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Practical Sailor



Pearson 32

Shaw-designed sloop is a capable cruiser and a reputable racer. PAGE 6



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When Plastic is Less than Fantastic

Eavesdropping at autumn boat shows, always produces some curious snippets of conversation.

"I want a boat I can plow into a seawall without any worries," I heard one prospective buyer tell a friend as he surveyed the boats assembled at the Strictly Sail Miami Boat Show last winter.

As far as I could see, there was only one boat that fit the bill: a steel-hulled Miami River tug that was pushing Haitian cargo boats just north of the show.

For any sailor who trusts his life to the thin barrier between himself and the deep blue sea, the inclination to buy an "indestructible" hull is natural. Sooner or later—such reasoning goes—either a mistake, bad weather, or some combination of the two will test the hull to its limit.

Granted, a cruising boat is exposed to nature's rawest forces, but good seamanship and passage planning can usually avoid the most worrisome. So, how strong does a hull need to be?

The question of hull strength becomes more relevant these days as an increasing number of fiber-reinforced plastic (FRP) hulls are being built using vacuum-assisted resin-transfer methods, or pre-impregnated (pre-preg) cloth. In both cases, the amount of resin can be more closely controlled than it can with conventional roller and brush lay-up. The result, if done properly—no small caveat—is higher fiber-to-resin ratios (70 percent fiber to 30 percent resin versus about 40:60 for hand lay-up) and theoretically higher strength-to-weight ratios. A core sandwich can yield even lighter, stiffer structures, but this is by no means seawall-smacking-proof. And depending on the thickness of the outer FRP skin, a reef-bound cored hull will likely come out worse for wear than a solid laminate hull.

One only need to look at the text and photos accompanying the Special Report on hull strength ("Lessons from the Boneyard," page 23) to recognize that the integrity of an FRP hull is dependent upon much more than fiber-resin ratios or how thickly the hull is laid up.

Just as critical are quality control during lamination, structural reinforcement, keel and rudder design, chainplate installation, hardware backing and reinforcement, and adequate attention to "stress risers" where extreme loads migrate and focus. The keel stub, mast partners, hull-deck joint, and rudder stocks are some of the common failure points in the boneyard boats that were inspected for the report.

As for longevity, poor attention to details like deck hardware attachment (leading to rotten deck core), poor secondary bonds, or poorly engineered hull-deck joints are what frequently doom older FRP hulls, not the strength of the laminate itself. Look at the floors and keel stub of the Pearson 32 (photo, page 9), and you get a pretty good idea why this boat is still around after 28 years.

No production FRP boats can be expected to stand a severe pounding on rock, coral, or concrete. Nevertheless, seeing what happens to some popular cruising boats when they are tested to the extreme, makes me extremely skeptical of unproven claims of engineered strength. It also makes me wonder how many off-the-line boats are actually built to their design specs.

Now matter how well built a fiberglass boat is, the material imposes strict limits. So the next time a salesman starts touting his production sailboat as "virtually indestructible," don't bother listening any further. Unless you're in the market for a steel-hulled tugboat, the seawall will always win.

Darrell Nicholson
Editor

On the cover: A Pearson 32 struts its stuff on Long Island Sound.

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SAIL NAKED?

In regard to your article "Sunscreen Stripe-off" in the June 2007 issue: Blocking UVB blocks the formation of Vitamin D, our most important defense against cancer. My wife and I observed a few years ago that we were no longer getting sunburned and were easily developing a healthy—yes, healthy—tan. After lots of research, we attributed this to the Omega-3 supplements we were taking, and our avoiding Omega-6 fats.

Alan Donaldson
Mac 26S and Sea Pearl Tri 21
Idaho Falls, Idaho

*We've gotten a lot of interesting responses to our sunblock test, including a correction from a chemist pointing out that our description of potions that rely on physical blockers as sunscreens "don't have any chemicals" was inaccurate. Titanium dioxide and zinc oxide are organic chemicals (as opposed to inorganic), but sunscreens containing these blockers usually also have inorganic chemicals in them. UVB radiation does indeed enable the skin to synthesize the "sunshine vitamin," Vitamin D, which is credited with many health benefits. As far as we know, there have yet to be any long-term, double-blind studies supporting the role Vitamin D plays in preventing cancer, but according to Edward Giovannucci, an associate professor of medicine at Harvard University who directed a Vitamin D study (*www.harvard-magazine.com/onl-line090532*), just 20 minutes on a sunny beach can yield five times what he proposes is a healthy amount of Vitamin D.*

SUNBLOCK

A University of California Davis study indicates that UVA waves can break down sunscreen ingredients that are absorbed into the skin and turn them into cancer-causing agents. (*www.sciencedaily.com/releases/2006/08/060828211528.htm*.)

One of the three potentially harmful ingredients is octocrylene (found in some of the products you recommended), and this must be encapsulated to prevent it from breaking down into potentially damaging free oxygen radicals (FOR). According to the study, micronized or micro-encapsulated titanium oxide or zinc oxide are needed to prevent the breakdown.

The U.S. Food and Drug Administration just approved L'Oreal's Anthelios SX, which contains mexoryl and the encapsulators. (My wife and I recommend Blue Lizard SPF 30 Sport, Sundurance XT, and Proderma Competition Grade Prism SPF 50 or 45.)

Joe Mastal
Via e-mail

None of the products we tested contained mexoryl—a photo-stable organic sunblock that was patented in Europe in 1982 and recently approved by the FDA—but several use the encapsulators. One of these was our Best Choice, Coppertone Spectra 3, which unfortunately has since been discontinued. From our understanding of the UC Davis study, frequent application of sunscreens with the encapsulators should prevent the formation of FOR. Given the editor's eccentric skepticism toward most pharmaceutical studies, protective clothing remains his preferred first line of defense. (Staying out of the sun is unlikely in this line of work). As it happens, PS *is in the midst of testing hats, and are beginning a project to test UV-blocking clothes. In the meantime, we'll grab a tube of the highly publicized L'Oreal goop and see how it does.*



We received a sackful of mail about the June 2007 sunscreen review.

WHAT ABOUT LANOCOTE?

Great article on anti-corrosives (April 2007). I just bought Lanocote spray and paste. It came highly recommended by a rigger.

Dwain Lovett
Montserrat, BWI

We've got it and are doing a followup. The editor has used a similar New Zealand-made product on his galvanized turnbuckles and rigging with good results.

NUFINISH FOR BOATS

Please add another product to your study of non-marine waxes (March 2007 issue). I am a Gemini broker, and my detailer has been using NU-FINISH for three years with great results. It goes on easy, comes off

PS ONLINE

Several new archive articles were added to the "Tools and Techniques" section of the *Practical Sailor* website (*www.practical-sailor.com/tools/*) this month. Among them are tips on lightning protection systems, selecting exterior and interior wood, cutting high-tech fibers, and varnishing. Popular Offshore Log articles written by former editor (and now editor-at-large) Nick Nicholson have also been posted, including advice on rigging for downwind sailing, spare engine parts for cruising, and techniques for safely securing dockside.

WHERE CREDIT IS DUE...

KUDOS TO WALKER BAY

We were an early purchaser of the new Walker Bay Genesis rigid inflatable. The features, construction, and price all attracted us to this dinghy. Our boat was late to arrive due to initial production delays, but we were happy when we received our new dinghy. Unfortunately, there were some issues with it, but we are writing because Chris Carroll and everyone at Walker Bay (*www.walkerbay.com*) went above and beyond to ensure our satisfaction. It is rare today to find a company that builds with tremendous quality and truly listens to its customers. All's well that ends well, and we are very pleased with our great new dinghy and even more pleased to be part of the Walker Bay satisfied customer family.

Walt Kerner
Elan 434
New Bern, N.C.

RITCHIE COMPASS

My 6-inch Ritchie Globemaster compass had a 2-inch bubble when I picked up my boat from the yard. I took the compass to John Bischof at the Ritchie repair station in rural Sedgewick, Maine, who meticulously centered the dome, torqued the bezel screws evenly, topped off the fluid, and replaced the O-ring at the filler plug. These attempts at stopping an evident leak failed, so John called the Ritchie Service Department in Pembroke, Mass., and at their request, shipped them the compass.

The gremlin was a slightly warped bezel that prevented a perfect seal. Ritchie (www.ritchienavigation.com) replaced the bezel and other parts at no charge.

This is an example of the benefits of a high-quality product from a first-rate company that has a worldwide service network.


Globemaster

Capt. John K. Butler Jr.
Bristol 38.8
Buck's Harbor, Maine

easy, and lasts about six months. He mixes it with a fine rubbing compound to clean the metal.

Brian Leiding
Naples, Fla.

NAVPAK PRO SOFTWARE?

I am looking at navigation software and read your review (September 2006) on this subject. I have examined Fugawi's demo program that you listed. I have also found software from Global Navigation Software Co., specifically NavPak Pro. Have you reviewed this software?

Jeff Donohue
Via e-mail

Mike Slinn, who evaluated navigation software last year ("Software Wars," September 2006) and tested Nobeltec's Admiral 9.1 for this issue (page 32), will be reporting on the NavPak software as soon as he fixes the head on his Beneteau First. In the meantime, you can check out Slinn's blog at http://www.marnav.info.

BEWARE IN THE BAHAMAS

This letter is a friendly warning to those who charter in the Bahamas. Not having had damage to a sailboat in a half-century of sailing, I elected to not take the insurance policy offered by The Moorings to charter a 38-foot catamaran at Marsh Harbour, Abacos. It was a costly mistake.

Shore areas were not well marked. Warnings of underwater rocks, destroyed six months before in a hurricane, had not been restored.

A long story short: I damaged a strut that took two days to fix ($2,500). Added to that were 14 laydays ($752) for a total of $3,252. It was an expensive lesson.

John E. Sonneland
Spokane, Wash.

TETHER TALES

I have a simple safety tether system on my Outremer 45 catamaran that might bear looking at: I have permanently installed port and starboard tethers which live on the jacklines by means of a sewn loop. They get me from the cockpit to the forestay, with enough slack to work at the mast but not enough to go through the lifelines. They are strong and failsafe, but best of all, they are silent: no dragging a piece of hardware forward along the deck, which is guaranteed to wake up the off-watch spouse. The only downside is not being able to go forward on one side and return on the other, but I never do that. I keep a short tether doubled on my harness if I need to move out of reach of the jackline.

John Spier,
Aldora, Outremer 45
Block Island, R.I.

