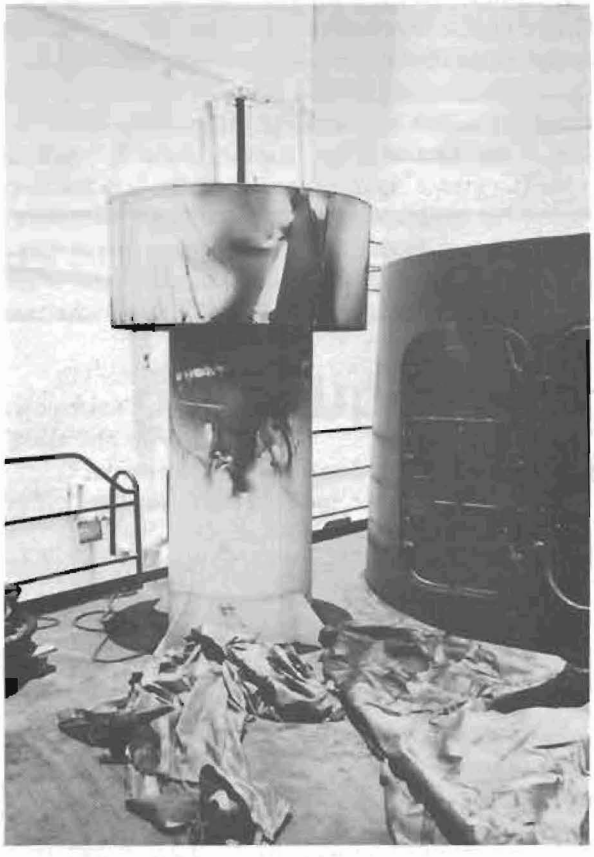
Is neglect of your engine room vent closures or a reluctance to use the fixed extinguishing system endangering your vessel? Two major engine room fires which occurred within 9 months of each other in 1987-1988 underscored the need to maintain and quickly use fixed fire extinguishing and associated systems. Both occurred when fuel leaked or was sprayed onto a hot exhaust manifold and caught on fire. In both cases, the crew delayed in flooding the engine room with CO_2 and could not close all the vents. Remember that fuel fires heat up quickly and that the ability of CO_2 and Halon to cool is limited. Halon may even break down and form toxic gases if overheated.

In the first casualty, which involved a 590-foot U.S.-flag ship built in 1981, the fire detection sensors in the zone where the fire started had been disconnected because they were being set off by exhaust leaks. The ship was operating with an unmanned engine room when the fire started, in violation of its certificate of inspection because all monitoring systems were not fully operative. By the time a sensor in another zone detected the fire and the crew responded, the smoke and heat were impenetrable. Power ventilation and fuel were secured using remote stops, but the crew had difficulty closing natural vents to the engine room and stack because dampers were frozen (corroded) in the open position and were

not marked to show the open/closed position. Some of the dampers never were closed.

The crew tried to fight the fire by hand. Finally, 2 hours after the fire alarm was sounded, CO_2 was released into the engine room. Within minutes, the amount of smoke escaping from engine room vents decreased and changed from black to white. It then gradually turned gray and became darker as the fire regained strength. The crew was preparing to abandon ship when another ship arrived and provided sufficient water pressure to get the fire under control. The fire caused over $2.3 million in damage.

Incidentally, the crew of the burning ship could not bring the emergency fire pump on line because its sea suction valve, located in an engine room sea chest, could not be opened. The wiring for the remotely operated valve actuator was damaged by the fire where it passed through the engine room and the back-up reach rod failed at the first of seven 90-degree bends. A manual pull which activated the reach rod was located behind glass and none of the crew could remember ever having tested it.



Port engine room ventilation supply vent and tarps used to seal the vent. *(Photo from the casualty file)*

The second casualty involved a 769-foot Liberian-flag ship built in 1976. This time the fire alarm properly sounded although it took some minutes to find the source of the fire. Engine room personnel attempted to fight the fire with portable and semi-portable extinguishers, but their efforts as well as those of the ship's fire party were unsuccessful. When the ventilation sources to the engine room were closed, one mechanical damper failed, and the vent could only be partially secured with a tarp. The fixed CO_2 system was discharged into the engine room 1 hour and 50 minutes after the first alarm sounded. While the CO_2 helped slow the blaze, it did not completely extinguish it. The fire was finally put out by a shoreside fire department over 16 hours after it started. Repairs due to the fire were estimated to cost $2 million.

