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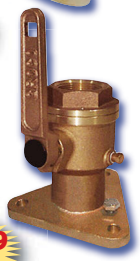

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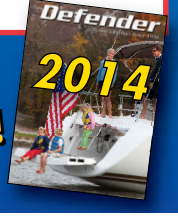

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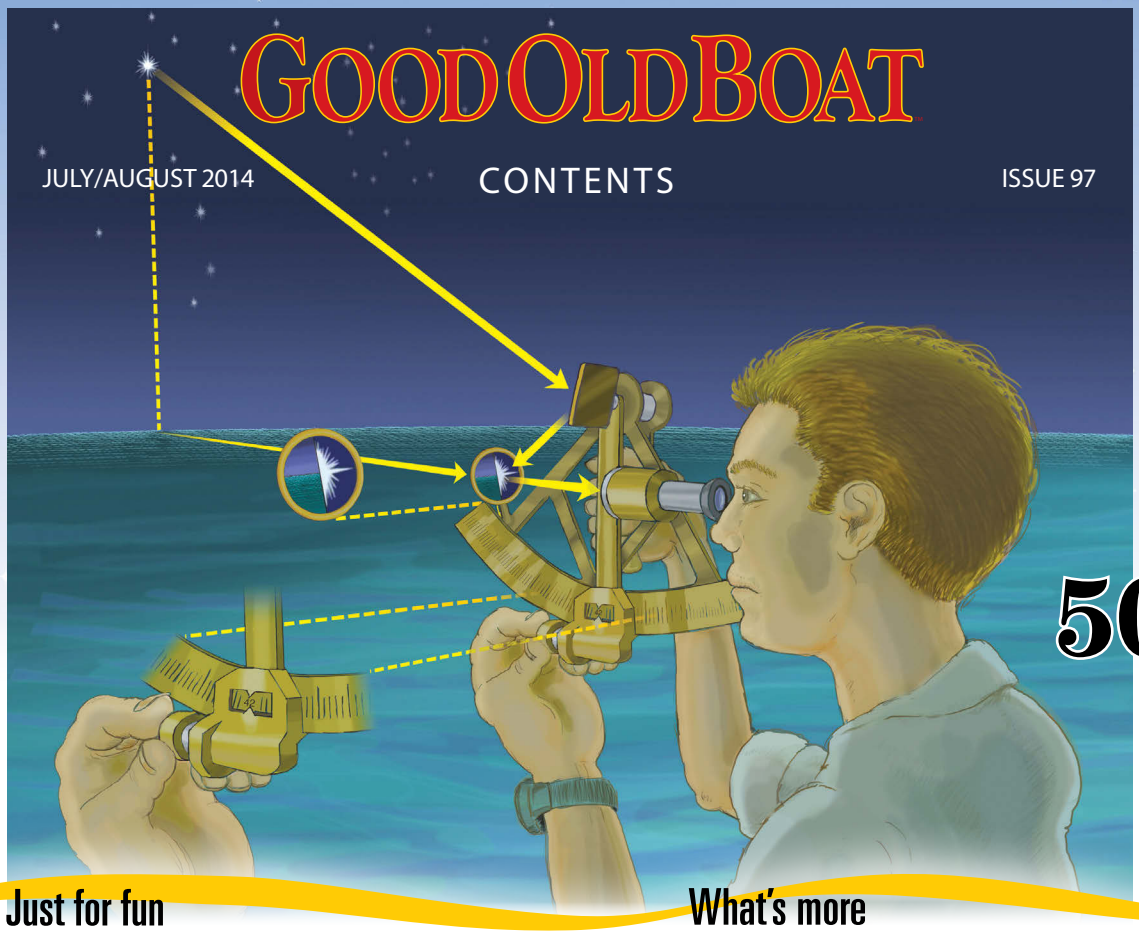

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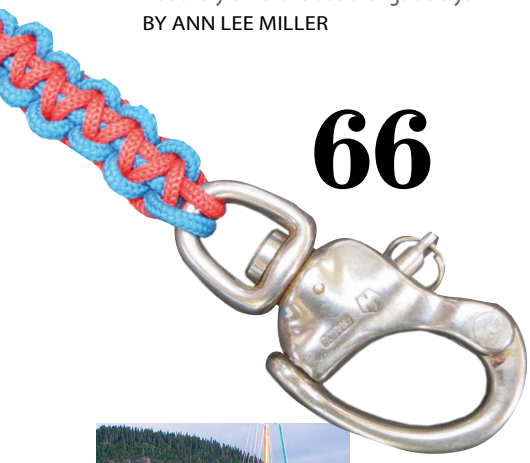
Just for fun



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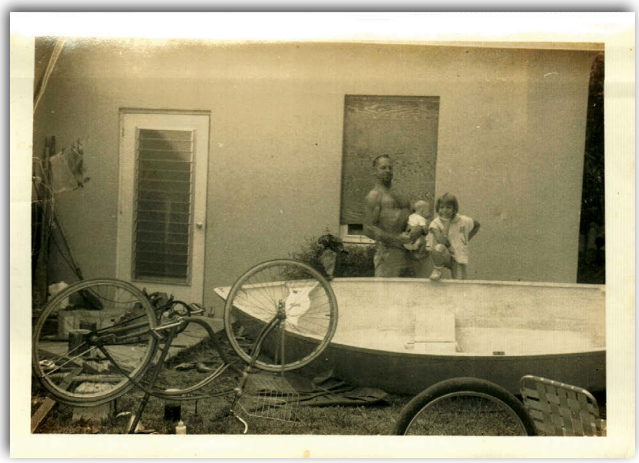

On the cover . . .
Fred and Jennifer Bagley met Brian Grabia, the solo sailor of *Tara*, in a remote anchorage on the northern shore of Lake Superior. *Tara* is a Baba 30 whose homeport is Bayfield, Wisconsin. Fred took this portrait in Ontario's Woodbine Harbor.

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Tom Wells, the official Good Old Boat Troubadour (check our masthead at left) has released two CDs with 12 of his original songs on each one. He composes all the music and lyrics, sometimes funny and sometimes philosophical about the joy of sailing. The CDs are available for download for $9.95 each at www.AudioSeaStories.com. When you listen, you're likely to recognize yourself or someone you know. Try the free sample songs there to see if you agree.

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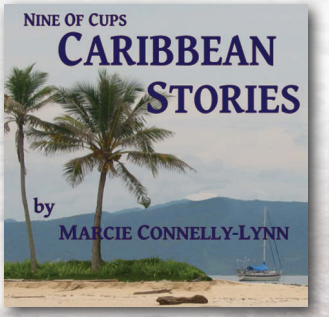

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Defensive sailing

Being prepared for the "what ifs"

BY KAREN LARSON

PHOTO BY TOM WELLS

Decades ago — when I took driver's education in anticipation of my 16th birthday and in the hope of earning a much-valued driver's license — they taught a concept called defensive driving. More years than I care to admit have passed since then. I once more have a 6 in my age, but it isn't that all-important 16. I'm OK with that. I wouldn't want to go through those teenage years again . . . unless I could do it with the wisdom I have accumulated since then.

I'm not sure defensive driving is taught anymore. Based on what I see on the roads these days, I'm almost certain that driver's education has adopted a new lesson plan. My observations tell me that video games have helped our youngsters develop lightning-quick responses, but their awareness of what unexpected things their fellow drivers might do seems to lag behind and a regard for the consequences of their actions seems more limited. In a video game, you just push "reset" and you get to do it all again. But there I go, sounding very much like a 60-something.

> "We are, after all, land-based mammals within the flimsy protection of somewhat imperfect craft surrounded by water."

Defensive driving meant thinking in terms of "What if?" and preparing yourself mentally to respond appropriately if one of those scenarios played out. It meant considering what unexpected thing a pedestrian or another driver might do, how the weather might change the driving conditions, or what you might do if the car broke down or you made a navigational error. What if the driver in the next lane drifts into my lane? What if an emergency vehicle comes by? What's the best way to recover if I miss my turn? What if the driver ahead of me is gesturing animatedly with both hands while swerving in the lane? What if someone suddenly steps or pulls out into the street?

In the end, all my musings come back around to sailing. It occurs to me that the best sailors are the ones who sail defensively. We are, after all, land-based mammals within the flimsy protection of somewhat imperfect craft surrounded by water. It's up to us to think about what unexpected things our fellow mariners in all kinds of watercraft might do. It is important to be alert for changes in the weather, and to know when to reduce sail.

It's vital to keep our sailboats in good working order in the hope of avoiding the awful cascade of events that results when everything seems to go wrong at once. I guess that concept might be known as defensive maintenance. It's critical to be able to preview the next several steps in a docking maneuver or sail change evolution and to let our crewmembers know what their roles will be. Jerry is the king of this kind of thinking. The evolutions almost always go as he foresees them. But when they don't go as predicted, it's important to have an alternative plan ready to go.

Sailors' brains are almost always thinking a step ahead. What if the wind shifts when we round the point? What if the engine fails? What if a line chafes through? What if the furler jams? What if we hit bottom? What if fog settles in? What if the GPS blacks out? What if the anchor drags? What if this protected anchorage becomes a lee shore in the middle of the night?

The "what ifs" are endless. We needn't dwell on them in the benign conditions that we typically enjoy. Sailing is about enjoying our time on the water. But we will enjoy our time aboard more if we feel safe and secure and prepared for pretty much anything. Sailing defensively may in fact make it more possible for us all to experience those sublime and tranquil moments aboard that drew us to become sailors in the first place.

Have a great sailing season this year and please sail defensively. We value every single reader!

Rayner memories, table enabled,

Rayner memories

In the May 2014 issue you have an article about Denys Rayner. Pete and I owned one of his designs, the 20-foot Westcoaster, for a couple of years. It was the precursor to the Westerly 22 and built out of laminated plywood. It was a darling little boat. We changed its very weary Bermudan rig for a junk, of course *(see Annie Hill's article, "Building a junk rig", March 2014* **–Eds.**), and spent three months living aboard her in Brittany. The mast was in a tabernacle and we would find a suitably high object (e.g., a bridge) from which to raise or lower the mast, so we could go in and out of the canals and wander around that beautiful part of France at will. With neither rigging nor spreaders to get in the way, and with the mast about the same length as the boat, once it was lowered it was rarely an issue. We had a 2-horse-power, 4-stroke Honda outboard, from which we got 25 miles to the (imperial) gallon in the canals! It was such a joy, and I don't recall spending a happier three months.

–Annie Hill, New Zealand

Table enabled

Thanks for the recent article on a folding bulkhead table with shelves ("An inspired table," March 2014). It was just the inspiration I needed! I recently bought an older 24-foot S2 that needed a new table (among many other things on my to-do list) and after reading your magazine I tried a version for myself. Mine is made out of ½-inch birch plywood and much simpler than the excellent one in the article, but it should work just fine for our small cruiser. Thanks for the idea.

–Stan Ferris, Tempe, Ariz.

The doctor is in

As always, I enjoyed the cover of the March 2014 issue of *Good Old Boat* . . . and the rest of the issue as well. As a semi-retired psychiatrist, I've long been acquainted (as I'm sure you have) with the snarky comment, "Well, he doesn't have both oars in the water." (Sincere apologies to the fellow in the boat on said cover.) I'm thinking this comment could apply to most of us who enjoy puttering with old boats. My personal craft is a 1973 Pearson P-30. My son's is a 32-foot Skerry class yacht built in Scandinavia in 1929 and currently under restoration. Oars in the water, half a bubble off — keep the good stuff coming!

–John B. Crane, MD, Washington, Mo.

Digital subscription kudos

I was hesitant about going digital because I have tried two other digital subscriptions recently. In both instances, I was forced to use a crippled reader to decode their proprietary formats. It made reading their digital versions difficult and I went back to paper.

In contrast, I like the PDF format you use. It allows me to pick the PDF reader of my choice and I have found a very nice one for my Android tablet. I find it much better than even the Kindle and Nook apps and it is a perfect complement to your format. I have a high-resolution tablet, so reading your PDFs in landscape mode (two pages, like one would read a paper magazine) is easy to do and doesn't give me eyestrain.

The app is EzPDF Reader. I use the Pro version because it only costs a few dollars and, when I find a good program on the Android market, I like to support the developers. The company that publishes it is called Unidocs (m.unidocs.com) and, in checking their website, I see they have a version for iOS as well. Another feature I like about EzPDF Reader is that it puts thumbnails of the pages across the bottom of the screen, so you can navigate large documents visually, rather than having to guess page numbers.

All in all, I am very happy with my decision to subscribe to the digital version of GOB.

–Michael Tackie, Murrysville, Pa.

Gadget-filled boat

Why go real-time sailing when you can cruise in virtual reality from the comfort of your home and pay for it all in bitcoins?

–William C. Winslow, New York, N.Y.

and easy e-reading

Birds be gone

I just read the article about bird-proofing lifelines in the March 2014 edition of *Good Old Boat* and want to say that I have used a similar system for many years to keep the seagulls off my sailcover. I have a small piece of shock cord around the mast, then a monofilament line from that cord to a hook at the tail end of the boom. I position the line about 6 to 8 inches above the sailcover and "Voilà!" — no mess from the gulls. Since the birds don't like the line above the sailcover, they also stay away from the lifelines.

–Robie Nickerson, Weymouth, Mass.

Department of corrections

Whoops! In our March 2014 issue, we misspelled the name of Brian Arthurs, one of the participants in the Swiftsure Race. To add to the confusion, we noted that Brian had won the race overall in 1985. What we really meant to say was the 1973 Islander 36 named *Cheetah*, now owned by Brian, won the honors in 1985. *Cheetah* was owned and sailed at the time by Peter Clarke.

–Editors

Reinpin or Ronspeg?

The May 2014 issue arrived today and it opened to Jim Shroeger's article about the "Reinpin." Hey! I know that trick! I use Ronspegs (a name I just created after reading about Reinpins) to make good use of several spaces on my Dolphin 24. The images show how I turn a single-seat settee into additional galley workspace. I also use these pegs to convert a settee into a dining table arrangement for two or to cozy dining for four, to install a cockpit table, and to hold seat backs up and out of the way. There are photos and explanations on the Dolphin 24 website: www.dolphin24.org/ronspeg.html.

–Ron Breault, Old Lyme, Conn.

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

Dick Cooper took the photo below of *Esperanza*, a 1963 Hinckley Bermuda 40, skippered by Virginia Albert sailing past Thomas Point Light during the 2012 Elf Classic Yacht Race from Eastport to St. Michaels, Maryland. Send your high-resolution sailboat photos to jstearns@goodoldboat.com and we'll post them on our website. If we publish yours here, we'll send you a Good Old Boat T-shirt or cap.

Bloxygen believer

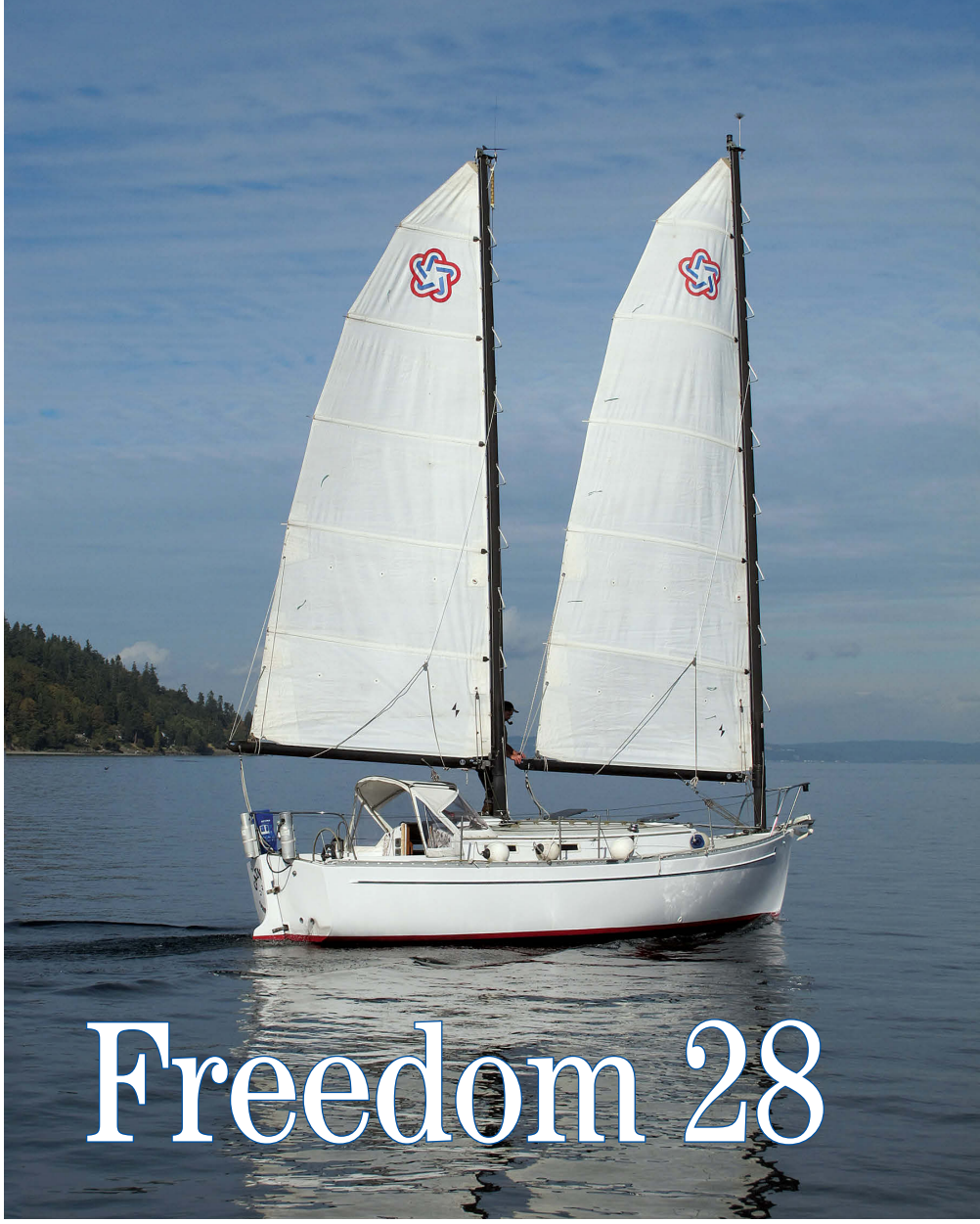
To repaint the battery tray in my boat, I just reopened a half-full 1-gallon can of primer that I last used more than eight months ago. The paint was totally liquid with not even a skim on top. I sealed this one with Bloxygen as I always do with the expensive marine finishes. It works; it pays.

–Lynn Meissen, Morro Bay, Calif.

This sure isn't Kansas anymore, Toto. Charles Walker's favorite lighthouse is at the harbor entrance at Bahia San Francisquito on the Sea of Cortez in Baja California, Mexico. Send karen@goodoldboat.com a high-res photo of your favorite aid to navigation. If we publish it, we'll send you a Good Old Boat cap or T-shirt.

A rare cat ketch and uncommonly good coastal cruiser

BY RICHARD SMITH



Freedom 28

Tom Curley pulled into the marina parking lot on his Victory motorcycle. We stood there admiring this eccentric machine, its form obediently following its function to the smallest detail. Walking down the ramp and along the dock we came upon the stern of Tom's Freedom 28, *Catnip*, the subject of this review. Twin 2-gallon propane tanks slung over the stern pulpit suggested a sense of purpose. It appeared that the design and arrangements of this boat were, like those of the Victory, inspired by practicality.

The most obvious eccentricity of the Freedom 28, brainchild of innovator and passionate sailor Garry Hoyt, is its cat ketch rig with unstayed masts. Garry was dissatisfied with what he took to be the unnecessary confusion of rigging and the complicated handling of modern sailboats. The Freedom's rig eliminated the profusion of shrouds, stays, turnbuckles, chainplates, and associated parts. In collaboration with Everett Pearson of Tillotson-Pearson Industries, he brought the concept right up to date with free-standing carbon-fiber masts.

In the mid-1970s, Garry asked Halsey Herreshoff to design the hull of the Freedom 40, the first boat in the line, as a platform to test the spars and to work toward his vision of a new sailboat. He eschewed the fin keel and spade rudder concept and, in a bold move, eliminated the headsails, dividing the sail area between a mainsail and mizzen of almost equal size. Like L. Francis Herreshoff, Garry wanted to use 16-foot oars instead of an engine, but later gave up that idea as unmarketable. The sails were self-tacking and wishbone booms were offered as an option on the 40.

Following the 40, Garry introduced a whole new line of Freedoms: a 33, a 44, and the 28 — all with carbon-fiber free-standing masts as standard. As with the 40, the original Freedom 28 had a long shallow keel and a centerboard, making it an ideal gunkholer.

A simple singlehander

Catnip, hull #37, was built in 1983 and Tom has owned the boat for 13 years. He has sailed her north through the Gulf Islands and along the coast of British Columbia. Though often sailing with crew, he prefers to cruise solo and finds the Freedom 28 ideal for this purpose. Tom finds the size just about right. It's small and handy enough to work into unfamiliar and crowded marinas and, with its 4-foot 6-inch draft, he anchors in places inaccessible to larger boats. At the same time, with all lines led aft to the cockpit, the single-line reefing system, and a single self-tailing winch, he's more than able to cope with the open water in the straits of Juan de Fuca and Georgia. *Catnip*'s mizzen weathercocks the boat and she will readily heave-to with the mizzen reefed. Good bluewater boats, Freedoms have crossed the Atlantic and the North Sea.

As Tom sees it, the main advantage of the Freedom 28 to the solo sailor is the cat ketch rig. Tacking requires only that the helm be put over until the boat is on the new tack. There's no jib to mess with. Main and mizzen sails can be set wing-and-wing for balanced downwind sailing and a staysail can be rigged between the masts to add more

Tom Curley tends lines on the cabintop of his Freedom 28, *Catnip*, as she sails herself under her cat ketch rig, a trait that makes her very adaptable to singlehanded sailing.

> “The outboard rudder is virtually foolproof, especially with the emergency tiller readily at hand.”

The outboard rudder makes fitting an emergency tiller very easy, above.

area. The mizzen also makes a good riding sail when at anchor, keeping the boat head to the wind. *Catnip* is fitted with two sets of lazy-jacks (some say lazy lifts) to hold up the booms and reduce the perils of furling.

Cockpit and deck

The Freedom 28's cockpit is Spartan though comfortable. The port seat locker, being above the quarter berth, is shallow, but a great place to stow the companionway dropboards. Opposite to starboard is a large, deep locker that contains the manual bilge pump and allows access to the rear of the engine, the transmission, and the dripless shaft seal. A bridge deck helps keep cockpit water out of the cabin and, as part of the main bulkhead, stiffens the hull. The engine controls are placed conveniently for the helmsman. A slotted scupper in the transom is large enough to drain large quantities of blue water from the cockpit in a hurry but small enough to keep out the brunt of following seas. The outboard rudder is virtually foolproof, especially with the emergency tiller readily at hand in a cockpit locker. Tom says he removes barnacles from his propeller and shaft by leaning over from his dinghy.

All the running rigging, including sheets and halyards for both main and mizzen, vangs, and reefing lines, is led to the cockpit and tended by one Barient 23 two-speed, self-tailing winch and a bevy of clutches. An Autohelm autopilot is handy when sailing singlehanded.

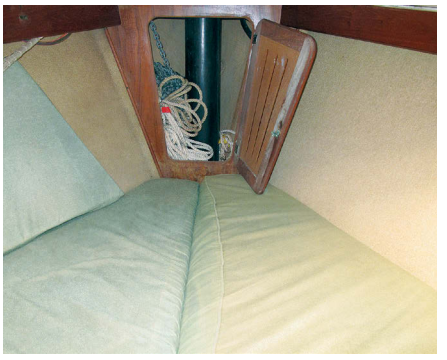
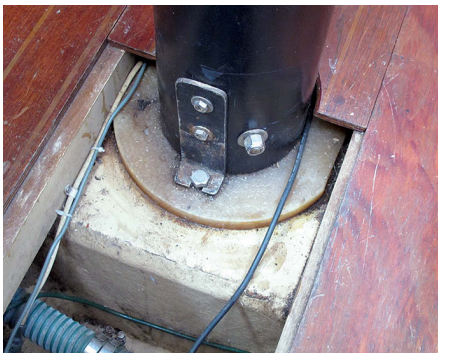
The wide sidedecks are bordered by heavy slotted-aluminum toerails outboard and a low, high-crowned cabin trunk inboard. In the absence of shrouds, they are obstruction-free. The mainmast and its collar, as well as a pair of heavy 10-inch mooring cleats, and chocks, greatly limit foot room on the bow when docking and anchoring. The shaft of *Catnip*'s 33-pound Bruce anchor, stowed on the solid 1-inch aluminum anchor sprit, is lashed to the deck between the deck hardware. Fitting a windlass on this fore-deck would be a challenge.

Construction

The hefty carbon-fiber masts are 6½ inches in diameter at the base, tapering to 3¾ inches, and are said to be as much as four times as strong as aluminum. Each one is bolted to a beam above the ballast with steel angle brackets. Freedom offered wishbone spars as an alternative to *Catnip*'s more conventional aluminum booms.

The hull is a hand-laminated fiber-glass sandwich with an end-grain balsa core. The deck is similarly constructed and the deck hardware is well backed up. The aluminum toerail and deck flange are fastened to the hull flange at 6-inch intervals with 5/16-inch bolts and 3M 5200 adhesive sealant.

Other than the shower pan in the head, the Freedom 28 does not have an interior liner. Bulkheads and furniture




The mainmast is stepped through the foredeck, at left, leaving very little room for the anchor and associated hardware, not to mention working crew. It almost fills the forepeak, center, but there's room for an anchor rode. The mizzenmast is bolted to its step under the saloon sole, at right.

Two versions of the Freedom 28 were built. *Catnip* is the one without the centerboard, which makes the saloon more open, at left, and places the head forward. The mizzenmast is prominent but does not interfere with use of the galley, at right. The quarter berth is visible on the port side.

are built of plywood and secured to the hull by tabbing. Handrails, ventilators, and other deck fittings are bolted through the deck with fasteners that are exposed in the cabin and readily accessible.

Belowdecks

The small forepeak is mostly filled by the mainmast, though Tom fits 60 feet of ¼-inch chain and 250 feet of ½-inch 8-plait nylon rode there. In the forward cabin two 6-foot 6-inch berths can be joined with an insert filler. There is stowage beneath, and a door closes off the cabin from the rest of the boat.

Aft of the cabin are some lockers to starboard and, on the port side, the head, which has a vanity sink, adequate stowage lockers, and a toilet that's plumbed to a 25-gallon holding tank. A Beckson opening port ventilates the compartment.

In the saloon, which is traditional in design, a 6-foot 6-inch settee to starboard provides a berth with the feet tucked in forward under a shelf. A 50-gallon water tank and the water pump are fitted beneath this settee. A U-shaped dinette on the port side seats four and, when the table is lowered between the seats, makes a double berth. Compared to the 6-foot berths on many boats this length, the extra 6 inches are a luxury, and a necessity for a 6-foot 3-inch sailor like Tom Curley.

Storage wells run outboard of the settee and dinette areas. The saloon is lit by two deadlights on each side and an opening portlight forward on the starboard side. Some people might find the large mizzenmast intrusive, stepped as it is between the saloon and galley, but it's handy to grab hold of or lean against in a seaway.

Ample teak creates a warm, snug feeling in the saloon while contrasting white surfaces in the galley differentiate the work space from the lounging area. A teak-and-holly sole runs throughout the boat. Hatches allow access to the bilge. Partial bulkheads separate the saloon from the galley and quarter berth and provide welcome handholds.

The L-shaped galley occupies the starboard side next to the companionway. It is fitted with a two-burner propane stove, but Tom prefers the single-burner Force 10 Sea Swing gimbaled propane stove he mounted above the counter. A 5-cubic-foot well-insulated icebox occupies the corner and a deep sink is adjacent to the ladder. Lockers and deep drawers to starboard of the companionway ladder provide adequate stowage. A 22-gallon fuel tank is located below the quarter berth, abaft the low dinette bulkhead.

Comments from a Freedom 28 owner

Our Freedom 28 had a centerboard hidden below the 8-foot drop-leaf saloon table. It was ballasted with lead and weighed 800 pounds! The ballast ratio was about 50 percent, so despite the shallow draft she was fairly stiff, even with the board up.

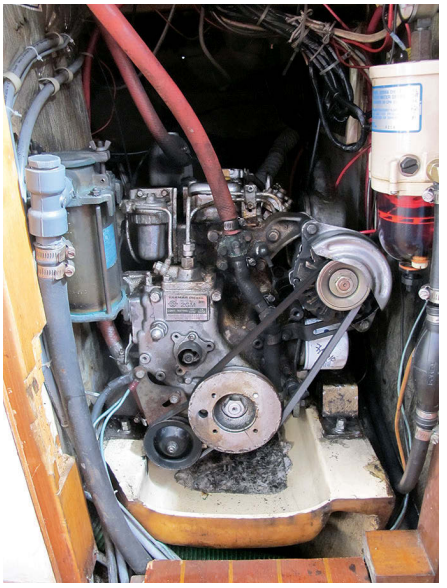
She was sluggish in light air, but could really move on a reach or run in anything over 10 knots. With my 249 PHRF rating (*other fleet ratings vary from 192-222 –Eds.*), we were able to hold our own and took a couple of thirds and one second in our B class. She also did well in any race with a long reaching leg and tacked pretty well considering her handicaps of centerboard, long keel, and barn-door rudder.

The interior was beautifully furnished in light wood with teak trim and the layout, while short on floor space, made sense. She had no full bulkheads within the cabin, and so much storage we would sometimes lose items for a while because of the great number of compartments.

She had wheel steering with the quadrant exposed at the stern and the cables run under the cockpit, making it very easy to service. The cockpit was deep and very comfortable.

Due to poor bedding by the former owner, we had core problems on both sidedecks, the cabin roof, and the transom, where the swim ladder was installed but not bedded. The engine always ran fine, but the tank leaked. Since it was under the engine, I emptied it and installed an 11-gallon black PVC tank in the starboard cockpit locker with an electric fuel pump. I also had to replace the ¾-inch shaft, which tended to whip and come loose from the coupling.

—John Fernandes, Warwick, Rhode Island



The engine is behind the companionway ladder, at right. Access to it can also be had from the galley and from a cockpit hatch.

The engine

A Yanmar 2GM powers the boat and, as in most boats of this size, it's a tight fit in its sound-deadened box. Removing the companionway ladder is the primary means of access. A 16-inch 2-blade propeller is a good match for the boat.

Under way

I couldn't wait to sail this boat and see for myself how she behaved. It was early autumn, sunny, cold, and breezy — ideal conditions for a trial sail. We cast off and headed for deep water. We came into the wind and Tom hoisted the mizzen, winching it up the last foot or two. *Catnip* was then weather-cocked, and it took very little to keep her head up. We shut down the engine, quickly raised the main, and trimmed for a broad reach.