TETHER ISSUE HEATS UP

I am writing in regard to the photo of Skip Allan wearing a safety tether doubled over the jackline (April 2007, page 20). As a rock climber for over 20 years, I have learned this is a very unsafe practice. Webbing-on-webbing or line under tension can melt in a very short distance. That is why climbers always use carabiners to separate webbing and line. The *PS* tester may not have ever experienced melting because he had not had enough force between the two webbings. But if he goes for a ride down a wet deck because of a wave, he could discover his tether melted as he goes overboard.

Please correct this unsafe advice, possibly by doing some testing, like figuring out the effect of a section of webbing running down a 40-foot jackline under tension.

Ted Scharf
Pittston, Maine

A melting tether is indeed a possibility, but it seems pretty unlikely during use on a boat. The biggest concern would be if the wearer, even on a short tether, still managed to go over and was dragged long enough for the tether to break due to friction. The doubled-over tether arrangement used by Skip Allan for our test is not meant to be used full time, or when moving around on the deck, but at fixed stations where the tether's full length puts the wearer at greater risk of being hurled or falling overboard. A short tether or two-leg tether would be better, but many sailors don't like them because they can be cumbersome to wear.

WI-FI HAPPY

You have requested information on experiences with Wi-Fi when cruising. We have been cruising the East Caribbean (British Virgin Islands to Grenada) for several winter seasons and have recently found Wi-Fi readily available (often free) in most marinas and many anchorages. However, we have found the use of an external antenna system far superior to the Wi-Fi cards available for most laptops. We use a 200mw EUB-362(EXT) made by Engenius. It is a very compact device that connects to our laptop with a USB cable. We upgraded from the standard 2db antenna to the optional 5db antenna. We have little trouble accessing Wi-Fi services with this arrangement, and the antenna is small enough to be readily portable. A marine kit with a permanent mount 8.5db external antenna is also available from *www.netgate.com.*

Readers planning to sail the East Caribbean might also be interested to learn that GSM cell phone service with data capability is available virtually everywhere. Data rates are currently about the same as dial-up, but it is fine for e-mail.

A GSM quad-band phone is required with a cable or blue-tooth connection to the computer. A word of caution: Before signing up for data minutes packages, determine if those minutes can be used internationally. In the case of Cingular (now AT&T), they cannot. Charges are 2 cents per KB internationally.

Chuck Poel
S/Y *Andiamo*
East Caribbean

Practical Sailor welcomes letters from our readers. Please include your name, home port, boat type, and boat name. Send e-mail to practicalsailor@belvoirpubs.com and mail to *Practical Sailor*, 7820 Holiday Dr. S., Suite 315, Sarasota, FL 34231.

PRODUCT ALERTS

ICOM M802


Icom M802

Owner reports of the Icom M802's audio "clipping" during transmission have resulted in a now-available improvement to the M802s.

On affected M802s, on certain voice patterns, the receiving party may hear only part of a word, and then the transmission quickly comes back. The operator may hear a few more words and then the voice would cut-out again.

According to Icom, this occurs when the radio's antenna is generating a standing wave ratio (SWR)—the ratio of maximum power in a wave to minimum power in the wave—of 1.6 or more. While proper installation and maintenance of an antenna system may help reduce SWR, there are antenna situations where the ratio may be higher than 1.6.

Icom's "improvement" to the M802 ensures that the radio will not "clip," no matter the SWR.

To upgrade your M802, contact Icom's service department at service@icomamerica.com or 425/454-7619. This improvement will be in all future M802s.

COLEMAN POWERCHILL 40

Following our review of thermoelectric coolers (April 2007), where we tapped the Coleman Powerchill 40 as our Best Choice, two readers reported that they had problems with the Powerchill's lighter plug melting. According to Coleman, a "small number" of the 40-quart Powerchills had "a quality issue affecting the fuse assembly." They told us that the issue was corrected, beginning with the February 2007 production. If you happen to own a Powerchill with a faulty fuse, or need to contact Coleman for any other reason, you can call their Customer Service Department at 800/835-3278.

GARMIN RECALL

Garmin recently issued a recall of most of its 500 series fixed chartplotters. The units being recalled are the GPSMap 520, GPSMap 520s, GPSMap 530, GPSMap 530s, GPSMap 540, GPSMap 540s, GPSMap 550, and the GPSMap 550s. For a complete list of the serial numbers of the units affected, visit *www.westmarine.com* and select "Product Recalls."

According to Garmin, the units may provide incorrect position information. Should a user be interfacing the unit with another device, then that device could be receiving incorrect data from the plotter. This is especially a concern where an autopilot may be using the GPS outputs: With bad information, the autopilot could navigate to an unintended location.

Owners of the recalled units should return them to Garmin for repair. Garmin will cover the cost of the repair as well as any shipping costs to and from the factory.

For more information, call Garmin at 800/800-1020.



Pearson 32

With mainsail slab reefing and a 120-percent, furling genoa, the Pearson 32 is well-equipped to dial in to winds ranging from 8 to 20 knots. Grumman's expertise ensured a high level of quality control for boats of the P32's era.

Bill Shaw's cruiser-racer still shines 28 years after it launched.

The Pearson 32 was launched in 1979, 20 years after the first Carl Alberg-designed Pearson Triton captured market interest at the New York Boat Show and promoted sailing as a middle-income activity. In the early 1960s, the company's principals, Clint and Everett Pearson, Alberg, and marketing strategist Tom Potter developed a reputation for functional, well built, cost-effective production sailboats that had widespread mass appeal. By the end of the first decade of production, the company had evolved into the dominant East Coast production-sailboat builder, and was bought out by aerospace giant Grumman. During these formative years, a new genre of sailboat was spawned, and each of the founders of the fledgling Pearson Co. made a sizable contribution to production-boat building. Before each went his own way, the original Pearson crew successfully turned a garage-based boatbuilding dream into a reality that spawned a dynasty.

Phase 2 of the Pearson plan came with a new owner, new designer, and new line of boats. Grumman, well capitalized from its military aircraft successes, leaped into the fray with a thick checkbook and considerable manufacturing know-how. Before they left, the Pearson cousins had recruited Bill Shaw, an 11-year veteran of the S&S design office, to be the in-house designer. He ended the Alberg era of full-keel, long-overhang sloops in favor of the fin keel, skeg, or spade rudder, and split underbody that he felt improved performance. Shaw found the Grumman era a chance to improve Pearson's production-boat building technology, and for 27 years, he acted as the chief designer and eventually general manager of the operation.



THE DESIGN

With a clear understanding of coastal weather conditions, inshore estuaries, and the cruiser-club racer mindset of potential buyers, Shaw began a campaign of designing boats of 30-plus feet that met the needs of local sailors. Pearson became a mature manufacturing company engaged in market research that showed that although customers may read stories about passages to Tahiti, in truth, they had just enough time in the summer to get to Martha's Vineyard and back. They belonged to yacht clubs with Wednesday night race series, and they wanted sailboats that could be raced and cruised without much fuss. The research also showed that more often than not, it was the skipper's wife who

Photos by Ralph Naranjo

CRITIC'S CORNER: PEARSON 32

PROS

- *Forward mainsheet traveler gives trimmers room when racing.*
- *Deep self-draining cockpit well.*
- *High cockpit coamings.*
- *Adequate side-deck width.*
- *Inboard shrouds improve sheeting angles.*
- *Practical anodized toe rail.*

CONS

- *Mainsheet traveler location presents potential hazard at companionway.*
- *Inboard shrouds consume side-deck space, requiring crew to pass outside.*
- *Conventional transom is less bather-friendly than newer sugar-scoop transoms.*
- *Deck-mounted headsail winch obsolete toe-stubber.*



The binnacle, bridge deck, and lazarette consume legroom, but the relatively small footwell effectively drains any green water.



held a pivotal vote on which boat would eventually be bought.

Shaw's challenge became one of designing sailboats that performed well under sail in light to moderate conditions, offered accommodations that made the summer cruise more comfortable, and garnered nods of approval as the boat bobbed on a mooring in front of a club house.

The Pearson 32 embraced all of these goals, and delivered on the challenge. Its waterline footprint was wider and longer than boats of the Alberg-era. With fine forward sections and an external-ballast, lead fin keel, the 32 offered better windward performance.

For the day, it had a fairly high-aspect-ratio spade rudder that worked in conjunction with the fin keel, guaranteeing turn-on-a-dime maneuverability. Added lift from the foil shapes improved its upwind ability. With a 10-foot, 7-inch beam and fairly flat sections, the boat's righting moment derived a big boost from form stability, and consequently, it carried sail well and showed less of a heeling tendency than earlier, lean, full-keel models.

Even with a 40-percent ballast ratio, the displacement of the boat was only 9,400 pounds, a number that when taken in context with 474 square feet of working sail area added up to decent light-air sailing ability. In short, Bill Shaw had looked closely at what New England sailors and those on Long Island Sound and the Chesapeake Bay were doing with their boats and designed the Pearson 32 to be the cruiser-racer that they were looking for.

In the years to come, other manufacturers would build competitors in this size range that were faster, but each of these iterations seemed to eat away at the cruising side of the compromise. The Pearson 32 was intentionally a 60/40 cruiser-racer, a boat that was easy to sail solo, luxurious for a couple, and quite user-friendly for a young family on a two-week summer cruise. It had some wood trim, but the extruded alloy toe rail, fiberglass coamings, and nonskid gelcoat decks were an effort to lessen maintenance through the use of more durable trim and finishes.

Another Shaw trait, seen on this design, was a sensible balance between the competing influence of accommodations and hull and deck configuration. Conceived first as a sailboat rather than a sailing houseboat, the relationship between side-deck space, cabin-house shape, and cockpit size achieved a harmony that works well underway and at anchor. Extremes were avoided, and the logic of the fin keel and spade rudder underbody proved its value. The era of canoe body hulls and independent foils did improve performance, but also made running aground a bit more of a concern. A hefty well-reinforced keel stub provided a rugged garboard seam for the lead-ballast keel of the P32, and lessened worries about running aground.

INTERIOR NOTES: PEARSON 32



The Pearson 32 came with two layout options, one with a port quarter berth (rare), and one without. Joinery is above average for a production boat of its era. A two-burner alcohol stove was common, but there's room for a gimballed, three-burner propane stove. The fine entry makes for a tight V-berth (right). Access (left) to the engine's front and sides is good, but reaching the back requires a contortionist.