Maintenance and testing of emergency equipment is important if we want the equipment to work when needed. Vent closures and remote actuators should be tested more frequently than at biennial inspections, and marking their open/closed positions should be considered. In the event of a fire, all ventilation must be quickly and effectively secured. The decision to activate the CO_2 or Halon system should be made early before the fire becomes deep-seated and the build-up of heat becomes excessive.∎

CONSUMER AFFAIRS

U.S. CUSTOMS
SMUGGLING AWARENESS PROGRAM

BOATERS AND MARINA OWNERS CAN HELP STOP DRUG SMUGGLING. The U.S. Customs Service has established a program to encourage the marine community to have a heightened awareness of drug activities. The program provides local citizens an easy method and opportunity to give information about smuggling to Customs while remaining anonymous by calling 1-800- BE-ALERT.

CASH AWARDS

Customs will pay cash awards ranging from $250 to $2,500 for anonymous information, or up to $250,000 to a documented confidential source, for information leading to the arrest and conviction of drug smugglers or to the seizure of illegal drugs or conveyances used in drug smuggling.

HOW TO DETECT A SMUGGLER

United States Customs wants the local marine community to be on the lookout for potential drug smugglers. It lists the following characteristics, found to be common among marine smuggling operations, that are worthy of arousing suspicion:

- Boats purchased with large cash payments.
- Immediate demands for electronics equipment or repairs without regard to cost.
- Loading or unloading activity dockside at unusual hours.
- Boats changed in internal configuration, i.e., raised decks, no access to bilges, fuel tanks added or modified, construction of concealed compartments, or modified bulkheads.
- Immediate repairs or modifications demanded without regard to cost.
- A false water line.
- Improper or false registration.
- Tow vehicle equipped to haul excessive loads or modified with heavy duty bracing and tires.
- Tow vehicle and trailer coming from somewhere other than the normal designated parking areas.
- Communications between a boat and a shore vehicle by unusual means, i.e., lights, flags, etc.
- Boat riding excessively low in the water.

YOU

CAN HELP!
REPORT
DRUG SMUGGLING
TO
U.S. CUSTOMS
1 (800) BE ALERT

TO REPORT SUSPICIOUS ACTIVITY—CALL 1-800-BE-ALERT

By taking these few simple steps to report suspicious activity to Customs, boaters will not only remain anonymous but also perform a great service to preserve and protect the marine community. Customs advises:

Be Alert! Write down the date, time, and location of activity. Take extra care to note any registration numbers or distinctive features of the suspects.

Be Accurate! Call Customs toll free number - 1-800-BE ALERT — any day — 24 hours a day. Tell the officer that you have information about narcotics smuggling. Ask for a special caller identification code number which will protect your identity. Give an accurate account of your information to the Customs Officer.

Follow Through! Call Customs again at 1-800-BE-ALERT ten days after your initial contact. Identify yourself by your assigned code. At this time you can learn if any action resulted from your information and if so, you can arrange for payment of your cash reward.

INDIVIDUALS CAN MAKE THE DIFFERENCE

Each person can make a difference. Participation in this vital program can be a big first step in securing a safe, drug-free marine community.

Safety Valve Sequencing on Power Boilers

CWO3 Alvin Shepherd and LTJG Brian B. Bubar

Safety valves are installed on all boilers to prevent the pressure in the boiler from rising above the maximum allowable working pressure (MAWP). They are connected directly to the steam drum of the boiler with no obstructions between the steam in the drum and the safety valve disc. On boilers where a superheater is incorporated, another safety valve is installed at the superheater outlet. This valve lifts at a lower setting than the drum safety valves to provide a positive flow through the superheater. The sequence in which these valves are set to lift depends on the type of safety valve system used on a particular boiler. The manufacturer's technical manual will describe the type of safety valve system in use and should be reviewed before any inspection or maintenance is performed.

