Good Old Boat

The sailing magazine for the rest of us!™

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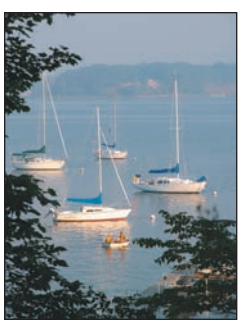

About the cover . . .

Dave Worfel shot this image of good old boats at anchor on White Lake in Michigan, the home port for his Catalina 30.

For the love of sailboats

Speaking seriously

Just for fun

What's more

GOOD OLD BOAT

FOUNDER/EDITOR **Karen Larson**
karen@goodoldboat.com

FOUNDER/TECHNICAL EDITOR **Jerry Powlas**
jerry@goodoldboat.com

PUBLISHER/ADVERTISING SALES DIRECTOR **Michael Facius**
612-605-8319 michael@goodoldboat.com

BUSINESS ADVISORY BOARD **Bill Hammond, Chair**
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763-420-8923 mark@goodoldboat.com

CLASSIFIED ADS AND FINANCIAL MANAGER **Karla Sandness**
763-420-8923 karla@goodoldboat.com

WEBMASTER **Jerry Stearns**

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55311-2655
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BUSINESS OFFICE: **1501 8th Ave. N.W.**
Jamestown, ND 58401
Phone: 763-420-8923
Fax: 763-420-8921
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Our contributors

Ed Lawrence (*The Whitby 42*, Page 4) is a contributing editor with *Good Old Boat*. Adam the grizzly is a celebrity bear (and neighbor in the Montana outback) who occasionally looks over Ed's shoulder during the editing process.

Dyke Williams (*The Yankee Dolphin*, Page 8) has sailed 'most everything from 8 to 96 feet. He and his wife, Katie, are "downsizing" with the sale of their Little Harbor 37 yawl. Their new challenge will be to age creatively on Ontario's Lake of the Woods in a J/27, a venerable J/22, a Laser, a Sailfish, and assorted canoes and rowboats.

Ted Brewer (*Dolphins galore*, Page 13) is a contributing editor with *Good Old Boat* and one of North America's best-known yacht designers. He also is the man who designed scores of good old boats…the ones still sailing after all these years.

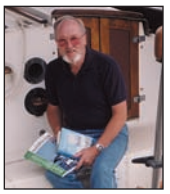
Phillip Reid (*Fixing a corroded mast*, Page 14) and his wife, Andie, and their Bernese mountain dogs, Tugboat and Steamboat, live in Wilmington, North Carolina, where Phillip writes, teaches college history, sails, dives, and works on *Miss Bohicket*, his Pearson 28.

Gregg Nestor (*Marine corrosion*, Page 18; *Pearson 28-2*, Page 33; *Quick and easy: A belt around the backside*, Page 74; *Quick and easy: A cure for mast rattle*, Page 75) is a contributing editor with *Good Old Boat*. More than 20 years and four boats ago, he discovered sailing and has been an avid "trailersailor" ever since. He and his wife, Joyce, sail an O'Day 222, *Splash*.

Ken Draayer (*Second life for the Cabot 36*, Page 26) is a writer, editor, and teacher in St. Catharines, Ontario. His summer leisure is spent sailing on Lake Ontario out of Port Dalhousie Pier Marina.

Lin and Larry Pardey (*When the engine quits*, Page 29) are doubling the summers of their lives. They'll spend the northern hemisphere summer exploring Puget Sound and the Gulf Islands on *Taleisin*. During the southern hemisphere summer they'll explore New Zealand waters on the 110-year-old sloop, *Thelma*, which they have renovated. Their latest project has been the introduction of two DVDs, *Get Ready to Cruise* and *Get Ready to Cross Oceans*.

Gerry McGowan (*Low-cost outfitting*, Page 38) started sailing when a skiing accident ended that passion and caused him to hobble to a neighbor's 10-foot sailing dinghy. A series of 11 sailboats from 9 to 46 feet brought him and his wife, Marolyn, to their present 1978 Nor'West 33.



Don Launer (*Rope 101*, Page 42) is a *Good Old Boat* contributing editor. He has held a USCG captain's license for more than 20 years. He built his two-masted schooner, *Delphinus*, from a bare hull and sails it on the East Coast from his home on Barnegat Bay in New Jersey.

John Danicic (*The Apostle Islands of Lake Superior*, Page 44), a professional photographer, spends his time on the hard building furniture, cedar-strip nesting dinghies, bronze port screens, and other sailing gear. Along with his wife and two teenage children, he sails *Mariah*, a Cape Dory 36 cutter.

Cade Johnson (*LEDs afloat*, Page 46) and his wife, Lisa, moved aboard their Perry-designed Polaris 43 in 1997 and spent four years in St. Petersburg, Florida, while preparing for cruising and wrapping up careers. Their cruise took them south around the western coast of the Caribbean and eastward to Venezuela.

Don Garvey (*America's Waterway Watch*, Page 51) is Marine Safety Officer for Coast Guard Auxiliary Flotilla 7 in New Brighton, Minnesota. He's an air crewman in the Auxiliary aviation program and completing his boat crew certification. The Auxiliary assists the Coast Guard Marine Safety Detachment.

James Baldwin (*Nicholson 31 makeover*, Page 52), a boatbuilder, surveyor, and cruising consultant, completed his second circumnavigation aboard *Atom*, his 28-foot Pearson Triton. Contact him at <http://atomvoyages.com>.

Jeff Fletcher (*Heroes*, Page 54) first learned to sail on Lake Lanier, near Gainesville, Georgia. These days he sails the *Echo*, a Nicholson 31, in saltier water…now that her refit by James and Mei Baldwin has been concluded.

Mark Abramski (*New mahogany-and-holly sole*, Page 55) is an electrical engineer and woodworker who discovered sailing at age 40. He and his wife, Linda Jean, center right, sail a Cape Dory 27 with their children, Katie and Steve.

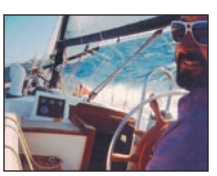
Joseph O'Connor (*Prayers over a Princess stove*, Page 59) began boating at a tender age. Soon an intrepid boater, he didn't become a sailor until his mid-30s. Joseph sails a 1977 Catalina 27, *Surprise*, around Santa Monica Bay in California…when he's not busy lighting his Princess stove.

John Santic (*Simple solutions: Let there be light*, Page 72) lives aboard *Sunspot*, a Fast Passage 39 cutter, currently in Solomons, Maryland. He recently spent three months crewing for friends on their sailing trip to the Galapagos Archipelago and Easter Island. Drop by <http://ourworld.cs.com/johnsantic>.

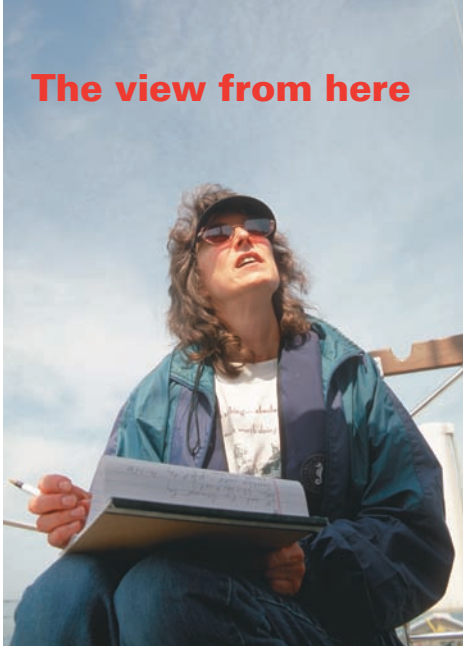
Bob MacDonnell (*Simple solutions: Cigarette lighter plugs*, Page 73; *Quick and easy: Space discoveries*, Page 75) left Nova Scotia in 1980 for a few years and never made it back. A retired electrical engineer, he and his Australian wife, Judy, are residents of Vanuatu on their cruising catamaran, *Siddiqi*.

Eric Manchester (*Swiftsure Classics*, Page 78) is a two-handed singlehander: captain and crew aboard his Cal 25, *Ceilidh*. When forced to be ashore, he lives with a spouse and cats in Victoria, British Columbia. His son, Jason, took the photos for this article. They often collaborate on writing and photo assignments.

Niki Perryman (*Boating about in a mess*, Page 80) and Jamie Morrison set sail from Australia 13 years ago aboard *Siandra*, their 1950s Robb Lion. Having recently completed their first loop of the world, they're exploring southern Tasmania but heading north toward Alaska.



Jim Ayres (*Reflections: Beyond the breakwater*, Page 88) was entranced by sailing when he hitched a ride on a trimaran headed out of Bimini. Next he sailed local craft in the South China Sea, Sulu Sea, Indian Ocean, and the Med. He cruised his Vagabond 47 for two years with his wife, three sons, and a fierce seagull-eating cat.



Home waters

Learning to bloom where you're planted

by Karen Larson

It was mid-June in Duluth/Superior on the Minnesota/Wisconsin border. We had a cockpit awning up . . . but not because of the sun. It rained for some portion of every day this spring, it seemed. So early spring lingered on near that great cold lake that has been our cruising ground for about 15 years.

On the day in question the weatherman had offered us bone-chilling 40-something temperatures with heavy fog, light wind, and occasional rain. But what's a sailor to do? This was the weekend we had available for working on our boat, which had been launched two weeks earlier. She had then floated — patient and neglected — while we made a mad dash to New Jersey and Maryland to do a couple of stories.

"You shoulda been here earlier this week," the locals said. "It was pretty nice on Monday . . . and Thursday." *Nuts!* Summer had come to Duluth while we were out of town! Sometimes you miss out.

So there I was, sitting in the cockpit sewing battens into the mainsail. *What?* Nobody else does this? It's a spring ritual with us. The boat chick (that'd be me) must sew a few stitches at the end of each of the four battens to reassure the captain that they won't fly out of there at some most inappropriate time when the sails are flogging. The next job would be to bend on the main, which would make *Mystic* look as if she could sail again after her long time out on stands in the snow.

There was a heater running in the cabin, but the cabin was in the usual spring disorder, and a mainsail is a large thing to unfold inside. To make sitting in the cockpit comfortable in 40-degree weather, I was wearing several layers of clothing plus my foul-weather jacket. My fingers were numb. Aware of the oddity of the total image in mid-June, I looked up at Jerry, when he returned with quarts of oil for an engine oil change, and said brightly, "I thought I'd sew out here where I could catch a few rays!"

Delightful weather

While sewing, I had been ruminating on the fact that we'd already been sailing on four boats — in delightful weather — out east. It makes one consider one's own cruising ground, with its short season, in a new light. It's one thing to know that they're sailing in Florida, Texas, the Gulf Coast, Southern California, and a slew of inland lakes down south all winter while my boat's on stands. But that's tempered by the certain knowledge that it's beastly there in the summer when I'm enjoying the coolest of lake-chilled breezes on my boat. We seldom swelter, at least. Besides, those southern cruising grounds were the inspiration for our second (and trailerable) boat. We're still working on that boat, but some winter soon we will enjoy the best of both worlds.

> "It makes one consider one's own cruising ground, with its short season, in a new light."

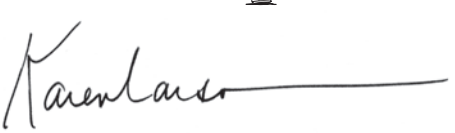
"What about all those cruising grounds in between?" I pondered. The Chesapeake Bay and other areas nearby on the East Coast suffer from high population density. So many sailors. So much demand on the marine services and available anchorages there. The New England coast is lovely. It reminds me of Lake Superior's natural beauty. But the seasons are nearly as short. And the population crush is just as problematic when the crowds from farther south seek a cooler location in mid-summer. And what of the many lobster pots?

California sailors have the requisite good weather but they lack my kind of cruising grounds: lots of great island anchorages only a sail away. That leaves the Pacific Northwest . . . a beautiful cruising ground. The season is longer. The water doesn't freeze. Alaska beckons. The underwater logs are more frightening than lobster pots, however.

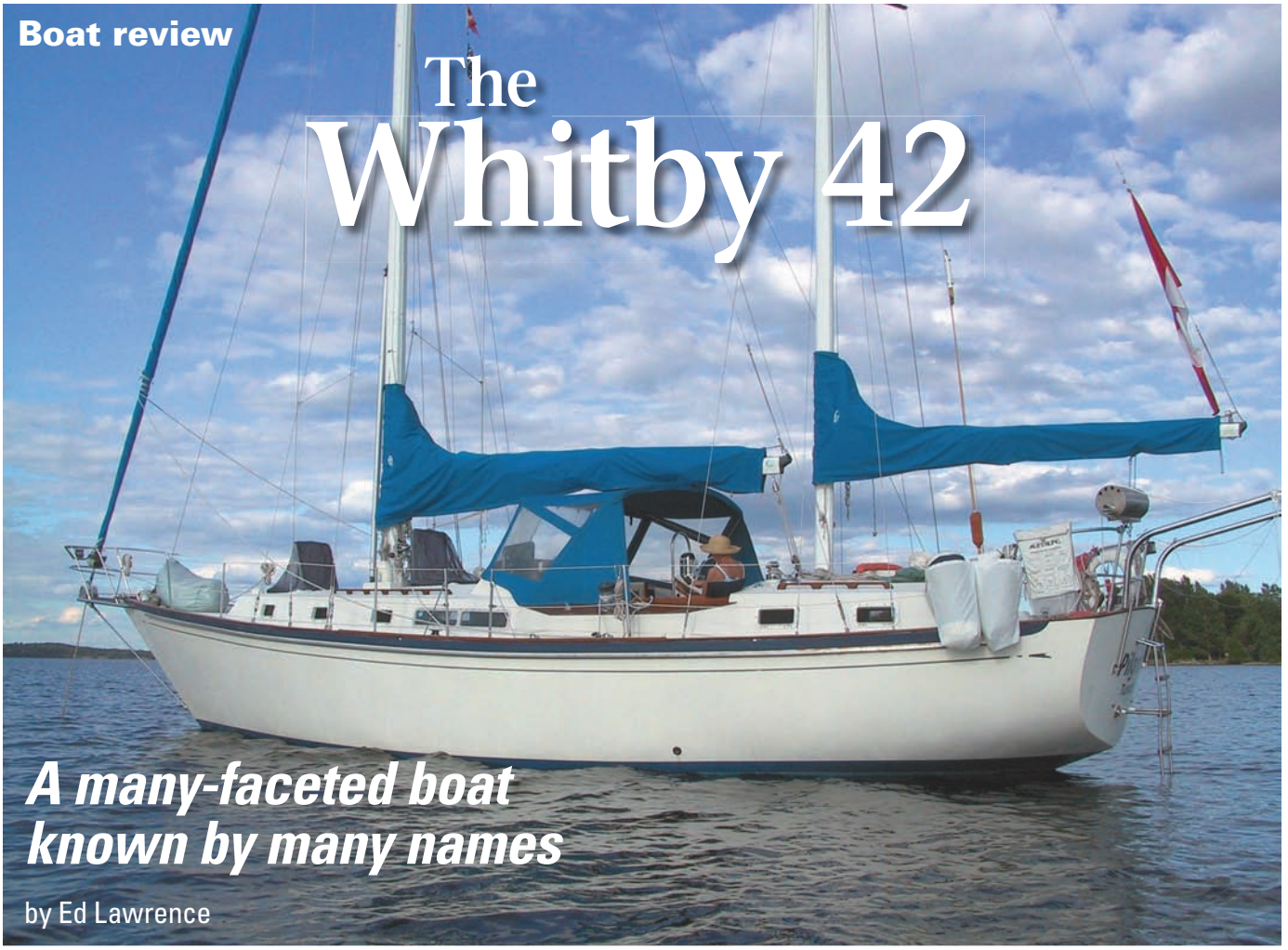
By the time you read this, we will have sailed *Mystic* to a new cruising ground: the North Channel of Lake Huron. The season is a tad longer there. The water's warmer. And there are new anchorages to explore. But it's a heck of a long drive from our home in Minneapolis. This one drawback will have a serious impact on our sailing lifestyle. We'll go for longer periods less often.

What it all boils down to is that no sailing location is perfect. But all are wonderful to those who live nearby. Sailors everywhere make the most of the largest body of water closest to where they live and work. A common expression from the 1970s expresses this nicely: "Bloom where you are planted." By necessity we all sail where we are located.

In my case, that means "catching rays" while wrapped in many layers and sitting under an awning in the cold and foggy rain. The summer's rewards will be worth every finger-numbing stitch in the mainsail.



The Whitby 42



A many-faceted boat known by many names

by Ed Lawrence

Ever have one of those conversations during which you wonder if you and other participants are speaking the same language or discussing the same topic? Actually, those can be fun when you're speaking with someone whose pronunciation makes "hail" sound like the place in which sinners reside.

I recently endured such an experience while discussing the attributes and merits of the Whitby 42 with several owners.

"What I really like is the bowsprit and cutter rig," one says.

"My boat doesn't have a bowsprit," another responds.

"Well, I really like the centerboard because it allows me to get into shallow anchorages and improves performance to weather," a third voice adds.

"Centerboard! *What* centerboard? My boat has a full, shallow-draft keel that only draws 5 feet," adds a fourth.

These sailors were all singing from the same songbook, but they were on different pages. This sailboat, a 42-foot ketch designed by Ted Brewer, did have a bowsprit . . . or didn't, depending upon an owner's preference. Though in theory a production boat — one that initially was constructed at the Whitby Boat Works in Whitby, Ontario — if the orders were accompanied by a negotiable instrument (read: dollars), buyers were allowed some latitude in their boat's configuration.

"If you want a bowsprit, we'll build a cutter ketch," the company's marketing materials said. Doug Stephenson was a member of the company's marketing team, also consisting of builder Kurt Hansen and his wife, Doris, president of the firm. Today Doug, who specializes in reselling Whitbys, says, "Ted Brewer chafed at the term 'cutter ketch,'" preferring that it be referred to as a double-headsail ketch. (For more on this subject from Ted's point of view, see the March 2005 issue.)

Made in Canada

Of the history of the boat, Doug says, "Hulls #1 to #200 and #301 to #333 were constructed in Canada and known as Whitby 42s."

After hull #200 was completed, construction was moved to Fort Myers, Florida, where boats were built until 1990. Doug says, "Hulls #201 to #300 were built in Fort Myers, but there is some duplication in numbers. Hulls #301 to #307 were placed on boats built both in Canada and Florida, although the alpha part of the numbers differed," so owners of boats with those numbers may unknowingly have identical twins under sail.

To confound amateur historians, the moniker attached to hull #234 (or thereabouts) through #307 of the boats built in Fort Myers was Brewer 12.8. "Some were built with a modified fin keel and skeg-hung rudder. Others, with an extended transom, were called the Brewer 44," Doug notes. The latter was 2 feet longer, significantly increasing the space in the aft cabin, narrowing the stern section, and having a reverse transom. "Other modifications were also in evidence, but many of the similarities are very apparent as being from the same tooling and builder-design concept," he adds. Right. Fort Myers

Brian Stewart's Whitby 42, *Pilgrim*, awaits the return of her crew, above. Exterior shots of Mike Curry's boat on facing page.

> **“…this boat fits well in the niche occupied by the likes of Garden, Alden, and Hinckley and will never be confused with a Farr 40.”**

also built maybe eight yachts with the mast moved aft and a tall sloop rig for a yacht club on Long Island, New York, which raced them as one-designs.

We're not done yet. The vital statistics displayed on Page 6 are those of the original boat. Those built in Florida may have an additional foot or three of waterline and 6 inches of beam. Thankfully, the hull, deck, and accommodations of all models are essentially the same — except to the extent that an owner requested significant modifications during the building process.

Tradition and technology

There is one item of which reviewers have no doubt: the Whitby 42 (by any name) married new technology (fiberglass) to a traditional design. The result was a seaworthy yacht having a surfeit of space belowdecks that provides the offwatch with room in which to lounge or sleep and the galley slave and navigator spacious areas in which to operate.

From an aesthetic standpoint, this boat fits well in the niche occupied by the likes of Garden, Alden, and Hinckley and will never be confused with a Farr 40. However, she carried a middle-class price sticker and was, therefore, well received in the marketplace. These days used Whitbys sell for $80,000 to $140,000, depending upon age and condition.

When viewed from abeam she displays a sheer that tapers slightly downward to max beam. Newer boats have a dark sheer strake and two-tone decks that greatly enhance her appearance by softening an otherwise all-white shape. Ted Brewer managed to elevate the main cabin, center cockpit, and aft stateroom enough to produce voluminous space belowdecks without disrupting her appearance with an unappealingly high deck profile. To my eye, her tallish mast and mizzen balance her profile, in the process providing sections onto which 875 square feet of canvas may be hanked.

Owners were provided with the keys to a Lehman Ford 4-254 diesel that produces 67 hp, enough to power her at 7 knots at 1,800 to 2,000 rpm. She carries enough fuel — 200 to 300 gallons — to claim a range of 1,200 to 1,500 miles. This will come in handy when the wind speed drops below 5 knots, as it did during our test sail in Seattle.

On deck

As you step aboard, your first impression will be that the cockpit is large enough that, if filled with very hot water, eight hot-tubbers could soak comfortably, with room atop the bridge deck for several wine buckets. Draining the hot tub would be a simple matter of exposing scuppers located in the corners of the foot well.

On a more conventional note, the helm station is the centerpiece of a rectangular area surrounded by teak seating that may be a magnet for visitors during happy hour. The space is large enough that a singlehander will need a wheel brake when it's necessary to trim jibsheets or the mainsheet, which is located atop the aft cabin in front of the mizzenmast. A neat touch is a hatch next to the companionway that will ventilate the galley while driving the deck crew nuts when savory aromas escape.

Cockpit storage is in a seat locker to port that could double as a doghouse for a Saint Bernard, and two propane tanks are located in stern lockers.

Among the advantages of a mid-cockpit arrangement is the elevated view it offers the skipper, especially when docking or searching the horizon after sunset. Cruisers may be forced to tow a hard dinghy or house it on davits, since there's little storage room on deck. An inflatable that can be stowed on deck may be a better choice.

Belowdecks

Going below when heeled may be an adventure, since the five ladder steps are very vertical; the flip side of that equation is that it takes up less space in the main saloon. If you are aboard a boat with Configuration A, as I was, you may think you've entered the reading room in a gentleman's club. The combination of 13 feet of beam amidships and an elevated cabintop produces dancehall-sized space and an arena-height ceiling overhead. A teak-and-holly sole gleams below.

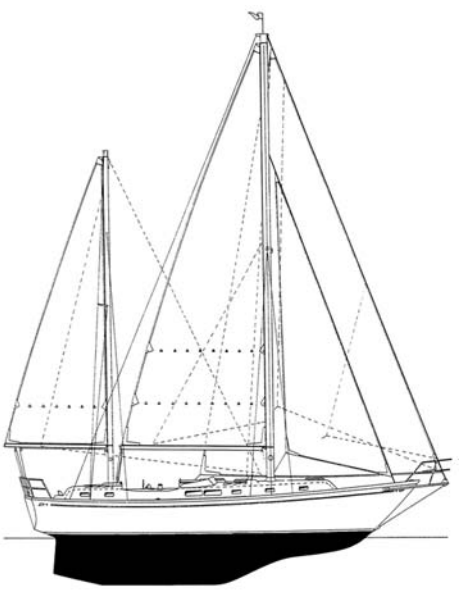
The space to starboard is adorned with two full-height chests of drawers with a fold-down table located at their center, a bar, two old-fashioned easy chairs, and, in some cases, a fireplace. To port is a settee large enough to comfortably seat four at a drop-

down table connected to the forward bulkhead. A cabinet on the bulkhead, which is concealed from view when the table is elevated, adds storage for dishes and cups. Brilliant!

In its other iteration, an L-shaped settee is to port and the leafed table is located in the center of the area, allowing diners on the starboard settee to rest their elbows on the table.

The aft area in the main saloon is occupied by a galley to port, opposite the nav station. The galleys were initially fitted with smallish, though deep, double stainless-steel sinks with covers, a three-burner stove, and hot-and-cold pressure water systems. Counters in the U-shaped space were covered with Formica edged in teak; they enclose a 7.5-cubic-foot refrigerator and a 5-cubic-foot freezer, built-in maple chopping board, and built-in garbage bin. The aft counter is 4 feet wide, providing a chef with room to carve a small cow.

On balance, the space is comfortably tight so that even when the boat is bouncing around, chefs will be close to their work, though a safety belt will be handy when on a port tack. A chef's only excuse for not preparing tasty meals would be a lack of raw materials or talent.



Whitby 42

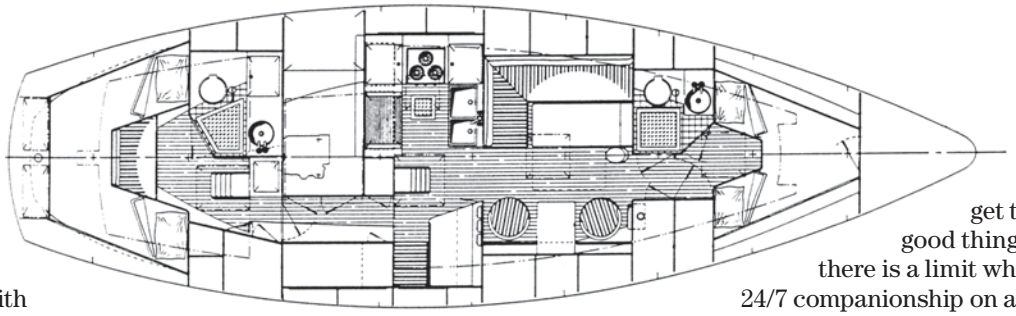
Designer: Ted Brewer
LOA: 42 feet 0 inches
LWL: 32 feet 8 inches
Beam: 13 feet 0 inches
Draft: 5 feet 0 inches
Displacement: 25,000 pounds
Ballast: 8,500 pounds
Tankage: 300 gallons fuel, 300 gallons water (varies)
Sail area: 875 square feet

Nav station

On the other side of the aisle, the navigator operates at what would now be considered an old-fashioned station into which a full-figured person will fit in relative comfort. Among the pluses are that the station faces forward, cabinetry is large enough for instruments and communication gear, the chart table is large enough for chart kits, and there is storage outboard in an enclosed cabinet.

At bedtime, separating the wheat (skipper) from the chaff (crew) is a companionway to starboard that leads to the aft cabin. The companionway houses a large workbench that has two large storage compartments for tools and outboard storage. Add leeboards, and the space could double as a Pullman berth for one (tiny) person.

Headroom in the aft cabin is more than 6 feet 2 inches, and two bunks that convert to a queen are oriented athwartships. Clothing is stored in a full-sized hanging locker and clothes bureau. There are lockers port and starboard. A vanity for the skipper supplements counter space in the enclosed head, which also is fitted with a shower. A plus is that the aft stateroom can be reached from the cockpit, so the skipper can slip below for a



snooze while the offwatch believes she's tending the wheel.

Crew quarters are in a forward stateroom lined with teak battens. It is enclosed by a solid wooden door that doubles as the cover for a full-sized hanging locker. The space houses two bunks that convert to a double and numerous storage lockers and drawers.

Ted Brewer scores Brownie points for fitting a relatively small anchor locker in the bow to increase room in the cabin. However, depending upon an owner's cruising plans and chain requirements, consideration might be given to leading the rode aft to a compartment under the berth. The rearrangement will reposition the weight lower and aft (good), though cleaning the chain before storing it is a must, lest sleepers contend with odors under their pillows (bad).

Access to a second head is via the main saloon or stateroom.

Performance

The Whitby 42 is not a downwind sled and will not beat to weather with the likes of a modern sloop. That's no surprise. During a test sail on Puget Sound arranged by Chris Tesh of Dockside Yachts, she ghosted along, making way in 5 to 7 knots of wind. We occasionally passed flotsam. When wind speed decreased to 5 knots, the keys to the Lehman made their appearance.

> **"A chef's only excuse for not preparing tasty meals would be a lack of raw materials or talent."**

The boat's owner, Mike Curry, made no bones about the fact that she "needs a touch of breeze to get into a groove and then produces a comfortable ride. Over 15 knots of wind, we typically sail under jib and mizzen. Her best sailing is on a broad reach in 10 to 12 knots of wind."

Based on typical performance calculations, she should produce 150-mile days, which was a benchmark in the mid- to late-20th century for cruising yachts. Any shortcomings in that area are offset by the fact that she provides comfortable working and lounging quarters.

Mae West once said, "You can't get too much of a good thing," but I think there is a limit when it comes to 24/7 companionship on a small boat, especially during those days when captain and crew have differing opinions about _____(well, you fill in the blank). That's no problem on this boat since, in bad weather, the three spaces belowdecks are easily partitioned. When the sun's out, the end of the bowsprit may be beyond hearing range of a voice emanating from the cockpit.

So the next time you're sitting around the keg discussing Ted Brewer designs, it might be wise to take into consideration the birthdate or the birthplace of a boat before betting the family jewels on whether it's a ketch or cutter or has a centerboard or fixed keel. Regardless of heritage, though, the Whitby 42 is a good old boat.

Interior shots of the V-berth and cabin of Mike Curry's Whitby 42, on facing page and below. Also on facing page, *Celestial Sea,* owned by Scott and Cheryl Young, shows off her lines both above and below the waterline.

The Yankee Dolphin

A whole pod of Dolphins continues to delight

by Dyke Williams

It was the mid-1950s. Enter Bill Shaw, the man who later designed a great many of Pearson Yachts' finest and was at that firm's helm as it became one of the top boatbuilders in the country (see article on the Pearson 28-2 on Page 33). But in his formative years Bill was designing for Sparkman & Stephens. One task was working with Olin Stephens on converting the CCA Rule (on which the Sparkman & Stephens firm was arguably the leading expert) to a new Midget Ocean Racing Club (MORC) Rule for smaller offshore boats up to 24 feet (this was later raised to 30 feet).

As an after-hours project, Bill designed a 24-footer to see if factors affecting safety and comfort, such as proper pitching and righting moments, encouraged by the CCA Rule, translated well into smaller boats designed for MORC. Those sketches were to became the Shaw 24 and then modified to become the 24-foot Dolphin, a boat that has been built in wood and fiberglass by many yards and is known by several names: Yankee Dolphin, O'Day Dolphin, Pacific Dolphin, Dolphin 24, and Shaw 24.

The Sparkman & Stephens-designed Dolphin was built from 1959 through the 1970s by at least five firms. The Yankee Dolphin built by Yankee Yachts was perhaps the best of the breed, but they're all basically the same hull shape and rig design. Thus, while describing the Yankee Dolphin, all the Dolphins are included here in one way or another. It's not clear how many Dolphins were built. There are at least 270 and perhaps as many as 300 or more. The 24-foot Dolphin is a medium-displacement masthead sloop with a hollow bow, cutaway forefoot, keel/centerboard, and attached rudder. Her classic appearance comes from a traditional profile, transom, and counter. Her overhangs are short, the waterline long, the wetted surface low. The boat has always been, and is yet today, quite fast.

The start of the story

In the 1950s, the CCA Rule was the reigning big boat, offshore handicap rule. It encouraged and rewarded designs that were seaworthy, seakindly, and comfortable. CCA rigs had shorter hoists and longer booms — a lower-aspect ratio that kept the center of effort and heeling moment down. By measuring mizzen sail area at only one-half or not at all, the CCA Rule encouraged yawl rigs because they could comfortably and safely weather almost any blow by setting just headsail and mizzen (jib 'n jigger). Creature comforts below were rewarded. Stripped-out hulls were penalized. It was a great rule. By contrast, CCA's successor, the IOR (International Offshore Rule) of the 1970s, resulted in high masts, short booms, empty hulls, oddly humped stern sections, and some wholly inadequate rudders.

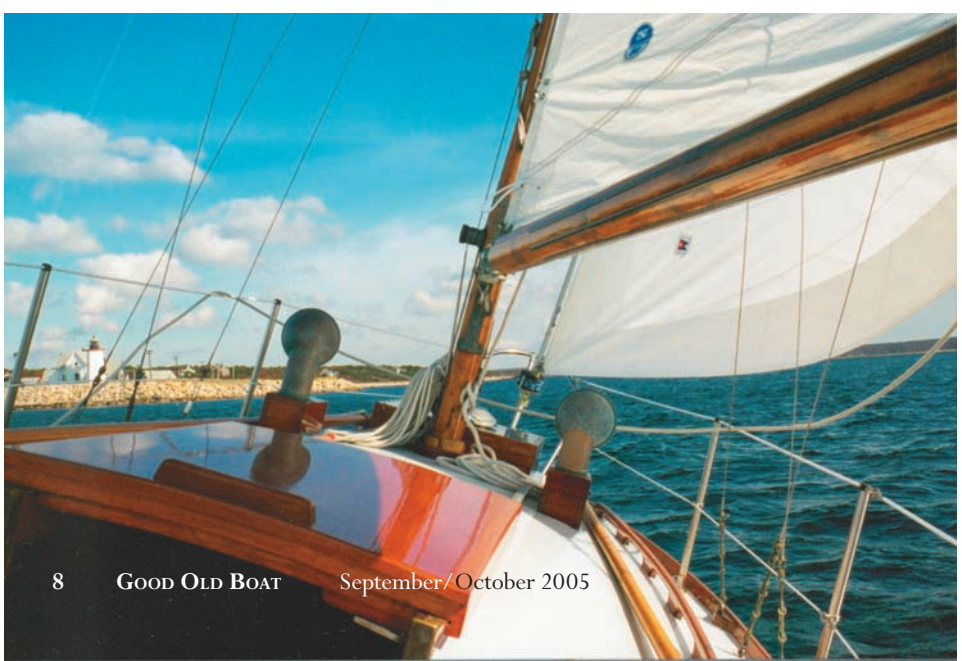
Of his 24-foot MORC design, Bill Shaw later said, "I did a half-size prototype of *Finisterre*, just to test the principles." For those who don't recognize the pedigree, *Finisterre* is known as the first of the light, wide, keel/centerboard breakthrough yawls by Sparkman & Stephens. She was raced illustriously all over the world by Carleton Mitchell.

