Investigation of Boat Fires

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Fires in watercraft occur regularly in California and we are often called in to investigate the origin and cause. Much of the state is on the coast, and those areas that are not are near bodies of water. Those areas that are not by the ocean or the lakes are inhabited by people with watercraft ready to get to the water.

The investigation of watercraft fires presents interesting issues not seen in vehicles or structures and a basic understanding of the construction and operating systems within a watercraft can be helpful during the investigation.

Watercraft fall into three categories; boats, ships, and yachts and the terminology for the boat/ship/yacht is different than any other property. A general knowledge of boating terms will assist in making the narrative of the origin and cause report more accurate and professional and allow a better understanding when interviewing a watercraft owner. Although there are many more, these are the basic nautical terms referring to watercraft;

BOW - The forward part of a boat.

STERN - The after part of the boat.

FORWARD - Toward the bow of the boat.

AFT - Toward the stern of the boat.

PORT - The left side of a boat looking forward.

STARBOARD - The right side of a boat when looking forward.

INBOARD - More toward the center of a vessel; inside.

OUTBOARD - Toward or beyond the boat's sides.

MIDSHIP - Approximately in the location equally distant from the bow and stern.

AMIDSHIPS - In or toward the center of the boat.

BULKHEAD - A vertical partition separating compartments.

HULL - The main body of a vessel.

GUNWALE - The upper edge of a boat's sides.

BOAT - A fairly indefinite term. A waterborne vehicle smaller than a ship.

SHIP - A larger vessel usually thought of as being used for ocean travel.

YACHT - A pleasure vessel, a pleasure boat.

CABIN - A compartment for passengers or crew.

COCKPIT - An opening in the deck from which the boat is handled.

BRIDGE - The location from which a vessel is steered and its speed controlled.

LAZARETTE - A storage space in a boat's stern area.

GALLEY - The kitchen area of a boat.

CUDDY - A small shelter cabin in a boat.

Boats, ships, and yachts are constructed primarily of wood and fiberglass with the predominant exterior finished surfaces being fiberglass. The interior surfaces can also be fiberglass, but are many times upholstered and padded synthetic materials over wood or fiberglass. Decks can be wood or fiberglass, sometimes covered with carpet and pad. Materials used are primarily synthetic because of moisture customary to watercraft.

Falling somewhere between a vehicle and a dwelling, boats have relatively small compartments with a comparatively high and volatile fire load. Fire extension, drop down, and radiant heat issues in watercraft present differently than dwellings, primarily because of compartment size and finishes. There is also comparatively more ventilation potential in most portions of a watercraft, although below deck, the opposite can be true.

A study conducted by BoatUS and published in Seaworthy magazine reported the following statistics on vessel fires, comprising a review of fire claims over a two-year period:

- 55% AC and DC wiring and appliances
- 24% Engine and transmis sion overheating
- 8% Fuel leaks
- 7% Miscellaneous
- 5% Unknown
- 1% Stoves

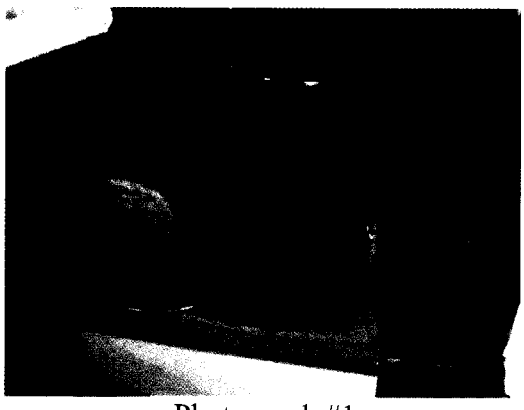
Electrical fires are responsible for over half of the fires evaluated. Issues to consider with respect to electrical wiring on watercraft include corrosion due to water and/or salt water, which can create a current flow, even in circuits not otherwise flowing electricity, and vibrations and movement, which can loosen connections and cause resistance heating.

There is the potential of AC and DC power on watercraft and the investigator must analyze which systems are present in the area of origin and whether or not they are capable of causing the fire. The status of the AC and DC systems will vary, depending on whether the vessel was underway, whether generators are operating, and whether shore power is involved.

Engine fires include the possibility of ignition by combustion and mechanical heat, electrical failures, and ignition of lubricating fluids or fuels. Similar to failures in electrical circuits, fuel lines and equipment can also be affected by vibrations naturally occurring with the operation of the vessel. Fires can occur when a vessel is being fueled, but in those cases, the cause is generally obvious. A common ignition source for a fueling fire is the ignition system when the engine is started after fueling.

Other customary fire causes encountered in structures, such as candles, heaters, cigarettes, and cooking also occur in vessels, but with the added hazard of closer proximity to combustible finishes and smaller compartments. Boats are also normally not as accessible as dwellings and fires not only spread faster due to the fuel loading, but extinguishment can take longer as fire units stretch hose line through security gates and down docks. Sometimes the waterline is where the fire is halted and the ensuing investigation is difficult at best.

The following case study and photographs involve a fire on a boat that was in a slip and secure when the fire department arrived and extinguished the fire. The fire was relatively small and a "V" pattern extended from an upholstered and foam-padded seat on a wood platform with no obvious heat source (Photo #1). The "V" pattern extended up the paneled wall, terminating near the upholstered ceiling. Reportedly, nobody had been on the boat for days prior to the discovery of the fire.



Photograph #1

Continued on page 25

Boat Fires continued from page 11

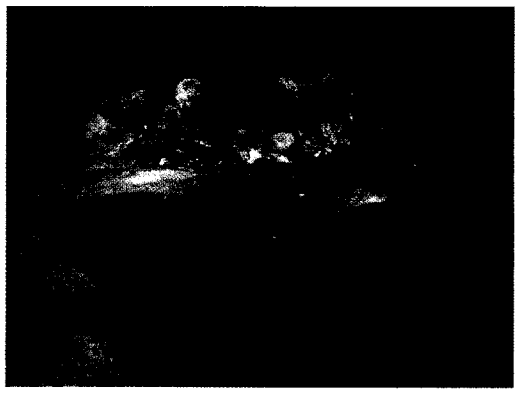
A closer examination of the scene revealed a smaller "V" pattern on the small shelf adjacent to the seat (Photo #2). A duplex outlet was within the "V" pattern, but the face of the outlet showed superficial damage. A hole for a stereo speaker was directly above the outlet (Photo #3). Behind the speaker hole, the back of the outlet, without gang box, was in an otherwise concealed space.

Photograph #2

An examination of the back of the outlet revealed significant corrosion, beading and melting to the metal components (Photos #4 & #5). Although nothing was plugged into the outlet, current flow resulted from corrosion and resistance heating, causing ignition of combustibles in the concealed space, extension through the speaker hole, and further extension up the paneled wall.

Photograph #3

As the fire extended up the paneled wall, a drop fire occurred on the synthetic seat cushion, which burned vigorously and caused the predominant fire pattern. An examination of other outlets showed varying degrees of corrosion and degradation of the metal components and conductors.



Photograph #4

As in all investigations, a systematic approach to evaluating ignition potentials and testing the hypothesis using expected fire behavior will most times reveal the event responsible for the fire. Keep in mind the differences in vehicles, vessels and structures and how fire patterns should present in each, based on size and fuel packages. In other words, when the scene doesn't quite fit the cause, keep looking, thinking, and testing.

Photograph #5