There are basically two spring-loaded safety valve systems used to protect marine boilers when an overpressure condition exists (46 CFR 52.01-3(d)(1)(i)(a)). For the purpose of this discussion, the first will be called "the conventional safety valve system," and the other will be called "the pilot valve system."

Both systems have a number of similarities. For example, both systems usually have at least three spring-loaded safety valves installed: two or more valves on the steam drum and one at the superheater outlet. Each of these valves operates independently of the others and has its own lifting pressure. Additionally, boiler safety valves operate with a "pop" type action, meaning that the valve opens completely upon reaching the set pressure and closes tightly upon recalling a determined lower pressure. This difference between the lifting and reseating is called blowdown. The American Society of Mechanical Engineers (ASME), section one, allows for a blowdown between 2 to 4 percent of the safety valve lifting pressure.

The difference between the two systems lies in the manner in which the superheater is protected. The superheater could absorb too much heat and be destroyed if a positive flow through the superheater was not allowed while the steam drum was being relieved. Both systems provide this protection, but the method of performing this function differs in the sequence of valve operation and purpose.

The Conventional System

The conventional safety valve system has two or more valves located on the steam drum set to relieve at a pressure not to exceed the MAWP (46 CFR 52.01-120(a)(6)). These valves are usually the same in design and relieving capacity and are normally set within a few psi of each other. Additionally, a safety valve will be located on the superheater which will be set at a predetermined pressure below that of the valves on the steam drum.

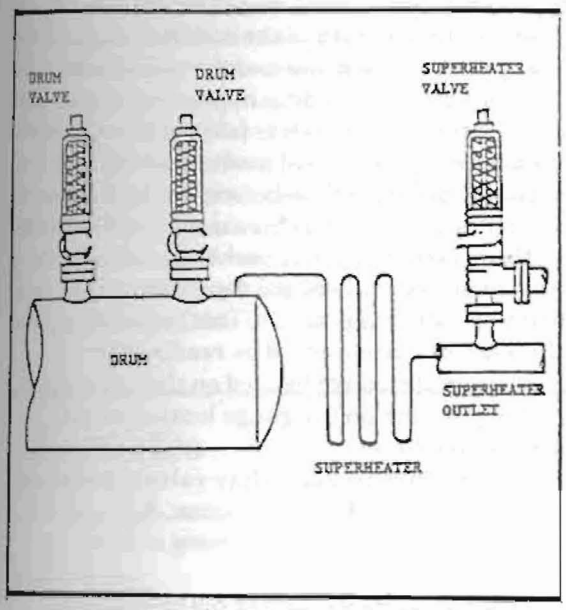
There are two basic types of safety valve systems. One, the oldest and most common, utilizes spring loaded valves designed to open or "pop" at a set pressure and to remain open until the desired pressure drop or "blowdown" has been reached. The lowest set valve is always the superheater valve....The superheater valve should open before the drum valves to assure steam flow through the superheater to prevent it from being overheated.[1]

This is consistent with Coast Guard regulations:

CWO3 Shepherd and LTJG Bubar are stationed at the Coast Guard Marine Safety Office in Toledo, Ohio.

[1] Harrington, *Marine Engineering* (New York, NY), The Society of Naval Architects and Marine Engineers (1980), page 118.

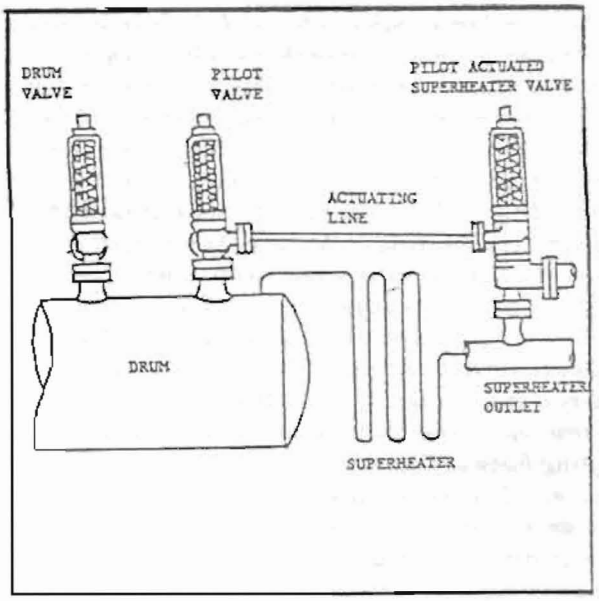
The setting of the superheater safety valve shall not exceed the design pressure of the superheater outlet flange or main steam piping beyond the superheater. To prevent damage to the superheater, the drum safety valve shall be set at a pressure not less than that of the superheater safety valve plus 5 pounds minimum plus approximately the normal pressure drop through the superheater and associated piping, including the controlled desuperheater if fitted (46 CFR 52.01-120(b)(2)).



