Preventative Maintenance

WHY BOATS SINK (AND HOW TO KEEP THEM AFLOAT)

The cost of repairing a boat that has been underwater, even briefly, is usually about 40% of its value.

Besides having to pay the deductible, the skipper typically loses the use of the boat for several weeks while it is being repaired. The best defense against a dockside sinking?

Visit your boat. And, at least twice a season, inspect any fittings above or below the waterline that could be letting water into the boat. All too often, skippers rely on bilge pumps to bail them out when they can't visit their boats.

The pump fails and the boat sinks. If you can't visit your boat regularly, consider using a buddy system with other boat owners to watch each other's boats.

Modern boats sink for a variety of reasons, which is the point of this section. According to the BoatU.S. Marine Insurance claim files, for every boat that sinks underway, four boats sink in their slips. There are two reasons for this discrepancy.

One reason is whenever a boat leaves the dock, someone is aboard, which leaves open the possibility that the leak will be discovered and the problem corrected before it sinks the boat. And, reason # 2, boats tend to spend a majority of their time at the dock.

Boats with motor wells such as this have scuppers that can become clogged with debris. In the case of this boat, the access port had been opened but not resealed. Water trickled into the bilge when it rained, eventually overwhelming the bilge pump.

WHY BOATS SINK AT THE DOCK

When a boat sinks at the dock, the question most likely to be asked is: "What happened to the bilge pump?" That's the wrong question, however. By dutifully emptying the bilge periodically, a bilge pump can actually hide a problem--until the pump clogs or the battery goes dead. Water, not bilge pumps, sinks boats. The correct question should be: Where did the water come from?

- In 50% of dockside sinkings, water found its way into the bilge through leaks at underwater fittings. The majority of the leaks are at stuffing boxes, followed by outdrive or shift bellows, failed hoses or hose clamps, sea strainers, and drain plugs.
- There were sinkings from air conditioning fittings, gate valves, transducers, mounting bolts, and mufflers. Boats went to the bottom as a result of a leaking speedometer impeller. It is certainly possible that more than one fitting had been leaking.
- It is also interesting to note that the finger was pointed at fittings above the waterline in 9% of the sinking claims. (Question: How can a fitting that is above the waterline sink a boat? Answer: Fittings that are above the waterline aren't always above the waterline.) More on this later.
- Water falling from the sky, either rain, snow, or sleet, accounts for a whopping 32% of sinking claims. Everybody has seen a rowboat or two awash, so this shouldn't be a surprise. What may be startling is

that all of the claims involved boats with self-bailing cockpits that should have shed the water overboard.

- Boats that sank after getting caught under a dock or banging against a piling accounted for 8% of sinkings. This number does not include boats that sank during hurricanes, or the number would have been much higher.

VISITING YOUR BOAT:

The First Line of Defense Against a Dockside Sinking

If you need a reason to visit your boat more often, consider that the cost of repairing a boat that has been underwater, even briefly, is usually about 40% of its value. Besides having to pay the deductible, the skipper typically loses the use of the boat for several weeks while it is being repaired.

At least twice a season, inspect any fittings above or below the waterline that could be letting water into the boat. All too often, skippers rely on bilge pumps to bail them out when they can't visit their boats. The pump fails and the boat sinks. If you can't visit your boat regularly, consider using a buddy system with other boat owners to watch each other's boats. Another alternative is to ask your marina manager to keep an eye on the boat. Many marinas offer routine inspections, but usually at an extra cost.

Here are a few things you need to check regularly to help prevent your boat from sinking...

- **Damaged Outdrive Boots** - Boats frequently sink because the rubber boots on the outdrive deteriorated. According to experts, outdrive boots should be examined two or three times a year. Rubber that looks dried out and cracked (cracks are most likely to appear in the creases) needs replacing.

  If possible, store the outdrive down, which eliminates most creases and prolongs the life of the rubber. Finally, for whatever reason, muskrats and other water-swimming vermin like to chew on outdrive boots. "RO-PEL" a malodorous commercial product, is an effective deterrent (One source: United Spray Systems: 800-950-4883.)

- **Damaged Mufflers** - Backfiring can blow a hole in a plastic muffler. Corrosion can eat a hole in an metal muffler. Both the muffler and the exhaust hose should be inspected carefully.
- **Dockside Freshwater Hookups** - Many boats sink because of problems in the boats' dockside freshwater systems. Water may enter through a broken fitting in the boat's hot water heater. Many sink after a hose burst (the freshwater system hadn't been properly winterized). The first line of defense against this sort of sinking is to turn off the water at the dock whenever you'll be away from the boat for more than a few hours.

