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## BOATYARD

# One Strike, You're Out!

It's not likely your boat will be struck by lightning, but stay friendly with your insurance agent just in case.  
By Mike Smith

**C**apt. Robert “Cujo” Brinkmeyer was nearly at his marina, coming home from a two-day offshore fishing tournament, when thunderheads started building over Biloxi, Mississippi. As he idled toward his slip, lightning struck on shore, in a parking lot about 100 yards away. Despite the powerful impact of the nearby strike, Brinkmeyer’s boat sustained no damage—but his mate standing on deck was laid out like he’d been hit by Thor’s hammer. By the time Brinkmeyer reached him, the mate was returning to the land of the living—his whole body was numb, on pins and needles like it was asleep, he said. But he soon recovered and showed no ill effects of the experience.

He was lucky: Usually when lightning strikes a boat, or close enough that “you can see the water boiling,” as Brinkmeyer described another near-miss, something bad happens—if not to people, then to equipment. The damage can be crippling, especially since so many modern onboard systems utilize electronics, the lightning bolt’s favorite food; an electromagnetic pulse can fry them like bacon. Repairs are usually complex and costly and will bring you closer to your

insurance agent than you ever wanted to be. But how worried should you be? Is it likely your boat will be struck by lightning? And can you prevent it, or at least minimize the damage?

According to the National Weather Service (NWS), in the U.S. there are about 25 million lightning flashes every year; the Centers for Disease Control and Prevention (CDC) says the odds of a person being struck by one of them are about 1 in 500,000. It’s more dangerous for boats: Based on data compiled from BoatUS Marine Insurance claims, boats have about a 1 in 1,000 chance. The CDC says Florida is the “lightning capital” of the U.S.; BoatUS says about one third of all lightning-related marine insurance claims come from Florida.

The majority of lightning strikes happen on sailboats, adds BoatUS, as an aluminum mast makes a great lightning rod (or “air terminal” in today’s parlance). In the powerboat world, trawlers, most of which also have masts, are the primary targets, about four times more likely to be hit than powerboats in general. But a sportfisherman’s aluminum outriggers and lofty tuna tower bristling with antennas constitute the cherry on a sundae for a roving bolt of lightning. In some lightning-



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protection systems, they take the place of air terminals.

The NWS says a typical lightning flash carries up to 300 million volts and 30,000 amps, enough juice to cook any and all electronics—almost every modern onboard system has some electronic component—and maybe even blast a hole in the hull. Lightning can travel up to 10 miles, cloud to boat, so when it sniffs a nearby ground, not much will stop it, certainly not a few layers of fiberglass. Rather than the charge exiting completely through an underwater ground plate or, in some strike-protection systems, the vessel's propeller, it can shoot off side flashes that destroy electronics and wiring before exiting directly through the hull into the sea. Experts advise if your boat's struck, have it hauled and the underbody checked, even if there's no apparent damage. The electrical discharge can degrade a fiberglass laminate without actually punching a hole in it.

So, let's face it. You can't prevent lightning from striking your boat, but the next best thing is a well-designed and engineered lightning protection system. There are differing opinions as to what that means, though. Both the American Boat and Yacht Council (ABYC) and the National Fire Protection Association (NFPA) publish specifications that differ in many ways.

### The ABYC Way

ABYC is the go-to authority for this kind of thing, with detailed "Standards" on every aspect of construction that boatbuilders have to follow to get certified. But for lightning protection, ABYC issues only Technical Report TE-4, Lightning Protection. An ABYC Technical Report is informational, explained Brian Goodwin, the council's Technical Director; a Standard is a requirement. "It's the difference between 'should' and 'must,'" he said. Why no lightning standard? Goodwin said that it's a challenge to devise an effective

protective system: "Anyone who tells you 'Do X,Y and Z and you'll be fine' doesn't know what's what."

Basically, Tech Report TE-4 says there should be an air terminal extending 6 inches higher than the top of the lightning protective mast, which will make it the highest point on the vessel. Boats without permanent masts should carry a temporary mast that can be erected should lightning be in the area, according to the report. (Good luck with that.) The air terminal should be connected by #4AWG or larger stranded copper wire, or the equivalent (an aluminum mast, for example; aluminum is an excellent conductor), to an underwater ground plate at least one square foot in area. The wire should be led as directly as possible, and "essentially vertical and straight." All major metal components—engines, tanks, handrails, bow and stern pulpits, etc.—within 6 feet of the lightning conductor should be tied into the conductor. The ground plate should also be connected directly to the engine's negative terminal. Metallic objects located so they cannot connect to the ground plate without long horizontal wire runs can be connected to the engine ground instead.

There's a lot more detail in Tech Report TE-4. It runs 12 pages and costs \$50 to non-ABYC members. If you're interested in giving it a read, I'd borrow one from an ABYC-certified technician at your boatyard, or ask him to check out your lightning-protection system with said report in hand, before the thunderheads build.

### The NFPA Way

The NFPA recommends more complex lightning protection, based on a theory developed by Dr. Ewen Thomson, CEO of Marine Lightning Protection, Inc., in Gainesville, Florida. Thomson is an electrical engineer and university professor who's spent more than 30 years researching lightning. His idea is to wrap the boat with protection, using one or more air terminals, a horizontal loop conductor around the hull and multiple grounding electrodes installed just above the waterline, as well as one or more conventional ground plates. This arrangement provides many paths for the lightning to find its way to ground.

