
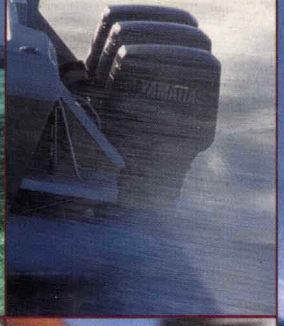

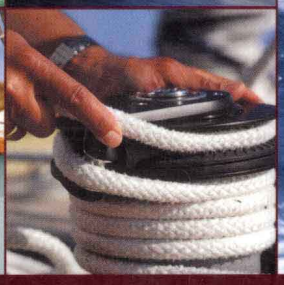
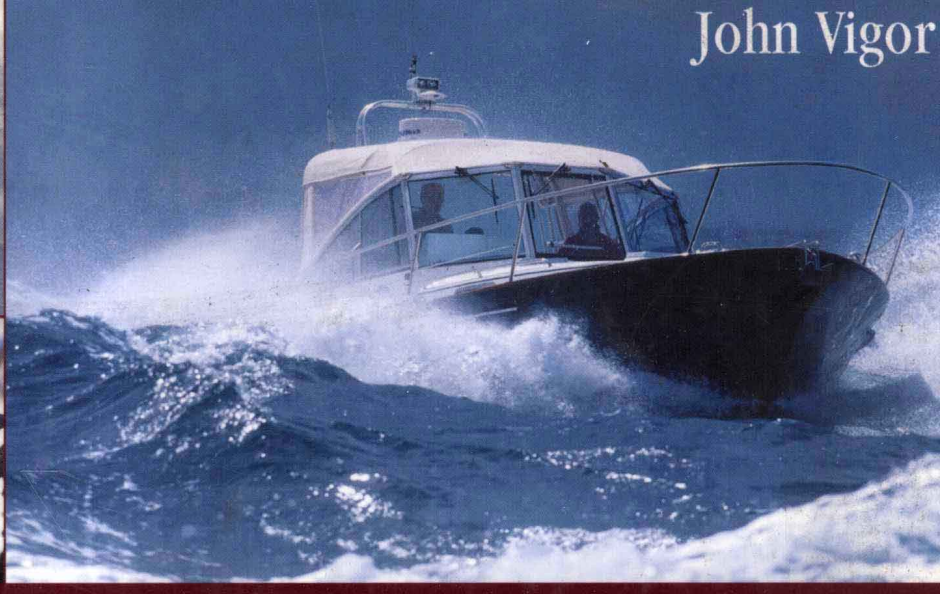

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The Practical Encyclopedia of Boating

An A–Z Compendium of Navigation, Seamanship, Boat Maintenance, and Nautical Wisdom

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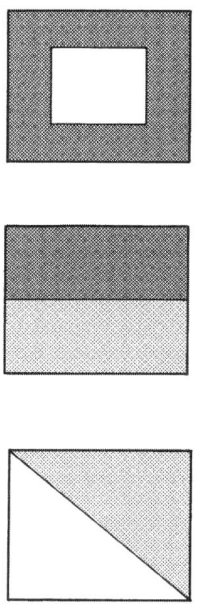