The conventional system. *(Drawing by ENS Mark E.Marro)*

To ensure positive flow through the superheater while the steam drum is being relieved, this system requires the superheater safety valve to be the first valve to lift. To meet Coast Guard requirements for this arrangement, the superheater safety valve must not only be the first valve to lift, but must lift at a formulated pressure below the lowest set drum safety valve (i.e., pressure of the lowest set drum safety valve minus pressure drop across the superheater minus 5 psi equals the maximum superheater safety valve setting) as indicated above.

In summing up, the superheater safety valve will be the first valve to relieve in the conventional safety valve system, which may be followed by one or both of the drum safety valves lifting as the overpressure situation demands.



The pilot valve system. *(Drawing by ENS Mark E.Marro)*

All valves in this system operate completely independent of each other.

The Pilot Valve System

During rapid maneuvering conditions, the superheater safety valve setting may be reached due to control response time. To prevent this from causing the superheater safety valve from operating continually, a pilot-operated safety valve system is sometimes used. A pilot-operated system consists of two or more valves located on the steam drum, one of which is set to relieve near, but not greater than MAWP. One of the valves on the steam drum is the pilot valve and is connected, by piping, to the superheater safety valve. The superheater safety valve is located at the superheater outlet just as it was in the conventional system. The pilot valve is located on the steam drum because the steam drum is not subject to the rapid pressure swings as is the superheater. In operation the pilot valve pops at its set pressure and almost instantly causes the superheater valve to lift. This is done by the escaping steam from the pilot valve being used to provide the necessary lifting force on the superheater valve. The superheater valve will also lift independently at a slightly higher pressure if the drum pilot fails to provide the lifting force.

The superheater valve opens and closes in unison with pilot valve and since the pilot valve will always be set lower than other valves on the steam drum, the pilot valve and the superheater valves will be the first valves to open if an overpressure should occur, no matter what steaming rate exists in the boiler. Thus, the superheater is protected against overheating of the tubes by having the flow through the tubes equal to the capacity of the safety valve on the superheater.... Thus, when the pilot valve pops at the drum pressure for which it has been set, the steam pressure created in the body is transmitted through the interconnecting line to the piston, thereby instantly exerting a lifting force sufficient to actuate the superheater valve.... This system permits accurate control of the superheater valve by drum pressure, where the steam temperature is predictable. Any possible effects of temperature variations at the superheater outlet are eliminated and the action of the superheater valve is consistent irrespective of temperature.... Finally the principle of "fail-safe" protection of the boiler is embodied in this design, as it should be in all safety valve designs. Both the pilot valve and the superheater valve will open independently to protect the boiler, even if the interconnecting line between the two valves should become disconnected or blocked.[2]

Coast Guard regulations recognize use of the pilot valve system. Most major boiler manufacturers have submitted plans implementing the pilot valve system. The Coast Guard has approved many of these designs, and there are numerous U.S. merchant vessels with this system installed.

Drum pilot actuated superheater safety valves are permitted provided the setting of the pilot valve and superheater valve is such that the superheater safety valve will open before the drum safety valve (46 CFR 52.01-120(b)(3)).

To sum up operation of the pilot valve system, the pilot valve, located on the steam drum, is the first valve to lift when an overpressure condition exists. The steam from the pilot valve is directed through piping to the superheater safety valve causing it to lift almost instantly after the pilot valve. If the overpressure condition continued, the drum safety valve would be the next safety valve to lift.

Valve Testing

Boiler safety valves are required to be tested on all U.S. merchant vessels at each inspection for certification (46 CFR 61.05-20).