  (There are also devices available at hardware stores that can be preset to shut off the water supply automatically.) Hoses and clamps throughout the system should be inspected periodically. While you're checking, make sure there's a pressure-reducer valve and only reinforced hose (look for the criss-cross pattern if the hose is made of clear PVC) is used, which accommodates the greatly increased pressure of a city water system.

- **Through-hull Fittings** - As a general rule, a boat whose gunwale is close to the water (low freeboard) has a greater chance of sinking accidentally. A ski boat, for example, is more likely to be overcome by rainwater, a slow leak, or a following sea than a cruiser whose impressive hull towers far above the water.

  But a boat is often much "closer" to the water than its freeboard would indicate. A cracked thru-hull at the boot stripe or a cutout at the transom for an outboard motor well that isn't protected by a splash guard means that, as a practical matter, the boat has to sink only an inch or two before it floods and heads to the bottom. Inspect fittings and hoses above the waterline with the same critical eye that you used on fittings down in the bilge. Double-clamp the thru-hulls and consider adding an anti-siphon loop or check valve to any that are within 8" to 12" of the waterline.

- **Scuppers and drains** - Even aboard boats with cabins and self-draining cockpits, it isn't unusual to have a leak or two at hatches, ports, chain plates, etc. Caulking these leaks keeps water out of the bilge and

also may prevent costly structural repairs later. Open boats and boats with especially low freeboard should be hauled for the winter in colder climates, as they are prone to being shoved underwater by snow and ice.

When scuppers are clogged with leaves or debris, water backs up and has a tendency to find a way into the bilge. Two other sinkings occurred because scuppers were cracked or broken scuppers and water leaked into the bilge.

- **Seacocks & Valves** - According to voluntary industry standards, seacocks or gate valves, which can be closed in an emergency or when the skipper is away from the boat for extended periods, must be used at all thru-hulls below the heeled waterline. The valves and fittings must be made of bronze or Marelon®, which are not likely to break when struck accidentally with a foot or anchor. (RC Marine's Marelon® seacocks are the only plastic seacocks that meet the requirements of Underwriters Laboratories.)

  Seacocks are widely regarded as being more reliable than gate valves. In an emergency, a quick glance at a seacock will tell you whether it is open or closed. With a gate valve, you can't tell. Gate vales also have a reputation for failing internally because the different metals-steel inside, bronze outside-aren't compatible. Look for a pinkish color on the bronze, which indicates corrosion.

  Other thru-hulls that need inspecting periodically are transducers and raw-water intake strainers. Ice can bend a strainer that isn't winterized properly. You should either drain the bowl or fill it with antifreeze. Even if the seacock has been closed for the winter, water can enter the boat when the seacock is opened in the spring.

  Removable transducers and impellers must be locked in place securely or they can work loose and sink the boat.

  Boats sink when hoses slip off the seacocks' nipples. Hoses connected to the fittings must be double-clamped with stainless steel clamps. Rusted clamps should be replaced.

  Boats sink because a hose split. Hoses at thru-hulls should be the reinforced type, which is usually a heavy black hose. Lighter, unreinforced PVC hoses can (and do) rupture and crack. Check the entire length of the hose, as excessive heat from the engine or chemicals (bilge cleaners, battery acid, etc.) can cause isolated failures. Replace any hoses that are suspect.

Keep the boat away from the dock - Boats sink because they either get caught under the dock or bang against the dock. Bow, stern, and spring lines should be arranged to keep the boat in the center of its slip.

Fenders and fenderboards can be used to cushion minor bumps but they will not overcome a poor docking arrangement. Double up on lines and use chafe guards if the boat is in an exposed location.

Plastic thru-hulls turn brittle and eventually crack form ultraviolet (UV) sunlight. Failures usually occur inside the thru-hull opening. If the thru-hull is only an inch or two above the waterline, rainwater or snow accumulations can force it underwater and sink the boat.

A plastic thru-hull that was an inch or two above the waterline cracked and the weight of the snow lowered the damaged fitting to just below the surface. The boat gradually filled with water and sank.

This small whole in the shift bellows cable was not found until after the boat had sunk.