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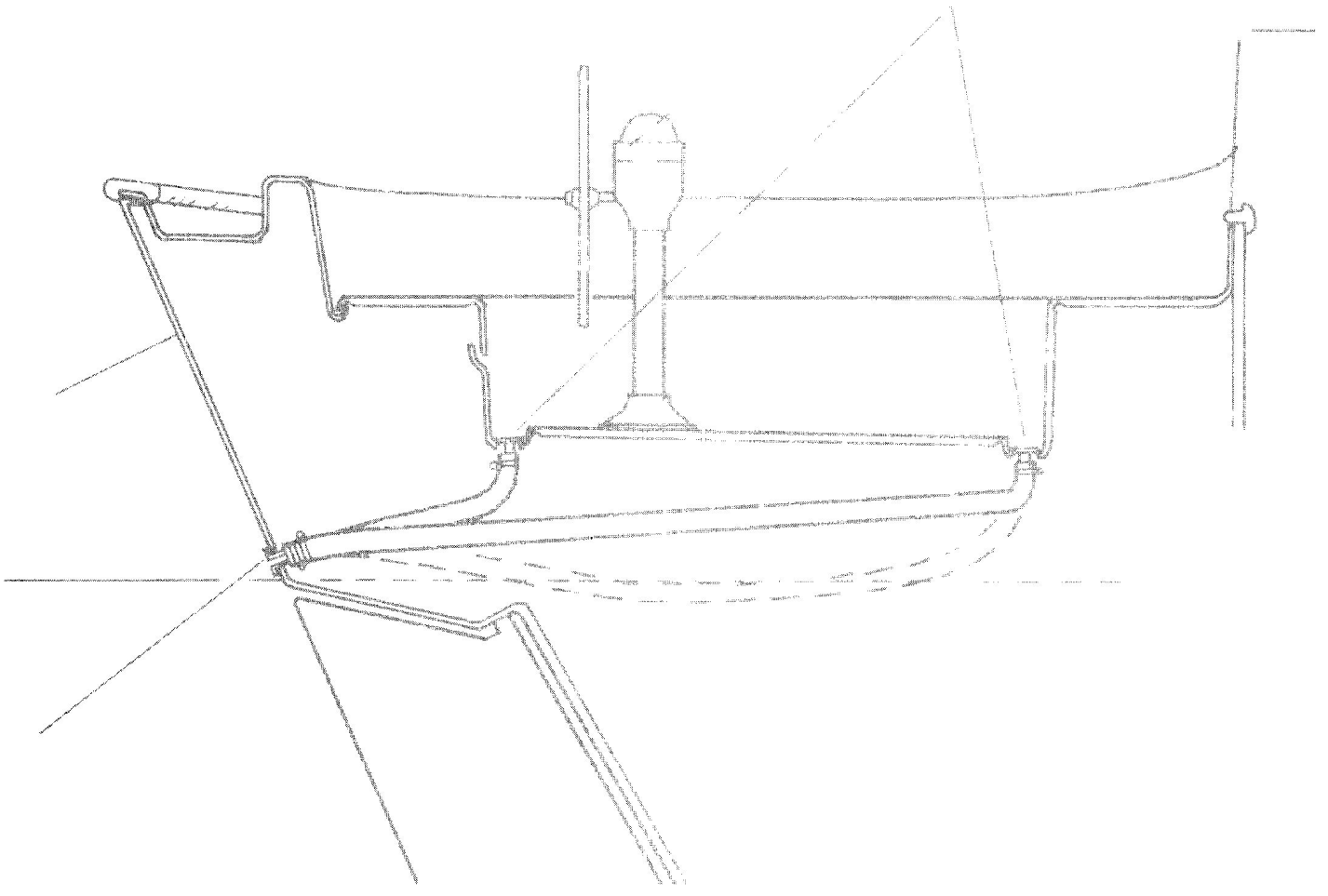

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I gratefully acknowledge the help of a host of people in the yachting community all over the world. There are so many that I can't possibly thank them all personally here, but I must admit that I could not have written this book without their invaluable insights and contributions to yachting knowledge and literature over the years. The wisdom is theirs. The mistakes are mine.

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Introduction

This is no ordinary encyclopedia. Admittedly, it's encyclopedic in form and content because it touches on every important boating subject from A to Z. But it's not written in the usual dry scholastic prose of an encyclopedia. This one is different. In refreshingly simple language, it informs, entertains, enlightens, and amuses.

It is nevertheless an authoritative, comprehensive guide that will help you solve many everyday boating problems. These alphabetically arranged entries and illustrations cover all aspects of boating, power and sail. They explain the mystery of how boats can sail against the wind, why the sea sometimes speaks with human voices, and why sailors think it unlucky to start a voyage on a Friday. They tell you how to dename your boat (so you can later rename it without suffering bad luck) and they reveal how good sailors *earn* the "luck" that keeps them safe at sea.

The subject matter has been arranged so that you can flip the book open at any page and find yourself following a fascinating trail from entry to entry of your choice. When you have a specific subject in mind, first look it up alphabetically, using the words you would normally use. If you don't find it there, go straight to the comprehensive index at the back of the book, which will guide you to the right place.

Running through the pages of this book is a thread of sensible hints and tips on everything from anchoring to zinc replacement. You'll find the explanations, definitions, and instructions here clear and helpful. This is a practical directory for practical people.

At the end of most entries you'll find a cross-reference. If it says, for example, "See also **Boat Types**," you'll find additional information on a closely related subject.