The initial Shaw numbers on paper looked good. Willard (Bill) Scranton heard about this design and commissioned a boat to be built by Jensen in Denmark — double-planked mahogany and cedar over oak, keel/centerboard, complete accommodations for four, and a yawl rig. The result was the first Shaw 24, *Trina*, the first MORC boat built. Her intended function was to be fast, safe, and comfortable. She won 27 consecutive races in three years following her launching in 1957 under four different handicap rules, including MORC. She excelled in all weather and was a light air flyer. Naval architect Gary Mull said of the Shaw 24 yawl: "That boat — with a jib and a jigger — could sail through anything."

Legends from afar

Her sister ships (24 built in wood, some as sloops) created apocryphal legends of heavy-air survival in places as far afield as the Aegean. (Truth in writing is called for here. Your author is the owner of the restored *Trina*. I am looking for a new "curator" to take this historic craft safely well into the new century. If serious, contact me at <yawlbear@aol.com>.)

Olympic medalist and boatbuilder George O'Day heard about *Trina* and approached Olin Stephens. The story I have from Bill Shaw is that George



wanted to build a 24-footer. Olin said Sparkman & Stephens would never do a boat that small (watch out later for dozens of them) and called Bill Shaw into his office. Bill got out his Shaw 24 plans, and they conferred. Olin suggested two changes: a sweet Sparkman & Stephens sheerline to replace the Shaw 24's slight reverse sheer and broader aft sections to help carry masthead spinnakers in a blow. Thus, in April of 1959 the first Dolphin 24 was finalized on paper as Sparkman & Stephens design #1497.

The design

The Dolphin was designed to be good at everything she does without also trying to meet special constraints: price points, ultra-light trailerability, headroom, massive interior. Her classic sheer, overhangs, ample cockpit, and elegant transom were the norm then and are echoed today by new boats reviving that traditional look. In the Dolphin size range, check out the Bridges Point 24 and the Quickstep 24. Going bigger, look at Joel White's Center Harbor 31. And there are hints of classic lines in the new J/100 and J/124. Even bigger are the new "daysailers": the Morris 36 and the Hinckley DS 42.

The Dolphins that resulted from the Shaw 24 have a quick hull and powerful rig, moving the boat well in light air and easily reefable for heavy air. The masthead foretriangle is quite large for its day. Many designers (Ted Hood is a staunch proponent) believe it's

***Trina*, the wooden beauty who started it all, captures the wind, on facing page. *Marionette*, Ron Breault's O'Day Dolphin, is decorated for a Sparkman & Stephens rendezvous, at top. These early Dolphins had a fiberglass hull with a wooden deck and cabin. In center, *Icelander*, a Yankee Dolphin owned by Bill Watson, shows her stuff under sail, and Jim Huxford's Yankee Dolphin on stands shows her Sparkman & Stephens heritage. Jim ran an active Yankee Dolphin website and was refitting his boat until he lost a battle with cancer. He is sorely missed. At bottom, Jim Sutro's Yankee Dolphin, *Duckling*, in Clipper Cove, San Francisco Bay.**

the genoa that provides a boat's serious drive. It should be noted, though, that Shaw 24 yawl owners think the Dolphin owners are "missin' a mizzen." Since waterline largely determines top speed, you might think boats with shorter waterlines would be slow. However, as soon as they heel a bit, as the wind gets up to where top speed is possible, the bow and stern overhangs enter the water, effectively lengthening the waterline. In light air, the less drag, the better.

Many sailors prize the proper feel and behavior of a boat while under way over having vast spaces inside. After all, we spend way more sailing time *on* a boat than *in* it. Romaine Corbin of Pacific Dolphin, Inc., noted, "Standing headroom is a dockside extra — one sits down or lies down as soon as possible when moving about at sea." Chris Vandersteen, the owner of a J. J. Taylor Dolphin on Lake Ontario, wrote, "I spotted the boat the summer before I actually purchased it and remember thinking that, though she was smallish, I really liked the shape of her. She looked sturdy and safe for my first boat, and I fell in love with the transom. She has proven to be very reliable, despite her age [45 years]."

Small *is* beautiful. Many sailors are really just dinghy sailors at heart. One of the Herreshoffs observed that the amount of use a boat receives is inversely proportional to its length. This certainly seems true — there is nothing like a boat you can arrive at and be under way in less than five minutes. I've always felt that if you can't pull or work something with one hand, it's too big. On the other hand, if you are looking for a good old boat one size up from the Dolphin, look at the Tartan 27. This is the Dolphin enlarged by Sparkman & Stephens.

In their own words

- **Romaine Corbin, Pacific Dolphin, Inc.:** "*Trina*, a wooden 24-foot scaled-down *Finisterre*, beats everything in sight and proves that small yachts can handle blue water as swiftly and safely as their big brothers . . . (her) powerful ends and long keel will give her the feel of a much larger vessel."
- **Jim Sutro (#84):** "The Yankee Dolphin was exactly the boat my wife and I wanted. The Yankee model has lots of exterior teak and interior mahogany. It has the look of a very classy yacht but isn't so big that it's impossible to maintain. It has an adequate cabin for long weekends, is trailerable, and is a solid, seakindly vessel as well. San Francisco Bay can be a washing machine on summer afternoons, and the stability was important to us. She sails upright when reefed and maintains speed without becoming uncomfortable. She makes surprisingly good progress without a lot of fuss and spray and responds to the waves without becoming twitchy or abrupt. She has been a very forgiving platform upon which to learn to sail."

  Sutro continued, "Several years ago a Pacific Dolphin [Doug Graham sailing *Big Dot* in 1996] competed in the Singlehanded TransPac Race. The boat arrived dead last and most of the entrants were home before it finished, but it corrected out as the winner in its class." (To top that performance, Doug singlehanded her back.)
- **Brent Adams (#78):** "She's a 'big little boat.' That is, she sails truer than some boats her size (full keel and centerboard). People are always surprised at how much room there is aboard and how much weather she can take under sail."
- **Ron Breault (O'Day glass/wood Dolphin #12):** *Marionette* has won her class in Spring Off Soundings three times, the latest in 2004. "Great performer to her rating. In light air, our motto is, 'As you cross the finish line look over your shoulder. If you can see us, you lose.' Boats need crew weight to windward in a breeze in order to carry sail. Otherwise, you have to reef and go to a smaller jib and don't have the power to punch through the troughs . . . I cannot think of any serious faults in this well-designed boat. She is the quintessential good old boat. Yes, I would do it again and we are . . . in my son's boat. *Passage* (hull #10) is currently undergoing restoration. At the end of the day there are few better feelings than sitting in the cockpit of my Dolphin and watching a 40-foot goldplater motor by and hear them say, 'Pretty boat.' This all results from an Olin Stephens design philosophy paraphrased as, 'Good-looking boats sail better.'"

The O'Day Dolphins

Beginning in 1959, the O'Day Dolphins came from Marscot Plastics, a division of the O'Day Corporation in Massachusetts. A few were classic transition boats. By that I mean they had glass hulls and wooden everything else, in part because a factory fire burned the deck/cabin/cockpit mold. The all-glass O'Day's hulls and decks were solid . . . no cores. Some had wooden masts, and some of those have since been replaced with aluminum. The O'Day interior layout mirrored *Trina's*: double V-berth, two quarter berths, head under the starboard seat, and a seat and galley to port (see illustrations on facing page). Power was provided by a gas Palmer Huskie inboard. Some boats were bought as kits — a completed glass hull and boxes of parts to be added by the owner. O'Day built 60 to 100 Dolphins.

I was a young whippersnapper racing International 14s in the Northeast when a friend and competitor, Sandy Van Zandt, announced one day that he'd be sailing 14s less because he'd be sailing a new Dolphin more. "*What*? A *keelboat*?" we cried. "How *could* you?"

We failed to comprehend. Sandy, you must understand, was the sailor who didn't like the sail shapes then made for 14s, so at first he built his own on his kitchen table and eventually became the sailmaker from whom we bought our sails. Trend leader? You bet. Did we "dinghy youngsters" understand the attraction of fast keelboats? Not then . . . but most of us do now. It must have been one of those first O'Day Dolphins that lured Sandy into leading the next trend.

The Yankee Dolphin

The late 1960s (through 1972) saw the Dolphin become the Yankee Dolphin as construction shifted to Yankee Yachts in Inglewood, California. Yankee Dolphin decks, cabins, and cockpits became a one-piece fiberglass unit. The company did use considerable teak exterior trim (toerails, coamings, eyebrows, handrails, hatches,

and so on) and a mostly mahogany interior, so the Yankee Dolphins have the "air" of classic wooden boats without any of the complications. The Yankee Dolphin brochure boasts of the boat's hull molding, thickness, woven roving content, and "longer-lived" isophthalic resin. "The Dolphin is a sound investment in racing and family fun," it states. "Truly a maximum boat with minimum maintenance — a real value." Base price in 1969 was $5,195.

Sparkman & Stephens designed an improved high-lift centerboard (lead-ballasted fiberglass), a cockpit-operated board hoist, and an updated rudder. Keel ballast is 1,650 pounds of lead. The self-bailing motor well accommodates outboards up to a 9-hp standard shaft, though today's four-strokes have a hard time fitting. The spars are aluminum; the mast hinges and steps on deck and is more than adequate in size and strength. The mainsheet acquired a traveler with cam controls.

Yankee offered a new interior plan that made very efficient use of space with a complete glass headliner and hull liner. The double V-berth remained, but aft of that was a fully enclosed head compartment with a head to starboard and a hanging locker and shelves to port. The wooden sliding door disappears into the main bulkhead and thus takes up no swinging room at all. Several lockers and drawers provide storage, and the galley includes a sink, pump, water tank, stove, and icebox. A dinette to starboard converts into a double berth, and to port are a small seat, galley, and icebox. Cockpit lockers without quarter berths are thus capacious.

The Pacific Dolphin

In 1976, Pacific Dolphin, Inc., of Anaheim, California, became the last major manufacturer of the design. As a supplier to Yankee Yachts, the owners of this company had inherited the molds when Yankee folded. Base price had risen to $9,750 by then. Construction began with a close replica of the Yankee version, complete with teak exterior trim and a teak interior. Later versions eliminated almost all exterior wood. Options introduced wheel steering, a slide-out galley that disappears aft toward the port locker (providing a fifth berth), jiffy reefing, and Vire or Yanmar inboards.

Other Dolphins

Other firms made a few Dolphins each. J. J. Taylor in Toronto offered some — about 10 to 12 — which were probably O'Day hulls finished in Canada. They had a galvanized rudder, the removal of which for replating became a problem. Lunn Laminates of Long Island built copies of the O'Day boat complete with Palmer inboards after O'Day ceased production. There may well be more builders. One caveat: the 23-foot Olympic Dolphin is something else entirely — a 2,000-pound trailersailer designed by Derek Angus in 1970.

Trailering

In the words of Dolphin sailors, the experts themselves:

- ***Jim Sutro (Yankee Dolphin #84):*** "My trailer is fairly substantial — GVW 7,000 pounds — and hauls *Duckling* handily. The roof of my E-250 (3/4 ton) stretch van supports a sawhorse, which makes a tolerable workplace for rigging the mast, whether for sea or for the road. The mast is supported by a tabernacle, and the boom is rigged as a gin-pole for erecting the mast. I can do it alone. The trailer has a caster wheel and rolls into the water on a chain."
- ***Ron Breault (O'Day Dolphin #12):*** "I don't really trailer this boat, except to and from her home in our barn in the spring and fall. I step the mast at my yacht club where we have a hoist. Stepping/unstepping on a trailer or at a dock can be done, but it's a heavy mast and a bit exciting for two people, never mind one. I think this boat is at the heavy end of what one would call "trailerable." I thought about trailering her back from Maine, but in the end it was easier, less hassle, and more fun to sail her back."
- ***Duane Post (Yankee Dolphin #184):*** "At best it would take three of us four hours to launch, rig, tune, and prepare for the cruise. And that was working really fast."

Trina's **interior, top three photos above, is similar to the interior in the O'Day Dolphins with two quarter berths and an open V-berth, which can be lengthened with filler cushions. A marine head is under the settee on the starboard side. A flip-up table extends the counter space by the galley sink and adds an eating surface for informal dining. A cover converts the sink to an additional countertop. The Yankee Dolphin was introduced with an updated interior plan.** ***Trina's*** **cockpit, lower two photos.**

Note the difference in the arrangement of the tiller on *Icelander,* Bill Watson's Yankee Dolphin, at left, compared with *Trina,* bottom photo on Page 11. Bill Shaw aboard *Trina,* at right.

Value and hazards

What should you do if a certain 24-foot hull in the boatyard turns your head? First, realize that this may be an emotional reaction and that owning a Dolphin is not *like* a relationship, it *is* a relationship. You may not be thinking clearly. If corporate hiring people make up their minds in the first 30 seconds and spend the rest of the interview rationalizing that decision, watch yourself. In your saner moments, however, you do have pedigree working for you. It should give you some measure of confidence that Sparkman & Stephens and Bill Shaw have each designed volumes of well-known and well-regarded boats. That fact will for sure matter to many potential buyers when you come to sell.

Moreover, licenses from Sparkman & Stephens to build Dolphins required each builder to adhere to very strict layup and construction standards. For example, hand-laid combinations of fiberglass cloth, mat, and roving are multiplied to create thicknesses of ⅞ inch in the keel wall, ¾ inch at the keel/hull curve, 7/16 inch at the waterline, and ⅜ inch at the sheer. And the hull/deck bond requires 153 alternating stainless-steel screws and bolts every 4 inches all the way around with epoxy resin between. Furthermore, the keel cavity is filled with a mixture of lead shot and epoxy resin whereby the keel and 3 inches of the hull become one solid mass. These are covered with heavy mat, roving layers, and resin to 18 inches up the side of the hull. In the words of Romaine Corbin of Pacific Dolphin, Inc., "No one is ever going to worry about dropping a keel or holing below the waterline."

Resources

Dolphin discussion list
<dolphin@list.sailnet.net>
Register with SailNet to join this group.

Outboards vs. inboards

Dolphins may come with outboards or inboards or both. The outboard wells work nicely, except that the new four-strokes take more room than two-strokes and may not fit or rotate as well. Owner Ron Breault reports that his 4-hp two-stroke moves his boat at 4.5 knots in a calm. It stores under the cockpit in a heavy-wall plastic tube. He loses 0.3 knots to drag while sailing with the prop in the water. But outboards leave more storage space below and are easy to afford, reach, service, and remove. It's also easy to install a loaner while yours is being fixed. Inboards are more expensive, have more moving parts, and are harder to reach, service, and remove. A new inboard could well be of greater dollar value than the rest of the boat. On the other hand, inboards put the prop directly in front of the rudder for improved slow-speed maneuvering, and they start and shift with readily accessible buttons and levers. The older I get, the more I value that.

What to look out for

Many Dolphin owners contributed to the following list of what to look at, watch out for, and have a surveyor render an opinion on (note that this list applies almost verbatim to virtually any similar-sized boat):

- Moisture-meter the hull and especially the cored decks. O'Days have wood in the hull-to-deck joint that is often "gone." Check near stanchions, fittings, and genoa tracks.
- Check shroud chainplates, their through-deck passages, the bulkheads to which they are bolted, and the bulkhead-to-hull bond. Water damage here may be the most common Dolphin problem.
- Check for compression or corrosion on the prop under the on-deck mast step.
- Check the topsides and bottom for gelcoat cracks or crazing from the extra-heavy gelcoating of the era. It is easy to live with these; one can redo the surfaces as time and funds allow.
- Check whether the trailer size and condition are up to the distances you plan. Do you have access to a big enough vehicle?
- Check the hull-to-deck juncture, ports, hatches, and so on for signs of leaks from caulking failure or tired fasteners.
- Check the rudder movement for bearing wear and the fittings for electrolysis.
- Wooden spars with original resorcinol glue may begin to separate. These can be cleaned up and epoxied back together.

Renew or restore

You *can* buy a used boat and just sail away. As for me, I *hate* surprises. I want a boat that's trustworthy. If I had a new old Dolphin, I would at least renew it by checking and replacing every last thing that was remotely suspicious or could stop the boat from getting me home. If possible, I'd budget an extra $2,000 to $3,000 (more if a yard does the work) to get a substantially new boat (and my own peace of mind).

Will it be worth it? Some think you need a masochistic streak to renew or restore a boat. My rule is: "Always try to buy from a distressed owner; do not buy a distressed boat." But there is considerable satisfaction in preserving something worth saving and making it work well and safely again. Dolphins are selling for anywhere from $3,000 to $10,000 today, more for Mr. Fussbudget's boat. You probably won't get your refit investment back in cash, but you're a sailor so you know what you get back in purely subjective ways.

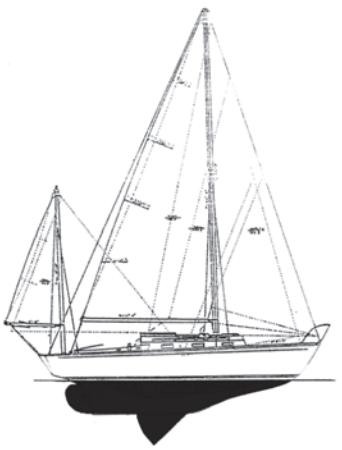
As Romaine Corbin said of Dolphins, "Boats that will get them there and bring them back — swiftly, safely, comfortably." In my book, that's the highest praise any boat could receive.

Dolphins galore

A designer's view of Trina *and her offspring*

by Ted Brewer

Yankee Dolphin



Trina

Morgan 24

O'Day 25

Bill Shaw's sweet little Trina has long been one of my favorite small yacht designs. From her yawl rig to her keel/centerboard hull with its medium displacement and triangular-shaped centerboard, *Trina* appears to be a miniature version of renowned cruiser/racer, *Finisterre*.

Bill Shaw worked for Sparkman & Stephens at the time, and *Trina* was given a careful review in 1959 when George O'Day commissioned S&S to design a new midget ocean racer. I'd always thought that the fiberglass Dolphin was a duplicate of the wooden *Trina* except for her sheerline and construction. Comparing the two, however, I discovered significant differences. Still, it's obvious that the designers at S&S had *Trina* in mind when they began work on the Dolphin design two years later.

Looking at the numbers, we can see where S&S made slight increases in the beam, waterline length, and ballast to give the Dolphin a lower displacement-to-length ratio, along with a touch more stability. A bigger change is the Dolphin's higher-aspect-ratio centerboard, which reduces wetted area and should improve efficiency. All these differences add up to slight performance increases while, to many eyes, the more conventional S&S sheer improves her aesthetic appeal as well.

Better rating

The Dolphin's sloop rig adds a few square feet of sail area, of course, but *Trina's* yawl rig would probably rate better under the Midget Ocean Racing Club rule of that era.

The newer Morgan 24 and O'Day 25 designs have lower displacement/LWL ratios due to their considerably longer waterlines, despite considerably heavier displacement. They also have lower beam/LWL ratios and, undoubtedly, a finer entrance. This should reduce resistance while their deeper, higher-aspect-ratio centerboards will improve weatherliness. The Morgan would give both the Dolphin and *Trina* stiff all-around competition. Due to her smaller sail area, the O'Day will be harder pressed to keep up with the fleet in light air but should shine when it breezes up.

The four little yachts are similar in their comfort ratios. In any case, such small craft can hardly be considered comfortable in heavy weather regardless of the numbers. Bear in mind that shoal-draft, keel/centerboard boats will recover slowly, if at all, in the event of a capsize beyond 90 degrees. These small yachts cannot be recommended for serious ocean passaging.

Still, given good condition and gear, any one of them would make a fine little singlehander or a cruiser for a cozy couple. A slight exception here for a sister to *Trina*: any wooden yacht that'll sport more than 40 candles on her next birthday cake had best be checked by an expert before she's taken very far from the pier.

	Yankee Dolphin	*Trina*	Morgan 24	O'Day 25
LOA	24' 2"	23' 11"	24' 11"	24' 10"
LWL	19' 0"	18' 6"	21' 6"	21' 0"
Beam	7' 8"	7' 5"	8' 0"	8' 0"
Draft, up/down	2' 10"/5' 2"	2' 9"/5' 3"	2' 9"/6' 6"	2' 6"/6' 0"
Displacement	4,250 lb	4,300 lb	5,000 lb	4,800 lb
Ballast	1,650 lb	1,500 lb	1,900 lb	1,600 lb**
LOA/LWL ratio	1.272	1.293	1.159	1.182
Beam/LWL ratio	0.403	0.401	0.372	0.381
Displ./LWL ratio	276.6	303.2	224.6	231.4
Sail area	296 sq ft	289 sq ft*	310 sq ft	270 sq ft
SA/Displ. ratio	18.1	17.5	17.0	15.2
Capsize screening	1.89	1.83	1.87	1.90
Comfort ratio	21.05	22.73	21.35	20.85
Year	1959	1956	1965	1975
Designer	S&S	Bill Shaw	Charley Morgan	Ray Hunt

*Yawl rig. **Estimated, based on similar O'Day/Hunt small cruising yachts.

Fixing a corroded mast

It's simple, really: Just cut a bit off, add a bit on

by Phillip Reid

When we had our boat surveyed before purchase, the surveyor noted "yellow moisture readings" on the moisture meter at the mast partners. The mast collar had pulled away from the deck, leaving a gap of broken caulk. At the mast butt on the keel, he found extensive corrosion damage, where the aluminum mast had sat in a pool of salty bilge water (kept higher than normal by the leaking mast collar) for who knows how long. He said we weren't in danger of a catastrophic failure, but the mast butt would need to be sawed off at some point. He was matter-of-fact about it, but it sounded like an awfully big deal at the time . . . and wouldn't it screw up my rig to have my mast a few inches shorter?

When I got around to facing it three years later, I did the work myself, I did a fine job, my rig's the same height, and it cost me very little.

There's a chance that any older keel-stepped mast is corroded at the butt, but chances are it's no big deal. You pull the mast, saw off a few inches, and make a riser to compensate for the lost mast height. Then you screw the riser to the keel and the mast step to the riser. The mast is no longer sitting in bilge water. If you have leaks and some water penetration of the deck at the partners, you address those at the same time. When you put it all back together, your boat's probably better than new.

Before pulling the mast, make a list of everything you want to do to the rig and to mast-mounted equipment while the mast's down, and budget the time and money for the entire project. If the standing rigging's due for inspection, this is a good time to do it. I even pulled all the chainplates for inspection, cleaning, and rebedding, since I had no idea what kind of shape they were in.

Pulling the mast

If your mast butt's badly corroded, the mast and step may be corroded together. Locate a supplier for a replacement step casting before you pull the mast, in case the step casting is too far gone to repair. Also make sure you've located the exact position of the step casting before the mast is pulled, in case the step bolts are so corroded that the step casting comes up with the mast. The position of the mast — up and down, fore and aft, and side to side — must be the same when the repairs are done as it was when the boat was built. Mark things, drill pilot holes through mating parts, make jigs. Do whatever it takes to position the mast as it was before.

When the mast is lifted, you should be below to keep the butt of the mast from scraping the bulkheads or other interior surfaces and to tend to the electrical wires coming out of the mast butt. Have some rags handy to forestall a potential mess. Have a hammer handy too. If the casting sticks in the mast tube, you will have to tell the lift operator to stop. If you can't pull the step off, you'll have to smack it off with the hammer. It may break, hence my advice to locate a replacement source in advance.

Repairing the mast partners

Even if you don't have access to a moisture meter and there's no external evidence of a problem, you'll be able to tell pretty quickly what kind of shape the mast partners are in once the mast is out. Many fiberglass production boats of the 1960s, '70s, and '80s have balsa-cored decks. Some builders used marine plywood instead of balsa in high-stress areas, especially anywhere something passed through the deck. Your deck sandwich probably consists a top fiberglass laminate (with non-skid gelcoat or paint), wood core, bottom fiberglass laminate, a thin layer of adhesive (or gap), and finally the headliner.

What many builders didn't do was seal the edges of the opening to prevent leaks from working into the deck core. Over a few decades, there's probably been some water intrusion. If the boat's been reasonably well cared for, it probably isn't anything major — a few inches of penetration all around — and it's pretty straightforward to fix.

If the boat was seriously neglected, there may be extensive rot in the deck core, and this may require a more extensive repair than the one described here. If you can't gouge out the wet core back to dry material by working through the mast hole, you have a much bigger problem. Tap the deck

Phillip's mast before the repair, above. Note how the mast collar has pulled out of the deck. Once the mast was out of the boat, the truth became all too apparent, on facing page at left. You can cut through a mast with a good hacksaw with a sharp blade. Be careful to cut it straight, far right.

with a plastic hammer to see how much wet core there is. Good core has a sharp sound; wet core makes a thud. The two sounds are quite different. You'll know.

If, like me, you are looking at yellow readings on a moisture meter and you know your mast collar has been leaking, but without softness or bulging above or below, you're probably looking at gouging out some rotted core to a depth of a few inches, cleaning out the void, and putting in new material. This should make (at the risk of getting too technical) one heckuva strong mast partner.

The whole scenario

Here's the whole mast-partner scenario: a cast-aluminum collar fits around the mast on deck. It may or may not have a flange that goes through the opening and it may or may not have a lip for a mast boot to fit around. The mast passes through a cutout whose edges are not sealed. The only thing keeping water out of the deck is whatever mast boots have been used over the years. Underneath against the overhead, you may find a trim piece (teak-veneer plywood, in my case) that fits around the mast. Over the years, water may have gotten well into the deck core, rotting some of it around the opening. It may have rotted out the interior teak trim piece (if present) and stained liners. It's possible that water could have damaged the tops of bulkheads. Inspect any wood in the general vicinity.

Here's what needs to happen to this setup, if it has become waterlogged: Once it's all taken apart and cleaned up, you may want to prime, fair, and paint the aluminum collar, then clean out the rot and fill the void and screw holes with thickened epoxy. Use the rotten interior trim piece as a template to make a new one out of teak, the hardwood of your choice, StarBoard, or exterior-grade plywood saturated in epoxy and painted with two-part polyurethane (my choice). Drill through the epoxy and interior piece so you can through-bolt everything from the aluminum collar down, bed the aluminum collar and the interior piece in sealant, through-bolt all of it with stainless bolts bedded in sealant, and end up with mast partners from hell. Whatever might keep you lying awake in your bunk worrying in the future, it won't be your mast partners.

> **"Whatever might keep you lying awake in your bunk worrying in the future, it won't be your mast partners."**

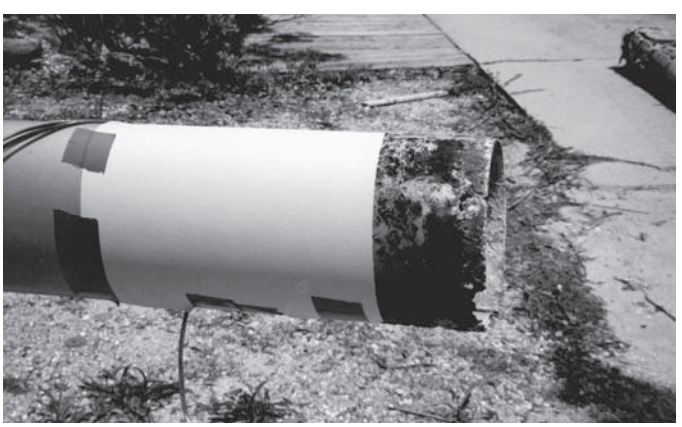
Sealing the edge of the hole

With a flat-bladed screwdriver or chisel, scrape out all the wet core. If you are finding soft, rotten, easily-removed core material as far back as you can reach, you are going to need to take a different repair approach, perhaps involving the injection of liquid epoxy through the upper laminate or removal and replacement of the top deck laminate and core around the partner. If the water has migrated that far, it is a much bigger project.

If there's loose, crumbling adhesive between the headliner and bottom deck laminate, chip it out with a knife blade or the edge of a screwdriver. You'll pack epoxy in there too. The safest way to dry the remaining core that is not rotted or delaminated is with low temperature heat and air circulation. Acetone will help water flow through the core but in all directions, and it is extremely flammable. Drying will probably take several days. Once the core is dry, drill out the screw and bolt holes to twice the diameter of the fasteners and clean out the void.

Wearing safety glasses and gloves, brush epoxy on the edge of the exposed core to seal it. Make up plywood pieces to fit in the void where the core has been removed. These should be a good fit with the remaining core and each other. Remember to leave at least ¼ inch between the front edges of the plywood and the opening; the edge of the finished opening needs to be filled epoxy, not plywood.

Mix up thickened epoxy to fill the gaps. Thicken it to the consistency of peanut butter. Use the proper hardener for the temperature you're working in. Pack your first batch into a cardboard caulking tube. Whatever you do, don't forget to put the cap into the end of the tube before loading it into the caulking gun and applying pressure. (Don't ask.) Jam a piece of clear vinyl tubing over the caulking gun nozzle; this will



allow you to get the epoxy into the back of the gap.

Squirt thickened epoxy into the gap, all around. Put in enough to fill the gap between the old core and the new core. Don't leave voids. A good fit for the new plywood core will help. Coat the plywood all over with unthinned epoxy as you put it in.

Large volumes of uncured epoxy will get too hot as they cure. This damages the epoxy, ruining its properties, and is a fire hazard. Let each small batch get through its exotherm before adding more. You may need to work in stages so the filled epoxy does not "go thermal," as it surely will if you put too much in at a time. Work in the shade even if you have to rig awnings. Smooth the edge of the hole to knock off peaks, but make sure it completely fills the gap with no indentations. Err on the side of too much; you can grind it off after it cures.

After the epoxy has cured, use a file bit on a drill (a powerful drill works best) and carefully smooth the epoxy at the edge of the opening, making sure to keep the edge vertical.

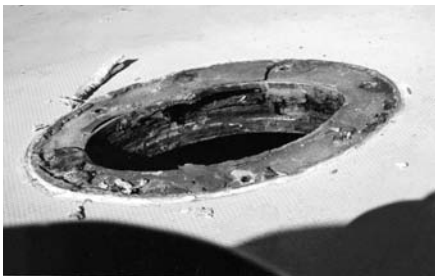
The deck collar assembly

When you're not on the boat, you can be working on the mast collar and its backing pad. The mast collar is probably aluminum and may be significantly corroded. After I wire-brushed mine down to clean metal, I washed it with acetone, prepped it with a two-part zinc chromate-based self-etching primer wash for aluminum (the marine paint companies make this), faired the pits with epoxy, sanded it smooth, washed it again, and painted it with four coats of two-part linear polyurethane paint. Make sure it's straight (not bent or warped) before you finish it.

If you already have an interior trim piece under the mast collar, you can use it as a template for your backing pad (or use the piece itself if it's still strong and intact). If there's no such piece, use cardboard to make a template.

You'll want the opening to match the opening in the deck exactly when the piece is through-bolted. To ensure this, put the deck collar in place (after you've finished and cleaned up the mast partners) and mark the screw-hole locations exactly on the deck, making sure the deck collar is centered exactly over the opening and doesn't move while you're marking. Remove the deck collar and clamp the interior piece or template exactly in place underneath. Drill the holes the correct size for the machine screws or bolts you're going to use, all the way through the interior piece below. Make sure they're as straight as you can possibly drill them. Replace the deck collar and check all the screws to make sure they fit. Make sure the interior piece fits exactly — opening and screw holes — before finishing it. The only way to do that is with a complete dry-fit. Once you're satisfied, over-drill the screw holes in the interior piece, clean out the holes, and fill them with epoxy. After the epoxy cures, re-clamp the piece in place and re-drill the correct size holes from above. Dry-fit it again. Then you're ready to finish the piece. My interior piece was rotted, so I used it as a template and made a new piece out of plain old exterior-grade plywood saturated in epoxy and painted with two-part linear polyurethane.

Make sure all surfaces are clean, then apply bedding compound to seal everything. Clamp the parts together lightly. Don't fully tighten until the caulk has started to tack; this helps form a better seal. Smooth out the edge of the caulk where it squeezes out into the opening; you want a flush-walled opening.



Shown from above, the mast partner area before repair has work to be done.

Clean partner area ready for epoxy fill.

Shown from below, loose adhesive between the headliner and bottom deck laminate has been removed. Note that the staining on the headliner has been cleaned off. There was only cosmetic discoloration of the bulkhead tops. Inspect any bulkheads in the immediate vicinity for water damage.

¼-inch x 4-inch-square aluminum tubing scrap with the outline of the original step casting. This will become the mast step riser that sits on the keel. It's worth less than $10 from a scrap metal dealer.

The mast butt

The first thing to do is to examine the mast butt itself. This is much easier when the mast is out of the boat and the butt is dry. Wipe the crud off and examine the metal for severe pitting (large in area and penetrating well into the wall thickness of the metal). On my mast, significant areas of metal had been completely eaten away. Establish how far up the mast the bad corrosion goes. Minor superficial pitting that looks like pockmarks doesn't count. Unless your bilge is really deep, you should get away with cutting off just a few inches. But before you cut, figure out what you're going to use for a riser. On my Pearson 28, 4 inches seemed to be the rule, which is why I used a scrap of ¼-inch x 4-inch-square aluminum tubing.

Stuff like this is available from scrap metal (and new metal) dealers who may have small pieces lying around. Scrap metal is really cheap. New metal dealers may be willing to cut you a piece.

Other owners of your type of boat are a gold mine for leads on stuff like this. If you can't find or can't use a piece of square tubing, you can have a metal shop put something together for you for $50 or so. You don't need stainless steel or bronze; aluminum is fine. If you have something custom made, an I-shaped structure will work.

Use the step casting base as a template. An alternate take on the I-shaped riser will work if your step casting is salvageable; clean it up and have the metal shop weld the step casting directly to the vertical piece, eliminating the top plate of the riser (and a welding joint).