We were in a 2-foot chop and headed toward whitecaps. In the 12- to 15-knot wind, with sharp gusts upward of 20, *Catnip* made 5 to 6 knots. She had an easy motion, neither pitching nor rolling excessively. I had the feeling that she would be similarly seakindly in heavier weather. The remarkable thing was how well she steered herself. With the wheel locked, the boat changed course as the wind changed and, for long periods, we didn't have to touch the wheel.

Bringing her close-hauled, Tom showed me how he trimmed by the main and adjusted the mizzen to avoid luffing. The cat ketch is not an especially close-winded rig and, without travelers for the sheets, the booms cannot be brought amidships, but *Catnip* footed well to weather nevertheless. Still, this is not a boat that can be pinched to gain a few degrees on the wind.

Heading for home, we ran wing-and-wing. She would wander a bit either side of the wind direction, and when we fell off a wave we jibed. I was grateful that there were no shrouds for the boom to slam against.

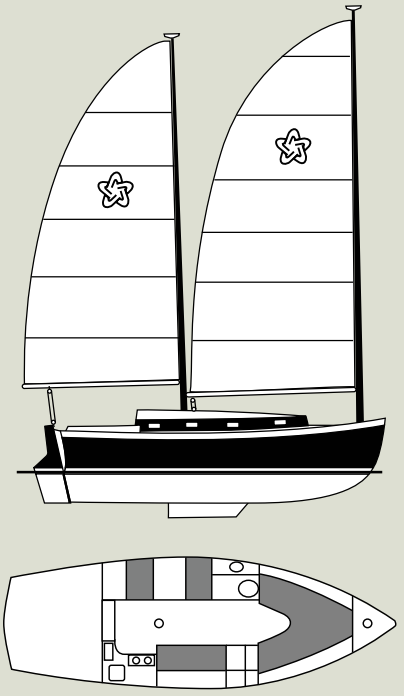
Conclusion

The Freedom 28 is a well-conceived, robust boat with bluewater capabilities. The cat ketch with free-standing masts offers advantages in simplicity, safety, and lower maintenance that conventionally rigged sailboats cannot match. It's a joy to sail, particularly in heavier weather and shorthanded. Some sailors will find the boat's speed broad reaching and downwind refreshing, but others will miss the weatherliness and speed around the buoys of conventional sloops. The large mast in the cabin may put off some potential buyers while others may value the generous berths and traditional no-frills layout.

As for appearance, some will be put off by the free-standing masts; others will revel in the non-conformity — the very strangeness — of the boat. There aren't many Freedom 28s out there; not many Victory motorcycles either.

Richard Smith, a contributing editor with Good Old Boat, *is an architect. He specializes in designing and building very small houses and has built, restored, and maintained a wide variety of boats. He and his wife, Beth, sail their Ericson Cruising 31,* Kuma, *on the reaches of Puget Sound.*

Freedom 28

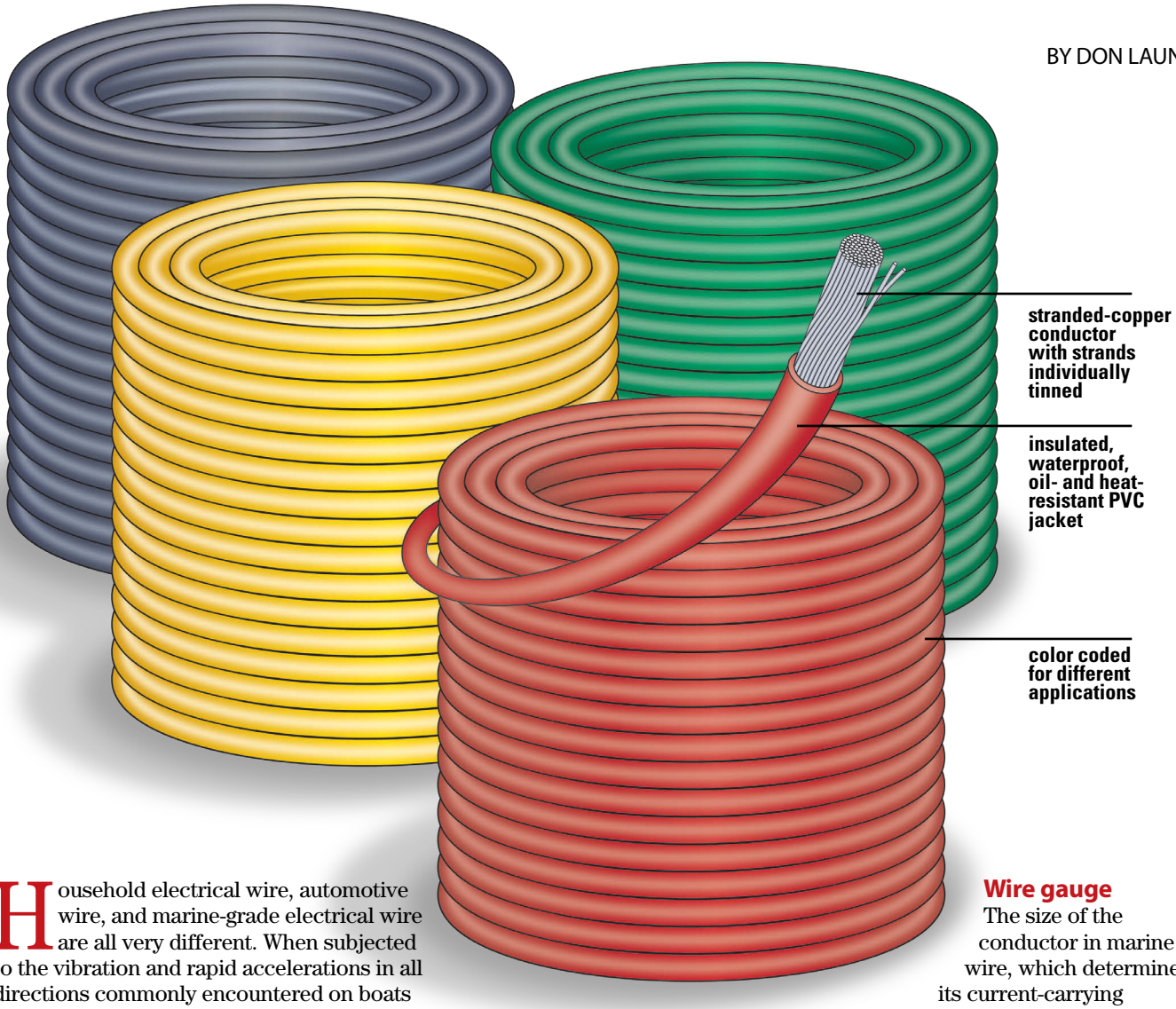


LOA:	28 feet 4 inches
LWL:	25 feet 9 inches
Beam:	9 feet 4 inches
Draft:	4 feet 5 inches
Displacement:	7,000 pounds
Ballast:	3,800 pounds
Sail area:	454 square feet
Disp./LWL ratio:	183
Sail area/disp. ratio:	19.9
Fuel	22 gallons
Water	50 gallons

Marine Electrical Wire 101

Use the proper wire for safety and reliability

BY DON LAUNER



LAYOUT AND ILLUSTRATIONS BY TED TOLLEFSON

Household electrical wire, automotive wire, and marine-grade electrical wire are all very different. When subjected to the vibration and rapid accelerations in all directions commonly encountered on boats and surface vehicles, solid copper wire can fail. Marine and automotive wire is, therefore, made with multiple strands of fine wire to make it flexible and reduce the chance of failure from work hardening or metal fatigue.

In addition, each of the strands in marine wire is tin-coated to protect the copper wire against corrosion should water intrude into the wire's jacket. This is especially important in a saltwater environment. To further shield the conductor, the PVC insulating jacket is heavy, waterproof, and oil-resistant. It is also able to withstand high heat, an important property when the wire must pass through the engine room. These wire specifications hold for both low-voltage DC wire as well as AC wire.

When doing a wiring job on board, resist the temptation to buy the less expensive house wire or automobile wire. These products just don't hold up in a marine environment.

Wire gauge

The size of the conductor in marine wire, which determines its current-carrying capacity, is specified using the American Wire Gauge (AWG) system.

In this system, the larger the number, the smaller the diameter of the conductor. Thus, 16-AWG wire is small, with a diameter of about $\frac{5}{100}$ inch, while the diameter of 0-AWG wire is large — nearly ½ inch — and has the capacity to carry very high currents. For wires larger than 0-AWG, the designations are 00-AWG, 000-AWG, and so forth.

Wires labeled SAE (Society of Automotive Engineering) are designed for use in surface vehicles, not for the special conditions in which marine wiring must serve. What's more, the copper conductors in SAE and AWG wires of the same designated gauge are different sizes. SAE wires are up to 12 percent smaller than AWG wires of the same gauge number.

The American Boat and Yacht Council (ABYC) wiring recommendations, and charts found in *Chapman's Piloting*

and other publications for boat owners and users, apply only when using AWG wires, not SAE wires.

Wire sizing for circuits

The wire specified for any circuit must be of a gauge that is sufficient to carry the combined amperages of all the appliances (loads) on that circuit without excessive power loss and without overheating.

Although copper is an excellent conductor, it still offers some resistance to the flow of electricity and this resistance is inversely proportional to the cross-section area of the wire — it increases as the diameter of the conductor becomes smaller. The higher the AWG number, the smaller the wire, and the greater its resistance per unit length.

Resistance also increases in proportion to the length of the wire between the voltage source and the load (appliance), and this resistance causes a voltage drop between the source and the appliance. If this voltage drop is excessive, the appliance will not perform efficiently. To avoid excessive voltage drop, the longer the wire, the greater the diameter of the wire's conductor must be.

The accompanying table shows the recommend relationships between wire length, amperage, and wire gauge to keep the voltage drop in a 12-volt system less than 3 percent when using AWG wire.

AWG wire gauge selection (12 volts)

Current (amperes)	Length of wire (feet)					
	10	15	20	30	40	50
5	16	16	16	14	14	12
10	16	14	14	12	10	10
15	14	14	12	10	8	8
20	14	12	10	8	8	6
25	12	10	10	8	6	6
30	10	8	6	6	4	2
40	8	6	6	4	4	2
50	8	6	4	4	2	1

Color coding

The ABYC specifies standard jacket colors for wires that have different functions. This helps enormously in troubleshooting electrical problems as well as in preventing wiring errors.

Some of the more common colors for DC wiring (in the U.S.)

red	positive (+) mains
black	negative (-) mains
green	bonding systems
gray	navigation lights
purple	ignition
yellow and red	starting switch to solenoid
brown	pumps (+), such as bilge pumps

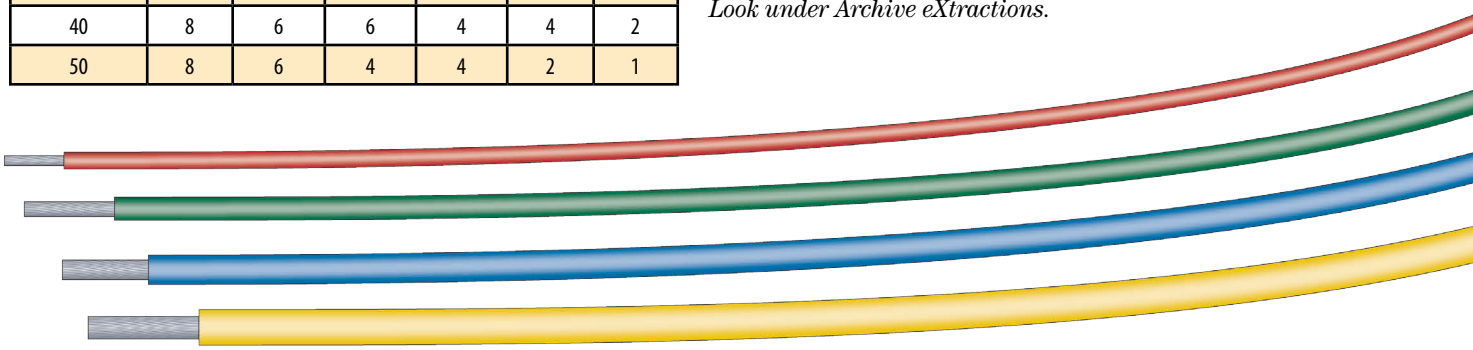
For AC wires (in the U.S.) the basic wire colors are:

black	"hot" wire, 120 volts
white	neutral
green	ground (earth)
red	in a 240-volt system, the second "hot" (120-volt) wire

Wiring diagrams

All boats should have wiring diagrams for their low-voltage DC and their AC electrical systems. These should be updated whenever a change or addition is made. The diagrams should show all batteries, switches, fuses, circuit breakers, lights, and appliances, and indicate the colors of the wires that connect them.

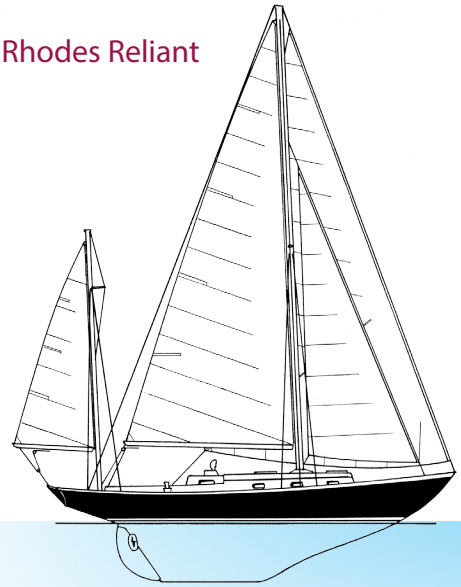
Don Launer, a Good Old Boat *contributing editor, built his two-masted schooner,* Delphinus, *from a bare hull. He has held a USCG captain's license for more than 40 years and has written five books. His 101 articles through November 2011 are available for downloading as a collection from the Good Old Boat download website, www.audioseastories.com. Look under Archive eXtractions.*



Seakindliness

The elusive measure of comfort at sea

BY ROB MAZZA



Rhodes Reliant

The subject of seakindliness comes up any time the conversation turns to long-range cruising. Someone who asks about a particular boat, "How seakindly is she?" wants to know how the boat responds to severe weather. Does she handle wind and wave without the helmsman having to fight the helm to hold course? Will she heave-to and remain steady? Does she provide a shorthanded crew with some level of comfort and security? In other words, is the crew dry, reasonably comfortable, and unlikely to succumb to seasickness because of the motion?

The prerequisites for a seakindly boat are usually perceived to be heavy displacement, a full-length keel, moderate draft, relatively narrow beam, slack bilges, and a moderate amount of overhang forward and aft. Another attribute that's considered beneficial, particularly with regard to upwind sailing, is good freeboard forward with enough flare to deflect spray and prevent the bow from burying in an oncoming sea.

The type of boat described above was popular after World War II. Designed under the CCA Rule, it usually had a full keel but, especially after the success of the Phil Rhodes-designed *Carina* and the S&S-designed *Finisterre*, might have been a keel/centerboarder, although these designs often had wider beam. Among the underwater configurations most often mentioned in regard to being seakindly are those of the Rhodes-designed Bounty II and Reliant and the Atkins/Crealock-designed Westsail 32.

These older hull forms from a previous design philosophy are seldom if ever offered by production builders today. By modern standards of performance they are slow and not very nimble. They may well be exceptionally good looking in a traditional aesthetic, but they lack speed and responsiveness. My own C&C Corvette falls into that latter definition, as some of my guest helmsmen have let me know in no uncertain terms!

The question is, what is the price we have to pay in performance to achieve seakindliness? Are the two mutually exclusive? To answer that, we must look at the characteristics believed to convey seakindliness compared with those required to achieve performance.

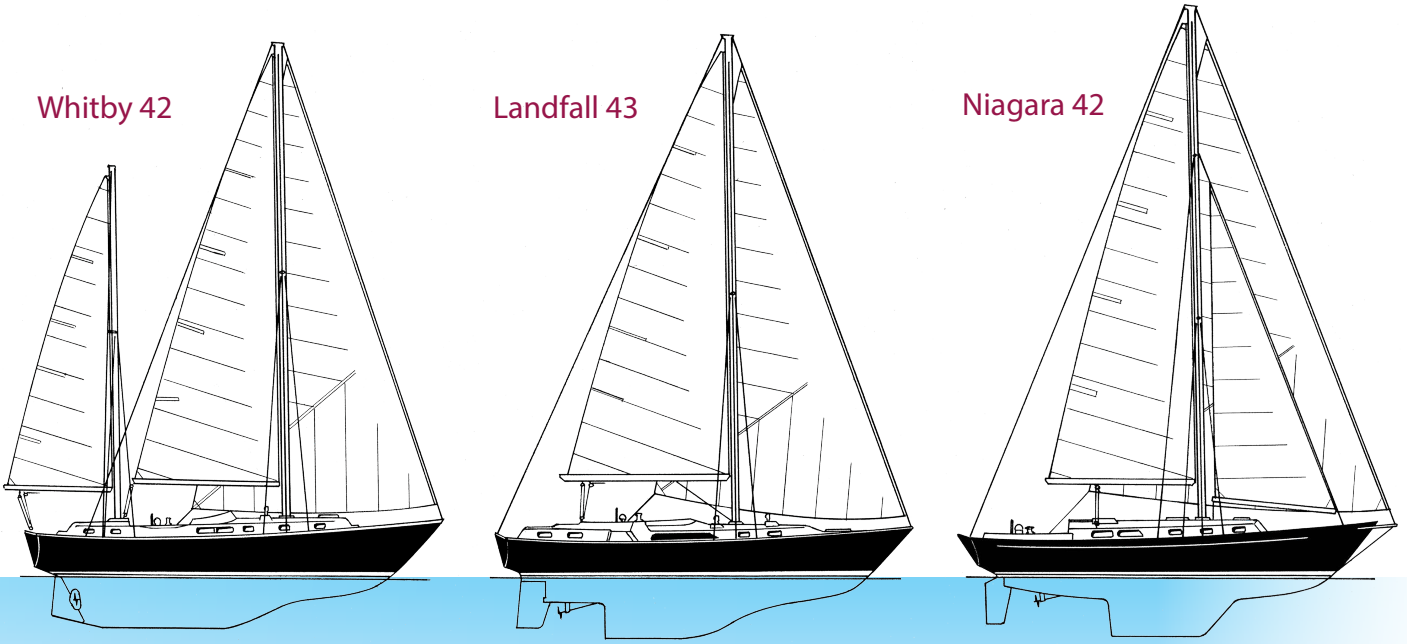
Displacement

In *The Proper Yacht*, published in 1966, Arthur Beiser states that the recommended displacement of the ideal cruising boat would be $(0.8LWL + 4)^3$. For a 30-foot LWL, that results in a displacement of 22,000 pounds or a displacement/length ratio of 364, which is moderately heavy. Not surprisingly, the majority of boats profiled in his book are of the full-keel or keel/centerboard configurations. Just as the book was published, however, the Cal 40 entered the picture, winning the SORC and the Bermuda Race in 1966.

High displacement dampens motion by increasing momentum and inertia. Momentum is important — it helps maintain speed in a seaway so each wave encountered does not have as much of an adverse effect on the forward speed of the boat. Increased inertia causes a heavy boat to take longer to accelerate to speed but also prevents the boat from responding quickly to the vertical acceleration of waves. Since the boat reacts more slowly, the motion is more gentle.

When it comes to pitching, however, things are more complicated. Weight in the ends of the boat can lead to excessive pitching or hobbyhorsing. As the bow rises to a wave, the rotational momentum maintains the upward motion excessively until the bow drops again, when the momentum then maintains the downward motion until it's damped by the impact with the sea. That's why on all racing or performance-oriented boats, no matter what their displacement, the goal is to concentrate weight amidships to avoid excessive wave-induced pitching.

Lighter ends react more quickly than heavy ends but travel through shorter arcs. The result is higher frequency but lower amplitude of motion. Which is more comfortable? Some argue that higher frequency of motion is more uncomfortable than greater amplitude, or more pronounced motion at a slower speed is more comfortable than less motion at higher speed. The general consensus is that heavier boats are



more comfortable at sea than lighter boats, no matter the weight distribution.

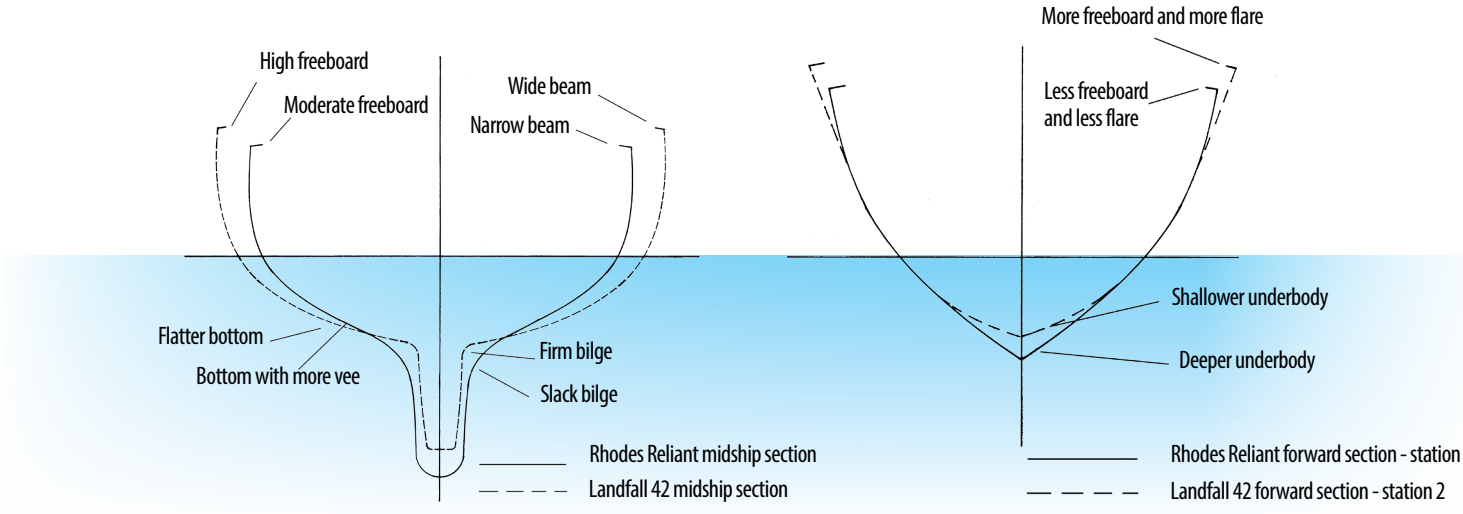
Complementary characteristics

Boats that are described as seakindly are relatively narrow of beam and have the slack bilges reminiscent of the Metre boats (the 12 Metre and 6 Metre classes, for example) of the International Rule and the early R-boats of the Universal Rule. In both keel and keel/centerboard designs with this configuration, the transition between the hull canoe body and the fin keel is not distinct — one morphs into the other with very generous fillets between the keel and hull.

As designs changed over time, the keel became more distinct and well-defined and the rudder became separate from the keel, remaining well aft as the trailing edge of the keel moved forward. Displacements became lower (primarily to improve off-wind boat speed), bilges became firmer, bottoms became flatter, forward sections more U-shaped, and beam increased, especially aft. The trend in modern production boats

Seakindliness design comparison

	Rhodes Reliant	Whitby 42	Landfall 43	Niagara 42
LOA	40′-9″	42′-0″	42′-1″	42′0″
LWL	28′-0″	32′8″	34′-5″	32′-6″
Beam	10′-9″	13′-0″	12′-7½″	12′-9″
Draft	5′-9″	5′-0″	5′-6″	5′-8″
Disp.	22,040 lb	23,500 lb	24,600 lb	19,800 lb
Ballast	8,240 lb	8,000 lb	9,075 lb	8,100 lb
LOD/LWL	1.46	1.29	1.22	1.29
Beam/LWL	0.38	0.40	0.37	0.39
Disp./LWL	448	301	269	257
Bal./Disp.	.37	.34	.37	.41
Sail area (100%)	803 sq. ft.	875 sq. ft.	771 sq. ft.	848 sq. ft.
SA/Disp.	16.3	17.0	14.6	18.5
Capsize No.	1.54	1.82	1.74	1.89
Comfort Ratio	45.3	33.6	35.4	29.2
Years built	1963-1976	1972-1988	1982-1986	1984-present
Designer	Philip Rhodes	Ted Brewer	C&C Design Group	Mark Ellis Design
Builder	Cheoy Lee Shipyard	Whitby Boatworks	C&C Yachts	Hinterhoeller Yachts



has certainly been in the direction of characteristics that improve performance rather than those that impart an easy motion.

It should also be said that lighter displacement generally results in lower costs. Boats, like a lot of commodities, can be priced by the pound. Of course, when taken to an extreme where lighter displacement is achieved with more expensive materials and processes, price does go up. Wider beam also allows more generous and roomy accommodation plans and greater cabin sole area. Extending that beam aft permits sumptuous aft cabins and generous cockpit space. So those changes that tend to have performance benefits also permit more spacious interiors and cockpits.

Narrower beam reduces torsional rolling movement or "corkscrewing" of a hull in a confused sea. The greater the beam, the more tendency the boat has to roll in any sort of cross or quartering waves. It is for that reason that some people consider catamarans uncomfortable in those conditions.

In the March 2014 issue (see "The Once and Future Bow"), we saw how bow shapes have changed with overhangs and flare forward giving way to plumb stems. If bow overhangs and flare "cushion" the impact of waves and throw spray away from the hull, then it follows that any design eliminating these features would compromise seakindliness. Aft overhangs are often mentioned as being important in maintaining seakindliness — the pitching motion is reduced or damped by the stern overhang becoming immersed as the bow overhang rises to the wave. Just as increased beam allows for larger interiors, longer waterlines and shorter overhangs allow more usable space forward and aft.

The middle ground

Do you have to give up performance and maneuverability to achieve a seakindly boat? It's one thing to be comfortable and quite another to be the last boat on the ocean. In preparation for the New Age of Sail exhibit at the Marine Museum of the Great Lakes at Kingston, Ontario, we have been documenting the large number of Canadian boatbuilders operating in the 1960s and '70s (see "Resources," page 19). The huge growth in sailing in this time period was brought on by the combination of the postwar economy and the introduction of fiberglass boatbuilding. Three 42-footers that emerged during this time period provide an insight into how three prominent Canadian builders accommodated the growing demand for cruising designs.

One of the first boats that showed this change in direction was the Ted Brewer-designed Whitby 42 built by Kurt Hansen of Whitby Boatworks in 1971. It is a center cockpit cruising boat with a traditional full keel, and one of the first designs to depart from the dual-purpose racer/cruiser philosophy of the time. It ended up being even more traditional than Ted himself envisioned. While Ted wanted to introduce the now famous Brewer Bite between the keel and rudder to reduce wetted surface, Kurt Hansen would have none of it, wanting a more conventional underbody. As a result, the Whitby 42 is the most conservative design in our group, being the earliest and most traditional.

The second Canadian builder to tackle the cruising boat concept was C&C Yachts with its Landfall series. During my 15 years designing for C&C, the principal goal was usually performance. Seakindliness did not come up for discussion very often because C&C and its competitors were designing dual-purpose racer/cruisers, not world-girdling cruisers. At C&C, that changed with the introduction of the Landfall line of pure cruising boats and with the design and building of the 67-foot offshore cruising schooner *Archangel*. New Zealander Sir Peter Blake later acquired *Archangel* and appreciated her comfort and performance when sailing offshore.

Neither the Landfalls nor *Archangel* had traditional full-length keels. Their rudders were mounted on long skegs linked to the keel to provide directional stability. Although certainly not light-displacement boats, neither were they obscenely heavy. Beams were moderately wide and drafts were shallow but without centerboards. Bilges were not as slack as the postwar boats, keels were more distinct but with

generous keel radii, hull configurations were sharper forward than the typical IOR shapes of the racing boats, and they had more freeboard and fuller sections forward.

The first of the series, the Landfall 38, was a rework of the C&C 38. The 42 was the first true dedicated cruising design, but C&C didn't reach its stride with this series until the Landfall 39, 43, and 48.

When I joined Mark Ellis Design in the mid-'80s, this racing/cruising conflict did not exist. Mark's very successful Hinterhoeller-built Niagara and Nonsuch lines and his Aloha 32 were aimed squarely at the cruising market and eagerly embraced by it. Even the magnificent custom Mark Bruckmann-built *Rangely* and Andy Wiggers-built *Bonaventure* were pure cruising boats.

Mark's philosophy was always to create a traditional cruising design aesthetic above a modern "performance" underbody. Right from the beginning, he abandoned the full-length keel in favor of a distinct keel and rudder configuration and even eliminated the rudder skeg in favor of a low-aspect-ratio all-movable cantilevered spade rudder. His hull shapes had some slack in the bilge and were sharp forward with moderate bow overhang and flare. They had generous freeboard, moderate rather than light displacement, and moderately wide beam.

Quantifying comfort

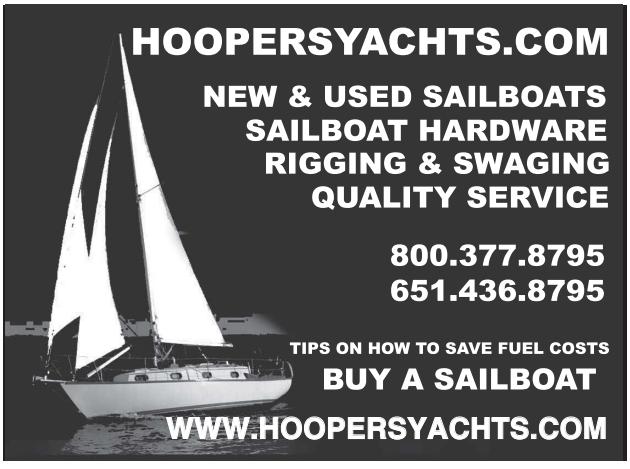
Ted Brewer attempted to address seakindliness in his much quoted Comfort Ratio. While I may quibble that Ted's ratio is not "non-dimensional," it does illustrate how sailing comfort diminishes as displacement decreases and beam increases. Note that all the boats discussed here are in the conservative range. The Rhodes Reliant has a Comfort Ratio of about 45 while the more modern boats average around the low 30 range. However, even Ted admits that his Comfort Ratio is only a guide and cannot possibly take into account all the factors that affect comfort at sea, which can vary from person to person, depending on their resistance to motion sickness and fatigue. However, as a first cut, the Comfort Ratio does give an indication of seakindliness and, when taken in context with the other performance parameters, gives a valuable indication of the trade-off between comfort and performance.