The NFPA's version of Thomson's system is described in publication NFPA 780, Standard for the Installation of Lightning Protection Systems. This standard covers lightning protection for all kinds of structures; boats are covered in chapter 10. You can read it by signing up for free access on the NFPA website, [nfpa.org](http://nfpa.org).

NFPA 780 permits using metal fittings, like outriggers, Bimini tops, hardtops, davits, handrails and, yes, masts as "strike termination devices," used in place of purpose-fitted air terminals. Each should be wired directly to a grounding electrode; the NFPA suggests using more than one, at least one of which is a minimum of one square foot in area, same as ABYC. But, like Dr. Thomson, the NFPA suggests encircling the hull with a horizontal loop conductor running outboard of the accommodations and electronics—essentially a #4AWG or heavier wire attached to the inside of the hull skin. Each strike termination device is wired to the loop conductor, which is, in turn, wired to one or more main grounding electrodes and possibly secondary grounding electrodes as well. This network of wires keeps the blast of current at the perimeter of the hull rather than running right down the middle, where it can side-flash into electronics and induce destructive currents in the ship's wiring.

What system do boatbuilders install? Well, have you noticed light-

ning rods sprouting from many boats at your local marina? Neither have I, so either builders are skipping lightning protection completely, or they're using the NFPA practice of employing masts, T-tops and outriggers as strike-termination devices. Nordhavn, on the other hand, follows the ABYC recommendations, said Engineering Manager Mike Telleria, including installing a bona fide air terminal. It's connected to a ground plate; all major metal components are wired together and also connected to the ground plate, he said. "Some customers ask us to get creative—adding DC surge protection, for example. It's not something we do on all the boats." Does a well-designed lightning protection system work? Telleria hesitated. "Get good insurance," he said, "especially if you're in a dangerous area."

### The \$64,000 Question

Telleria is not alone in his hesitancy. It's very hard to tell whether a lightning protection system actually works or not. Boats are rarely struck by lightning, so most of us will never find out, if we're lucky. But unlucky folks have to deal with surveyors and insurance agents after being lightning-struck, so who better to ask for advice? Doug Alling is CEO of Knox Marine Surveyors and Consultants, overseeing seven accredited surveyors working from six offices in the southeastern U.S. "Lightning—it's the gift that keeps on giving," he deadpanned. "It has a mind of its own; damage can run the gamut from nothing at all to sinking the boat." Some boats have holes blown in the bottom, while others look like they've been shot with a shotgun.



*It's a myth that lightning never strikes the same place twice. In fact, it can strike the same place (like a boat's antenna) repeatedly.*

Alling added, "I don't see that a sophisticated ground system is a real deterrent to damage." Sailboats with the mast tied to a ground plate sometimes get some benefit, but powerboats aren't the same: The charge finds its way out however it can. A boat doesn't have to suffer a direct hit; engines with ECMs, multifunction displays and entertainment systems can be victims of a near miss. "Electronics are very delicate; it doesn't take much to damage them." Alling's advice when it comes to lightning? He agrees with Telleria: "Have a really good insurance policy."



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## BOATYARD

Such a policy might very well be written by the Global Marine Insurance Agency; headquartered in Traverse City, Michigan, Global writes marine policies in all 50 states. Michael Gretzmacher is the claims manager. There's no "typical" lightning strike, he said. "You don't know the damage until you start fixing the boat." Sometimes things that look bad aren't so serious; it's usually worse if lightning passed through the engines. Older boats often need completely new electronics, since replacements for burned-out units won't interface with the ones that survived the strike, and a proper repair means replacing everything. Claims also come in for boats near a strike that weren't hit directly. "There's no easy answer when it comes to lightning," said Gretzmacher.

The bottom line? Apparently, the best way to mitigate lightning damage is not to get hit by lightning. And how do you do that? It's the luck of the draw when the boat's unattended at the dock, but underway good seamanship should help. Check the weather forecast before heading out and during your cruise, especially in the summer when storms often develop in the afternoons. (SiriusXM has marine plans that include real-time lightning strike information.) If you see thunderheads—towering cumulus clouds, sometimes with an anvil-shaped top—or hear rumbling in the distance, assume you're about to become a target. Thunderclaps, sound waves caused by lightning superheating the air as it passes through, can be heard for about 10 miles, which, coincidentally, is also the

maximum range of a typical lightning bolt. So even if the storm clouds are miles away, if you can hear the thunder, look for shelter on shore, ideally indoors. Admittedly, your boat getting struck by lightning is a long shot, but if it happens, better that nobody's on board. And don't forget to send your insurance agent a Christmas card this year. □

### What's for Dinner?

Capt. Brinkmeyer told me of a friend whose yacht was struck by lightning about halfway between Florida and Bermuda. The blast killed the diesels, cooking their electronic control modules and the associated sensors on the engines, and burned out virtually every electronic component in the boat. But a handheld Iridium satellite phone was still working. The skipper used it to call MTU in the U.S., who talked him through getting the engines running in limp mode using the spare ECMs he had onboard. He inched his way to Bermuda where he could get proper repairs. The boat was seriously damaged, and two years later electrical problems are still cropping up. "Before I go offshore again, I'm buying myself a cordless Iridium sat phone, keeping it fully charged and stowed someplace safe," said Brinkmeyer. Maybe he should keep it in the microwave oven. Why? A microwave oven is engineered to keep electromagnetic radiation inside, cooking the food and not the chef. It'll work just as well keeping out the electromagnetic pulse of a lightning strike. Stow a handheld VHF, GPS, etc., in the microwave. With luck, it'll survive even if lightning fries the rest of your electronics.



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