If you use tubing, your life will be easier the closer you can match the footprint of the step casting. The surface of the keel may be uneven, and if the footprint of the new riser is wider than the step casting, it may not sit down completely, causing your mast to be just a little bit taller and your stays and/or shrouds to be just a little bit shorter, which is irritating and expensive to remedy.

Cutting off the mast butt

The principle is simple: cut off exactly the same amount of mast butt as the height of the riser you're going to use. Measure up from areas of the bottom edge that are still straight and intact. Use the edge of a file folder wrapped around the mast to connect the dots, and tape it in place to use as a guide. You can cut through the mast pretty handily with a good hacksaw with a sharp blade. Be careful to cut it straight. File or sand the cut edge smooth.

Optional, but recommended: clean up the section of the mast that lives below the cabin sole and apply a full aluminum treatment of zinc chromate primer wash, epoxy barrier primer, and two-part polyurethane paint to the area — inside and out — to protect the mast from further corrosion. If you've always wanted a painted mast in the cabin, go all the way up to the overhead.

Keel-stepped masts may be stepped in a variety of ways. In some cases, the butt of the mast sits in a casting on the keel. In other cases, the butt of the mast sits in a casting that rests on floors or stringers or both. These may rest on the keel but commonly do not. They attach to the keel sump, or reinforced area above the keel. If any parts of the structure that supports the mast are made of wood, inspect them for rot, delaminated plywood, or other kinds of failure. If the structure is metal, inspect for corrosion. If any of this structure needs replacement, it must be done with a plan to bring the new surfaces to the same point in space as the old ones so the mast butt will be in the same place. If you designed the new step to be higher than the old one by the amount you cut off the mast, that must also be taken into account.

The mast step has been removed from the boat.

The mast step is now clean and bare with the ears cut off and holes drilled. Note the area where it corroded all the way through. This will be filled with thickened epoxy.

Phillip bedded and through-bolted the step casting to the top plate of the riser. Then he bedded and screwed the riser to the keel. He coated the screws and bolts with 3M 5200 where they contacted the aluminum.

Do not assume that the loading is all compression, straight down. With a keel-stepped mast there is considerable side loading and there can be loading fore and aft, particularly if there is any mast bend in that direction. Study the original mounting for clues to the designer's intent.

Nice feature

Shims are a nice feature if you can work them in, because you'll have recourse if the mast needs to be raised or lowered a bit. This may happen if the mast was already short from wearing in the step casting.

In all cases, there should be a direct metal path from the mast to the metal keel. This can be either metal structure or wire. Use at least #8 wire to ground the mast to the keel, unless there is a direct metal structural path for the lightning bolt you hope you never meet. If wire is used, it should make as few bends as possible to reach the keel. Even a partial turn or bend in the wire adds inductive reactance to the circuit in a lightning strike. Any resistance to current flow increases the likelihood of side flashes, which are a danger to the crew.

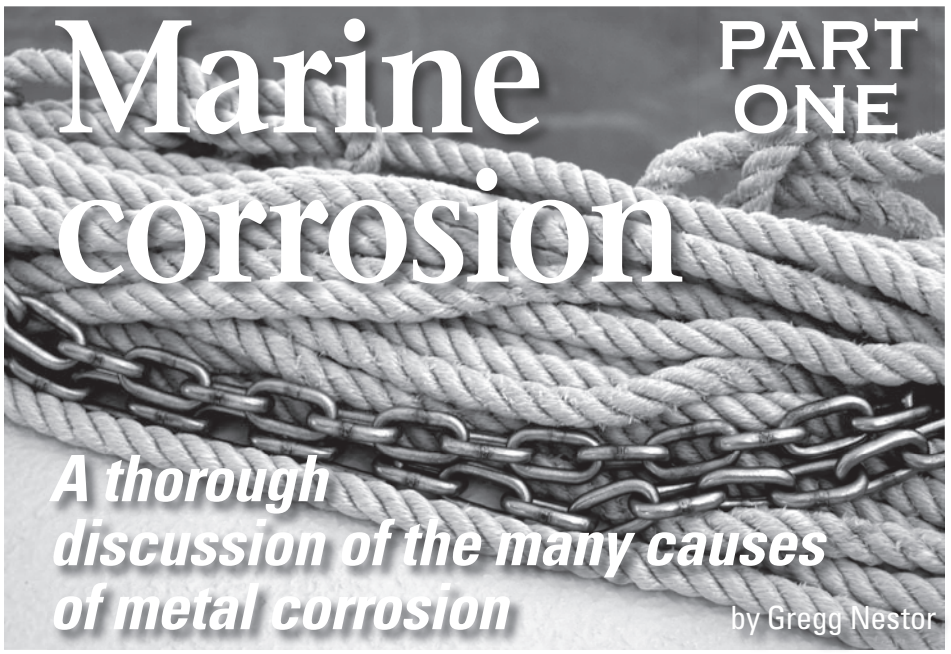
The moment of truth is when the mast is back on the step and the turnbuckles are re-attached. If something is a little off, one or more shrouds or stays aren't going to go back on. In my case, I had to add an eye-jaw toggle to my headstay. No hanging matter — the mast is straight — but it was irritating and stressful. I think the bottom plate of the riser, a little wider than the step casting, sat up a little higher, which is why I strongly recommend making triple-sure the riser sits exactly the way the step did, even if that means a custom-made, welded, I-shaped riser.

I put in some temporary wedges at the partners, tuned the rig, and used Spartite to chock and seal the mast partners. I covered that with a rubber mast boot and covered that with a Sunbrella mast boot cover. I don't expect to ever worry about the mast again.

Author's note: Even when I do a boat project "alone," I don't really. Thanks to Michael O, Lou, and Cap'n Ron of the Pearson 28 Forum (<http://www.geocities.com/CptinRn>) for getting me started on this, and thanks to Jack for helping me finish it.

Marine corrosion

PART ONE



The heat-affected zones on this stainless-steel chain are beginning to show signs of weld decay.

A thorough discussion of the many causes of metal corrosion

by Gregg Nestor

THE STUDY OF CORROSION CONSIDERS the reactions between a metal and its environment. From the standpoint of a boatowner, the study of corrosion also includes corrosion-suppression techniques. Therefore, in order to anticipate, minimize, or suppress corrosion, the boatowner must first consider its causes.

Corrosion theory

Corrosion is nature's way of returning processed metals — both pure and alloy — to their original native states as minerals or chemical compounds. For example, in its natural state, iron ore exists as various iron-oxide compounds (FeO, Fe_2O_3, Fe_3O_4). In making iron and steel, the oxygen is driven off and elemental iron results (Fe^0). To reverse this process, nature needs only to add water and oxygen. This natural reclamation process is corrosion.

Corrosion is a broad and complex subject; however, it can easily be understood and defined as an electrochemical process that involves three main steps, as shown in the illustration at right.

- At the anode, metal goes into solution. In this example, iron ions go into the water, where they are soon oxidized.
- At the same instant that the metal goes into solution, two electrons are released and begin to migrate through the metal to the cathode.
- Completing the electrical circuit, oxygen in the water moves to the cathode, where it uses the electrons that migrated to the cathode and forms hydroxyl ions (OH^-).

The chemical reactions are as follows:

Anodic reaction

$$Fe^0 \longrightarrow Fe^{+2} + 2e^-$$

Cathodic reaction

$$\tfrac{1}{2}O_2 + H_2O + 2e^- \longrightarrow 2(OH^-)$$

Subsequent to the actual electrochemical corrosion process, additional chemical reactions occur that provide us with the precipitated corrosion products as well as visual indicators. In the case of iron, the most common are as follows:

The negatively charged hydroxyl ions that were produced at the cathode migrate toward the anode. At the same time, the positively charged iron ions move toward the cathode. They combine to produce ferrous hydroxide.

$$Fe^{+2} + 2OH^- \longrightarrow Fe(OH)_2$$

This compound is rapidly oxidized (combined with oxygen) to ferric hydroxide.

$$4Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 4Fe(OH)_3$$

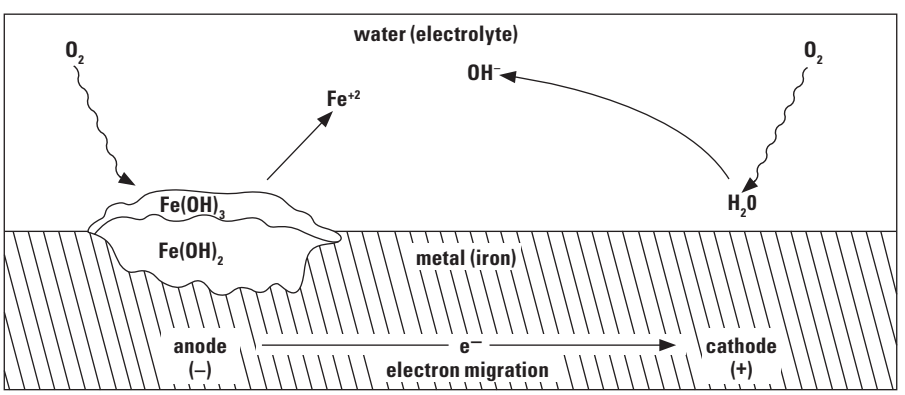
When the ferric hydroxide is dehydrolyzed (the water is removed), ferric oxide (red rust) is all that remains.

$$2Fe(OH)_3 \longrightarrow 3H_2O + Fe_2O_3$$

The corrosion process in all metals is similar to that of iron; however, the end products are not called rust. Rust is peculiar to iron and steel and more of a colloquial term. It is more technically correct to refer to the products of corrosion as "a metal's oxide."

Every metal surface is covered with innumerable minute anodes and cathodes. These sites may be the result of stress, compositional differences, or surface irregularities, to name just a few. Regardless of the cause, a difference in electrical potential exists between each anode and cathode. It is this difference in potential that allows current to pass through the metal, resulting in reactions at the anodic and cathodic sites. The anode is the region of lower potential (–) and the site of metal loss, while the cathode is the region of higher potential (+). In general, the lower the potential of the anode, the greater the metal loss — and thus the more serious the corrosion problem.

The degree of corrosion is also a function of the ability of ions and electrons to migrate through the elec-



trolyte (water) and take part in the chemical reactions. Waters that are higher in dissolved solids are more conductive and can cause more severe corrosion. Salt water, with its higher dissolved solids content, is more corrosive than fresh water.

Galvanic series

Any metals when immersed in water will soon develop a measurable electrical potential. Those of lower potential can be expected to corrode more easily and extensively than those of higher potential. When dissimilar metals are coupled, either by wiring or by simple contact with each other, and are immersed in water, the one with the lower potential will become the anode and actively corrode. The table to the right shows the galvanic series for metals immersed in sea water.

The most "noble" metals are those located toward the bottom of the series. These are electrically less negative (or more positive) and less chemically active (or more passive). These metals are said to be cathodic and are more resistant to corrosion. The metals nearer the top of the series are less noble. They are more electrically negative (or less positive) and more chemically active. As such, these metals are anodic and corrode most easily.

When two metals, as shown in the table, are coupled, the metal higher in the series will corrode. The driving force for galvanic corrosion is the potential difference that develops between the two metals. This difference in potential increases as the distance between them on the galvanic series increases. *Any metals that are more than 200 millivolts apart on the series will cause the more anodic (higher on the series) to corrode.*

Immersion is not necessary for galvanic corrosion to take place. Wood that is wet with sea water can act as the electrolyte and allow ion migration.

Common onboard galvanic couples include propellers and their shafts, stainless-steel screws in an aluminum mast, and dissimilar metals in the engine's cooling system.

Polarization/passivation

Changing the potential of either the anode or the cathode or both to reduce the difference in electrical potential between them reduces the corrosion reaction and minimizes the associated metal loss. This shift to more of an equilibrium in corrosion potential is called polarization.

To some extent, polarization occurs naturally during the corrosion process, either by the depletion or removal of chemical reactants, such as oxygen or chloride, or the formation of a passivating monomolecular oxide film on the metal's surface, as is the case with stainless steel.

Unfortunately, polarization is not always complete or effective in reducing the corrosion potential and must be aided by other means, such as chemical (coatings), mechanical (insulation), or even electrical (impressed current).

Should polarization be interrupted at any point, a very active anodic site will develop, accelerating corrosion.

Chemical factors

Understanding the ramifications of a metal's aqueous environment helps greatly in determining the potential for and extent of a corrosion problem.

Acid/alkaline — Simply stated, pH can be defined as the hydrogen ion concentration. It is measured using a special, logarithmic pH scale, which ranges from 0 to 14, with 7 being neutral. The higher the concentration of hydrogen ion, the lower the pH and the more acidic. The lower the concentration of hydrogen ion, the higher the pH and the more alkaline, or basic. Most natural waters have a pH of 6.0 to 8.0, with sea water tending to be on the alkaline side.

The actual effect of pH on a given metal is determined by the behavior of its oxide. If the oxide is soluble in an acidic medium, the metal is considered acid soluble and will therefore corrode rapidly in this environment. On the other hand, if an alkaline medium dissolves the oxide, the metal will experience extensive corrosion in that high pH range. With the exception of the most noble metals, most metals fall into the first category (see illustration at the top of Page 20).

Galvanic series

Anodic, or least noble, end (Active)	Millivolts (mV)
Magnesium (Mg)	-1730
Magnesium (2% Manganese [Mn])	-1670
Magnesium (9% Aluminum [Al], 1% Mn, 1.5% Zinc [Zn])	-1580
Galvanized Iron (Hot Dipped)	-1140
Zinc Electroplating	-1130
Cadmium (Cd) Zinc Solder (71%/29%)	-1120
Zinc	-1050
Cadmium	-860
Cadmium-Plated Steel (Cd 0.001 in.)	-860
Aluminum (Marine Alloys 5086, 5083, 6061)	-820
Mild or Structural Steel (A36)	-790
Alloy Steel	-740
Aluminum (Forged Alloy)	-730
Stainless Steel (316, 317, 321, 347, 302, 304 — active, oxygen starved)	-550
Tin (Sn)	-500
Manganese Bronze, CA-464 Naval Brass (58% Copper [Cu], 39% Zn, 1% Al, 0.25% Mg)	-450
Naval Brass (60% Cu, 39% Zn)	-450
Yellow Brass	-450
Admiralty Brass (70% Cu, 29% Zn, 1% Sn)	-360
Copper CA-110	-340
Brass (60% Cu, 40% Zn)	-330
Gunmetal (88% Cu + Sn)	-310
Silicon Bronze (96% Cu, 1.5% Silicon)	-260
Tin Bronze	-260
Lead (Pb)	-240
Copper/Nickel (CA-715 - 70% Cu, 30% Ni)	-200
Aluminum Bronze (90% Cu, 10% Al)	-150
Stainless Steel (316, 317, 321, 347, 302, 304 — passive, oxygenated)	-150
Monel 400 & 500	-110
Titanium (Ti)	-100
Silver (Ag)	-80
Graphite and Carbon Fiber (C)	(+250)
Platinum (Pt)	(+260)
Cathodic, or most noble, end (Active)	**Millivolts (mV)**

A metal oxide that rapidly dissolves in both acid and alkaline situations is referred to as being amphoteric. Amphoteric metals exhibit their greatest corrosion stability at an intermediate pH range. Two important shipboard metals that fall into this category are aluminum and zinc (see illustration at right).

In addition to the pH of the water, the pH of several other shipboard situations can adversely affect the corrosion process. These include, but are not limited to:

- Rain water (acid rain)
- Teak cleaners/brighteners (many use both an acid and an alkali)
- Acid-cure silicone sealants
- Engine exhaust (upon combination with water, an acid is formed)

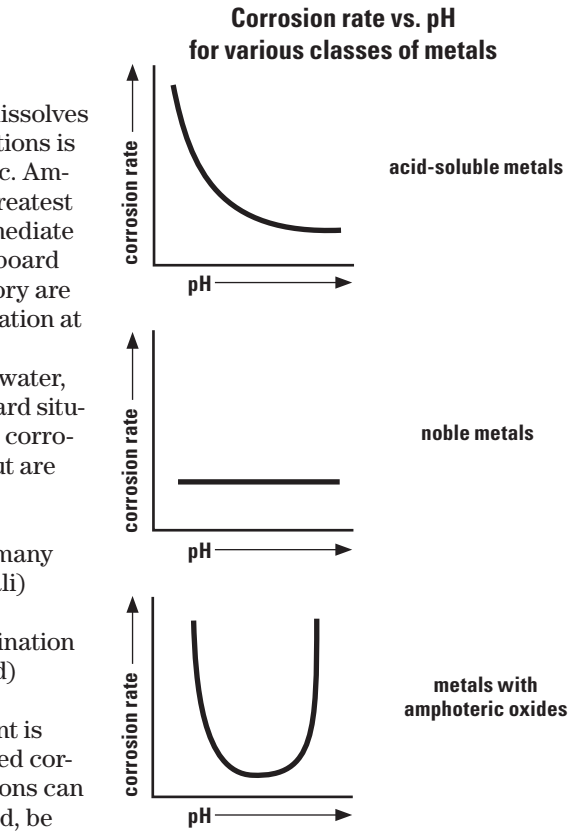
While an acidic pH environment is generally a cause for accelerated corrosion, strongly alkaline solutions can cause the deterioration of wood, be it the boat or its brightwork. Wood is comprised of cellulose fibers that are bound together with a natural adhesive called lignin. Strong alkaline solutions can dissolve lignin, leaving only the structurally weak cellulose. This "corrosion" process is called delignification.

Dissolved solids

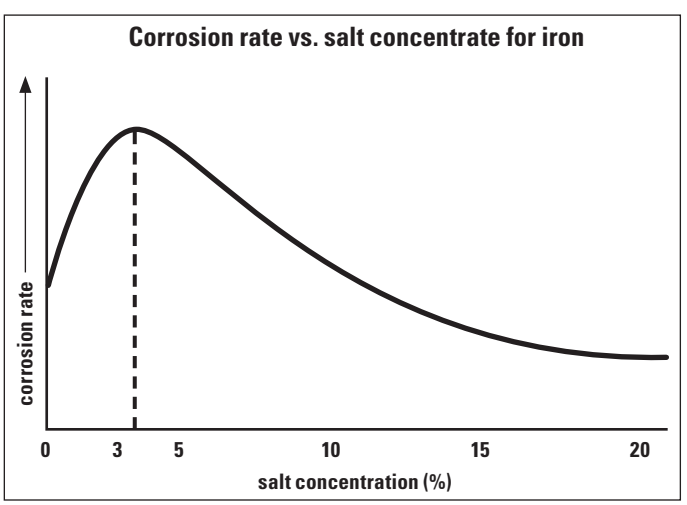
The impact of dissolved solids on the corrosion process is somewhat complex. Not only the concentration is important; so are the various ions involved.

The extent of the corrosion is a function of the ability of both the ions and electrons to migrate through the water and participate in the various chemical reactions. Waters that are high in dissolved solids are more conductive and are responsible for severe corrosion. Sea water, with its high concentration of dissolved solids, is extremely conductive and much more corrosive than fresh water.

Salinity — The presence of salt, or more specifically the chloride ion, makes water extremely corrosive. The figure at right illustrates the effect of salt concentration on the corrosion rate of iron. Note that the corrosion rate is at its highest at a salt concentration of 3.5 percent, which coincidentally is just about the salt concentration of sea water. The chloride ion aids corrosion in two ways. It increases the electrical conductivity of the water, and it tends to interfere with and break up the protective oxide films formed by some metals.



Oxygen — The greater the amount of dissolved oxygen in the water, the greater its corrosiveness. This is due to the fact that an increase in oxygen allows for an increase in the rates of the various chemical reactions at or near the cathode, thus promoting corrosion. In sea water, the corrosion rate of mild steel increases in direct proportion to an increase in dissolved oxygen. A doubling of dissolved oxygen doubles the corrosion rate. Generally speaking, as water temperature increases, the amount of dissolved oxygen decreases.



Suspended matter — Sand, silt, mud, clay, and other particles suspended in the water pose very little in the way of a corrosion problem. However, when they are allowed to settle out on a metallic surface, they can quickly form a porous deposit and establish a differential aeration cell. The area beneath the deposit is oxygen-deficient and becomes anodic while the open surface is now cathodic. With a difference in electrical potential formed, corrosion begins. The differential aeration cell can lead to aggressive localized pitting. This condition is commonly referred to as under-deposit corrosion. Good housekeeping, especially in the bilge and lockers, can just about eliminate under-deposit corrosion.

Microbiological — Microbiological corrosion can occur directly or indirectly. Direct involvement takes the form of corrosion that results from the biological process associated with the metabolism of the bacteria. Examples of corrosive microorganisms include sulfate-reducing bacteria (*Desulfovibrio desulfuricans*) and sulfur-oxidizing bacteria (*Thiobacillus thiooxidans*). While sulfate-reducing bacteria consume hydrogen and accelerate the corrosion process at the cathode, the sulfur-oxidizing bacteria manufacture sulfuric acid and a low pH. Beneath both of these colonies, severe localized pitting results.

The corrosion that is associated with indirect microbiological activity is usually the byproduct of bacterial metabolism, which results in a deposit and the formation of a differential aeration cell. Organisms such as *Beggiatoa* and *Thiothrix* are well known as

troublesome fouling organisms. Generally, microbiological corrosion takes the form of localized pitting.

Like sailboats, microorganisms are cosmopolitan, in that they can be found throughout the world. They inhabit water, land, and air, and they are quite adaptable to shipboard life, given the right environment. Cleanliness is their enemy.

Physical factors

Understanding certain physical aspects of the relationship between water and a metal can provide insights into the corrosion potential. Common physical factors include:

Temperature — Generally, corrosion increases with an increase in temperature. Nowhere is this physical factor more in evidence than in the closed recirculating cooling system of a sailboat's engine. It is in this environment that a rise from 60° to 180°F may increase the corrosion rate by as much as 400 percent. Fortunately, antifreeze products routinely incorporate a corrosion inhibitor in their formulations. To insure that temperature protection as well as corrosion inhibition are constantly maintained, it is a good practice to drain, flush, and recharge the system with fresh antifreeze on a routine basis.

With an increase in the temperature, some metals or alloys can even change their electrical potential. At approximately 150°F, the zinc coating on galvanized steel no longer provides corrosion protection. It becomes cathodic, while the steel becomes anodic and corrodes.

Lastly, should a temperature variation occur within one piece of metal, the cooler portion becomes cathodic, while the warmer part becomes anodic and corrodes.

Dissimilar metals — As was discussed earlier, when two dissimilar metals are in contact with each other and exposed to a conductive solution, a difference in electrical potential develops. The metal lowest in electrical potential becomes anodic and corrodes.

One of the most routine shipboard practices involving dissimilar metals is the use of stainless-steel fasteners on an aluminum mast. The fasteners are cathodic to the anodic spar. To reduce the electrical potential between the two, the fasteners are normally coated with an insulating paste. If they are not, corrosion of the spar area adjacent to the fastener will take place and the hole will eventually enlarge.

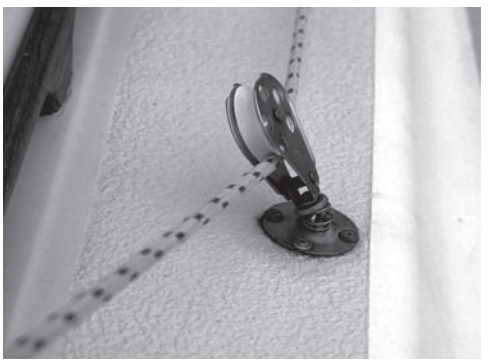
Cathode-to-anode ratio — The rate of corrosion increases in direct proportion to an increase in the ratio of cathodic surface to anodic surface. Where the area of cathodic surface is greater than that of the anodic surface, an unfavorable cathode-to-anode ratio exists. If the ratio is significantly high, the resulting corrosion will be severe localized pitting. Therefore, whenever possible it is favorable to maintain a low cathode-to-anode ratio.

Stainless-steel fasteners on aluminum spars are good examples of low cathode-to-anode ratios.

> **"Microorganisms inhabit water, land, and air, and they are quite adaptable to shipboard life."**

Metallurgy — Metals are never uniform. All metals exhibit surface flaws such as nicks, scratches, and cuts. These areas will eventually become anodic to the rest of the metal.

Differences in the metal's microstructure can promote the formation of a galvanic cell and subsequent corrosion. This includes such microscopic items as a difference in metal grain densities, the inclusion of a non-homogeneous metal or compound in the grain structure, and the presence of a precipitate at the metal's grain boundary. Metals that have been stressed or are under stress normally develop anodic sites at the stressed area.



Corrosion fatigue or possibly fretting corrosion, top, beginning to take place where a brace is welded to the stanchion. An oxygen differential cell has developed beneath the fairlead, center, and active corrosion is taking place. Oxygen deprivation is occurring where the stanchion is in the base, bottom. This is interrupting the formation of the protective oxide film on the metal's surface and corrosion is taking place.

Unfortunately, an increase in metal purity is no guarantee that corrosion will decrease, but it does help.

Types of corrosion

The corrosion of a metal's surface can take many forms. The major types that are routinely encountered in the marine environment are highlighted below:

Uniform attack — Sometimes referred to as atmospheric corrosion, uniform attack is characterized by the even, steady loss of metal over

the entire metal surface. When the difference in electrical potential is not great, the anodic and cathodic sites tend to shift from place to place on the metal's surface. This results in uniform metal loss. Given appropriate conditions, all metals can exhibit some uniform attack.

If your boat is made of steel, chances are that you're quite familiar with uniform attack. Any areas that are missing paint will quickly develop this common form of corrosion. If you don't sail a steel boat, you're not immune from uniform attack. Inboard engines are predominantly made of cast iron. Where the protective coating of paint is missing, uniform attack can occur. Exhaust manifolds and risers are excellent candidates for uniform attack.

Pitting — Pitting corrosion is one of the most destructive and intense forms of localized attack. This is the result of the formation of a highly active, localized anodic site. Pitting can occur under deposits, at high temperature zones, at imperfections on the metal surface, at holidays in paint coatings, and around bits of weld spatter. Pitting is the most common cause of metal failure. Even if not fully perforated, pits create stress concentration sites that lead to failure when stress is applied. It is an insidious form of corrosion, since it is not readily apparent. Areas where pitting corrosion can occur include under deposits, on keel bolts, inside stanchion bases, inside lower terminals of wire rigging, and beneath plastic lifeline coverings.

Tracing rust stains to their source can aid in identifying the source and type of corrosion.

Erosion — This form of corrosive attack is one in which metal loss is accelerated by the velocity or abrasion of a flowing medium (water). This form of localized attack often occurs at areas where water changes directions. Cavitation can cause erosion corrosion. It causes damage due to the formation of bubbles in the water as they collapse against a metal surface. The resultant shock physically dislodges metal grains from the surface. The presence of deep, circular pits, along with an overall roughened surface, is evidence of cavitation. Areas susceptible to cavitation include the suction side of pump impellers and boat propellers. Attack can even occur inside diesel engines, caused by the pressure created by piston slaps.

Selective leaching — Selective leaching (known as de-alloying) is the preferential disintegration of one element from the alloy matrix. Three common forms, in order of general importance, are dezincification, degraphitization, and de-aluminification.

Dezincification is the selected removal of zinc from copper-zinc alloys (brass). This results in a weak porous copper structure having a reddish, coppery color. There are two forms of dezincification. The "plug type" form is localized and characterized by deep penetration. This form occurs in waters of high salt content. The "layer type" form is more general and uniform in nature and will occur over the entire metal surface. Resistance to dezincification varies with the alloy. For example, brass of 70 percent copper and 30 percent zinc is less resistant than admiralty brass (70 percent copper, 29 percent zinc, 1 percent tin), which is less resistant than inhibited admiralty brass (admiralty brass plus a small amount of arsenic, antimony, or phosphorus). Bronze, Monel, stainless steel, or even hot-dipped galvanized are better choices.

Cast iron is subject to a similar problem called degraphitization. When iron is selectively removed, the result is a weak structure of graphite and iron oxides.

Look for signs of crevice corrosion in swaged fittings and turnbuckles and in confined spaces, to name just a few.

De-aluminification is a form of selective leaching associated with aluminum bronzes and a seawater environment.

Boats sailed in fresh water are generally safe from selective leaching. If you're a saltwater sailor, places where selective leaching may occur include fittings and fasteners made of yellow brass (dezincification), cast iron keels (degraphitization), and possibly components fabricated of aluminum bronze (de-aluminification).

Under-deposit corrosion — Under-deposit corrosion is generally the result of the formation of an oxygen-differential aeration cell. The water above the deposit is oxygen rich, while the area beneath the deposit is oxygen deficient. This difference in oxygen concentration establishes a difference in electrical potential, with an anode being formed beneath the deposit. The result is extensive localized corrosion, which establishes a self-perpetuating corrosion cycle. The metal that is lost through the corrosion process precipitates out and creates another deposit, which in turn establishes another differential aeration cell and more corrosion.

To exacerbate the situation, aggressive ions such as chloride and sulfate may be incorporated in and beneath the deposit. When a seawater-saturated organic mass is the deposit, the resulting corrosion is sometimes called poultice corrosion.

When colonies of microorganisms, including barnacles, form the deposit or are found to be present beneath a deposit, the resultant corrosion is categorized as being microbiologically

induced. This microbiological form of corrosion was discussed on Page 20.

Under-deposit corrosion is probably the most insidious form of localized attack because it's often overlooked until a premature failure occurs. Look for signs of under-deposit corrosion in places where water can collect and allow its suspended solids to settle out. On a metal boat, the first place to check is the bilge with its many nooks and crannies. Keep those areas free of debris. Also check anchor and chain lockers. Monitor the engine temperature in order to determine if the heat exchanger is fouled. This fouling is the precursor to under-deposit corrosion.

Remember, it doesn't have to be dirt to be a deposit. A piece of waterlogged wood left in contact with a steel deck can initiate under-deposit corrosion.

While not a deposit, the vinyl coating on stainless steel lifelines has been known to create conditions for the establishment of oxygen-differential cells and promote corrosion of the stainless steel wire. You also want to take a peek at metal components that have been wrapped with tape.

> **"A piece of waterlogged wood left in contact with a steel deck can initiate under-deposit corrosion."**

Crevice corrosion — Crevice corrosion is categorized by localized attack occurring within or immediately adjacent to a crevice or other area that is shielded from the bulk environment. In addition to cracks, flaws, and scratches on the metal surface, fasteners, welded lap joints, and sealants can cause crevice corrosion.

The small volume of stagnant solution within the crevice is oxygen deficient and quickly becomes anodic, due to the formation of an oxygen-differential aeration cell. Attack is localized and can be severe due to the unfavorable cathode-to-anode ratio. Tracing rust stains to their source can minimize this form of corrosion. Look for signs of crevice corrosion in swaged fittings, closed-body turnbuckles, tight corners and flanges on metal structures (pulpits), and in the narrow confined spaces around fasteners and fittings.

Cracking — Cracking can be divided into two main categories, both of which are associated with the configuration of the crack. Intergranular cracking occurs between metal grain boundaries, while transgranular cracking crosses grain boundaries.

Intergranular cracking refers to localized attack at metal grain boundaries. This form of stress cracking is most prevalent in austenitic and martensitic stainless steels, which have been improperly heat treated and left in a stressed state. The metal can crack perpendicular to the direction of stress.

When austenitic stainless steels containing moderate amounts of

carbon are welded, the metallurgy of the heat-affected zone is changed and becomes more susceptible to corrosion attack. This type of intergranular cracking is often referred to as weld decay.

Hot-short cracking is another form of intergranular cracking. It can take place during manufacturing or when a metal is hot-worked or even welded. Upon cooling, low-melting elements in the grain boundaries can result in the formation of minute cracks. These cracks provide the environment in which other forms of corrosion can develop, especially crevice corrosion.

Transgranular cracking is the result of cyclical stress as opposed to constant stress and is a mechanically assisted form of stress cracking. Two types of transgranular cracking are corrosion fatigue and fretting corrosion.

Corrosion fatigue takes place under the simultaneous conditions of a corrosive environment and recurring stress. Fittings that are exposed to sea water and subject to continual flexing, such as chainplates, are good candidates for corrosion fatigue.

The constant abrasion between load-bearing metal surfaces subject to vibration can result in a form of transgranular cracking called fretting corrosion. Proper material combinations, lubrication or even insulation, or the elimination of vibration can minimize this form of attack.

Stray-current corrosion — Stray current is the unintentional or uncontrolled leakage of electrical current flow from one wetted metal surface, through an electrolyte, to another wetted metal surface. This condition is usually caused by a faulty electrical system. The point where the current leaves the metal and enters the electrolyte (water) is the anode. This is the area where corrosion takes place. The point where the current leaves the electrolyte and reenters the metal is the cathode. In a DC circuit, current flow will be from the hot side (+) to ground (–). The anode and cathode need not be close. In fact, they may be yards apart. The path of stray-current leakage may be across any moist surface including wetted wood. With stray-current flow, it makes little or no difference if the metals are the same or different. Unlike DC stray current, AC stray current will corrode both wetted metal surfaces.

A common source of stray-current leakage is from a hot wire with deteriorated insulation or a connection exposed to moisture or bilge water. The best prevention against stray-current corrosion is a properly installed and maintained electrical system.

The most common components that can experience stray-current corrosion are the metallic through-hull fixtures. These are followed by the propeller and its shaft, then the rudder shaft.

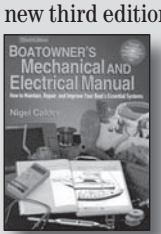
Fuel-system corrosion — While not a specific corrosion type, fuel-system corrosion is often overlooked. As such, it is one that can lead to serious consequences, usually at an inopportune time.

Deposits can form in diesel fuel tanks when water separates from the fuel and when asphaltenes, waxes, and just plain dirt ultimately settle to the bottom. Add to this cocktail some microbes and, in addition to the fouling of close-tolerance fuel-system and engine components, a severe cycle of corrosion and further fouling develops. The best defense is using good quality fuel, routinely changing the fuel filter, and judiciously applying a microbiocide fuel additive.