We can see in this comparison the evolution from the cruising-hull shape of the 1940s and '50s, that was renowned for seakindliness, to the more modern configurations that improved performance and livability while still maintaining a higher degree of sailing comfort than their more extreme racing brethren. This direction was also reinforced in the work of other postwar cruising boat designers in the new era of fiberglass. Bill Crealock and Bob Perry are just two examples, and both of them designed classic "modern" cruisers like the Pacific Seacraft 37 and the Valiant 40 based on sacrificing a little bit of seakindliness for increased creature comfort and improved sailing performance.

Rob Mazza is a Good Old Boat *contributing editor. A lifelong sailor, he writes about good old boats from the vantage point of having been involved in the design of a good many of them.*

Resources

New Age of Sail exhibit,
May 5 to November 30, 2014,
at the Marine Museum of the Great Lakes
at Kingston, Ontario:
www.marmuseum.ca



Restoring an

Essentials first, then the fun parts

BY NATHAN BAYREUTHER

I first laid eyes on an O'Day Mariner as a teenager while working at my family's marina in Niantic, Connecticut. It was a derelict, but there was something about the lines that attracted me. As much as I wanted to restore it and claim it as my own, schoolwork and other commitments prevented me from doing so. Fast forward 10 years and, after taking my wife sailing in my Dyer Dhow and hearing her later utter the magic words, "I think you need a bigger boat," my thoughts returned to the Philip Rhodes-designed Mariner.

Based on the Rhodes 19, the 19-foot Mariner was first built in 1963, sported a large cockpit and a small cabin, and was meant to appeal to families wanting to daysail or cruise overnight. O'Day made about 4,000 hulls, and the design is still produced at Stuart Marine in Rockland, Maine. The Mariner Class Association is extremely active and celebrated the 50th anniversary of the birth of the Mariner in 2013.

Although far from being a derelict, the boat I bought did need quite a bit of help. The deck and hull had separated at the transom, the rubrail was chewed up and smashed at the bow, the centerboard was a rusted hunk of iron, the mast step was sinking into the deck, the chainplates leaked, the portlights were crazed, the gelcoat was faded and mottled . . . the list goes on.

There was a lot to do, but I decided to take some very important advice my father gave me: only do the work necessary to make the boat seaworthy and get out on the water as soon as possible. This gave me the opportunity to sail the boat, figure out how I wanted to restore her, and prioritize restoration tasks. Fixing the sinking mast step and removing and refurbishing the iron centerboard were at the top of the list, but I also wanted to do a fun project and design a new cabin sole.

Replacing the deck core

O'Day Mariners from the early 1970s have a single strip of plywood fiberglassed fore and aft under the the cabin roof as a stiffener for the mast step. Beneath that is a thicker arch made of oak and fiberglassed in place from port to starboard. This provides sufficient support for the mast that a compression post is not needed. While the cabin arch seemed to be in good condition, I suspected the plywood core under the mast step was rotten. A few test holes confirmed that.

Since the arch impeded my access to the core from inside the cabin, I decided to remove the fiberglass skin from the top. From inside the cabin, I drilled a small hole in each corner of the core, going all the way up through the top skin so I could see exactly where it was from above. I connected the dots with a marker and carefully cut off the top skin using a small cordless hand-held Makita circular saw. The skin came off quite easily — there was no bond left between it and the core. The entire length of the plywood piece was soaking wet and it crumbled and split apart when I probed with a screwdriver. I chiseled and scraped out the rest, dried the area with a heat gun and, using West System's *Fiberglass Boat Repair & Maintenance* manual as a guide, sanded the surrounding edges with an electric disc sander to create a 12:1 bevel.

I obtained a new carbon-fiber G10 deck core from Connecticut-based Forte

Nathan was first attracted to the O'Day Mariner as a teenager. Later in life he acquired one to sail, at top, and restore, above.

O'Day Mariner

Carbon to dimensions just slightly smaller than the rectangular recess in the deck. *(Forte does not currently list this product –Eds.)* Following the directions in the West System repair manual, I prepared the new core and recess by sanding them and wetting them out with epoxy. I then mixed a substantial batch of West System 105/205, adding 404 filler to make a mayonnaise-like consistency. I used a notched spreader to coat the bottom and all the sides, making sure to get it in every crevice. After that, I simply placed the core in the slot and pressed it down firmly until a little epoxy mix squeezed out the sides.

The thickness of the fiberglass cabintop varied somewhat, although it was generally about ¼ inch thick. To build up close to this thickness, I used three layers of 24-ounce woven roving and two layers of 12-ounce cloth, alternating them. Each layer was slightly larger than the previous one to match the sanded bevel and spread the load. After applying the fiberglass with epoxy, carefully sanding it after it cured, and fairing the surface with epoxy and fairing compound, it looked pretty good. After painting, it looked fantastic and, when I drilled and tapped the holes into the G10 for the mast step, I took comfort knowing it would never rot again.

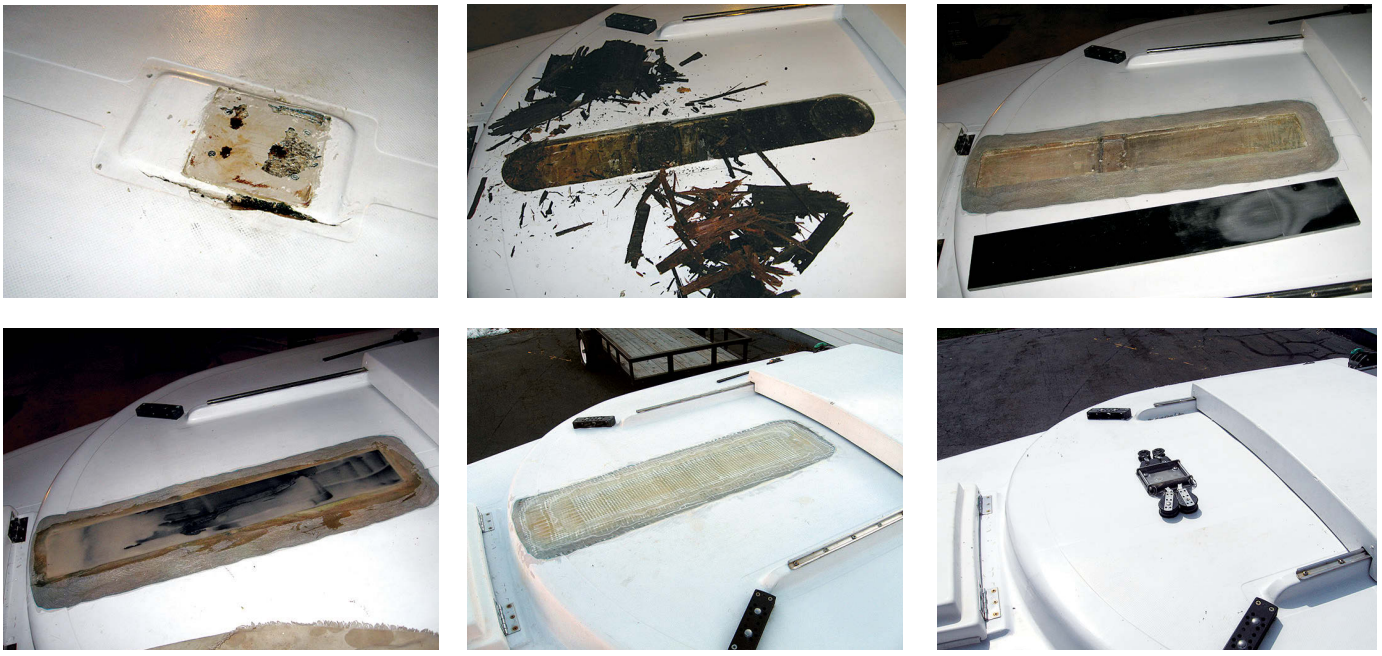
Centerboard cleanup

To restore the 165-pound centerboard, I needed to remove it from the boat. With the boat on jack stands, my plan was to lower the board out of the trunk and into some kind of cradle while keeping it level.

I built a wooden cradle out of 2 x 4s. It consisted of a longitudinal piece, a crosspiece on the bottom at each end, and two pairs of vertical supports to guide the centerboard onto the longitudinal piece and hold it upright. I fitted large rubber casters on the ends of the crosspieces so I could move it around. The vertical supports were short enough that the whole cradle could fit beneath the boat.

I used a floor jack to take the weight of the forward end of the centerboard while the pendant supported the aft end. With a piece of wood on the jack, small enough to fit just inside the centerboard case opening, I put slight upward pressure on the front of the centerboard. This allowed me to easily knock out the pivot bolt from inside the cabin. I positioned the cradle under the boat to catch the centerboard as it came down, then alternately lowered the floor jack and eased the centerboard pendant from inside the cockpit. Eventually, the board came all the way out. I cut the pendant and removed the board.

The centerboard was completely rusted and the leading edge was scarred from collisions with underwater objects. I took the board to a metalworking shop that sandblasted the whole thing for only a few dollars. A fellow Mariner owner had previously recommended a rust-preventive paint



The cabintop mast step on Nathan's Mariner was collapsing, upper left, due to a rotten plywood deck core beneath it, upper center. He cut out the plywood, ground the area clean, and replaced it with carbon-fiber G10 material, upper right. After epoxying the G10 in place, above left, he fiberglassed over it, above center, then faired and painted it. With the mast step back in place, above right, it was as good as new, but stiffer.


The 165-pound centerboard was covered in rust and presented a challenge. However, Nathan's ingenuity in building a trolley on casters, and muscle in the form of a floor jack, at left, enabled him to extract it and move it around for sandblasting and painting, at right.

called POR-15. I ordered a quart of it and applied three coats right after the board was sandblasted. Four years later, I can happily say that POR-15 has helped keep my centerboard rust-free.

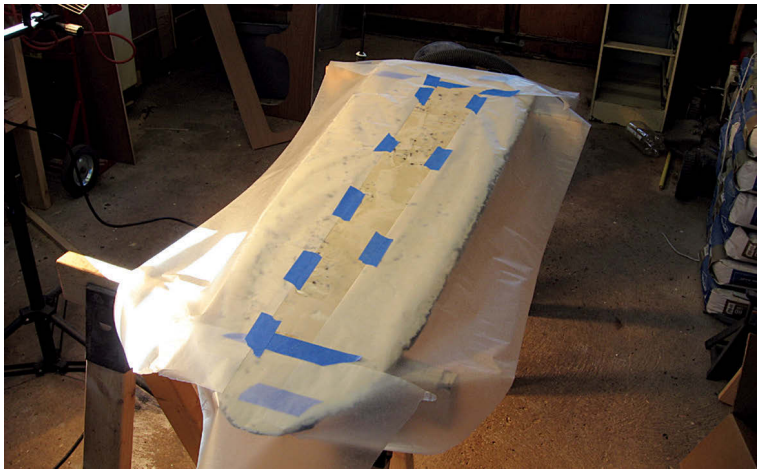
After applying several barrier coats of epoxy, I faired the surface with the same compound I used for the deck core project. When I had finished, it began to look like a centerboard again, but something needed to be done about the edges. I used a technique described on the Mariner Class Association online forums. I taped wax paper around the edges, then flipped the board over and put fairing compound on the edges. Wrapping the wax paper around the edge and pulling it snug, I taped the free edge to the other side of the board. I let it dry, removed the wax paper and, voilà! A new edge — that desperately needed sanding.

I sanded it smooth, applied more epoxy barrier coats, and added two coats of bottom paint. It looked brand-new. Eventually, I put the board back in the boat using the removal process in reverse. It was a little trickier getting it back in, but by using a large screwdriver inside the cabin to align the boltholes, I was able to insert the pivot bolt without difficulty.

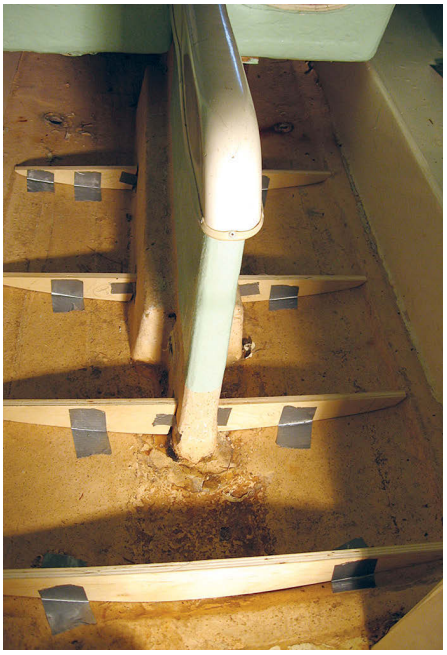
Cabin sole

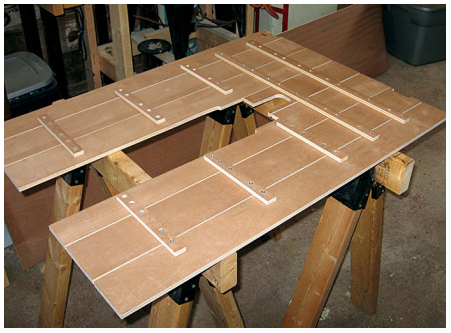
Most boats have a common problem: they leak, whether a lot or just a few drops. Mariners are notorious for leaking at the centerboard bolt. Try as I might, I hadn't been able to seal it correctly and I suspected there were a few other small leaks as well. I got tired of having gear slide off the berths while sailing and landing in the small puddle that accumulated in the bilge. I decided to make a cabin sole that could be removed in a hurry, but would be stable and look nice. I originally thought I'd make it out of mahogany boards, but after a conversation with my wallet I decided to go with mahogany plywood. This was still expensive, but I could use the leftover pieces to make new hatchboards.

The first part of the project was to make supports for the sole. I used the technique of "story-boarding," (also called a "story stick," or "joggle stick"). This is a 19th-century technique that works very well and allowed me to duplicate all the curves of the boat extremely accurately. An Internet search will provide the finer details. In my case, I created a joggle stick, clamped a board to the side of the centerboard case, and traced away, transferring the markings




Nathan had a metalworking shop sandblast the centerboard. He then coated it with POR-15 rust-preventive paint and epoxy barrier coats and faired it, using wax paper to wrap and form fairing compound around the edges, at left. Two coats of bottom paint, at right, finished the job.





Nathan decided a cabin sole would be an improvement. He carefully measured and cut supports, shown taped in place, far left, then made a pattern for the sole. He made the sole of boards cut from a sheet of mahogany plywood, at left, with gaps between them. The varnished sole looks grand, below.

to plywood I later sealed and epoxied to the cabin floor.

After I made the supports, I used the story stick technique to get an outline for the new sole. I could have taped pieces of cardboard together, but the story stick method was extremely accurate and fun. I transferred my tracings to a piece of scrap plywood. It fit extremely well, and I needed only a few small adjustments to make it fit perfectly.

I procrastinated before taking a saw to the nice mahogany plywood. I finally said, "I'll never *finish* it if I don't actually *start* it," so I made the last measurements and just plowed ahead. I cut 4-inch-wide strips and clamped them together with bits of 3/16-inch-thick wood in between to create spaces for water to drain through. I then put the scrap-plywood template on top, traced all around, and carefully cut the boards with a jigsaw. I joined them with crosspieces on the underside.

I took the sole to the boat, fully expecting to make marks for adjustments, but everything fit so well I didn't need to do a thing. While several coats of varnish made the sole a bit slick, it still looks fantastic, is extremely functional, and requires only a couple of coats in the spring. No more wet feet or gear!

Over the next few years, I completed a number of other projects that have turned the boat into a small cruiser. There's more on my website. If you ever have the opportunity to buy an O'Day Mariner, do it! You won't regret it. It's a fast, easy, comfortable boat to sail and maintain, and the Mariner Class Association is a top-notch organization that offers a tremendous amount of support for its members.

Nathan Bayreuther has owned his 1970 O'Day Mariner, Orion, *since 2007 and is the current president of the Mariner Class Association. A professional full-time organist, he grew up next door to his family's marina, Bayreuther Boat Yard, in Niantic, Connecticut. Nathan lives with his wife and son in Wallingford and sails the waters of Long Island Sound in his spare time.*

Resources

Mariner Class Association
www.usmariner.org

Nathan Bayreuther's website
www.mariner1922.com/index.htm

West System books
www.westsystem.com/ss/use-guides

Forte Carbon
http://fortecarbon.com

POR-15
www.por15.com

Story stick
Type the term into any search engine.

The blister question

To peel or not to peel?

BY TODD DUFF

The photos on these pages illustrate a complete six-layer laminate peel and replacement using biaxial cloth and vinyl-ester resins followed by an epoxy barrier coat. This project was completed in just a week by Todd's friends at the Annapolis Gelcoat Company. It resulted in restoring 100 percent structural integrity to a hull that had been very badly compromised by a severe case of osmosis.

Ever since the early 1980s, when the phenomenon of fiberglass hull blistering became widely apparent, the dilemma many boat owners have had to face is "When is blistering a problem and how bad does it have to be before a repair is necessary?" Thankfully, one of the most amazing things about fiberglass boats is how easy it is to undertake extensive repairs and have the results of those repairs leave you with a hull that's just as strong as when the boat was new, or even stronger.

One of the most common hull repairs, and certainly one of the most controversial, is blister repair. The controversy stems first because these hull repairs are often precipitated by negotiations during the sale of a boat and second from a number of misconceptions about the implications of osmosis and the resulting degradation of a laminate structure.

The condition of the bottom is frequently an issue that prevents an older fiberglass boat from selling after a survey and sea trials have been completed. If the pre-purchase survey report points toward the need to undertake a proper and potentially expensive repair to a bottom due to osmosis, this finding may be challenged by the broker, the owner, the buyer, or the contractor. The conflict is likely to center on the best way to accomplish a suitable repair. This difference of opinion can ultimately lead to compromises that result in an ineffective repair being undertaken.

A blister repair done incorrectly can result in a badly degraded or weakened hull laminate. This can cause excessive flexure of the hull, may allow the osmosis to continue to degrade the laminate and, in some cases, might actually weaken the structure of the hull even more than if it had been left alone . . . while the boat owner is under the impression he or she has "fixed" the problem. To put it another way, an improperly repaired bottom may ultimately lead what was in reality only a cosmetic repair to become a much bigger problem for the owner years later.

However, if a repair is properly accomplished, there is no reason a hull cannot recover all of its original strength and rigidity or become even better than new through the use of state-of-the-art materials and procedures that were not available when the hull was originally built.

The osmosis process

Osmosis is a term used within the marine industry to refer to the ingress of water molecules into a fiberglass laminate structure. The resulting chemical breakdown of the laminate creates a blister through a process known as hydrolysis. Blisters can form between two layers of gelcoat or between the gelcoat layer and the first layer of laminate. Blisters of this variety can, after the laminate has dried thoroughly, be dealt with by a simple cosmetic repair. Often these blisters are tiny, the size of a

The boat was a 1979 Morgan 461 sloop that had spent nearly her entire life immersed in tropical waters. While sanding the thick buildup of bottom paint, the crew discovered many hundreds of tiny blisters. They first tried opening each one with a Dremel tool and waiting for the laminate to dry (PHOTO 1). The original plan was to "spot fill" these blisters using epoxy filler. However, when moisture levels failed to come down significantly after several weeks, an exploratory removal of the gelcoat was in order. That revealed a bigger problem (PHOTO 2).

pencil eraser at most, and can be widespread over the wetted surface of a hull.

Left alone, however, small blisters can lead to a breakdown in the first layers of laminate. At this stage, slightly larger blisters form, up to the size of a dime or so, in the first layer of laminate.

Typically, the first layer of laminate on most hulls is chopped-strand mat. This is used because it has excellent "hiding" properties and can lessen the possibility of print-through to the gelcoat finish from subsequent layers of woven roving as the hull ages. Unfortunately, chopped-strand mat is a less-than-perfect "sponge." If it was not well wetted out during layup, a close inspection years later may reveal that it is full of small air voids that — through osmosis — have become full of water.

Chopped-strand mat unfortunately exhibits a propensity to transmit any moisture present within its structure to the laminate below. Even at this stage, this first layer is largely non-structural and, in many cases, provided the hull was heavily built and the mat has not significantly degraded, it may be possible to remove the gelcoat, thoroughly dry out this first layer, spot-fill any blisters and voids, then simply protect it with a barrier coating and bottom paint.

Even if the first mat layer is heavily compromised but the underlying structural laminate turns out to be sound, removing this first thin mat layer and making sure that new exposed laminate is dry and fair may be enough to provide a suitable foundation on which to apply a barrier coating and bottom paint. This may be all that's necessary for a satisfactory repair.

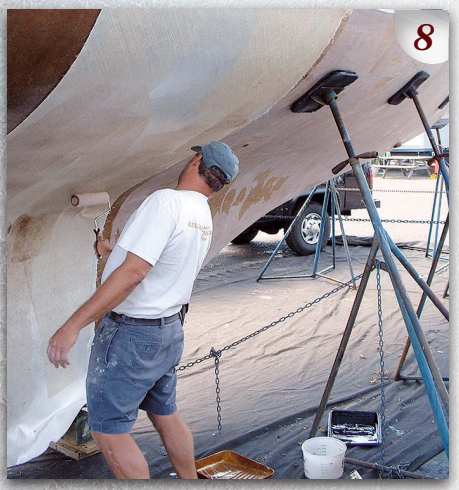
Deeper trouble

Sometimes, however, removing this first layer reveals a more advanced stage of osmosis: additional pockets of moisture and compromised, or hydrolyzed, laminate. In this case, provided that the damage is localized to a reasonable number of specific areas, it may be acceptable for these blisters or voids to be ground out, the proper laminate be replaced (not with body filler or epoxy putty!) and, once thoroughly dry, the bottom be barrier coated.

> "The bad news . . . is that removing the first layer of mat could reveal many areas of high moisture content."

The bad news, particularly with vessels that have spent many decades in the water, is that removing the first layer of mat could reveal many areas of high moisture content. These have formed because air voids within the woven roving layers that were not properly wetted out during the construction process have become filled with water. In this case, a laminate profile should be taken to determine the extent of the ingress of moisture and progression of the resulting osmotic degradation.

The team removed additional layers of fiberglass to see how deep the osmosis had progressed (PHOTO 3). Each successive cut went deeper into the hull and revealed lower moisture levels and better "color" until uncompromised laminate was reached. They removed six layers (including the first layer of mat) before finally reaching good sound laminate on which to rebuild (PHOTO 4). All this was accomplished in just two days using a commercially available gelcoat planer (PHOTO 5).



A laminate profile is accomplished by carefully grinding a small area of the bottom and removing layer after layer until good undamaged laminate is found. Once the number of layers of damaged fiberglass has been determined, a repair can begin with the removal of those layers with a fiberglass planer.

It's a simple job to cut out and lay-up new layers of cloth to restore the hull to its original thickness and structural integrity. Using some of the new biaxial cloths and vinylester resins, followed by an epoxy barrier coating, may provide a decades-long or better-than-new repair.

Misconceptions about osmosis

We've all heard the boat owner in the yard claim, "My old such and such has never had a blister." However, if you take a look at some older hulls, you're likely to find massively crazed gelcoats that are unable to form a blister because they are thin and brittle, and underlying laminate structures so porous a blister simply cannot form.

It's important at this point to bring up some misconceptions that continue to float around the waterfront.

Misconception #1: *These old hulls were built so thick you could lose half the glass and she'd still be plenty strong. Also see Misconception #2.*

Misconception #2: *These old hulls had (twice, three, pick a number) times as many layers of glass as they needed. They just overbuilt them because they didn't know how strong the stuff was.*

It is true that most older fiberglass designs had fairly thick hulls, but that's because they were often patterned after wooden boat designs. The architects and engineers had to stipulate the use of many layers of laminate so the weight distribution would be similar to that in the wooden designs they were mimicking. In order to float correctly on their lines they had to weigh as much as their wooden sister ships. Because the architects and engineers knew that the structural characteristics of the laminates were substantial, they believed the thickness of the laminates alone, combined with a few full or partial bulkheads, would provide enough rigidity. Developments such as cores, ribs, and stringers came later.

When these hulls were new, and if they had no large flat sections or unsupported panels, they could indeed be quite stiff. As time went on and the material was better understood, however, it became evident that fiberglass laminate structures, even if not compromised by osmosis, began to become "softer" and less rigid when flexed repeatedly over time. The use of cores made of balsa or foam helped control flexure considerably. Other manufacturers addressed this problem through the use of stringers and floors (transverse stiffeners) rigidly glassed into the hull structure to bring the flexible nature of fiberglass better under control.

Some manufacturers "floated" bulkheads, allowing the hulls to flex and move within a fairly wide range. The "internal grid structure" so common today was a mass-production-driven development that allowed a builder to make a hull even thinner by making the interior furniture and cabin sole supports (floors) integral to the structural stiffness of the hull.

Once they had finished planing the hull, the team began spot filling and fairing individual spots to create a smooth and fair structure for relamination (PHOTO 6). On the day of layup, they set up a temporary workbench of plywood and sawhorses where the cloth could be rolled out and cut to approximate size (PHOTO 7). Working in sections along the hull, they applied a light resin coating. Once the resin became tacky, they carefully placed the new cloth in position (PHOTO 8), and followed up by thoroughly wetting out the cloth (PHOTO 9).

This means that on an older hull, built with thick laminates and having no significant flat sections, the loss of structural integrity of some of the outside layers of the hull might be considered as insignificant. In many cases, if a bottom on one of these boats develops minor blistering of the outside layers of laminate, a thorough drying of the structure and spot repairs made to the areas of the hull where blisters had formed may be enough of a repair to be considered structurally sound. This is especially true when followed by a state-of-the-art barrier coating. On a more modern thinner hull or one of cored construction, however, the rigidity of the structure must be more carefully considered when making a plan for a proper osmosis repair. In many cases, a peel and relamination of the hull is the only acceptable solution.

Misconception #3: *Balsa or foam cores in the hull can't transmit water into the adjacent core, even if holed.*

If the hull is a cored structure, it's vitally important to confirm that moisture has not migrated into the core material of the hull. Despite all of the engineering papers written in the early years of cored hull construction claiming water could not intrude laterally in a cored laminate, we've made more observations over time. We know that if water molecules do indeed infiltrate a cored area — particularly one of organic material such as balsa — moisture can travel extensively throughout the adjacent area and may, depending on the extent or severity of the ingress, lead to a very expensive repair.

Because of this potential complication, if a cored hull is being considered for repair, in addition to performing a laminate profile, it's wise to also take core samples in order to accurately assess the integrity of the underlying structure.

Misconception #4: *Those little cracks in the gelcoat don't mean anything.*

It is true that, especially on some of the older heavily built boats, a gelcoat crack may not necessarily point to a structural weakness. However, as gelcoats age, they often shrink and produce cracks. It is vitally important with any of the newer hulls having large flat sections to take a laminate hardness profile of a hull that has extensive gelcoat cracks or crazing. If flexing is occurring, telltale cracks often show up in the area of bulkheads, stringers, or floors. On more modern boats, the internal grid structures may become separated or show spiderweb cracks in the inside surfaces where the grid unit joins the hull. All these things point to a possible softening of the laminate structure due to osmosis. In cases like this, the only way to restore structural integrity is to remove the weakened laminate and replace it.

Testing for integrity

When trying to determine the structural integrity of the fiberglass laminate you have exposed for repair, a valuable tool called a Barcol meter will determine the rigidity of the laminate structure. This instrument has a tiny metal probe that's forced against a laminate to give a reading of the laminate's relative hardness. Readings of less than 25 on the scale of the instrument are generally considered to be too "soft." Readings above 45 are considered to be "brittle."

This is an oversimplification, as certain types of resins and composite

As each layer was added, the crew worked diligently to wet out the fabric (PHOTO 10) and remove excess resin and air from the material (PHOTO 11). In this stage of the process, it's important to remove all the air, leave no voids, and work excess resin out of the cloth to ensure that the correct resin-to-glass ratio is achieved (PHOTO 12). A close-up view of the new laminates shows the thickness attained as each area of the hull was covered with new cloth (PHOTO 13).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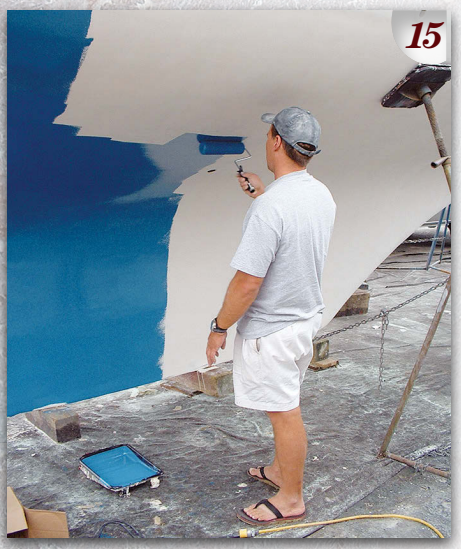
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structures have characteristics that could hedge the higher "cutoff" figure, but the lower figures are of the greatest interest to note when deciding where to stop when peeling a boat for a relamination with new cloth. Even if low moisture readings are encountered after removal of a layer or two of laminate, a Barcol test should be performed.

Note that, if a boat is left to dry for a period of years in a yard following many decades of immersion and a severe case of blisters, the material may read "dry" on a moisture meter because it has lost all its resin content. Laminating on top of this heavily degraded material would be a waste of money. If financially viable, all compromised or weakened laminate should be removed when trying to restore a boat's original integrity.

Thankfully, water absorption through the layers of an underwater surface due to osmosis is so slow it can take decades before extreme procedures are necessary. It is not unusual, when performing a laminate profile, to find that the laminate immediately under the gelcoat looks whitish and has high moisture content. A layer down from this, the laminate may be much darker and moisture content may have fallen significantly. Often, the next layer down shows readings that are all quite normal and a fairly non-invasive repair may be sufficient.

Repair options

After conferring with contractors and surveyors about the best way to undertake a proper repair, and in order to ensure the best possible outcome, it is very important to be certain that — no matter what method or to what extent the issue is addressed — the end result be a dry, hard, and fair bottom with no structural weakness. Using state-of-the-art materials may ensure a long-lasting repair. Under no circumstances should anyone be happy with simply grinding out wet blisters, filling them with putty, and slapping a barrier coating over a bottom that is not thoroughly dry and sound.

Removing and replacing fiberglass laminate is a straightforward procedure that should not be daunting or unnecessarily expensive. Many new tools are available for the removal of old laminate or gelcoat, and any of the large marine wholesalers can provide the materials needed to rebuild a hull.

If your boat has blisters, you might be lucky enough to find that it needs only a drying out, spot repairs, and a barrier coating. Less luckily, you could learn that your boat needs a full peel and relamination. In either case, however, provided you follow proper procedures and accepted up-to-date industry methods, your money will be well spent and you will be secure in the knowledge that you have restored your boat to its original structural integrity.