PRO: Good front engine access



CON: Tight V-berth

There's been an ongoing debate about the Alberg era versus the Shaw era in the Pearson dynasty, and neither group seems to accept the validity of the others' claims. Alberg's boats had an aesthetic appeal, a lovely shear line, a kind motion off the wind, and their tough hulls were built as thick as a plank. Shaw brought more modern design and construction ideas to Pearson, and his boats definitely sailed faster. They were lighter, the foils added more lift, and if getting from here to there a half-knot faster is important, the Shaw design definitely trumped its predecessor.

ON DECK

The Pearson 32's conventional cabin profile and narrow but adequate side decks lead to an aft cockpit protected by sizable coamings and a deep self-draining cockpit well. The sloop's user-friendly deck layout came standard with an Edson wheel and a mainsheet traveler set at the forward end of the companionway hatch, just aft of a short bridge deck. This arrangement allows the mainsail trimmer to remain separated from the helmsman and jib trimmer when racing, but by the same token, it causes a short-handed crew to have jobs to do at either end of the cockpit. Because it's a relatively small cockpit, this separation of mainsheet and helm isn't as problematic as it would be aboard a larger vessel.

But there is another concern with this mainsheet arrangement that does need to be addressed: the danger of an unintentional jibe. If it occurs just as a groggy crew member makes his or her way up the companionway ladder and onto the deck, it can result in injury or even a crew-overboard incident.

Shaw always sailed and owned the boats he designed, and having been schooled by the dean of deck layout, Rod Stephens, he clearly understood the importance of optimum line leads and the efficient location of winches, tracks, and other deck hardware.

By the time the Pearson 32 was being designed and manufactured, there were enough predecessors afloat for the Pearson team to have worked out a simple and efficient sense of sail handling. Halyards were handled at the mast with the mainsail cleated in traditional fashion to the starboard side, and the jib to port. A deck-mounted winch was provided to tension the luff of the headsail, and when reliable roller furling systems stole the show, the P32 was a natural candidate for the headsail makeover.

The inboard shrouds improve the sheeting angle but cause those moving forward and aft to take an outboard route. The lifelines and the grab point provided by the shrouds themselves make it a safe enough transition for those going forward. There are handholds on the cabin house both forward and aft of the shrouds. The original gelcoat nonskid is good, and when the time comes to renew the nonskid, it can be done easily with epoxy primer and LPU top coat laden with a nonskid additive or through the use of new single-part paint products.

ACCOMMODATIONS

The four-step stainless tube and teak companionway ladder leads below to a cabin with 6 feet of head room, which seems large for a 32-footer. Immediately to port is the nav-station and to starboard is the galley. As an option, Pearson offered a quarter berth on the port side aft of the nav-station, which added a berth but eliminated the spacious port-side cockpit locker. Many of the 113 Pearson 32s built came with a two-burner alcohol

Pearson demonstrated better manufacturing controls than many of its competitors in the late 1970s thanks to Grumman's focus on quality engineering practices.

Hull: Laminate materials for the hand-laminated solid FRP hull were bench cut, pre-marked and carefully overlapped inside the female mold. Crews wetting out the dry fiberglass used serrated rollers to remove air bubbles and better insure interlayer bonding between the units of FRP composite material. The bottom of the sump is thick enough to accept the tensile loads created by the ballast, as well as handle other non-sailing stress and strain associated with unintentional groundings. Extra units of 24-ounce woven roving and chop strand mat were used in the turn of the bilge and along the centerline to add stiffness and improve the load bearing quality of the laminate in high stress areas.

Hull-deck joint: The hull-to-deck joint incorporates an inward turning hull flange, and the outer perimeter of the deck element overlaps this part of the hull. There are several advantages to this form of construction, and they include the extra seam strength derived from the angle-bracket-like stiffening effect of the inward turning flange itself, the potential for a large overlap of the seam, and an adhesive seal as well as mechanically fastened junction. The fact that the seam is not directly exposed to topside impacts makes it superior to outward turning flanges that provide only a small overlap, and are constantly exposed to whatever the topsides rub or bump against.



Fiberglass athwartship floor frames helped reinforce the keel stub and cope with the side force imposed by the lead ballast keel.

Deck: The deck is a balsa core sandwich structure that is stiff enough to have prevented delamination problems, and these boats have a good reputation when it comes to water intrusion and core deterioration.

Rudder and keel: The spade rudder stock is stainless steel, and the fiberglass coated high-density urethane foam core blade was well designed and constructed. The bolt-on lead ballast keel attached to a stub like keel sump that was molded into the hull. Good quality stainless steel keelbolts are placed side by side in the keel stub, and on boats PS has inspected, neither the nuts, bolts nor the keel show signs of deterioration.

Rig: Chainplates are inboard and are mechanically fastened to the main plywood bulkhead. Care needs to be taken to keep the deck penetration point where these chainplates enter the cabin well bedded. Any water penetration will result in wood rot that may significantly diminish the structure supporting the chainplate.

stove, but there's enough room in the in-line galley for a three-burner, gimballed stove with oven, plus a sink on one side and an ice box on the other. Serious cruisers can easily convert the ice box into a refrigerator. This small but utilitarian galley is usable at anchor and underway, another good test of a functional sailboat.

Forward of the partial bulkhead that separates the galley and nav-station from the rest of the main saloon are two settee berths and a table that folds up against the main bulkhead. The two settees are good sea berths and allow for comfortable meal time seating. A small forepeak V-berth and compact but functional head make up the accommodations forward of the mast. The sloop's relatively wide beam (10 feet, 7 inches) contributes to the spacious feel in the main cabin. The bunks are a little short, and those over 6 feet, 3 inches will find themselves resisting the desire stretch out.

Shaw was careful to balance the performance needs with nice accommodations. During this era in the Pearson evolution, there was a feeling that efficiency under sail was a valuable part of cruising and that club racers were really cruising boats with newer sails and an efficient underbody.

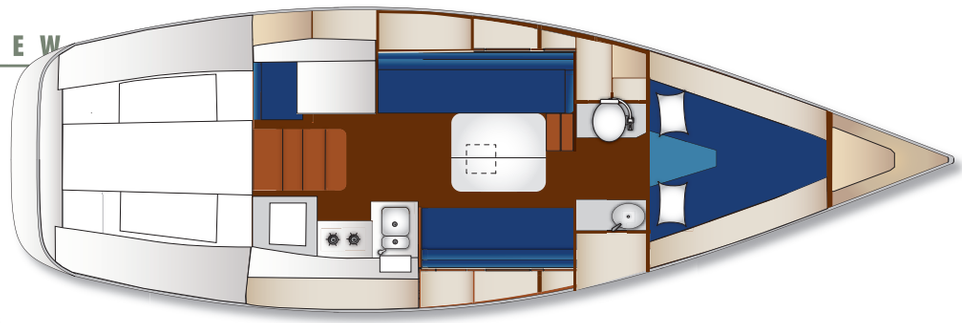
SYSTEMS

Access to the engine is good, thanks to its location immediately under the companionway ladder. Two wooden engine bed stringers provide support for mount brackets and the original Yanmar 18 horsepower (2GM) can be easily replaced with a newer model or several other engine options. There's room for a water heater in the bottom of the cockpit locker to port (non quarter-berth models), and a battery stowage box is located in the starboard locker. Even though the systems aboard this boat were intentionally kept simple, there is pressure water in the head and galley. With the addition of a slightly larger alternator, an owner can easily add a small evaporator-type sealed compressor refrigeration system, rounding out this boat's credentials as a very capable summer cruiser.

PERFORMANCE

The Pearson 32 is absolutely fun to sail. It's small enough to easily singlehand, yet large enough for a couple or young family to summer cruise. With a 208-square-foot





Bill Shaw's fairly high-aspect spade rudder (left), on the P32 diverged from the skeg-mounted rudders typical of many 1970s Pearsons. The saloon table folds up into the bulkhead, opening space in the main saloon (above.) Design ratios for three classic cruisers from the 1970s compare quite evenly (below). Designer Gary Mull's narrower, longer Ranger 33 has a performance edge, though it will have less initial stability than the Pearson. The Pearson's greater beam, draft, and ballast should make it stiffer in a blow than Bill Lapworth's Cal 31. All three deftly straddle the cruiser-racer line, with enough sail area to enjoy Mid-Atlantic summers, yet sufficient ballast and form stability to tuck in a reef and hold their own in windier venues like San Francisco Bay.

mainsail set up with a simple slab-reefing system, and a roller-furling, 120-percent genoa, the 8- to 20-knot wind range is covered. Top this two-sail inventory off with a reaching asymmetrical spinnaker for light-air fun and functional cruising, and a small working jib to replace the furling genoa during breezy spring and fall conditions, and you're set to go sailing rather than motoring from one harbor to the next. The advantage to cruising a boat with light-air efficiency lies in the enjoyment of making good progress, even when 10 to 12 knots and shifty is the status quo.

PEARSON 32 IN CONTEXT

	Pearson 32	Cal 31	Ranger 33
LOA	31′ 8″	31′ 6″	33′ 2″
LWL	25′	25′ 8″	26′ 3″
Beam	10′ 7″	10′	9′ 7″
Draft (shoal)	5′ 6″	5′	5′
Displacement	9,400 lbs.	9,170 lbs.	10,500 lbs.
Ballast	3,800 lbs.	3,600 lbs.	4,500 lbs.
Sail area (100%)	474 sq. ft.	490 sq. ft.	529 sq. ft.
Engine	18 hp.	16 hp.	30 hp.
Water	38 gal.	21 gal.	15 gal.
Fuel	19 gal.	21 gal.	18 gal.
SA/D ratio	17	17.9	17.6
D/L ratio	269	239	259
Used boat price*	$23,500	$25,000	$24,500

* Average price posted on used boat websites; condition may vary greatly.

CONCLUSION

A 5½-foot draft qualifies the P32 as a shoal water-capable cruiser that's just right for coastal cruising and exploring the estuaries along the East Coast. But with this 32-footer, the shoal draft stats also come with an efficient foil shape and external lead ballast, providing enough lift and lateral plane to enhance sailing ability both on and off the wind. Add to the mix a respectable sail area-displacement ratio of 17, and it's clear that this Pearson is more than an oversized pocket cruiser. Envisioned originally as both a club racer and a family cruiser, the boat lives up to both expectations. For those who prefer spending time sailing when they go cruising, it's a boat worth a very close look, especially with current prices ranging from $18,000 to $30,000.