See Marine corrosion, Part 2, in the November 2005 issue for more about ferrous and non-ferrous construction materials and how to avoid corrosion.

For further reading …

Boatowner's Illustrated Handbook of Wiring, by Charlie Wing, and *Boatowner's Mechanical and Electrical Manual* by Nigel Calder (now in a new third edition), are two useful assets for more information about corrosion. These and other books can be found at <http://www.goodoldboat.com/bookshelf.html> or by calling 763-420-8923.



Second life for the Cabot 36

This handsome Canadian cruising design is back again

by Ken Draayer

The Cabot 36, designed by Ted Brewer and Bob Wallstrom, was launched in 1973. Just 49 were built before Cabotcraft Industries of Sydney, Nova Scotia, closed its doors. But her sweet lines attracted renewed interest from the present builders.

Some sailors fall in love with every boat they see. Others, like owners of the classic Cabot 36, are firmly monogamous. And why roam? She's rare — they only made 49 — and the older she gets the more she turns heads. Add her pedigree — design by Ted Brewer and Bob Wallstrom, a chapter of praises in Richard Henderson's *Choice Yacht Designs*, plus several articles over the years — and you know why boats like the Cabot 36 engender loyalty out of plain old fiberglass.

Trouble is, she lived a short production life, leaving her admirers with two questions: "Whatever happened to this good old boat?" And, "Is she gone for good?" The answer to the first is, "She fell on hard times." The answer to the second is simply, "No." YachtSmiths International of Halifax, Nova Scotia, a builder with a special interest in classic revivals, has found and refurbished her molds. The first in a new line of Cabots hit the Halifax Boat Show last February.

Production began in Sydney, Nova Scotia, in early 1973, when two entrepreneurs from Toronto, Ontario, created Cabotcraft Industries and commissioned the design team of Bob Wallstrom and Ted Brewer for an offshore cruiser. The Cabot 36 is a cutter-rigged sloop designed to be a beauty and built to be a beast. She has nice lines, gorgeous teak jewelry, and an ample layout below. In *Choice Yacht Designs*, Richard Henderson describes her bustle as a little extra protuberance aft that means a lower quarter wave and extra interior room. She is also high enough in the stern to minimize the chance of getting swamped in following seas.

The keel's leading edge sweeps back, making it more resistant to fouling and collision damage. George Kephart of Poolsville Maryland, who sailed his Cabot for at least six months of every year for 16 years and halfway around the world, says there are a few rocks just south of the airport in Athens, Greece, that are the worse for wear after an encounter with his Cabot, the *Sarah Fraser*. He says, "She's the most seakindly boat of her size I've ever been in."

Hull plug

Tony Waldegrave, who has run the Cabot Owner's Association since the late 1970s, can show you a plug from his hull that has a good inch-and-a-half of Airex foam core and fiberglass. Richard Henderson reports that Ted Brewer was accustomed to asking sailing guests to take a whack at a sample of this material with an ax or sledgehammer: "Ted's point was well made, that this kind of construction makes a very strong hull . . . light weight, good insulation, and great stiffness."

Hull #31, the only yawl produced by Cabotcraft, survived a vicious storm in December of 1982, with winds of up to 70 miles an hour that blew directly into the harbor at Cabo San Lucas, Mexico. *Sail* magazine reported that "the remains of 27 large boats lay scattered" on the rocks. *Dancing Bear*, the Cabot yawl, then owned by Bob Hume of Dana Point, California, survived without structural damage. The only other survivor was a steel-hulled yacht owned by the famous French sailor, Bernard Moitessier.

So what happened to this storied boat? Well, for one, production was never without its trials. The facility

Brian Smyth, now head of engineering for YachtSmiths, found the hull, deck, and liner tooling abandoned in a Nova Scotian field.

at Point Edward Industrial Park in Sydney was an old brick-and-timber navy base from World War II, heated from a central steam plant and used by the coast guard. In late 1973, John Perring, the key fiberglass man, Bob Wallstrom, and Jim Marsh, manager of the new plant, had to start on the lofting under low ceilings cluttered with beams, bracing, and old steam pipes. Improving that facility took time and energy away from boatbuilding.

So did the task of improving human capacities. Cape Breton, like much of the rest of Canada at the time, relied on its natural resources and just didn't have a plentiful supply of managers and tradespeople, especially in the relatively new technologies of fiberglass boat construction.

The story of the first boat to show at the U.S. Sailboat Show in Annapolis, Maryland, in 1974 conveys the chaos that besieged the first years. By the time the crew had to leave for Annapolis, the boat still was not done and had to be towed behind an old 1950s Mack truck followed by a working crew in a Winnebago. Every time the convoy stopped, out of the Winnebago jumped the proud crew from Cabotcraft to continue putting her together. Bob Wallstrom later drew a cartoon showing a bunch of guys on top of the Winnebago with table saw, thickness planer, and shaper, and one carpenter carrying joiner work over a swaying catwalk to the boat behind.

The first Cabot 36 was completed en route to its first exhibition at the U.S. Sailboat Show in Annapolis, Maryland, in 1974. The finishing crew followed in a Winnebago, jumping out to work on the boat whenever it stopped.

The original lofting of the 36's lines by Bob Wallstrom, John Perring, and Jim Marsh onto the Cabotcraft shop floor back in 1973.

Government partner

By 1976, the company's private investors turned the operation over to their government partner, the Cape Breton Development Corporation (Devco), and Roy Mac Keen was hired to right a ship that was listing. Roy had managed a marina in the Bahamas for the colorful Canadian horse-racing millionaire, E. P. Taylor, as well as a shipyard for R. T. Symonette, then prime minister of the Bahamas.

While production and costs improved, Cabotcraft could not avoid the economic downturn that few other Canadian boat companies survived. The Canadian dollar was at $1.03 in 1976 when Cabotcraft was struggling to sell its product. The oil crisis was pushing up the cost of resin. Inflation was hot, and government legislation that had given some protection to Canadian boatbuilders was removed.

Despite plans to diversify (adding a 30-foot version for which Bob Wallstrom was going to do the design, plus molds for the 41-foot Cape Islander fishing vessel), the business simply wasn't there. In July of 1978, Devco pulled the plug. Cabotcraft's assets were disposed of, and for the next 25 years the molds for this well-respected boat lay forgotten in a Nova Scotian field.

In 2002, Brian Smyth, now director of engineering for YachtSmiths International, was in the Bahamas with his wife, Susan, and their three children, delivering a boat for a client. They were moored beside a yacht of such lovely classic lines they just had to make inquiries. She was a Cabot. On return to Nova Scotia, Brian scoured the records of the Boatbuilders Association, where he recalled seeing the molds for sale a few years before.

The two-part hull mold was discovered inverted in a field and screwed together to prevent water from entering. The wood bracing was rotting, but the interior seemed fine. The deck mold, also inverted, had a skin coat of fiberglass in it. The liner mold also had pieces in it from an earlier layup and was in the worst shape. It was wintertime, so everything had to be carefully freed from a buildup of ice and snow.

Reconstruction of the first new

Cabot 36

Designers: Ted Brewer and Bob Wallstrom
LOA: 35 feet 7 inches
LWL: 29 feet 8 inches
Beam: 11 feet 8 inches
Draft: 4 feet 9 inches
Displacement: 15,000 pounds
Sail area: 632 square feet
Ballast: 5,500 pounds

Cabot was something of an archaeological dig, trying to restore and fit together pieces that had suffered some deterioration and changed shape over years of abandonment. The hull molds, for example, resting on stem and stern, had relaxed.

Original position

"The way we handled that," Brian says, "was to take 2 x 8s and spread the sheer back out to its original position. When we spread the sheer out, it shortened the boat. It flexes. And we just did that until it came back in line with the deck mold, which we knew had not distorted very much." In future construction they'll have a metal template made from the deck mold.

The skin that remained on the deck mold suggested that someone over the years had tried a one-off edition of the boat. When YachtSmiths popped that skin off and set it aside, it discovered significant osmosis in the mold. The Halifax Boat Show, in which the company had purchased space, was just weeks away. Shades of the former company descended. Using tooling gel to restore the mold would have delayed production a few weeks. The problem cooked for a few days until, in a moment of serendipity, Brian noticed the perfect condition of the discarded deck skin. With some quick and clever rehab, it became the mold for the first deck.

The hull liner mold was also a sow's ear that became a silk purse. The original Cabot's liner was fiberglass with wood trim and cabinetry. Years of weathering, however, had deteriorated the mold so badly that parts had to be cut away, leaving YachtSmiths not much more than a template of the original. But the result, says Brian, is that "the new Cabot will have way more wood." In fact, he offers a full mahogany or teak interior to suit clients' wishes.

YachtSmiths hired E.Y.E. Marine Consultants of Nova Scotia to do a structural analysis and new layup using Lloyd's of London draft rules, so new Cabots will meet or exceed Lloyd's requirements for offshore vessels. And the company has reconnected with Tom Johansen, who originated the famous Airex core material in the first boat. "Tom is the guru. He's done it all in fiberglass," Brian says. "He didn't know we were building the Cabot and was all excited." The new layup will include another Tom Johansen product, Corecell. While the new layup, like the original, is done by hand, plans are to introduce infusion technologies for future construction.

So the Cabot is back, her beauty and reputation intact.

Resources

YachtSmiths International
2 Maitland St.
Dartmouth, Nova Scotia
Canada B2Y 3L7
902-463-0741; 866-856-7848
<http://www.yachtsmiths.com>

When the engine quits

Test your seamanship skills in tricky situations

by Lin and Larry Pardey

Sun glistens on a perfect French Polynesian sailing day. The trade wind blows across the deep waters of the pass that cuts through the reef between Huahine and the open sea. The 35-foot sloop cuts a gentle wake as it powers seaward through the pass. Its crewman, Chuck Ryan, a lifelong sailor, had attached the halyards to the sails before he raised the anchor. Now he is clearing up the foredeck while the owner stands at the helm motoring toward their next destination, Raiatea.

Halfway through the pass, the engine quits. Chuck watches bemused as the skipper dives belowdecks to the engine room. Chuck hoists the headsail, goes back to the cockpit, trims the sheet for a beam reach, and sails clear of the pass. When the skipper pokes his head out of the companionway hatch and looks around at the open sea, then glances up at the wind-filled sails, he says, "Gee, that was a good idea!"

Chuck has years of sailing experience in big boats and on engineless dinghies. So his actions came naturally to him. The owner, like most modern sailors, has spent more time with motorized transport. So his actions were just as natural. Play along with us if you want to gain the skills and confidence to think of your sails as highly reliable motivational power — as an extra margin of safety — and then to react instinctively, as Chuck did, should your engine disappoint you in tight quarters.

Though theoretical sailing is no substitute for the real thing, we hope this quiz will get you thinking about the many options open to a boat that is powered by sails and an engine. The next time you are powering into a port, you can hone your seamanship skills by asking yourself, "What would I do if the motor quit right now?" Once you've practiced visualizing your responses, try out a few of these maneuvers just as you would do a crew-overboard drill.

Rules for this quiz

- ***The goal*** — To stabilize the situation by placing your boat in the safest possible position before you take the time to find out what caused the engine to shut down. The safest position may be out in more open water or comfortably at anchor.
- ***Tools available*** — You can use sails, warps, anchors, or dinghies. There are no trick answers or questions. But here, as in the real situation afloat, calm consideration of prevailing and frequently changing conditions is paramount.
- ***Disclaimer*** — There are probably other sailing maneuvers you could use to obtain the same results. The hints that follow each question should give you ideas that have definitely worked for us.

Earning points

- If you think first of calling for outside assistance, such as a tow, you lose five points.
- If all your sheets and halyards are rigged and sails are clear to hoist, you gain one point.
- If your sails are set up so both main and headsail can be up (or out) in one minute, add two points.
- If your ground tackle is set up so it is ready to let go within one minute, add two points.
- If you have warping lines coiled and ready, without the need to move other gear off them, add two points.
- If your regular crew knows how to handle ground tackle and sails and is well-versed as to which halyard or sheet is used for each sail, add three points.
- If you practice these maneuvers under way and are left feeling satisfied with only a slight adrenaline surge, add five points.

Scoring

- ***10 or above*** — You are organized and ready to downgrade a sudden engine shutdown from a cruise-ruining experience to simply an interesting incident.
- ***7 or below*** — It would pay to take the time to practice real-life engine-failure drills when you're out sailing.

Situation A

You are inside the breakwater, near the starboard side of the channel, when your engine runs out of fuel and suddenly stops. Since the wind is on the beam and there is a 3-foot swell wrapping around the end of the breakwater, the boat is being set toward the rocks to leeward. If you do not act quickly, your boat could be smashed to bits when the swell drops it onto the breakwater rocks. What do you do?

Solution A

You are in a difficult situation as you have very little time to raise sails before you hit the rocks. You also don't have room to set an anchor. The most important reaction is to steer to head up immediately toward the windward side

Continued on next page

ILLUSTRATIONS BY FRITZ SEEGERS

Solution A, Continued from previous page

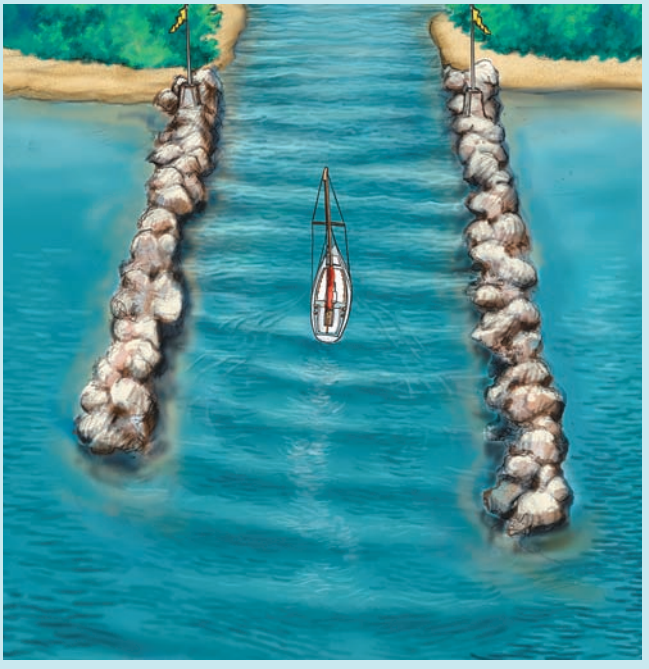
of the entrance before you lose any boat speed. (This is a reaction that should become just as natural to you as your reaction when the car you are driving stalls and you use the last bit of momentum to move toward the side of the road.) As you head up, you can decide if you have gained enough space to anchor. If not, get as far to windward as possible, then fall off onto the most favorable tack, heading either into, or out of, the harbor.

Move forward slowly under bare poles to gain the time you need to get your sails up and pulling. Your jib would be the best choice once you are on your selected tack, as it can usually be set and working faster than your mainsail.

Hint: the most prudent way to enter this harbor with a beam wind is to keep your mainsail up and your jib ready to hoist or unfurl. We often use binoculars to assess the traffic. If it is heavy, it could pay to wait outside until it eases off. Then you could enter on the windward side of the channel and, if your engine quits, have more time (and therefore room) to anchor or raise sails needed to reach in or out of the channel with safety. Though the rules of the road would put you on the leeward side of the channel in this situation, we would use the rules as guidelines only, especially in fresh to strong winds. We would keep a careful lookout and hug the windward side of the channel.

Situation B

You've had a really boisterous sail, and sludge from the bottom of your tank plugs the fuel filter. Your engine quits just as you are halfway through the breakwaters. The wind is brisk and dead on the nose.



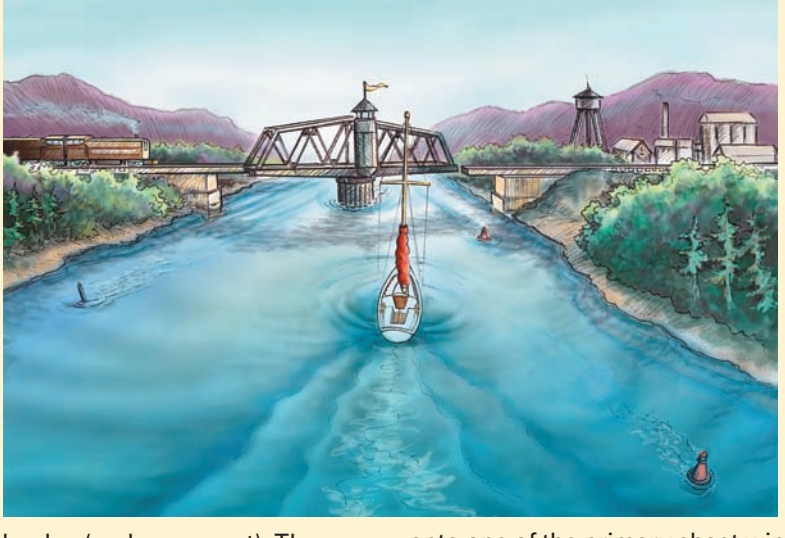
Solution B

If there is little traffic and not too much swell, one option is to anchor when your boat speed drops to zero. But if the channel is deep or the holding is poor, this may not work.

Your second option is to hoist your headsail, choosing either the jib or staysail according to wind strength, and back the sail (sheet it to the windward side of the boat) to help pull the bow of the boat around so you can run out to open water. If your mainsail is up, you must push the boom all the way out so the power is off the sail and the boat can literally spin on its axis. Even the slightest bit of power in the mainsail can counteract the headsail and keep it from spinning the boat around quickly. It pays to practice this maneuver out in open water so you can see the effects for yourself. Paying out the mainsheet should become an almost automatic response whenever you want to head off quickly.

Situation C

You are motoring through the Intracoastal Waterway. The dredged channel is about 150 yards wide. The current is running with you at about 2 knots. As you approach a railway bridge, your engine gets an airlock. A train is approaching and the bridge begins to close.



Solution C

Quick anchor work is required here. A bow anchor will usually save the day (and your mast). The trick to this with a short-handed crew, of course, is to get someone to the bow fast enough to drop the anchor. The other issue requiring precision is to let out enough scope so the anchor will hold before you run out of room at the bridge.

Hint: for channel sailing, having a stern anchor set up is invaluable. If the anchor is ready to go and in easy reach of the helmsman, you have an emergency brake for the boat. This system works even better if the rode can lead from the stern roller directly onto one of the primary sheet winches. (There is a complete chapter on stern anchor systems in our book, *The Capable Cruiser*. See Page 61 for ordering information.)

Situation D

Your boat is anchored at X. The wind turns 180 degrees and you are now on a lee shore. You can't use your engine as the mechanic is still re-building your starter motor. But the wind is building and you must leave the bay to find a safer spot to re-anchor.

Solution D

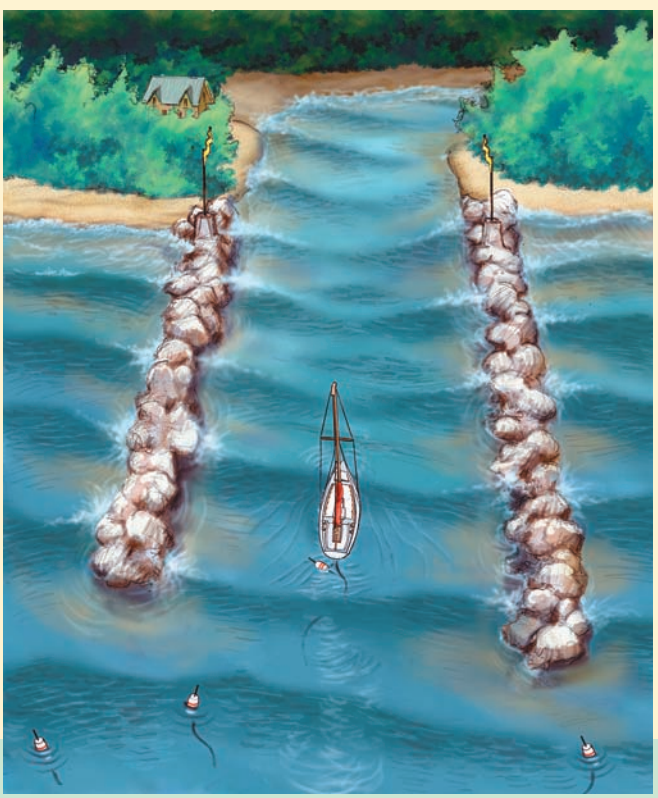
Get the appropriate sails ready — put a reef in the main, use a smaller jib, get the halyards in place. Raise your anchor just until it breaks free of the bottom, then let out about 1½-to-1 scope so the anchor drags slowly along the bottom. You should drag straight aft, downwind. If the boat tends to bear off and edge toward the boats anchored to port or starboard, let out a little more scope. Once you have dragged back to position Y, you can pull up your sails and recover your anchor as you sail free. In real close quarters, you might have to let your anchor cable go, as discussed in Situation F.

Hint: in crowded situations, when there is reason to be sure, we pay off under sail onto one tack rather than another, and we leave the anchor just holding until the head of the boat swerves onto the appropriate tack. Then we swiftly haul up the last 30 or 40 feet of cable hand-over-hand. If your gear is too heavy to handle manually, don't risk your back. Buoy your gear, slip your rode, and leave it behind for later retrieval.

In exceptionally tight situations we have added a pendant line to the anchor cable with a rolling hitch, then led the line aft through a fairlead amidships, then onto a sheet winch. By easing out the anchor rode and tightening the pendant, we get the boat to swing beam-on to the wind. We then set sail and let the buoyed anchor rode go first. Then we cast off the pendant and are sailing free on the tack we prefer.

Situation E

The wind is from astern. The line from a lobster trap becomes tangled in your propeller and brings your engine to a grinding halt just when you are between the breakwaters. At the inshore end of the breakwaters, the entrance takes a bend so you cannot be sure how much traffic you will encounter once you enter the harbor proper.



Solution E

Though this looks like the least adrenaline-producing situation of those so far presented, it holds potential problems also. Most of us would, at first glance, decide to continue into the harbor. If this is your choice, the jib would be the best sail to use because it can be raised most easily in a following breeze. You could simply sail into an open area of the harbor and anchor, then sort out your engine problems.

But what if the harbor is really crowded and full of ferries, fishing boats, and charter boats? It could pay to edge over to the side of the entrance, then head into the wind and set first your mainsail, then your jib, and tack back out into open water. Once out in the open, you can relax and sort your options out.

Hint: just as the jib is almost always the easiest sail to set when you're running downwind, it is also the easiest to de-power so you can slow down once you are in among anchored boats. Simply let the sheet out completely to slow the boat down. To take more speed off the boat, begin weaving. Put the rudder hard over in one direction for about 10 seconds, then slowly put it hard over in the other direction. Try this sometime in open water; you'll be amazed at the speed reduction it produces.

Another hint: when you let the anchor go on a downwind approach, ease out about 3-to-1 scope, then have the helmsman swing the rudder hard over to steer the boat toward whichever bow roller you're using (port or starboard). This should keep the anchor rode from rubbing against your hull and removing the antifouling or topsides finish. You may have to continue to ease out more chain as the boat turns to protect your topsides.

Situation F

You have motored into a new anchorage. Just as you get your anchor down, you see smoke coming from the engine room. You automatically shut down the engine. A quick look below shows the electrical wiring harness has fried itself by shaking loose from its holders and falling against the exhaust manifold. Given a few hours and the gear on board, you can fix it. But to add to your bad-luck day, the anchor begins to drag slowly and refuses to set, no matter how much scope you put out. You can't restart the engine until the electrics have been fixed. It's time for some quick decisions.

This fried-harness scenario did happen to us on a delivery. Fortunately, it was while we were at sea, and Larry was able to rig up an alternate set of connections as we reached onward. The rest of the scenario and the others in this quiz are a combination of situations we have actually encountered during years of sailing without an engine.

Solution F

Plan 1: If time allows, launch your dinghy and row a line to the dock or nearest mooring.

Hint: flake your long warping line into the dinghy. Then row away from your boat, paying out line as you go. It will be much easier than pulling the line off your boat and through the water. Flaking a line means laying it out in a random manner, not coiling it as you would for a line you intend to store on a hook or cleat. A flaked line almost never snarls. We use our stern anchor line for this, as it is always stored in the cockpit locker so it's available and quick to use.

Plan 2: There's lots of room around you, so an alternative would be to raise your sails, recover the anchor, and sail out of the bay into open water. There you could sort things out and check the engine. If the engine will not restart, shorten sail and re-enter the bay to anchor with a larger or different type of anchor, one suited to the local bottom conditions.

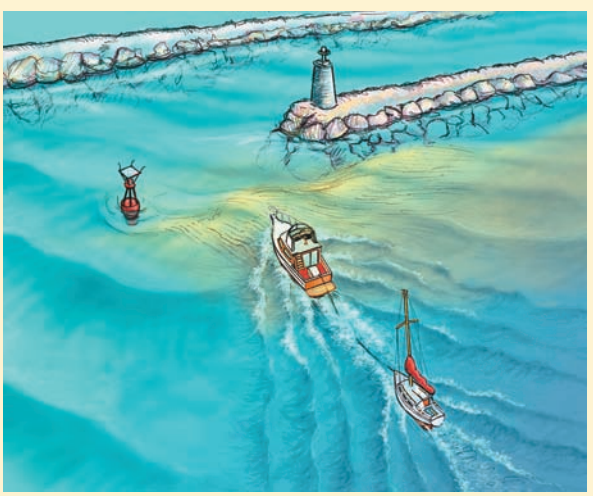
Hint: if no other anchor holds, resort to your old-fashioned fisherman-type (fluked) anchor. It will usually hold in the rock, weed (kelp), or hard sand that gives other anchors grief.

Plan 3: If you are dragging quickly, get your sails set and buoy the end of your anchor cable with a fender. Slip your rode (let it go), then sail out to open water, as discussed in Situation D. Heave-to outside the anchorage and if you cannot get your engine started, send your crew in with the dinghy to retrieve the ground tackle. Or, if your boat and crew are nimble, sail back in to retrieve your ground tackle once you have sorted things out.

Hint: we have 80 feet of ⅝-inch three-stranded nylon line secured to the inboard end of our main anchor chain. It is belayed to the lower part of the bits (bowsprit supports that go through the deck and into the chain locker) with a round-turn and two half-hitches. This knot can be untied under heavy loads. If we want to slip our ground tackle we can pay out all the chain, then easily secure a fender to this line, let it go, and get under way. No need to find a wrench to open a chain shackle, nor is it scary or difficult to handle this soft line (as it would be with chain) when the boat is bouncing around.

Situation G

You have accepted a tow because your engine is out of commission and you need to get into a crowded port to begin repairs. Suddenly the boat towing you goes aground. What do you do?



Solution G

The helmsman should immediately head hard to windward. The crew standing by the towline should let go simultaneously. Otherwise, if the boat towing you has less draft, you will run aground also. Worse, if he draws more than you do, you could find yourself ramming the towing vessel at speed.

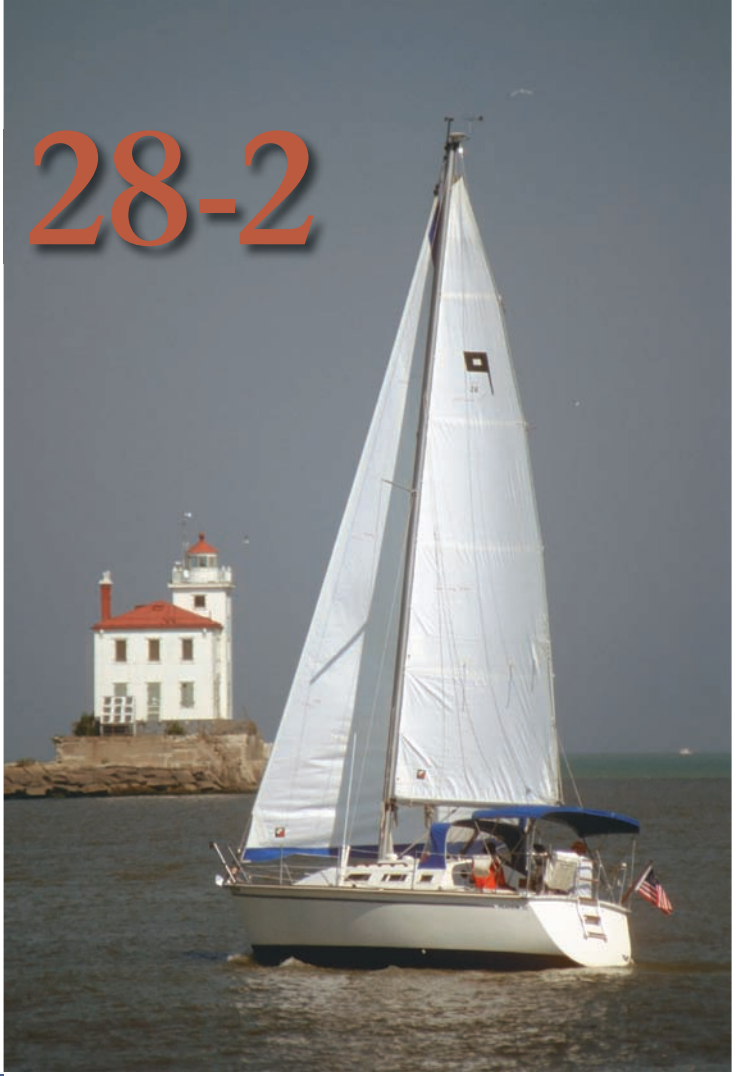
Hint: whenever you ask for a tow, ascertain the draft of the towing boat. Then be sure to give the folks on that boat your line. This is important should that skipper later be tempted to claim salvage. Be sure you do not use a spliced eye or bowline on your bow cleat. Neither of these can be released once they are under tension. Use a round-turn and two half-hitches or several turns on the cleat before putting a hitch over the cleat so that line can be released swiftly and surely, if necessary.

Continued on Page 76

Pearson 28-2

A third-generation performance cruiser

by Gregg Nestor



At the 1959 New York boat show, Clint Pearson and his younger cousin, Everett, introduced their first sailboat, the Carl Alberg-designed, 28-foot Triton. The design was so appealing and well received that they returned to their Bristol, Rhode Island, plant with 17 orders in hand. Pearson Yachts was off and running. Over the next seven years, a total of 707, modified full-keel, 28-foot Tritons were built. Other sailboat models followed, and Pearson Yachts eventually became the largest sailboat manufacturer in the country.

The second-generation 28-foot Pearson appeared on the water in 1975. This time, the designer was Bill Shaw (pictured on Page 12). The boat was fundamentally different from Alberg's Triton, with increases in waterline length, sail area, and displacement, but only a slight drop in the sail area/displacement ratio. The full keel was replaced with a fin keel, and the drop in the displacement/LWL ratio reflected a departure to a performance cruiser/racer design. This basic design, along with a few modifications in 1976, lasted until 1982.

After a two-year hiatus, Pearson Yachts introduced its third and last 28-footer in 1985. This latest Bill Shaw design was as different from the second-generation Pearson 28 as the second was from the first-generation Triton. While the overall measurements of the 28-1 and 28-2 were essentially similar, a reduction in displacement resulted in an increase in sail area/displacement and a decrease in displacement/LWL ratio. The Pearson 28-2 was a higher performance cruiser/racer. The production of the 28-2, as well as Pearson Yachts, the company, lasted through 1989.

In addition to the increased performance of the 28-2, its accommodations, influenced by European designs, changed dramatically, adding style and increased cruising comfort and maximizing usable space. With an overall length of 28 feet 5½ inches, a waterline length of 24 feet 4½ inches, a beam of 9 feet 10 inches, and a displacement of 7,000 pounds with 2,550 pounds of ballast, the Pearson 28-2 is distinctively sleeker and more graceful than its predecessors.

Design and construction

The profile of the Pearson 28-2 displays a flatter sheer, high freeboard, a fine entry, and a reverse transom. The

Volantis, a Pearson 28-2 owned by Bill Barnwell, graces Lake Erie's Fairport Harbor Light, above and to left.

coachroof is cambered and integrated into the deck, providing for increased headroom in the main cabin. The hull is a solid laminate of fiberglass cloth and resin, while the deck is a sandwich of two layers of fiberglass with an end-grain balsa core. This sandwiching provides additional strength and rigidity without a significant increase in weight. Everett Pearson was the pioneer in the use of end-grain balsa as a coring material.

The hull-to-deck joint is an outward flange that is bonded chemically and through-bolted on 4-inch centers. The joint is finished off with a two-piece vinyl rubrail and capped with a teak toerail. While this outward flange may add ease to manufacturing and is strong and secure, it is susceptible to damage from contact with docks and other things that boats occasionally bump into.

The Pearson 28-2 was available in two underwater configurations, a 4-foot 10-inch fin keel and a 3-foot 6-inch shoal keel, both with spade rudders. While the ballast of each is external, the fin keel contains 2,550 pounds of lead and the shoal keel 2,900 pounds of cast iron.

The deck hardware is of good quality and strength, and it is properly installed. Everything is through-bolted and secured to backing plates. All underwater through-hulls are bronze ball valves.

On deck

Located prominently on the stem is a substantial cast-aluminum stemhead fitting with integral anchor roller, a nice touch.A locking anchor well with overboard drain offers a generous capacity. It can house more than 300 feet of rope and chain rode plus a spare anchor — that is, if one takes a little time stowing it all. A pair of chocks and two open-throat cleats complete the forward anchoring/mooring hardware.

Except for the reinforced, smoked acrylic hatch, located on the forward slope of the coachroof, the foredeck is free of obstructions. For added safety, there's a bow pulpit and dual lifelines. The molded non-skid deck is colored two-tone beige to reduce glare. The sidedecks are 18 inches wide and the shrouds are inboard. Along with the teak handrail, located on each side of the coachroof, this makes for ease of movement forward and aft. The cambered coachroof is also beige non-skid and incorporates a sea hood with a pair of integral Dorade vents that serve the main cabin.