WHY BOATS SINK

UNDERWAY

Any boat has the potential to sink underway for the same reasons that it could sink at the dock--a hose slips off, a packing gland leaks, etc. Many boats sink because of leaks at thru-hulls, outdrive boots, or the raw water cooling system, all of which are routinely implicated when boats sink at the dock.

There are also many other reasons that boats sink underway, however, which have nothing to do with loose hose clamps or broken fittings. Boats underway can strike floating debris or stray onto a rocky shoal ("Navigation error"). There are careless skippers who forget to install drain plugs. Many boats sink after coming down hard off of waves and splitting open.

Once a boat starts to sink, it will gain momentum as it settles into the water. If a boat has a two-inch hole that is a foot below the waterline, for example, over 78 gallons of water will pour into the boat per minute. When the same hole is three feet below the surface, the flow of water increases to 136 gallons per minute. Keep in mind also, that other thru-hulls that had been above the waterline will be underwater. If any of these fittings are cracked or missing, the flow of water into the boat will accelerate further.

- **Low Transoms** - The single most critical reason boats are flooded on open water has to do with transom height. Most boats that are swamped are outboard powered, with engine cut-outs that are often only inches above the waves. Motor wells are supposed to be the second line of defense when a wave comes over an outboard's transom but, in some cases, the well is too low, too shallow, and/ or not sealed adequately to the cockpit. Scuppers in the motor well and cockpit may also be slow to drain, especially if they re clogged. And whenever water lingers in the well or cockpit, the chances of another wave coming aboard increases. So too is the risk of being swamped.

  Aside from transom height, the other contributing factor when a boat is swamped is typically weight distribution-- too many people at the stern together with scuba tanks, large coolers, bait wells, etc. that reduces buoyancy aft. In most cases, swamping occurs when the boats are stopped or idling.

  Prevention: Especially on outboards with low cut outs, be conscious of weight distribution. Avoid storing scuba tanks, heavy coolers, etc. near the transom At slow speeds, keep the boat moving toward the waves. Don't ever anchor from the stern!

  Most scuppers are slow to drain anyway, but when they're plugged up with leaves and other boat-gunk the water can linger in cockpits and motor wells a dangerously long time. Use a dockside hose with a power spray nozzle to flush out debris.

- **Drain Plugs** - It's difficult to understand how a missing drain plug could sink a boat. Wouldn't the skipper realize that the boat was filling up with water? Typically, the water is out of sight in the bilge until hundreds of gallons have come aboard. By then, the boat might be floating well below its lines. In some cases, the source of the leak wasn't discovered until the boat was raised.

  Prevention: How can an absent minded skipper remember to install a drain plug? Try leaving a drain plug (you should have at least one spare) with the trailer's winch handle or with the ignition key --anywhere it is sure to be seen before launching the boat.

- **Cooling System Leaks** - A 300-hp engine pumps approximately 30 gallons of water through the cooling system every minute. Depending on which fitting lets go, you could find yourself with the water pouring into the bilge at the same time the engine overheats, which means you're liable to be greeted by clouds of hot steam when you open the engine hatch.

  Which fittings are most vulnerable? Any fitting that is loose or corroded can let go. In one case a cooling water pump hadn't been adequately tightened. On other boats, hoses slipped off, a raw water heat exchanger burst (end cap), and a plastic muffler split open when the engine backfired.

  Prevention: All of the fittings in the cooling system should be inspected periodically for loose connections and brittle or split hoses. Typically, a break in the cooling system will cause the engine to overheat before much water has been pumped overboard. The hatch

is opened, the problem is discovered, and the boat can usually be saved. The exception is a break in the exhaust or muffler. Backfiring can blow a hole in a plastic muffler, corrosion can eat a hole in a metal muffler, exhaust hoses can split and the engine will continue to pump water--a lot of water--aboard.

- **Striking an object** - Submerged or partially submerged boards, logs, etc., are typically swept into rivers and bays after large rain storms and have been responsible for damaging and even sinking many boats.

  Prevention: Slow down whenever you see floating debris. For every log visible on top of the water, there is likely to be two that are bobbing just below the surface. If you do strike something, indicated by an ominous "klunk" somewhere on the hull, open the engine hatch immediately and make sure the boat isn't taking on water.