RESOURCES

NATIONAL PEARSON YACHT OWNERS ASSOCIATION
pearsoncurrent.com

PEARSON DISCUSSION FORUM
sailnet.com/Forums/pearson

PEARSON INFORMATION SITE
pearsoninfo.net

CHESAPEAKE BAY PEARSON SAILORS ASSOCIATION
cbpsa.com

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Cost-Efficient Halyard Choices

Ultimately, halyard prices are linked to the size of the hardware that is already on your boat.

Permanently hanked-on sails reshape the way sailors look at high-tech fibers.

While considerable development continues in the realm of high-tech, high-budget halyards, cruising sailors and club racers face a variety of choices but few new products since our last comprehensive halyard comparison ("For All-Rope Halyards, It's Hard to Beat New England Ropes' Sta-Set," December 1997). One recent addition to the range is VPC, from New England Ropes, which brings the low-stretch, low-creep characteristics of Vectran into an affordable upgrade from polyester double braid. Creep is a fiber's taffy-like gradual elongation over time while under a static tensile load, and given how most sailors today are relying on at least one permanently hoisted sail, this factor will likely come into play.

Over the last decade or so, the large production-boat builders have found that more than 80 percent of new-boat buyers are choosing in-mast furling mainsails on boats 30 feet and longer. These boats all have roller-furling headsails, too, so the selection of halyard material is simplified somewhat: The halyards for these sails are rarely handled, so "hand" becomes a less-important quality to consider.

Another attribute, though, becomes more important: durability under load. The working end of the halyard spends its life under tension, bent around a sheave at the masthead. Because the sail remains aloft indefinitely, the halyard is rarely inspected, and must be trusted to perform without supervision throughout a season, or longer, if the boat is sailed year-round. All of these lines, except the Amsteel, have polyester covers, so one can expect similar service lives.

For sailors who have conventional sails and use the halyards on a regular basis, hand remains important. So too does the line's willingness to run free without snagging. And these sailors have plenty of opportunities to inspect the line for wear at its critical points.

Clutch slippage is also a factor. In last year's rope clutch test ("Clutch Play," April 2006), we used three of the halyards featured in this comparison. Subjected to 400-pound loads in two of our preferred clutches, the Lewmar D2 (the easiest to bleed) and the Spinlock XAS (the best gripping), Yale's Vizzion proved to hold the best (average slippage 3/8-inch), followed by Samson Warpspeed (13/32-inch) and New England Ropes Sta-Set (7/16-inch). We will be looking at all these halyards' clutch performance in a future test.

Regardless of sail type or deck gear, one factor always affects the choice of line for any halyard, and that is stretch. When the goal is to get the best performance out of a sail, its halyard should stretch as little as possible when it comes under additional load from a freshening breeze or sailing closer to the wind. When a halyard stretches, it allows the sail fabric to move aft. The draft of the sail moves with it. This results in the driving force rotating aft, creating more heeling moment and more weather helm. The boat is sailing less efficiently than it could, and you may be forced to reef earlier than you otherwise would.

As its fabric pulls aft, a sail on a mast track will scallop between the slides, and horizontal wrinkles will form at the slides. Apart from looking unseamanlike and making life less pleasant aboard, this also puts uneven stress on the sail fabric, which could—depending on how much sailing you do under these conditions—shorten its useful life.

PS VALUE GUIDE — HALYARD LINES

MAKER	PRODUCT	CORE MATERIAL	DIAMETER	WEIGHT (100 FEET)	SPLICE REQUIRED	BREAK STRENGTH	1,000-POUND LOAD/ BREAKING STRENGTH
NEW ENGLAND ROPES	Sta-Set	Polyester	7/16 (11 mm)	6.1 lbs.	double braid	6,600 lbs.	15.15%
	Sta-Set-X	Polyester (parallel fiber)	7/16 (11 mm)	5.9 lbs.	parallel core	7,400 lbs.	13.51%
	VPC	Vectran/polyolefin	10 mm	5.3 lbs.	double braid	6,500 lbs.	15.38%
	T-900	Dyneema/Technora	5/16″	3.4 lbs.	core-to-core	7,300 lbs.	13.70%
	Endura Braid	Dyneema	5/16″	2.7 lbs.	core-to-core	7,000 lbs.	14.29%
	V-100	Vectran	5/16″	3.6 lbs.	core-to-core	8,000 lbs.	12.50%
	T-900	Dynema/Technora	3/8″	5.8 lbs.	core-to-core	11,800 lbs.	8.47%
	Endura Braid	Dyneema	3/8″	5.5 lbs.	core-to-core	10,000 lbs.	10%
	V-100	Vectran	3/8″	6.6 lbs.	core-to-core	12,500 lbs.	8%
NOVABRAID	XLE	Polyester	7/16″	6 lbs.	double braid	6,200 lbs.	16.13%
	Polyspec	Spectra	5/16″	3.5 lbs.	core-to-core	7,500 lbs.	13.33%
	Polyspec	Spectra	3/8″	4 lbs.	core-to-core	9,800 lbs.	10.20%
SAMSON	XLS	Polyester	7/16″	6.4 lbs.	double braid	5,800 lbs.	17.24%
	XLS Extra	Dyneema/polyolefin core	7/16″	5.7 lbs.	core-to-core	6,100 lbs.	16.39%
	Validator II	Vectran	3/8″	5 lbs.	core-to-core	11,000 lbs.	9%
	Warpspeed	Dyneema	5/16″	3.0 lbs.	core-to-core	6,200 lbs.	16.13%
	Amsteel**	UHMWPE*	5/16″	3.6 lbs.	12-strand	10,500 lbs.	9.52%
	Warpspeed	Dyneema	3/8″	3.8 lbs.	core-to-core	9,800 lbs.	10.02%
	Amsteel**	UHMWPE*	3/8″	3.6 lbs.	12-strand	15,500 lbs.	6.45%
YALE	Portland Braid	double-braid polyester	7/16″	6.3 lbs.	double braid	6,840 lbs.	14.6%
	Vizzion	Vectran	7/16″	6.6 lbs.	double braid	6,500 lbs.	15.38%
	Maxibraid Plus	UHMWPE*	5/16″	3 lbs.	core-to-core	7,500 lbs.	13.33%
	Maxibraid Plus	UHMWPE*	3/8″	3.7 lbs.	core-to-core	8,600 lbs.	11.63%
	Crystalyne	Vectran	5/16″	2.6 lbs.	core-to-core	7,200 lbs.	13.89%
	Crystalyne	Vectran	3/8″	4.8 lbs.	core-to-core	11,500 lbs.	8.70%

So, here's another reason to renew your halyards, and perhaps even upgrade them: to save wear and tear on your sails.

Ironically, a cruising-boat owner's budget is often expended on comforts and electronics, while the sails, which one would suppose are the boat's reason for existing in the first place, get short shrift. When it finally comes time to specify the halyards and running rigging, the pot is empty. Ultimately, for the sake of a hundred dollars saved on a halyard, the owner never sees the full performance he paid for in his new sail.

For an average boat in the mid-30-foot range, a new mainsail can cost from $2,000 upward, and the premium for a "performance" mainsail over a basic Dacron model starts at about $500. Anyone investing that much would be well advised to hoist it on a halyard that does it justice. For about $100 over the cost of a basic polyester double braid, halyard stretch can be reduced by 75 percent, and the sail will be better able to deliver its promised performance.

By the same token, if you have an aging sail that's rather stretchy along the luff, you could eke another season or two out of it while you save up for a new one by spending a couple of hundred dollars on a less stretchy halyard. The halyard you bought will still be good for the new sail a few years down the road.

Another benefit of a low-stretch halyard is that it reduces effort in the cockpit. Trim-conscious sailors will find they have to make fewer adjustments to the halyard to keep the draft where they want it.

HOW WE TESTED

For this article, we looked exclusively at the cost/stretch aspect of new halyards. The Stretch to Cost Table on page 14 shows quite dramatically how great the benefit is for an additional investment that is really quite small, relative to the

	PERCENT STRETCH	STRETCH/ 50 FEET	PRICE/ 100 FEET	PRICE SOURCE
	4%	24 in.	$96	hamiltonmarine.com
	2.4%	14.4 in.	$101	hamiltonmarine.com
	1.65%	9.9 in.	$127	hallspars.com
	1.1%	6.6 in.	$167	hallspars.com
	0.8%	4.8 in.	$183	hallspars.com
	0.7%	4.2 in.	$193	apsltd.com
	0.6%	3.6 in.	$239	hallspars.com
	0.6%	3.6 in.	$257	hallspars.com
	0.35%	2.1 in.	$238	apsltd.com
	2.25%	13.5 in.	$80	rwrope.com
	0.12%	7.2 in.	$182	rwrope.com
	0.10%	6 in.	$218	rwrope.com
	2%	12 in.	$91	defender.com
	0.7%	4.2 in.	$150	defender.com
	.54%	3.2 in.	$277	mauriprosailing.com
	0.55%	3.3 in.	$156	defender.com
	0.49%	2.9 in.	$150	defender.com
	0.45%	2.7 in.	$233	defender.com
	0.37%	2.2 in.	$213	defender.com
	3.2%	19.2 in.	$63	drmarine.com
	0.8%	4.8 in.	$157	hallspars.com
	0.7%	4.2 in.	$177	hallspars.com
	0.55%	3.3 in.	$228	hallspars.com
	0.35%	2.1 in.	$151	hallspars.com
	0.25%	1.5 in.	$196	hallspars.com

cost of a new sail. While we specifically looked at a main halyard, the results apply equally to a jib halyard for the same reasons.

For our comparison, to keep the math simple, our hypothetical test boat was somewhere around 35 feet, with a mainsail luff length of 40 feet. Running the halyard back to the cockpit, we assumed 50 feet of line between the winch and the head of the fully hoisted sail. Again for simplicity, we assumed a halyard load of 1,000 pounds, which is a reasonable maximum to expect the mainsail to exert on it—after that, it's time to reef. (Once reefed, stretch resistance becomes even more important on a conventional sail, because the exposed halyard is now longer by the depth of the reef. When a luff-furling sail is reefed, adjusting halyard tension is pointless.)

For each sample of cordage we examined, we took the manufacturer-supplied stretch characteristics and calculated the stretch in inches that would result from our 1,000-pound load acting on the 50-foot standing part of the halyard. To simplify the pricing, we assumed buying 100 feet of line to provide an ample tail in the cockpit and enough extra length to allow "freshening the nip" a few times over the halyard's life.