Before discussing valve testing, it is important to understand the condition that exists in the steam drum and the superheater. There is a 20 to 40 psi drop in pressure across the superheater of most boilers (always check the manufacturer's technical manual for the maximum pressure drop before testing). This means if the pressure in the steam drum is 1000 psi, the pressure at the superheater outlet will be between 960 and 980 psi depending on the steaming rate of the boiler. This pressure difference can be observed by reading the pressure on the gauge located on the steam drum and the pressure on the gauge located on the superheater outlet.

The conventional safety valve system can be tested in any order or sequence. For illustration, one method of testing will be discussed.

To set up for testing of the conventional safety valve system, the superheater safety valve and the lowest set drum safety valves would be gagged. From this point, steam pressure in the boiler should be increased until the ungagged safety valve lifts or until MAWP is reached. If the safety valve does not relieve before MAWP, it will have to be adjusted to a suitable range. If the valve operates satisfactorily, including proper blowdown, the gag from the other drum safety valve should be removed. The pressure in the boiler should then be increased until this drum safety valve lifts Once this valve has proven proper operation, the gag from the superheater safety valve can now be removed and this valve testing using the same procedure in testing the other valves. Keep in mind the formula required by regulation when testing the superheater safety valve (i.e., pressure of the lowest set drum valve minus the pressure drop of the superheater minus 5 psi equals the maximum pressure setting of the superheater safety valve).

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[2] Osbourne, *Modern Marine Engineers Manual Vol. 1*, Cornell Maritime Press, Inc. (1978), pages 10-43 through 10-44.

Although not written, this regulation (46 CFR 52.01-120(b)(2)) assumes that the gauge on the steam drum will be used in testing the superheater safety valve. If the gauge at the superheater outlet were used and this formula applied, you would be in effect applying the drop across the superheater twice. Thus, you would not subtract the pressure drop across the superheater if the gauge at the superheater outlet were used when testing the superheater safety valve.

Safety valves in the in pilot valve system may also be tested in any order or sequence. One particular method allows independent testing of each safety valve and unison testing of the pilot valve and superheater safety valve. To illustrate this method: all safety valves except for the drum valve should be gagged. The boiler pressure should be increased and the drum valve tested. After this valve has proven proper operation, the gag from the superheater should be removed. This valve can now be tested independently. Once this has performed satisfactorily, the gag from the pilot valve can now be removed and this valve tested. Keep in mind when testing the pilot valve the superheater safety valve is also being tested in unison.

Conclusions

The conventional safety valve system is not outdated or nonfunctional but is very dependable and the most common system in use today. The pilot valve system is not new and has Coast Guard approvals dating back over 20 years. Both systems are very safe and provide adequate protection, each having its own inherent advantages and disadvantages.

Safety valves, just as their name implies, are provided on boiler installations to aid in safe operation of that steam plant. Proper maintenance, use, and testing of safety valves will provide a margin of safe operation that may never be recognized but will be ever appreciated.∎

Keynotes

Final Rule

CGD 82-015, Casualty and Accident Reporting; Accident Report Threshold (February 6)

The Coast Guard is raising the reporting requirement threshold to $500 for vessel accidents involving only property damage. Because of inflation since 1979, the existing $200 threshold has resulted in the submission of increasing numbers of accident reports for minor incidents. These reports tend to distort the statistical base for the Boating Safety Program. These additional accident reports, which were not required to be submitted in 1979, have also increased the administrative burden on the Coast Guard and the reporting burden on the boating public. Raising the accident reporting threshold to $500 will compensate for the effects of inflation, provide for a consistent statistical base and reduce theadministrative burden on the Coast Guard and the reporting burden on the boating public. State casualty reporting systems may continue to require submission of accident reports at a lower threshold than that required by the Coast Guard.

The effective date is March 8, 1989. For further information, contact Mr. Carlton Perry, Office of Navigation Safety and Waterway Services (G-NAB), U.S. Coast Guard Headquarters, 2100 Second St., SW, Washington, DC 20593-0001; telephone (202) 267-0979.

