

Seaworthy

KEEPING YOU AND YOUR BOAT SAFE ON THE WATER

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Petty Officer Jennifer Williamson, USCG



Light Up The Night

The right navigation lights are essential to safe piloting after dark

By Daniel Rutherford

The aftermath of a collision between a sailboat and a powerboat seven miles east of Bethany Beach, Delaware in July 2012 (see page 5 for details).

LET'S CONSIDER A scenario for a minute. You're heading out across the lake for a night of fishing. You have your navigation lights on. You are at the wheel and you have one of your crew members watching the horizon for any signs of vessels ahead. It's a big lake and it's dark, very dark. Perhaps you slow down a bit, but there is no "restricted visibility" so you are still moving quickly. Suddenly, out of nowhere, you strike another vessel and two people are killed. What went wrong?

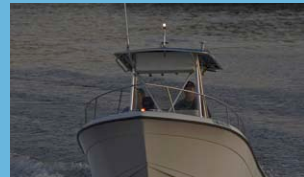
This scenario actually happened, one of many tragedies I have investigated as a marine surveyor specializing in accident investigation and reconstruction. In this case, the boat that was hit was drifting, motor off, lights off, in the middle of the lake. That's right, no lights. They were off to make it easier to gaze up at the stars. That simple mistake turned into a tragedy. Many of the cases involving collisions at night that I have investigated and that result in serious injuries or even deaths could have been prevented with the correct navigation lights used properly.

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IDEAS FOR STAYING AFLOAT

We wired a resettable counter into each of our three bilge pump circuits. On our boat, an abnormal number of activations usually indicates that a packing gland needs tightening, but it could also warn that a gasket or weather stripping needs replacing, or be an early sign of a slow leak that could eventually sink the boat.

Walt Bilofsky
Tiburon, CA

My 21-foot Tahiti Day Cruiser has holes in the steering wheel rim, which I found are perfect for holding the drain plug when not in use. This is a sure way not to forget it! Maybe others have similar steering wheels and can use this tip.

Ron Wynner
Sherman Oaks, CA

MORE BELOW-WATERLINE WISDOM

In “The Bad” photo on page 8 of the April issue of *Seaworthy*, the left picture shows a plastic water filter connected to the seacock. Isn't that filter made of PVC or similar plastic? Why is it acceptable while PVC piping isn't acceptable?

Terry Slattery
Annapolis, MD

Steve D'Antonio: *Nearly every aspect of the installation shown in the photo is undesirable. The seacock, the hose type, and the direct attachment of the strainer to the seacock are all incorrect. The strainer itself, while rated by the manufacturer for raw-water use, is, in my opinion, inappropriate for this and any raw-water application. With few exceptions, I remain unenthusiastic about PVC for raw-water plumbing in most situations, particularly when assembled in the field. Most PVC lacks the necessary tensile strength and modulus of elasticity*



to be confidently used in raw-water applications. I've encountered multiple examples of failed PVC in raw-water applications. Exceptions include PVC engineered, used, and supplied in situ by equipment manufacturers; watermakers for instance.

Last year, a surveyor examining a sailboat I was thinking of purchasing suggested that I install a wire electrically connecting all of the seacocks in the boat to ground. I had not heard of this before and wondered if it is a recommended practice?

Marc Mandel
Sea Cliff, NY

Steve D'Antonio: *The system to which you and your surveyor are referring is called bonding. That's an electrical connection between all underwater metals as well as key components within and on the vessel, from spars and fuel tanks to engine blocks and deck rails. The reasons for bonding are several, including prevention of electrocution, stray current and galvanic corrosion, and lightning damage mitigation. From a corrosion perspective, and in the simplest of terms, bonding underwater metals, seacocks, struts, rudders, etc. together*

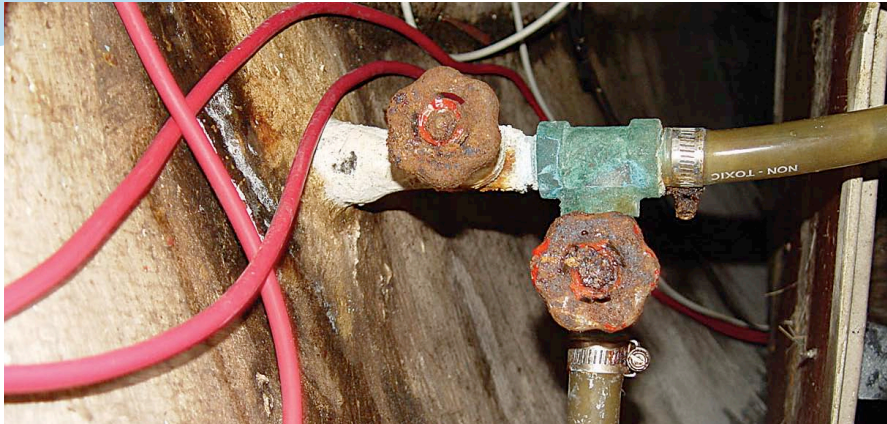
affords all of these components a common source for galvanic corrosion protection when a key component is also added to this system, a zinc or aluminum anode. Without the anode, if it is absent or depleted, the bonding system offers no corrosion protection. In fact, without a working anode, bonding can increase the likelihood of corrosion of less noble metals within the system—manganese bronze propellers, for instance.

American Boat and Yacht Council (ABYC) guidelines recommend that vessels be bonded, though many European and some American manufacturers believe that it does more harm than good, a notion with which I am not in agreement. A properly designed, well-maintained bonding system offers undeniable safety and corrosion benefits, making your surveyor's suggestion a sound one. If the system is neglected, if connections are compromised, or if anodes are not maintained, then issues can arise; however, that's true of countless other onboard components. You will find a selection of links to my online articles including half a dozen about corrosion at: stevedmarineconsulting.com

NAV LIGHT REFRESHER

You mentioned the importance of checking your navigation lights in the last issue. Of course, you know that the way you tell a sailboat (under sail) from a powerboat is by the characteristic of the white light – powerboats under 40 feet show an all-around white light but the sailboat shows one of only 135 degrees, visible from astern.

Although the required lights must not be obscured in any way that interferes with their visibility by other vessels, I think that it is a good idea if you can arrange to have a very small amount of each light reflected back



In response to our article, surveyor Alison Mazon shared this photo of badly corroded gate valves in a below-waterline installation.

to the cockpit so you can monitor the lights continuously at night. If this is not possible, then consider replacing any incandescent fixture with an LED.

Pete Rosenfeld
Charlotte, VT

See our cover story this issue for more on navigation lights, including information on what lights your boat should be showing when underway.

FUEL FIX

The first story in Small Stuff of the *Seaworthy* April 2014 issue brought to mind the fuel system problems that we had on our Leopard 40 catamaran, *Lux*. We did a series of blog posts about it at svlux.blogspot.com. We had thought that an obstruction like the seals from additive bottles or perhaps remnants of boat diapers or paper towels had made their way into the fuel tank.

The clog turned out to be gunk in the tank, which built a dam around the fuel pickup pipe inlet. Blowing out the line would work for a while, until the sloshing fuel brought the gunk back to the pickup. The solution was to empty the tank and clean out the gunk. What was confusing to us was that the filter remained clean. The volume was low enough that the gunk wouldn't be picked up but the residue was

thick enough to starve the low-pressure fuel pump. Since then, I have heard of another vessel with similar problems and solution.