Our baseline rope was double-braid polyester, 7/16-inch in diameter. This kept our assumed 1,000-pound load at no more than 15 percent of the line's average breaking strength. A smaller diameter would probably suffice in the real world, but it would stretch more, precisely the opposite of what we're trying to achieve.

The resulting graph of inches of stretch plotted against cost produced a dramatic curve, from which it's quite obvious that the first $100 you spend over the basic polyester double-braid halyard buys a significant reduction in stretch. We should note that the values used for stretch are interpolated from data provided by the manufacturers in their literature or on their websites. While they may not be precise, we are confident that they reliably illustrate the argument. We intend to do our own testing on all of these lines, including stretch, to be reported on in a future issue.

The prices used in the graph are the lowest prices we found for each product. While researching these, we were reminded of how important it is to shop around. The price sources we used, and they are by no means exhaustive, appear in the "PS Value Guide Halyards" at left.

LEARNING THE ROPES

The fibers commonly used in the products we studied are polyester, ultra-high-molecular weight polyethyline (UHMPE, sometimes written UHMWPE), para-aramids, and liquid-crystal polyester polyarylate (LCP). Polyolefin (polypropylene) is also used to add bulk to some fiber combinations.

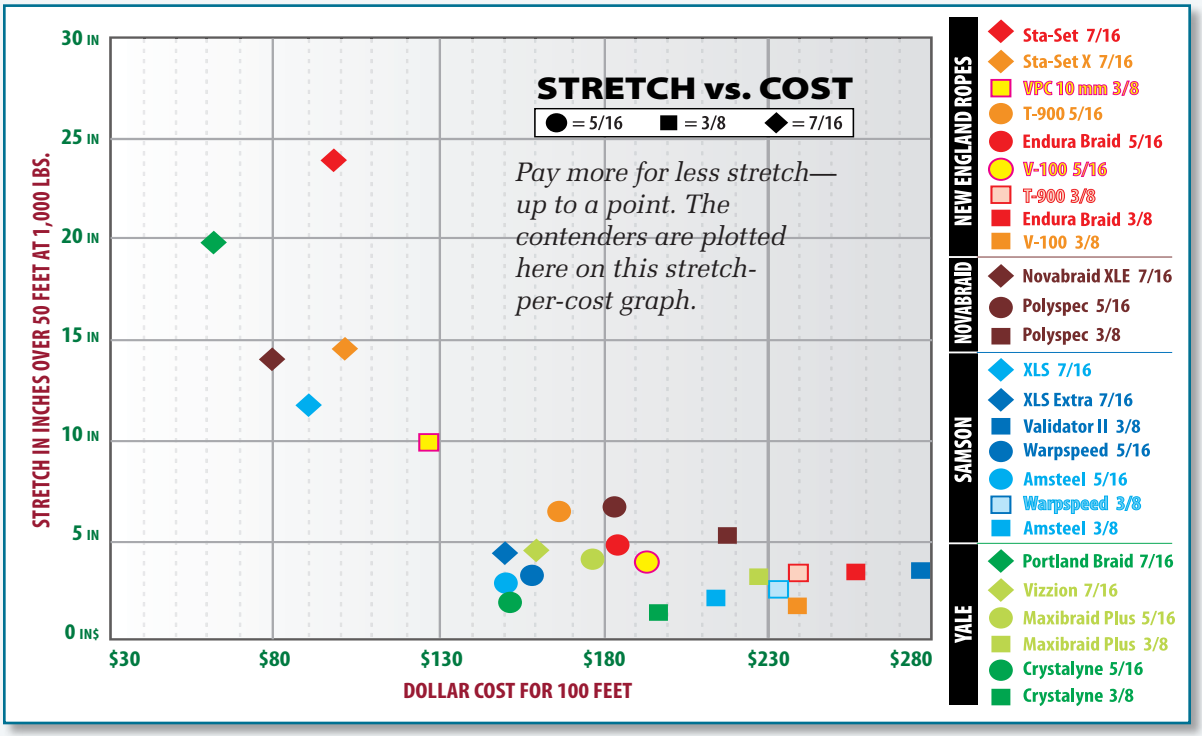
This side of the Atlantic, polyester is usually known by its Dupont trade name, Dacron. It is inexpensive (relatively), has good tensile strength, and resists degradation by UV light, but it has a low Young's Modulus (meaning, it's stretchy). Compared to 7x19 stainless-steel wire, which was commonly used in the past for halyards, it's very stretchy.

UHMPE comes under two common brand names, Spectra and Dyneema. Each of these has variants, but that's beyond the scope of this article. UHMPE has high strength and low stretch, which in combination with its generally good resistance to UV makes it well suited to halyards.

Para-aramids include Kevlar, Technora, and Twaron, variations on a molecular theme from different manufacturers. They exhibit similar strength to UHMPE at a lower price, but the trade-off is they're not totally happy bending, they don't perform well under abrasion, and they don't stand up to sunlight as well. In sailing applications, they are usually found protected by a covering of some sort, except when they are the protection—against the heat generated when highly loaded lines are blown off a winch.

Vectran is the only LCP found in marine rope. It has high strength, low stretch, and better abrasion

Stretching Dollars



While less stretch is desirable, "stretchy" double-braid nylon remains an affordable halyard choice. Prices in this graph are based on PS research prior to publication. Sources are listed on the table on pages 12 and 13. Better prices may be available.

THE ROPES. The ropes can be divided into four different classes, based on their construction.

LEVEL 1: Double-braid polyester, relatively stretchy intro-level ropes with a long track record.

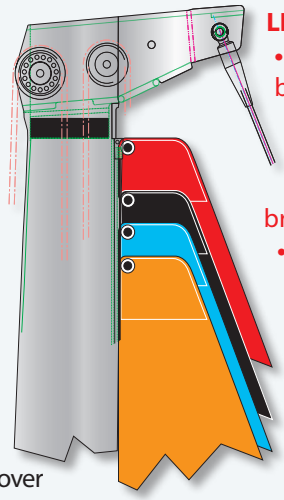
- **New England Ropes (NER): Sta-Set**
- **Samson: XLS**
- **Novabraid: Novabraid XLE**
- **Yale: Portland Braid**

LEVEL 2: Parallel-fiber polyester core, with a braided polyester cover.

- **NER: Sta-Set X**

LEVEL 3: Economical, bulked high-tech core with polyester cover

- **NER: VPC**—Vectran/polyolefin core, braided polyester cover
- **Samson: XLS Extra**—Dyneema/polyolefin core, braided polyester cover
- **Yale: Vizzion**—Vectran/polyolefin braided core, braided polyester cover



LEVEL 4: Specialty high-performance line

- **Novabraid: Polyspec**—Spectra core, braided Polyester cover
- **NER: T-900**— Blended Dyneema/Technora core, braided polyester cover
- **NER: V-100**—12-strand Vectran core, braided polyester cover
- **NER: Endurabraid**—12-strand Dyneema core, braided polyester cover
- **Samson: Amsteel**—12-strand single-braid UHMPE
- **Samson: Warpspeed**—12-strand Dyneema core, braided polyester cover
- **Samson: Validator II—**Vectran core, braided polyester cover
- **Yale: Maxibraid Plus**—12-strand UHMPE core, braided polyester cover
- **Yale: Crystalyne**—12-strand Vectran core, braided polyester cover

resistance than the para-aramids. It is far less susceptible to creep that UHMPE, and for that reason, it is useful when under standing loads. It, too, needs protection from UV.

Polyolefin, sometimes listed as MFP, is an inexpensive fiber used to bulk up small volumes of high-tech fibers to increase diameter and improve "hand." It is basically polypropylene, and used by itself, appears in ski-tow ropes and on life-saving equipment. It's light, and it floats, but it doesn't stand up to UV light.

PLOTTING PRICE VS. STRETCH

Plotting cost against stretch using the same 1,000-pound load on a range of ropes produces a very clear picture of what you're buying. (For loads other than our 1,000 pounds, scaling up or down should produce the same relationship between stretch and cost.) You can almost halve the stretch by simply upgrading from 7/16-inch Sta-Set to the same size in Sta-Set X. Going up another level (see rope list) halves the stretch again, even with a reduction to 3/8-inch diameter to reduce cost. As stretch approaches zero, cost goes through the roof, but that's of little consequence even to the serious club racer, because several choices lie within a reasonable price point.

One way to use the graph would be to pick a maximum cost you'd be comfortable with and look at the individual plots to the left of that number. You'll find that some of them are higher-tenacity material at smaller diameters. We figured 5/16-inch (8 millimeters) is as small as is comfortable to handle. Depending on your boat's current winches, rope clutches, and sheaves, these may not work for you.

We included one single-braid line, Amsteel, simply for comparison. If you're tempted to go that route, you should consult a rigger about covering it so that it can lock properly in stoppers.

UV resistance and other factors like abrasion resistance and ease of splicing will be the subject of future tests on these halyard materials.

CONCLUSIONS

When it comes to making your decision, you will have to take into account factors beyond dollars and stretch—nothing's simple. And until we do further testing, any definitive recommendations would be premature. Nonetheless, using the accompanying tables you should be able to find a good halyard that best meets your requirements and budget.

First: What size and type of line do you currently have? If this is original equipment, the entire halyard system may have been designed around it, from the masthead sheaves to the turning blocks at the base of the mast, to the clutch on the cabin top. Before electing to go down a size, or even two, in line diameter, you need to be sure this won't trigger a cascade of modifications necessary to accommodate it.

If you had wire, you will have to change the masthead sheaves to suit any synthetic line (and those sheaves are probably due for replacement anyway). Sheaves grooved for wire will make short work of a synthetic replacement. The higher high-tech lines, such as the 12-strand, single-braid Dyneema or Spectra (Amsteel, for example), work best under high loads in a sheave with a flatter-profile groove. The line flattens, reducing the difference in tension between the inner and outer fibers. Double-braid lines, which are the most suited to cruisers and casual racers anyway, are less fussy.

Going down a size in diameter will help your halyard system's efficiency by reducing internal friction as it turns around the now relatively larger sheaves. Most rope manufacturers specify a sheave-to-line-diameter ratio of 8:1 for optimal performance, but you rarely see this in many production-boat setups.