A

Abandoning Ship

Why it may not be such a good idea in extremely bad weather

You'll often hear the old advice never to abandon your boat until you have to step *up* to the life raft. It sounds deceptively easy, but the only time it works is in reasonably calm water. People who advocate it as a general rule have obviously never seen an inflatable life raft performing its antics alongside a boat in a bad gale, rising and falling like an elevator gone mad, crashing and bashing against the hull, jerking and tugging and doing its best to puncture itself or break the painter and fly away like thistledown in the winter wind. It's up one moment, down the next, and then it's disappearing forever over the swells to leeward.

Nevertheless, the principle is sound: Don't abandon your boat until you are absolutely, positively sure it's going to sink. Too often, a partially waterlogged boat is found still floating months or years after it was abandoned, whereas those who actually managed to get into the life raft are never seen again. Trying to board a life raft in those conditions may be far more dangerous than staying with the boat.

Fifteen lives were lost during the Fastnet Race in Britain in 1979—many of them when boats were being abandoned. It happened again during the Queen's Birthday storm off New Zealand in June 1994, when three sailors died—the *only* ones who abandoned their boat and got away in a life raft.

Unfortunately, the pressure to abandon ship before it's necessary is often very great. It's not easy to resist, particularly if you have a well-found raft in good condition.

You may be exhausted mentally and physically after fighting a gale, pumping bilges, and possibly suffering a dismasting or other damage. You'll experience a feeling of not being in control, of having made wrong decisions. You may also be frightened if the weather seems to be getting worse. You'll certainly be scared by the noise: the banshee scream of the wind and the bloodcurdling thunder of solid water hitting the hull. In addition, you'll probably be feeling guilty about leading your crew into danger.

It all becomes too much, and the inflatable raft offers a way out—you want nothing more than to curl up in the fetal position in the soft belly of a boat. It offers peace: relief from the great mental strain of making decisions and giving orders to a crew, or trying to quell their panic. The life raft will look after you. There's nothing to be decided: no more fighting, no more mess of tangled ropes, no more chaos down below—complete and wonderful capitulation. Just lie down and let it carry you away. The lure of the life raft is very strong.

Yet, it's a fact that few boats sink from the stress of storms, even those abandoned with hatches open. Your best bet is to think about the possibility well in advance, to be fully aware of the pressures you'll experience to abandon ship too early, and to fight them until it's quite evident that the raft really is your last refuge.

See also **Life Rafts**.

Accidental Circling

Accepting the inevitable could keep you out of trouble

Well-documented studies carried out in the Northern Hemisphere show that people who are cut off from sensory information about their surroundings tend to move in a circle, usually clockwise. It makes no difference whether they're driving, walking, swimming, or steering a yacht.

So, if you happen to be caught in dense fog in a dinghy—or even in a bigger boat—without a compass, accept that your chances of steering a straight course are slim. You may have a little breeze to

guide you, but there's no guarantee it will remain steady in direction. If you have a fishing line, try trailing a length astern to help you keep going straight ahead. However, even if it does keep you straight for a little way, you won't know in what direction you're traveling, and sooner or later you're going to start veering off to the right, even if it does take a little longer.

Merely knowing that you're going to circle clockwise is not much of an aid to practical navigation; its usefulness lies in the fact that you will not fool yourself into believing you can maintain a straight course. That could keep you out of worse trouble.

To my knowledge, no equivalent studies have been carried out in the Southern Hemisphere, where it's possible that you might circle counterclockwise instead of clockwise.

See also **Fog Types**.

Accidents on Board

Dealing with a wide range of calamities that can't be avoided

Like many other sports, boating involves certain risks that can never be entirely eradicated. Despite the best training and precautions, accidents do happen and always will. But you can substantially reduce the risk of death or serious injury by preparing for the worst, installing equipment to handle emergencies, and knowing how to use it.

First, be aware of the wide range of accidents that occur on boats. The major ones involve fire, carbon monoxide, falling overboard from your boat or dinghy, collision, being hit on the head by a boom, getting a finger caught in an anchor chain or a line to a winch, and being run over by a propeller.

Following is what you can do (and what, in some cases, you are *required* to do by federal law) to lessen the consequences of an accident.