Pearson 28-2 at the dock, top left. Stemhead fitting with integral anchor roller, top right. Anchor locker, bottom left. The Pearson 28-2's cockpit, bottom right. Aft cabin cockpit portlight, bottom center.

Even though the cockpit measures 7 feet in length, the usable seating space is approximately 6 feet. The remaining foot is taken up by the impressive bridge deck. The seats are sloped outward for comfort and drainage. Two drains adequately remove water from the cockpit foot well and one scupper drains the seats. For stowage, there's a cubbyhole in each coaming and a very large sail locker to starboard. The locker is also home to the water heater, Y-valve and holding tank, and emergency tiller. In addition, it provides some access to the steering mechanism.

To starboard, within easy reach of the helmsman, is the manual bilge pump. Completing the picture is an Edson radial drive steering system, a split stern pulpit with swim ladder, a pair of open-throat mooring cleats, and a teak flagpole.

Belowdecks

Access below is gained by removing the two solid teak hatchboards and sliding the smoked Plexiglas companionway hatch beneath the sea hood. The accommodations are a dramatic departure from the traditional, especially compared to those found on boats of 28 feet. The interior is open and airy, designed to make best use of space and to provide cruising comfort. Headroom is 6 feet 1½ inches.

The V-berth, no longer separated from the main cabin by the head and sink on one side and a hanging locker on the other, resembles a settee in the bow. It's a shade over 6 feet long and 5 feet 8 inches at its widest, easily accommodating two adults. Outboard and above are full-length fiddled shelves and adjustable reading lamps. The large overhead hatch provides for natural illumination and ventilation. Beneath is the 35-gallon plastic water tank, as well as several deep bins for stowage. The partial bulkhead is fitted with curtains; when drawn, they separate the V-berth from the main cabin.

Abaft the V-berth is a wrap-around dinette and settee with a fixed, centerline drop-leaf table. The table is supported by the compression post that passes through it. Above it is a vent leading to the Dorades and two adjustable spotlights that illuminate the dining area. Since the port and starboard arms of the U-shaped settee measure 68 inches, they are not intended for use as berths, except possibly for children. Outboard and above each settee are a full-length fiddled bookshelf, a reading lamp, and a full-length locker with sliding doors. There is adequate stowage beneath the settee cushions and seatbacks.

Just aft and to port is the L-shaped galley, consisting of a deep stainless-steel sink with pressurized hot and cold water, a two-burner countertop stove, and a variety of bins, lockers, and a drawer for stowage. Originally, the counter-

Companionway with traveler on bridge deck, top left below. View forward with the table open, top right. Looking aft, left door to head, right door to aft cabin, bottom left. Looking aft at galley and open door to aft cabin, bottom right.

Looking into aft cabin, at left. L-shaped galley to port, at right.

top stove was alcohol. Our review boat has been upgraded with a Kenyon combination electric/butane unit. For galley ventilation there's a screened opening port and for illumination, an overhead fixture that offers white and red light.

Small vestibule

The door abaft the galley leads to a small vestibule with a louvered hanging locker, a fiddled tabletop, and wall-mounted mirror. With the door closed, this makes for an intimate changing area, as well as privacy for the large (74-inch x 61-inch) double quarter berth. This aft cabin's creature comforts include two opening screened ports, a small ventilation hatch, two reading lamps, a dual-color overhead light, a full-length fiddled shelf, a 110-volt outlet, and stowage beneath the berth.

Starboard and across from the galley is a well-insulated icebox. The lid of the icebox makes a handy chart table. There's a built-in chart rack on the front of the box and a pencil rack and shelf behind to hold navigation instruments. Above is the electronics locker, which also houses the AC and DC electrical breaker panels. Light and air are provided for by means of a screened opening port. And at night a fluorescent light illuminates the chart table surface.

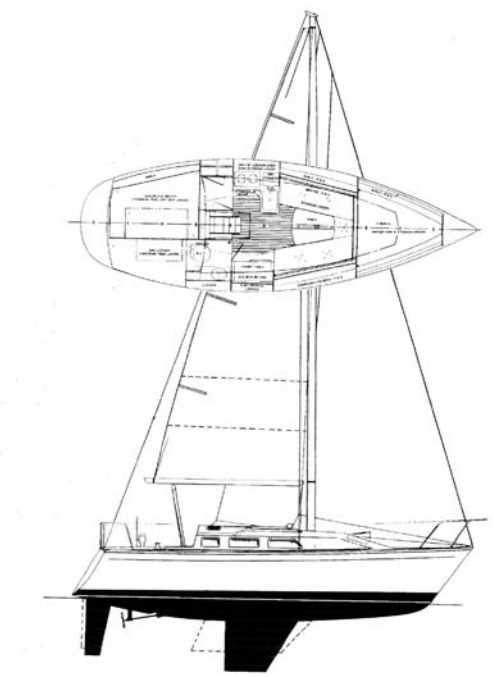
The door aft of the icebox/chart table gives privacy to the head. In addition to the marine toilet, there's an integral shower with pressurized hot and cold water, a hand sink and counter, a deep under-the-counter cabinet, a laundry hamper, and a locker with mirrored doors. An opening screened port and a small overhead hatch provide excellent ventilation and daytime light. A combination white/red overhead fixture provides nighttime illumination.

Pearson Yachts utilized both a fiberglass-reinforced plastic pan and overhead liner in the construction of the 28-2. Access to all deck hardware is from behind well-thought-out access panels. The wood portions of the interior, including bulkheads, doors, ladder, overhead handrails, cabinetry, and trim, are varnished teak, while the sole is teak and holly. The joinery is well above average standard. In addition to the opening ports (five throughout the boat), there are two fixed ports in the main cabin.

The rig

The Pearson 28-2 is a masthead sloop with a sail area of 384 square feet, comprising a mainsail and 100-percent jib. The rig incorporates single swept-back foil-type spreaders and has a bridge clearance of 41 feet 10 inches from the waterline to the top of the deck-stepped mast. The standing rigging consists of a headstay, upper and lower shrouds, and a split backstay, all ¼-inch stainless-steel wire. The double-braided Dacron halyards, outhaul, and jiffy reefing lines are all internal. The halyards are cleated on the mast and, to assist in hoisting the sails, two Lewmar #7 single-speed winches are located just above each halyard cleat. The mainsheet is attached to a traveler that's situated on the aft portion of the bridge deck. On each sidedeck, a genoa track leads to Lewmar #30 two-speed self-tailing sheet winches located midway on the cockpit coamings.

For auxiliary power, the Pearson 28-2 relies on a Yanmar 2GM20F diesel. Coupled to a two-bladed propeller, this 16-hp, freshwater-cooled engine pushes the boat along at better than 6 knots. Fuel is supplied from an 18-gallon aluminum tank. Access to the engine is above average to very good.



Pearson 28-2

Designer: Bill Shaw
LOA: 28 feet 5½ inches
LWL: 24 feet 4½ inches
Beam: 9 feet 10 inches
Draft: 4 feet 10 inches / 3 feet 6 inches
Displacement: 7,000 pounds
Sail area: 384 square feet
Ballast: 2,550 pounds / 2,900 pounds
Headroom: 6 feet 1½ inches

Under way

The Pearson 28-2 is a very nice sailing boat. It appears to have no bad manners. It points quite high and is balanced under nearly all conditions. The helm is responsive, and the boat is quick. The review boat's stock sails had been

replaced with a full-battened main and a 150-percent genoa. Even when overpowered, the Pearson 28-2 developed practically no weather helm.

Things to check out

In general, the Pearson 28-2 has aged quite well. Noticeably absent are the extensive gelcoat cracks common to so many of the boat's contemporaries. With that said, however, there are a few non-age-related items that need to be addressed. The outward hull-to-deck flange is subject to damage and possible leaks if struck hard enough. Check out any rubrail that has been replaced or damaged. Leaking portlights are common. There is a void between the inner headliner and outer skin. Expansion, contraction, and flexing eventually break the sealant's bond, and a leak develops. With a deck-stepped mast, check beneath for possible delamination. Unlike the deep-draft model, the keel of the shoal-draft model is made of cast iron. This is always a maintenance issue. Lastly, there have been some reports of hull blisters.

Summing up

New from the factory, the Pearson 28-2 came loaded with standard equipment. The only options originally available were draft (shoal vs. deep) and a cradle. In today's marketplace, the Pearson 28-2 is tough to beat in its size range for cruising comfort, performance, and value. There are usually only a few available at any time, and prices range from $24,000 to $28,000, depending upon condition and upgrades.

Resources

Pearson Yacht Owners Association (National)
<http://www.pearsoncurrent.com>

Pearson 28 site:
<http://www.geocities.com/CptinRn>

Pearson 28-1 Forum
<http://www.frontiernet.net/~mpetrush/pearson>

The author's wife, Marolyn McGowan, negotiates with a potential customer.

Low-cost outfitting

Learn the hard-won secrets of a frugal do-it-yourselfer

by Gerry McGowan

You make lists of things you want to repair or upgrade on your project boat. But when you visit your local chandlery, reality sets in: "*How* can I tell my spouse how much it will cost to fix up the boat?"

All is not lost. There are ways to significantly cut the cost of the things you have to do or want to do. I like to call it *low-cost* outfitting, rather than *cheap* outfitting. Cheap outfitting means substituting something cheap or shoddy for the real stuff; low-cost outfitting means finding the real stuff at a bargain. What follows are the secrets of a frugal boater who has done this on five boats over the past 16 years.

Do it yourself

The single most important secret is to do all, or at least almost all, the work yourself. Labor rates in my area hover around $60 an hour in boatyards and $25 an hour and up for independent contractors. I kept track of my labor time in a recent project (Replacing a cabin overhead, *Good Old Boat*, May 2005) and discovered that I saved between $3,000 and $5,000 in labor costs. Since the material costs were less than $500, the savings for the entire project were between 85 and 90 percent. Later in the year I replaced the engine in my boat, cutting an $11,000 project into one that cost $7,000. I had never done an engine replacement before, but I read up on it, listened closely to the dealer who sold me the engine, planned the job carefully, and worked slowly.

I didn't measure twice, cut once. I measured five times, mulled it over, measured again, and then cut. Consequently, I spent about 100 hours doing a job that the dealer estimated he would charge at 60 to 80 hours. But he was impressed with my clean, organized installation, freshly painted engine room, and the fact that I had mounted the engine in pre-drilled and tapped holes in the engine bed from my homemade alignment jig. It lined up with a few turns of the mount adjustments. All this was the result of careful measurement and planning, rather than a lot of skill or experience.

Learned by doing

I knew very little about working on boats when I started. I learned by doing and did the best job I could. I have a pet peeve about shoddy amateur projects and determined to make up for inexperience by thorough planning and careful work. If I didn't know how to do something, I learned.

When I wanted new upholstery and couldn't afford the $2,000 price tag, I learned to sew, and I recovered the cushions myself. Later I applied my new sewing skills to make dodgers, sails, sailcovers, sheet bags, a Bimini, and many other minor projects in addition to upholstering a gaggle of boats and motorcoaches. I purchased a sailmaker's sewing machine with my savings and have used it for 12 years now on four boats and two motorcoaches. I figure I've saved at least five times the cost of the very expensive sewing machine so far. Since tools are reusable, I would much rather buy the tools to do a job than pay for someone else's labor. Paid labor vanishes as soon as you sell the boat. Tools, on the other hand, are like the battery bunny: they just keep going and going.

The biggest obstacle to starting a large do-it-yourself project — whether an engine installation or re-upholstering your cushions — is fear. A project seems so overwhelming when contemplated as a whole. I find that every large project can be viewed as a series of more manageable sub-projects; I like to keep a list of these sub-projects and triumphantly cross each off as completed. You might even list the amount you saved at each step as a

morale booster. This is money you just put into your boating bank account.

Used marine stores

Used marine stores, also known as consignment stores, can save you money and are fun simply for wandering about. My first experience with one of these was when I found a new traveler car for an obsolete track at a cluttered little store in St. Clair, Michigan. The dealer's price was too high, but I hung around for a while shooting the bull, and he finally agreed to my lower offer. I ended up saving about half the cost of a new one. Half-price appears to be the typical price range.

I have purchased travelers, blocks, a muffler, a propane tank, a kerosene tank, a kerosene heater, pumps, and many other little items I've lost count of. My favorite was a brand-new Harken Magic Box for $10 that I used to make the neatest outhaul adjuster in town. My least favorite was the Taylor kerosene heater, mainly because it was missing an essential part. It took too much searching to discover why the heater kept flaring up and frightening the heck out of me. Then I discovered that I could substitute replacement parts from a Force 10 heater, since it used the same burner. I eventually saved about 75 percent of the cost of a new heater and learned all about kerosene burners in the process. This is the sort of education you don't get from a book.

The rule to heed when you go into one of these stores is that not everything is a bargain. Much of the merchandise is overpriced and/or worn out. The fun part is finding that which is truly worth the price. There seems to be little consistency in pricing in some cases, with expensive junk sitting next to a real bargain. Shop carefully!

The *Good Old Boat* website has a list of marine consignment stores at <http://www.goodoldboat.com/consignments.html>. It's frequently updated and pretty extensive. I have checked it out and find it very useful.

Marine swapmeets

My favorite way to spend a Saturday morning is at marine swapmeets. These can be a source of unbelievable savings. One time I purchased a $175 Danforth 18H anchor for $20 and a $1,000-plus (if new) Enkes 26 self-tailing winch for $75. With a coat of paint, the anchor lies safely under the V-berth as a spare. The winch — after disassembly, cleaning, and lubrication — adorns the starboard side of my cockpit. The port side has a used Harken 44 self-tailer purchased over the Internet at a marine consignment shop and refurbished with a Harken spring and a washer costing $7. I figure I added the pair of large self-tailers to my boat for $390 after subtracting the amount recouped from the sale of the old winches at another marine consignment store. This compares with $1,700 to $2,300 for the same winches if purchased new.

Swapmeets are also a great way to clean out the garage or boathouse. At the meet where I purchased the winch,

Resources for low-cost outfitters

Regional boating magazines

Look for these in chandleries and marinas. This is a representative (but not complete) list:

48° North
<http://www.48north.com>
Latitude 38
<http://www.latitude38.com>
Northwest Yachting
<http://www.nwyachting.com>
Northern Breezes
<http://www.sailingbreezes.com>
Southwinds
<http://www.southwindssailing.com>
Points East
<http://www.pointseast.com>
SpinSheet
<http://www.spinsheet.com>

Internet suppliers

I have used all of these sources and can recommend them. There are probably many similar ones I haven't used yet:

Bo'sun Supplies
screws and rigging hardware, great prices and selection
<http://www.bosunsupplies.com>
Defender Industries
everything you need, low prices, great catalog
<http://www.defender.com>
Garhauer
great hardware at great prices
<http://www.garhauermarine.com>
Jamestown Distributors
screws and many other items
<http://www.jamestowndistributors.com>
Layline
hardware and one-design hardware
<http://www.layline.com>
Performance Yacht Systems
all types of rigging, electronics, plumbing, and hardware
<http://www.pyacht.com>
Rigging Only
good prices on winches, furling gear, hardware, and rigging
<http://www.riggingonly.com>

Online used-sail brokers

Listing of online used-sail catalogs
<http://www.sailingtexas.com/csails.html>
Sail Exchange
<http://www.sailexchange.com>
Atlantic Sail Traders
<http://www.usedsails.com>
Minney's Yacht Surplus
<http://www.minneysyachtsurplus.com>
The Sail Warehouse
<http://www.thesailwarehouse.com>
National Sail Supply
<http://www.nationalsail.com>
Popeye's Marine Exchange
<popmar@gte.net>
Kelly Marine
<jibkelly@aol.com>
Pablos Crews
<pablocrews@juno.com>

Marine used-goods stores

These are ones I have dealt with:

Port Townsend Marine Exchange
2706 Washington St.
Port Townsend, WA 98368
360-385-4237
Minney's Yacht Surplus *(used sails and hardware in Costa Mesa, Calif.)*
949-548-4192
<http://www.minneysyachtsurplus.com>
Pacific Marine Exchange
700 W. Holly St.
Bellingham, WA 98225
360-738-8535
<http://www.pacificmarine.com>
For a much more extensive and up-to-date listing see the *Good Old Boat* website:
<http://www.goodoldboat.com/consignments.html >

The crowd at Swantown marine swap-meet in Olympia, Washington.

I sold a brass galley pump for $40. I had purchased it for $4 at an earlier swapmeet and polished it only to learn that it didn't fit in my galley. The buyer was ecstatic as the same pump sells for $120 at marine stores. I was ecstatic with the 900 percent profit for an hour's worth of polishing. My wife was ecstatic since I bought less than I sold and reduced a pile of obsolete boat equipment to cash, rather than paying the trash company to haul it away.

Beware at swapmeets; it's easy to buy something that doesn't fit or has problems. My latest purchase — a complete, brand-new, Autohelm 5000 underdeck autopilot for $100 — came close to falling into this category. I discovered several days later that Autohelm no longer supports this unit and could not even supply me with a schematic or pinout info. No one else could help either, so I was left to muddle through on my own.

The problem was that the Autohelm was for hydraulic steering and I have mechanical steering. Using a multimeter and jumper cables to the car battery, I figured I could connect the Autohelm hydraulic control amplifier directly to the existing Benmar drive-unit motor, bypassing the Benmar circuit board. It worked perfectly; a sea trial of the hybrid system went well. The Autohelm now resides in a little teak box on the steering pedestal and is far more convenient to use than our old Benmar unit, which required going below each time we wanted to change the course.

If I had been unsuccessful in getting the Autohelm to work, I would have boxed it up and taken it to a marine consignment store. Some purchaser with hydraulic steering would have gotten a good deal, and I would have made a modest, or perhaps substantial, profit.

Internet

You can find almost anything on the Internet, including lots of information on old boats, owners' associations, and some interesting companies selling sailing stuff. My favorite Internet company has got to be Garhauer, maker of the best bargain sailboat hardware anywhere. The quality of the stuff is equal to the best Harken or Schaefer has to offer, and the prices are much lower. For example, I outfitted my current boat with stainless, big-bearing single blocks for the princely sum of $18 each. The hardware is standard equipment on Catalina and other boats and is highly rated by *Practical Sailor*. You can only buy it directly from Garhauer and, after using their equipment for about 15 years, I can highly recommend it.

Used-sail brokers are a special category of Internet stores. Many carry an extensive listing of thousands of used sails that can be searched online. Some of the listed prices seem excessively high, but some are tempting. My only personal experience with one of these companies was negative; the sail was not that good, and I sent it back. I may try it again, however, if I can find a really good sail that doesn't need much work. If you can find just what you want, you might save a bundle. Just take into account the cost of any necessary modifications or repairs. Converting a used hanked-on sail to roller furling, for example, may cost 40 percent of the cost of a new sail purchased in the off-season. Unless the sail is in really good condition, it may not be worth purchasing and converting.

> **"My wife was ecstatic since I bought less than I sold and reduced a pile of obsolete boat equipment to cash."**

Commercial marine stores

Marine stores serving commercial fishermen and other professional boaters can be a real money saver compared to local marine chandleries specializing in pleasure boaters. When I can, I use the same products as sold by the local West Marine, but I purchase them from my local commercial marine store. I've spent so much time there over the years that they greet me by name when I enter the store and have granted me the commercial discount, about 40 percent off the shelf prices. Of course, I entered their store several times a day for several months and was a good customer by any standards.

I first discovered commercial marine stores many years ago when I found that I could buy a box of 100 stainless-steel screws by mail order from Jamestown Distributors for the price of 10 purchased at the local hardware store. I started purchasing boxes of screws and saving the leftover ones in fishing lure storage boxes from the local discount store. I still have them and replenish the supply as necessary.

Regional boating magazines

A regional boating magazine can be a source of larger used equipment and a good way to unload some of your bigger castoffs. I sold the old diesel engine I had removed from my boat for $1,200 using a single $20 ad in *48° North*, a Seattle-based sailing magazine. I could have sold a dozen engines. The calls kept coming for many months.

Home Depot and others

Although I don't find a lot of good marine stuff in the large lumberyards, I regularly use them for several items. Last year I bought several sheets of a Russian version of Baltic birch ½-inch plywood for $20 for a 5-foot-square sheet at Home Depot. This works great for interior boxes, covers, shelves, and so on, as the void-free all-birch edges can be attractively varnished. It did not pass the boil test (microwave a small piece in a cup of water). It quickly turned into a bunch of potato chip-like plies, so it is only usable inside. I varnished it well and put Formica on several surfaces, and it looks like new after a damp year in my boat.

I also generally buy Formica at the Home Depot; the selection is wonder-

ful on special orders, and the price is about 40 percent lower than at my local lumberyard. I'd prefer to use a Formica surplus store, but one can be hard to find in many areas; Home Depots (or similar stores) are not.

Surplus stores

I have found several items used in my boats in surplus stores at great prices. The first was Formica at a store that sold only laminate. I am not sure where it came from — I suspect overstocks and surplus — but the store had hundreds of colors and sizes, and the price was about 50 percent of normal lumberyard prices. I put a Formica headliner on my Ericson 46 and used about 400 square feet, saving at least $300 in the process.

The most common surplus item I have purchased is fabric. I have found end-of-rolls and seconds in fabric stores all over the country. It saves a lot to pay $6 to $10/yard, rather than the $25 to $40/yard commonly charged at upholstery stores. Always make sure that the store has enough for the project, and inspect the fabric as it is unrolled for cutting. You have little chance of locating more if you don't buy enough, and major flaws may make you re-think that fabric choice. I have never found more than a few flaws, which I simply avoid when laying out the pieces to be cut. I always buy a few yards more than necessary, just in case. Since the average job requires about 30 yards, the savings by buying surplus fabric can run $600 to $1,000.

Substitution

You don't always have to use the best. I made a cockpit grating of iroko, rather than teak, as it was $5 a board foot instead of $13. I figured that I am just going to walk on it, and Philippine mahogany had served well for the original grating for 20 years. Iroko's resistance to water and weathering are almost as good as teak's, and it is often considered the "poor man's teak."

Teak is also wasted on boat interiors since other woods costing less than half as much work very well. I like Honduran mahogany, jabota (Brazilian cherry), iroko, and American walnut for dark woods. I also see many other very attractive dark exotic woods at my local wood supplier for less than half the cost of teak. If you want light woods, then oak and ash work very well, as do birch and maple. (For other suggestions, see the article on teak mystique in *Good Old Boat*, January 2005.) Protected by varnish and kept dry, all of these will last forever down below.

Paint stores

I have painted a portion of a deck using automotive paint systems. They matched the desired color, I was able to brush/roll the products, and they wore like iron. Almost any town has an automotive paint supplier, which will match colors as desired. While not cheap, the paints were still half the cost of similar marine paints.

You can also take plugs or cutouts into a regular paint store and buy color-matched touchup paints for a very reasonable price. I purchased a quart of urethane-modified gloss enamel from the local Sherwin-Williams store for $10. Staff matched it to a plug cut out of my cabintop in about 2 minutes.

Your local marine specialist

I have had good luck stopping in at my local rigger or similar business and asking if it will meet the Internet price on some large item, such as a roller-furling system. Quite often the store will, and a long-term and profitable relationship can be formed for both parties. The staff knows that, while they may not make a big profit on that item, they will profit on all the things I will buy in the future. I have a first-name relationship with a local rigging company, which will get all my business in the future based on great service and competitive prices.

Price matching

The Internet is a great thing for saving money, as it encourages a local supplier to be competitive with everyone else in the country. When planning a major purchase, I shop all around the country for the best price. For many items (webpage printout or catalog in hand), I then go to my local West Marine and ask it to match the price. I have only been hassled once and have saved hundreds of dollars on the remaining items. The hassle was when I talked to a new clerk. The rest of the time, dealing with the same people again and again, they unflinchingly met the price. For most items, the sales tax just about matches the shipping costs I would have to pay. So I get the item locally with the advantage of good customer service and at the best Internet price. Since I spent several thousand dollars at West Marine during the past couple of years, the company is a little more profitable, and I have saved at least 10 percent of my cost, which makes me happy and the "hole in the water" not quite as deep.

The bottom line

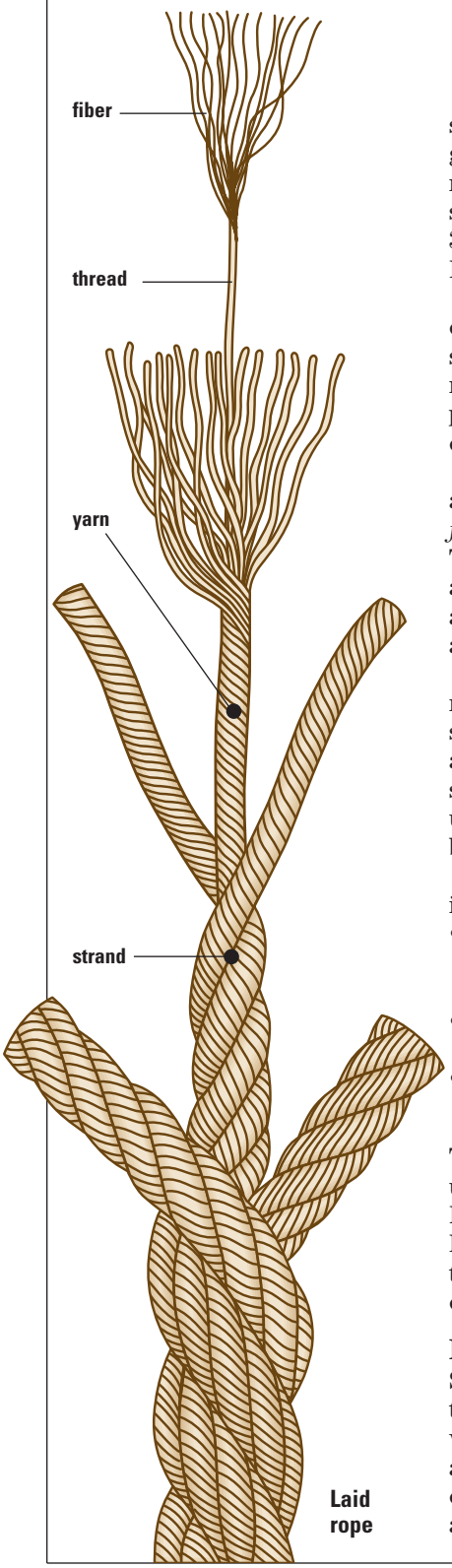
Owning a boat is not cheap. Unless you are rich, it probably represents a major investment and a major ongoing expense in your life. Reducing the costs involved in maintenance and upgrading can cut the out-of-pocket cash flow significantly. Doing so has allowed me to sail considerably beyond my means. It turns out to be a lot of fun as well (although my attitude shifts somewhat when I'm up to my elbows in contact cement or fiberglass-sanding dust).

Trying to find bargains and adapting or fitting them to my boat are almost as much fun as sailing. As the quote from Kenneth Grahame's *The Wind in the Willows* goes, "Believe me, my young friend, there is nothing — absolutely nothing — half so much worth doing as simply messing about in boats…In or out of 'em, it doesn't matter. Nothing seems really to matter, that's the charm of it."

The author examines a potential purchase at a swapmeet.

Making sense of the bewildering range of boating lines

by Don Launer



ROPE IS THE PRODUCT OF CORDAGE MANUFACTURERS BUT, with a few exceptions, when ropes of less than 1-inch diameter are used aboard a sailboat for a specific function, they are known as lines. (The etymology of the word *line* is from the Latin, *linea*, which means, um, rope.) Until relatively recently, the dimension given for a rope was its circumference — thus, a 3-inch hawser was one of 3 inches in circumference. Now, rope dimension is usually given as the diameter.

Until the middle of the 1900s there was a very limited choice of rope (or line, if you wish) from which the sailor could choose — hemp, sisal, and cotton. Now, many synthetic lines have come on the market and, surprisingly, they are often cheaper than their natural-fiber counterparts.

The manufacturing of three-stranded rope has not appreciably changed, however. It starts with a small *fiber*. Several of these fibers are twisted into a *thread*. These threads, in turn, are twisted into *yarns*. The yarns are twisted into *strands*. Finally, three of these strands are twisted into a "three-stranded laid rope," the traditional form of rope that was first made from natural fibers.

It is common practice that three-stranded rope has a right-hand twist, although a left-hand twisted rope is sometimes encountered. With three-stranded twisted and laid rope, there is considerable stretch, however, since the three twisted strands tend to straighten out under tension. The construction of the more modern braided rope reduces this stretching tendency.

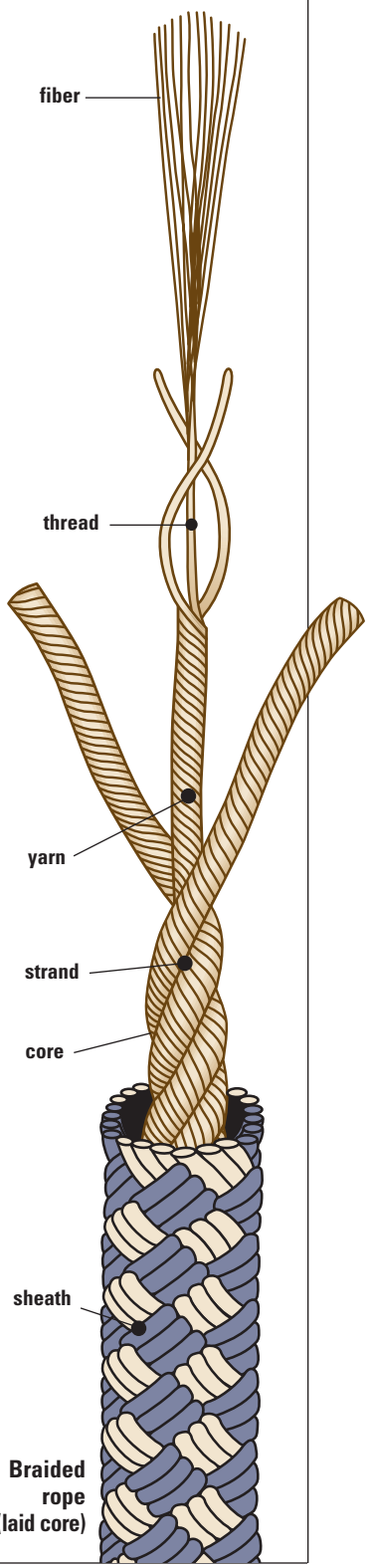
Braided rope has a braided outside sheath and an inner core, which can be one of several varieties:

- ***Parallel core*** is a braided cover enclosing a core whose bundle of fibers and threads are oriented parallel to the line's axis.
- ***Double-braid*** is a braided cover over a braided core of the same material.
- ***Core-loaded double-braid*** is a braided cover over a braided low-stretch core of a different material.

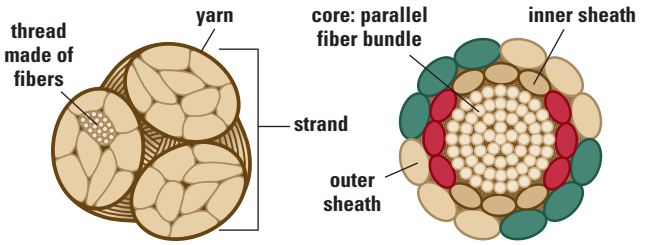
There are three basic man-made fibers that have been used by sailors for decades: nylon, polyester (called Dacron in the United States and Terylene in Great Britain), and polypropylene. Of these three basic synthetic ropes, nylon is the strongest, with polyester a close second, and finally polypropylene.

Best choice

Since nylon has high-strength, excellent abrasion-resistance, and great elasticity, it is the best choice for use when there will be shock loads, such as for docklines and anchor lines. But those same attributes make it completely unsuited for use as running rigging, such as halyards, where stretch would be a detriment.



Layout and illustrations by Ted Tollefson



Polyester, on the other hand, provides almost as much strength as nylon, but with little stretch. When purchased "pre-stretched," its elongation under load is even less. It also has good abrasion-resistance. This makes it the all-around choice for most other applications on board.

Polypropylene has the lowest strength of the three. It is relatively cheap and has the advantage of being lighter than water, so it floats. This makes it the line of choice for dinghy painters, reducing the possibility of its sinking and fouling the propeller. Polypropylene, though, is more susceptible to ultraviolet deterioration and is subject to melting when cornering through a chock under high tension.