Todd Duff is an accredited marine surveyor and writer/photographer from the Virgin Islands. Todd and his fiancée, Gayle Suhich, are currently on a 6-month cruise in the South Pacific aboard their 50-foot Flying Dutchman cutter Small World II. *The Line Islands, Cooks and Samoa, Tonga, and Fiji are on their list of destinations.*

Using just four layers of state-of-the-art biaxial cloth, the crew achieved a laminate thickness equal to that of the original six layers and better tensile strength. Once the laminate was completed and faired, a barrier coating was applied for additional protection against future water ingress (PHOTO 14). After a final sanding, it was time at last for the bottom paint (PHOTO 15). After just a few days of hard work, the osmosis repair was complete and the bottom was as good as new. The boat was once again ready for the water (PHOTO 16).

Tackling blisters one by one

A plan and hard labor win the day

BY DALE BAGNELL

I had known for a couple of years that *Moonshadow*, our 1983 Hudson Force 50, needed to have the gelcoat blisters on the bottom repaired. Blisters affect some fiberglass hulls more than others and can be caused when water enters voids in the hull and builds up osmotic pressure within the laminate. The typical cure is to grind out the blister, dry it thoroughly, and fill it with a high-quality epoxy filler. When we bought *Moonshadow*, the surveyor had described the blistering as cosmetic and suggested we look into it the next time the bottom needed to be painted. That time had arrived.

Moonshadow had had blister problems in the past. The previous owner paid a boatyard in southern California to correct the problem a dozen years before. They sandblasted the bottom, repaired the blisters, and applied eight coats of epoxy barrier coat. It took several months and cost tens of thousands of dollars, but the blisters returned after a few years. The previous owner's advice to me was to forget about heroic measures and just fix the blisters that I found every two to three years when I hauled the boat to apply bottom paint.

I thought about this, did some research on the Internet, and reviewed the solutions offered by some of the large epoxy and paint vendors. I decided to find a boatyard in the area that could educate me on the latest techniques for blister repair and would permit me to do a lot of the work myself to keep the costs reasonable. We needed to work quickly. I had a 30-day window, not the typical two to four months a blister job and barrier coat can take. I selected a DIY boatyard and scheduled a time for the haulout. On July 2, they hauled *Moonshadow* and power washed the bottom so we could have a good look at the situation.

A plan of attack

After inspecting the boat with the pros at the boatyard, we decided on a game plan. The hull would need to be sanded down to the barrier coat and all of the blisters ground out until we had solid fiberglass to work with. The bilges would need to be drained to the last drop and we'd use a de-humidifier to dry the interior. After grinding and drying the blisters, we would fill them

***Moonshadow*, a Bill Garden-designed Husdon Force 50, cuts an impressive figure under sail, at top of page. At 30 tons, she was close to the limit on the boatyard's 35-ton travel lift, at left. After a pressure wash, a close inspection of her hull revealed extensive blistering. Although the surveyor considered it largely a cosmetic problem, Dale chose to treat the blisters to prevent them from getting worse over time.**

After the blisters had been ground out with the Dremel tool, at left, most areas of the hull did not look pretty. A large blister in the bow turned out to not be a blister at all but water in the keel from a leaking bobstay chainplate, at right. No area of the hull was spared, below.

with two-part epoxy followed by a new barrier coat and bottom paint.

We started by sanding the hull to see how extensive the blistering was. Initially, it appeared there were 300 to 400 blisters. This turned out to be a very optimistic estimate . . . we would repair more than 2,000 blisters before we were finished. Eventually, they were washed out with solvent, dried, and filled with a two-part epoxy.

To remove the blisters, we used a Dremel tool with a small grinding wheel. The work went quickly. I would grind out a shallow depression over the blister, rotate the tool 90 degrees, and grind it deeper from a different direction. This resulted in a shallow divot deep enough to pop the blister. When it popped, liquid would flow, sometimes quite forcefully. It was important to wear safety glasses and rubber gloves, as this liquid contains styrene and really burns the skin. When I was sure I had opened up the blister completely, I left

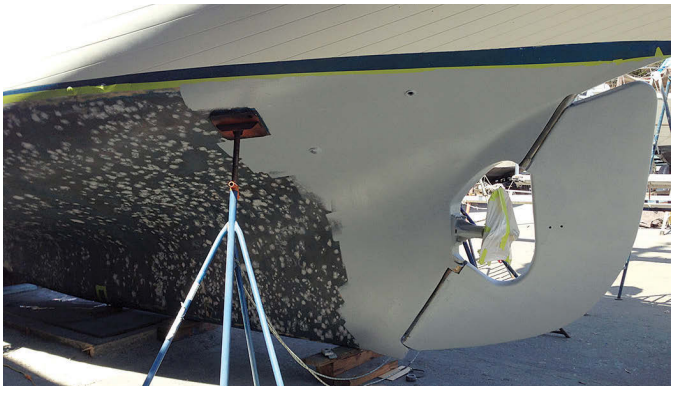
it for a day to drain. The following day, I ground it deeper and wider until there was good quality fiberglass lining the depression. Most of the blisters were drained after two or three grinding sessions and we cleaned them with acetone and allowed them to dry for a few more days before filling them.

A daunting prospect

We had set aside two weeks to remove the bottom paint and dig out the blisters. Things went well for the first few days, but then we started to run into problems.

The surface area of a 50-foot full-keel boat is immense. After a few days of sanding, I realized I needed help. I could manage the sander for just an hour at a time before needing a break. Wendy and I had recruited family and friends to help with the work on weekends, but we also hired a couple of friends to help us with the heavy sanding during the week.

As we began to get the bottom sanded down and the first few hundred blisters opened up, we realized there were many more blisters than we had thought. Many of them were previously



As the drill and fill work progressed, Dale was able to begin applying the first layer of barrier coat, at left. While *Moonshadow* was out of the water, he took the opportunity to improve her looks by painting the cove stripe to match the lettering on the name boards, at right.

Several thin coats of Epifanes one-part Topside Enamel created a smooth finish on the boot stripe, at left. To achieve a chemical bond, the first coat of bottom paint must be applied over a green barrier coat, so Dale and his friend Ray coated the entire hull twice in one day, at right.

repaired blisters in need of further work and others were small blisters in the process of forming. We decided to grind everything, hoping to get ahead of the curve. After a week, we had nearly 2,000 divots in the hull with about 100 more blisters still draining and in need of further attention. At this point, I began to have second thoughts about tackling a project of this scope.

Experts at the boatyard assured me we were doing fine and said to stay focused on the work at hand without getting too far ahead of ourselves. The blisters that were ground out and dry could be filled. That would leave only 100 or so blisters remaining. We could focus on the remaining blisters one day at a time until they, too, were ready to be filled. This divide and conquer strategy proved to be good advice and, as the blisters were filled and faired, we began to get a real sense of accomplishment.

I tried several epoxy fillers. I needed something easy to mix, apply, and sand. I settled on a new filler by System Three Resins called SilverTip QuikFair that was very easy to work with, easy to sand, and yet had tremendous strength. It had become a favorite in the yard with many of their technicians. It's available from Jamestown Distributors. Toward the end of the third week we had 90 percent of the blisters drilled and filled.

Barrier coat

Once we had successfully ground out and filled all the blisters, it was time for the barrier coat. Because we wanted to make the hull as smooth as possible before applying the first layer of barrier coat, we filled and sanded the entire hull three times . . . until we could no longer find any obvious flaws. After consulting with the boatyard pros, we selected Sherwin Williams Pro-Line Low Temperature Curing Epoxy Primer. This two-part epoxy primer is designed to be applied on less-than-perfect bottoms and claims to have the latest technology for preventing water intrusion. Each gallon of primer is mixed with a quart of epoxy hardener just before application.

The good news about this barrier coat is that, when you discover a flaw in the hull, you can apply additional epoxy filler right over the barrier coat and sand it down before you apply the next coat. We went over the boat two to three more times filling and sanding. When it was as smooth as we could make it, we applied the final layer of the barrier coat.

Bottom paint

The first coat of bottom paint should be applied while the last barrier coat is still green so they will bond chemically. As soon as the barrier coat is dry to the touch, it's time to begin. The bottom paint needs to be applied quickly without excessive rolling that might disturb the underlying coat.

Once we got the first coat of bottom paint applied, we quit for the day. My friend Ray and I were completely worn out after applying two coats (barrier and bottom) to the hull of a 50-foot boat in one day. We retired to a nearby pub to celebrate our progress and recharge for the next day.

Boot stripe

I thought this would be a good time to give the boot stripe a new coat of paint. I sanded the old boot stripe carefully with 150-grit wet/dry sandpaper and applied a coat of Epifanes one-part topsides enamel. After this had dried for a couple of days, we sanded it

Counting the cost

We had prepared a budget for the bottom job based on the price sheet on a marine yard's website. We came in fairly close, but there were a few surprises, mostly the cost of bottom-coating material and the amount of labor involved. Our actual costs were:

Haulout and launch, power wash	$ 700
Lay days	$ 900
Sander rental and discs	$ 250
SilverTip QuikFair Epoxy	$ 260
Pro-Line barrier coat, 6 gallons	$1,140
Sea Hawk bottom paint, 5 gallons	$1,211
Paint, LanoCote and misc. supplies	$ 500
Supplies sub-total	$4,961
Labor*	$1,840
Total cost	$6,801

*Wendy and I did most of the work, but with generous help from family and friends on the weekends. We also hired friends to help with the heavy sanding to help keep the project on track.

Wendy and her sister polished the propeller to receive the LanoCote, at left. Dale finished up after moving the jack stands, at right.

again and applied a second coat with a roll-and-tip method. It was windy when we applied the second coat and it was drying very quickly. I worried that the finish would have an orange-peel look, but the paint is amazing and continued to level out overnight. It looked great when we removed the masking tape in the morning. The secret is to keep adding solvent to the paint to ensure that it flows well during the painting and drying process.

Cove stripe

I had noticed that a lot of the wooden boats at the Master Mariners Regatta held each year on San Francisco Bay sported a yellow or gold stripe on their topsides. The letters on *Moonshadow*'s nameboards were a gold/yellow color. I matched this color as well as I could by mixing two Epifanes enamel paints together. I sanded and taped, then applied the new color to the cove stripes. It seemed like the right accent for a classic sailboat design and I was very pleased with the result.

Propeller treatment

Wendy and her sister had sanded the propeller and polished it to a high luster. I wanted to keep it in that condition. The boatyard recommended a marine-grade grease called LanoCote that works as an underwater metal coating to slow marine growth.

Before applying the grease to the prop, the propeller must be warmed to 100 to 120°F. I used a propane torch to heat it up (being careful not to let the shaft bearing get hot) and, once it had cooled, applied a generous coat to the propeller, shaft, and locking nuts.

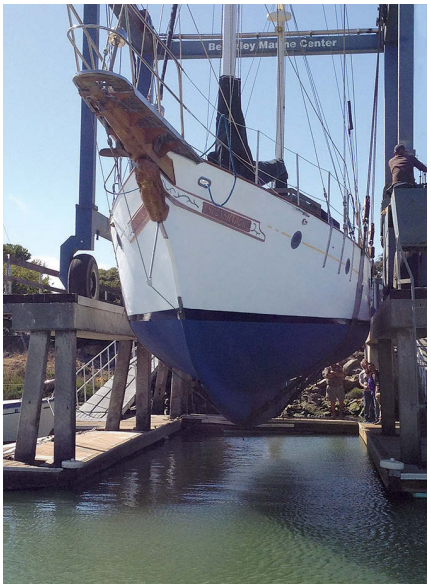
Launch at last

Before we could launch *Moonshadow*, we needed to reach the parts of the hull under the jack stands and we wanted to block the boat a little higher off the ground to give us better access to the bottom of the keel. We had to repeat the process in each of these areas: grind out the blisters, fill and fair, and apply two layers of barrier coating and two coats of bottom paint.

On launch day, *Moonshadow* was the last boat to go in the water just before closing time on a Friday afternoon. The yard was careful to block the boat and apply wax paper to the lifting slings to prevent any damage to the new paint.

Summary

This was a big job that took us the whole month to complete. Now that we have a dependable barrier coat in place, I hope we'll have very few blisters to repair on our next regular haulout. We had a diver look at the bottom about a year later and he found no trace of blisters. He said there was



Moonshadow **was the last boat launched on Friday afternoon before the boatyard closed for the weekend, above. Dale had finished the project within his 30-day time frame.**

some slime on the propeller but no barnacles and it cleaned up easily, so I would say the LanoCote is having a positive impact.

Dale and Wendy ***Bagnell*** *live aboard* Moonshadow, *their 1983 Hudson Force 50, on San Francisco Bay. They are currently refitting her in anticipation of an extended bluewater cruise in a few years' time.*

Resources

Silver Tip QuikFair epoxy
System Three Resins
www.systemthree.com

Jamestown Distributors
www.jamestowndistributors.com

Pro-Line barrier coat
www.sherwin-williams.com
Search on "pro-line"
(Alternatively, contact the Pro-Line Store 619-231-2313.)

Sea Hawk Sharkskin bottom paint
www.seahawkpaints.com

LanoCote Prop and Bottom
www.forespar.com/products/propandbottom.shtml

Epifanes paint
www.epifanes.com/home.htm

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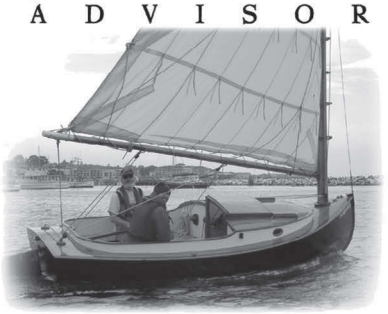

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Lifeline security

Make inspection and maintenance your watchwords

BY FRANK LANIER

During the golden age of sail, old salts greeted new crewmembers with the advice, "One hand for the ship and one hand for yourself." One trip to the yardarm during a howling gale to reef a flapping mass of wet, frozen canvas was all it took to validate this bit of wisdom. As Ol' Jack Tar was often forced to hold on with his eyelids while manning the decks or working aloft, it's little wonder a right good tar was said to possess a hand with "every hair a rope yarn, every finger a fishhook."

Today's sailor has it better with regard to staying on board but still has to contend with rough seas, wet decks, and bad weather. Modern safety gear — PLBs, handheld VHF radios, and personal flares — make it easier to find crewmembers once they're overboard, but it's the old-school stuff — harnesses, jacklines, and lifelines — that keeps them on board in the first place. Of this fundamental safety gear, none plays a more vital role than a vessel's lifelines. It's important to keep your lifelines ready, willing, and able.

Lifelines "just don't get no respect." Their condition and upkeep can be a matter of life and death, yet they're often burdened with numerous unrelated tasks and used as clotheslines and all-purpose tie-down anchor points for fenders and lines. They serve as impromptu grab holds when boarding, fending off, or coming alongside. Even sailors who are aware of the role lifelines play in keeping them on board while under way often fail to realize their value at the dock (where vigilance is more relaxed) or while the vessel is hauled out, where a failure can result in a long fall and a hard landing.

The system as a whole

Mention lifelines and most sailors think of the wire running along the perimeter of a vessel's deck, but that's only half the story. In addition to lifeline wire and its associated hardware (pins, shackles, swages, and so on), it's imperative to view the role played by stanchions, bow pulpits, and stern rails.

Stanchions keep lifeline wires at the correct height, provide rigidity to

A bent toggle bolt, at top, will prevent the lifeline from being tightened and is a potential point of failure. Any damaged hardware item, such as this broken stanchion mounting bolt, at left, should be replaced immediately. Stern rails are often burdened with solar panels, outboard engines, wind generators, davits, barbecues, and man-overboard poles that make inspecting them difficult and add stress to the lifeline system, at right.

the system, and help absorb the initial impact of a potential crew-overboard situation. Bow pulpits and stern rails are able to absorb the force of a flying body and they add strength to their associated stanchions.

Lifelines are commonly constructed of 300 series 7 x 7, 7 x 19, or 1 x 19 stainless-steel wire rope, but high-tech, low-stretch synthetic rope is increasingly being used. The first decision one faces with wire is whether to use vinyl-coated or bare wire.

Coated wire looks nice and is easier on sails. Because it's slightly thicker, it is also easier on hands. When the coating is worn or damaged, however, it can trap water that wicks along the wire and accelerates corrosion. As this corrosion is often beneath the coating, it remains undiscovered until a failure occurs. For this reason, vinyl-coated wire is not recommended and is actually prohibited by many offshore racing organizations.

Uncoated wire lifelines allow you to visually inspect their condition at all times. As the diameter of uncoated wire is smaller than the same-sized coated wire, you can enhance safety by increasing the wire size. In a pinch, larger diameter lifeline wires can even be used to fabricate emergency stays and shrouds. (*See Don Casey's argument for uncoated lifelines, November 2009. –Eds.*)

For coated wire, the general recommendation is that lifelines be replaced every five years, regardless of how good they look. Inspect the plastic coating regularly for damage due to chafe or cracking from UV exposure or old age. Pay particular attention to the ends (often the first place corrosion occurs as the coating has to be cut back to install terminal fittings) and never tape over damaged spots that can trap water, as that makes matters even worse.

> "…rope has the added attractions that it's lighter and doesn't corrode."

Rope lifelines

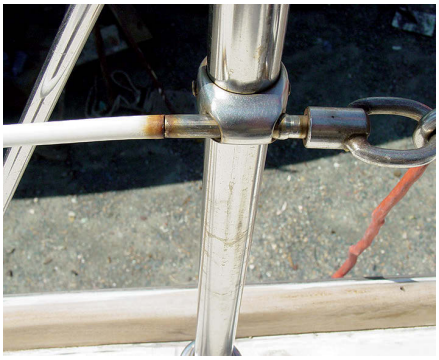
The use of Spectra, Dyneema, and other high-tech, low-stretch rope in lieu of wire has become increasingly popular. *(See David Lynn's report on installing Dyneema lifelines, March 2013. –Eds*) The cost of rope is similar to that of stainless-steel wire, and rope has the added attractions that it's lighter and doesn't corrode. The disadvantages of rope lifelines are a greater susceptibility to chafe and UV damage that is more difficult to detect than wire corrosion. As a result, rope lifelines should probably be replaced more frequently than bare stainless-steel lifelines.

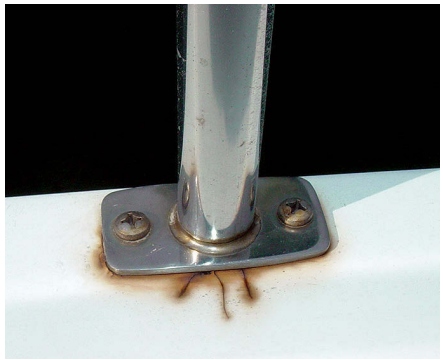
Inspecting lifelines

Lifelines epitomize the expression "as strong as its weakest link," as failure of just one component can lead to someone taking an unplanned swim. When inspecting lifelines, take your time and be thorough:

- Make sure all clevis pins are pinned and all turnbuckle barrels are properly secured with turnbuckle nuts (and pins if possible).
- Clean and polish fittings, swages, and other hardware, then inspect each with a magnifying glass for stress cracks and corrosion.
- Inspect vinyl-coated wire closely for damaged coating and signs of rust.

A stress crack and some corrosion are visible at the base of the lifeline-attachment eye where it's welded to the pulpit, at left. Also, the cotter pin looks loose and could fall out if the clevis pin it's securing rotates over time due to vibration. Where a vinyl-coated lifeline passes through a stanchion, the coating can chafe away, at right, creating a path for water to enter the wire and initiate corrosion.





Even when a vinyl coating is undamaged, water can wick between it and the terminal fitting and penetrate the wire, at left . A vinyl coating can crack due to age, especially at a stress point, such as this stanchion, at center, allowing moisture to enter and corrosion to begin. The "running rust" stain extending from beneath this stanchion base, at right is a sure sign the mounting hardware (or the stanchion itself) is corroding. It might also indicate that water has penetrated the deck laminate. The stress cracks in the gelcoat are another sign of trouble.

Replace the wire if you see chafe, cracking, or wear on the coating.

- To check uncoated wire for broken strands, take a handful of tissue paper, encircle the wire and lightly drag the tissue paper its entire length. Broken stands or "meathooks" will snag the paper. Don't hold the paper too tightly or they may snag a little meat as well.
- Remove all lifelines annually and inspect them for kinks, wear, damage, or corrosion, paying particular attention to the wire at end fittings and where it passes through stanchions.
- If you use end lashings (a multi-purchase lanyard of small-diameter low-stretch line) rather than turnbuckles to attach and tension the lifelines to bow pulpit or stern rail, replace them annually. Lashings should be no more than 4 inches in length (with lifelines fully tensioned) and as strong as the wire they attach. Line strength is reduced at each bend of the line around a lifeline terminal eye and the corresponding pulpit attachment point. When calculating lashing strength, throw in a couple of extra turns for an additional safety margin. Some sailors use lashings so they can cut them to quickly lower the lifelines should they ever need to retrieve a crewmember who has fallen overboard.
- Check all lifeline hardware (gates, turnbuckles, and so on) to ensure that each is in good condition and adequately sized. It's also a good idea to tape pelican hooks and similar gate hardware closed to prevent accidental opening.
- Verify the height of your upper and lower lifelines. The American Boat and Yacht Council (ABYC) recommends a minimum stanchion and top lifeline height of 24 inches, although heights of 36 to 42 inches are preferred. The recommended maximum height for lower lifelines is 9 inches above the deck. This is intended to keep an adult from rolling beneath the lifelines (consider fitting netting if there are children or pets on board). Rigging temporary chest-high lifelines of low-stretch line is also a good idea when heading offshore.
- Lifelines should be tight, but not to the point of bending stanchions or deforming the pulpit or stern rail. If, by using the muscles of your arm only, you can deflect a lifeline more than 2 inches by pressing down with your thumb at mid-span between two stanchions, it's probably too loose and should be adjusted.

Stanchions

The condition of any single stanchion may not seem significant, but as each provides strength to the system as a whole, all must be maintained in top condition. Put off replacing that bent stanchion now and it may fail completely if it's heavily loaded, such as when a crewmember falls against the lifelines in heavy weather.

Stanchion bases must be strongly constructed and through-bolted to the deck with properly sized hardware and backing plates. In some cases, the stanchion and base is a one-piece unit; in others, the stanchion slides into a socket in the base and is held in place with a setscrew or machine screw.

The best setup has the stanchion secured with a transverse bolt that passes through both stanchion and base with an additional setscrew to tighten the stanchion in the socket itself. Through-bolts (with locknuts or lock washers) or machine screws are preferable to Allen screws. If Allen screws are used, there should be at least two, with both threaded through the base and set into dimples in the stanchion.

An easy safety upgrade is to replace the lower setscrew with a machine screw. Drill a hole in the stanchion slightly larger than the screw (so it threads through one side of the stanchion) and use a lock washer to secure it in place.

Stanchion inspection

- Release the tension on lifeline wires and give each stanchion a good wiggle. If loose, determine if the cause is a sloppy stanchion-to-base fit (possibly due to a loose setscrew) or flex in the deck itself. Slight play due to the former is acceptable, but flexing due to a weak deck is a different story and must be addressed. Verify that the mounting hardware and backing plates for each stanchion base are of adequate size and strength. Backing plates should be two to three times larger than

the stanchion base and constructed of ⅛-inch stainless steel or aluminum. Fiberglass or other composites (StarBoard, for example) should be between 3⁄16 to ¼ inch thick.
- Gelcoat cracks around stanchion bases (often an indication of point loading or thin, poorly reinforced decks) should be inspected thoroughly, even if seemingly cosmetic in nature. Installing larger backing plates or top plates can help reduce point loading by distributing stanchion base loads over a larger area.
- Inspect stanchions and their bases for bends, cracks, broken welds, looseness, and corrosion. Bent stanchions, as well as fractures in the stanchion or its base, are often the result of passengers or crew using stanchions to hoist themselves on board, but fractures can also occur if water enters the base socket and freezes.
- Combining dissimilar metallic components (a stainless-steel stanchion coupled with an aluminum base, for example) promotes corrosion and one or the other should be replaced.
- Tighten stanchion screws and all base-mounting bolts and hardware regularly, and replace any that are stripped or damaged.

Bow pulpits and stern rails

Sailors have an uncanny knack for finding a gadget or doohickey to occupy almost every bit of available space. As a result, stern rails (whose primary job is anchoring the lifelines) are often burdened with solar panels, outboard engines, wind generators, davits, barbecues, man-overboard poles, and more.

It's almost impossible for designers to factor in the additional loads imposed by these aftermarket add-ons, but they can degrade the entire lifeline system. The best way to maintain structural integrity is to install arches, davits, and equipment independently of the lifeline system. If a stern pulpit is used as a mounting platform, additional supports may be needed. In some cases, the best solution may be to fabricate a new stern rail of larger-diameter tubing, with larger base supports or stiffening struts.

If any part of your lifeline system seems inadequate or fails to meet generally recognized standards, don't hesitate to upgrade it — just make sure those retrofits are properly engineered and robust enough to get the job done.

Pulpit and stern rail inspection

Many of the inspection points for stanchions apply to pulpits and stern rails as well.
- Check that each base is properly through-bolted and verify the presence of properly sized backing plates.
- Ensure that all mounting hardware is in good condition, tight, and secured with lock washers or Nyloc nuts.
- Unlike stanchions, bow pulpits and stern rails typically use welded bases rather than retaining hardware. This means you don't have to worry about loose through-bolts or setscrews. However, you will need to check all the welds closely for hairline cracks and corrosion.
- Inspect all lifeline attachment points (welded eyes and so on) for distortion, corrosion, and cracked welds. Clean and polish welds and hardware and inspect them for cracks with a magnifying glass.

Your lifeline system is one of your vessel's most aptly named components. Life jackets, harnesses, and tethers are one line of defense, but nothing matches the 24/7 security blanket provided by a lifeline system — as long as it's well-designed and properly installed and maintained. The time to make sure your system is up to the task is before it's needed.

Frank Lanier is an accredited marine surveyor with more than 30 years of experience in the marine and diving industry. He has captained and maintained vessels from dive boats to passenger ferries in the Atlantic, Caribbean, and South Pacific. He's also an avid writer, public speaker, and award-winning journalist whose articles appear regularly in marine publications worldwide. Frank sails his good old boat, Melelu, *a 1978 Union 36, on Chesapeake Bay, although she's currently in Marsh Harbour, Abaco, Bahamas. Find him at www.captfklanier.com.*

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Roadside seduction

The Oxford Dinghy lured a family into sailing

BY ALAN KEENE

The *last* thing on my mind that Friday evening 34 years ago was buying a boat. With Peg beside me and our son Chris in the back seat, we headed into the curve leading into Oxford, Maryland, on our way to Grandmom and Grandad's house. Oxford, an idyllic little town on the Chesapeake Bay's Eastern Shore, was home to my parents and we were there for a weekend visit.

Before completing the curve, we saw a sight that would forever change how we'd spend our leisure hours. Sitting by the side of the road were two beautiful little sailboats with blue- and white-paneled sails. Near the head of each sail was the silhouette of a duck in flight . . . a duck that would in later years come to represent a Chesapeake Bay classic, the Oxford Dinghy.

The next morning, Peg and I stole away to check out the little sailboats. Since neither of us had ever sailed before and had little interest in learning, our purpose was more of an excuse to enjoy a little time away from our rambunctious 4-year-old.

The sailboats were breathtaking. Though I didn't know a gunwale from a gudgeon, I looked at the two Oxford Dinghies, an 8½ footer and a 10, from every possible angle. I was captivated by the incredibly high level of craftsmanship reflected, literally, in every turn and curve.

Voluptuous in varnish

First I noticed the gorgeous mahogany thwarts. The flawless mahogany boards of the forward and midships thwarts were so highly varnished they appeared to be encased in liquid plastic. It was like looking into a mirror. The stern thwart was even more impressive. Shaped like a horseshoe as it followed the rounded stern, its graceful line gave the boats a much larger feel.

The 10-foot model stole my attention. Her fiberglass hull was a beamy 57 inches, but her beam didn't detract from her looks. With a flat bottom from the stem to the turn of the bilge, she sat rock solid on the 2 x 4 supports. A shallow wooden skeg ran aft from amidships, curving up the stern and ending just below the motor/rudder mount.

The rounded stern was beautiful. From astern, she looked almost like a legless antique bathtub, but in the best of ways. Hanging from bronze gudgeons and pintles on the motor mount was a traditionally shaped wooden rudder with a removable tiller. All of the woodwork glistened.

From abeam, the graceful look was heightened by her modest sheer, the canvas gunwale guard dipping noticeably from bow to stern. With a depth of more than 1½ feet, however, the freeboard was more than ample to make any captain and crew feel secure. Two well-placed sets of bronze

"Simpy elegant" describes the Oxford Dinghy, on facing page, and it's not hard to understand how even non-sailors would be drawn to it, especially upon seeing the richly varnished woodwork, at right. With its trailer, it's ready to sail on any inviting patch of water, below.

oarlock sockets rested along the inwale, allowing an oarsman to row from virtually any position in the boat. And, making up for the few inches of waterline lost by the curved stern, the line of the plumb bow plunged almost straight down to the water.

A 3-foot-long fiberglass centerboard trunk extended forward from under the midships thwart and a pivot handle at the leading starboard corner controlled the board's depth. Farther forward, under the bow thwart, was the hardwood mast step. The wooden pivot handle and mast step were also highly varnished.

Gunter rig

The sailing rig, called a sliding gunter, carries 62 square feet of nylon sail on the 10-foot model. The mast is in two sections, and the top 7 feet of the sail's luff is permanently attached to the shorter piece. When the mast is stepped, the halyard raises both the sail and the spar, which slides up the mast on a metal ring and adds 7 feet to the height of the mast. The 9½-foot boom extends almost 2 feet beyond the stern. It is connected to the mast with another metal ring and the loose-footed sail is attached at the tack and clew. When unstepped, the entire rig fits snugly inside the boat.

The 2-inch-diameter mast and 1½-inch spar and boom were made of aircraft aluminum with the ends plugged so the entire rig would float.

Meeting the master

As Peg and I continued to gasp at every new discovery, a gentleman appeared from a nearby workshop and introduced himself as Dale Denning, the designer and builder. A cruising sailor and retired mechanical engineer, he said he had never been happy with the dinghies he'd owned in the past. Either they didn't row well, or sail well, or motor well . . . but more than that, they were all tippy.

So he decided to build a better dinghy for himself, a stable one that could do all of those things reasonably well. And he did. It wasn't long before the cruising community caught wind of his creation and requests started rolling in. The end result was Dale Denning Inc.

Dale refused to let his cottage industry interfere with his cruising lifestyle, regardless of the backlog of orders. Every fall, he set sail for the Florida Keys, leaving only the warm months for boatbuilding. His yearly production was rarely more than 30 dinghies, but that was fine with him.

"Would you like to sail one?" he asked. "My 10 footer's back on Town Creek and there's a nice little breeze out there."