Terry Slattery
Annapolis, MD

THE SEARCH FOR ETHANOL-FREE GASOLINE

In the April issue of *Seaworthy*, you requested feedback on the ethanol-free website Pure-Gas.org. I visited one listing, the Fisherman's Village Marina in Punta Gorda, Florida, which did indeed carry ValvTect gasoline as listed on the website.

However, based on information from the ValvTect website, ValvTect gasoline may not be ethanol free. It may be regular ethanol gasoline with additives to prevent water separation, probably the same additives I could buy and add to ethanol gas by myself. That's not the same as ethanol free.

Stan Galper
Pembroke Pines, FL

We asked Pure-Gas.org about their inclusion of ValvTect gasoline on the website and Jonathan Lathbury from Atlanta, Georgia responded. "I talked with a customer service exec at ValvTect," he wrote. "He said

that the ValvTect brand is placed on marine fuels when it meets their specifications and contains their additives but that it was up to the supplier as to whether or not the gas would have ethanol in it. Obviously the need for ValvTect additives is reduced if the fuel does not contain ethanol. So if a marina or service facility is listed on Pure-Gas.org as selling ValvTect, then chances are the fuel does not contain ethanol. However, if you encounter a listed station selling ethanol fuel, then please remove the listing. If in doubt, do a test of the fuel to be sure."

You recently ran an article about ethanol-free gas and one person commented that he had used avgas as a replacement for non-ethanol fuel. As an aircraft mechanic, I thought I would pass along a warning.

When synthetic oils were first coming on the market, an aviation company started selling a 100-percent synthetic oil for use in aviation piston engines. It was not very long before the people using this oil started having oil pressure problems and engine failures. It was discovered that the synthetic oils could not keep the lead found in aviation fuel in suspension and it began settling in oil passages and oil pans. Currently, all aviation oils for piston engines use either a crude-based oil or a synthetic mix.

One-hundred percent synthetic oils are being used in boat and other piston engines. Since your basic automotive gasoline does not have lead, the use of synthetic oil is not an issue until the lead is introduced by way of aviation fuel. So if you are going to use the avgas in a boat, or any other piston engine, be sure you are not using a synthetic oil in it. They do not play well together.

Chip Woods
Memphis, TN

COLREGS AND NIGHT NAVIGATION

The International Regulations for Preventing Collisions at Sea (COLREGS) is akin to the Bible when it comes to safety at sea and assessing the risk of collision. The COLREGS supply us with a well-tested set of rules to live by, including those governing navigation lights. If you, as a fellow boater, haven't read the COLREGS – not a very difficult or time-consuming process – please do so before you hit the water this season, for my sake, as well as your own.

I hope we all know the basic “Rules of the Road” by now. For instance, if you and another vessel are approaching each other and are “in sight of one another”, the boat forward of you and to starboard is the “privileged vessel”, which makes you the “burdened vessel” in a collision scenario – you must keep out of their way. Conversely, if you have a vessel ahead of you to port, you are the “privileged vessel” and they are the “burdened vessel.” These common situations are easy to see during daylight. But in the dark, the only way to see a boat and tell what direction it is moving is by its navigation lights. COLREGS define what navigation lights must be used at night and in restricted visibility so the same collision avoidance procedures can be taken.

COLREGS Part C - Lights and Shapes defines the lights and shapes that must be carried by different vessels in different conditions. First and foremost, the “Rules of this part shall be complied with in all weathers” from “sunset to sunrise” and “during such times no other lights shall be exhibited.” The COLREGS even go so far as to say that “The lights prescribed by these Rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility.” Bottom line? If it's hard to see, your navigation lights should be on.

Let's return to the situation we started with – the boat floating on the lake with no lights in the dark. This example helps to illustrate the COLREGS as an intertwined set of rules. Was the drifting vessel (motor off, not anchored) a vessel “underway”? Were they required to “post a lookout” per the COLREGS? Were they required to “take action to avoid collision”? Were they required to display their navigation lights? The answer is “all of the above.” If they had taken the required steps, it's likely that there would have been no collision and two lives would have been spared. Unlike cars that need headlights to see, as mariners we count on navigation lights to allow us to be seen.

Part C – Lights and Shapes not only defines when we should be displaying our navigation lights, but it also defines the types of lights, placement of the lights, colors of the lights, and intensity of the lights. For instance, if I were to ask you where your masthead light was, you might say, “At the top of my mast.” Well, you might be wrong. That light is prob-

ably your all-round light that you use when you're anchored. Your masthead light, for those sailors in the crowd, is the light on the forward side of your mast that should show an unbroken white light over an arc of 225 degrees. For powerboaters, your masthead light is the same 225 degree arc carried probably on the forward side of your fly-bridge or on a short staff under your all-round light. Boats under 12 meters (about 40 feet) can carry one all-around white light that serves as both masthead and stern light. Power-driven vessels (which also means sailboats when motoring) must display this light when underway.

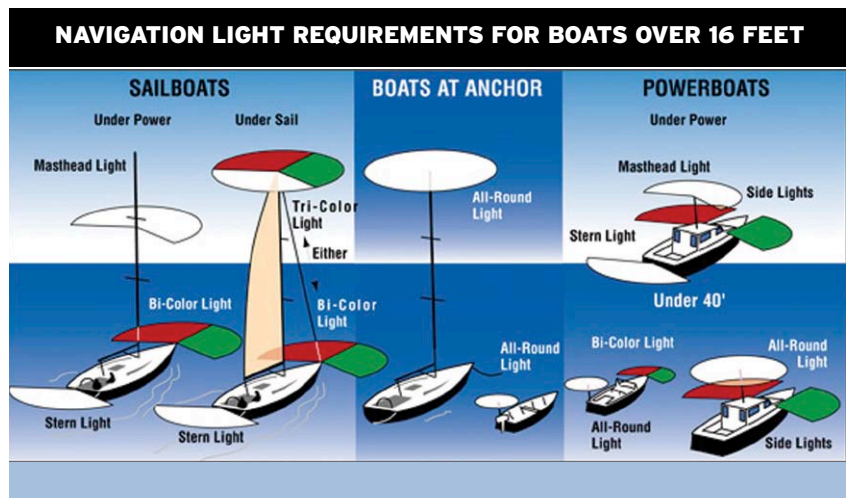
The red and green lights carried forward are called sidelights. Sidelights each have an arc of 112.5 degrees “so fixed as to show the light right ahead to 22.5 degrees abaft the beam on its respective side.” Notice that both lights together cover an arc of – you guessed it – 225 degrees. When you combine your sidelights with your masthead light, an approaching vessel from forward of 112.5 degrees will see either a red light with white above it (if approaching from the port side) or a green with a white above it (if approaching from the starboard side). If you see red, you're likely the burdened vessel, and if you see green you're likely the privileged vessel, just as if you could be seen in daylight.

NAVIGATION LIGHT MISHAPS

So what can go wrong with navigation lights? How about a combination red/green sidelight on the bow that is obscured by an anchor hanging off the bow rail? Or a combination bow light that was properly mounted on the bow of a bass boat by the manufacturer, only to have the dealer install a trolling motor bracket that blocked the starboard side of the light? How about sidelights that were installed on the radius of the deck of a boat so that the arc of visibility for the lights

▶ ONLINE EXTRA

See this article online for links to the COLREGS and to animations to test your navigation light knowledge



West Marine



The trolling motor mounted here almost completely blocks the green sidelight, rendering it useless.