SPRING FITTING OUT CHECK LISTS

A complete safety inspection of the engine, hull, and other systems should take, at most, only an hour or two. And attention to detail this spring can make the upcoming boating season a lot safer and more enjoyable.

OUT OF THE WATER

Inboard boats

- Replace deteriorated zincs. They disintegrate, giving you a good indication of what would happen to underwater machinery if zincs were not present. Zincs that disappear after one season indicate a serious problem with the boat's bonding and/or electrical system.
- Inspect prop(s) for dings, pitting, and distortion that can cause excessive vibration and can loosen everything on the boat. Worn or loose props also cut down your top end speed and fuel economy.
- Inspect the hull for blisters, distortion, and stress cracks. While small blisters may be dried, sanded and filled, larger blisters may require professional attention. Distortion and stress cracks should also be addressed by a professional repairman.
- Inspect and lubricate seacocks. Hoses and hose clamps (two at each fitting below or near the waterline) should be inspected and replaced as necessary. This is also the best time to replace gate valves, if any, with seacocks. Gate valves are prone to failure and are not as reliable as seacocks. You also can't glance at a gate valve to see that it is closed.
- Make sure engine intake sea strainer(s) are free of corrosion and is properly secured. Strainers that were not drained properly in the fall could have been bent by ice over the winter.
- Inspect the rudder and rudder post to make sure they aren't bent or damaged. Any looseness must be corrected.

Outdrives and Outboards

- Inspect rubber outdrive bellows for cracked, dried, and/or deteriorated spots. Look especially in the folds! A bellows that is suspect should be replaced.
- Replace deteriorated outdrive zincs.
- Check power steering and power trim oil levels. Follow Manufacturer's maintenance schedule or use factory-authorized mechanic.

WHO NEEDS TO WINTERIZE?

Of all 50 states, which would you guess had the most freeze-related claims? New York? Maine? Michigan? Guess again.

An examination of the BoatU.S. Marine Insurance claim files found that balmy California had more winterizing claims than

any other state, including any of the “deep freeze” states.

While winters may be much colder in the deep-freeze states, the bitter temperatures are a fact of life and preparations for winter are taken very seriously.

But in the more temperate states, like California, Florida, Texas, Louisiana, Alabama, and Georgia, winter tends to be relatively comfortable in most areas with only an occasional cold spell. And if the forecasts aren’t taken seriously, they can do a lot of damage.

STORAGE ASHORE

In some parts of the country, where winter means several months of bitterly cold weather, storing boats ashore is the norm. In warmer climates, however, ice and snow may occur infrequently, and the choice between storage ashore and storage in the water is open to discussion.

Storage in the water means you might get a jump on the boating season next spring. On the other hand, boats stored ashore (on high ground) won’t sink. If you have a choice, storage ashore is a safer bet.

Storage ashore may also be less expensive over the life of a boat, since a hull surrounded by air for several months each winter is less likely to develop blisters than a hull that remains in the water. These blisters, the fiberglass equivalent of rot, occur on many boats when water soaks into the laminate below the waterline.

One note of caution: The vast majority of the problems in temperate states involved boats that were being stored ashore. Since water retains heat longer than air, boats surrounded by air are more vulnerable to a sudden freeze than boats surrounded by water.

Even a brief cold spell that lasts only a night or two can do considerable damage. In temperate states, boat owners must winterize engines and freshwater systems, especially when boats are stored ashore. In deep freeze states, boats stored ashore must be winterized earlier than boats stored in the water.

STORAGE IN WATER

If the boat must be left in the water, the thru-hulls have to be protected by closing all seacocks and gate valves.

Leaving a thru-hull unprotected over the winter is like going on an extended vacation and leaving your home’s front door open.

Failure to close thru-hulls is a major cause of loss in the BoatU.S. insurance program. In a recent study of 40 winter-related claims, seacocks or gate valves left open caused or contributed to the sinking of seven of the boats in the sample group.

If the boat must be left in the water, the thru-hulls have to be protected by closing all seacocks and gate valves.

This boat in Maryland sank when it's plastic thru-hull was shoved underwater by the weight of the snow. the intake was broken by ice (the surveyor who inspected the damage suspected that it was already cracked) and water flowed into the boat.

It should be noted that raising and refurbishing a boat that sinks, even at a dock, is a daunting job that can keep the boat in the repair yard for many weeks over the spring and summer. Whenever a boat is stored in the water over the winter, all thru-hulls, with the exception of the ones for cockpit drains, must be closed or it could be on the bottom next spring.