Going down two sizes, from 7/16-inch to 5/16-inch, will certainly get you into the high-tech material within your budget, but you may not get the stretch savings you hoped for. Also, you may find your stoppers won't accommodate the line.

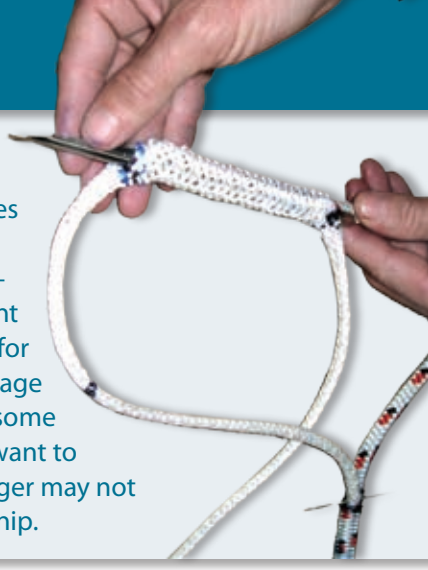
Check the range of sizes your clutch or stopper will handle. If it will accommodate a size smaller than your present halyard, you can move up to a higher tenacity fiber core for better performance and down in diameter, and still gain the low-stretch advantage.

If you have permanently hoisted sails, you might want to look at a low-creep fiber for the halyards. This usually means a Vectran blend, and therefore more expense, but you won't suffer from gradual loss in luff tension as the season goes by. Because your sail is either all the way up or off the boat, the fall of the halyard, the part that would be hung on the mast or wherever when the sail is up, doesn't have to be high-tech. A good rigger will be able to combine a single-braid standing part with a cover-only tail, saving both weight aloft and money.

Make sure you make both the tail and standing part long enough to permit freshening the nip a few times. Where the halyard sits on the masthead sheave, it will wear, and it will be exposed to ultraviolet (UV) light. Regular inspection, and cutting off and replacing the splice once in a while should prevent an untimely failure.

All of the lines discussed here can be spliced, but their differing constructions will dictate just what type of splice to use. Splice required is listed in the Value Guide, with additional information available on the manufacturers' websites. Most of the suppliers also offer splicing services, and depending on line size and splice complexity, $15 to $30 seems like a bargain when measured against frustration most of us part-time riggers will suffer should we attempt the job ourselves.

Splice-ability



Once you get into high-tech ropes with cores of Vectran, Dyneema, Spectra, or other high-tech materials, a conventional double-braid splice (at right) will not provide sufficient holding power. Most of the high-tech ropes call for a more difficult, core-to-core splice. Most cordage suppliers can do the splice for about $15-$30; some riggers may charge more. Cruising sailors will want to be able to splice their own halyards, since a rigger may not be at hand when it comes time to change the nip.

CONTACTS

NEW ENGLAND ROPES
508/678-8200, neropes.com

NOVATECH BRAIDS
902/742-4212, novabraid.com

SAMSON ROPE
360/384-4669, samsonrope.com

YALE CORDAGE
207/282-3396, yalecordage.com



To capture a line under load in the Garhauer 60SN snatch block (shown here), users must bend the line.

Snatch Blocks

Harken wins as Garhauer and Lewmar also have strong showings.

The snatch block was developed to be installed and removed from the mid-region of a working line, and it has been loved and cursed by racers and cruisers alike. Most sailors use the hardware to lead spinnaker sheets and guys, function as a temporary turning block for a preventer, or to provide the right angle for an outboard genoa sheet lead. Many cruisers have found that a snatch block can be used as a friction-free fair lead when kedging off an unseen sandbar. Snatch blocks can also be used in sea anchoring: Cruising icons and well-known authors Lin and Larry Pardey (*www.landlpardey.com*) describe in their "Storm Tactics Handbook" how they use rugged snatch blocks and a guy to maintain the boat's attitude to the wind and waves during nasty weather.

In short, this versatile piece of hardware is a welcome addition to any gear locker, and today, there are more interesting variations of the technology than ever before.

Snatch block preferences can vary greatly according to particular needs. Race-oriented sailors will want something strong, light, and efficient, while robust construction and reliability rank high for cruisers.

Practical Sailor's ideal snatch block will be rugged, serviceable, and made of high-grade materials that won't fail in demanding saltwater-sailing conditions. The snap shackle and opening mechanism should remain fast under extreme flogging, yet be easy and quick to open by hand. The ideal block will rotate and pivot freely so that it provides a fair lead at a wide range of angles. A becket is a nice feature, particularly on a block meant for light-air sails, since a collapsing sail will likely let the block fall noisily to the deck if it is not supported from a lifeline by a light line or shock cord. Every element, bearings included, should be as maintenance-free as possible, and highly resistant to the sun and seawater.

WHAT WE TESTED

We asked manufacturers to send us a pair of snatch blocks appropriate for the genoa sheets on a cruising boat in the 35- to 40-foot range. We did not specify line diameter or working load—or even the use for which the block was intended, something that an ordinary consumer should do.

Ultimately, we were sent blocks from six manufacturers—Antal, Garhauer, Harken, Lewmar, Schaefer, and Wichard. The blocks' working loads ranged from 1,980 pounds (Wichard) to 5,000 pounds (Schaefer). Sheave diameter ranged from 2¼ inches (Antal and Wichard) to slightly over 3¼ inches (Garhauer). For historical perspective, we included a collection of similarly sized blocks dating back more than two decades. Not every snatch block manufacturer was represented in this test, but the selection offers a good cross-section of the blocks available today.

All but two of the blocks we tested had hinged cheeks that opened outward. The Antal and Garhauer cheeks rotated on swivel pins, so that they always remained parallel to the sheave. Testers found both types worked well, and their final ratings were based

Friction, Function, and a Saltwater Dip



In our testing of six new, top-quality snatch blocks, we looked at real-world hardware ergonomics, and we measured, tugged on, and took apart each piece of gear. We rated each block on line loading ease, both with a slack sheet and with one that was already under tension.

Low friction was deemed a desirable trait, so we built a jig that used hydraulic pressure to induce line load. This allowed us to put each set of blocks under identical load and measure how easily their sheaves turned. We monitored the load in the closed loop with a strain gauge and used a spring scale to measure how much force it took to move the tensioned line.

Our definition of efficiency was defined by how easily the line loop moved under fixed loads of 100 and 200 pounds.

We compared several older weathered and worn snatch blocks with the new being evaluated, and we also tested a set of Harken fixed Black Magic blocks as a benchmark for low-friction operation.

Using a magnet, magnifying glass, and manufacturer specifications, testers rated the quality of each block's metal components. To test corrosion resistance, we soaked each block for three days in a saltwater bath and noted any visible oxidation.



Blocks are suspended in a saltwater bath (above) to check corrosion resistance. A test jig (right) is used to evaluate block friction.

more on performance (See "How We Tested," above), ease of use, and construction quality, than on their opening mechanism.

ANTAL

Antal's aluminum snatch block got high marks as a functional design. Its rotating cheek plate offered side loading, and the latch mechanism was simple and straightforward. The block is actually a synthetic rubber-coated aluminum cage block with a composite resin-and-fiber main bushing. Small ball bearings lie between the sheave sides and the cheekplates, but despite innovative design, the block was anything but friction free.

Antal had submitted two different sized blocks for testing, so we initially assumed that the "stickiness" problem might be due to the small diameter (1½ inches) of the 9040/SN sheave. Our solution was to retest with the 9060/SN and substitute the Black Magic bullet block we used as a control. Even with this switch to the most friction-free block as a partner for the larger Antal, the Antal 9060/SN scored the poorest in our friction test. These results clearly indicated that the bearing system of the Antal snatch block is nowhere near as efficient as the free-spinning Harken and Garhauer products. Several of the simple axle and bushing blocks also out-performed the product in the friction test.

Bottom Line: The Antal side-rotating snatch block gets good marks for design execution and operation, but it demonstrated poor performance in friction abatement and has a limited range of movement.

GARHAUER

The 60/SN features a cheek plate rotating opening with a pin stop that makes the latching process a simple, two-handed operation. The friction-free spin of the Torlon ball bearing race enables these blocks to score as well in the tension test as the Harken blocks. Garhauer's Ronstan trunnion-type snap shackle allowed for a wide universal pivot action. The ball bearing race is slightly exposed to sunlight, and it would make sense to stow these blocks below when they're not in use. The anodized alloy cheek plates and innovative, pressed-ring sleeve keep the bearings permanently captured, but in dusty, salty areas, a regular routine of fresh water washing will extend the life of the non-replaceable bearings.

When attempting to insert a sheet under load into the open side of the Garhauer block, the configuration of the opening would not allow the line to feed straight into the block. The sheet had to be bent slightly to conform to the block's architecture.

The Garhauer was the block most affected by the corrosion bath test, actually losing a small amount of aluminum at one of its pointed ends.

Bottom Line: Although it's not as easy to load as others in the test, the Garhauer was exceptionally friction-free, light, and priced right. It's our Budget Buy.

HARKEN

This one-hand operated, bottom-opening snatch block, was one of the testers' favorites. Not only is

PS VALUE GUIDE

SNATCH BLOCKS



BRAND/ MODEL	ANTAL 9060	GARHAUER $ 60SN	HARKEN ★ 1609	LEWMAR ✓ SZ2	SCHAEFER 11-99	WICHARD 34500
PRICE	$209	$125	$299	$152	$281	$130
PRICE SOURCE	apsltd.com	garhauermarine.com	defender.com	mauriprosailing.com	mauriprosailing.com	defender.com
SAFE WORKING LOAD	2,860 lbs.	3,500 lbs.	3,500 lbs.	3,500 lbs.	5,000 lbs.	1,980 lbs.
SHEAVE DIAMETER	2.36 in. (60 mm)	3.5 in. (89 mm)	2.5 in. (63 mm)	2.83 in. (72 mm)	3 in. (76 mm)	2.19 in. (56 mm)
WEIGHT	9.4 oz. (w/o snap shackle)	21.4 oz.	19.8 oz.	33.7 oz.	36.9 oz.	8.6 oz.
FRICTION	22/38 lbs. *	8/12 lbs.	8/12 lbs.	13/22 lbs.	11/20 lbs. *	20/37 lbs.
LATCH TYPE	Rotating cheek	Rotating cheek	Opening cheek	Latch	Latch	Latch
BEARING	Bush/ball	Ball	Ball/roller	Bush	Bush	Bush
SNAP SHACKLE	Lashing	Trunnion (Ronstan)	Trunnion	Universal	15-degree pivot	Universal
SHEAVE	Plastic	Aluminum	Glass/Delrin	Delrin	Aluminum	Plastic
CHEEK FENDERS	Rubber	None	Urethane	Polycarbonate	Urethane	Rubber

✓ Recommended ★ Best Choice $ Budget Buy

* Block not tested with identical mate.

it user-friendly, and the most efficient in our friction testing, but its rugged construction promises years of heavy-duty use. The investment-cast stainless steel body is a chunky piece of metal that adds some extra weight, but it also stabilizes the load handling and provides a secure point to attach the rugged trunnion-action snap shackle.