Beyond these three basic fiber groups is a range of more expensive options, as well as their associated high-tech terminology. Some of these new terms are:

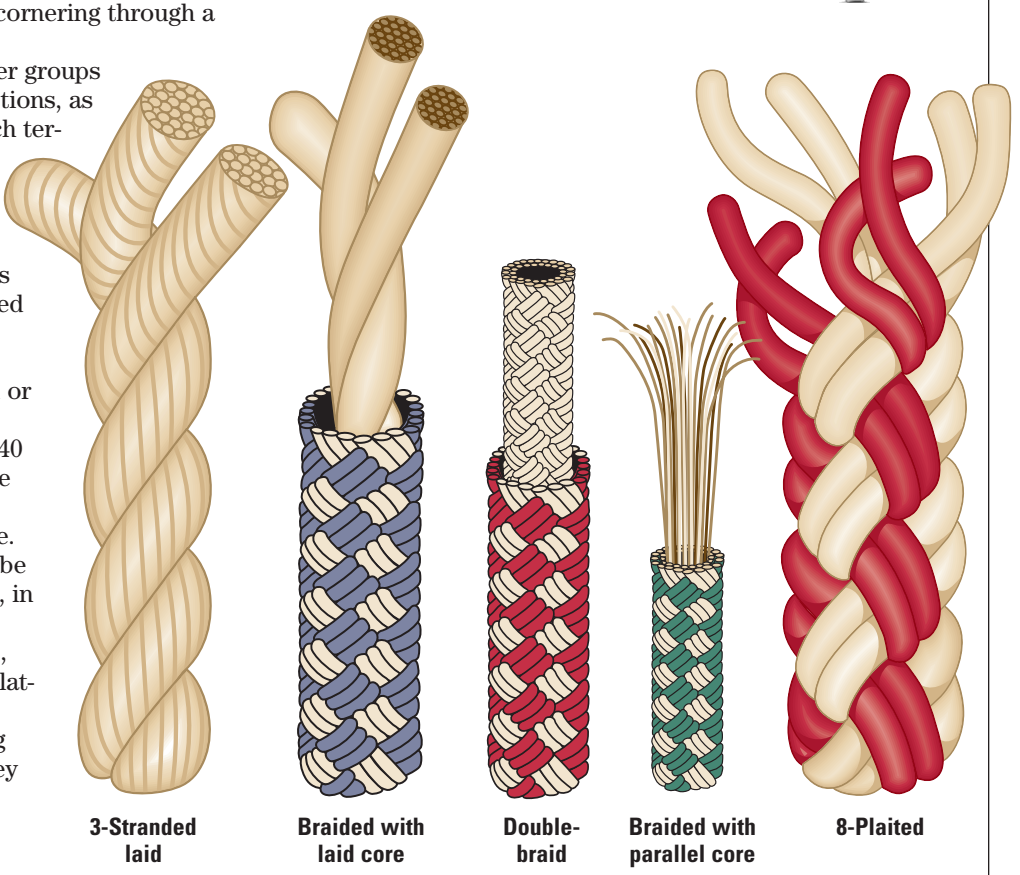
- ***High modulus,*** which basically means low-stretch. Most of the high-modulus lines are very slippery and, when tied using the knots that we know well, are prone to failure. Although a bowline in a nylon or polyester line decreases the strength of that line by about 40 percent, in a high-modulus line the strength is reduced by an astounding 70 percent or more. For this reason, knots should be avoided in high-modulus lines, in favor of splices.
- ***LCP*** *(liquid crystal polymer)*, such as Vectran, is one of the latest rope-making fibers. These thermoplastics are very strong and abrasion-resistant, but they have low UV-resistance.
- ***HMWPE*** *(high-molecular weight polyethylene)* includes ropes such as Spectra, Amsteel, and Dyneema. Despite its high strength, HMWPE is so lightweight that it floats. Pound for pound, it has 10 times the strength of steel and is three times stronger than polyester. It is also low-stretch (stretching takes place during the manufacturing process). It has good abrasion- and UV-resistance, but it is high-priced and very slippery.
- ***Aramids*** are in the nylon family and are marketed under the names Kevlar, Technora, and Twaron. Although they are high-strength with relatively low-stretch, they have poor UV- and abrasion-resistance, especially when subjected to sharp bends under load.

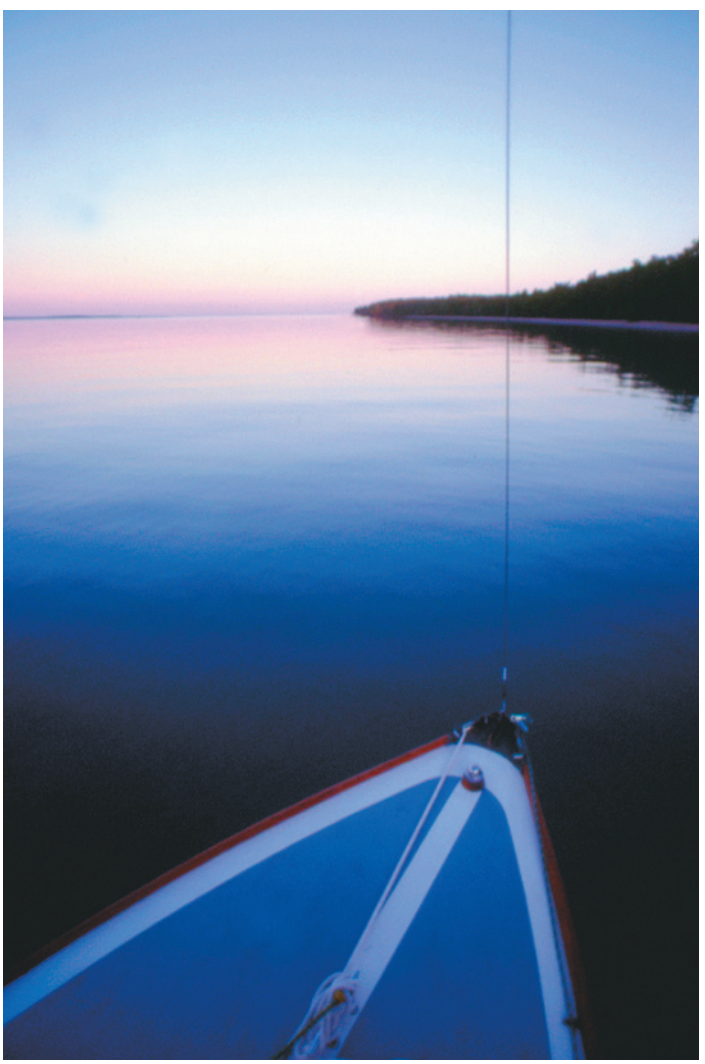
Line care

There are general rules that apply to all types of lines to help extend their life:

During the boating season, hose off lines with fresh water to wash away dirt and salt crystals. At the end of the season, soak the lines in warm soapy water, then rinse them and hang them up to dry.

During the off-season, remove as many lines as possible from your boat, especially those with a low UV-tolerance. This will extend their life considerably.





The Apostle Islands of Lake Superior

A bit of sailing heaven five months a year

Photos by

John
Danicic

LEDs afloat

Modern lighting projects for cruising sailboats

One of the simplest and most prized projects on Cade and Lisa Johnson's Polaris 43 is this array of colored LEDs inside a 6-inch woven basket. They use this upside down in the cockpit as a night light.

by Cade Johnson

We began tinkering with LED lighting in our boat several years ago. Since then we have completed numerous small lighting projects and have discussed the topic of LED lighting with other cruisers. What follows is a distillation of our experiences.

LEDs are light-emitting diodes. A diode is a device that passes electric current in only one direction. In a diode, electrons encounter a transition from one type of conductor (P material) to another (N material) and at this transition they abruptly experience a drop in energy. In an LED, the energy drop is great enough to form a photon of visible light. If an electron were to enter the LED from the other direction (simplistically speaking), it would encounter an energy rise and would not have sufficient energy to pass the rise. No current could flow.

The two types of semiconductor material (P and N) in an LED are joined together and connected to the external world by tiny wires, which in turn connect to larger copper leads. (Often these leads contain solder blocks near the housing for stopping the leads against a circuit board.) The diode, its reflector, and its tiny connection wires are placed into a tiny reflective dish. This assembly is sealed in clear epoxy plastic. The top of the clear plastic is formed into a rounded shape to act as a lens, and the copper leads exit from the bottom of the plastic. The emitted light is directed by the reflective dish to the lens and focused into a beam. Early LEDs had to have this focusing because they did not produce much light. The design has been retained for the more modern and much brighter cousins, the ultrabright LEDs.

Advantages of LEDs

Because of the way they produce light, LEDs are very energy-efficient. Almost no heat is released. A simple 12-volt reading-light circuit can be built that will consume only 20 milliamps (abbreviated mA and equivalent to 0.020 amps, or less than 0.5 amp-hour per day). It is still generally possible to get more light per watt from fluorescent bulbs, but sometimes one does not need the amount or quality of light that fluorescent bulbs produce. Because of the way they are constructed, LEDs project their light in a relatively narrow beam, so a bright beam is focused into a relatively small area. This can be an advantage — there is no need to use external reflectors or lenses to direct a sharp beam, but if more diffuse light is needed, it is relatively easier to scatter light than to focus it. (For example, roughen the LED lens with some 120-grit sandpaper, and the light will be considerably diffused — no optics expertise required.)

LEDs come in a variety of colors; it can be fun mixing colors to create a festive atmosphere. Furthermore, a range of colors creates a broader available light spectrum, making it easier to discern the true color of objects that are illuminated by the light.

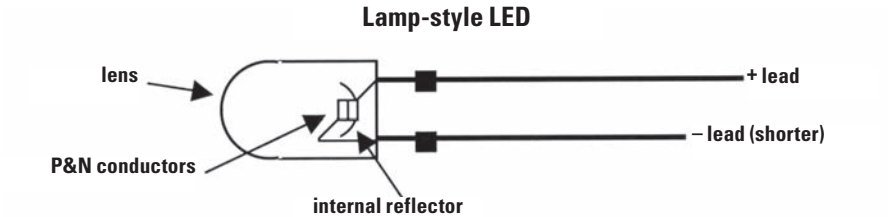
LEDs have an estimated lifetime of about 100,000 hours; if an LED reading light is in use every night of the year for two hours, it could theoretically last 130 years. Manufacturers did not come up with that 100,000-hour duration by measuring how long LEDs last on boats, but nonetheless an LED light cluster has the potential to be very durable. LEDs do lose intensity with age, which is why most boating LED lights are rated at 50,000 hours (or 5.7 years of continuous use).

The disadvantages

LEDs are relatively expensive. Although the price is declining, ultrabright white LEDs are still more than $2 each unless purchased in bulk. And they were not designed for use on boats. The electrical connections to an LED are slender copper wires that have been coated with electrical solder; they are not very resistant to corrosion.

LEDs typically emit light of a very narrow frequency range — the colors are very pure. Because of the narrow spectrum, objects they illuminate will appear either the color of the LED or black. If you want to read a chart, for example, it may be difficult to distinguish various shades of blue under a red LED, as all will appear black. This can be addressed by always including a white LED in a cluster or at least mixing a couple of specific colors to broaden the emitted spectrum a little.

White LEDs, unlike all the other types, emit a relatively broad spectrum of colors. They do this because they are really blue LEDs "in dis-



> **"…if an LED reading light is in use every night of the year for two hours, it could theoretically last 130 years."**

guise," with a phosphor coating like an old black-and-white TV screen. The blue light excites the phosphor coating, and the phosphor then emits a range of different lower-energy photons of light. Most white LEDs have a bluish cast, which can make food unattractive but is good for reading printed material. Some of the newest white LEDs have a slightly yellow cast like an incandescent light.

Although LEDs can produce an intense beam, their total light output is quite low. If a small screw is lost on the cabin floor at night, overhead LED lighting will not serve for the search. Sometimes a brighter light is required, such as a conventional incandescent bulb. We have modified our overhead lights with two-way, center-off switches so we can turn on the dim LEDs or switch to the old incandescent lamps, if necessary.

LEDs are delicate electronic devices that can be easily destroyed if mishandled. For example, they must not be overheated or the two different conducting materials may become separated and the LED will no longer function. The most likely ways to overheat an LED are by passing too much current through it or by overheating it when making a solder connection.

Designing an LED project

We use LED lights on our boat for low ambient light in the main cabin and the cockpit, as a spare anchor light, as reading lights, as our chart table lighting, as a replacement light for failed instrumentation lights, and as auxiliary lighting in the galley.

When contemplating a boating lighting project, it may be helpful to review the well-thought-out lamp selection guide at the Alpenglow Marine Lights website (<http://www.alpenglowlights.com>). Although Alpenglow does not make LED-based light fixtures and considers LEDs a less-than-optimal lighting choice, the company's ideas about planning lighting in general are useful. For instance, LEDs can project a narrow and intense beam of light or they can produce a diffuse, but dim, glow more like other lighting sources. Both types of lighting may be needed at times. It is pleasant to sit and chat with friends in low diffuse light, but a more focused beam is necessary for reading or doing detailed work.

LEDs of the ultrabright variety come in red, amber, green, blue-green, blue, and white. We have found that a mix of colors is better than a monochrome light in every case. The eye works better with a range of colors even if the colors are dim. All LED colors have a frosty or cool tone, so always include an amber LED in the mix to warm up the appearance of the light.

Ultrabright LEDs differ from regular indicator lights, such as may be found on the front of a PC or a cell phone charger, in that they produce 1,000 to 10,000 millicandles of light intensity where regular indicator LEDs may only produce a few hundred millicandles. At a distance of a foot or two, an ultrabright LED may be almost painful to look at in its narrow cone of focus.

Three are enough

A cluster of three white LEDs can provide sufficient light to enable a person to read comfortably if the light is directed in a beam. The same three LEDs can provide a diffuse illumination in a roughly 6-foot by 6-foot area in our teak-paneled (dark) saloon.

A ring of 12 LEDs makes an anchor light that is clearly visible for a mile, though the U.S. Coast Guard won't certify a homemade array. However, since we are generally cruising in waters where few vessels even have running lights and where the nocturnal boat operators are more likely to have their attention focused on the horizon than the sky, we consider our deck-level LED lighting to be more important lighting than a mast-top light. We believe, furthermore, that a mile of visibility is more than sufficient even though our boat exceeds 12 meters in length. Right or wrong, we only use the mast-top 2-mile incandescent light if we are anchored where we may be passed closely by large commercial vessels.

Color of LED	Voltage drop at 20 mA
Red	1.5
Amber	1.8
Green	3.4
Blue, blue-green (white)	3.6/3.8*

*Nichia-brand white is rated 3.8 volts at 30 mA

For those who need an LED-powered, USCG-certified anchor light or running light, Orca Green Marine makes several models. One model uses one red, one green, and three white Luxeon LEDs. By energizing the red, green, and white lights, the light shows as a tricolor running light. By energizing a pair of whites in the port and starboard sectors instead of the red and green, it shows as an all-around white anchor light. Other features that can be added to this basic unit are a strobe (the white LEDs flash) and a photo sensor that turns the light on and off.

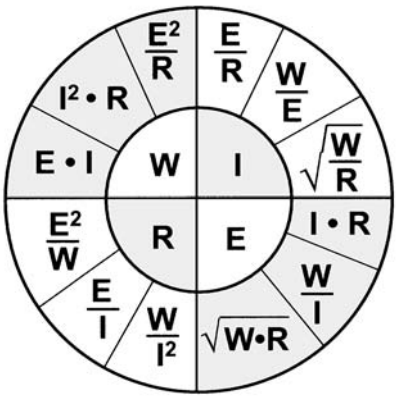
GreenRay offers arrays that are snap-in replacements for some existing incandescent bulbs, and Stecktronics offers arrays that can be used to convert existing anchor and deck-mounted running light housings to LEDs.

All of these offerings can be obtained from Hotwire Enterprises (<http://www.svhotwire.com>). John Gambill and Libbie Ellis at Hotwire are also a good source of information on the rapidly changing field of LED lighting for marine use.

Color and energy

LEDs emit their light as electrons drop in energy. The color of light is related to the size of the drop. A red LED has about a 1.5-volt drop in energy, whereas amber has about a 1.8-volt drop, and green LEDs have about a 3.4-volt drop. Blue and blue-green LEDs (and white — which are blue in disguise, remember) have about a 3.6-volt drop. They produce nearly their nominal light output when a current of 20 milliamps is passing through them, and these voltages are those that correspond to this current for the respective color LEDs. If greater voltage is applied, then more current will flow (and the device may overheat). Nichia-brand white LEDs can operate at a continuous current of 30 mA and 3.8 volts, but LEDs from a distributor may originate from various manufacturers and the original specifications

Ohm's law for DC and non-inductive AC currents



I = current in amps
E = electromotive force (potential) in volts
R = resistance in ohms
W = power in watts

may be unknown — it is best to limit current to 20 mA to play it safe.

When designing a project for a boat, the normal voltage will be around 12.5 volts, but at times the lighting circuit may receive up to 14.5 volts if the batteries are being charged. Consider designing your projects for about 13 volts if you occasionally run the engine at night or maybe even 14 volts if you have a charging source at night frequently. On the other hand, if you have abundant electrical power, you probably don't need to build LED projects anyway. Plan for the LEDs to operate at 20 mA at the greatest expected voltage. We generally have had good success with this approach; even if the batteries are badly discharged and the voltage drops to 11.9 volts, the same LED circuit will give good light.

LEDs tend to have a relatively constant voltage drop within their normal range of operation. If more voltage is applied, the current rises quickly — LEDs do not block excess current. So, if you place three white LEDs and one amber LED in series, at 12.6 volts they will pass almost exactly 20 milliamps. However, at 13.6 volts it is difficult to predict the current they will pass. The extra volt could cause the diodes to pass excessive current and overheat. It is good practice to install a resistor — a device with a known tendency to block current — into the circuit with the LEDs to keep the current from being excessive.

We have bought most of our LEDs from All Electronics Corp. (<http://www.allelectronics.com>) because it often has low prices, but there are many other distributors on the Internet, and local electronics shops may have a good selection as well. A few years ago, we bought an assortment of LEDs directly from one of the major manufacturers, Nichia Corporation (<http://www.nichia.com>). We have made our projects with lamp-type LEDs in a clear plastic enclosure called T-1¾, which is about 5 mm (a little less than ¼ inch) in diameter and perhaps 8 mm (about 5/16 inch) in height. A smaller T-1 enclosure (similar shape but only 3 mm — about ⅛ inch — diameter) is also available for most LEDs. These days, we see flat surface-mount LEDs available as well. For the projects we contemplate here, the T-1¾ style is intended, but other case designs may also serve your needs.

Resistors: A necessary evil

Resistors have a property of blocking current known as resistance, and this property is measured in units of ohms. The voltage drop **E** of a resistor is equal to the product of the resistance **R** (in ohms) and the current **I** (measured in amps); this is known as Ohm's law:

$$E = I \times R$$

For the example above, if we want our three white LEDs and one amber LED to only pass 20 milliamps at 13.6 volts, we should add a resistor that passes only 20 milliamps if it has a 1-volt drop (the other 12.6 volts of drop occurs in the LEDs: 3 x 3.6 + 1.8 = 12.6; see chart on Page 47). By rearranging Ohm's law, we can determine that such a resistor must have a value of

$$R = E/I = 1 \text{ volt}/0.020 \text{ amps} = 50 \text{ ohms}$$

With a 50-ohm resistor, the LEDs are protected from excessive current at higher voltages. The resistor converts some of the power into heat, but most of the power is still going to lighting.

Resistors are a necessary evil — necessary to prevent LEDs from being damaged by excess current and evil because they use power but do not produce light. They diminish efficiency. In fact, resistors are specific about the amount of heat they can produce. Larger-capacity resistors are physically larger. The equation for heat production in a resistor is: power **W** is equal to the value of the resistor in ohms times the square of the current in amps that is passing through the resistor:

$$W = I^2R$$

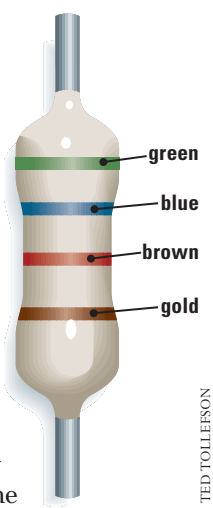
A 100-ohm resistor passing 20 milliamps of current dissipates power $W = I^2R = 100 \text{ ohms} \times (0.020 \text{ amps})^2 = 0.04$ watts. The smallest commonly available resistors are 0.25 watt, so they suffice for small lighting projects.

Sold in bulk

Resistors are sold at electronics stores and are available by mail order. In the electronics industry, resistors are sold in rolls of 1,000 for very little money, so individual resistors have a value well below $0.01. Buy them in bulk variety packs and throw away the resistors with high values (anything over 1,000 ohms) or give them to a ham radio hobbyist who will almost surely never need them either but who will still find them to be a thoughtful gift.

A resistor's resistance value in ohms is described by a color code. Resistors are painted with colored bands. The first two bands indicate the first two digits of the resistor's value. The third band indicates how many zeros follow the first two digits. The color code is 0–black, 1–brown, 2–red, 3–orange, 4–yellow, 5–green, 6–blue, 7–violet, 8–gray, and 9–white. Thus, a resistor with a value of 560 ohms would have color bands of green–5, blue–6, and brown–just one following zero, as shown in the illustration at right. A fourth band on the resistor is gold or silver to indicate the precision with which the resistor has been made. Virtually all modern resistors have a gold band indicating the actual value is within 5 percent of the color-coded value, but any resistor will work fine

560-ohm resistor



TED TOLLEFSON

Use a small soldering iron to make connections. Be quick. Keep the iron in contact with the LED leads only long enough to make a connection. When possible, an alligator clip between the LEDs and the soldering point helps sink excess heat.

for an LED lighting project. The fourth band is important though. Since it is gold or silver, it is distinctive as the fourth band, so you know which way to read the color code.

Resistors are made in certain typical values. When you buy a variety pack, you will find some resistors with values close to those you have calculated you need, but probably none will be exact. Close is good enough — even within about 20 percent of the value you calculate will probably work. (That is why the fourth, or tolerance, band is mostly irrelevant.)

Resistor values

Suppose we need more light and plan an array of LEDs with two each white, green, amber, and red LEDs. Now one white, green, amber, and red in series have a voltage drop of (3.6+3.4+1.8+1.5 = 10.3 volts; refer to the chart on Page 47). If we are designing for a maximum voltage of 14.5 volts and a maximum current of 20 milliamps, then our resistor needs to have a value of (14.5 – 10.3) / 0.020 = 210 ohms for each strand of four LEDs. Alternatively, one single resistor could be used to supply the two parallel strands; since this single resistor would need to carry twice as much current, it will have only half as much resistance, or about 95 ohms. In our early projects, we often followed this approach to save on resistors before we bought a larger supply, but we do not recommend it except in difficult circumstances. If one of the LED series fails, the other series will be driven by a somewhat greater than anticipated voltage. Certainly if the different strands in a circuit have different combinations of colors (and therefore differing voltage drops), give each strand its own resistor.

A couple of final comments should be made about resistors and LEDs. The first is that all LEDs look alike, and you will sometimes forget the color of a particular LED. All the LEDs are in clear cases so color is only apparent by turning them on. But you cannot simply connect one to a 12-volt source — it will pass too much current and burn out in less than a second. A resistor should be connected to the 12-volt source, and this regulated current supply should be used to probe the LED. The resistor should have a value of about 500 or 600 ohms so it will not allow too much current to pass through even a red LED.

An exception to the issue of series resistors for LEDs is that some LEDs are sold with a resistor already built in. If you need a simple indicator lamp, a 12-volt LED may be right for you, but it is not a good choice in lighting projects because it is not very bright and cannot be connected in series to take full advantage of the available voltage.

To check an LED for color and function, connect the negative side of the 12-volt battery to one lead and connect the positive side of the battery to the 600-ohm resistor. Use the other lead of the 600-ohm resistor as the positive connection to the LED. LEDs are generally constructed with a long lead and a short lead; the long lead is positive. If the LED does not light, reverse the polarity of the connection and try again. If it still does not work, it is probably a bad LED.

Project assembly

There are several issues when putting the LEDs together. The LEDs must be connected with observation of the proper polarity. Since the leads of the LEDs are often cut shorter for use, it is sometimes beneficial to mark the polarity with a felt-tip pen, coloring the negative (short) lead near the point where it emerges from the plastic. Connect LEDs so that the positive lead of one LED connects to the negative lead of the LED next to it. The resistor can go on the positive or the negative side of the series of LEDs.

Use a small soldering iron (35-watt) to make connections and keep the iron in contact with the LED leads only long enough to make a connection. It is good practice to connect an alligator clip between the LEDs and the soldering point to sink excess heat, but this is often not feasible. We have not burned out any LEDs with our soldering iron, but we are always afraid we will, so we keep the soldering time as brief as possible. Of course, the average hobbyist will have no way to determine the temperature of the soldering iron, but for what it is worth, the Nichia website specifications for its LEDs indicate that the LEDs can tolerate a soldering temperature of 350° C for three seconds and that soldering should occur below the solder block in the leads.

We often have mounted the LEDs around a small piece of polyvinyl chloride piping, drilling a couple of closely spaced 1/16-inch holes where each LED is mounted for the leads to go through the pipe. We make the connections on the inside of the pipe, and the LEDs project outward or are bent to point in a common direction along the pipe axis. The pipe can then be used to support the entire project in a fixture.

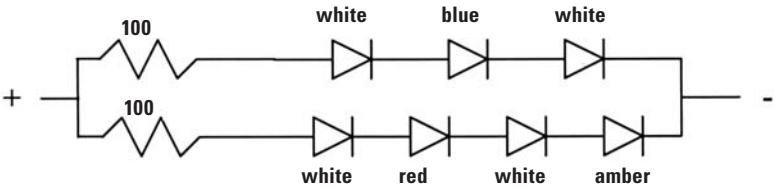
Bending the leads is a delicate process. Hold the lead wire in two places to bend it rather than holding the LED case. Bending the lead using the case as a fulcrum can damage the clear epoxy and cause moisture to enter and create damage, or it can even cause mechanical distortion of the semiconductor and damage the junction where light is produced.

Resources

There is a great deal of information about LEDs on the Internet — search the terms "light" and "diode." A good place to start is Don Klipstein's LED page at <http://members.misty.com/don>.

For general information on the development of efficient lighting sources, review the article, "In Pursuit of the Ultimate Lamp" by Craford, Holonyak, and Kish, *Scientific American*, February 2001. The story of LED development is far from complete, but enough development has occurred that LEDs have some real contributions to make to sailing.

Schematic diagram of mixed-color LED cockpit light



When the soldering is completed, it is important to thoroughly seal the LED leads from exposure to the environment. Liquid electrical tape, PVC glue, varnish, epoxy, or paraffin wax can be used. Coat the leads and connections to wires, and extend the coverage right to the point where the leads enter the clear plastic body of the LED. Otherwise, marine salt and moisture can cut its life to a year or less.

The easy way

LED lighting solutions are also available in prepackaged arrays that can replace nearly any bulb from various marine manufacturers at a considerable additional cost beyond the LEDs themselves — we have seen them at boat shows. After completing one or two LED lighting projects, you may conclude that the extra cost to have a manufactured assembly is worthwhile. On the other hand, building these simple electrical circuits can be a rewarding project. Furthermore, after a moment of reflection, it easy to see that there are thousands of possible combinations of LEDs that can be operated on 12-volt systems, and your individual LED lighting needs may not match a prepackaged solution.

Examples

Several LED projects on our boat have been successful. One is a mix of colored LEDs inside a 6-inch woven basket that we hang upside down in the cockpit as a night light. The mix of LEDs includes two white and one blue LED in one series and two white, a red, and an amber LED in another series. The two series each have a 100-ohm resistor and the two are connected in parallel; the current draw is 40 milliamps.

Our unofficial anchor light has four series of three white LEDs each, for a total of 12 LEDs. They are arranged in a circle. Each group of three LEDs is in series with a 100-ohm resistor. The light draws approximately 80 milliamps.

Another project was the creation of a strand of six amber LEDs and two strands of blue and green LEDs mounted in a U-section teak molding strip over our refrigerator lids. The LEDs shine down into the refrigerator when it is opened. The total lighting strip requires 60 mA and provides enough light to prepare boat meals on the countertop when the refrigerator tops are closed.

America's Waterway Watch

The Coast Guard asks boaters to be careful observers

by Don Garvey

On September 11, 2001, America was attacked from the air. Many terrorism experts feel it is only a matter of time before another attack occurs. Next time, the enemy may come by sea. Rivers, bridges, tunnels, ships, and ports are all inviting targets. With more than 95,000 miles of shoreline and 290,000 square miles of water, there are numerous routes of attack. In response to this potential threat, the U.S. Coast Guard, the branch of the military charged with protecting our maritime community, has developed the concept of Marine Domain Awareness (MDA). MDA has been defined as "the effective understanding of anything associated with the global maritime environment that could adversely impact the security, safety, economy, or environment of the United States."

As part of MDA, on September 11, 2003, the Coast Guard and Coast Guard Auxiliary launched America's Waterway Watch. The immense job of the Coast Guard prohibits it from being everywhere all the time. The objective of Waterway Watch is to enlist the boating community as additional eyes and ears of the Coast Guard. Waterway Watch is similar to the Coast Watch of World War II, during which citizen-volunteers mobilized to scan our shores for U-boats and saboteurs attempting to infiltrate the United States.

Recreational boaters, marina operators, fishermen, and waterfront concessionaires are knowledgeable and familiar with their home waters. They are first to notice when something "doesn't add up." Consider an example from the aviation community: immediately prior to September 11 an alleged terrorist, the so-called "20th highjacker," was arrested in Minnesota when a flight school instructor felt something about one of his students just wasn't right.

Waterway Watch does not require joining up, paying dues, or attending meetings. All one has to do is keep on the lookout for suspicious or unusual activities and report them to the Waterway Watch National Response Center at 877-24-WATCH. If time is critical, contact the Coast Guard on Channel 16 or call 911 immediately.

Lookout list

The Coast Guard and Coast Guard Auxiliary have developed a list of things to be on the lookout for:

- Persons who appear to be loitering near a boat or waterfront facility for no apparent reason
- People checking out or "casing" a boat
- Boats tied to or loitering near dams, bridges, or locks
- Unusual videotaping, photography, or questions about boats or marine facilities
- Boats with unusual or obviously inappropriate modifications
- Anything that strikes you as wrong: fishing in unusual areas, unusual diving activities, lights flashing between boats or between boats and shore at night
- Persons tossing and recovering items into and from the water
- Missing fences or lights in sensitive areas
- Persons buying or renting fishing/recreational vessels with cash for short-term, undefined uses

Be especially watchful around:

- Bridges
- Commercial areas: ports, fuel and cargo docks, cruise ships
- Industrial facilities: power plants, water intakes, locks, and dams
- Military bases

If you see suspicious activity, take notes on what you observe — the time, date, location, number of people and physical description, vehicles used, license plates, boat registration number. Then report your observations to the National Response Center. Do not challenge, question, or intervene in any way. Do not place yourself or your companions at risk. If you can take photos or videotape without exposing yourself to risk, try to do so.

Protect your boat

Other things you can do to assist the Coast Guard include: Secure and lock your boat when no one is aboard. Disable engines on stored boats or block trailered boats to make sure they are not easily moved. Display the Waterway Watch decal on your boat or waterside facility to remind yourself and others to watch for and report suspicious activity. Keep at least 100 yards from all military, cruise ship, or commercial shipping. Avoid all security zones or restricted areas. For information on restrictions in port areas, call 800-682-1796 or go to <http://www.uscg.mil/safeports>. For brochures, decals, and pocket cards on Waterway Watch, call 800-368-5647 or go to <http://www.americaswaterwaywatch.org>.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PART ONE

Nicholson

A classy English lady gets a facelift

by James Baldwin

Once embarked on a limited refit project on your classic cruiser, you will surely be tempted to carry on until she is transformed into the boat you dreamed she could be. Somewhere along that path you come to comprehend that on an old boat, each seemingly simple job begun inevitably leads to three more complex jobs.

An example of this effect is when we pulled down saloon headliners to reach the fasteners to rebed leaking deck fittings. With the headliners down, it was a good opportunity to install added overhead lighting and enlarged Dorade vents. Then it seemed a shame to reinstall those old sagging, discolored, vinyl-covered headliners. Better to replace them while they're down and the tools are out. If going for new deckhouse headliners, we might as well replace the other headliners under the decks and in the forward cabin to match. If we're going that far, now's the time to add some storage lockers in place of that unwanted pilot berth, since the new headliners under the sidedeck can easily be shaped to fit around the new locker cabinets.

Thus began, step by step, the interior overhaul project on a 1982 Nicholson 31 located in Brunswick, Georgia. Her owner, Jeff Fletcher, works full-time running his mortgage company in Atlanta. For this reason, he asked me, along with my wife, Mei, to upgrade the boat's essential systems and get her ready for extended cruising vacations. As individual jobs were completed, Jeff found this was his best opportunity to customize *Echo* with features unavailable in the one-style-for-all reality of a production boat.

With the maintenance and upgrade work nearly complete on the rigging, sails, deck hardware, plumbing, electrics, and other mechanical systems, we moved on to some more creative work, refinishing and customizing the boat's interior.

Jeff originally thought the teak-faced plywood bulkheads and cabinetry were in such a damaged state with cracked varnish, holes, scratches, and discoloration that we should cover them with Formica. However, closer inspection after stripping and revarnishing some sample areas showed most of the teak veneer could be saved. Besides, covering all these teak surfaces in laminate would subtract from the interior's rich, natural look. It was problematic as well. The fine cabinetmakers at the legendary Camper & Nicholsons yard made skillful use of what they had. But their economy in using thin strips of teak trim glued onto edges of panels and doors meant that the trim would be broken in the process.

We worked out a scheme whereby we stripped and revarnished the navigation table and most bulkheads. Then we replaced the teak plywood locker doors in the main cabin with solid teak louvered doors backed by Formica-covered panels surrounded with generously thick teak trim.

Added locker cabinets

Since Jeff had no plans for bunking six people at a time (*six people living on a 31-foot boat?*), the pilot berth above and outboard of the port saloon settee was an obvious place to convert to storage lockers. Unfortunately, the converging lines of the settee backrest, the cabinhouse sides and sidedeck, and the adjoining curved galley layout meant there were few right angles to work with. Using a cardboard mockup, we worked out a simple cabinet layout consisting of three lockers behind a single vertical panel with a narrow shelf between it and the settee backrest.

To begin, we removed the pilot berth cushion, its plywood face board, and the berth's canvas bottom, replacing it all with a bottom of ¾-inch-thick cabinet-grade plywood covered on top with Formica. Similar plywood

31 makeover

composed the new front panel cut to fit from the cardboard template. We ordered five sets of teak louvered doors and frames, sized 20 inches high by 15 inches wide — along with separate offset hinges, elbow latches, and finger holes — and assembled them ourselves. We set three of the door frames in position on the front panel, traced them, and cut out their mounting holes. Then we set the front panel in place and marked it for the position of the locker shelves and dividers. One locker was left without a shelf for stowing bulky items or for use as a video locker.