I don't know what came over me that morning in 1980, but there we were, Peg and I, sitting in the middle of Town Creek trying to figure out how to sail. After discovering that a sailboat wasn't really a sailboat without a keel — or in this case a centerboard — off we sailed toward open water. Accidental jibes and uncomfortable angles of heel notwithstanding, Peg and I fell in love with sailing that Saturday morning. Since it was love at first sight with the 10-foot Oxford Dinghy, there was only one thing for us to do.

Its timeless design and quality of build make the Oxford Dinghy the quintesssential boat for simply messing about in.

Confirmed sailors

Our order slip shows a date of August 6, 1980 but, due to the order backlog at Dale Denning Inc., we didn't take delivery until May 30 of the following year. As atypical buyers (the vast majority of Dale's customers being cruising sailors), the delay did not inconvenience us and gave us plenty of time to find a suitable trailer.

Since the Oxford Dinghy was designed to be a stable yacht tender first and a sailboat second, rowing ability was a major consideration in its design. With Shaw & Tenney spruce oars and bronze rowing hardware provided as original equipment, it was clear that Dale Denning was a strong believer in the art of oarsmanship.

In spite of the shallow skeg and broad, flat bottom, the boat tracks well when being rowed. And the ability to drop the centerboard in rough seas or windy conditions is a real advantage. The relatively heavy weight of the 10-foot model (135 pounds), combined with the improved water flow provided by the rounded stern, allows for a generous glide between strokes. The rounded stern also allows the boat to be rowed stern-first with much less resistance than a boat with a flat transom.

The Oxford Dinghy is fun to sail. Unlike so many small sailing tenders of its generation, its rig is much more than an afterthought. While most small boats look awkward carrying a sail rig, the Oxford Dinghy looks perfectly natural. Few 10-footers out there can carry more sail than her 62 square feet and remain upright, but she remains fairly stiff even in strong winds with the centerboard down, when she daws almost 3 feet.

Her only real weakness under sail is that she develops a pronounced weather helm when sailing upwind in heavy weather, making for an uncomfortable battle with the tiller. Centerboard and sail adjustments don't seem to help appreciably.

Not surprisingly, she sails best in 8- to 10-knot winds, where she can easily reach hull speed of 4¼ knots. While the boat can obviously be sailed by someone sitting on the thwarts, ducking under the 9-foot boom while tacking and jibing in a fickle wind can become tedious. If the wind is light to moderate, it's more comfortable to singlehand while sitting in the bilge aft of the midships thwart.

Outboard test

In the 33 years we've owned our Oxford Dinghy, I've only hung an outboard motor on her stern once, and that was to test the outboard . . . not the dinghy's ability to carry one. The motor was a 5-horsepower 4-stroke, which proved to be about 3½ horses too big. With Peg sitting all the way forward on the bow thwart and me on the horseshoe, our little dinghy leaped up on plane at the first twist of the throttle. The slightest movement of the motor's tiller resulted in an exaggerated change of direction. I was relieved to get back to port.

Based on that very limited experience, my guess would be that a tiny 2-stroke motor would provide ample power to move a full load on to its destination.

A rare find today

The Oxford Dinghy is the creation of a man who loves the water and the boats that sail on it. Designed and built as a "better dinghy" to hang from the davits of a large cruiser, ours became a trailersailer, introducing us to the world of sailing. For 15 years she was our only sailboat and plied the lakes and rivers and bays of the Delmarva Peninsula.

At a production rate of just 30 boats a year from the late 1970s to the mid-'80s, Dale Denning didn't build many of these boats, but he built each one to the highest of standards, using only the finest materials. He couldn't do it any other way.

Since so few Oxford Dinghies come on the market these days, it's difficult to determine what an average asking price might be. The last 10-footer I saw for sale was back in November 2010 and the owner was asking $2,500. Based on that figure, it wouldn't be surprising to see one in exceptional condition priced at over $3,000 today. That's a handsome sum to pay for a 30-plus-year-old sailing dinghy, but maybe not so much for a Chesapeake Bay "classic."

Alan Keene, a retired mental health professional and former Chesapeake Bay *boating columnist, sails* Tackful, *his 1982 Catalina Capri 25, out of Havre de Grace, Maryland. His Oxford Dinghy, informally known as* Odie, *is currently in the early stages of restoration.*

A wooden wheel

BY BERT VERMEER

Easy on the eyes and warm to the touch

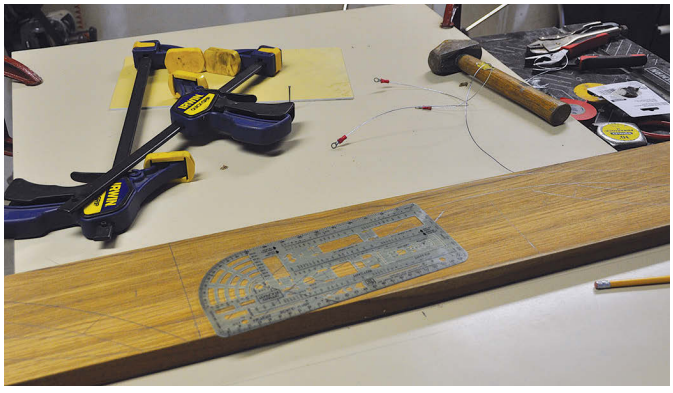
The stainless-steel steering wheel on our 1978 Islander Bahama 30 was always cold on the hands and the eyes. I wasn't a fan of expensive leather covers so, for visual appeal and warmer hands, wrapped rope around the rim. But a teak rim was always my dream. Edson offered a teak-rimmed wheel, but at more than I was willing to pay.

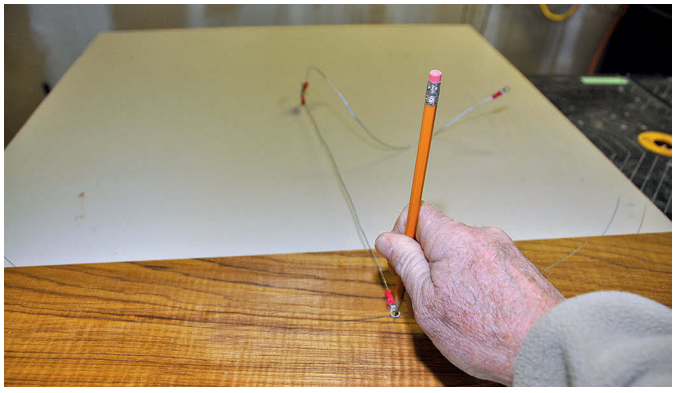
The question became: "How can I build my own?" I had never before tackled a project like this and couldn't find any information on how it was supposed to be done. With my limited knowledge and woodworking skills, I approached it with trepidation. Friends thought it wasn't possible. My fallback position was to return to the basic stainless-steel rim or wrap it in rope again. I don't pretend to be a carpenter or shipwright and am not saying mine is the correct way to build a wooden wheel, but this is how I managed to do it at minimal cost.

I started with the Edson 36-inch stainless-steel wheel that's been on *Natasha* for a number of years. I took measurements with the intention of providing between ⅛ and ¼ inch of solid teak over the 1-inch rim. Instead of a purely teak rim, I wanted oak inserts on the inside and outside edges, joining the fore and aft teak halves. I thought this would enhance the look and reduce the amount of teak required. I included an oak quadrant at the bottom of the wheel to provide a quick visual reference for the wheel's position when sailing.

Measuring and shaping

The first step was to set up a measuring table. I used an old countertop and placed a nail in a position that would





Natasha takes the wheel of her grandpa's Islander Bahama 30, at top. After all, it does have her name on it! Before starting work, Bert gathered the tools and the wood, at left. He drew the inside and outside curves on the wood using wires with eyes at each end, at right.

allow me to lay out the wheel's radius. I measured two lengths of wire (as it doesn't stretch) with eyelets at both ends, one to the inside and one to the outside radius of the wheel. This allowed me to mark cutting lines on a 1 x 8-inch teak board. To minimize waste, I drew the pieces as long as I could within the width of the board while allowing for overlapping pieces facing the opposite direction on the board.

I cut each piece just outside the drawn lines using a handheld jigsaw. A floor-mounted bandsaw would have been ideal, but you work with what you have. To ensure each piece would be identical, I clamped them all together side by side, then sanded them down to the drawn lines. I started with a belt sander and finished with a sanding block cut to the same inside and outside radii.

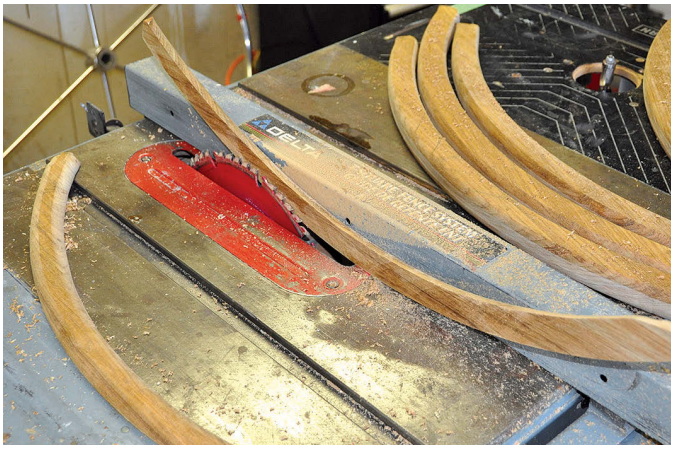
Careful with those tools!

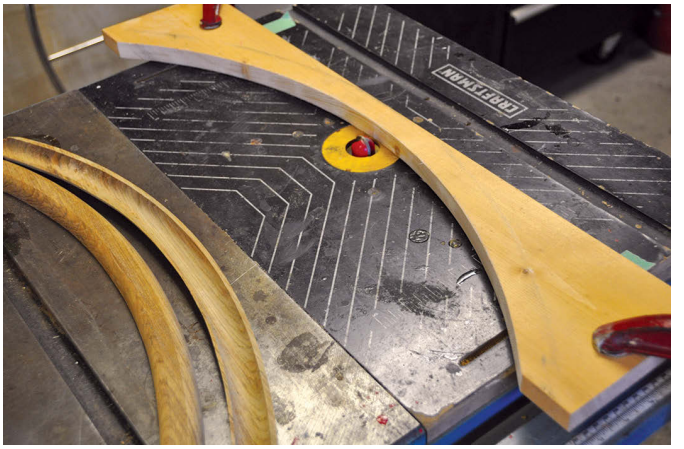
The next step was to round the edges of the pieces. I used a quarter-round router bit with guide bearing for accuracy and, being a coward with power tools, took small cuts with the table-mounted router until I achieved the desired edges. I then cut each piece in half lengthwise on the table saw (with great care — count the fingers!) creating two finished pieces (front and back) from each curved piece.

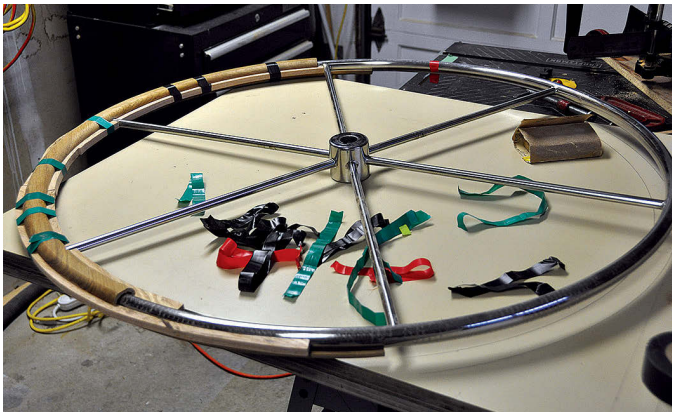
> "… whatever I did with the teak, I first practiced on much less expensive pine."

Hollowing out the cut pieces to accommodate the stainless-steel rim was the riskiest and most challenging part of the project. This would have to be accomplished using a 1-inch bullnose router bit. The standard straight router fence would not work; there was just too much room for error as the curved pieces were moved past the bit. So I built a curved router fence out of pine to the same radius as the outside dimension of the curved teak, aligning it carefully on the router table. Using plenty of practice pieces (did I mention that, whatever I did with the teak, I first practiced on much less expensive pine?) and multiple shallow cuts with the router, I now had the front and back shells for the rim.

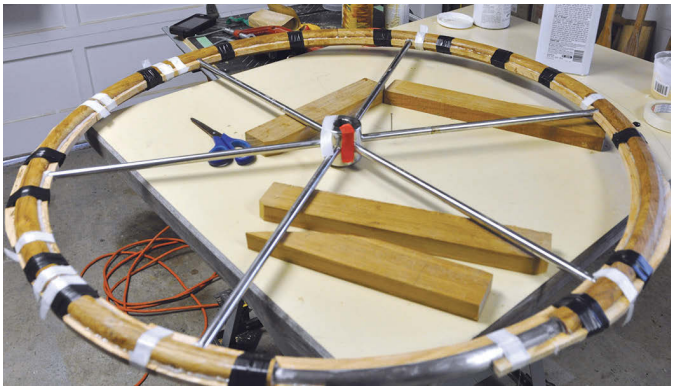
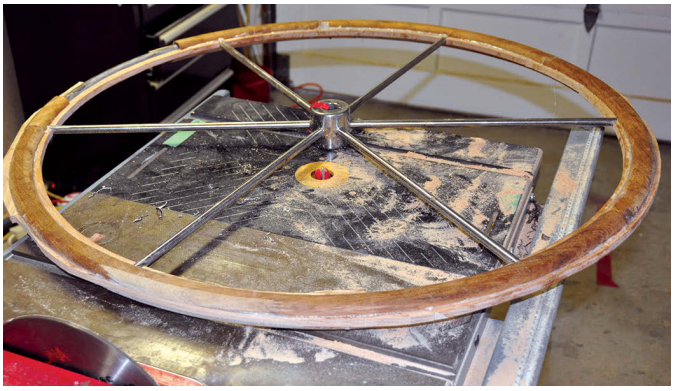
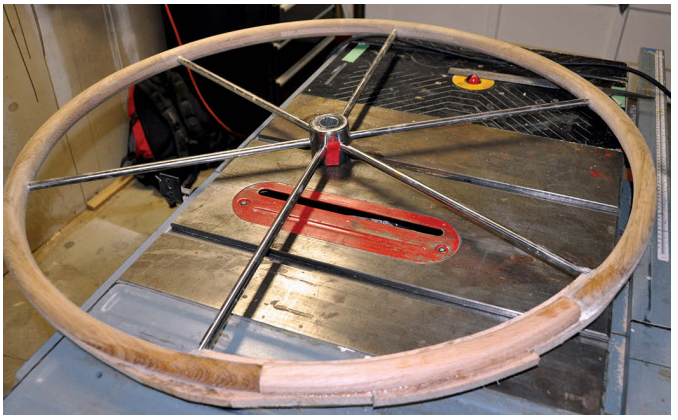
The oak inserts between the front and rear teak pieces were next. Using the same procedure as with the teak







Carefully, Bert sliced the shaped pieces in half, upper left. To hollow them out, he used a 1-inch bullnose router bit and a custom fence, upper right. To ensure a proper fit, Bert first assembled the pieces dry, above left, then arranged them in assembly order on the floor, above right.


Bert applied a thick epoxy paste to the parts and taped them in place around the wheel, overlapping the joints, upper left. The gap is for the oak "telltale" piece, upper right. Sanding gets under way, above left. The boat's name in gold is in the middle of 13 coats of varnish, above right.

pieces, I drew the narrow curved sections onto a ¾-inch oak plank, cut the curves, then clamped them together and sanded them into shape. I wasn't too concerned about the non-critical edges (those not facing the stainless-steel rim) so the photos show a very rough cut. Another time I'll be more careful — it would save a lot of sanding! The inserts were cut to a width that would allow sufficient room inside the teak shells for epoxy once all the pieces were assembled on the rim.

Assembly and finish

Before putting it all together, I roughed up the stainless-steel rim with 80-grit emery cloth and washed it thoroughly with acetone. Using epoxy and filler, I came up with a thick, sticky, non-drip paste that I troweled into the hollow of each teak piece. I also coated the critical sides of the oak inserts. I placed each piece on the rim using overlapping joints and held them in place with elastic electrical tape. I was careful to ensure that each wood piece lined up with the next one on the epoxy bed. No clamping was necessary; the elasticity of the tape created sufficient pressure to bring the pieces together. Clamping would have simply squeezed out more epoxy and warped the teak. It was an anxious day waiting for the epoxy to cure!

The most time-consuming part of the project then began: sanding! Starting with a small sanding disc on an angle grinder, I sanded the oak inserts on the inside and outside of the rim until they were level with the teak. Then, using the sanding blocks again, and progressing from 80- to 220-grit sandpaper, I sanded the whole rim into a smooth, round profile. Around the spokes, I used a Dremel tool with a sanding disc.

Once I was satisfied with the shape of the wooden rim, I began the varnishing. I used Epifanes high gloss in seven initial layers, creating a very smooth, high-luster finish. Any good marine varnish would suffice. I had a local sign shop create the boat name in imitation gold leaf, placed it on both sides at the top of the wheel, and finished it with six more coats of varnish. Our granddaughter Natasha was most pleased and I'm very satisfied with the results. It took about 40 hours of spare time to build (and probably just as much time to varnish!) with minimal cost in material. The oak, epoxy, and varnish were already on hand from previous projects; all I needed to buy was the teak.

And now I have my wooden wheel!

Bert Vermeer and his wife, Carey, live in a sailor's paradise. They have been sailing the coast of British Columbia for more than 30 years. Natasha *is their fourth boat (following a Balboa 20, an O'Day 25, and another Islander Bahama 30). Bert tends to rebuild his boats from the keel up. Now, as a retired police officer, he also maintains and repairs boats for a number of non-resident owners.*

Levity's NEW RUDDER

A lack of options pointed to DIY

BY STEPHEN PERRY

I met my rudder on March 30, 1998. It was attached to a Nicholson 35 that my wife, Mary Broderick, and I were about to buy. Our surveyor had just warned us that the rudder was waterlogged. I was concerned, but as we stood together in the boatyard he asked, "How many boats in this yard do you think have water in their rudders?" Before I could answer, he replied, "Nearly every one of them." He said the rudder was otherwise generally sound and would not need immediate attention. This was welcome news, but I knew I would see the inside of that rudder someday.

Levity was nearly 30 years old when we bought her. Our initial five-year plan involved upgrading her antiquated systems and preparing her for offshore cruising. But after sailing her for several seasons, we discovered a problem that overshadowed her waterlogged rudder. *Levity*'s hull-to-deck joint leaked badly and, over time, caused damage to her decks and interior. This had to be fixed before *Levity*'s refit could move forward (*see "Tearing* Levity *Apart," May 2014 –Eds.*).

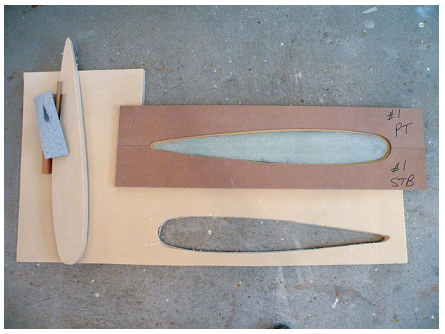
In 2002, these issues prompted us to haul her out for major repairs. Our five-year plan was tossed overboard and her restoration, which ran into 10 years, became the *Levity* Project.

Since she would be out of the water for an extended period, I removed the rudder and the entire steering system for a general upgrade. I wasn't planning to repair the rudder right away but I was anxious to see what was inside, so I drilled a few holes though the fiberglass shell. I was not entirely surprised to find wet, foamy mush inside, but my spirits began to sink when, a few holes later, I found more of the same. Finally, I cut a door in the side of the rudder. It was now obvious that, after we completed more pressing repairs, the rudder had to be rebuilt.

Eventually, with other aspects of *Levity*'s repairs well under way, I decided to revisit the rudder, which had occupied a corner of my shop for several years. First, I removed the bottom paint from the rudder to check the condition of the fiberglass shell. After working for several hours with a grinder, I uncovered extensive fiberglass delamination. Much of this damage stemmed from a modification made to the original rudder design by a previous owner.

It was time to decide whether to have *Levity*'s damaged rudder repaired or built new and whether to attempt the work myself. I sent a detailed

After Stephen stripped the paint off the rudder, he discovered extensive delamination, at left. He laid out the dimensions for the new rudder stock on the old rudder, center, and scribed templates to check the rudder's shape, at right. The new rudder eventually took its place, at top.




Stephen made a foam mold for each of the four frames, at left. After attaching and aligning the fiberglass frames to the rudder post, he made a trial fit on the boat, center. He fitted rigid polyurethane foam between the frames and shaped it with saws, rasps, and a surform tool, at right.

description and digital pictures of the damage to three companies that specialize in rudder construction. I also contacted several boatbuilders and specialty fiberglass shops and chauffeured my rudder to a nearby marine repair facility for evaluation.

Weighing alternatives

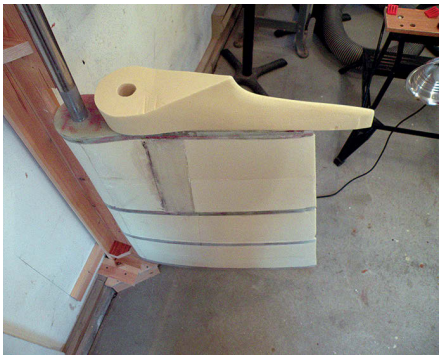
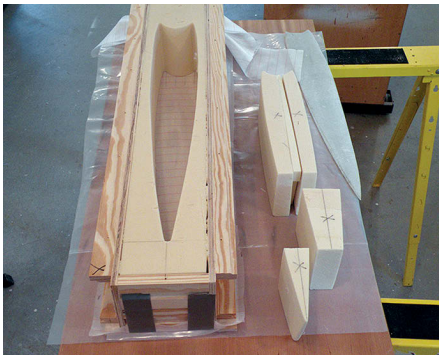
Most of the companies responded promptly. I received estimates that ranged from $1,200 to $2,500 for repairing the rudder using the existing stock and from $2,500 to nearly $12,000 for building a new rudder in fiberglass. I also received a $6,000 estimate for a new carbon-fiber rudder weighing approximately 40 pounds, less than half the weight of *Levity*'s existing rudder. Although the repair estimates were reasonable, I wasn't sure if repairing the rudder made sense because the extent of the corrosion on the existing rudder stock was unknown.

As our surveyor had noted, many rudders on older boats suffer from moisture issues. Fortunately for good old boat owners, the leading companies that specialize in rudder construction own the molds for many U.S.- and foreign-built production boats, so the cost of building a new rudder for an older production boat is often reasonable. Unfortunately, I failed to turn up rudder molds for our Nicholson 35 built in the U.K. in 1973, which meant it would be necessary to create molds in order to construct her new rudder. Since I had cut away most of *Levity*'s rudder on the port side, making the molds would be more complicated.

Another potential complication was the modification made by a previous owner. A rudder has many dimensional parameters that determine how efficiently it will work. If the previous owner had not made the modification correctly, the existing shape might not be optimal. I made templates at four selected positions on the rudder and, to my relief, they showed that *Levity*'s rudder shape conformed to the conventional rudder formulas I'd checked.

I began to consider framing a rudder much like the wing of an airplane. The carpentry involved in constructing fiberglass frames from templates of the rudder would be tedious, but not difficult. This would bypass the need for molds and allow me to create a superior structural frame. If the rudder stock assembly was constructed accurately, filling the voids between the frames with lightweight foam and fine-tuning the shape would be relatively straightforward. Once this was accomplished, covering the finished shape with layers of glass cloth would produce a nearly seamless rudder. The process would still be labor-intensive and involve some experimentation. And, of course, the devil is in the details.

I reviewed the options before committing myself to this project.


Stephen made the rather complicated shape at the top of the rudder as a separate piece, at left. He made a mold for the foot, which he decided could be sacrificial, center. He set the old and new rudders side by side while checking the new foot for fit, at right.

While the method of construction did not appear to be difficult, there was a cost-benefit ratio to consider. Since I had never built a rudder, the learning curve would be steep and my time and expense estimates might be off considerably. The potential for material failures added yet another element of uncertainty.

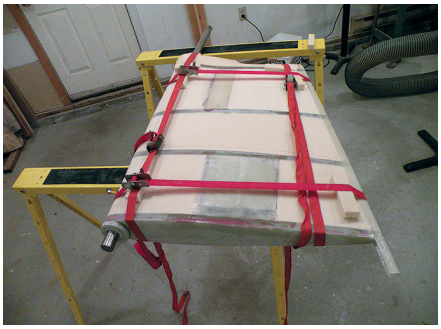
A closer examination of the old rudder revealed more damage than I had realized. The trailing edge had a split that could be opened up with a putty knife and I could see areas of the body where entire layers of cloth were delaminating. This convinced me that building a new rudder was the best way to proceed on the *Levity* Project, which had not yet involved cutting corners.

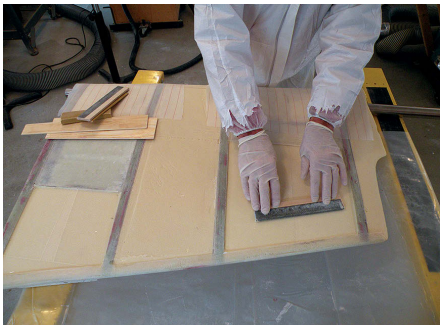
It seemed that I was headed toward building the rudder myself. I decided to pursue the "wing method." Based on discussions with several builders, I estimated about 120 hours of labor to build the rudder and material costs of $1,500 to $2,000, including a new stock.

The plan

The original rudder was constructed with a bronze stock and separate lower pintle. For the new rudder, I planned to use a one-piece rudder stock with welded steel vanes (or flags) to resist the twisting of the body relative to the stock. Welded steel joints are stronger than brazed bronze, and 316L stainless steel seemed like the best material to use. In order to retain more control over the process, I decided to have local machine and welding shops fashion the post from my sketches and measurements. I ordered a 5-foot length of 1½-inch-diameter, mill-finish, solid stainless-steel rod for the stock and ¼-inch-thick plate from which the flags would be cut.

I would construct the frames that defined the rudder's shape in my shop from various weights of fiberglass cloth and epoxy resin. Using the templates I made, I planned to subtract approximately ¼ inch from the perimeter for the thickness of the GRP skin and cut a form in which to lay up frame sections about ¾ inch thick. I would make these molds out of household-type foam board insulation. After the parts set up,





After gluing the foam shapes into the frame, Stephen epoxied the top and trailing-edge spine in place and held everything with band clamps, at left. He sanded the foam a little below the level of the fiberglass frames, center, and built it back up with fiberglass cloth and epoxy, at right.

Rudder stock woes

The machinist left a message informing me that the rudder stock was done and ready to be picked up. The machining cost of $600 plus the cost of raw materials brought the total price of the rudder stock to $750. This was close to several quotes I'd received for a completed stock. Back in the shop, I was ready to start fitting the fiberglass frames to the post . . . or so I thought. When I measured the stock, I discovered it was 3 inches too long. I called the machinist in a mild panic and learned he had not measured the stock material because he'd assumed that it had been supplied to him cut to the proper length. Disappointed, I took the stock back to the machine shop to discuss the options.

This was not destined to be an easy fix. The top of the stock had been machined beautifully for the quadrant keyway and the upper 2 inches were square cut for the emergency tiller. The lowermost flag, where the first fiberglass frame would attach, was welded 2½ inches above the bottom. The welder (who worked independently of the machinist) suggested cutting the extra 3 inches out of the middle and welding a sleeve for a splice, but I thought this would weaken the stock. I felt that cutting the bottom of the stock to the proper length, then cutting off and re-welding the bottom flag would be a better solution. Due to the length of the flags, the post could no longer be put on a lathe, so the machining at the tip — the pintle, in effect — would have to be done with hand tools.

I briefly considered starting anew, but the method discussed seemed viable so I gave the machinist the go-ahead. A few days later, I had the stock back in my shop, where careful inspection revealed a large dimple on the tip right where it would ride in the bushing. It was caused by the machinist torch-cutting the flag instead of machine-cutting it. (Torch cutting is faster but is generally less accurate and, if not done carefully, may overheat the metal). I thought an ill-fitting pintle and bushing were too much of a compromise. It was time to find a new machinist.

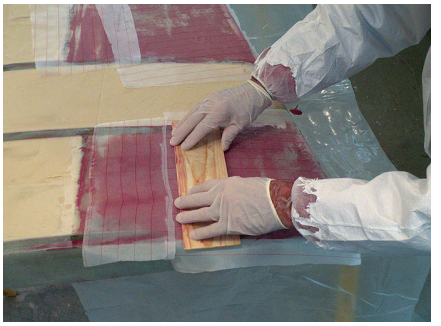
At first I assumed this newest problem would be easy to rectify. The stock was 1½ inches in diameter and the phenolic bushing in the heel bearing was tapped out easily. If the tip could be accurately reduced to 1⅜-inch diameter, a new bushing could be inserted. After explaining the problem to a different machinist, I heard the words I had been hoping for: the shop owned a point-to-point vertical boring machine that could accomplish the modification to the tip without any problems. The stock would be put into the machine vertically, upside-down, and a rotary cutter head moved downward at hundreds of points around the circumference, thereby reducing the

I would break off the foam board and clean up the parts.

I positioned the four templates (which I cut from ½-inch medium-density fiberboard for its dimensional stability) at roughly equal spacing along the stock, except for the top and bottom 5 inches. I planned to build the rudder foot separately as a sacrificial piece and eliminate some complicated fiberglass work, and the complex shape of the top would have to be sculpted by eye and careful measuring. Next, the frames would be assembled to the steel flags on the stock. I would drill holes for the top and bottom frames to slide over the stock and cut notches for the two intermediate frames. I would mark and router a channel into each frame for the flags to fit into, giving additional strength. Everything would be glued together with filled epoxy.

I planned to fill the body of the rudder with rigid polyurethane foam glued in place with epoxy, cutting the foam sections with a generous allowance to allow for shaping. After cutting away the excess foam, I planned to shape the remainder with longboards and sanding blocks, using the fiberglass frames as a guide. The top section would start out as a large block epoxied to the top frame and sculpted in place. Then I would glass over the entire body by wrapping the glass fabric around the leading edge and ending at the trailing edge, tapering off the layers where they met. The sacrificial foot would be completed separately and attached to the bottom frame. I planned to construct this part using a plug made from rigid polyurethane foam.

In preparation for the rudder construction, I mounted a wall bracket from which to hang the rudder in my shop. That allowed me to swing the rudder from side to side and align the fore-and-aft centerline of the quadrant with the top of the rudder where it met the hull. This would ensure that the trailing edge was aligned with the centerline of the boat. I also built a wooden stand that could support the rudder in different positions for each step of its construction, including barrier coating and painting.



Stephen applied fairing compound and leveled it carefully with a flat board.