Harken's snatch block design is fast and easy to latch as well as release. It provided the most convenient means of capturing or releasing a sheet under load. The geometry of its snap shackle is such that when working with a loaded line, the snap shackle can be easily locked onto a padeye.

The thick rubber padding on the cheeks minimizes gelcoat chipping caused by light-air sheet slackening, and the roller bearing-supported sheave rotates on a central axle that smoothly latches to the articulating side cheek. Our only concern was the magnetic permeability of its sheave pin. All other blocks had completely non-magnetic sheave axles.

Bottom Line: The Harken block was a top performer in testing, is quality constructed, and easy to use and maintain. It gets the nod for *PS* Best Choice.

LEWMAR

Elegantly simple, this hefty traditional snatch block would be a wise choice for those looking for ultimate reliability and do-it-yourself repairability. All it takes are two 9/16-inch wrenches or sockets to loosen the sheave axle pin and pull apart the easy-to-assemble block. When the latching operation starts to get sloppy, a new set of dowel-like rubber grommets can be installed to return it to just-like-new status. Those cruising far afield and those who leave their snatch blocks rigged and exposed to the elements won't go wrong with Lewmar's rugged design. The bearing system in these blocks is a simple Delrin sheave running on a metal bushing, and the frame, latch, and universal pivoting snap shackle are all stainless steel.

The Lewmar survived the corrosion test fairly well, but showed some oxidation around its latch. It was also only one of two test blocks that is easily disassembled.

Bottom Line: Well-designed, rugged, and easy to use, the Lewmar block is *PS*'s Recommended block for off-the-beaten-path cruisers.

SCHAEFER

Another tried and proven product is Schaefer's traditional snatch block design, and we looked at its range of three differently size blocks. Our test pair were the large 11-99 and medium 07-99 models. They are identical in all aspects, except size and safe working load, which were 5,000 pounds for the large and 3,750 pounds for the medium.

These blocks cannot be disassembled, but their simple, rugged design promises years of reliability. The large sheaves and rugged cage structure operated smoothly, with fairly low-friction operation, and potential cosmetic deck damage caused by the block's heft was prevented by the addition of shock absorbing urethane side plates.

Schaefer's snap shackle was not the trunnion type, limiting articulation to about 15 degrees off the vertical. In certain conditions—snapping the block to an open toe rail, for example—this limited range of movement could cause the snatch block snap shackle to hang up, and possibly cause some damage to the block. Such problems are less likely to occur if the block is supported with a shock cord.

Schaefer's peened over, cold formed, stainless steel main axle pin showed some signs of oxidation after the corrosion test.

Bottom Line: The Schaefer block is held back by a limited range of movement and high friction readings.

WICHARD

The Wichard block's latch mechanism opens the entire top portion of the block and is pinned closed by a piston-like extension of the main axle. The block handled efficiently during testing, but it was on the small side in comparison to other competitors. When it came to friction testing, it was clear that sheave size, or roller/ball bearings make a difference. The block's small size and bushing-

SNATCH BLOCK DETAILS

Snatch block makers use various design elements to achieve the same goal: a movable block that can be used in a pinch where a fixed block is not in place.

1. The Wichard block uses a side-pull pin to secure its bottom latch.

2. The Lewmar block's bottom latch is secured with a hook. The snap shackle's universal joint allows a full range of motion. The safe working load is clearly stamped on the snap shackle.

3. Testers liked the design execution of the Antal 9060's side-opening block.

4. The Schaefer snatch block had a limited range of motion at the snap shackle.

5. The trunnion-type snap shackle on the Harken block uses the locking pin as a pivot point, allowing a full range of motion.

6. The line must be bent slightly to fit into the side-opening Garhauer.

7. The Garhauer's Torlon bearings will see some ultra-violet exposure.

8. An eye on the top of the Schaefer block accommodates a line or bungee cord for supporting the block from above.

9. The one-handed, push-button Harken was testers' favorite.



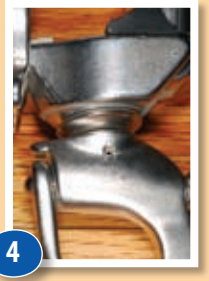
Wichard 34500



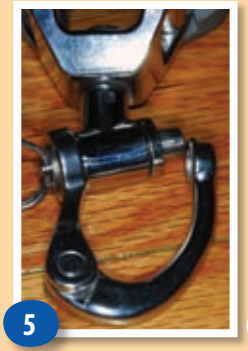
Lewmar SZ2



Antal 9060



Schaefer 11-99



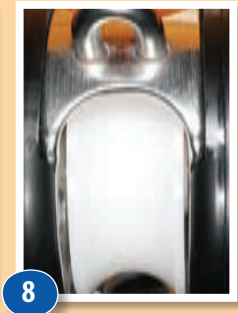
Harken 1609



Garhauer 60SN



Garhauer 60SN



Schaefer 11-99



Harken 1609

Snatch Block Metallurgy Holds Clues to Longevity



Although less resistant to corrosion than 316 stainless, the hardened magnetic, martensitic stainless steel in the snap shackles is stronger.

Structural quality has a lot to do with both how a block functions and how long it will last. We rated each snatch block tested based upon the materials it was made from and the attention to detail seen in the construction. The observed deterioration and under-load failure seen in the older products we inspected provided insight into potential failure modes.

Among the older gear, signs of physical deterioration (rust and crevice corrosion) directly correlated with an increased tendency to fail under conditions that were a small percentage of the block's original safe working load. Magnetic permeability, or the habit of some lower grades of stainless steel to be attracted by a magnet, also directly correlated with metals prone to chemical corrosion. Broken parts from older snatch blocks had an 85 percent correlation with magnetic permeability. From that evidence, we determined that the less magnetic stainless steel components (316 alloy) are better suited to the marine environment.

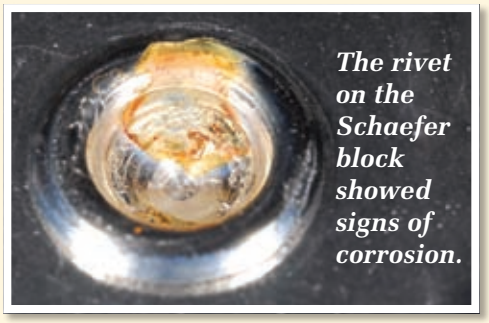
Of the new products, snap shackles across the board were magnetic, and were made from either 17-4 PH, 15-5 PH high-strength stainless steel, or other, similar precipitation-hardened martensitic stainless steel, rather than weaker, but less corrosion prone, 316 stainless steel. All of the high-strength alloys have the anti-corrosion quality of 304 grade stainless steel, while the 316 alloy contains a chromium-to-nickel ratio that all but eliminates magnetic tendencies, and is more noble on the galvanic scale.

It was not surprising to see that older blocks showed considerable corrosion and cracking around snap shackle bodies and pivot pins, but less around higher grade, 316 stainless steel snatch block cheek plates, and other parts. In an annealed state, even low-grade stainless (304) is non-magnetic, but cold working and polishing can induce magnetic traits in such lower grades of stainless steel. Thus, when a poorer quality metal is pressed into a complex shape and highly polished to create an initially shiny surface, it actually becomes more prone to failure.



Magnetic components on older blocks, like this sheave axle bolt, were more prone to failure.

As noted, many different grades of stainless were used in the blocks we tested, and all were mechanically abraded and electro-polished (an electro-chemical process that causes ferrous metal contaminants to be removed from the surface.) The result was a gleaming array of shiny stainless steel that ranged from absolutely non-magnetic, to metal that was as vigorously attracted to a magnet as high-ferrous content mild steel. Experts consider magnetic permeability of a stainless steel alloy to be a pretty fair indicator of material grade in 300 series alloys. However, magnetic quality is a symptom rather than the cause of a problem in marine hardware. It is indicative of high-strength alloys and lower grades of austinitic 300 series stainless steel. All are more corrosion prone, and this characteristic, rather than the magnetism itself, is the real issue when it comes to the durability and longevity of marine hardware.



The rivet on the Schaefer block showed signs of corrosion.

The axle bolts on all of the blocks tested, except for the Harken snatch block, showed no magnetic permeability. Older snatch block axles that failed under load were seriously corroded and displayed significant magnetic permeability. Some investment-cast stainless steel block parts were attracted to a magnet (Lewmar and Wichard). Others were not (Harken and Schaefer), and only Antal's web- or line-lashed snatch block showed no magnetic properties at all.

The long story short, is that 316 stainless, even cold formed and highly polished, shows little if any magnetic permeability. However, it is seen less and less in modern hardware—especially when a strong metal is required to get the job done.

type bearings, not surprisingly, yielded higher friction readings in our test.

Bottom Line: Like most Wichard hardware, this snatch block is well-engineered and nicely finished. Poor performance in the friction test put this one behind the leaders in our test.

OLD TIMERS

Along with obvious signs of corrosion and physical deterioration, the working antiques we tested scored poorly on friction tests, and the worst examples of corrosion were directly linked to broken axle shafts and cracked snap-shackle pivots. The oldest Gibb tufnol blocks and a silicon-bronze roller-bearing Nicro/Fico product looked pretty bad, but still worked reasonably well. The silicon-bronze chrome plating was all but gone, and a green patina covered the metal, acting as a natural protective coating to hold any further corrosion at bay. In a pinch, disassembling these blocks, cleaning, and lubricating them with a simple lithium grease or higher-tech product can return them to satisfactory usability—a trait that holds value to long-distance voyagers.

CONCLUSIONS

If you're a performance-oriented sailor, ball- or roller-bearing supported sheaves really count. Harken and Garhauer blocks stole the show when it came to friction-free operation, which will make light-air spinnaker trimmers smile. Cruisers with smaller winches should also check these out.