Notice of Proposed Rulemaking

CGD 87-089, Cargo Gear Inspection and Testing Intervals (February 6)

The Coast Guard proposes to amend its regulations on the interval for inspection and testing of cargo gear. This proposal would extend the interval to 5 years from the

presently required 4 years. This action is taken to be consistent with standards of other countries so as not to place U.S.-flag vessels at a competitive disadvantage by requiring more frequent inspection.

Comments are due on or before April 7, 1989. For further information, contact LCDR Stephen L. Johnson, telephone (202) 267-2997.

Interim Final Rule

CGD 83-013, Carriage and Use of Liquefied and Non-liquefied Flammable Gas as Cooking Fuels on Vessels Carrying Passengers for Hire (February 10)

Coast Guard regulations currently prohibit the carriage and use of liquefied and non-liquefied flammable gas as ships' stores on vessels carrying passengers for hire. Because a portion of the small and uninspected passenger vessel industries have expressed a desire to use these gases as cooking fuels, and the systems using these fuels have improved over the years since this prohibition was first put in place, the Coast Guard has reconsidered the prohibition. This rule removes the prohibition as it pertains to cooking appliances. Further, it promulgates standards governing the design, installation and testing of cooking appliances using these fuels on small and uninspected passenger vessels and the installation of wood and coal burning stoves.

This rulemaking is effective March 13, 1989, except for Subpart 25.45, which will be effective August 9, 1989. For further information, contact LCDR Mark G. VanHaverbeke, telephone (202) 267-1181.

Request for Applications

CGD 89-009, Towing Safety Advisory Committee (February 13)

The U.S. Coast Guard is seeking applicants for appointment to membership on the Towing Safety Advisory Committee (TSAC). This committee advises the Secretary of Transportation on rulemaking matters related to shallow-draft inland and coastal waterway navigation and towing safety.

Eight members will be appointed as follows: Three members from the barge and towing industry, reflecting a geographical balance; two members from port districts, authorities, or terminal operators; and two members from the general public.

To achieve the balance of membership required by the Federal Advisory Committee Act, the Coast Guard is especially interested in receiving applications from minorities and women. The committee will meet at least once a year in Washington, DC or another location selected by the Coast Guard.

Requests for applications should be received no later than April 10, 1989. For further information, contact CDR Richard Asaro, telephone (202) 267-0449.
(Editor's Note: The preceding Request for Applications reflects corrections published in 54 FR 7909, dated February 23, 1989.)

Notice of Grant Exemption

CGD 89-010, Boating Safety; Information Pamphlet for Personal Flotation Devices (February 23)

The Coast Guard is granting an exemption from Personal Flotation Device (PFD) pamphlet text and illustration requirements to manufacturers who are subscribers to Underwriters Laboratories (UL) Listing Services for Marine Buoyant Devices, Buoyant Vests, and Buoyant Cushions. Starting March 1, 1989, these manufacturers would have to provide two information pamphlets with each PFD sold or offered for sale for use on recreational boats, in order to comply with both Coast Guard regulations and new PFD pamphlet requirements in the UL Standard for Marine Buoyant Devices (UL 1123). The Coast Guard is conducting a rulemaking to update its PFD pamphlet text and illustration requirements. This grant of exemption relieves PFD manufacturers of the burden of providing two different pamphlets while the Coast Guard conducts this rulemaking.

The effective date is February 23, 1989. A copy of UL 1123 PFD Pamphlet requirements and an example of a type III PFD pamphlet may be obtained by sending a self-addressed 8-1/2 x 11" envelope with postage paid for 4 ounces to Commandant (G-NAB/12), U.S. Coast Guard, 2100 Second St., SW, Washington, DC 20593-0001, or by calling the Coast Guard at (202) 267-0979.

Suspension of Effective Date

CGD 81-059a, Licensing of Officers and Operators for Mobile Offshore Drilling Units (February 28)

Notice is hereby given that the previously published effective date (April 1, 1989) of the Interim Final Rule regarding Licensing of Officers and Operators for Mobile Offshore Drilling Units is suspended indefinitely. This action is being taken because comments on the Interim Final Rule indicate substantive revisions to the rule are necessary. Affected members of the maritime public will not be required to comply with the Interim Final Rule as published.

For further information, contact LT R. K. Meints, telephone (202) 267-0224.