Getting started

After ordering the material for the rudder stock, I visited the machine shop. I brought the original rudder and three sheets of sketches showing the finished product in detail. Every dimension was important: the work was not complex, but exact machining and placement of the quadrant keyway was critical. I used the old rudder to confirm in three dimensions the positioning of the various parts. Everything seemed clear to the people at the shop. I returned to my workshop to start making the fiberglass frames.

I laid the four templates on a piece of 1-inch-thick foam board. Using a scribing tool, I reduced the shapes by ¼ inch before carefully cutting the foam that would become the mold. After pre-cutting the fiberglass cloth and writing down the correct sequence for application, I used epoxy resin and a combination of woven roving, stitch mat, and cloth to build up each part to a ¾-inch thickness. Once the fiberglass had cured, I broke off the foam, cleaned up the parts, and placed them inside the

diameter. This process leaves tiny ridges that are small enough to be removed with minor hand finishing.

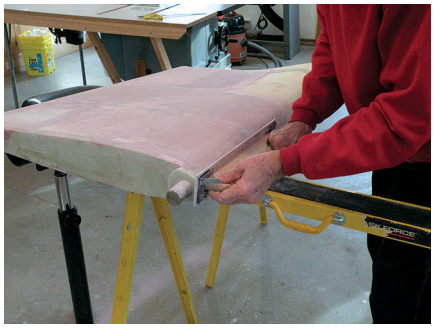
There's a saying that if it sounds too good to be true, it probably is. A few days later, I learned that the boring machine would only accommodate a length of 55 inches — just 2 inches short of what was needed. When I asked if there was another option besides hand shaping the ⅛-inch reduction myself, I was referred to a larger machine shop, located about 45 minutes away, with a horizontal rotating-head milling machine. By now, I had spent a lot of money on gas chauffeuring my hunk of steel. Of course, saving money was not the reason I had decided to proceed with the project in this fashion and I was learning invaluable lessons.

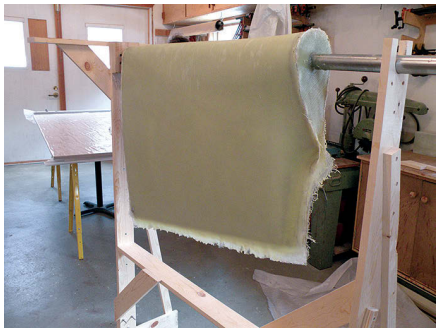
The new machine shop specialized in large commercial transmission work and housed an impressive array of production machinery. Unfortunately, none of the equipment appeared to be capable of making this seemingly simple cut. The machinists recommended cutting off the lower flag so the post would fit into their lathe, then milling the tip and welding the flag back in place. Since they produced gears, spindles, and casings and seemed almost over-qualified for this job, I decided to have the work done as they suggested. I could see the light at the end of the tunnel.

A few days later, I returned for the finished rudder stock. At the main office, however, I learned that they'd had to do a little more cutting and welding than expected, which cost a bit more, but at least they'd been able to do the job. I left the office thinking that I would finally be taking the finished stock back to my shop.

On a large array of floor-to-ceiling shelves where completed parts awaited further processing, it was easy to spot my 57-inch-long stock among the myriad transmissions — and also to see that something was very wrong. It was no longer straight. It appeared to be out of true by about an inch. The light I had seen at the end of the tunnel had become a train.

When the machinist welded the flags back on the stock — improperly — the stock overheated on one side and warped. I was wondering if I should send the whole mess to the recycling bin after all when the shop manager approached and said their 30-ton press could slowly persuade everything back into alignment. After the press had been worked along its entire length, the stock measured up nicely along a straightedge. The owner of the shop informed me there would be no additional charge for that final operation. (Was he serious?) The total cost for the completed rudder stock was now $1,350. But, finally, the project could move forward.





Stephen did the final shaping with sanding blocks and a longboard, at left. For fiberglassing, he supported the rudder on a specially built rack that allowed him to fix it in different positions, center. He trimmed the excess fiberglass after the resin had cured, at right.

templates to confirm that everything was within expected tolerances.

Unfortunately, my instructions to the machine shop had not been clear enough and the rudder stock took longer to complete than expected (see "Rudder Stock Woes," page 46), setting my schedule back by nearly a month. When I finally received the finished rudder stock, the fiberglass frames were ready for installation. I had drilled and notched the frames for fitting to the rudder stock and routed a ⅜-inch-deep groove in each frame along the centerline. But when I placed the first frame onto the top flag and into the groove, I discovered the flags were not welded accurately to the aft surface of the post. All four frames were off by a couple of degrees, so my previously cut grooves were now in the wrong positions.

To work around this error, I filled the grooves and machined them again after matching each frame to its flag. I set up jigs to hold the frames in place and parallel to each other while the thickened epoxy set up. Everything lined up nicely with the test jig, but I thought a trial fit on the boat made sense before I committed to building the body. If minor corrections were needed, it would be much easier to make them now.

Fitting the rudder in the boat is best done with a knowledgeable and reasonably strong helper. Due to the flare at the top and the close fit to the skeg, the rudder had to be tipped in and up through the hull at the same time as the upper bearing was positioned. Doing this myself involved multiple trips up and down the ladder, moving the rudder up a few inches each time and blocking it up, while preventing the upper bearing from jamming in its port.

When the rudder was finally in place, I ran a string from the center of the trailing edge of the keel, aft under the bronze lower bearing, and farther aft where I attached it to the lower trailing edge of the rudder. I swung the rudder from side to side until the string came directly under the bronze bearing center point, indicating when the rudder was aligned with the centerline of the boat. The top of the rudder proudly presented a near perfect fit where the hull met the rudder.

Foaming and fairing

Back in the shop, I mounted the skeleton of the rudder to its wall bracket to begin filling it with rigid polyurethane foam. The material was easy to cut and shape. I joined the oversized sections with thickened epoxy and held them together with band clamps. Foam blocks under the straps prevented them from sticking to the epoxy and kept the bands from deforming the edges of the foam.

I used surform tools and sanding blocks of various sizes and shapes and the body of the rudder quickly took shape. Shaping the foam was messy work; it produced fine, granular dust that clung to just about everything, probably due to static electricity. It was difficult to vacuum up. It took several

Resources

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passes to completely remove the dust from the surfaces. Even then, the dust would return and coat the surfaces all over again.

I encountered some difficulty shaping the material where the foam met harder surfaces, particularly the solid fiberglass frames and epoxy joints between the foam sections. My initial plan had been to use sanding blocks that would ride on the adjacent frames, abrading the foam exactly to the shape of the frame. But no matter how perfectly straight the block and regardless of the sandpaper grit, foam constantly raked out below the level of the frames. Sanding across the epoxy glue lines didn't work either, and left a thin epoxy ridge, proud of the surrounding foam.

I wanted to eliminate this scalloped surface prior to applying the final skins of fiberglass, because applying the glass first and dealing with the uneven surface later would require too much handwork with the longboard. The easiest solution was to build up the low areas between the frames with filled epoxy and strike the mixture off with a long straightedge, but I had hoped to avoid extensive use of fillers.

Instead, I sanded the foam areas between the frames to a uniform depth of about ⅛ inch and filled them with epoxy resin and fiberglass cloth. This was time-consuming, but with careful buildup using lightweight cloth, the finished result was more than acceptable. The rounded leading edge proved to be a bit more work but, in the end, the entire body had a fair, uniformly hard surface on which to apply the final layers of fiberglass.

Glassing and test fitting

I put the rudder in the freestanding jig so I could rotate it and secure it in different positions. I calculated that six to eight layers of 12-ounce stitch mat (woven roving with mat stitched to it) would yield the skin thickness needed. I used epoxy resin with slow and extra-slow hardeners so I could apply several layers of fiberglass fabric without the risk of the epoxy curing too quickly. At the end of a long day, which I spent flowing on resin, applying fabric, and pressing the fabric into the resin with the laminate roller, the epoxy began to set up. Seven layers of fabric were now on the rudder. I carefully applied release fabric to the entire surface.

Stephen made a trial fit on the boat before adding the sacrificial foot.

After it had cured for a day, I pulled the release fabric off and cleaned up the excess epoxy and rough edges. A spot check with the templates showed that the shape was very close to ideal. The first trial fit of the completed rudder was in order.

Installing the rudder was even more difficult this time, since the additional foam, epoxy resin, and fabric had nearly doubled its weight. When the lower bearing was fastened in place and the support blocks removed, the rudder could be swung from side to side easily. The top required only minor filling with a couple of layers of glass or fairing compound. However, when I stepped back to look at it, I realized the foot was not quite right. When I made the mold, I had forgotten to take into account the rake of the rudder stock. The foot should have been tapered in height from fore to aft. I would have to cut the bottom to the proper shape and reglass that section to correct this mistake.

The final shaping of the rudder and foot would have to wait while I turned to another aspect of *Levity*'s restoration. It was now autumn and we had started applying epoxy barrier coat to the hull. We wanted to complete that before we lost our weather window for the year. I cleared the area around *Levity* of all planks, blocks, and tools so I could get an unobstructed view of her. Even without the additional 6 inches of the rudder foot, *Levity* now had a working rudder for the first time in 10 years.

Stephen Perry and his wife, Mary Broderick, have been sailing coastal New England waters together for more than 20 years and hold USCG Masters licenses. Stephen is currently working full time on the Levity *Project, with Mary's help, and they are planning a much-deserved extended cruise.*

More online

There's almost always "the rest of the story." When Stephen decided to build a replacement rudder for *Levity*, he was confident the job was well within his capabilities. He had already repaired *Levity*'s hull-to-deck joint, which involved some complicated fiberglass work. Building *Levity*'s new rudder allowed him to experiment with a different type of construction. There was also the potential for cost savings. The finished rudder looked great, but two unexpected problems lurked beneath its surface: excess weight and minor, but irritating, resin issues. Correcting those problems on the completed rudder would not be easy, but he felt he had to try. Based on what he learned while constructing his prototype, Stephen rebuilt the rudder the following spring. He employed several strategies to reduce its weight and correct the imperfections in the glasswork. He describes how he accomplished this in a second article online. Go to www.goodoldboat.com/reader_services/more_online/rudder_project.

Sextant Reflections

Celestial bodies have lost their star appeal

BY HENRY CORDOVA

I was in my early twenties when I first learned about celestial navigation. I had an interest in astronomy as a kid, was a fairly knowledgeable amateur astronomer as a teenager, and majored in astronomy in college. So when I joined the Navy, I finagled myself into the navigation department aboard a missile destroyer. I'd never been exposed to navigation before, but I soon fell in love with it — it fit right in with my interests and background. My shipboard training was in the practical aspects of piloting and dead reckoning, plotting and chartwork, publications, electronics, and aids to navigation. I was introduced to celestial navigation and even worked out a position or two as part of my training although, in the modern Navy, the sextant is rarely used and only by the officers and senior enlisted men.

Still, I loved the work and, after going back to school and finishing my degree, I became an avid sailor and had a chance to sharpen my wayfaring skills further. But it wasn't until many years later, as a married man with a responsible career, that I decided I would buy a proper yacht capable of crossing an ocean. I realized I would need more than simple piloting and dead-reckoning skills; I needed to master celestial navigation. I bought a professional sextant, picked up a couple of books on the subject, and taught myself the arcane art of determining my position at sea by sighting distant objects in the solar system and the galaxy.

> "You and your ship become part of the sea, connected to the world and the heavens themselves."

No great mystery

Celestial navigation is not really difficult. It sounds very mysterious, but in practice it has been reduced to a long and involved procedure of looking up numbers in published tables and adding and subtracting columns of figures. Knowing the mathematics (mostly high school trigonometry) is not really necessary. Understanding the math and science as I do may have made it more interesting for me, but it is important to keep in mind that we're not talking brain surgery or particle physics here.

Working out a position is like accounting — a lot of rules to learn, and some adding and subtracting on preprinted forms that keep you from losing your place and remind you what comes next. It's all been designed by geniuses to be done by idiots. I would compare it in complexity to figuring out the taxes for a small business, except navigation doesn't change the rules on you every year.

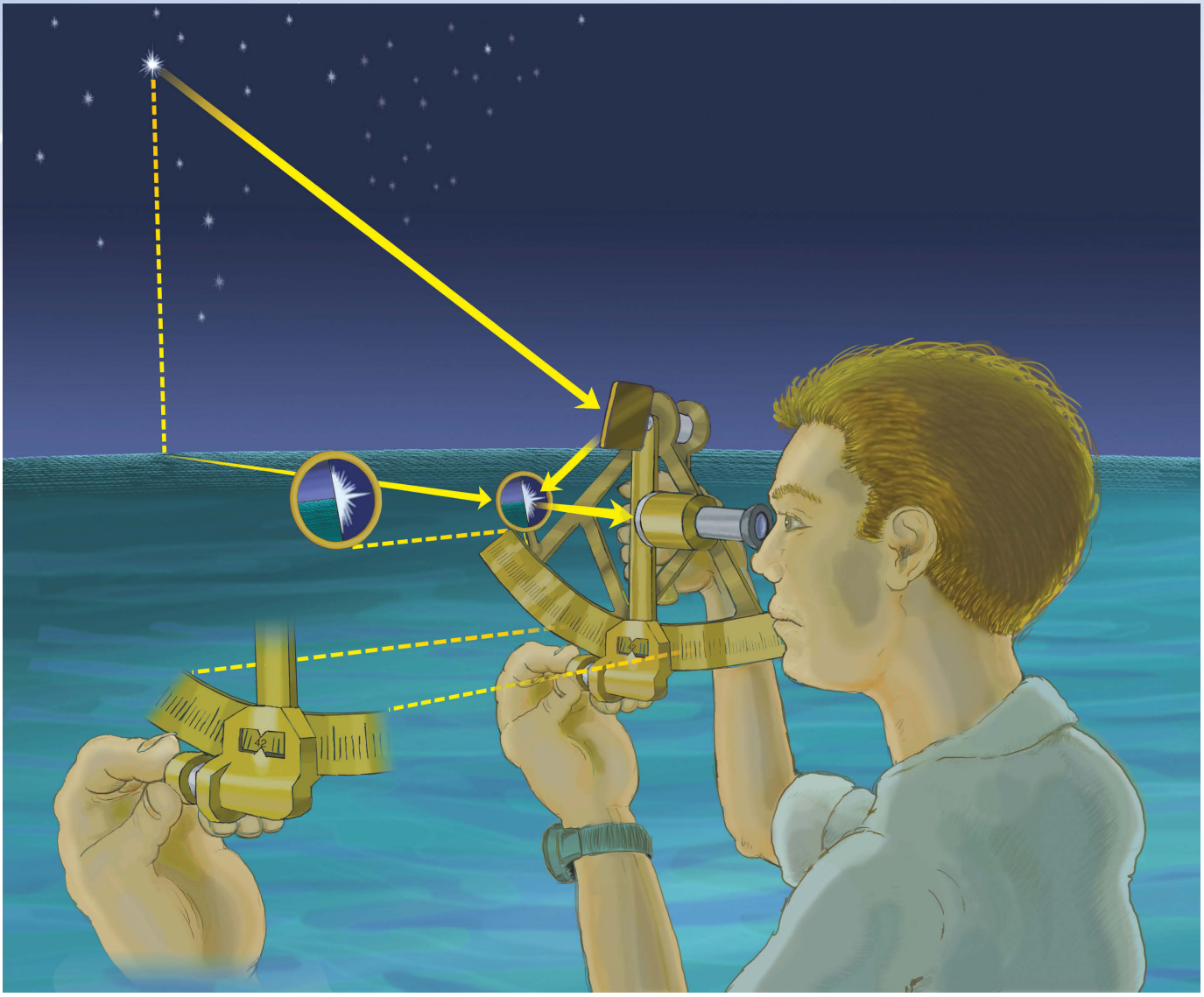
The physical skill involved in using the sextant to make celestial observations is comparable to firing a rifle. Anybody can do it, and after a few dozen shots you'll get good enough at it to not embarrass yourself. Sharpshooter skill is not really necessary.

Although the practice of celestial navigation can be reduced to a mechanical sequence of steps that lead you to placing an "X" on a chart, it helps to learn the theory in order to understand what you're doing. You'll then know how the process ties together every aspect of navigation as well as other disciplines: mathematics, astronomy, timekeeping, the calendar, cartography, and geography.

When you put it all together, it makes sense in such a way that you no longer need to memorize the steps; it becomes an integrated body of knowledge, you grasp how it all fits, and it gives you immense confidence and valuable peace of mind. You can still get lost, but being lost will never terrify you again. You and your ship become part of the sea, connected to the world and the heavens themselves. There is no feeling quite like it. Knowing you understand celestial navigation gives you a feeling of pride that's difficult to communicate but others can sense in you. Besides, if you're the only one who can navigate, your crew is not likely to mutiny, at least not when you're out of sight of land.

Shooting stars

At any given moment in time, every star and planet is directly overhead at some spot somewhere on Earth, and the Nautical Almanac lists these "terrestrial positions" for a large number



ILLUSTRATIONS BY FRITZ SEEGERS

of heavenly bodies used for navigation. (The earth spins around once a day and flies around the sun once a year but, if you know the date and time, you can correct for that.)

With the sextant, you can measure the angular distance between a star, for example, and the horizon, which allows you to calculate how far it is from the point that's directly overhead your position. That in turn allows you to determine how far away you are from that star's terrestrial position. If the star is 40 degrees away from your horizon (50 degrees away from your zenith), then you are 50 degrees away from its terrestrial position. A degree is 60 nautical miles. That's all there is to it.

In practice, it's a bit more complex. First, you estimate your position, which you call your assumed position. It need not be accurate; anywhere within a hundred miles or so is good enough. Then you measure the elevation of the body above the horizon with your sextant, noting the exact time of the observation. You then go through a rather involved table look-up procedure to determine the star's terrestrial position (from the almanac) and another one to determine where it should appear in the sky at that moment. Comparing the distance you measure with the one you expect tells you how far away you are from your assumed position. You draw a line on the chart and you are somewhere on that line.

After repeating this process for several stars, and correcting for the motion of the ship during the intervals between observations, you have several lines on the chart. Where they intersect is your position. How closely they intersect gives you a rough idea of the error in your position (which may vary considerably due to conditions, your skill as an observer, and mistakes such as misidentifying a star or making a mathematical blunder).

You need a minimum of two observations, but taking several will allow you to discard any obvious errors. Under

ideal circumstances, you can locate yourself to within about a half mile. In general, your true position will be within several miles of the position you calculate.

With some practice, the whole operation takes about an hour, most of it spent with books and tables in front of you, scribbling furiously.

On an ocean passage, you would normally do this twice a day: at twilight, when it's dark enough to see the navigational stars but still bright enough to see the horizon, and at dusk, when you can see the stars through the sextant while you can still see the horizon. You might also get a simple latitude by shooting the sun at noontime. Identifying stars is easy. You can use a gadget called a star finder until you learn how to use the star chart printed in the almanac. After a while you will learn their names and where they live, and they will become old friends.

Angles and mirrors

The question I'm most frequently asked is, "What do you see when you look through the sextant?"

The instrument is basically an arrangement of mirrors that allows you to look in two separate directions at the same time, superimposing both images in the field of a small telescope. A reading involves twisting a knob until the reflected image of the glowing dot of a star or planet, or the edge of the sun or moon, just touches the horizon. At that moment, you note the time to the second and read the angle indicated on the instrument.

By the time I taught myself how to use a sextant, I had been laid off from my posh Silicon Valley job and had to shelve indefinitely my plans to go sailing. Over the next year, as I looked for work and went through the money I had saved to buy my boat, celestial navigation became a part of my life. It kept me going through a stressful time, one when I came to question my own ability to earn a living and support my family. But no matter what, I could take some comfort in knowing I could take a ship anywhere on the planet the old-fashioned way with the help of the stars and a compass.

I took several offshore trips with sailing friends, so I was able to satisfy myself that I had the practical skills and theoretical knowledge. As a means of digging deep into the intricacies of the spherical trigonometry and nautical astronomy involved, I also developed navigational software that ran on a pocket calculator. By the time I had done that, I considered myself an expert.

I had hoped to sell my software and perhaps earn a living as a yacht navigator on offshore races or as an instructor, but the times had changed. While I was learning the craft, inexpensive Global Positioning System receivers became ubiquitous on all but the smallest boats. Celestial navigation became as obsolete as Morse-code telegraphy, hard-hat deep-sea diving, or muzzle-loading firearms.

Archaic exercise

No one seriously studies celestial navigation anymore except as a hobby. The skill that was essential to the safe passage of

the world's commerce has now become a pastime for dilettantes, a quaint art for armchair sailors. Real mariners are better off spending their time learning first aid, diesel repair, or any of a hundred other essential shipboard skills than investing the time and effort in learning celestial navigation and in the constant practice required to keep the skill sharp. Short of total war or a breakdown in civilization, it's highly unlikely the GPS satellites will be allowed to deteriorate. Nonetheless, the Nautical Almanac is still faithfully published for the convenience of navigators.

I still have my sextant, neatly packed away in its polished-hardwood felt-lined box. It's a beautiful instrument with an indescribable feel and even a unique smell to it from the lubricants and the mahogany. I take it out occasionally and admire it. Once a year or so, I take it to the beach, shoot some sights, and calculate a fix, just to prove to myself that if I had to, I could still guide my ship wherever she needed to go.

It's a good feeling, but a bittersweet one. The sextant has become a memory of my youth, relevant only to me, and a reminder that times change irrevocably. It can take me anywhere in the world but it can't take me back. Its ties to the past are there, of generations of seamen braced against a bulkhead on a rolling deck, bringing a star down to earth. I am tied to that past, but it is a past. I am one of the last generation to have used a sextant as anything other than just an amusement. There is some grandeur to that, but also a great sadness.

Henry Cordova is a retired geographer and lives in Florida. He was a navigation technician aboard a guided missile frigate, studied mathematics and science in college, and has owned a San Francisco Pelican and a MacGregor 22. Henry enjoys writing, astronomy, celestial navigation, and collecting star atlases.

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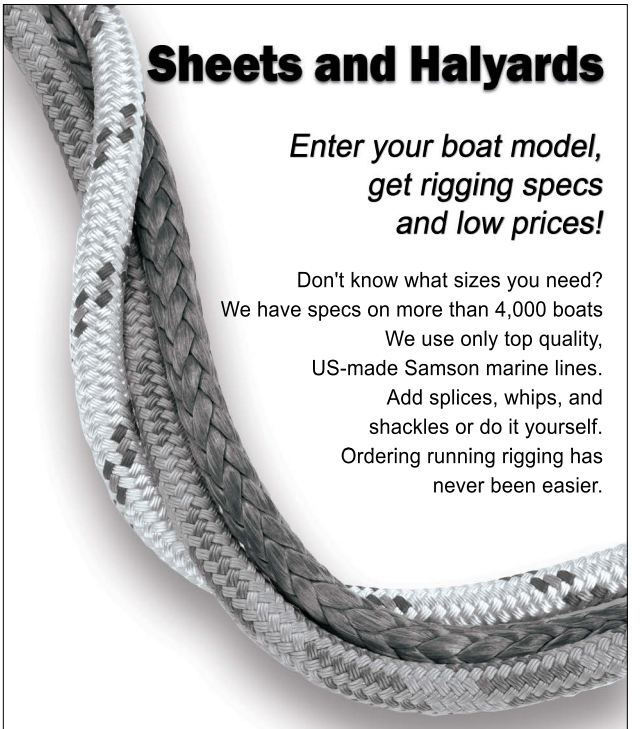

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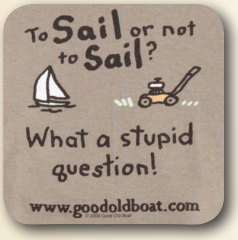

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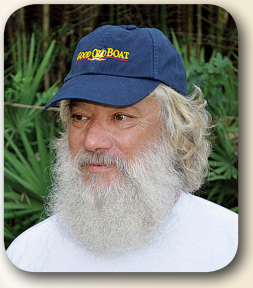

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Performance in Starck-ly beautiful French style

BY ALLEN PENTICOFF

A problem many inland sailors face is that they eventually get tired of sailing the same water. Two years ago, that is what possessed Jim and Jessica McCann of Franklin, Tennessee, to move their 1990 Beneteau First 32s5, *Down Island*, from Percy Priest Lake near Nashville, Tennessee, 186 miles down the Cumberland River to a slip in Green Turtle Bay Marina on Lake Barkley in Kentucky. Jim says, "We got to where we had named every cedar tree on Percy Priest." But before they made the move, they had enjoyed many years of sailing other boats, mostly Beneteaus, on those waters. They thought a Beneteau 210 would be nice to trailer about for exploring other places but didn't follow through and instead bought a Beneteau 310 for its headroom. Their next upgrade was to a Beneteau 370, which Jim did not feel sailed very well. He described it as "a condo on the lake."

"I wanted a boat with a length somewhere between the 310 and the 370," Jim says. "After a lot of research, I felt the 32s5 would be exactly the boat I was looking for, and it has proven to be the perfect boat for me and my family."

At 9,260 pounds, its displacement was halfway between the First 310 and the Oceanis 370. It gave him the room he wanted below and, because it is a First series, the performance he sought. "Additionally," Jim says, "I found the interior striking — with the mahogany, white upholstery, and gray marble laminate countertops."

Down Island has a wing keel that draws 4½ feet, which Jim needs in the shallow lakes where he sails in Tennessee and Kentucky.

About 10 years ago Jim began to search for one of the 65 Beneteau 32s5s built. Starting with the online Beneteau sailing forum, he simply began asking owners if they wanted to sell their boats. Before long, he found *Down Island* on Lake St. Clair near Detroit, Michigan. They now sail her on Kentucky Lake and Old Hickory Lake.

History

Beneteau is a French company with deep family roots. Benjamin Beneteau started building wooden fishing trawlers in 1884. His son André took over the company in 1928 and the third generation, Benjamin's granddaughter

Jim and Jessica McCann sail their trend-setting Beneteau First 32s5, *Down Island*, on lakes in Kentucky and Tennessee, above.

The recessed companionway and broad bridge deck, at left, became a recurring feature on the new generation of production sailboats. Another non-traditional styling feature is the black-tinted windows that wrap onto the coachroof above the portlights. The cockpit is comfortable and relatively deep, at right, and the helmsman can steer while seated on the cambered coaming. The inboard teak slats on the seats are grabrails.

Annette (then 22 years old) and her naval architect brother André took charge in 1963. Within a year, they were producing fiberglass recreational boats that quickly proved popular. Annette later married, becoming Annette Roux, and she has held a major role in the company ever since.

Beneteau launched the First series of performance sailboats in 1972. Annette came up with the name after visiting a California Harley Davidson dealership where she observed their claim to "Numero Uno." Ultimately, Beneteau would produce many more designs in the First series, as well as cruising boat lines called Idylle and Oceanis. They introduced a trend in sailboat appearance (sometimes called "Euro styling") that other boatbuilders quickly adopted.

In 1986, Beneteau opened a manufacturing facility in Marion, South Carolina, to meet the demands of the U.S. market. In 1995, it acquired a former competitor, Jeanneau, and continues to produce and distribute boats under that name. That same year Beneteau also acquired the Lagoon catamaran brand. Beneteau today has dozens of dealers and several production plants worldwide and has a solid claim to being the largest builder of sailing yachts.

Design

French style and chic is on full display in the 32s5, which was introduced in 1988. The little "s" in the boat model stands for Philippe Starck, a prominent industrial and commercial designer who styled the deck and interior. The first Starck model was the "First S." The First 35s5 was the second. Designed in collaboration with naval architect Jean Berret and introduced in 1987, it was considered an "audacious boat" by some observers. After the same pair designed the First 41s5 in 1989, Jean Berret said of Philippe Starck, "This unconventional thinker helped me distance myself from sailing archetypes. We built a daring boat — we still remember the surprise prompted by the vertical hull porthole! — with great elegance as much under sail as inside."

The 32s5 is a moderate-displacement sloop with a fin keel and a spade rudder. With its displacement/length ratio of 192 (deep keel version) and a generous sail plan, it is quick around the buoys, earning it a PHRF number of 144 to 153 seconds per mile. That compares favorably with the J/30, which is most commonly rated at 144 in its fleets across the United States.

The 32s5 was available with either a deep keel (6-feet draft) or a shoal-draft wing keel (4-feet 5-inches draft). The sugar scoop transom, raked bow, and sloped coachroof give it a modern, racy look.

Construction

The solid fiberglass hull has a molded interior grid system of stringers and floors that is bonded and glassed to the hull. Following what was fairly

The sugar scoop transom, at right, provides a more convenient way to board the boat from the water or a dinghy than does a conventional transom.

The Philippe Starck interior shocked Americans with its modern white and metal elements, above left. The head (to starboard) and the aft cabin (to port) flank the companionway, above right. The tray on the galley counter covers the second sink. Philippe Starck's saloon table, at left, appeals to the eye of the engineer and that of the artist.

standard practice at the time, the deck is cored with end-grain balsa, although some reports indicate the use of other materials in select areas. Beneteau is good about removing the balsa where there will be deck penetrations.

The 32s5 has a ⅞ sloop rig with double spreaders and discontinuous rod rigging (the cap and intermediate shrouds are made of lengths of rod connected at the spreaders). The backstay can be adjusted from either side of the cockpit with a single 12:1 tackle.

On deck

The shrouds are inboard, which makes going forward on the wide sidedecks quite easy. Plentiful handrails and double lifelines provide security. A nice sized self-draining anchor locker in the foredeck has an integral windlass pad. The companionway is recessed into the main bulkhead above a high bridge deck.

The Beneteau 32s5 has a true sugar scoop transom that is attractive and practical for boarding from the water

Comments from Beneteau 32s5 owners

"The Beneteau First 32s5 received a Boat of the Year award in 1990. Its interior, designed by Philippe Starck, is beautiful. It is well laid out with plenty of room and feels much larger than 32.5 feet. It is a good choice for anyone looking for a racer/cruiser. Mine has the wheel upgrade and I thought the cockpit would be too small for eight people racing, but there are many comfortable places to hang out.

"I added a 3DL genoa and it points almost as well as the J/Boats I race against. The bottom in front of the keel is flat, so it doesn't do well in heavy chop. I have to fall off to compensate. I added self-tailing winches. It is easy to singlehand. I am not happy with the backstay arrangement which is hard to tighten while I am steering. All in all, I love the boat."

–Stewart Wickstein, Perth Amboy, New Jersey

"Since we have had our boat for more than 20 years, we have replaced a lot of things: new sails, new rigging, new teak in the cockpit, and new upholstery in the cabin. We replaced the portlights, which made a big difference as the originals had become crazed. We are thinking about replacing the Plexiglas in the hatches because of crazing.