This man-overboard module prevents the stern light from being seen from the port side.



This red/green sidelight is barely visible on deck, let alone by someone on another boat.

Daniel Rutherford

were at 45-degree angles rather than across the horizon? These are all real examples that resulted in tragic accidents.

When approaching a vessel from a direction more than 22.5 degrees abaft her beam (from astern), you should see only one white light, the stern light, which makes you the burdened vessel. Stern lights cover the other 135-degree arc that sidelights don't – you can't see both stern lights and sidelights if they are properly mounted. But what if the stern light is blocked by a man-overboard module (MOM) or Horseshoe/Type IV throwable device, or laundry drying on the rail? That one obscured light, if it results in a collision, might cost your life or someone else's.

One last case to help illustrate just how important the proper display of navigation lights is: In 2012, there was a collision between a sport-fisherman and a sailboat off the coast of Delaware (cover photo). It was a dark, almost moonless night, but the weather was clear and visibility was unlimited. Both vessels were equipped with and operating their radars, and both vessels were equipped with and running their navigation lights. But somehow they found each other in that big ocean, the powerboat colliding with the port bow of the sailboat, resulting in injury.

The investigation revealed that the powerboat's navigation lights were all energized and properly displayed. The sailboat was fitted with all required lights and she was under power, meaning she had to show the lights of a powerboat. She had, just prior to the collision, switched on all of her navigation lights. Unfortunately, the investigation also revealed that the stern light was mounted in such a position as to be obscured from the port side by a MOM and there was evidence to show that the combination bow light may not have been illuminated because one of the wires leading to the light at the base of the bow rail was corroded and had parted. This case went to court and settled on a mutual fault basis showing that despite the burdened vessel (the powerboat in this case) not giving way, there was fault attributable to the privileged vessel (the sailboat) because she, too, was in violation of a navigation rule (incorrect use of lighting).

SEE AND BE SEEN

Now that you know how dangerous incorrect or inoperative lights are, here is what I suggest you do at your first nighttime opportunity. Take your boat out to a safe anchorage, turn off all of the deck and cabin lighting, and turn on all of the navigation lights. From a dinghy or another vessel, circle your boat and make sure that all of your lights are in compliance with the COLREGS.

First, see if they are all working. If not, check the wiring connections to the lights. Make sure those connections are clean, intact, and watertight. Check the bulb and filament. If the bulb has a cloudy appearance, a loose filament, or any indication of burning, replace it. Check the bulb contacts and clean them (a small piece of emery cloth is perfect for cleaning the contact surfaces). Now make sure that the light is mounted correctly so that it projects the proper arc of visibility.

Next, check to see that they are bright – most nav lights have to be seen from two miles away. If they seem dim, remove the light's lens (if possible) and check to be sure that it is clear and not hazed over by UV degradation. Often, lights mounted on rails are hung by straps or fittings that allow the light to sag downward over time. The lens needs to be perpendicular to the waterline unless otherwise stated in the mounting instructions. Perhaps most importantly, is there anything hanging over the light or obstructing its full arc of visibility? Navigation lights are useless if they can't be seen.

Each time before you venture out at night, don't just flip the switch and assume the lights are on. Visually check and examine the lighting to make sure it is both on and visible. Remember, your navigation lights are how you are going to be seen (or not seen) by others. ⚓

Daniel K. Rutherford is president of Ocean Marine Specialties, Inc., a marine consulting firm that specializes in marine accident reconstruction and claims investigations. He is a Certified Marine Investigator and Licensed Private Investigator. He has been investigating marine cases for over 30 years.

The Care And Feeding Of Sterndrives

Keeping your sterndrive in tip-top shape will add years to its life – and help to keep your boat afloat

By Doug Alling

STERNDRIVES WERE FIRST commercially introduced in the early 1960s, and came to dominate the boat propulsion market in short order. The biggest names in the sterndrive game today are Mercury and Volvo with thousands of older Outboard Marine Corporation (OMC) drives still in use but no longer being produced.

When you power up your engine and pull away from the dock, you set in motion a lot of activity at the stern of your boat. You push the throttle, engaging the prop. Power from your engine is transferred to the sterndrive via the drive shaft. Exhaust is pushed from the engine and exits at your prop. All of these functions start inside your boat and end at the sterndrive and require holes through the transom of your boat, at or below the waterline. Three to be exact: One for the throttle cable, one for the drive shaft, and one for the exhaust. And there's only one thing that keeps the water outside the boat from entering those openings – the sterndrive's bellows, those black corrugated rubber things that are clamped to the boat's transom and sterndrive in a place that makes them really hard to see. Perhaps the old saying, "out of sight, out of mind," is why bellows become such a big issue when it comes to sinkings. Take away the biggest and most obvious cause of boat sinkings at the dock – hurricanes – what do you think comes in second place? If you guessed sterndrive bellows failures, take a bow.

Take a moment to think about the environment that bellows operate in

and the work they are tasked to do. They are exposed to hot and cold, wet and dry, vibration, UV, and marine life (sharp barnacles), and through all that they are expected to stretch, expand, and contract as you tilt and steer your sterndrive. Bellows will wear out – and when they do, they can easily let enough water into the boat to sink it. To keep your sterndrive-powered boat afloat, bellows require inspection and maintenance on a regular basis.

BELLOWS INSPECTION AND MAINTENANCE

Inspection of the bellows can be accomplished while the boat is out of the water – on a lift, a work stand at the marina, or on its trailer. Keep safety in mind while doing this! Make sure the boat is properly supported and if on the trailer, chock the trailer tires. It is good practice to make sure that there's no way the engine can be started while you are performing your inspection by disconnecting the batteries. The inspection area is tight and will require moving the sterndrive from one position to another – port and starboard, up and down – to access as much of the bellows as possible. The inspection is as simple as taking a close look (a

flashlight is required) at the condition of the rubber bellows and their clamps. Are there any obvious signs of cracking? Is the rubber becoming brittle? Is there any rust showing on the bellows? Do the stainless steel clamps show any signs of corrosion? If you spot any marine growth (barnacles, mussels, or the like), they have got to go. Barnacles and broken shells can be razor sharp and your rubber bellows won't stand a chance against them.

That's what to look for outside of the boat. Inside the boat, look for any water tracks at the transom pass-throughs and standing water in the bilge. If your bilge pump has been cycling on and off, it's time to inspect the bellows.

OK, we've done our inspection and things look good, but keep in mind that all manufacturers have a recom-



mended replacement schedule for your sterndrive bellows. You will most likely find it in your owner's manual and you should adhere to it. If you are unsure or can't find the information, a call to the manufacturer's customer service center is in order. I have dealt with both Mercury and Volvo in this regard and both manufacturers have been very responsive. Even if your bellows inspection shows good results, the manufacturer knows best when it comes to keeping them in tip-top shape and how often they should be changed. Most manufacturers agree that a 5-year-old bellows is living on borrowed time. Not replacing it is inviting water into your boat.

If you poke around the Web, you'll undoubtedly find videos posted on how to change out your exhaust bellows while the sterndrive is still attached to the boat. It can be done – with really small hands and the right tools. But the exhaust bellows is the only one that can be changed while the sterndrive is attached. The other two bellows contain the drive shaft

and shift cable, and they can only be changed by removing the sterndrive from the boat and disconnecting those systems. Changing out the exhaust bellows alone goes against one of the first rules that a marine surveyor learns: If something breaks or wears out underwater (a bad cutless bearing, a bent rudder) and there are two or more of them, you must always check them ALL. If you are going to the trouble of changing the exhaust bellows, replace the other two, period.