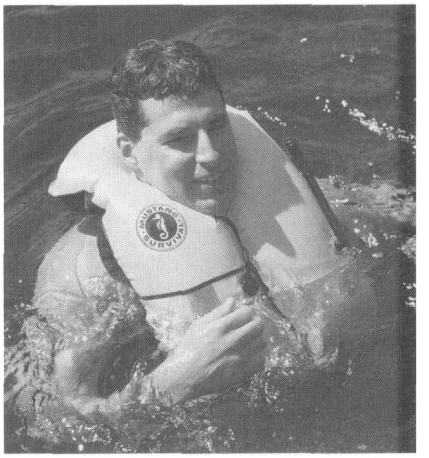
Fire

Keep several U.S. Coast Guard–approved fire extinguishers on board. Federal law dictates how many your boat should have, but it's the very minimum. Take at least of couple of extra extinguishers, and check them regularly. Place them near likely spots for fires—the galley and the engine compartment—and along exit routes, where you might have to put out a fire before you can escape into the cockpit. Show all your passengers where they are and how to use them.

Carbon monoxide

This colorless, odorless gas is a killer. It's a by-product of combustion, and it's found in copious quantities in engine exhaust. If exhaust fumes are blowing over the stern into the accommodations, beware. It also forms where open flames are burning—at the galley stove, oil lamps, and heaters. Your charcoal barbecue grill is another prolific producer of carbon monoxide, which, incidentally, has the ability to travel rapidly in a draft of air, even upstream. Many deaths have occurred in sleeping cabins tightly sealed against cold weather in which open-flame heaters were being used. There have even been reported cases of knee-boarders overcome by carbon monoxide while being towed behind powerboats.

The danger signs are lightheadedness, headache, light nausea, dizziness, and unnatural sleepiness. Drag yourself into



Inflatable life jackets, which the coast guard classifies as type 5 personal flotation devices (PFDs), are convenient to wear (top). *In use* (above), *they provide more buoyancy than most.*

fresh air immediately. In advanced cases of carbon monoxide poisoning, the skin turns pink.

The best defense is to vent your stoves to the outside atmosphere and maintain a steady flow of fresh air inside the boat, cold as it may be. It's equally important to install a carbon monoxide monitor-alarm. Marine stores sell battery-operated alarms.

Falling overboard

This risk is always present, in big boats and small. Even if you can swim well, it might be a long time before the boat can turn back to rescue you. In cold water, you will quickly become weak and confused as hypothermia sets in.

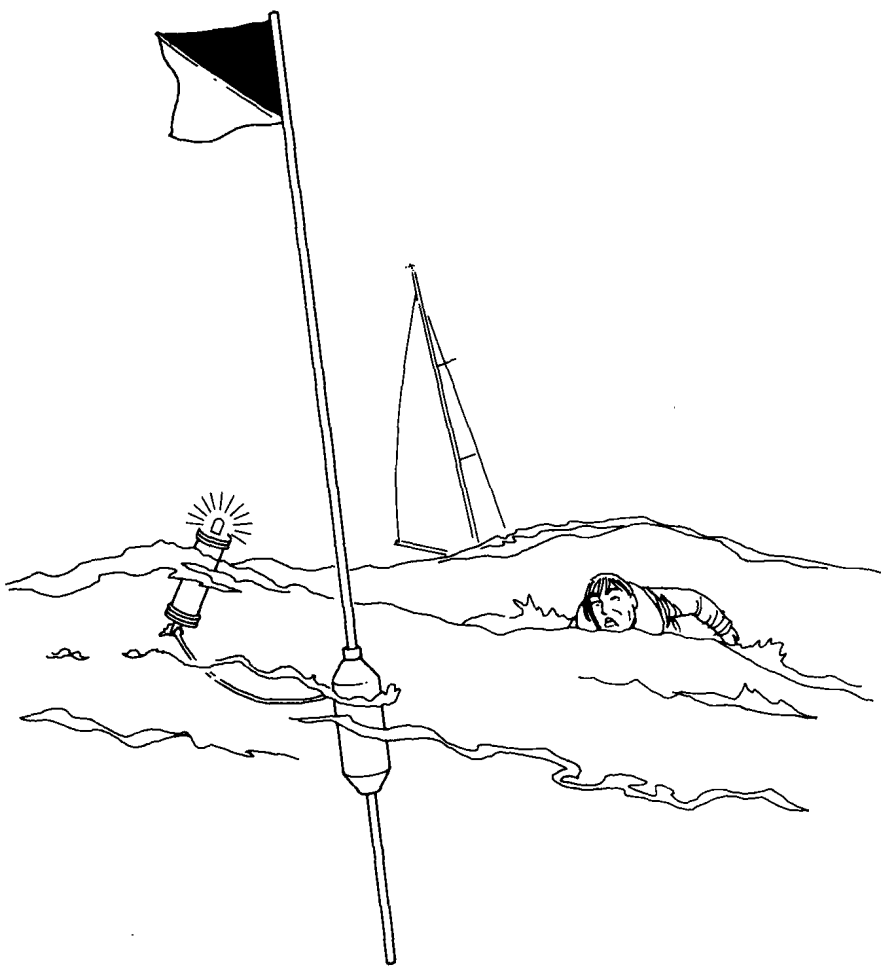
Most life jackets, as mandated by federal law, don't have to be worn all the time you're aboard. But it's a good idea to don one when the weather turns bad because you're likely to be in the water much longer if you fall overboard. Better still, discipline yourself to wear a slim vest-type life jacket all the time you're on deck. It won't hamper your movement much and, although it's not as buoyant as an offshore-type jacket, it will be ready when you need it. It should have reflective patches, a pocket for a crew-overboard light, and a good whistle.