Chemical of the Month

continued from page 29

Chemical Name: 2-Nitropropane
Formula: $CH_3CH(NO_2)CH_3$
Synonyms: Isonitropropane
Physical Properties
- boiling point: 121oC (249oF)
- freezing point: -93oC (-135oF)
- vapor pressure: 12.9 mmHg (20oC, 77oF)
- evaporation rate by vol.: 110
- solubility in water by vol.: 1.7 (25oC, 77oF)

Threshold Limit Value
- time-weighted average: 25 ppm
- short-term exposure limit: 50 ppm

Flammability Limits in Air
- lower limit: 2.6%

Combustion Properties
- flash point: 40oC (103oF)
- autoignition temperature: 428oC (802oF)

Densities
- liquid (water = 1): .987
- vapor (air = 1): 3.06

Chemical Designations
- CHRIS Code: NPP
- Cargo Compatibility Group: 42 (Nitrocompound)

Nautical Queries

The following items are examples of questions included in the Third Mate through Master examinations and the Third Assistant Engineer through Chief Engineer examinations:

Engineer

1. Proper maintenance on a dry chemical extinguisher would include _____.

A. adding water to the powder
B. painting the CO_2 cartridge red
C. puncturing the CO_2 cartridge
D. shaking the powder to loosen caked-up portions

Reference: National Safety Council, *Accident Prevention Manual for Industrial Operations*

2. The diesel engine exhaust gas bypass on a waste heat boiler is installed to _____.

A. prevent engine back pressure at heavy loads
B. increase total engine efficiency at low loads
C. prevent boiler corrosion at low engine loads
D. improve engine fuel consumption at any load

Reference: Maleev, *Diesel Engine Operation and Maintenance*

3. What will cause an automatically controlled R-12 compressor to start?

A. Closing of the solenoid valve.
B. Closing of the expansion valve.
C. Increasing suction pressure.
D. Decreasing suction pressure.

Reference: NAVPERS 10524-C, *Machinist's Mate 3 & 2*

4. An emergency diesel generator cooling system is equipped with an automotive type

thermostat. If the thermostat bellows loses its charge, the thermostat will _____.

A. open, and the coolant temperature will increase
B. open, and the coolant temperature will decrease
C. close, and the engine coolant temperature will increase
D. close, and the coolant temperature will decrease

Reference: NAVPERS 10541-A, *Engineman 3 & 2*

5. The greatest detrimental effect on idle electrical equipment such as cargo pump motors is _____.

A. loss of residual magnetism
B. absorption of moisture in the insulation
C. insulation varnish flaking
D. dirt collecting on the windings

Reference: Hubert, *Preventive Maintenance of Electrical Equipment*

Deck

1. Which item of lifeboat equipment would be most suitable for night signaling to a ship on the horizon?

A. A red parachute flare.
B. A red hand-held flare.
C. A flashlight.
D. A lantern.

Reference: Hayler, *American Merchant Seaman's Manual*

2. The parallax angle will vary the most with the time of year for _____.

A. Venus
B. Jupiter
C. Saturn
D. Polaris

Reference: Bowditch, *American Practical Navigator*

3. Freeboard is measured from the upper edge of the _____.

A. bulwark
B. deck line
C. gunwale bar
D. sheer strake

Reference: 46 CFR 45.3(G)

4. Preparation of Station Bills and signing of same is the responsibility of the _____.

A. chief officer of the vessel
B. owner of the vessel
C. master of the vessel
D. United States Coast Guard

Reference: 46 CFR 97.13-15 84

5. You are on a container vessel. Which of the following concerning the handling and stowage of containerized hazardous materials is true?

A. Open-bed containers may be used to transport hazardous materials if the cargo is properly secured.
B. A portable cargo tank of a flammable, cryogenic liquid may not be in transit for a period exceeding its marked rated holding time unless the liquid is inhibited.
C. A portable cargo tank containing a cryogenic liquid must be shipped on deck unless forced ventilation is provided to the tween decks.
D. A container loaded with packages of tear gas would display a placard reading "Irritant."

Reference: 49 CFR 176.76

Answers

Engineer
1-D; 2-C; 3-C; 4-C; 5-B
Deck
1-A; 2-A; 3-B; 4-C; 5-A

If you have any questions concerning "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.