BEYOND BELLOWS

While you are inspecting or replacing the bellows, take a little time to look over your prop as well. Any visible damage? Any signs of fishing line down there? Fishing line can damage the seals that hold the gear oil in the sterndrive housing. Monofilament line can even reach the melting point when wrapped around a revolving propeller shaft.

If line is discovered, removal of the prop may be necessary to disentangle it. Take a look at the seal that is just

forward of the prop and look for any signs of leaking oil. Then, take a look at the gear oil itself. Is the level OK? If the oil has a milky white appearance, water has entered the sterndrive and the oil will have to be replaced.

Remember, refilling your sterndrive oil is counterintuitive. New oil must be pumped UP into the sterndrive. Never refill from the top oil port or vent hole. If you are concerned about the integrity of your oil seals, your mechanic has a simple method of checking them by vacuum or pressure.

As you run down the list of recommendations your sterndrive manufacturer has outlined for annual maintenance, you'll note that you should be lubricating some important moving parts. Don't overlook the prop shaft, U-joint shaft splines, and steering system cables. One grease gun may not cover the needs of these different applications. Check your owner's manual for recommendations.

If your boat spends much of its time in saltwater, corrosion of the sterndrive becomes a concern. Manufacturers

This anode is past due for replacement. Without proper anodes, an outdrive will quickly corrode.



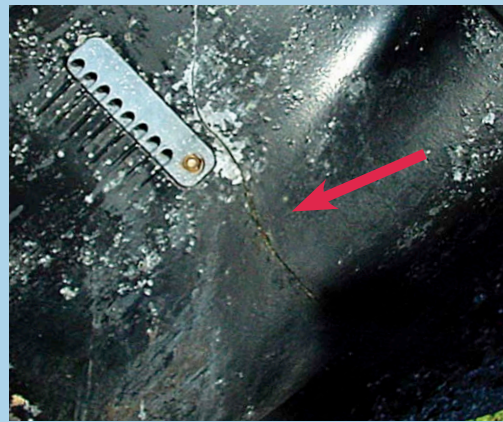
Marine growth can be razor sharp and slice open bellows, allowing water into the boat. Inspect bellows frequently throughout the season.



Fishing line wrapped around the prop shaft can cause the lower unit seal to fail, allowing water to contaminate the oil, which can destroy the unit.



This lower unit cracked over winter when trapped water froze and expanded. Check for milky oil in the unit before laying up for winter.



install sacrificial anodes that are designed for your boat's sterndrive and protect the aluminum housing from corrosion. Monitor them closely and replace them when they become half wasted. How often that is depends on the amount of time the boat spends in the water. Check your motor's manual for the location of all of the anodes because some are cleverly hidden, such as under the cavitation plate just above your propeller.

Replacement with aluminum anodes is recommended. Magnesium anodes should only be used if your boat lives in clean fresh water all of the time. Remember that anodes should never be painted. Mercury Marine has gone the extra yard and in some sterndrives has installed the MerCathode system. This is an active or "impressed" system that actually delivers a small electric current to the sterndrive to counteract corrosion on the unit. The MerCathode derives its power from your boat's battery so, to be effective, your battery has to be charged, and all wires and connections have to be sound. Again,

your mechanic should have a simple test to ensure that your Mercathode system is working properly.

Not only should you keep the paint brush away from your sterndrive's anodes, you should steer clear of getting too close to the sterndrive itself. Most bottom paints contain copper and most sterndrives are constructed of aluminum. These two dissimilar metals do not cohabitate well and underwater can turn into a battery of sorts that can lead to corrosion issues. It's important to keep the copper in your bottom paint away from the aluminum in your sterndrive. So, when painting the boat's transom, keep an unpainted area around your sterndrive. Most recommendations are for about one-and-a-half inches of unpainted surface. Use a copper-free, drive-specific paint, such as West Marine's Antifouling Outdrive Spray paint, if the boat is kept in the water full time.


And finally, when it comes to storing your sterndrive, it's important to prevent water from entering the exhaust hub of the propeller. Openings

10 STERNDRIVE TO DOS

1. If you keep your boat on a trailer, inspect your sterndrive's bellows several times each season. Haul out boats kept in the water at least once a year for a complete sterndrive inspection.
2. If one bellows needs to be replaced, replace them all.
3. Replace the bellows per the manufacturer's recommendations, even if you see no damage.
4. Lubricate moving parts at least annually.
5. If you get fishing line caught on your prop, inspect the seal in front of the prop for damage.
6. If gear oil is milky, replace the seals, as well as the oil.
7. Remember to pump gear oil UP when refilling.
8. Replace anodes when they are half their original size. Use aluminum for sterndrive anodes.
9. When applying copper bottom paint, leave a margin around the sterndrive to reduce the potential for corrosion.
10. To keep water from entering the exhaust hub when storing your sterndrive, leave it in the "down" position or use a waterproof cover.

Ignoring your sterndrive now can cost you money and down time this season.



that are designed to let the exhaust out can also allow rainwater and snowmelt in. Water will accumulate in the unit's housing if the drive is stored in the "up" position. In cold weather, any accumulated water in the sterndrive can freeze and, under the right conditions, ice may expand and crack the housing. When putting your boat away for the season, store the sterndrive in the "down" position or use a sturdy, waterproof cover over the prop to prevent water accumulation in the housing. 

Capt. Doug Alling is an American Boat and Yacht Council (ABYC) Master Technician, the principal surveyor for Rum Line Marine Consultants, LLC near Charleston, South Carolina, and a member of the Knox Marine Consultants team.

ESD Or Drowning?

Whichever it is, don't jump into the water!

By Beth A. Leonard

▶ ONLINE EXTRA

ESD Resource Center
www.BoatUS.com/Seaworthy/ESD

TYPICAL BEHAVIORS EXHIBITED BY VICTIMS

DROWNING	ESD	ELECTROCUTION
Victim cannot speak or shout	Victim will feel tingling, numbness, pain, paralysis	Victim may be able to scream once
Reflexive "ladder climbing"	Initially, victim may be able to shout	Sudden cessation of all activity
Looks "playful"	Looks distressed and not playful	If wearing flotation, may roll on back with face out of the water and be unresponsive
Lasts about 60 seconds with an adult and as little as 20 seconds with a child	May turn into drowning behavior once victim begins to get water in lungs	If not wearing flotation, will likely roll onto face

WebMD.com, interviews with ESD witnesses



USMC via Wikimedia Commons

SO YOU'RE STANDING on a dock, and you see someone struggling in the water. Is the person drowning? Or suffering from Electric Shock Drowning (ESD)? We all know what drowning is – a swimmer gets water into his or her lungs, has difficulty breathing, and cannot stay afloat. ESD occurs when very small amounts of alternating current (AC) in fresh water cause a swimmer to suffer paralysis or even electrocution. Awareness of ESD has been increasing, but too many people who spend time around fresh water haven't yet heard of it.

HOW DO YOU TELL THE DIFFERENCE?

When someone is drowning, they usually lack the lung capacity to speak, let alone yell, and their actions become entirely reflexive. Drowning victims typically move their arms as though climbing a ladder, take quick gulps of air, and then slip underwater. Their mouth is just below water level much of the time. The struggle is quiet, and often looks "playful." This behavior lasts about 60 seconds with an adult – and only 20 seconds with a child – before the victim disappears beneath the surface. If you have any doubts about whether someone in the water is in trouble, ask if they're OK. If

they can't answer, they need your help immediately.