"We have had two problems with the boat's design. One is the lack of a cover over the companionway. When it rained, water got into the cabin and pooled on the top step. We solved that with a canvas snapped over the entire companionway during the rainy season. The other was a saltwater vent from the raw-water intake over the alternator. We rerouted the vent, but not before the alternator had to be replaced.

"The boat sleeps two comfortably (*not counting the settees –Eds.*), one in the aft berth and one in the forward berth. Two could sleep in the aft berth, but the cockpit floor is over the berth and it is very close. The forward berth comes to a vee in about 6 feet and is very tight for two. The settees are long enough and comfortable enough for a 6-footer. In the cabin, six adults can eat a meal and/or have drinks. In the cockpit, we can fit eight for drinks, but that is tight."

–Damuel Dehaven, San Francisco, California

or a dinghy. The swim ladder elegantly folds up for storage under the platform but can be deployed only from the sugar scoop, and the scoop transom, while neat, could use a handhold of some sort.

Because the hull tapers aft of amidships, the cockpit is narrow compared to those on more modern boats. This allows the seats to be a comfortable distance apart for bracing your feet while heeled, and the helmsman can sit comfortably on a coaming to steer. Teak strips on the cockpit sole and on the seating areas help keep you from sliding around, but may be hard to keep clean. The inner strip on each of the side seats forms a handrail, which raises the question, "Why don't all sailboats have these?" While under way, the seats feel very supportive and secure, and the cockpit could be a very comfortable napping area.

Belowdecks

A beautiful and elegant interior awaits below. White upholstery and a splash of shiny aluminum fittings and trim contrast boldly with the dark mahogany of the cabin sole and curvaceous cabinets (a "classic" version with lighter teak finish was also available). Gray marble galley counters complete the décor. The white upholstery in *Down Island* appears to have stood up to the years very well. The windows curve up into the overhead. They shed lots of light on an otherwise dark interior and have built-in blinds for privacy. There is ample headroom, and aluminum rails on the overhead provide handholds.

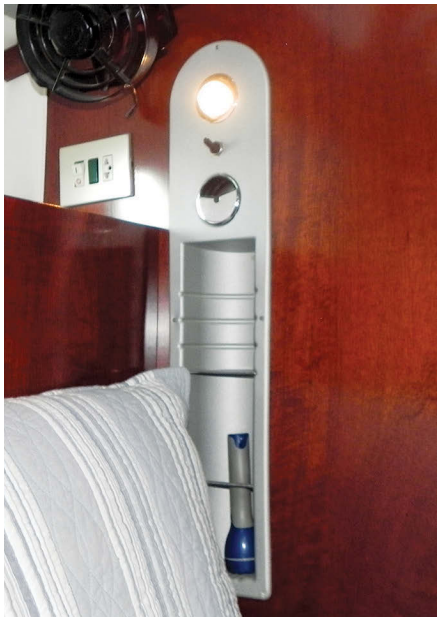
A nice, large, well-lit and ventilated quarter berth on the port side area aft could be used as the master cabin. The head is conveniently located in the same area on the starboard side.

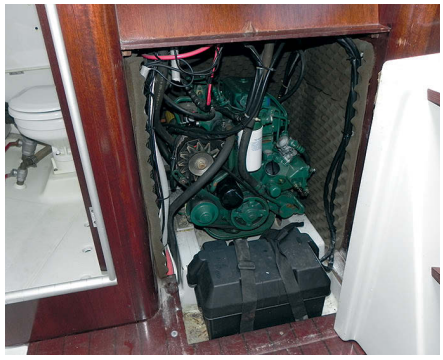
The galley, forward of the quarter cabin, is well thought out and a secure place to prepare food. An innovative tray/bridge that clips onto the rail and cutting board enlarges the preparation area when needed by covering one of the two round sinks.

The water heater is located under the excellent nav station to starboard. The fuel and holding tanks are also located to starboard, and the water tank is on the port side.

In the center of the saloon, the drop-leaf table contains plenty of storage. Forward, the comfortably sized V-berth can be closed off with folding doors. On *Down Island*, air-conditioning equipment is located under the berth.

The sides of the forward cabin are padded for comfort, at right. Elements of the styling revolution are evident in the dark acrylic storage compartments, the aluminum door frame, and the faceted overhead liner.





The berth in the aft stateroom extends under the cockpit, far left. Although it's larger than a standard quarter berth, it's not for the claustrophobic. The Starck influence is visible everywhere. A typical detail is the light fixture, near left, that has built-in stowage for small items. The Volvo diesel engine is behind the companionway stairs, above, where it is reasonably accessible.

The compact head is tucked beside the companionway on the starboard side. It has a convenient grabrail on the vanity front and a fold-down seat for showering.

Ample storage spaces are provided throughout the cabin. Access to the 18-horsepower Volvo diesel engine, behind the companionway ladder, is quite good, and the dipstick can be reached through a smaller panel on the port side. Batteries are located in the aft cabin but are reasonably easy to get to.

Under way

You know a boat with such pleasing lines is going to sail well. And it does. The Beneteau 32s5 parts the water with little effort and points high with ease. The narrow cockpit offers comfortable steering positions behind the wheel and off to the side with excellent visibility forward. The steering is light and responsive, motoring or sailing, and the boat tacks quickly, even in light air. Most of the running rigging lines are led aft to the cockpit, where 12 clutches secure them, and the boat has two winches on the cabintop and one on each cockpit coaming.

The mainsail's mid-boom sheeting arrangement is cumbersome, as it often is on larger boats, making quick adjustments difficult. Setting and handing the full-battened sail would be easier if the battens were on cars.

The jib (a 140 percent genoa) had a tendency to snag on its way across the boat when tacking in light air. It's on an Isomat roller furler and the drum is below deck level, which impeded our efforts to resolve a problem we encountered while unfurling the sail.

Drawing 4-feet 5-inches, the shoal-draft model is perfect for inland sailing and gunkholing. It would also make a good boat for Florida, where shallow draft opens up many waters and makes grounding less likely. A wing keel, though, can sometimes be difficult to free once it is grounded. *Down Island* moved quite well in the light air we had on the day of our test sail. I don't doubt she can exceed her theoretical hull speed of 7 knots.

Conclusion

It's too bad that so few of these beautiful boats were made. I give it high marks on all counts for construction and design, and sailing it is a real pleasure. The 32s5 is of a size that can provide adequate creature comforts without requiring a big crew or a big budget to own and operate. I understand why Jim decided he needed to hunt one down.

The Beneteau 32s5 appears to have few flaws, and a well-cared-for one should offer no surprises. A thorough survey will reveal weaknesses that need attention on any particular boat. These boats are currently priced between $25,000 and $48,000. Some of them could have a suit of racing sails.

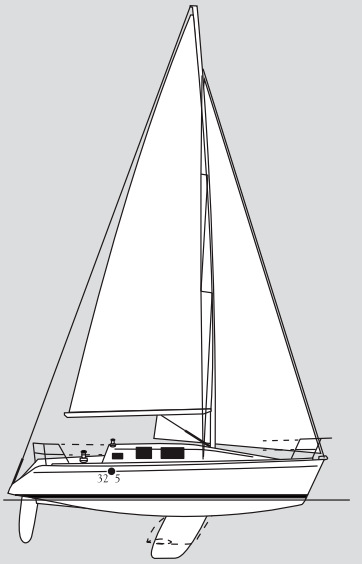
Resources

Parts and support

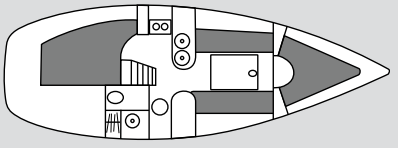
Beneteau USA
www.beneteauusa.com/sailboats

Resources
http://beneteau.sailboatowners.com
https://groups.google.com/forum/#!forum/beneteau-owners
www.beneteau-owners-association.org.uk/index.php?

Beneteau First 32s5

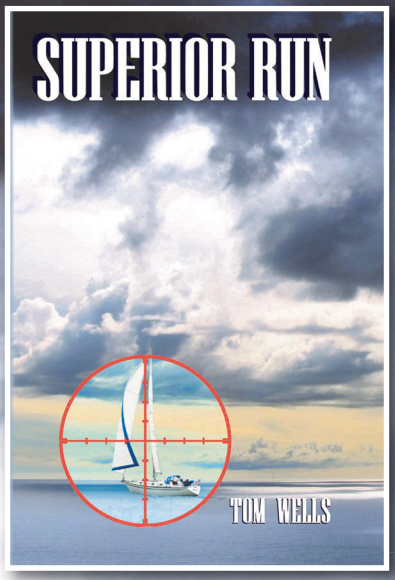


Designer:	Jean Berret and Philippe Starck
LOA:	32 feet 6 inches
LWL:	27 feet 10 inches
Beam:	10 feet 10 inches
Draft	
fin keel:	6 feet 0 inches
wing keel:	4 feet 5 inches
Displacement	
fin keel:	9,260 pounds
wing keel:	10,000 pounds
Ballast:	
fin keel	2,980 pounds
wing keel	3,720 pounds
Disp./LWL ratio:	192 (208)
Sail area:	455 square feet
Sail area/disp. ratio:	16.5 (15.7)
Fuel	18.5 gallons
Water	40 gallons
Holding tank	12 gallons



Allen Penticoff, a Good Old Boat *contributing editor, is a freelance writer, sailor, and longtime aviator. He has trailer-sailed on every Great Lake and on many inland waters and has had keelboat adventures on fresh and salt water. He presently owns an American 14.5, a MacGregor 26D, and a 1955 Beister 42-foot steel cutter that he's restoring.*

Introducing . . .



A suspense novel written for sailors by sailor/author, Tom Wells.

Paul Findlay is living his dream, sailing the Great Lakes aboard his beloved sailboat and writing about his voyages to pay the bills. When Paul receives a cryptic call for help from his old college roommate, Rich Perry, the dream quickly turns into a nightmare. A deadly game of cat-and mouse across the greatest of the Great Lakes begins . . .and the cat has all the modern advantages.

About the Author

Author Tom Wells is an engineer, a long-time sailor, and a Contributing Editor and boat reviewer for *Good Old Boat* magazine.

He has a sequel in the works, featuring Paul Findlay and his sailboat in another nautical setting.

What readers are saying

This book is addicting. It practically reads itself ... [*Superior Run*] could be the offspring of Tom Clancy meeting Sandra Brown on a Great Lakes cruise ... Tom Wells' knowledge and passion of sailing and the Great Lakes makes this a richer read, enough to whet your interest in one of the most beautiful spots on Earth. I will be awaiting the sequel(s).
— *Dave, NY*

An imaginative plot and excellent narrative pull the reader in. — *John, RI*

Superior Run is a true sailor's novel.
— *Karen, OR*

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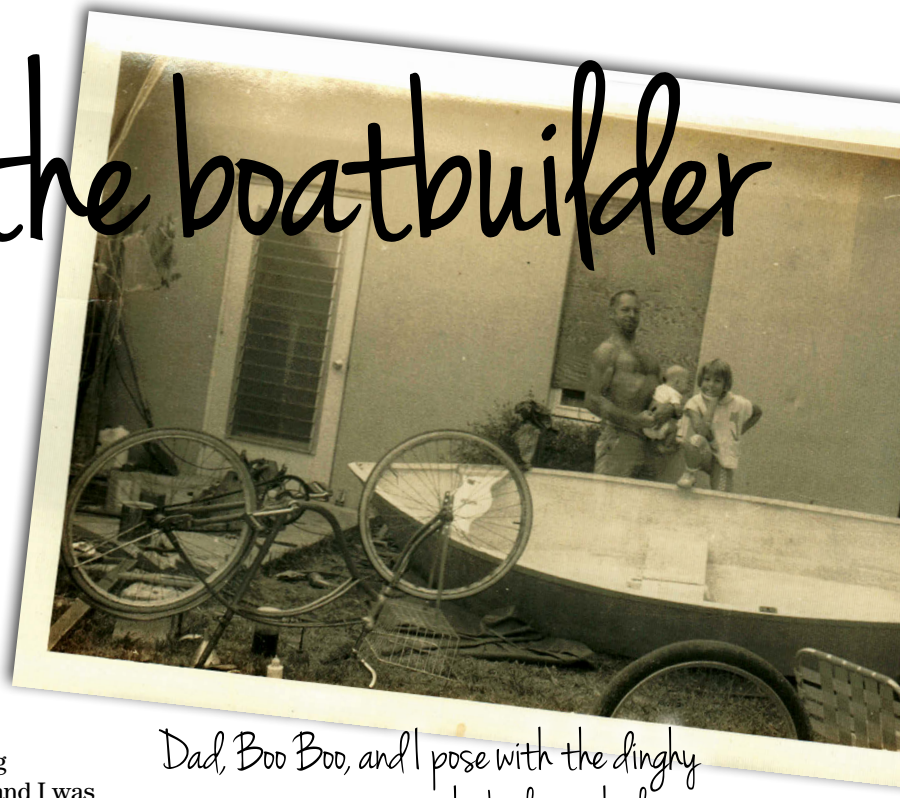
My dad, the boatbuilder

BY ANN LEE MILLER

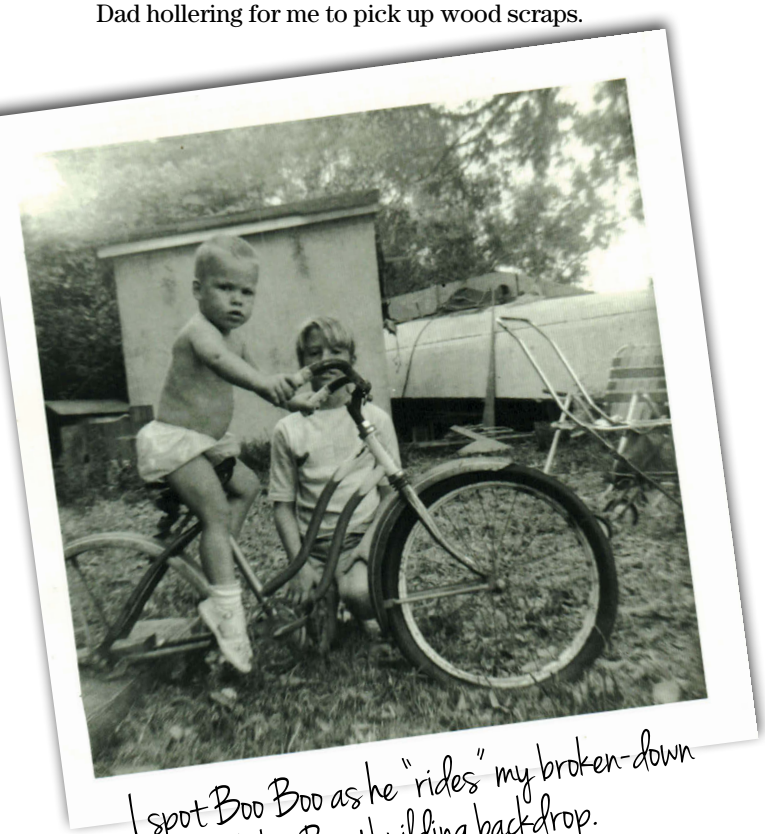


Dad, Boo Boo, and I pose with the dinghy he built in the living room.

My brother, Boo Boo, materialized in a crib in the dining room in 1964 about the time Dad birthed a boat in the living room. Dad had to take the boat apart to get it out the front door. After reassembling the dinghy and proving it seaworthy, Dad went to work on a 40-foot yawl in the backyard. I was not impressed. He'd merely moved his lumber, power tools, and sawdust outside.

His job lifeguarding and managing Shenandoah Pool, however, scored mega points. When I was not in school, I pedaled to the swimming pool for a day of mermaid-dom. Chlorine was king, and I was pool-rat royalty.

At home, the boat rose from the yard like a bloated, capsized canoe beside my banyan tree. I watched Dad work from my tree "house" where my overactive imagination saw a front door, multiple rooms, and back stairs. When Dad's radio opera music chased me away, I headed for my fort in the bushes behind the boat where I pretended I couldn't hear Dad hollering for me to pick up wood scraps.



I spot Boo Boo as he "rides" my broken-down bike. Boatbuilding backdrop.

During the day, Dad hosted pre-school swim lessons, tested chemicals, and disinfected the locker rooms. Boo Boo went to the Cuban babysitter's. Mom went to bed after her night shift as a nurse at Jackson Memorial Hospital. And I braided my hair for second grade where I threw up on my desk and earned "Daydreams too much" on my report card.

After the hull was completed, Dad papier-mâchéd fiberglass to the wood planks with resin. This was my least favorite part of the process. The cloth itched something fierce. When the lid on a five-gallon can of resin gave way, my left leg plunged knee-deep into the sticky, stinky goo. For years I thought that's how I got that birthmark on my calf.

Dad layered fiberglass and resin on the hull until it was strong enough to withstand bashing into a coral reef and a seawall, multiple running aground episodes, and a hurricane.

A crane mashed down the grass in our yard one day when I was at school and flipped the boat right side up, keel down on Dad's homemade jack stands, an event that ushered in change. Dad quit his job to babysit and build the boat full time.

While he played with power tools, putty, and paint, I ran free in our half-Cuban neighborhood. The Cubans' homes were easy to spot by their tidiness, but I didn't realize how white-trashy they thought we were until Lourdes and Pupe's mother polished my saddle shoes before taking me to the movies. Thanks to my Cuban playmates, I picked up an impressive blue Spanish vocabulary . . . though I never figured out which words were bad and which were *really* bad.

Even though Boo Boo had shown up with his devil-made-me-do-it grin, white angel hair, and affection for dirt, Dad didn't wish any less that I'd been born a boy. No matter how high my puny, grade-school arms heaved me up the rope that hung from the banyan tree, I never made it to the top. I raced up and down the sidewalk on my Dad-crafted skateboard and scooter. I spattered my report cards with A's and B's. But I never won the carnival prize of Dad's approval.

Not every child is raised alongside a yawl

As I was finishing fourth grade, the crane rumbled back, puffing black smoke. The machine surged to life, groaned, and lifted the ark into the air. The jack stands collapsed onto the dirt like Pick-Up-Sticks as the boat crept skyward.

At the Miami River, the process reversed. The crowd of friends and well-wishers held a collective breath as the straps were released and the boat floated. A cheer went up. Dad whacked the bow twice before the champagne bottle broke, christening our boat.

Two weeks later, the boat bobbed beside Pier One at Dinner Key Marina. My church dress dried in the breeze, our only sail on the still mast-less boat. Dad handed me a box of large, black letters that might be used on a mailbox or sign. "Figure out what I'm naming the boat."

I wrote down 38 possible names in an hour and a half, but Dad said I hadn't come up with the name yet. I sighed. As usual, I hadn't met Dad's expectations. I jumped overboard and swam around to the end of the pier where other kids were doing cannonballs.

Later, I treaded water at the stern of our boat, blinking salt water out of my eyes, waiting for the black shapes to come into focus where Dad had affixed our boat's name to the transom: *The Annie Lee*. My throat tied in a knot. Up on deck, Dad grinned at me.

But life is never smooth sailing. Come hurricane season, Laurie gusted across the Gulf of Mexico with 105 mile-an-hour winds headed for the Glades and South Florida. It was October 27, 1969, and my family barreled across Biscayne Bay under full sail, heading for a hurricane hole to wait out the storm.

I planted my 11-year-old self on the foredeck, scanning the distant shoreline for a gap that might be our cove. I was not afraid. Dad would keep us safe. But his tension bled into me.

Sailing was supposed to soothe but, even under clear skies, Dad stressed. He could have taken a lesson from the hippies he admired. They rattled around Coconut Grove in beater Volkswagen vans, on bikes, or on foot wafting Patchouli oil, incense, and I-don't-care in their wake. They didn't care about jobs, haircuts, or monogamy. They ingested bean sprouts by the pound and brownies when they got the munchies. The women burned their bras.

I glanced back at the cockpit. At the helm, Dad stood ramrod straight in his crew cut. Mom posed at his side, her white uniform tented to symmetrical cones by a sturdy bra. They were a hip American Gothic portrait of monogamy.

We were coming up fast on a buoy. I shouted to Dad and pointed. Dad levered the tiller hard to starboard and the boat swerved and came about. He yelled, "What color is the damn buoy?" the second I remembered he was colorblind.

The hull near completion.

Hull complete, awaiting keel and fiberglass.

"Red!" Mom shouted. He angled the boat into the wind and we drifted past the buoy. Dad raised his voice over the flapping of the sails. "Annie, check our depth!" I scrambled over the main cabin, readying for the thud of our keel hitting bottom.

Rigging clanged against the new-to-us aluminum mainmast. My fingers closed around the depth sounder, a long mop handle with notches carved at one-foot intervals. Patches of sand blinked through the seaweed below us, but we still floated. Dad angled back into the channel. The sails filled. I let the pole roll from my fingers, releasing a breath I didn't know I'd been holding.

My five-year-old brother crouched in the corner of the cockpit, wide-eyed. These were the best days of his life, he'd tell me later. Dad white-knuckled the tiller, his calming yoga workouts not paying off.

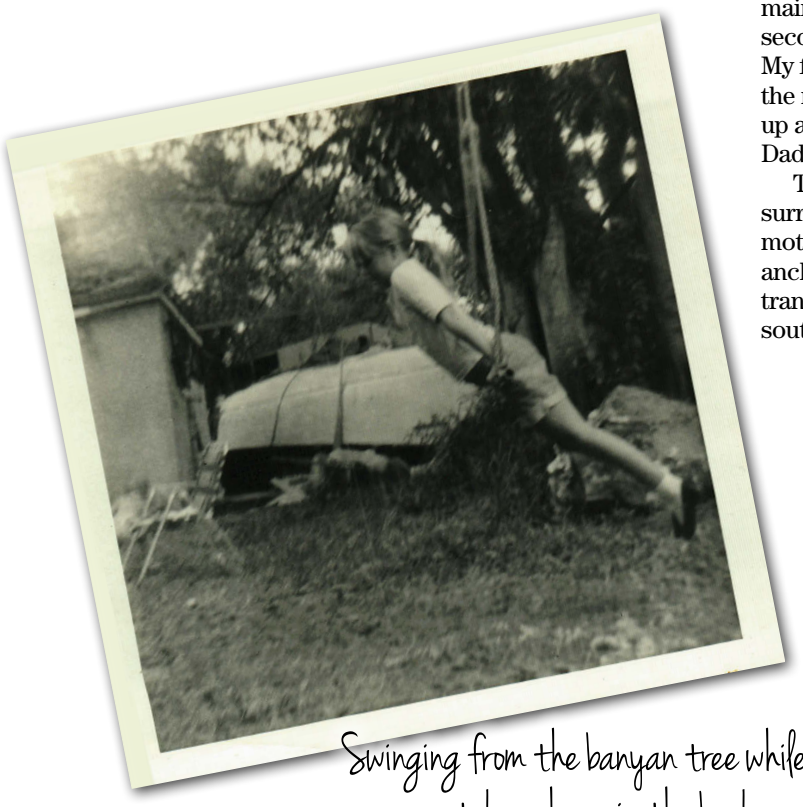
I think Dad secretly wanted to be a hippie. But flower children were young. Dad was riding full-throttle toward 45. No hippie would coat his kids' noses, cheeks, and shoulders in zinc oxide 24/7 when the rest of the world was frying itself in Johnson's Baby Oil. Hippie dads wouldn't make their kids check in every hour. They wouldn't saddle their offspring with chores like painting a stretch of deck or stacking lumber in the aft cabin. A hippie dad would be too stoned to make his kid read aloud Euell Gibbons' *Stalking the Blue-Eyed Scallop* and phonetically sound out all the 50-gallon words.

My stomach growled as my eyes swept across the seawall looking for an opening. I wondered if there was anything to eat on board that hadn't lived in the bay. The bean sprouts Dad grew in the cupboard didn't count. He ground conch in a hand-cranked meat grinder into chowder and fritters that had to be chewed 25 times and tasted like rubber hose. Clams were dug at low tide. We scooped shrimp — when they ran — in nets from the dock. Dad gigged, cast-netted, and spear-fished our food. Once in a while he poached a Florida lobster by reaching into a crawfish hole, ripping off its tail, and stuffing it into his trunks. He never got caught.

Dad hollered for me to take down the foresail. While I worked, my brother manned the tiller. Dad downed the mizzen sail, and Mom — binoculars to her eyes — yelled, "There's the inlet!"

We slid into the mouth of the waterway, and I dropped the mainsail. Dad yanked on the lawnmower cord to our 10-horse, secondhand, Johnson outboard, swore, yanked, swore. My fingers clenched around the bowsprit as we coasted into the narrow inlet. Mom sat at the helm, my brother smashed up against her side. Finally, the motor coughed to life, and Dad muscled it down the stern into the water.

Ten minutes later we puttered into a virgin cove, surrounded on four sides by land and pines. Dad killed the motor and we glided into the perfect center. We dropped anchors fore and aft and stowed sail to the sound of our transistor radio blaring the weather. Hurricane Laurie hooked southwest and headed for Mexico. We cheered.



Swinging from the banyan tree while the boat takes shape in the backyard.

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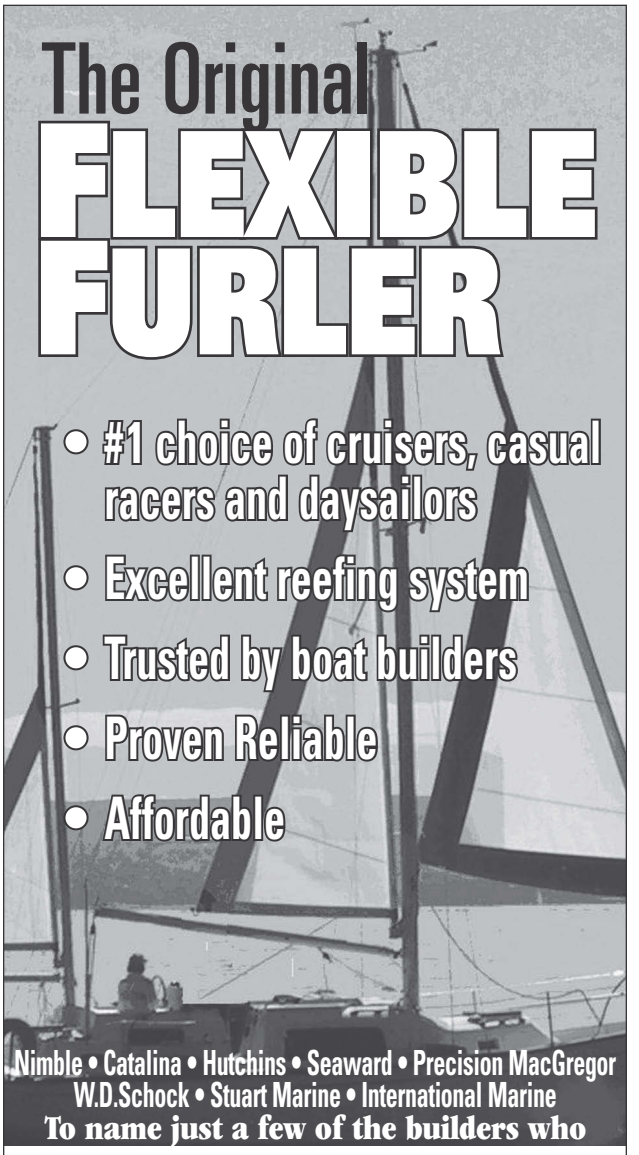
Located in Bingen, WA

That night, in my bunk, I lay awake listening to the strange sounds of the cove. Dad wasn't a hippie. Our car was a 10-year-old Plymouth Valiant he'd painted tan — with a paintbrush — over the original white. But a picture from half a life ago lapped against my ear from the other side of the hull. I'd been five when my parents quit their jobs, packed us up, and drove out west to pan for gold — in a Volkswagen van. I shouldn't have been surprised several years later when Dad grew out his hair like Willie Nelson or that he never again worked a "real job."

Dad protected me from skin cancer, unhealthy eating, and a sedentary lifestyle. He gave me books, boats, and the ability to write for 12 years without a paycheck. I have Dad to thank that I rebelled into conservatism and God. Conservatism may be expendable, but God I'll keep.

Ann Lee Miller earned a B.A. in creative writing from Ashland (Ohio) University and writes full time in Phoenix. She grew up in Miami, Florida. This article is an excerpt from her memoir, Boat Days, *due out in 2015. More than 100,000 copies of her debut novel,* Kicking Eternity, *have been downloaded from Amazon. Her other novels are* Avra's God, Tattered Innocence, *and* The Art of My Life. *For fun, she guest lectures on writing at colleges, hikes in the mountains with her husband, and meddles in her kids' lives. She blogs boat tales at AnnLeeMiller.com.*



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Lanyards: the sailor's keepsafes

Use them for handles, tethers, and tie-downs

BY DAVID LYNN

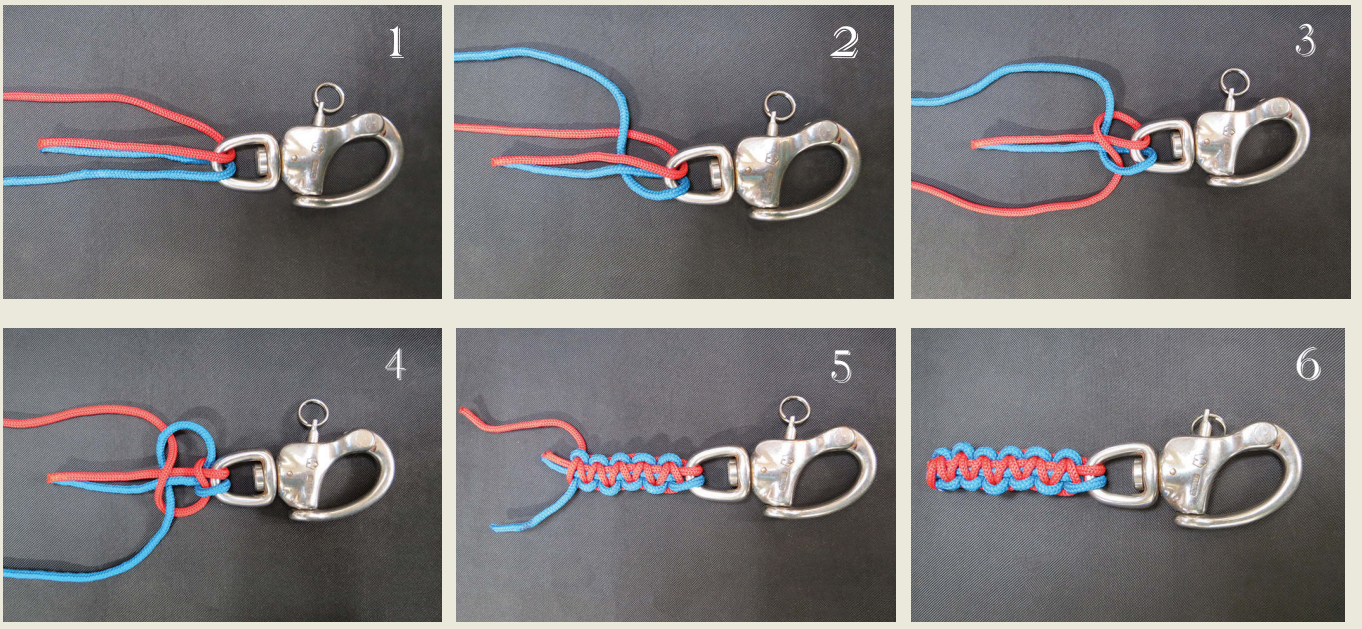
We have dozens of lanyards aboard *Nine of Cups*. We use them on pelican hooks, zippers, key rings, flashlights, and even USB flashdrives. I've used a lanyard knot with very fine line to make jewelry. I once used a variation of it to make a belt when John Santic, a friend who joined us on a passage to Easter Island, discovered he had forgotten to bring one. Our ship's bell sports a rather fancy lanyard attached to its clapper, and we use another lanyard to secure the cockpit table when it's not in use.