We installed the locker dividers and shelves with 1-inch x 2-inch oak framing. We screwed short pieces of oak framing onto the back of the front panel where needed for mounting support and then laid the panel face down on the back of a sheet of Formica. As with the locker bottom panel, we traced the Formica roughly ¼-inch oversize all around and cut it out with a fine-toothed blade on a jigsaw. Laminates are prone to chipping or cracking when cut like this unless they are well supported under the cutting edge. We set up a makeshift cutting table on the dock using a half sheet of plywood supported by boxes. Cutting the laminate oversize makes alignment easier during cementing and reduces the chance of chipped edges intruding on the finished panel. In any case, teak trim over all edges covers any corner chips or joints with less-than-perfect fit. When it was important that the edges of the laminate be smooth and straight, we clamped the laminate to a piece of plywood that acted as a cutting guide for a small router with a straight-collared bit.

Contact cement

We cleaned the face of the plywood panel and back of the laminate with acetone and coated them with contact cement. When dry to the touch, which took about 10 minutes under the Georgia sun, we laid plastic Venetian blind slats on the dry glue of the laminate and set the panel in position on top of the slats. Then we pulled the slats out one by one, beginning in the center and working out toward the edges. Don't try cementing laminates without slats or dowel rods; the tenacious grip of contact cement gives you only one chance to position it correctly. Once glued, the panel was turned over and the laminate locked in place by hammering a cloth-covered block of wood slid slowly over the entire surface. Following this, we cut out the locker door frame holes and trimmed the laminate flush to the panel edges with the straight-collared router bit. With care, a belt sander or medium-grit sanding disc on an angle grinder can also be used for this work.

All the interior locker plywood was given three coats of varnish, and a 1½-inch-high teak fiddle was glued to the front edge of the locker shelves. Then we screwed the front panel into

> "…on an old boat, each seemingly simple job begun inevitably leads to three more complex jobs."


f


g


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The pilot berth is removed in favor of more space (a). A new shelf is created and cabinet dividers installed (b). The finished settee and storage cabinet (c). The chart table was similarly refurbished, before and after views (d and e). The starboard settee was modified with new cabinets to match those on the port side, before and after views (f and g). The fabric hull liner covering in the quarter berth was removed and replaced with Formica, before and after (h and j). Storage space was revealed (i) between the hull liner and converted to additional lockers.

Heroes

by Jeff Fletcher

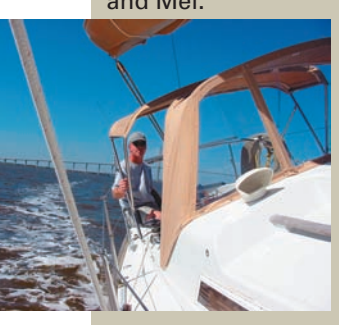
"My heroes have always been sailors.
Still are, it seems.
Gladly in search of and two steps ahead of themselves and their beam-reaching dreams."
With apologies to Willie Nelson

Living in a time when the true heroes of our world are fighting overseas, perhaps it's too much of an overstatement to call sailors heroes. Words such as "admired" and "respected" are just as suited. I have had the good fortune of having my sailboat refitted by a hero of mine. When I needed help, James Baldwin, as luck would have it, was on the East Coast not far from where my boat was berthed.

When I purchased a 1982 Nicholson 31, the boat itself — other than a few cosmetics and cruising items — was exactly the boat I had yearned to own for many years. I think all boatowners have an image of how our ideal boat should look and what equipment we long for. The mere thought of transforming a 20-year-old boat into my vision was a daunting task. Law school and a career in the mortgage business did not equip me with the skills necessary. Enter James Baldwin and his wife, Mei.

Take an engineer's attention to detail, a craftsman's skill, and a long-distance sailor's experience, then finally blend them all together with a romantic's love of the sea and an unselfish willingness to share all he knows . . . and you have James Baldwin. When you add the sharp mind, easy laugh, and loving touch of Mei to the mix, the team emerges, able to jump a boat refit (or anything else they choose to tackle) in a single bound.

I am in awe of their refit and transformation of my boat into one that I am proud to own. Thank you, James and Mei.



When he learned that James Baldwin's article about the refit of the Echo *would be published, Jeff Fletcher wrote this note to the editors. James was not aware of this small addition.*

The exterior of the refurbished vessel; with an old boat, you will carry on until she is transformed into a dream boat.

place from the back to its frames. The exterior edges were trimmed in teak quarter-round molding. The long narrow shelf between the settee backrest and the new cabinets received a ½-inch-thick by 4-inch-high teak fiddle rising 2½ inches above the shelf counter. We varnished all doors and teak trim after the other projects were completed.

We installed the other two teak louvered door sets on the existing starboard locker cabinets at each end of the central bookshelves. The old cabinet's plywood doors were lower but slightly wider than the new doors, so we removed the hinges and latches, epoxy-glued the doors in place, ground the thin teak trim flush, and cut out the correct hole size for the new doors. We made paper templates for the exterior surfaces of the cabinet/bookshelf panels, then traced them onto the Formica, which was cut and glued to the old plywood panels as we had done on the port locker face using plastic slats as separators during fitting. All five cabinet door frames were later secured from the inside with aluminum brackets so they could be easily removed for varnishing. The teak corner moldings were fit and tacked in place with brass finishing nails. The double bookshelf was given removable teak retainers as well as hooked elastic straps needed to keep books from sliding about in a seaway.

Working around the liner

Parts of the interior hull liner, such as the sides of the V-berth and quarter berth, were covered in a fabric resembling outdoor carpeting. In cold climates it offers some insulation. People seem to like its appearance and sound-deadening qualities, and it is cheap and easy to install. It's also difficult to clean or dry and a terrific home for dust and mold. I avoid using it and was relieved when Jeff agreed to have it replaced with Formica. Once we removed the old carpeting and its disintegrating foam backing, we washed the fiberglass liner surface with acetone and abraded it with a coarse sanding disc. We made paper templates and cemented the Formica in place. Bending the standard counter-grade laminate to conform to the slight curves on these surfaces presented no problem. We trimmed the edges with teak quarter-round molding.

I have a special loathing for those prefabricated fiberglass hull liners that save on production costs but block access to vital areas of the hull. The way most liners are installed, it's impossible to reach many parts of the hull and extremely difficult to later add collision bulkheads within the hull's lower lockers where they are most needed. If boats were constructed with a combination of fully accessible lockers, collision bulkheads, and areas of rigid foam flotation between the liner and hull, hull liners would be an asset to sailors and not just the builder.

The hull liner in this Nicholson 31 formed a shelf outboard of the quarter berth. Under the shelf was a 6½-foot void with a small access hole and a narrow slot open to another inaccessible area behind the battery box liner. We converted this into a storage locker by cutting two large access holes in the top of the shelf, fitting them with removable latching doors, and installing a plywood locker bottom. Inside this locker was an ideal location to install the new amateur radio. The radio's low-profile, detachable control panel was mounted nearby on the instrument panel below the marine VHF.

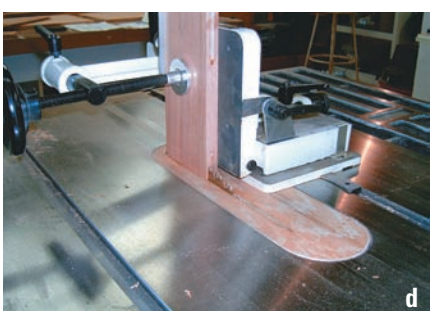
Part 2 of the story of the Nicholson makeover will follow in the November 2005 issue.

The final result of much effort is shown at left (a): a renewed and infinitely more practical floor covering that can take future sanding and maintenance. But such things are not accomplished without much effort.

New mahogany-and-holly sole

Smart addition to a venerable Cape Dory 27

by Mark Abramski



Last January I set out to refinish the interior woodwork of *Linda Jean*, our 1981 Cape Dory 27. Most of the interior woodwork was easy to remove and simply needed to be sanded and refinished. However, the cabin sole was starting to show signs of delamination. My original plan was to re-glue and refinish the teak-and-holly veneer plywood, but close inspection showed that the plywood was too far gone. I got out the pry bar and putty knife and removed the old sole. Fortunately, the old pieces, although badly delaminated, retained enough of their shape to serve as patterns for new ones.

Our cabin sole was built in three sections. The center section was flat and was the classic teak-and-holly pattern. The other two pieces were teak-veneer plywood and were curved and bent into place to form "sides" of the sole. All pieces were held in place with glue and screws along the perimeter.

From my perspective, the new sole had to satisfy the following requirements:

- Classic look
- Durable and rot resistant
- Easy to refinish when worn
- Affordable to build
- Easy to install

One option would have been to buy teak-and-holly plywood and replicate what was in the boat. I didn't choose this option because getting the side pieces bent into the proper shape would have been quite involved. The original installers had to "file to fit" the backs of the side pieces and used small pieces of plastic laminate to shim them into place. Furthermore, thin veneer provides limited opportunities for future refinishing and repair.

I had read some articles on rebuilding the cabin sole by gluing solid teak-and-holly boards directly to the fiberglass sole, but this solution didn't address the curved sides. Another problem is that it doesn't allow for expansion and contraction of the solid stock;

The previous sole was preserved as a pattern at left (b), a rough frame was made of milled mahogany (c), a tennoning jig was used to cut the stiles (d), the tongue was planed to fit (e), and glue was applied to the stripped and prepared fiberglass sole (f), above.

Even without the finish, the new sole is a big improvement (g); a before-and-after view emphasizes the point (h). To take a curve, the side pieces were constructed of 7/32-inch thick strips (i), then strips were glued to the floor panels to serve as glue surfaces (j) and the second long piece was set in place and clamped (k). The underside of the side pieces prior to trimming (l). All three pieces of the sole were trimmed and readied for installation (m); the sole was clamped while the glue set (n). A special frame was constructed for the bilge hatch (o).

I feared it would eventually buckle.

I decided that a frame-and-panel design would work for the flat part of the sole. The panels could be fitted with holly inlay for the classic look and the frame would allow for expansion and contraction of the panels. I decided to make my own two-ply plywood for the side pieces. I wanted to make the surface ply thick enough to support many years of hard use and subsequent refinishing yet thin enough to be easily bent.

I considered using teak, but it is extremely expensive, doesn't glue well, and is rough on tools. I decided to use mahogany and holly. It would provide that classic look, water resistance, and a nice contrast to the darker teak interior.

Frame and panel design

The design of the frame and panel section had some unique considerations:

- The dimensions needed to be proportioned so there was visual balance. The panels needed to be large to maximize the yachtiness, yet the frame could not appear dainty.
- The panel layout had to appear symmetrical, given that one of the panels was to be the bilge hatch.
- The frame had to have sufficient glue surface to hold together after being trimmed to size.

The thickness of the stock was increased from the original ½ inch to 9/16 to provide adequate glue surface for the tongue-and-groove joints that hold the frame together.

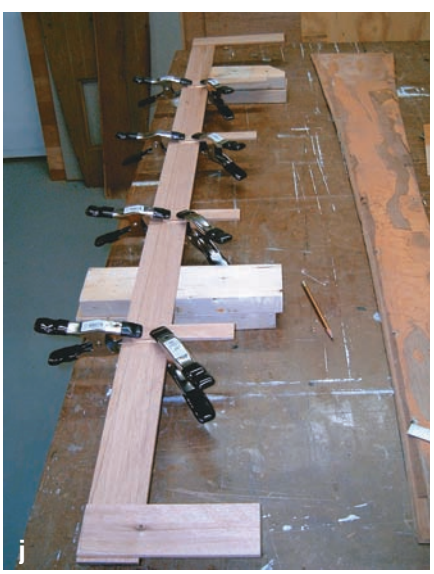
Side-piece design

The side-piece design is quite simple: one 7/32-inch ply forms the face and a second 7/32-inch ply is glued to the first …but a gap is left between the pieces that make up the inner ply to facilitate the bend (see illustration in middle of facing page).

Frame construction

The most time-consuming part of this project was milling the rough stock to size with three smooth surfaces (one edge and two faces). I bought the mahogany for this project rough from Lakeshore Hardwoods in Pulaski, New York, which has a wonderful selection of many different species of furniture-grade hardwood lumber that are reasonably priced. The advantage to buying lumber rough is that it is more affordable and you can ensure that it will be straight, square, and smooth after it is finished.

I used a table saw, joiner, and surface planer to mill the mahogany to approximate width and length and a finished thickness of 9/16 inch. If you don't have access to these tools, your best bet is to have the lumberyard mill the

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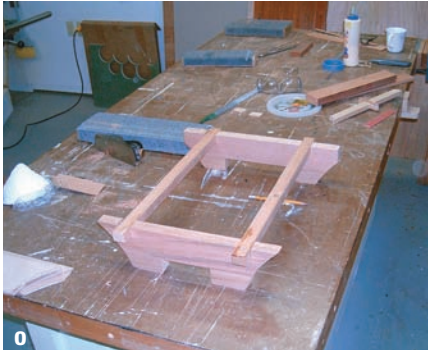

o

stock for you. You will probably have to pay an hourly shop fee. I used biscuit joints to laminate narrower boards into wider ones and tongue-and-groove joints to attach the frame stiles to the rails. The groove was cut on the table saw and is 3/16-inch wide by 5/8-inch deep. I cut the tongues in the stiles on the table saw using a tennoning jig.

I used waterproof yellow carpenters glue on all laminated joints and to attach the stiles to the rails. This glue is approved for outdoor applications but not for underwater applications. It takes an immediate tack, sets up quickly, and is extremely strong.

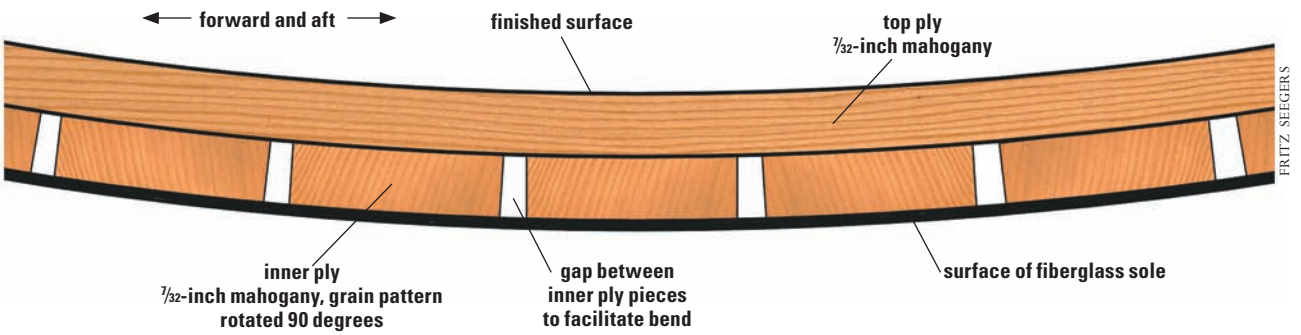
the shoulder of the tongue and the frame. The same is true for the panel that serves as the bilge hatch.

When cutting tongue joints, I like to tune the joint to the final dimension with a rabbeting plane. The tongue should be planed down so it slips easily into the groove on the frame. If the tongue is too thick, it can split the frame stock that forms the groove. Once the panels were trimmed to

Then I applied glue to the edge of the first long finished piece and the tabs. I set the second long finished piece in place and clamped it, ensuring that the seam was properly aligned along the face. I repeated this until the piece was complete.

Trimming and finishing

I used a hand-held jigsaw to trim the sole and a bandsaw for the side pieces. I cut each piece about 1/16 inch from the line and sanded to the line with a hand-held belt sander. I finished all pieces, front and back, with multiple coats of semigloss polyurethane.



Panel construction

The panels were built by laminating 2½-inch mahogany strips together using biscuit joints. However, before the final glueup, it was necessary to inlay the holly strips into each mahogany strip. I cut holly strips to a touch larger than 5/16 inch by 3/16 inch. Each of these strips was then glued into a 5/16-wide by 3/16-deep rabbet on each mahogany strip. I cut the rabbets on a router table. The extra width and thickness of the holly gave me the ability to plane the holly perfectly flush with the mahogany. Once the holly was planed flush, the panel could be laminated together and trimmed to shape and the tongue cut around the perimeter.

When sizing the panel blank, keep in mind that it needs to be large enough to accommodate the tongue as well as the field (the part you see). Also, the panel will expand and contract in the frame, so it should be sized such that when fitted in the frame there will be a gap of approximately 1/16 inch between

size and the tongues tuned, I finished both sides of the tongue with a coat of polyurethane followed by candle wax. I also trimmed the corners of the tongues at a 45-degree angle to the panel sides. This ensures that when the frame is assembled and glued, the panel will not adhere to the frame.

Frame assembly

To assemble the frame, I added glue to all glue surfaces, slipped in the panels, and clamped the assembly together. Even without finish, the new sole was already a big improvement over the old one.

Side-piece construction

Construction of the side pieces begins with laying out and numbering the 7/32-inch strips that make up the bottom ply. I used the old side pieces as a template. Next, I glued a few strips along the length of the first long finished piece to serve as glue surfaces (tabs) for the finished face lamination.

The bilge-hatch frame

In the original sole, the bilge-hatch cover sat in cleats that were screwed to the plywood sole. When you stood on the bilge hatch, the weight of your body was essentially hanging on the hatch from the plywood sole. I believed that with 9/16- inch solid stock, there was some risk of the mahogany stock failing due to this loading condition. My alternative was to build a free-standing frame assembly to support the weight of the bilge hatch and anyone standing on it. In this design, the frame transfers all of the load to the bottom and sides of the bilge.

This frame was built by carefully scribing the bilge radius onto plywood patterns, trimming those patterns until they fit properly, and then building the frame members from those patterns. The longitudinal members of the frame are let into dados such that the frame was installed and screwed together after the new sole was installed.

Sole installation

Installation of the new mahogany sole was straightforward. First, I prepared the fiberglass surface in the boat by scraping all the old glue off with a razor blade. Next, I cleaned the surface with soap, water, and an abrasive pad.

I chose polyurethane construction adhesive to hold the new sole in place. It holds really well, is waterproof, and remains flexible for years. I applied polyurethane construction adhesive to the underside of the mahogany sole by running a bead or two along the perimeter of the frame and one bead along the center of the panels (fore to aft). I did not apply adhesive to the sides of the panels where they meet the frame, as the panels must be free to expand and contract across the grain. I set the sole in place and clamped it, using weights.

Side-piece installation

Installing the side pieces required bending the pieces into shape and clamping them. Once again, I used polyurethane construction adhesive, but I had to build special clamps that would expand from the cabin overhead to the sole. Once both side pieces were in place, a bead of caulk in the seams between the side pieces and the bottom piece completed installation.

Expenses

This project was relatively inexpensive. The mahogany cost was between $120 and $140 and the holly cost about $30. The construction adhesive is about $3 a tube, and the cost of a can of finish is about $8. I made the clamps from scrap I had lying around the shop. A budget of $200 is ample for this project.

The finished project

I couldn't be happier with the way the project turned out. All of my requirements were satisfied, and I enjoyed the work. I believe the result retains a very traditional yachty feel, yet it is distinct from the usual teak-and-holly plywood solution found on many boats.

Resources

Lakeshore Hardwoods
Pulaski, New York
<http://www.lakeshorehardwoods.com>

Prayers over a Princess stove

FRITZ SEEGERS

Sailorly advice for the fight against the evils of alcohol

by Joseph O'Connor

Advice to the new owner of a boat with a Princess stove:

THE VALVE-LIKE THINGIE ON THE TOP of the stove is where you pour in the alcohol. Turn the valve; you'll notice that it screws off like a cap.

Now you need some fuel. Make sure you buy official marine-grade alcohol stove fuel. Pay no attention to the denatured alcohol solvent at your local paint store. One thing to remember about alcohol as a fuel is that it is invisible in whatever form you find it. You should use a funnel to help get some of the alcohol into the stove. Much of it, with no explanation at all, will escape the funnel, no matter what you do, and soak your sleeve or pour itself down the back of the stove and wind up underneath.

Carl Jung opined that obsessive drinkers are trying to contact their spiritual natures through the use of spirits. I'd say spirits (or alcohol) have the ability to do amazing things all by themselves. I am living proof that this is so. I'd have to guess that, between the threat posed by my Princess alcohol stove and the 16 gallons of gasoline in the tank for the Atomic 4 engine, I'm just playing Russian boat roulette, but then I really am a risk taker. I also used to own a 1959 Jaguar with a Lucas electrical system, so I know the true meaning of the word "risk."

After you manage to get some alcohol into the Princess, you are now prepared to find out that the stove needs a serious rebuild. You can get the parts from A&H Enterprises, 714-258-2525. If you're like me, and you have a $30,000 restoration project ahead of you just to keep your boat from sinking with all hands in the marina, you'll press ahead without the Princess rebuild. Many seasons will come and go, and you'll be looking for a reasonably priced Origo stove, but just when you find one for sale cheap on the Internet, someone else will snap it up, or you'll be out of cash at that moment. Finally, in desperation you'll go back to your boat and use the Princess.

Pump the plunger

Where was I? Ah, yes, after you mop up the now completely invisible alcohol stove fuel and have recovered from the fumes, you just pump in and out on the plunger on the front of the stove. If you are lucky, it'll pump solidly about 8 percent of the time, and you'll be able to pump up some pressure inside the fuel tank. If you vary the angle of the plunger slightly on each stroke, you may find an angle that gives you more solid pumps than other angles. This angle will change after every plunge, so experience won't do you any good, but you will have something to do with your mind while you are pumping up the pressure.

Next, bring out your secret weapon. You will need either a little squirt bottle of alcohol stove fuel with a teeny little squirt nozzle on top or some Sterno. The good thing about Sterno is that you can squeeze it through a sock and become an obsessive drinker. Anyway, squeeze a *leetle* tiny bit of alcohol stove fuel into the bottom of one of the burners or spoon in a tiny bit of the Sterno and a dash of Angostura bitters, then light it off. You can probably dispense with the Angostura bitters if you are religious.

The purpose of the first ceremonial lighting of the fuel in the bottom of the burner is to placate the curtain gods. It is well known that from time immemorial the curtain gods have frowned on all watercraft, especially watercraft with pressurized alcohol stoves, most especially watercraft with Princess stoves and cheap owners. You have not yet sacrificed properly, the curtain gods say. You don't have an Origo stove. Therefore, if you approach the Princess without a sacrifice, you risk burning up your curtains and losing your eyebrows. This is why I have Peek-a-Booo shutters on my portlights. I've changed the dynamics

Continued on Page 71

Good Old Boat

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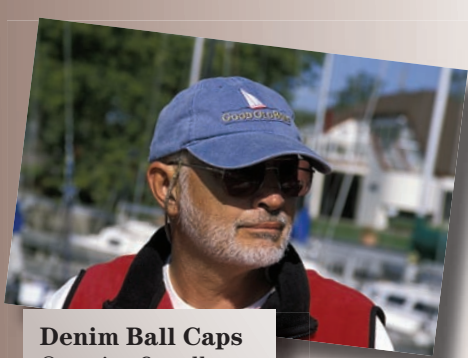

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Nautical Books

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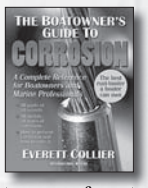

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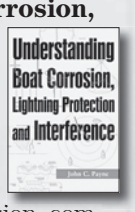

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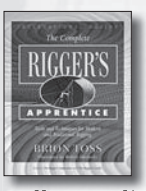

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Lofrans windlass, Achilles dinghy w/Nissan OB. Too much cruising gear to list. Rhode Island boat until '98. Now in SW Fla. Live-aboard slip available. $34,000.

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1998. Ted Brewer-designed motorsailer. One owner. Freshwater only. Yanmar 18-hp diesel, dual steering stations, shoal draft. Standing headroom 6'4". Tanbark sails, VHF, stereo/CD, AP, Horizon S/D. Upgraded lighting. Pilothouse cushions professionally recovered. Sleeps 4. Alcohol/electric stove, fridge 12v/120v. Bimini, sailcover, mizzen cover. In Holland, Mich. $39,000.

Mark Mow
mtmow@earthlink.net
574-848-7044

Bayfield 25
1974 w/recent upholstery, IB 8-hp Yanmar diesel, dual batteries, major electrical upgrade including 3-stage battery charger, epoxy bottom, new head, propane stove, extra insulation around built-in self-draining cooler, water tank and faucet, extra sails (main refurbished last year), new through-hulls and fuel filter. Featured in *Good Old Boat* in July '02 issue. Sorry, no trailer. In Knoxville, Tenn. Photos at <http://www.ofoto.com/BrowsePhotos.jsp?showSlide=true&Uc=bvx0d9hl.4nm1ihih&Uy=-k94n52&Ux=0>. $5,000.

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1978. Powerful cruiser/racer, fresh water only. Harken RF, inner forestay and running backstays, spinnaker. Networked Raymarine ST60 S/D, plotter, WAAS-GPS, AP. Dodger, cockpit cushions, battery charger, Ritchie compass, plow anchor on roller, Danforth anchor, stereo, 3-burner stove w/oven, fridge, washdown pump, Webasto hot water. Sleeps 8. In Cornucopia, Wis. <http://www.cornyboats.com/aquila>. $55,000.

Dennis Ommen
763-553-9141

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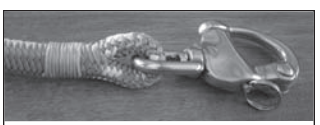

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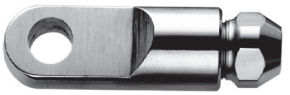

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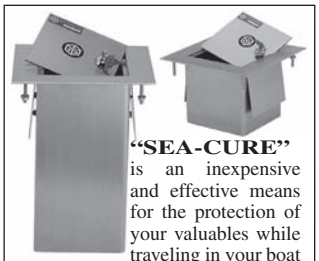

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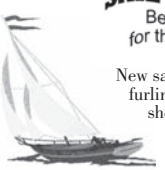

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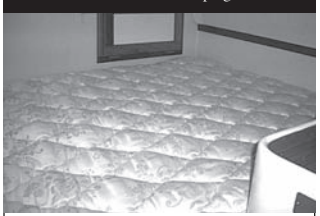

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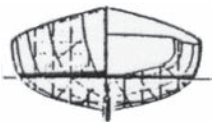

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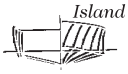

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Prayers over a Princess stove, Continued from Page 59

of the struggle entirely. Of course, soon after I made that change I began experiencing strange shorts in the electrical system, so I think I've merely succeeded in driving the struggle deeper into the psyche of the boat.

Goal achieved

When the invisible flames have died down, you have achieved your goal. The curtain gods have been appeased. If you have your pot of water or soup pot or whatever it is that you want to heat up, put that pot on the burner just after you light off the ceremonial fire. This starts heating the pot, keeps the flames contained, and preserves your eyebrows. Maybe. At this point you may be thinking of bringing nothing that needs heating on any subsequent trip — ever.

The side effect of the ceremonial sacrifice to the curtain gods is that when the flames die down, the burner will be hot. This is the magic moment. If the stars are aligned properly, if the bottom is perfectly faired and barnacle-free, and if the Dow Jones average is just so, you should be able to release ever so slightly just so much pressurized alcohol stove fuel by slowly turning one of the fuel-release knobs on the front of the stove and holding a match to the resulting fuel/air mixture.

Know what a fuel/air bomb does? Maximum damage. Remember this when releasing the fuel into the burner. It won't explode, but a flareup will spell curtains for your curtains. Just a wee bit of fuel will do. You'll hear the hissing almost immediately, and you'll have your match there ready to light the stove. The fuel/air mix is now perfectly invisible, as will be the resulting flame, should you achieve one. You are left to your own devices to figure out if you have achieved success or whether you have to start over with the other burner.

Long lighters

What you really need to buy in order to light the stove is one of those long-nozzle plastic lighters, the ones that have a switch and a trigger. If you get enough pressure on the switch, you can't properly pull the trigger. If you release some of the pressure on the switch, then you *can* pull the trigger but you won't get a flame because you have to put more pressure on the switch to do that. After some practice you may get a flame 12 percent of the time. This is a high score; consider yourself lucky.

And there you go! Instant cheery heat to boil the water for your oatmeal, make coffee, or bake bread. Bake bread on a Princess stovetop? It can be done. And if all of this seems discouraging, it is not meant to be. After a few seasons of practice, you should be bringing a Thermos of hot coffee along from home and cooking on your propane barbecue on the stern rail.

Did you hear about the grease cup on the water pump on your inboard engine? Did you know that you have to give it a turn after every two hours of engine use? No? How about the freshwater flush of the outboard after every use? No? Well, there's more boating fun ahead for you to discover.

Let there be light

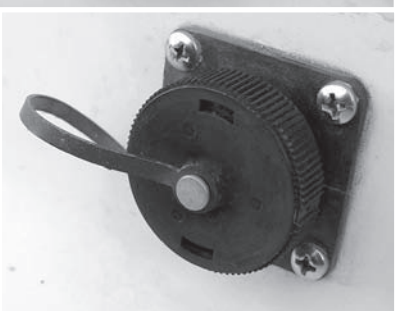
A quest for reliable electrical connectors

by John Santic

My boat came equipped with a powerful and reliable hand-held spotlight. I consider a spotlight to be an essential piece of safety equipment when boating after dark. If I'm out at night, I keep mine plugged in and at hand in the cockpit. Unfortunately, the spotlight had a flimsy power connector that was very unreliable. When you plugged the connector into the receptacle, the only thing that held it together was the friction of two small metal prongs. My spotlight has a coiled cord that was springy enough to accidentally unplug the connector. It was always an unpleasant surprise when the cord would spring back and everything would go dark. I resolved to replace the connector with something more reliable.

Other portable electronic devices use cigarette lighter plugs, but they also rely on a friction fit. Looking on the Internet, I found a nice set of industrial-quality connectors manufactured by AMP, which I ordered online from Digi-Key. The AMP connectors have a few advantages:

- They are twist-lock connectors that can't accidentally pull apart.
- They are polarized (to prevent a reverse-polarity connection) and have beefy contacts.
- The receptacle has a weather-resistant cap.
- The plug has good strain relief to keep the wire connections from breaking if the wire is pulled.
- They are available in many sizes and pin configurations for different applications.



The closed cockpit receptacle by AMP, at right, and the receptacle in use, above. Advantages over the lowly cigarette lighter receptacle? At the top of the list are a twist-lock connection, so there are no surprises when unplugging, and a weather-resistant cap.

AMP CPC (Circular Plastic Connectors) Series 3, shell size 17

For each plug

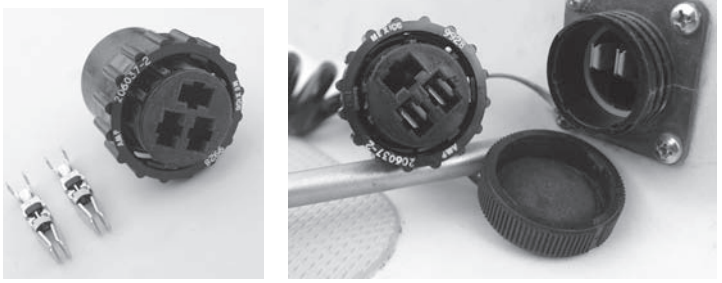
Item	AMP Part Number	Quantity
Plug body	206037-2	1
Socket contacts	66740-8	1 per pin position
Cable grip	207387-1	1

For each receptacle

Item	AMP Part Number	Quantity
Receptacle body	206036-2	1
Pin contacts	66261-1	1 per pin position
Cap	207445-1	1

What you'll need

All of the connector pieces are available separately so you can install new connectors or replace worn parts. Here's a breakdown of the parts you'll need. Consider getting extra parts as spares and to convert new equipment in the future. (A note on terminology: the plug goes on the end of the spotlight wire; the receptacle attaches to the boat.)



Replacing your unreliable cigarette lighter receptacle is a simple do-it-yourself project. You need the parts shown here. Purchase extra spare parts while you're at it.

At last check, the approximate parts cost for a plug was $13.40 and for a receptacle $8.70. This might sound expensive, but the AMP connectors are good quality and work well. What's the cost of a cheap connector failing on a dark and stormy night?

Assembly notes

If you add new receptacles to your boat's wiring, be sure to use marine-grade wiring of the proper size and protect the circuit with a fuse or circuit breaker. For example, a spotlight can draw 10 to 12 amps or more. The AMP connectors can easily carry 15 amps per pin.

Follow a consistent polarization plan. For example, connector pin 1 is ground, pin 2 is 12 volts.

After crimping a pin to a wire, reinforce the connection by soldering it too. Use only rosin-core solder intended for electronics; other types of solder may contain corrosive acid. To avoid melting the plastic connector body, solder the wires to the connector pins before inserting the pins in the connector body.

After assembling a plug or receptacle, put silicone caulking on the soldered wires inside the connector to protect them from moisture and vibration.

Use silicone spray on the connector pins to avoid corrosion.

Resources

AMP connectors are available online from:

Digi-Key <http://www.digikey.com/>
Search on "part number" in parts search.

Allied Electronics <http://www.alliedelec.com/>
Search on "part numbers."

How to select the correct wire size, other information about marine-grade wiring:

Ancor Wire <http://www.ancorproducts.com/>

How to solder:

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Cigarette lighter plugs

by Bob MacDonnell

Microphone plugs and jacks are another way to defeat the self-defeating cigarette lighter receptacles. These come in several configurations, are polarized, and have a threaded locking ring.

Are you tired of those self-defeating cigarette lighter plugs and receptacles that lose contact at inopportune times? No wonder. They have a spring in the tip of the plug that tries to eject the plug!

Microphone plugs and jacks are available in several pin configurations, are polarized, and have a threaded locking ring. Since they are made of brass, they are not recommended for outside use, but inside they are great for light loads such as GPSs and portable lights. No more accidentally disconnected instruments, trouble lights, or light pumps.

A belt around the backside

Spreading the winching strain on a trailersailer

by Gregg Nestor

Two heavy-duty vehicle recovery straps, top, when looped together, center, become a boat-retrieval belt, bottom, with a rated capacity of 18,000 pounds.

THE VERSATILITY OF TRAILERSAILING AFFORDS ME THE OPPORtunity to enjoy a variety of diverse sailing grounds. All I need to do is hitch the boat to my pickup and drive there. While sailing to windward at 55 miles per hour has its rewards, a new challenge quickly emerges upon arrival at the new sailing destination: the launch ramp.