A victim experiencing ESD will feel numbness, tingling, pain, and paralysis, and they may be shouting. They look distressed, not playful. At the extreme, if electrocution occurs, the victim may simply roll onto his or her back or face and be totally unresponsive.

WHAT SHOULD YOU DO?

No matter what is causing the problem, **don't jump into the water** to try to save the victim. Only professionally trained lifeguards can deal with a drowning person without putting themselves in danger. And if the problem is ESD, going into the water could kill you. In either situation, call 911. Then you should "reach, throw, row, but don't go." Use an oar or boathook to pull the victim to you, throw flotation to the victim if he or she is still responsive, or get into a boat and try to reach the person from there.

Once you have retrieved the victim, check for a heartbeat. If you cannot detect one, use an Artificial Electrical Defibrillator (AED) if one is

available. Make sure the victim's chest is dry first. Maintain CPR until emergency personnel arrive.

FOR MORE INFORMATION

The BoatU.S. ESD Resource Center has much more information on ESD, including an introduction to what it is and how it happens, guidance on how to test your boat or your dock, and more information on dealing with victims. 🚤

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Lowering The Lightning Odds

Just how likely are you to be struck by lightning? If you're a boater in certain parts of the country, more likely than you might think

By Beth A. Leonard

EVERY TIME ONE of the megamillion lottery jackpots makes it into the news, several articles appear analyzing the odds and proving that you are far less likely to win the big bucks than you are to be struck by lightning. Those articles generally quote the risk of getting struck by lightning as 1 in a million, which sounds pretty comforting. But that's not all there is to the story.

As this chart shows, your odds of being struck sometime in your lifetime, assuming you live to 80, are 1 in 10,000. Surprised? We were.

Table 1. The odds of getting struck by lightning (2011)

Estimated U.S. population as of 2011	310,000,000			
Annual number of deaths reported	39	Number of injuries reported	241	TOTAL 280
Estimated number of deaths	40	Estimated number of injuries	360	TOTAL 400
Odds of being struck by lightning in a given year (reported deaths + injuries)	1/1,000,000			
Odds of being struck by lightning in a given year (estimated total deaths + injuries)	1/775,000			
Odds of being struck in your lifetime (Est. 80 years)	1/10,000			
Odds you will be affected by someone being struck (10 people affected for every one struck)	1/1,000			

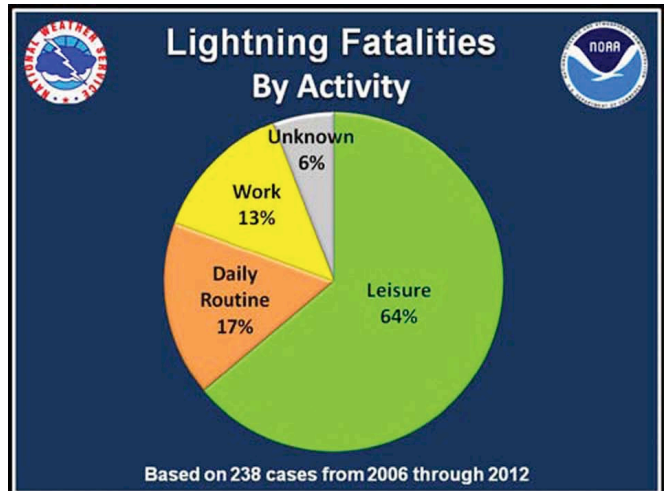
Source: NOAA

Now, just to put this in perspective, 1 in 5 of us will die from heart disease. If you want to reduce your chances of an untimely death, you're far better off cutting back on donuts and hitting the treadmill than hiding under your bed during a thunderstorm. And lightning deaths have actually been declining since the middle of the last century, according to www.lightningsafety.noaa.gov, peaking at 432 in 1943 and dropping steadily to a new low of 23 in 2013 (largely a function of work moving indoors). In fact, annual deaths and injuries have decreased by 40 percent since 2011, so based on that, the current odds of getting struck by lightning over the course of your lifetime might be more like 1 in 15,000.

We're willing to bet that you're far more likely to die on your boat from a heart attack than from lightning.

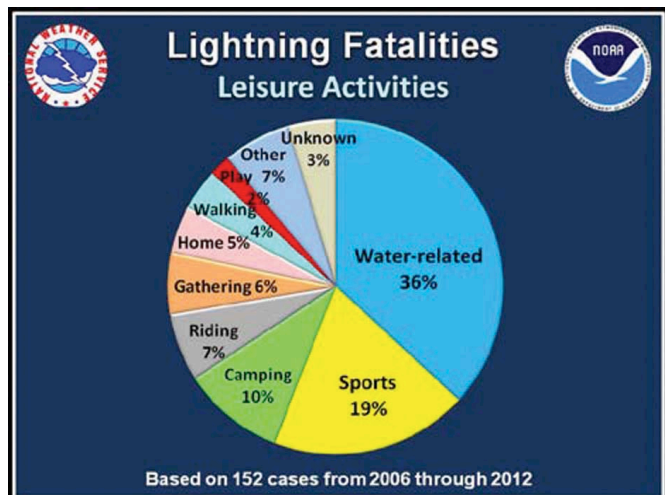
That said, if you spend your leisure time out of doors, like we do, instead of playing video games, your odds of getting struck are, alas, higher than average. If you spend your outdoor time on the water, like we do, they are higher still. In fact, of the 238 lightning fatalities between 2006 and 2012, 40 of those, or 17 percent, occurred when the victim was fishing or boating. Only eight died playing golf.

Figure 1. Lightning fatalities by activity



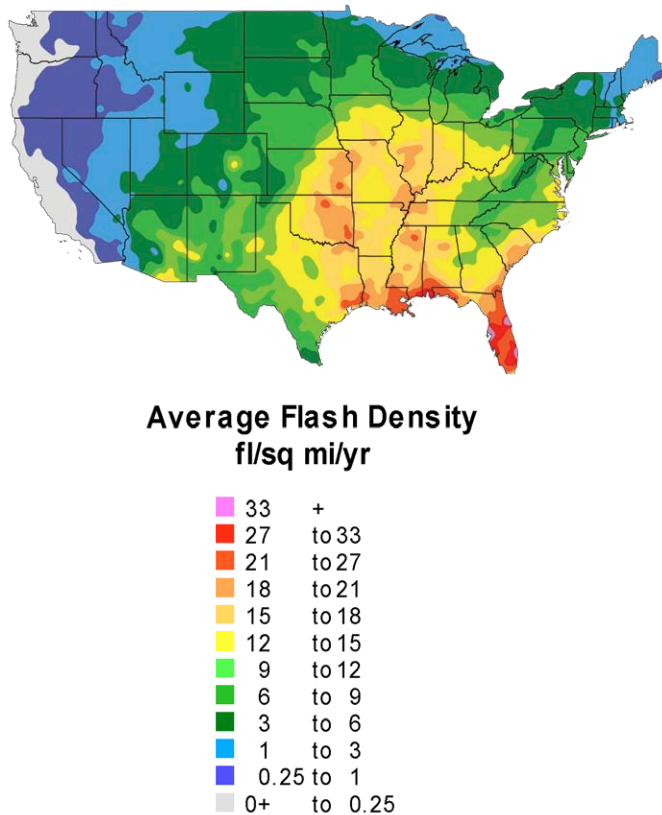
Source: NSW, NOAA

Figure 2. Lightning fatalities by leisure



Source: NSW, NOAA

Figure 3. Cloud-to-ground lightning incidence in the continental U.S. (1997-2010)



Source: Vaisala, Reprinted with Permission

If you boat in certain areas, you're even more likely to have a close encounter of the electrifying kind. That's because lightning strikes are far from evenly distributed across the country as Figure 3 shows. That translates into far more lightning deaths in Florida than any other state (Figure 4).