Inflatable life jackets have now been approved by the U.S. Coast Guard, but you'll notice that guardsmen don't wear them. That's because this type of life jacket is not foolproof: it doesn't always inflate when it should, especially if you fail to maintain it religiously. These life jackets are becoming popular because they look smart, don't get in your way, and can incorporate a harness; however, they're still not as reliable as solid flotation.

Lifelines, the wires running through stanchions at the edge of the deck, are supposed to stop you from falling overboard, but they are often too low to do the job properly, especially on sailboats. Regard them as backup; never rely on them.

In heavy weather, it makes sense to use a harness and tether attached to a jackline running fore and aft so that you're always attached to the boat. Try to arrange it so that the tether is short enough to stop you going overboard—people have drowned from being dragged alongside in harnesses and not being able to scramble back aboard.

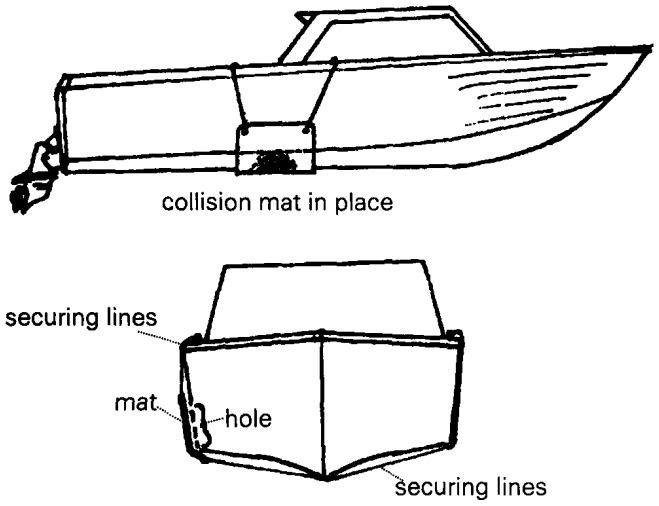
A crew-overboard pole, equipped with a flag and a strobe light, is a valuable aid for locating someone in the water, and should be kept ready for use in the cockpit.



A crew overboard pole, when deployed quickly, can guide a boat back to the lost crew.

Collision

Whether you collide with an iceberg, a rock, or another boat, there's always a chance of sinking. A collision mat might stem the



A collision mat might slow down a bad leak while you make temporary repairs.

flow of water until you can make temporary repairs, but some alternative form of flotation is advisable just in case: a life raft or a dinghy.

You can avoid collisions by cautious navigation and thorough application of the rules of the road, but primarily by keeping a good lookout at all times.

Head injuries

Your only defense against being hit on the head by the boom is to be aware of the danger and duck at the right time. Accidental jibes happen without notice, so be extra cautious if you're in a sailboat that's running dead downwind. If it's a long leg, pin the boom forward with a preventer line so it can't jibe. Otherwise, it might be a good idea to wear a helmet; an even better idea is to wear a life jacket. If a jibing boom knocks you overboard and you're unconscious without flotation, you'll be lucky to survive.

Finger injuries

Anchor lines and sheets handling heavy loads around winches often cause finger injuries. The immediate cure for a trapped finger is to ease the load on the line or cut it, but prevention is a matter of awareness and caution. Be sure to tell landlubbers to keep their fingers well clear of winches and cleats.

Propeller injuries

If you're in the water being rescued, keep your legs well clear of propellers; they inflict nasty wounds. If you are the rescuer, turn off the motor at the last moment. Don't assume the prop will stop turning in neutral gear because sometimes they don't.