And all thru-hulls, especially the ones for the cockpit drains, must be double-clamped with stainless steel hose clamps at each end. This is critical. When water freezes it expands and will lift a poorly secured hose off of a fitting. The hose itself is also important. Lightweight hose and PVC tubing can rupture or crack. Use only a heavily reinforced hose, especially at cockpit drains.

If your boat has thru-hulls below the waterline that can't be closed, either because they are mechanically frozen open or have broken (typical with gate valves, which is why they are not recommended), it should be stored ashore for the winter.

Seacocks are closed by moving the handle down so that the handle is parallel to the hull. Gate valves are closed by turning the wheel clockwise.

After the seacock or gate valve has been closed, remove the hose so that it drains and then use an absorbent cloth or turkey baster to eliminate any residual water, which can freeze and crack the nipple.

(Taking off the hose also assures you that the valve has closed properly.) Reinstall the hose immediately and secure the two clamps.

It should be noted that thru-hulls above the waterline are not required to have seacocks and most don't. That doesn't mean that these thru-hulls aren't vulnerable.

Ordinary plastic thru-hulls deteriorate in sunlight and have been broken when they were shoved underwater by the weight of snow and ice in the cockpit, which then sinks the boat. Plastic thru-hulls near the waterline are especially vulnerable and should be replaced with bronze or Marelon (the latter is the only type of plastic approved for marine use by U.L.).

ENGINES

Engines don't like to be idle, even for three or four months over the winter. BoatU.S. Marine Insurance claim files contain many stories of engines that froze and failed after skippers failed to winterize their engine properly. Generally, engine blocks that freeze and crack are not covered by a boat's insurance policy.

But even if the engine makes it through the winter, a half-hearted winterizing effort will come back to haunt you as the engine gets older and wears out prematurely. Unless it is winterized properly, moisture, acids and corrosion will continue unabated. Winterizing the engine is one job that is truly critical; follow the steps below and consult your manual for specifics.

DOWN BELOW

Most marinas are like floating ghost towns over the winter, with little to deter prowlers. Electronics and other valuables that can be dismounted should be taken home for safekeeping. If you have an EPIRB, make sure it won't be activated accidentally.

Besides electronics, all flammables--spare cooking fuels, charcoal, paints, thinners, and varnish - should be stored ashore, preferably in a tool shed away from the house. All are fire hazards. Portable propane canisters should never be stored below on a boat, even during the season, as the canisters can rust and leak. Leave at least one fully charged fire extinguisher in clear sight.

Take home all food stuffs, including canned and bottled goods. Bunk cushions should be propped up, or better yet, taken home. Open various locker doors, hatches, ice box lids, etc., to circulate air and inhibit mildew. Metal zippers on cushions will benefit from a few squirts of a light lubricating oil.

ON DECK

If your boat could talk, it would ask - perhaps plead - for a winter storage cover. Winter covers, typically canvas or synthetic, are a terrific benefit to your boat's gelcoat and general well-being. Canvas covers tend to last

longer but are also more expensive than their synthetic counterparts.

With any cover, a frame, either wood or aluminum, should be used to circulate air and prevent pooling on the cover. Merely draping an old tarp over a cabin may do more harm than good.

Shrink wrapping, a technique borrowed from grocery and department store packagers, is being used by some boatyards to keep boats dry over the winter. With shrink wrapping, heat is applied to a thin plastic so fits snugly over a plastic frame. At the end of the season the entire cover, including the frame, is disposed of.

In addition to ensuring cockpit drains are clear, having a boat cover can keep the cockpit from filling with ice and snow and dragging down the boat.

While shrink wrapping is very effective at keeping moisture out, it will also trap moisture inside and create horrendous mildew problems if vents aren't used along the entire length of the cover. Another problem: Cabins and decks painted with two-part polyurethane paints may peel or bubble. Vents should be used along the entire length of the cover. Inserting a series of foam pads between the hull and cover also allows condensation to escape.

Finally, some skippers mistakenly believe that biminis, which shield the crew from glaring sun will also protect the boat from freezing rain and snow. Quite the contrary; expensive biminis tend to get ripped apart or aged prematurely while doing absolutely nothing to protect the boat. Biminis should be stowed below, or better yet, taken home and cleaned over the winter.

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