So, if you boat or fish in Florida (and a few other high-risk states), your odds of being struck by lightning are clearly higher than average. How much higher? Still nowhere near dying of a heart attack, but high enough that it's not silly to think about. (If you boat on the West Coast, getting struck by lightning is silly to think about.)

OK, enough about you for the moment. How likely is your boat to be struck? The BoatU.S. Marine Insurance files suggest the incidence is somewhere around 1 in 1,000. And that's not lifetime risk – that's anytime risk. Most of us know someone whose boat has been hit. So your boat is much more at risk than you are. That's because it can't hide under the bed. Most boats can't even get in out of the storm. And, if it's miles from shore or has a big mast sticking out of it, it's very likely the tallest thing around. In a future issue, we'll talk about boats and lightning. But in the meantime, if we can make you safer, we'd like to.

Until now, there's been no way to reduce your risk other

Figure 4. Lightning fatalities by state, 1959-2012

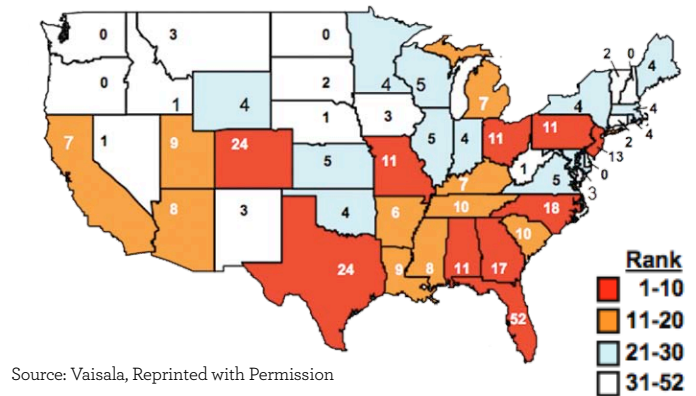
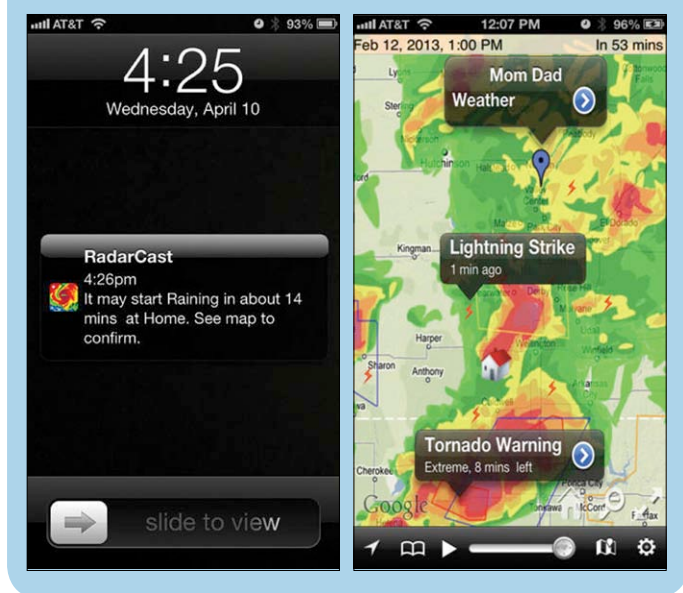


Figure 5. Radar Cast Elite App



than to get off the water at the first rumble of thunder. Very good advice, if not always a practical option. But today, technology can lend a hand.

NOAA has made real-time lightning strike data available, and a number of app developers have integrated it into high-definition weather radar apps for both the iPhone and Android. Google "lightning app NOAA" and you'll find a selection. In addition to keeping you informed of storm activity and movement, these can give you a heads up when lightning is in your area, and allow you to see if it is moving toward you. If you are not too far offshore, they can provide adequate warning to get off the water and to safety before you even get wet.

So go online and get an app. It may not radically reduce the (already low) odds of your getting struck by lightning, but it's cool. And there is a very, very small chance that it will save your boat – or even your life – someday. ⚡

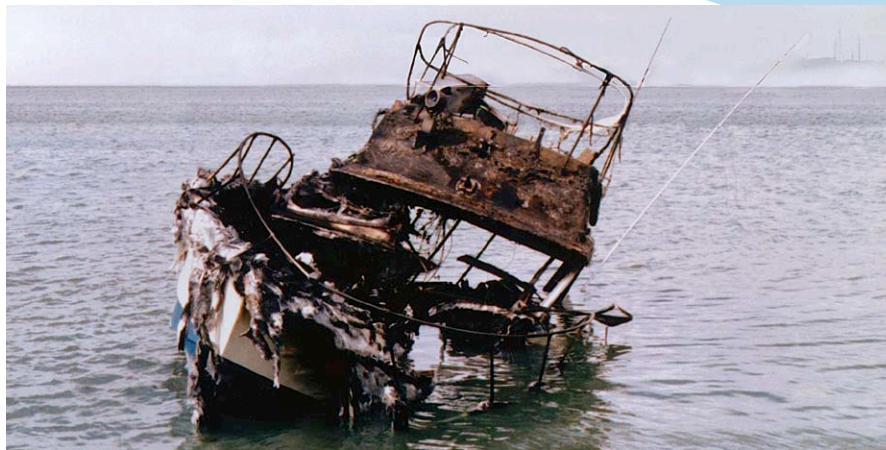


GASOLINE REFUELING DANGERS

Last year, *Seaworthy* received several reports of gasoline explosions. In all cases, the boats exploded right after refueling. Older gas-powered boats have the highest risk because their fuel hoses – especially fill hoses – tend to be older and more likely to leak. Unfortunately, the hoses are often hard to inspect and get brittle and crack, and clamps get rusty (fuel fills must be double-clamped), which can cause gas to leak into the bilge during fueling.

Last Memorial Day, a 32-foot Wellcraft with nine people aboard, including six children, exploded as it was pulling away from the fuel dock at Oak Grove Marina in Maryland. The occupants jumped into the water to save themselves, but two children were hospitalized with burns. While refueling, gasoline fumes had collected in the engine compartment. When the owner tried to restart one of the engines after it stalled, the boat exploded.

Gasoline vapors in the engine compartment can stall an engine or make it hard to start because the gasoline-rich air going into the engine makes



the mixture too rich for the engine to burn. A backfire or errant spark can ignite the buildup. Refueling a gas-powered boat is not like filling up your car at the local gas station and should be done with full attention to the job. Here's a list of procedures that should be followed every time you refuel with gasoline.

- Have everyone leave the boat while refueling.
- Shut off all engines, electric motors, and galley stoves and turn off the battery at the main switch.
- Close all compartments, ports, windows, and hatches. The idea is to keep fumes out of all spaces while fueling.
- Don't smoke.
- Keep the nozzle in contact with the fill to prevent static sparks.
- After fueling, make sure the gas tank cap is replaced, wipe up or wash off any excess or spilled fuel, open all hatches and ports, and let the boat air out.
- Operate the bilge blower for at least four minutes.
- Sniff your bilge and engine compartment areas before starting your engine. Keep in mind that a bilge blower can't remove vapors from spilled liquid gas, so use your nose before turning the key. If there is a strong odor of gas, get everyone off the boat, notify the attendant, and call 911.
- If the engine is hard to start after refueling, stop cranking and investigate!