See also **Fire on Board**; **Harnesses**; **Heaters**; **Jacklines**; **Life Jackets**; **Lookouts**; **Preventers**; **Winches**.

Adhesives

Four types of boat glue and one powerful sealant

Modern glues have proved to be surprisingly efficient and durable, even on boats, where salt, moisture, heat, grime, and the ultraviolet (UV) rays of the sun do their best to degrade them. Many boat parts that formerly required fixing with nails, screws, rivets, or nuts and bolts are now fastened in place with glue only. Indeed, the major hull components of many small plywood boats are now held together solely by fiberglass tape glued in place.

Nearly all glues used in boat work fall into one of the following four categories:

Rubber glues, the basis of contact adhesives, may be natural or synthetic.

Melamine-urea types of glue are water-resistant and very forgiving, which makes them suitable for amateur use. Examples include Weldwood plastic resin, Casco urea-formaldehyde, and Aerolite resin glues.

Epoxies, probably the most popular glues used on boats, also are forgiving in many ways because their curing times can be controlled, and they can be stiffened and strengthened with fillers to avoid dribbling and slumping. Epoxy resin fills large gaps and is an excellent sealer for wood. It is almost exclusively used to laminate new fiberglass to old fiberglass hulls.

In fact, epoxy sounds like the ultimate glue, and it might have been except for two flaws:

in its normal state, it's not waterproof or heatproof; and it can be adversely affected by salt water and sunlight, both of which are plentiful where boats abound. For exterior use, therefore, it should be protected from salt and sunshine by paint, preferably white or a light color. Varnish that contains UV-ray filters offers some protection, but not as much as paint.

Resorcinols have the very qualities that epoxies lack: they are not affected to the same extent by water or sun. Typically a purple-brownish color, they are the glues used in exterior- and marine-grade plywoods. The original resorcinols were not gap-filling and required a good fit between the pieces of wood to be joined. However, newer varieties have the ability to fill gaps and require less clamping, making them the best wood-to-wood glue available for marine use.

Resorcinol comes in two basic forms. One needs temperatures of 70°F (21°C) or higher to effect a cure; the other, an imported version made by Ciba-Geigy and known as Aerodux or Cascophen, will cure in temperatures as low as 50°F (10°C). The U.S. product is known as Weldwood and is available at marine hardware stores.

Polyurethane sealant needs to be mentioned in connection with glues. It's a bedding compound that also has great adhesive powers—so much so that anything you bed down in polyurethane is never likely to come apart. It's used for permanent sealing bonds, such as hull-to-deck joints, or where a ballast keel joins the hull. The most popular brand is 3M 5200.

See also **Sealants**.

Air Masses

What you can expect when the barometer rises or falls

All forms of boating are directly affected by the weather—but what exactly is weather? It's simply the reaction of the atmosphere—a relatively thin layer of air that surrounds the Earth—to changes in temperature and pressure.

In simple terms, the atmosphere consists of huge invisible bubbles of air, often hundreds of miles in diameter, rising and falling, warming and cooling, like the colored wax in a lava lamp.

The restless motion of the air masses is caused by simple physical laws, but the results are so complicated that even professional meteorologists armed with the latest computer technology can rarely issue a forecast that is valid more than three days ahead. Nevertheless, boaters who know a few basic principles concerning the movement of air masses can often forecast the weather in their immediate vicinity with reasonable accuracy.

Warm bubbles of air are low in pressure and will rise; cold bubbles of air are higher in pressure and will fall. Air in a bubble of higher pressure will try to balance the pressures by moving toward a bubble of lower pressure; the action starts when two bubbles meet. These boundary zones are called fronts.

The larger the difference in pressure between the two air masses, the faster the air will flow from high to low pressure. That's the air movement we call wind.

If your barometer drops 6 millibars (0.177 inch) or more in 12 hours, thus indicating that the pressure is changing rapidly, you may safely assume that a major low-pressure storm system is fast approaching—especially if the cloud cover has been increasing and the winds have either changed direction or increased in speed.