When at sea, and I go forward at night or when the weather is bad, I never leave the safety of the cockpit without my safety harness on, attached to the jacklines with a stout lanyard, and I always take my trusty rigger's knife with me, attached to a lanyard around my neck.

The Ashley Book of Knots, one of our most-used onboard reference books, devotes a number of pages to different lanyard knots. Some are simple, some are extremely complex, but all are useful and decorative. The version I describe here is one of the easiest to make.

David Lynn is a Good Old Boat *contributing editor. He and his wife, Marcie, have lived aboard* Nine of Cups*, their 1986 Liberty 458 cutter, since purchasing her in Kemah, Texas, in 2000, and have sailed more than 70,000 nautical miles in their ever-so-slow world circumnavigation. Marcie has just published* Nine of Cups Caribbean Stories*, an ebook about the first major destination on their cruise. It's downloadable at www.audioseastories.com. More will follow.*

Lanyard step by step

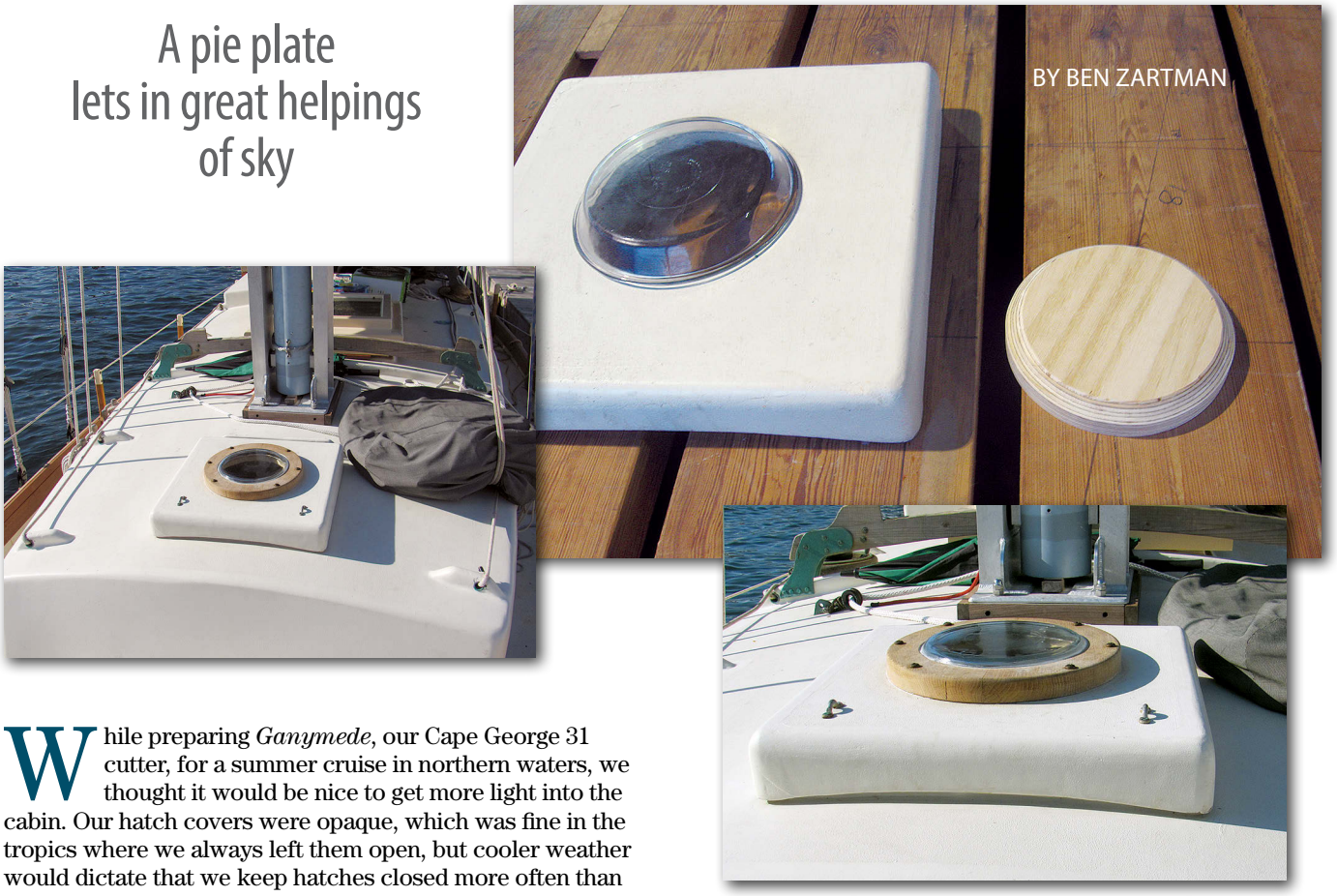


Start with a length of line 12 times the finished length of the lanyard and cut it in half. To begin the knot, pass the two lines through the ring in opposite directions (PHOTO 1). The most difficult part of the lanyard is tying the first knot (PHOTOS 2 and 3). Tie it as shown and pull it tight (PHOTO 4). Once this knot is done, repeat the process until the lanyard is complete. Note that one of the lines always passes over the top of the two center lines while the other always passes beneath them. (Normally, the lines won't be different colors as in the photos, and it is not always easy to keep track of which line passes on top. I tie a small knot at the end of the top line to keep them straight.) Work the knots tight and stop knotting when the lanyard is the right length (PHOTO 5). To finish, cut the ends off each of the lines, leaving about ⅛ inch, and use a cigarette lighter to melt the remaining ends (PHOTO 6). (While they are still hot, I press the ends flush with my finger. Alternatively, I sometimes put a drop of clear glue on each end and trim them once the glue has dried.)

Forehatch skylight

A pie plate lets in great helpings of sky

BY BEN ZARTMAN



While preparing *Ganymede*, our Cape George 31 cutter, for a summer cruise in northern waters, we thought it would be nice to get more light into the cabin. Our hatch covers were opaque, which was fine in the tropics where we always left them open, but cooler weather would dictate that we keep hatches closed more often than not. I had always meant to turn the big skylight hatch into a real skylight. This I did when I finally found some suitably-sized glass in a dumpster, but the forehatch was a more difficult problem.

It's a sturdy one-piece fiberglass hatch lid that seals nicely and has never let in water. It seemed a shame to ditch it in favor of an ungainly acrylic-topped box frame. A bronze-rimmed deadlight would have been the classy choice but, having bought such things before, I knew that wasn't an option. So I did the next best thing.

In the center of the hatch I cut a 9-inch hole, then glassed a small coaming around it to keep water from seeping in. The coaming fits nicely inside an inverted pie plate that I picked up for $4 at Walmart. To hold the plate down on the hatch lid, I made a simple wooden trim ring, which I fastened in place with machine screws threaded into tapped holes in the fiberglass. It lets in an amazing amount of light, didn't cost much more than the $4 for the pie plate and — in the unlikely event the tempered glass ever breaks — my wife has two more pie plates just like it in the galley.

While she loves the extra light my new arrangements let in, Danielle does get strangely suspicious if she catches me eyeing her big glass casserole dish.

A few minutes with a saw, a mold for a fiberglass coaming, and a trim ring are all it took to enlighten an opaque hatch with a pie plate.

Ben Zartman and his wife, Danielle, live with their three young daughters aboard Ganymede, *the 31-foot Cape George Cutter he built from a bare hull. After exploring the Canadian Maritimes last summer, they wintered in Newport, Rhode Island, where Ben will be working once more on the schooner* Aquidneck *for the summer. Follow them on their blog at www.zartmancruising.com.*

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Quick and easy

Outboard on wheels

A mobile stand takes the weight

BY DAVID SHARP

I live just a couple of houses from the beach where I keep my dinghy, but now that I have a heavier 4-stroke outboard it's a chore lugging it down to the boat. The problem is with the 4-stroke, not my age. Portable outboard motor stands that I could find were really overkill for my little 2.5-horsepower engine, so I bought a very inexpensive hand truck at a local discount store and converted it to a portable outboard stand.

I added a notched crossmember made from a 2 x 4 as a motor mount, and extended the foot on the bottom of the truck a few inches to prevent it from tipping backward on uneven ground with the motor on it. This extension is just a piece of scrap metal bolted to the foot. The portable stand works very well for storing and transporting the motor. When I get to the beach and put my outboard on the dinghy, I secure the stand to the seawall with the dinghy lock.

David Sharp and his partner, Nancy Grinnell, cruise their 1969 Tartan 34, Pegasus, *out of Newport, Rhode Island.*

The outboard clamps to a 2 x 4 that's notched so the motor's bracket clears the truck's crossbar. David fastened the board with a lag bolt at each end through the truck frame. The metal plate extends the truck's foot to prevent the rig from tipping.

BETA MARINE

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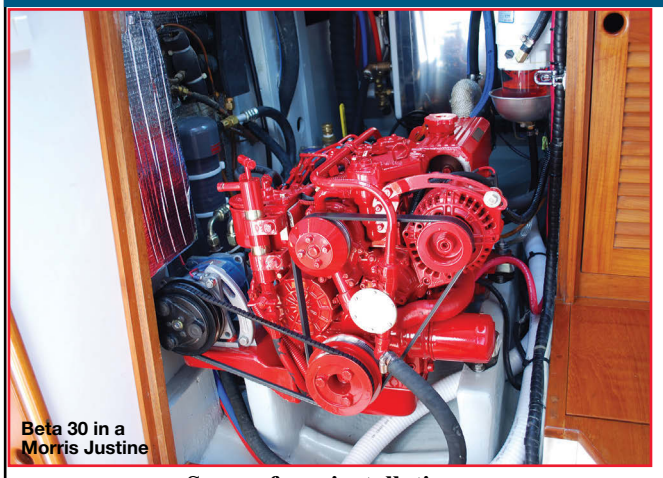

Beta 30 in a Morris Justine

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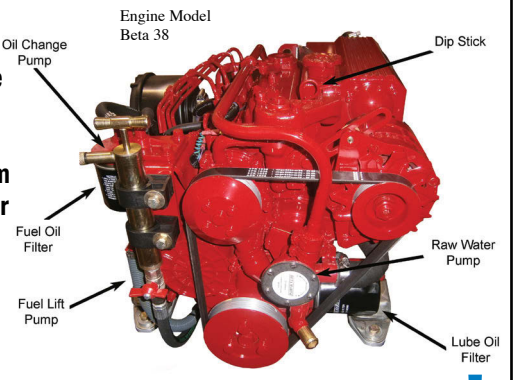

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	Morgan OI 33
Beta 28 (BD1005)	Alberg 37
	Pearson 35
Beta 35 (BV1505)	Pearson 365
Beta 38 (BV1505)	Sabre 38Mk1
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Boats for Sale

Morgan 42 MK II
1973 sloop. Same owner 40 years. Feature boat in April 2012 issue. Meticulously maintained, freshwater boat. Re-engined w/ Westerbeke M38 diesel. Rerigged w/Charleston Spar mast and boom, shrouds, turnbuckles, solid boom vang, and RF. St. Joseph, MI. $49,500.
Ronald Rueckwald
269-313-2586
rrueckwald@aol.com

Sea Sprite 30
1984 sloop. Built in Bristol, RI, by CE Ryder. Hull #8. 14-hp Universal diesel, new electronics, new propane oven/stove. Two-owner boat. Endless upgrades, completely outfitted, meticulously maintained. Fairclough winter cover. Must see to appreciate! Old Saybrook, CT. $39,900.
Gary Brink
860-227-7739
brinkgar@gmail.com

Tayana 37
1985. Ketch version of Bob Perry's famous bluewater design. On the hard for a few years but has been properly stored. Now ready for a new owner. Extensive upgrades completed. Finish her off and sail away. Bayfield, WI. $59,900.
Tim Edwards
715-779-3153
edgowi@gmail.com

Nonsuch 30 Ultra
1985. Lovingly maintained, spacious coastal cruiser seeks new captain. Not ready to retire yet, but her current captain is. Always sailed in fresh water. Off-season, stored indoors since '07. Nearly new sail and lifelines, new house batts and 20-amp charger. Fully equipped for comfortable cruising. Roomy 11'8" beam w/dinette layout and pullman double berth forward. Westerbeke 27-hp diesel, optional Zodiac inflatable w/6-hp OB. Muskegon, MI. $61,000.
Carol Faber
faberrc@comcast.net

Bristol 29
1969 sloop. Herreshoff design, coastal cruiser. Well maintained. LOA 29'2", beam 8'11", draft 4'6", 8,400 lb. Tiller. Dacron main and genoa. Standard cabin layout. Universal Atomic 4 gas engine, Monel 15-gal fuel tank. Manual head with 15-gal holding tank. Alcohol stove and icebox, 32-gal FW tank. Oxford, MD. $19,500.
Edmund Cutts
410-226-5416
cuttsandcase@verizon.net
www.cuttsandcase.com

O'Day 34
1984 sloop. Silver Anniversary Edition. Fresh water only, kept on Delaware River. Universal 25-hp diesel. Neil Pryde main, 150 genoa and jib w/blue sailcovers and blue dodger. Very well kept with full maintenance logs available since purchased in '03. Immaculate boat. Recent bottom and refinished teak interior. Riverside, NJ. $32,900.
Ozzie Pedrera
856-914-0475
ozzie@LNF.com

C&C 27 MK I
Classic 1972 sloop with many upgrades. Nice original gelcoat. Lots of equipment. Well cared for Atomic 4. New gauges and wiring. Recent survey. Spinnaker and gear. New cabin cushions and cockpit cushions. Newer standing rigging and lifelines. Madison, CT. $9,900.
Bruce Zuwalick
203-421-5447
Brux1949@sbcglobal.net

CatsPaw 7.7
2013 dinghy. Never touched the water. All stitch and glue using meranti marine plywood. All other wood is mahogany. 3 coats West System epoxy inside and out, 2 coats marine enamel on the outside. Oars, oarlocks, and bow eye. More images available on request. Andover, MN. $700.
Doug Birch
612-419-6653
dougw.birch@comcast.net

Tayana 37 MkII
1983. Your winter home or your idyllic sailing life. Circumnavigate the world or the Caribbean. Daysail to the fabled San Blas Islands of Panama or just relax on your mooring and enjoy the warm water and sun. $89,000 OBO.
William Trindle
svcheval@yahoo.com
www.sailboatlistings.com/view/23215

Tartan 34C
1976. Freshwater boat w/Yanmar 22-hp diesel, 3'11" draft w/CB. Lewmar ST primary and halyard winches, new '10. Canvas includes dodger, Bimini, and connector new '10, mainsail cover new '13. Hood FB main with Harken battcars, Harken RF w/150 genoa. Custom cockpit cushions. Wonderful teak interior w/Origo non-pressure alcohol/electric stove, fridge, H/C pressure water. Cheboygan, MI. $28,500.
Paul Wenner
513-777-2158
wennerpa@gmail.com
http://76tartan.wordpress.com

Allied Seawind II 32
1977. Excellent cond. An able, well-found cruising vessel. Rebuilt Universal diesel, new transmission, complete sail inventory w/ mizzen staysail and Profurl RF. Raymarine AP, GPS, depth, VHF. All standing rigging, thru-hulls, seacocks, portholes replaced. All systems including propane stove, fridge/freezer, water heater, extra water tank and pumps added '09. Includes nesting pram and ground tackle. Ready to go. St. Petersburg, FL. $29,500.
George Coburn
727-896-0111
geoskimmer@hotmail.com

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website:
www.goodoldboat.com/resources_for_sailors/sailing_classifieds/

Mystic River Sloop 18
1978. Good cond. LOA 18', LOD 16', beam 7'. Classic daysailer by Peter Legnos w/registered trailer. Fiberglass hull, wooden mast, gaff, boom, and bowsprit. She draws so little with the CB up that she will sail in wet grass. Very stable boat. Electric trolling motor w/new battery as auxiliary. Red Creek, NY. $3,900.

Will & Kathy MacArthur
315-754-8885
rcmac4@gmail.com

Alberg 37
1968 plastic classic. Very pretty and very well maintained. Perkins 4-108 w/1,450hrs. Sailor prop. 155 genoa, FB main w/Dutchman. Dodger and Bimini vgc. Navman W/D, Simrad AP, Garmin 215 plotter. Standing and running rigging new in '00. Many upgrades. sailaway condition. Camden, ME. $47,500.

Jon Kuhl
207-236-2202
jonhelenk@juno.com

Pearson Vanguard 32
1963, hull #7. 8-yr restoration. All systems including new Beta Marine engine w/125 hrs, electronics, breaker panel, cabin, topsides, below water line. Restored to concours condition (as commented by local surveyor). 9 bags of sails, vg to new cond. Winter storage paid. Beverly, MA. $29,000.

Peter Rollins
978-922-5082
n2013q@comcast.net

Bill Boyd Catboat 23
1979. 23' x 10' x 27" draft (5' CB down), 6,000 lb. Wm. Garden design. Pretty, roomy, heavily built, stable, environmentally friendly, lots of character. Will go about anywhere. Folding mast, new sailcover, good sail. New cushions, Porta Potty, new canvas cockpit cover. Triple-axle King trailer. Electric Yacht IB. She's a joy to sail! Williamson, IA. $18,000.

Ford Brockman
641-203-0319
fsbrockman@hotmail.com

Nor'Sea 26
1979 Raised salon w/tandem-axle trailer. Yanmar engine with 320 hrs. RF, bow pulpit with 2 anchors. Fridge w/freezer, pressure water, 2-burner propane stove w/oven, vacuum head, watermaker. 1,800-watt inverter, WS. All lines lead to cockpit. 4' draft, full keel. Stored indoors. Payson, IL. $27,000.

Larry Waters
217-653-2384
waterse@adams.net

Vindo 35
1976 Swedish sloop. Sound fiberglass hull. Beautiful teak decks and cabintop over fiberglass. Newer Yanmar diesel 3GM30 (about 11 yrs) w/210 hrs. Fuel system polished, new Racors ('13). RF jib, Bruce anchor. Engineer maintained. Needs some restoration. Annapolis, MD. $24,000.

William O'Neil
239-565-2345
thejobo@aol.com

Cal 24
1984. Fast, fun, stable, solid construction. New main in '10, Harken furler w/135 genoa, spinnaker, and complete set of original sails. Yamaha 8-hp long-shaft in good cond. Indoor storage last 2 seasons. Got a bigger boat, motivated to sell. Castine, ME. $5,500.

John Mitchell
207-883-6353
jhmitch@maine.rr.com

Cape Dory 25D
1983 classic. Seaworthy, ready to sail. Alwgrip jade green hull. Tan deck, sailcover, dodger. Main w/3 reefs, jiffy reefing, lazy-jacks. 140 and 110 genoas, gennaker. Head w/shower forward. Roomy main cabin sleeps 3-4. Galley includes deep ice box and Origo alcohol stove. Yanmar 1GM. Systems have been well maintained and upgraded. Triad Trailer w/8,000 lb towing capacity. Trailer included. Round Pond, ME. $19,000.

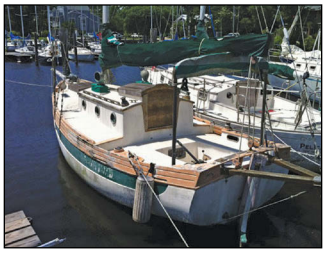
Charles Garrison
cwg.cc@verizon.net

Catalina 25
1982 tall rig. Fin-keel with tandem-axle trailer, Honda 9.9 OB. Mainsail new in '11, jib, 150 genoa, spinnaker, storm jib, Raymarine tiller pilot, Tempur-Pedic mattresses in V-berth and quarter berth, large water and holding tanks. Set up for cruising. $6,800 OBO.

Jeff Reimer
989-330-3785
Jeff.glsailorman@gmail.com

Westerly 25
1967 Westerly Windrush. Triple keeler w/2.5' draft. Yanmar 3GM. RF jib. On good road trailer. Recent illness forces sale. Located W. Michigan. $5,000 Negotiable.

Steve Lewis
269-358-8407
stevelewis517@gmail.com



Falmouth Cutter 22
1980 Lyle Hess design. LOD 22'. LOA 30'6" (includes bowsprit and boomkin). Mentioned in John Vigor's *Twenty Small Sailboats to Take You Anywhere*. Bluewater features, heavy displacement, full keel, thick hand-laid-up solid fiberglass hull, heavy duty OB rudder, Yanmar diesel, strong bridge deck, cutter rig, long bowsprit and boomkin to handle larger sails. Many have circumnavigated. $32,625 OBO.

Sidney Bertheaud
504-920-7878
bluedog60@me.com
http://sailingtexas.com/201301/sfalmouth101.html

Boats for Sale, cont

Ranger 33
1978. Second owner since '79. All years on Lake Superior. New rig, keel mast step, drainage system, head, depth, cushions, companionway door. Rebuilt mast and engine drivetrain. Atomic 4 in exc cond. Restored teak interior, original hull gelcoat in beautiful cond. Madeline Island, Lake Superior. Madeline Island Yacht Club membership may be negotiated as part of sale. $30,000.

Joe O'Brien
763-234-1031
joe@callta.com

Cal 40
1964. Bill Lapworth design built by Jensen Marine. Beautiful cond. A delight to sail and easy to live aboard. Cabin and deck white and light gray, varnished mahogany/white interior. Port Huron, MI, area. $30,000 OBO.

Phillip Ireton
734-455-4626

Bristol 29.9
1977. New main, jib, cruising spinnaker, dodger. Yanmar 3GM30 diesel engine. 2 batteries w/charger. 18-gal SS fuel tank. Mahogany interior. Teak-and-holly sole. 2 anchors, 2-burner CNG stove. Sailaway cond. Rhode Island. $12,500.

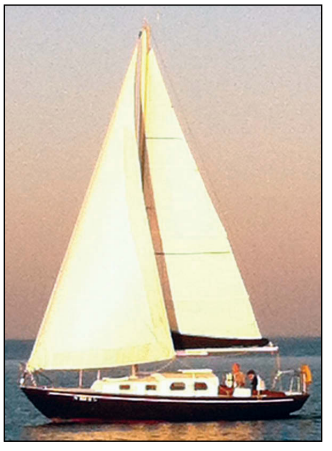
Allan Howe
401-647-2459
askhow88@verizon.net

Ranger 28
1977. (GOB feature boat Sept '06). A delight to sail. Fully restored. Carefully maintained. New bottom paint. Many upgrades. Enhanced Atomic 4. Dinghy and davits. All sails in excellent cond. On the hard. Atlanta, GA. $10,500.

Walt Hodge
770-498-1678
walt@wingnwing.com

Knarr 30
1960 wooden sloop. Built in Norway. Honduras mahogany, carvel-planked, varnished finish with white deck. Spruce spars, newer sails, spinnaker, and rigging. 6-hp OB in motor well with cockpit controls. *Freya* has been well cared for with a single owner for the last 25 years, sailing out of Oakville, Ontario. The Knarr personifies the romance of sailing with a community of devoted owners and loved around the world. $8,000.

Brian Courchesne
905-849-1050
bcourche@gmail.com
www.ladyben.com/SearchResultsFull.asp?VesselID=4471



Bristol 27
1966 classic Alberg design. WS, CDI furler. Sails are like new: 150 genoa and Doyle Stackpack FB main w/lazy-jacks. 10-hp Yamaha. Imron dark blue brushed paint job, teak toerails, and mahogany coamings get many compliments. White cabin top needs repainting. A sound, compact cruiser ready to take you anywhere. On Lake Ontario. Choose steel cradle or stands. $6,500 OBO.

Dennis Cannan
585-342-9775
dcannan@aol.com

Pearson 28-1
1979. Very well maintained. Foresail cover 1 yr old. Dodger and mainsail cover 2 yrs old. Sails in vg cond. Atomic 4 engine in great cond and runs strong. Harbor View Marina, Newport News, VA. $9,200.

Bill Yoke
757-503-2154
yoke97@verizon.net

Wanted

Trailer for C&C 30
The editors of *Good Old Boat* (Karen and Jerry) are looking for a used over-the-road trailer for their C&C 30, *Mystic*. The trailer should be made of steel (so we can weld to it) and be capable of carrying its own weight plus 10,000 lb.

Jerry Powlas
763-494-0314
jerry@goodoldboat.com

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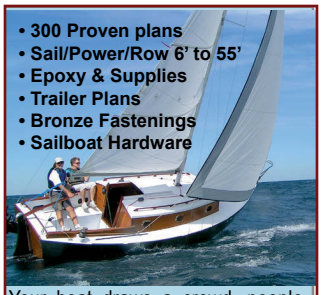

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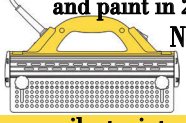

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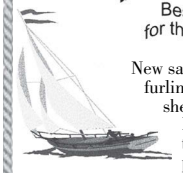

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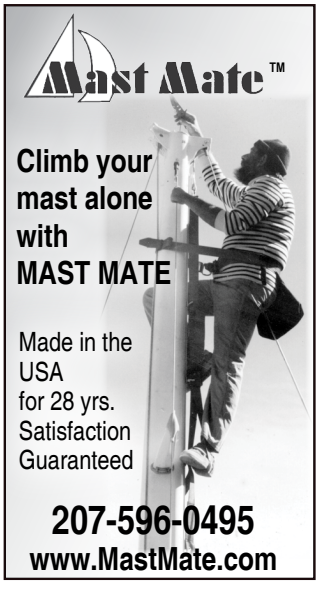

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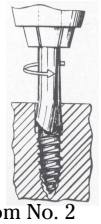

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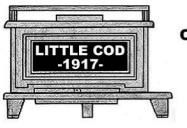

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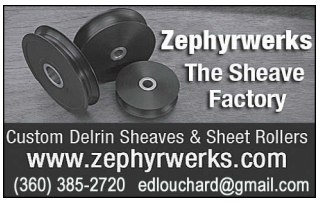

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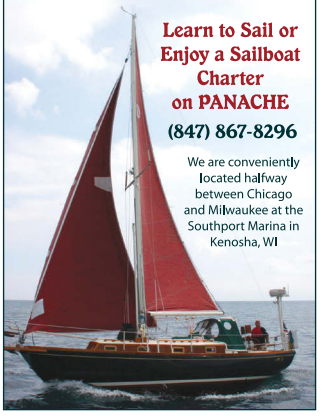

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Cruising on Shoe Leather

Parallels between the Blue Ridge and the deep blue

BY GARY MILLER

I used to dream about sailing around the world in our beloved 32-foot double-headsail Cheoy Lee ketch, *Experiment*. You know the dream. Snapping myself into a harness in preparation for stormy sea passages under gale-force winds. Or gentle, giggle-inducing sailing, skidding down the slopes of 20-foot waves under idyllic trade winds. Or dropping the anchor each night next to cruisers from all seven seas, only to take off again the next morning for some uninhabited isle.

Then life got in the way. Marriage. Family. Kids. Jobs. Even a bout or two with nasty life-threatening diseases. Time to re-run the dream with a little editing. A few friends and family members, wise in their ways, had some sage advice.

"Take a hike," they said.

What? That's it? No more Miles Smeeton? No more Bernard Moitessier? Whaddya mean, take a hike?

"The Appalachian Trail," they said. "Very similar to world cruising in your good old boat."

As it turns out, they were right. But to prove this theory I strapped a 40-pound pack on my 65-year old back and started a 2,200-mile hike from Georgia to Maine. I had to give up after only (*only?*) 400 miles, but for 10 precious weeks I lived the adventure of a lifetime. It was more exciting than the TransPac.

> "The Appalachian Trail," they said. "Very similar to world cruising in your good old boat."

During this landlocked adventure I would draw several parallels between the world of sailing and the world of hiking. I share them with you.

The biggest: it doesn't take a major league disaster to make a voyage — or hike — memorable. A certain editor included this advice in her missive when I began the hike and it's true. Getting up at dawn, bending on the sails (er, hiking boots), and heading off into what is surely the unknown is, in and of itself, an adventure worth sharing. Trust me on this.

Another: we like the solitude of the voyage. But we also like the social support of potluck dinners on the beach (or around the campfire). We can have both. Of the hundreds of people I questioned on the Appalachian Trail, nearly every one cited the social aspect of the journey as one of its major attractions. Yet the same people would wax eloquent — not unlike us sailors — on the one-on-one beauty of nature. The sunlight, the flora and fauna, the water . . . these grace hiking and sailing with equal blessings.

On board *Experiment*, we used to have a saying (it's not original, but I have no idea who the original author was): "When you think it's time to reef, REEF!"

Whether sailing or hiking, plan ahead for safety no matter what shakes out. During the course of this little walk in the woods I helped rescue two people in need of emergency medical attention. An outbreak of the dreaded norovirus affected hundreds of my fellow hikers. I shared food with colleagues who ran out unexpectedly. And I taught a 7-year-old to fish, in case he really ran out of food and had nowhere else to turn (pressure fishing if there ever was).

How many of us have not done similar deeds when cruising? Actions like towing a dink whose outboard had quit. Or helping a neighbor down the dock go aloft to retrieve an errant halyard. Or simply buying a friend a soda or drink at the local watering hole.

My beautiful wife of nearly three decades, Ann, never liked *Experiment*. "Too many strings to pull," she declared. Like any dutiful husband, I took the hint and bought a fully renovated, simpler boat. *Viridian*, — a 1969 Pearson 35 sloop with refrigeration, radar, hot water, autopilot, and so on, — offered the finest gear available.

This brings us to the last parallel. You can enjoy hiking with an Army surplus pack, a shower curtain for ground cover, and a cheap tin pot you picked up for $1 at a garage sale. Or you can spend a small fortune at your local outfitter.

It's the same with sailboats. Either way, you can have fun.

Gary Miller has had a long career photographing, writing, and editing for magazines, corporations, and organizations. Still an active freelance writer and photographer today, his subjects include photography, sailing, fishing, travel ,and video production. His last sailboat was Viridian, *a beautifully restored Pearson 35 sloop.*

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