WATER + SUNLIGHT + NUTRIENTS = SCUM

That's a formula boaters know well, having seen that green scum line often enough along the waterline. And it's not normally a problem that a little scrubbing won't overcome. But if a boat is left for long enough, and if water manages to pool somewhere in the summer heat, you might just find yourself with a cockpit full of water if your boat's on the hard. What started as a little bit of water in this boat generated enough algae to clog all the scuppers, and water that was over six inches deep when the owner found it. So if your boat is left on its own in the summer heat, on a trailer or on the hard, make sure to stop by and take a quick look



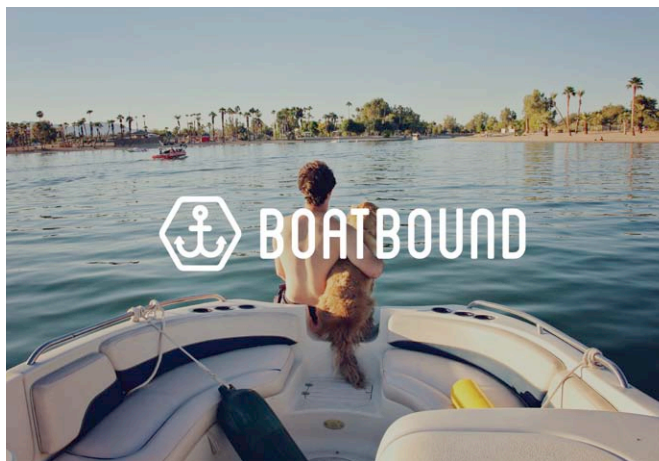
every couple of weeks to be sure you haven't started an algae farm in your cockpit.

INSURING PEER-TO-PEER

Peer-to-peer businesses have sprung up all over the Internet and allow people with something they aren't using to get money for letting someone without that something use theirs for a little while. Airbnb, for instance, helps you find an apartment in New York City rather than paying for a hotel room, often for a fraction of the hotel price. Peer-to-peer has come to boating, and several companies including Boatbound, Cruzin, and Boatsetter are bringing together those who want to use boats with those who own them. This is a great new way to get people out on the water when they don't have a boat of their own or want to boat away from home.

But this rental business model raises some serious insurance issues. Who insures your boat if someone else rents it? Who insures you if you rent someone else's boat?

Most recreational marine insurance policies will not provide coverage during any rental period – no matter whether you are renting someone else's boat or renting your boat to someone else. Some companies may not provide coverage at all if the boat is offered in a peer-to-peer program. While BoatU.S. Marine Insurance may provide a policy to those offering their boats in a peer-to-peer program, **there is no coverage of any type during the rental period.** If you would like to rent someone else's boat and you have a BoatU.S. policy, you can obtain an endorsement that will extend the liability coverage of your boat policy to you while renting another boat. But bear in mind that this supplemental coverage does not provide for any damages that you may cause to the rental boat itself.



The boat peer-to-peer businesses that BoatU.S. is aware of provide their own insurance policy that covers damages that may occur while the boat is engaged in a rental arrangement. But before you enter into any agreement, check with the peer-to-peer business about their coverage to make sure you are adequately protected no matter which side of the transaction you are on. Boat owners should look at how much the policy will actually pay if the boat is lost completely, how much the payment will be reduced by depreciation if the boat is damaged, and whether salvage charges will be deducted from the payment for damages to the boat. Renters should also look at the liability coverage in the event they injure someone in an accident and make sure it is at least as high as what they have through their own boat or auto policies.

FUEL TANKS UNDER PRESSURE

A member from Florida called *Seaworthy* last summer to complain about his portable gas tank swelling up from the hot sun and causing gas to spew out of his dinghy's outboard motor. Some of his dockmates, he said, were having similar problems, including engine flooding. All of them had recently bought new EPA-compliant portable gas tanks.

The new tanks and jerry jugs have special fittings that greatly reduce evaporative emissions from gasoline. These new-style tanks are required across the country now and boaters will be seeing more of them for sale as the old-style ones are sold out. The problem with the tanks centers around the fact that in order to reduce vapors, their vents don't open until the internal pressure reaches five pounds per



square inch. Traditional tanks simply vent to the atmosphere and don't build up pressure. The Florida member reported that his tank swelled up like a balloon in the hot tropical sun.

Before the tank reached 5 psi, the internal pressure forced gas into the outboard where it spewed inside the cowling, eventually dribbling out.

Fortunately, there are a couple of solutions to this problem. The easiest is to simply disconnect the gas tank from the engine when not in use (open the fill cap to relieve pressure before disconnecting or connecting; otherwise the hose may spew gas) and keep the tank out of the sun. The other solution is to purchase a fuel demand valve, which allows gas to flow only when the engine calls for it.

These are available from gas tank manufacturers and large retailers for about \$25.



FOR MOST OF the country, this winter proved to be one of the coldest in recent memory. All-time seasonal snowfall records were set in cities across the country including Detroit and Toledo; Chicago experienced its third coldest winter on record; a snowstorm brought Atlanta to a standstill; and record snowfall and frigid temperatures dominated the headlines well into April. All of that cold weather froze the Great Lakes almost solid – 92 percent of the lakes were iced over on March 6, 2014, the second highest ice cover on record. Heading into May, the Great Lakes remained 26 percent ice-covered, with Lake Superior more than half-blanketed in ice. The ice cover also contributed to below-average temperatures through Memorial Day and delayed the start of the boating season in much of the country, but most especially in the Great Lakes. And the impact is likely to be felt well into the summer, according to Jia Wang, an ice climatologist at the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory in Ann Arbor. "This prolonged winter will affect summer temperatures. This summer will be cold,

and then a cooler fall," he said. Other meteorologists agree with his assessment. Hopefully they'll be wrong, and this photo of the ice-encrusted Great Lakes will cool you off and make you appreciate the summer heat. If not, it will serve to remind you of why this summer has a decidedly chilly feel.

DOES THE COAST Guard have an obligation to launch a rescue effort? Some boaters assume that informing the Coast Guard of a potential problem means they must respond. That assumption was tested in a court case that was resolved in November of 2013, and the court's finding may surprise you.

A husband and wife were boating in the coastal waters of North Carolina in rough seas when the wife fell overboard. She was not wearing a life jacket, and her husband turned the boat around and then dove into the water to rescue her. When the couple failed to return home as expected, the husband's father called 911. They transferred him to the North Carolina Wildlife Resources Commission (NC Wildlife) who in turn passed the information on to the U.S. Coast Guard.

The Coast Guard had no way of

knowing whether the couple was actually in distress or where they were, and their search assets were already deployed responding to a confirmed emergency. The Coast Guard advised NC Wildlife that they would not be initiating any search at that time. The next day, the Coast Guard dispatched a utility boat that found the couple's empty boat, and then deployed 12 boats and planes to search the area. The wife made it ashore without assistance 12 hours after going into the water, and the husband's body washed ashore two days later. The wife brought suit against the Coast Guard for breaching its "duty of care" by not attempting to rescue the couple immediately.