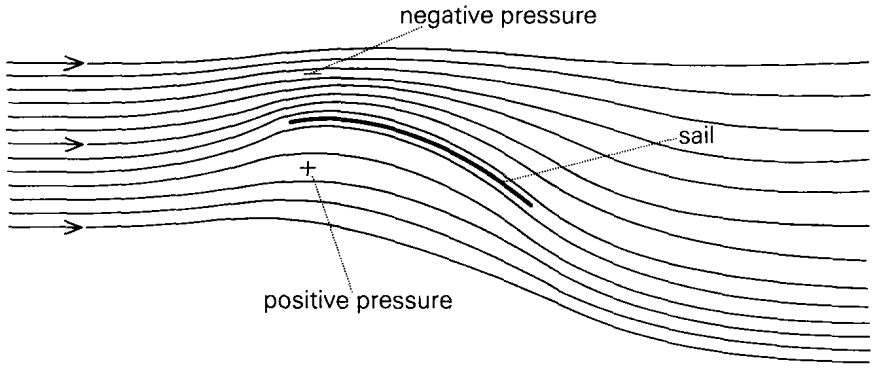
Air that flows into a low-pressure area is forced to ascend; as it rises, it cools, causing the water vapor it contains to condense and form clouds—hence, the increasing cloud cover in the vanguard of a storm. But air descending from a high-pressure area and moving outward from its center tends to be warm and dry, so fewer clouds form. When your barometer is high, therefore, expect fine weather.

See also **Barometer; Buys Ballot's Law; Clouds; Weather Fronts; Weather Maps.**

Air Pressure on Sails

How the wind causes pressure on sails and why that's important

You've probably heard the America's Cup experts talking about the pressure being better over on the starboard lay line. In the language of sailors seeking to dazzle television viewers with their expertise, that means there's more



Wind blowing over a sail causes differences in air pressure that provide forward drive for a sailboat.

wind over on the right. How does air pressure equate to wind and what does it mean to ordinary boaters? Well, it should mean something to sailboat owners because, simply put, wind creates areas of high and low pressure on sails, and that's what makes them work when you are sailing across or obliquely into the wind.

When I was a kid, I had no difficulty understanding that an airplane wing, which is simply a horizontal sail, tended to rise if you tilted it slightly upward in front. The air hitting the bottom of the wing simply forced it up like a wedge. But the further I progressed with science lessons, the more ridiculous my theory appeared. What was happening, my mentors explained with great patience, was that air molecules passing over the rounded top of the wing had a longer course to follow than those sliding along the straight bottom, so they had to move faster to meet up with the bottom molecules at the aft edge of the wing. If you speed up a stream of molecules, the pressure drops; therefore, with less pressure on top and greater pressure below, the wing was forced upward.

Unfortunately, no sooner had I learned that theory by rote than they changed it again. These days, the theory of how a sail gains lift to windward is much more complicated.

No matter. For the purposes of celestial navigation, most of us assume that the sun revolves around the Earth. We know it's not true, but it brings the right results. The same applies to yacht sails: one side of a sail sucks (negative pressure), the other side shoves (positive pressure). It's caused by air pressure that depends on the angle of the wind. That's all you really need to know.

See also **Sails and "Lift."**

Albatrosses

Although much admired, these great fliers can bring bad luck

The albatross, the largest of all sea birds, is a wonderful flier. In the "Roaring Forties" south of the equator, the Great Wandering Albatross (*Diomedea exulans*) will follow a vessel for weeks on end, and is even reputed to be able to sleep on the wing. Scientists have recorded specimens with a wingspan of 20 feet (6 m). In the North Pacific, the Blackfooted Albatross (*Diomedea nigripes*) and the Short-Tailed Albatross (*Diomedea albatrus*) are common, and all are members of the web-footed petrel family (genus *Diomedea*).

Understandably, these solitary birds, which are so at home on the vast oceans, have always inspired awe in sailors. For many centuries, European mariners believed that an albatross housed the soul of a dead sailor. Therefore, it was considered bad luck to kill one, as Samuel Taylor Coleridge pointed out in his famous poem, "The Rime of the Ancient Mariner." So beware if you ever find yourself in the Roaring Forties towing a lure for fish. If an albatross takes it, you're in big trouble—one way or another.

Oddly enough, the word *albatross* stems from the Portuguese and Spanish *alcatraz* (a word familiar to Americans), which has actually come to mean pelican. An albatross looks nothing like a pelican, of course; it seems that in the golden days of exploration, Spanish and Portuguese sailors gave the name alcatraz to most new sea birds they came across, just as many English-speaking sailors with scant interest in ornithology referred to all sea birds as seagulls.

Alternators

Rules of thumb concerning horsepower drain and charging

It's easy to regard the alternator as a free source of electrical power,