In many areas that I have visited, below-normal precipitation, poor ramp design, and/or a minimum of 2 feet of water at the ramp have made retrieval of my shoal-draft trailersailer difficult. Even though the sailing grounds may have been enjoyable, if I've had a bad experience retrieving my boat, I've tended to shy away from making a return trip. Since I trailersail to expand my horizons, I vowed to do something to minimize my retrieval difficulties.

A couple of years ago, I fabricated a tongue extension for my trailer (see article in the July 2004 issue). Using it in tough situations works well 80 percent of the time. To cover the remaining 20 percent, I paid a visit to my local auto-parts store. Before I did that, however, I measured the perimeter of my boat. Starting at the bow, I secured my tape measure to the towing eye and, maintaining that level, extended my tape aft, around the stern, and then forward to where I began. The tape read close to 50 feet. At the auto-parts store I found a variety of heavy-duty vehicle recovery straps. These straps are constructed of nylon webbing with pull loops on each end, and they come in several widths, lengths, and capacities. I purchased two belts, one 20 feet and one 30 feet in length. When looped together, they give me a 50-foot belt. Both are 2 inches wide and have a rated capacity of 18,000 pounds, more than adequate to handle my 2,200-pound trailersailer.

When needed, I wrap the belt around the hull of the boat. To keep it from sliding down into the water, I loosely suspend the belt from stanchions, cleats, or other deck fittings by means of light line. At the bow, I connect my winch to the belt loops, not the towing eye, and begin winching the boat onto the trailer. Instead of putting all the strain on the small towing eye and surrounding area, it's now spread out around the entire boat. It works great.

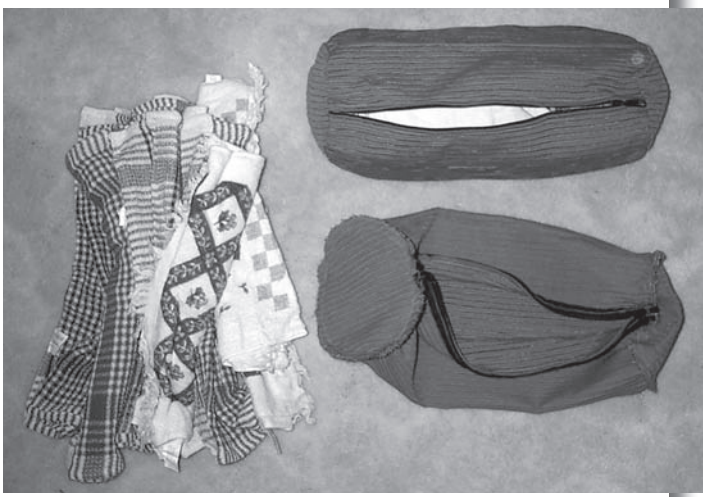
Retrieval problems are a thing of the past.

Space discoveries

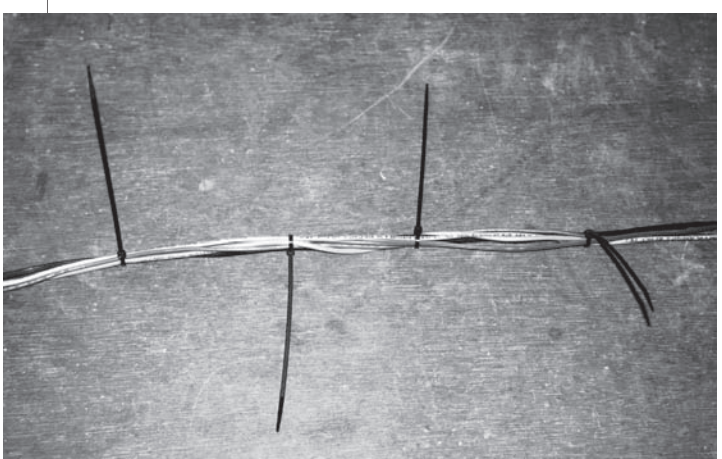
Use bolster cushions for storage

by Bob MacDonnell

Not enough room on your boat? Sounds familiar. Here's an idea: make bolster pillows or cushion covers from pieces of upholstery fabric that match your color scheme, and store tea towels, hand towels, and other linens in them. The bolsters also double as back supports.



As liveaboards, Bob and Judy MacDonnell learned many space-saving tricks. This one will give back a drawer or shelf…or two! The result is useful storage in full view.



A cure for mast rattle

Wire ties prevent a midnight cacophony

by Gregg Nestor

Awhile back, we had the occasion to spend the night aboard our boat at an unfamiliar marina. The wind was freshening and the water was stirring in the bay, causing our boat to do some rocking. About 2 a.m. (*why is it always the middle of the night when things happen?*), I was awakened by the sound of something banging on the mast. Knowing that my halyards, topping lift, and lazy jacks are all external to the mast, I guessed that I had forgotten to properly secure them away from the mast, thus avoiding such a cacophony.

I shook my head clear of sleep, zipped my windbreaker up over my pajamas, grabbed a flashlight, and headed up the companionway. I discovered that the lines had been properly secured, but the noise continued. Pressing my ear to the mast, I determined that the sound was coming from inside. The wiring from my anchor light, steaming light, and antenna were dangling about inside and causing the rattling sound. This had to be corrected but not in the middle of the night.

Later, with the mast down, I saw the loose wires that had been responsible for the noise. Since I've been wanting to install a foredeck light for some time, I used this opportunity to also eliminate the mast rattle. I fastened a messenger line to the wires at the top of the mast and pulled them out through the base. I added a pair of wires for the foredeck light and bound all the wires together using cable ties.

I placed the cable ties at 12- to 14-inch intervals, their tails left long and each offset approximately 120 degrees from the other. After using the messenger line to pull the wires back into the mast, I made the appropriate connections. Looking inside, I saw that the wire ties, with the tails attached, held all the wiring essentially in the center of the mast. It's been quite some time since I performed this fix, and I'm happy to report that my mast is rattle-free.

Cable ties to the rescue: when the wires inside Gregg's mast kept him up at night, he was determined to fix the problem by preventing them from dangling loosely.

When the engine quits, Continued from Page 32

Now practice

We hope these ideas will spark your imagination. Though many people trust their engines implicitly, remember that every scenario we have described *has* happened.

There are many things that can stop your prop unexpectedly. Boats frequently get into serious trouble because of that old foe, a line in the prop. Stern anchor rodes and jib sheets are the most frequent culprits.

A final hint: whenever you set a stern anchor, clove-hitch the inboard end of the rode to your gearshift lever. Then, when it's time to start the engine, you have a reminder to tend the rode and pull out any slack before the prop starts turning. Also, set up a reminder system so you don't start your engine until the sheets and anchor cable are secured on deck.

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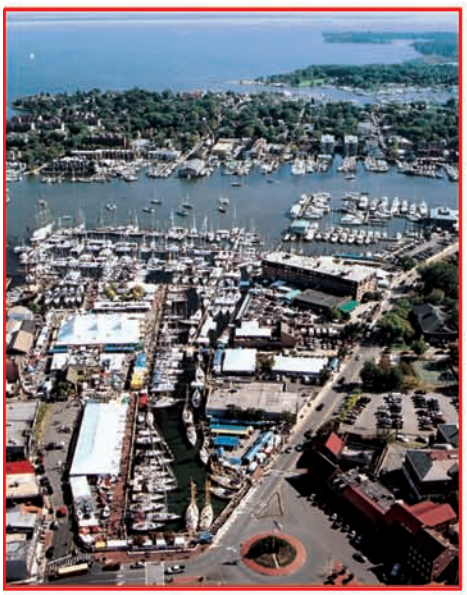

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Pre-1975 entries almost double for 2005

by Eric Manchester • photos by Jason Manchester

Sequels aren't as good as originals, so the theory goes. But, this year's Classics Race sponsored by *Good Old Boat* — part of the Swiftsure International Yacht Race at Victoria, British Columbia — launched a fleet nearly double that of last year. Over half of last year's rivals returned to challenge 19 newcomers. A Cal 20 fleet was new for 2005, and the classics divisions comprised 16 different makes of sailboat, ranging in length from 20 to 67 feet. With 90 percent of the 28-boat flotilla finishing the contest, most sailors proclaimed it to be even better than the 2004 inaugural event.

The Swiftsure event includes races with multiple divisions, sailing overnight round trips of 140, 103, or 78 nautical miles to turning points of either Swiftsure Bank, Clallam Bay, or Cape Flattery. Classic pre-1975 sailboats pursued fun and glory around one of two inshore courses. The Cal 20 fleet raced 17 miles, as did higher-rated classics. Lower-rated classics covered 22 miles. The long-distance routes were contested by many other classics that opted to test their endurance and seasickness tolerance. The regatta is run under the auspices of the Royal Victoria Yacht Club and reflects the efforts of 300 volunteers and the generosity of sponsors.

Race day — May 28th, 2005 — dawned to limp flags. Light air stifled the start area, where classics mingled in the 215-boat armada awaiting divisional guns. A problem setting the line delayed the start. Fading breezes made

departures painfully slow. Some boats languished for an hour barely past the line, struggling to grab wind rising just out of reach.

Sheltered waters

Later the wind and sea escalated, but the classics were sheltered from 35-knot winds and seas up to 12 feet that pummeled the long-distance courses. Instead, the classics divisions enjoyed 15-knot breeze and fairly flat water, with a brief dose of 20 knots and 4-foot lumps.

"The day was perfect. The course wasn't challenging. My son and grandson crewed with me, then we met family for pizza," said Pat Carey (*Kismet*, Cal 40).

When the spray settled, *Dystocia* (Cal 2-30, Bob Bentham) repeated as long-course winner; *Lifestyle* (Paceship 26, Mike Byrnes) won the short course; and *Lemon Pie* (Cal 20, Ewan Cadger) won the Cal 20 race.

"We got up our kite sooner than the leading boat, caught it by surprise, and passed it to win," said Bob Bentham.

"We had our pre-race Scotch, then motored until 17 seconds before the 10-minute warning, trying to find wind on the line. The air was tragic — less than 1 knot — and the chop stopped us. We loosened everything to keep it soft," said Mike Byrnes.

"It was great being in the big-boat starts — even better to be in a day-race and home in bed that night. We loved seeing the old boats, with their beautiful lines. We're newcomers to the Cal 20 fleet and feel humble to get the trophy. I'm sure they won't let that happen again next year," said Ewan Cadger.

Coming back next year is a recurring sentiment among competitors, according to Bob Bentham: "Friendships come out of this event."

Facing page, top from left: winners include *Dystocia* (Cal 2-30) in the long course, *Lemon Pie* in the Cal 20 one-design race, and *Lifestyle* (Paceship 26) in the short course. Other beauties below from left include *Shuttlecock* (Thunderbird), *Querencia* (Sparkman & Stephens), and *Summertime of Wight* (custom). This page, top from left: *Escape from LA* (Cal 20); Bob Bentham, skipper of *Dystocia* and second-time winner (in as many years) of the *Good Old Boat* Classics Trophy; and *Strait Shooter* (Cal 20). Bottom from left: *Shuttlecock* and *Jade* (Annapolis 44).

Boating about in a mess

Living in a work zone tests patience

by Niki Perryman

Well, we're at it again: beefing up our hard-working 1950s racer in the hope she'll sail onward for another hundred years. The job this time is replacing *Siandra's* aft saloon bulkhead, which was thrown in by some cowboy calling himself a boatbuilder in the early '70s after the original bulkhead disintegrated in a gas explosion.

It's a job long overdue. Crossing the Pacific last season, the partition continuously reminded us of its inadequacy by shrieking and groaning as the hull twisted around it. It was such a poor fit to the surrounding frames, we would stuff the gaps with multiple paddle pop sticks in our quest for a quiet offwatch. We knew the bulkhead was flimsy, but only when my partner, Jamie, dismantled it did we find it was hanging from the deck beams by a few household nails.

For the first time ever, I have no practical involvement in the work. I'm chief wage-earner, bill-payer, part-time project consultant, and sounding board for Jamie's ideas. Most importantly, I'm the dog who gets kicked on bad days.

All of this I do just a couple of feet from the work zone. It's a little like setting up office in the middle of a farmer's field with someone plowing around you: peculiar when you're accustomed to driving the tractor yourself. While I try to keep my mind on words and my fingers tapping at the keyboard, the smell of wood dust has me hankering for a chisel, a sanding block, or a paintbrush.

Living aboard while rebuilding the interior is taxing enough. Add the office, and it's a nightmare. Aft of the saloon table (including cockpit, lazarette, quarter berths, engine-box, companionway, and aft saloon seats) has become a miniature boatbuilding workshop. Ever seen a joinery bench, wood store, machine room, paint shed, and laminating department squeezed into an area smaller than your car?

Vying for elbow room

The office smothers the chart table plus a chunk of saloon berth. Forward, vegetables and pasta vie for elbow room with homeless books, the sextant, and that vital sparkplug of productivity, the espresso machine.

Our "living area" is a joke. We have a single comfy seat, so at mealtimes one unlucky butt has to perch among the tools. Visitors stay in the cockpit. We eat meals on our laps, as there's nowhere to shove the office. Wood shavings surface in cups of tea as if by magic.

> "Ever seen a joinery bench, wood store, machine room, paint shed, and laminating department squeezed into an area smaller than your car?"

Every night before climbing into bed we perform the Great Gear Shuffle, passing aft a ton of displaced equipment that spends its days on top of our bunk. At night, it litters the cabin sole — a minefield for sleepy souls who need a pee in the small hours. In the morning we shift it all forward again.

I'd be lying if I gave you the impression that we're tolerant, flexible people who can take all this in stride. We're not. The invisible demarcation line between workshop and office is hotly disputed daily. I have to vacuum my keyboard and printer to remove the dust that rains down constantly. Jamie, against natural urge and his belief in creative chaos, is forced to be a tidy worker. We both simmer at one degree above cranky.

Biting her tongue

As I write, I hear furious cussing from the workshop. Could be that the block plane has fallen into the bilge or that, in the middle of a batch of fast-cure

epoxy, he has coated the wrong face of the wood. It's better not to ask, I've learned. Just bite my tongue and pretend I'm 300 feet away in a room with soundproofing.

Meanwhile, Jamie has figured out that if my face is screwed into a frown and I'm thumping the keyboard as if it deserves a good thrashing, it might not be the right moment to tell me his dad's latest joke, mention an interesting boat he just spotted, or suggest I put the kettle on.

But there's one advantage of living aboard a restoration project: you never run out of incentive to complete the job. Despite irritations, work proceeds apace. Balks of New Zealand kauri and Australian silver ash have metamorphosed into a strong, well-fitting bulkhead. Jamie is in the final stages of rebuilding the surrounding furniture, my efforts have kept us financially solvent, and we're still speaking to each other.

It's a miracle, when you think about it.

Green flash and northern lights

I loved the essay on the northern lights and the green flash (July 2005). As a Southern boy I have never seen the aurora, but I am very familiar with the flash. A youngster growing up on the West Coast of Florida, I had clear tropical skies and an uncluttered, sharp horizon at sunset, probably the only place in the United States where this is common. Perfect observing conditions (too hazy on the Pacific coast). When I was about 12 years old, I read an article in *Sky and Telescope* about the flash (yes, it is a very real atmospheric physical phenomenon and has been photographed many times), so I started looking for it. When conditions are ideal — that is, a highly transparent sky (about 50 percent of the time in Florida) — you will see the flash in about one sunset in 10, an infrequent, but not really rare, phenomenon. If you live there and know what to look for, you will catch it often over the course of a lifetime. I've seen it several dozen times.

But I would really like to see the northern nights. The green flash is local, atmospheric refraction and scattering; the aurora is a visible manifestation of the planet as a part of the solar system, the earth's magnetic field, and ionosphere interacting with the solar wind. Like the tides, sunlight, and the Milky Way at sea, it is evidence of our direct connection to the rest of the universe. That's heavy.

Henry Cordova
Tamarac, Fla.

Gandy Dancer plays on our minds

In 1981 I started a small boatbuilding company called Spar Tech Engineering and built fiberglass rowboats from a design by William Chamberlain called the Chamberlain Dory Skiff. This boat is 13 feet 6 inches long but is otherwise the same boat as *Gandy Dancer*. I built a number of these boats with and without centerboard trunks. They will sail but are tender and not good in heavy air. If anyone would like to have one, I can provide bare hulls or complete boats. The plans for the Chamberlain Dory Skiff are available from the Mystic Seaport Museum if a home builder wishes to take on this project. John Gardner has also published a version of this design in his book, *Building Classic Small Craft*. These are very beautiful little boats that will last a lifetime when constructed of fiberglass. By the way, I find your magazine informative and interesting. Thank you.

William Wolf
Chesapeake City, Md.
wolfwe@earthlink.net

Gandy Dancer *was featured nearly a year ago in the November 2004 issue. We are still getting mail about that boat and boat plans. Author Reuel Parker is not the only one in love with that dinghy.*

Kid in a bag?

At age 2, the editors' youngest granddaughter, Eleanor Murphy, a.k.a. Nora, is already doing reliability testing (see photo above). This carryall bag from SailorBags was the editors' Christmas gift to Amy, the busy mother of three ages 2, 3, and 5. The rugged bag made from sailcloth was presented at her request. When it arrived at *Good Old Boat*, we were impressed with the durability of construction and the thought that went into pockets, zippers, and keyholders. SailorBags is at <http://www.sailorbags.com> or call 800-639-1754. (Batteries and Nora not included.)

Editors

Ted Brewer helps me appreciate my boat

I very much enjoy Ted Brewer's articles regarding design features from his work. "Planning a head" (March 2005) is a wonderful example. So often with our good old boats, retrofitting involves our becoming amateur designers or places us at the mercy of boatyard designer wannabes. Having a feel for the issues Ted has spent many designs and much training laboring over helps me appreciate what I have and any changes that wear and tear force me to consider. Kudos for another fine issue.

Ed Verner
Plant City, Fla.

A template error

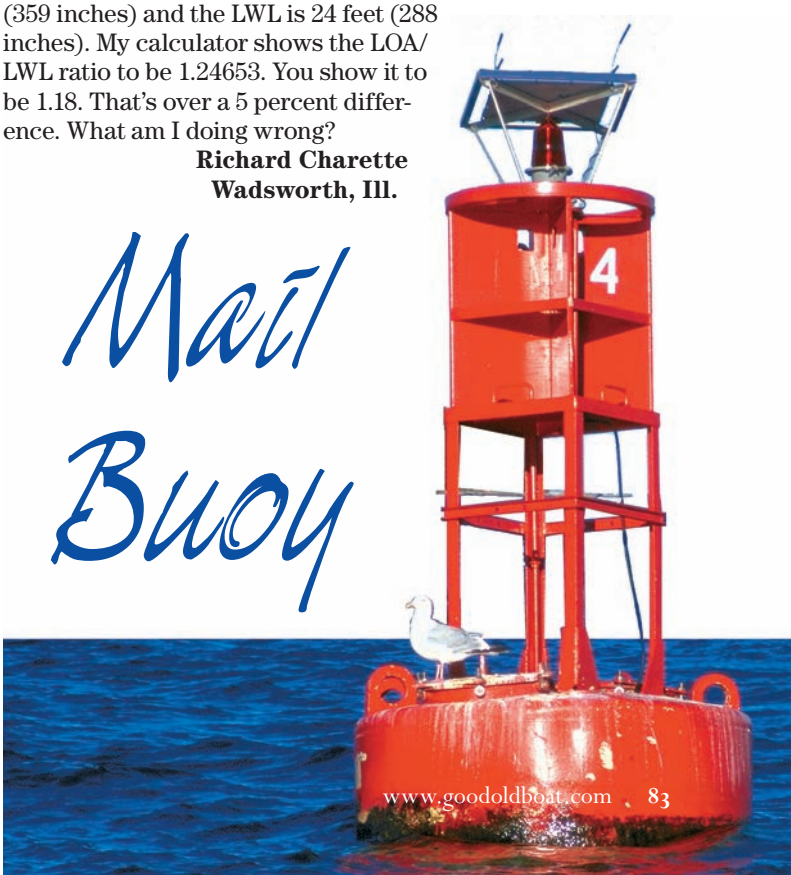
If you've ever used templates, you'll understand the significance of this next exchange between Richard Charette and Ted Brewer.

What am I doing wrong?

I always read the comparisons that are written about various boats in your publication. In the July 2005 issue, you make comparisons between the Bristol 29.9 and three other boats.

I have a 1984 Sea Sprite 30 that is in its finishing stages of a keel-up (four-year) total restoration. So I thought I would compare the Sea Sprite 30 with the boats in your article. I got stuck right off the bat when I tried to figure the LOA/LWL ratio. The LOA on the Bristol 29.9 is 29 feet 11 inches (359 inches) and the LWL is 24 feet (288 inches). My calculator shows the LOA/LWL ratio to be 1.24653. You show it to be 1.18. That's over a 5 percent difference. What am I doing wrong?

Richard Charette
Wadsworth, Ill.



Mail Buoy

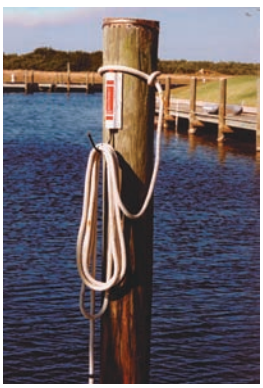
Template gremlins

Now I'm truly embarrassed. I checked the LOA/LWL on all four of the boats in the article and every darned one of them is wrong! They should be as follows: Bristol 29.9, 1.25; C&C 30, 1.21; Catalina 30, 1.2; Ericson 30+, 1.2.

I think that what happened is that I normally take a table from a previous article in order to avoid having to set it all up again. Then I insert the new names and numbers. Somehow, in going through this particular table, I skipped over calculating the LOA/LWL, so the numbers from the original table were used again. Sorry! Sorry!

I did spot-check some of the other numbers and I think that's the extent of the error.

Ted Brewer
Gabriola Island, British Columbia



Happy birthday, LineCatcher

Here's something that's been catching on lately: LineCatcher, DockCatcher, and MooringCatcher. In honor of the 80th birthday of sailor/inventor Ray Walker, let's review his catchy creations.

The first was LineCatcher, a wire hook attached to a piling with a vinyl holder for the docklines when returning to your slip. If the piling's beyond reach, a boathook will do the job nicely.

For the skipper on a floating dock, DockCatcher is mounted on the outer corner and passes the docklines to you as you pass by. No jumping off the boat to fetch the docklines. No vocal critique.

MooringCatcher followed; it is mounted on the mooring ball to hold your lines 5 feet out of the water, offering clean lines without mud or denizens of the deep.

Now that Ray's 80, he would like a partner to do the "heavy lifting" required to further develop these patented products for use on fresh water or the sea coast. You can reach him toll free at 877-666-7464 or <http://www.dockcatcher.com>. Tell him we sent you!

Editors

Drascombes

I've been interested in Luggers since reading some of Ken Duxbury's Lugworm books many

years ago. His Drascombe Lugger was very cleverly fitted out for cruising with a full tent and all necessary cruising equipment. I found the review of a rebuilt wooden Drascombe Lugger (July 2005) very interesting, but it omitted an important current source of Luggers, parts, and refurbishing of older Drascombe boats.

While Churchouse Boats has marketing rights to the Drascombe name, having acquired it from McNulty, who had taken it over from Honnor Marine (UK) Ltd. when it ceased trading, another company, Honnor Marine, bought the molds and rights to manufacture the line, although not the Drascombe name. The new Honnor Marine produces a full line of fiberglass Drascombe designs but markets them under the name Original Devon. They will also, I understand, refurbish older Drascombes. I don't know if they have any North American suppliers yet, but information is available on their website, <http://www.honnormarine.co.uk>, and the principal of the new company, Bob Brown, is very friendly. Anyone interested in a Lugger, or one of the other Drascombes, such as the slightly smaller Dabber or the bigger Longboat or Coaster, would do well to check out the Honnor Marine website as well as Churchouse Boats.

Incidentally, I have no connection with either of the current companies. I bought a British version of the Rob Roy 23 from the original Honnor Marine (UK) Ltd. after it acquired the rights to that boat and met Luke Churchouse when he was managing director of the original company. I liked him very much, and the company was a good one to do business with. I corresponded with Bob Brown, mostly out of interest as to whether there was any consideration of Honnor Marine putting the Rob Roy back into production.

Robert Lewis
Brooklyn, N.Y.

Welcome aboard, Hal Roth!

I think you've got a good thing going with your magazine. In the other magazines, I'm tired of reading about this yacht that costs $3.2 million or $1.3 million. These people are not in the real world.

Hal Roth
Easton, Md.

Got a PURflux fuel/water separator?

For the benefit of owners of good old Dufours and other makes with PURflux fuel/water separators:

I recently overhauled the entire fuel system and had difficulty finding the CN135 filter elements for the PURflux PP99DN fuel/water separator, which was original equipment along with the Volvo Penta MD6A diesel in my 1974 Dufour Safari 27. The filter has served me well for many years, since 1979 when I got the boat. I have periodically tapped off a little water, but I don't recall actually taking it apart before. I rinsed the element in gasoline to remove some trapped particles and was surprised by its good condition after three decades, but I'm sure it has a finite life and will one day crumble in my hands. I like to have critical spares aboard, though in this case the separator would probably work without this first filter element in the system. (Next in line is the screen in the fuel lift pump, then the fine filter canister, both on the engine.)

After much web searching and email messages to a dozen firms, I was finally referred by the manufacturer, PURflux/Filtrauto in France, to its sole U.S. distributor: Western Hemispheres in California, where I was able to order the filter ($9.75 plus $7 shipping). The firm sells car parts (the filters are used in many European makes), but you can search by filter part number (CN135 or PF-CN135). If you still have the original equipment, you might be interested in this lead: sales@pieces-international.com, 800-222-3320. The company's website is <http://www.westernhemispheres.com/>.

Jim Caskey
Rockville, Md.

What does woman want?

It was with great pleasure and a touch of pride that I read your article, "What does woman want?" (January 2005). I say pride because I am lucky enough to be living my dream aboard OUR sailing catamaran here in the South Pacific. I learned long ago that if I wanted Mary, my wife of 34 years, to join me, I would have to do exactly the things you described in your article. Eleven years ago Mary and I had been enjoying living aboard our 25-foot Columbia, *Dream Weaver*, for four weeks each summer in the northern waters of Georgian Bay, when I asked her if she would be willing to live aboard full-time when we retired.

She said, "Yes," followed by a list of parameters that would have to be met. WE proceeded over the next 10 years to meet every one of those parameters. In January of this year, after selling everything we owned in Windsor, Ontario, we flew to Sydney, Australia, to take delivery of OUR 12-meter catamaran, *Bella Via*, complete with two separate cabins and

two heads, two of the necessary requirements for her to live aboard full-time. Mary says, "Two heads are better than one." Of course, I know that two heads are twice the maintenance.

A few weeks ago I made my first bluewater passage from Sydney to Noumea, New Caledonia, and back to Brisbane. Unfortunately Mary, due to family needs, was not able to make this trip. I'm proud to say that she was deeply disappointed. She will most certainly be on the next passage. We expect to sail the east coast of Australia for six to nine months and then explore the many islands of the South Pacific. We are a long way from our home waters of Lake St. Clair, but 10 years of sailing, studying, and planning as a team got us to this wonderful situation today. Like you said, "Get her involved from the start."

Paul Major
Out cruising

Another aspiring double-braid splicer

I have a 1973 San Juan 24 that's been in my boat shed for nine months getting a refit. I, too, am an aspiring double-braid splicer. The most effective instructions I've found so far are in *The Marlinspike Sailor* by Hervey Garrett Smith. I've found the method to work on new and used rope. I run my used lines through the washing machine with a bit of fabric softener before attempting splices. When I finally get them untangled, they splice quite well.

Similar instructions are available at <http://www.samsonrope.com/home/recmarine/splicing/index.cfm>. Tips and instructions for splicing used lines are included. In fact, Hervey Smith's instructions are for Samson ropes, so maybe that's where he got the info. Anyway, it works for me!

Peter Jacobs
Victoria, British Columbia

Bonded with this one

From time to time the editors receive a marine product to test. Shown at right is the sun visor, which hooks on the earpieces of a pair of glasses, that got a good reception with Karen. It's called ProShade and is touted as being a visor, an eyeglass case, and a lanyard (which can be tightened to prevent loss of those expensive glasses). Karen wears hers with a bike helmet for biking, as well as on the boat. The black underside of the visor cuts glare. The company says the visor floats a pair of glasses. (We have not yet tested this claim!) Check out <http://www.proshade.net> or call 727-867-8238.

Editors

Step-down keels

In response to the letter about the Scheel keel and the American 23 in the July 2005 issue Mail Buoy, Ted Brewer writes:

My one disagreement with a patent was the Scheel keel. Henry Scheel managed to patent it, somehow, but I have a drawing from the Webb Institute class of 1890, or thereabouts, with a sailing yacht fitted with that type of keel. Bill Luders' father was in that class at Webb. Still, Scheel collected a lot of royalties on a patent that should never have been issued. Besides, the keel didn't work!

Ted Brewer
Gabriola Island, British Columbia

Columbia logowear

News for Columbia owners: Capt'n Pauley Productions has signed a licensing agreement with Columbia Yacht Corporation for the use of the Columbia logo. Capt'n Pauley is offering clothing items such as T-shirts, sweatshirts, and hats, as well as other items including mugs, stickers, and mousepads. Burgees will be available in the near future. For further information, contact me at <pesterle@preferred.com> or 302-224-0273, or visit <http:// www.captnpauley.com>.

Paul Esterle
Newark, Del.

Magazine abuse

I just subscribed to your publication after looking at the sample issue … wow! I have not abused a magazine this badly in my life! I think I have read every word several times, including the advertisements. I found your website while trying to figure out what boat I was looking at on the side of the road next to a barn. After I contacted the owner, I found that he had eight days to have it off the property after an estate sale. I bought it for $250.

Lee Smith
Gridley, Calif.

Send questions and comments to *Good Old Boat*, 7340 Niagara Lane North, Maple Grove, MN 55311-2655, or by email to jerry@goodold boat.com.

RICK VOSS

Wanderlust

Lake Huron or bust

by Jerry Powlas

Different people are disposed to do different things. When I met my editor and wife, I was happily sailing around triangular race courses on a large lake in the Minneapolis suburbs. I had been doing that for many years and was quite content to continue thus . . . into the foreseeable future. She was a sport. She became my crew. Finally when our relationship was strong enough to withstand it, she asked what was the big deal about sailing around buoys a mile apart in the same part of the same lake three times a week, spring, summer, and fall.

This line of reasoning lead to our buying a nice coastal cruiser, which we kept in the Apostle Islands of Lake Superior . . . 250 miles from our home. After about a dozen years — during which I was completely contented sailing on Lake Superior — she began a campaign to sail elsewhere. I tried to ignore this. The messages got stronger. Her log entries, which had once waxed poetic, were getting shorter and shorter. She had the wanderlust.

Now, Lake Superior is not that small and confining. I got out my *Economist Pocket World in Figures* and looked it up. According to that reference, there are 174 countries in the world; 61 of them are smaller than Lake Superior. The lake is larger than Ireland. It is about the size of Switzerland and the Netherlands combined. I was happy in Lake Superior, and I was quite content to continue sailing there . . . into the foreseeable future.

Nope.

When a guy has a wife who is a skilled and enthusiastic sailor and she wants to move on, it is certainly in the best interests of the man, woman, boat, and the plot line of the story to move on. So other than shakedown cruises to make sure *Mystic* is ready, the first real sail of the season will be across the lake 400+ miles west to east, through the Soo Locks, and across half of the North Channel in Lake Huron.

There now, that will be an all-new cruising ground. All new . . . for a while. Then what? I've seen it happen twice now. I think I know what's next.

Beyond the breakwater

Away from the hurly-burly, drifting in contentment

by Jim Ayres

I know a magic place. A place where there are no 10-mile-long traffic jams, no honking horns, no howling disk jockeys or lying politicians, and no hurly-burly scrum for money. A place where you can look back on all of that as it fades away into the distance. A place where elemental forces prevail and peace comes with the knowledge that you are in the hands of something much larger and more powerful than you can ever be, where the only sounds are the lap of water, the rush of wind, and the gulls' cries.

Here is how to find it: clear the harbor… pass the breakwater… turn off your engine and set sail in any direction away from land. Send your senses outward. Feel the heaving power of the sea as it carries you away. After a mile or so, heave to. Drift now in the lap of the sea. Feel the damp breeze on your naked skin. Trail a hand in the water of life. Maybe a dolphin will glide under your hand and press its smooth cold skin to your palm, greeting you in the language of our planet. Breathe in harmony with the swells. Sailing is, above all, sensual.

Drift now in the lap of the sea. Feel the damp breeze on your naked skin… Sailing is, above all, sensual.

Look back at shore. The buildings of any city will have taken on their proper insignificance in the ageless order of the universe. Here is where life began, and here you can get a clear look at the true nature of our world. All the lessons needed for life can be learned here. You can sail to Cebu or Madagascar or the enchanted isles, but whatever magic you seek or need can be found here, a mile beyond the breakwater.

We don't conquer it

No one conquers the sea. No one really conquers anything, except himself, and accomplishing that task comes more from acceptance than overcoming. There are times when we must beat into the wind to stay our course, but to get where we are supposed to be, we must find the right course just off the wind and work with the forces of the universe. Headlong, insistent banging into the wind will result only in being thrown back down to try again.

Deep in the night, I dream of long Pacific swells rising and falling away off the coast, and I float on them in a small sailboat, balanced to go wherever wind and wave might take me. The swells surge, fathomless, green and dark, with power enough to take me anywhere. Strands of kelp fringed with foam break the surface, gulls cry and wheel, and the land, sere and baked, drifts farther and farther behind. I float in pelagic communion, knowing that I am no more and no less than the gulls or the kelp or the plankton. And I am comforted by that knowing.