The 4th U.S. Circuit Court of Appeals in Richmond, Virginia, ruled that federal law authorizes but does not impose a duty for the Coast Guard to launch rescue efforts. "Because the USCG has no duty to rescue, the law imposes no standard of care until an attempted rescue commences," U.S. District Judge John Gibney wrote.

The Coast Guard takes very seriously its search and rescue responsibilities, and it's rare for anyone to think they have not gone beyond the call of duty in responding to an emergency. But that doesn't mean that we, as boaters, should take for granted what they do or their obligation to do it.

WE ARE CONSTANTLY impressed by the depth of our readers' knowledge and the range of their experiences, and not just when it comes to boats. After our piece on the potential issues with lithium-ion batteries in April, we got a very interesting email from Dan Van Sickle near Panama City, Florida. After 27 years in the United States Air Force, Dan fetched up in the Pentagon with the rather overlong title of Division

Chief for Requirements for Strategic Defense Forces right when President Carter was elected. “Carter made it clear he wasn’t going to defend anyone,” Dan wrote, “so I didn’t have a job.” Not to worry, the Directorate of Operational Requirements had something for Dan – running the remnants of the Deputy Directorate for General Purpose. If anyone needed anything that was not a weapon or munition, Dan was their guy.

His assignments were many and varied, and some were quite interesting. “One of my troops ran the development of the GPS system we all know today. Another had responsibility for all the satellites that make up the space-based Strategic Warning systems we depend on for earth-wide surveillance, and another directed the development of lithium-ion batteries that are now in demand for powering many of the electronic gadgets we carry in our pockets and purses.” These high-energy batteries were being developed to replace the huge quantity of lead-acid batteries used to provide the backup power for the Minuteman ICBMs (Intercontinental Ballistic Missiles) in silos all across the country.

After a year or so of research, the Air Force Electronics Laboratory in Rome, New York came up with the lithium-ion scheme. “Development progressed to the point,” Dan wrote, “where a demonstration of performance was required before the program could proceed. The lab ran a full-scale rehearsal of the demonstration to be conducted the next day, and then put the new battery, which was huge and heavy, on recharge and went home for the night. That night, the lithium-ion battery exploded and burned the whole laboratory to the ground.” That could have been the end of the story, but obviously, it wasn’t.

“That was over four decades ago,”

Dan said, “and now we have lithium-ion batteries powering all kinds of gadgets. These batteries are still occasionally burning down houses and autos. About a year ago, a house two blocks from ours went up in flames from a lithium-ion battery associated with a model airplane being charged in the garage. They are still temperamental and unpredictable. Treat them with great respect and caution.”

MANY OLD SALTS will tell you that if you ever go overboard, the first thing you should do is to toe off your boots because they will fill with water and make it harder to stay afloat. John Aldridge knew that when he



fell off his lobster boat 40 miles off the tip of Long Island. But then something funny happened. He realized that his boots, heavy industrial ones with extra-thick soles, were actually lifting his feet out of the water. Having gone overboard while his partner was down below asleep, Aldridge knew that he might be in the water for a long time. If he were to survive, he’d need every advantage, and it didn’t make sense to throw away something that floated.

Aldridge did take off his boots, but he kept hold of them. He took each boot and turned it upside down, then plunged it back into the water trapping air inside. He put one under each arm, and there he was, floating on twin boot pontoons.

This is just the beginning of an amazing survival story. Aldridge ended up spending almost 12 hours in the water, kept afloat by his boots, while 21 fishing vessels and several helicopters searched for him. His rescue was a combination of science, skill, and luck. But all would have been for naught if he hadn’t held those boots. If you want to read a great sea story, Google “a speck in the sea.”

MOST INSURANCE POLICIES – whether for a car or a boat – don’t cover things that break. If your car’s transmission dies, you don’t call your insurance company; you get the car to a mechanic. Similarly, if the gears get stripped in a boat’s lower unit, you have no choice but to reach into your own pocket to get the boat running again.

But now, if your boat’s relatively new, you may have a choice. BoatU.S. Marine Insurance has just started offering a new supplemental coverage in 23 states that will pay to repair or replace the lower unit of an outboard motor, or the upper and lower units of a sterndrive motor, in the event of a mechanical breakdown. The parts will be covered for any sudden failure even if it is due to wear, tear, and corrosion, a common exclusion in most insurance policies.

The boat must be less than 10 years old when the coverage is purchased, and it can then be kept until the boat is 15 years old. You will have to pay an additional premium, which starts as low as \$23 per year. This coverage does not apply to any of the internal components of the engine itself. But if you have a relatively new boat and want some additional peace of mind, this may be an inexpensive way to get it. To find out if this coverage is available in your state, call 800-283-2883. 🏠

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Nighttime Safety

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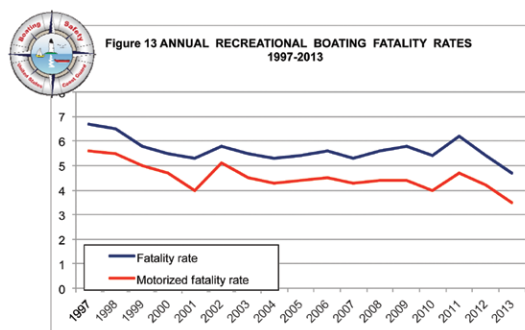
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The Afterdeck: Safer Boating


THE U.S. COAST Guard just came out with their annual statistics on fatalities, injuries, and accidents in the recreational boating world – scintillating reading indeed if you make your living poring over insurance claim files! For those of you who are less interested in combing through 79 pages of graphs, charts, and tables filled with numbers covering every conceivable way someone can come to grief aboard a floating vessel and organized by state, time of day, time of year, body of water, and so on – well, we’ll be happy to summarize. The news is good.

Fatalities on recreational boats fell to an all-time low (since recordkeeping began) of 560 in 2013, a one-year decline of 14 percent. Reported injuries also declined to a new low of 2,620, down 12.7 percent from 2012. This continues a long-term downward trend in both statistics, but what’s even more noteworthy, the number of fatalities per 100,000 registered boaters declined dramatically, down to 4.7 from 6.2 in 2012. As the table at right from the Coast Guard report shows, since at least 1997 boating has been getting safer.

That was not always the case. Back in 1973, boating fatalities topped out at 1,750, the most ever reported in a single year. That was two years after the Federal Boat Safety Act had been signed into law by President Nixon. Testimony from Richard Schwartz, the founder of a new and still struggling organization called the Boat Owners Association of the United



States, was key to the passage of the legislation. The new law enacted three landmark changes: The Coast Guard now had the authority to regulate manufacturers; a “defect” law now applied to newly manufactured boats; and the Coast Guard was strongly urged to create an Office of Boating Safety. In the years that followed, fatality rates continued to decline, thanks to these changes and a concerted effort on the part of the industry and boating safety organizations to address safety and education.

While most of us spend a lot more time in our cars than on our boats, it is still interesting to note that the fatality rate for passenger vehicles on land in 2011 (the most recent data available) was, according to the National Highway Traffic Safety Association (NHTSA), 12.6 per 100,000 registered vehicles – versus 5.4 for boats that year. Even when you separate passenger cars from motorcycles and trucks, the fatality rate in 2011 was still 8.9, more than half again the boating rate. The data are not really comparable, so we can’t say absolutely that boating is safer than driving, but we can say boating is surprisingly safe and getting more so. That’s good news for all of us who spend time on the water. 

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