A trunnion-type snap shackle or universal joint improves attachment—insuring universal movement. This wider range of bending prevents a snap shackle from being damaged due to variations in sheet lead angles or padeye design. The improved articulation makes odd lead angles tolerable, and allows the snatch block to self align with the loads imposed.





Stainless steel roller bearings reduced friction on the classic Nicro-Fico snatch block (above right). The Antal C. Fibre snatch block (above left) uses lower-friction Delrin ball bearings, but the sheaves' small diameter put it at a disadvantage compared to the modern snatch blocks PS *tested.*

Harken and Garhauer provided trunnion-type snap shackles, while Lewmar and Wichard used a universal toggle-type attachment to achieve a similar range of movement.

Antal's snap shackle and Schaefer's modest 15-degree range of movement were less versatile. Antal does offer a lashing option that may appeal to some racers, but one of the advantages of a snatch block is its ability to be moved from one attachment point to another as quickly as possible, and a snap shackle is better suited for this.

Bigger blocks mean larger diameter sheaves, and the benefits include better load distribution on the bearing surface and less point load on the line itself. Our friction test showed a clear trend, revealing that once ball and roller bearings were removed from the equation, bigger blocks run smoother than smaller blocks.

The two-step attachment process to setting up a snatch block ranged from butter-smooth to downright difficult. Once again, Harken topped the charts with its unique clam shell-like, push-button opening process. Of the side-opening types, testers preferred Antal's approach. However, Garhauer's use of a Ronstan trunnion-type snap shackle was a big hit, and its large-diameter sheave and roller bearings helped yield excellent friction ratings.

Only the Antal and Lewmar blocks were easily DIY disassemblable, as compared to nearly all of those made a few decades ago. This is likely a market response to today's sailors who replace rather than repair broken gear, a game plan that's hard to implement at sea or in remote landfalls.

Harken's easy-to-operate, friction-free, front-loading snatch block gets the Best Choice kudos. Lewmar's bulletproof traditional entry was rugged, easy to refit, well-constructed, and our Recommended choice for the long-range cruiser. Our Budget Buy, Garhauer's proven side loader, is a cost effective competitor.

CONTACTS

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PS's attempts to get the Wick-er towel to grow mold or develop a foul odor have not succeeded—so far.

The Human Shammy

Wick-er Warmup towel dries fast and resists mold.

The high-tech materials found in underwear and outerwear are making their way into the towel market. The Wick-er Warmup towel, made by Discovery Trekking Outfitters in Vancouver, is a polyester fabric that wicks water away from the body and then dries almost as fast as you can get it on a clothesline.

The lightweight towel is made with Silver, an anti-microbial technology that kills bacteria, so the towel will not develop a smell, no matter how often you use it or how rarely you wash it. This Silver lining is permanent too; it won't wash out.

The towel is a good fit for those who are in and out of the water several times a day. It's the shammy—without the smell—for humans. Its size and weight make it ideal for packing and carrying, and its quick-drying, anti-bacterial features make it a great choice for boaters.

The towel works by pulling water away from the body and then distributing it across the surface of the fabric. Cotton towels absorb moisture into the fiber, and so take longer to dry. The Wick-er Warmup pulls moisture around the fibers rather than absorbing it, allowing it to evaporate quickly.

In *Practical Sailor* tests, the Wick-er Warmup towel dried three times faster than a thin cotton towel. *PS* found that fresh water dries quickly, salt water rinses out easily, and sand shakes off with a couple of flicks.

The towel comes in a dozen colors and is sold in four sizes, ranging from a body-wrapping beach towel to a runner or golfer's face cloth. Prices range from $29 for a 58 x 34-inch beach towel to $6 for a 10 x 10-inch face cloth.

CONTACT

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Ego Case Boasts iPod Protection, Clear Sound

Late last year, *PS* published an article about devices that keep iPods free of moisture, sand, and dust (see *PS* November 2006). Only one of those products came with speakers instead of earphones—the iFloat from Brookstone—but it didn't have a water-resistant speaker, and the sound quality diminished significantly once the speaker got wet. Now we've discovered a worthy replacement: the Ego Waterproof Sound Case.

Made by Atlantic Inc., of California, the Ego employs a sturdy rubber gasket and a snap latch. Atlantic claims the Ego's clear polycarbonate is shatterproof. It has rubber guards on each corner and a shock absorbent insert (it comes with three to accommodate different iPod models) that cradles the iPod. *PS* testers dropped the Ego from 36 inches onto concrete three times, and no damage was noted. The device also floats; however, it's not intended for immersion.



Ego Waterproof Sound Case

The Ego weighs just over 1.75 pounds, but it's relatively compact (9.8 x 6.5 x 1.8 inches). An opaque membrane allows users to manipulate the iPod's control wheel, and whatever device you use it with (iPod or mp3 player) will connect via a standard 3.5 millimeter jack. The Ego is powered by four AA batteries, which the company claims should deliver 30 hours of operation.

Testers floated the Ego in a freshwater pool and in salt water and splashed water over it for five minutes: no problems. The sound quality won't compare to most high-end audio systems, but it does offer tonal clarity and pleasing mid-range sounds. At full volume (64-72 dB at 10 feet), the sound should be sufficient to incite a little dancing in the cockpit.

The Ego sells for $149 and comes with a storage bag, kickstand, shoulder strap, and a one-year warranty, which doesn't apply to the music player. It's the best product for the job, in *PS*'s opinion.

CONTACTS

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Lessons from the Boneyard

The Annapolis Naval Station boatyard saw significant damage from storm surge during Tropical Storm Isabel in 2003. Hauling is a valid storm tactic as long as the storage area is well above sea level.

Photos by Ralph Naranjo

Can today's production boats withstand the ultimate test?

Contrary to the testing-oriented automotive industry, sailboat builders seldom willingly destroy boats to validate construction quality. High per-unit cost and limited R&D budgets cause destructive evaluations of new sailboats to be relegated to laminate samples, test coupons, and small subsections of new models, rather than experimenting with the sacrifice of a complete vessel. Just the thought of taking a brand-new, marketable sailboat and subjecting it to an intentional grounding, dismasting, or capsize is enough to give most yacht brokers chest pains.

Instead, baseline scantlings, laminate schedules, and building practices, such as those promulgated by the American Bureau of Ships (ABS), help to guide pre-construction engineering. Some companies voluntarily comply with the International Standards Organization (ISO) system of certification, while others use finite element analysis to digitally analyze the structural features of a new vessel. Past production results and owner feedback also help a builder define just how "strong" a new boat should be. The goal is to create a vessel for a specific type of use that is capable of withstanding the associated natural forces, and some degree of operator error. The wear and tear associated with time is also factored into the equation, as are the designer's and builder's usually unstated views of the lifespan of the boat.

Because real-world destructive testing goes beyond the scope of most builder's R&D efforts, the results of storm damage and operator error have become the next best alternative to controlled destructive testing. Insurance companies, standards bodies, and others involved in the big question of just how strong a recreational vessel should be made, look carefully at broken boats. Such after-the-fact analysis provides valid engineering feedback. A close inspection of critical failures and the factors that lead to their occurrence can explain how a boat should be built and what should be changed or maintained.

Marine surveyors and other industry experts employ a forensic approach to post-storm damage evaluations, noting easily observable as well as hidden problems that lead to or become apparent after an incident.

Practical Sailor recently toured a yard that contained numerous storm-damaged vessels with the intention of finding areas of potential concern in FRP construction. It wasn't pretty. We saw shorn-off keels, ripped winch-base pedestals, AWOL chainplates, and bent rudder stocks. The boats came from a broad spectrum of production builders, yet it's difficult to draw definitive conclusions about how one maker deals with unusual stresses over another absent an understanding of what these boats actually endured.

Accordingly, it's impossible to state that any of the boats pictured







A fall gale swept across western Long Island Sound in 2006, driving these boats ashore.
1. *This Alden 44's lead-ballast keel absorbed much of the pounding, but its shallow draft allowed the rudder to also make contact with the rock jetty.*
2. *The junction between the hull and keel (note the keel bolts, inset) was the focal point for loads when this Beneteau fetched up on a rocky outcropping.*
3. *Attached rudder designs, like this one on an Island Packet 44, aren't immune to damage during a severe grounding episode.*

here are "defective," because the treatment each received was catastrophic, highly variable, and well outside the conditions they were designed for.

Nonetheless, understanding failure points can give us a better picture of common vulnerabilities and how builders might address them.

WHAT'S REASONABLE?

The first of many lessons learned is that sailboats are designed, engineered, and built to handle sailing loads, and the point-loading associated with collisions or fetching up on a coral reef, granite ledge, or surf-swept sandy shoal make all promises of ruggedness and survivability a tenuous crapshoot at best. Just one look at what happens to FRP when its elastic deformation ability is exceeded, and critical fracturing of the hull skin results, conveys much about recreational boating's most favored material. Its inability to survive heavy point loads is one reason why there aren't many FRP tugs, workboats, or warships. Fiberglass has many redeeming qualities, and it's these positive traits as well as their limitations that boat owners need to understand.

Fiberglass molding revolutionized recreational boatbuilding not simply because the new material was rot resistant and offered a good strength-to-weight ratio, but because it provided a means of generating smooth curves and complex shapes that could be reproduced cheaply and efficiently.

Unfortunately, the material was anything but ideal, and it's the downside to FRP construction that tends to get little press. Far from a perfect composite, glass fiber and resin have little affinity for each other. To make the bond work, a chemical coating must be added to the glass filaments and other synthetic fibers used as reinforcement in the resin matrix, whether it's polyester, vinylester, or epoxy resin. This water-soluble chemical finish allows the resin to form a covalent bond with the fiber, and when solidified, the composite forms a hard but flexible skin just a little denser than hardwood. The finish used to link glass filaments to resin is the weak link in the adhesion





1. The point loading of a roadside guardrail doomed this boat, whose anchor rodes had parted during Tropical Storm Isabel in Annapolis, Md.
2. Although this Beneteau 44's solid FRP stem is capable of handling sailing loads, there was little question as to whether the rock or the fiberglass would win the tussle that left a gaping hole in its hull.
3. A hole is all that is left of FRP-bonded stainless steel chainplates on this Island Packet 44, which was found dismasted and driven onto rocks beneath a low bridge near Stamford, Conn.



process. This is why when destructive loads cause an FRP structure to tear, the ragged, resin- free filaments look as if they were never properly "wet out," making it appear as if the failure was due to poor lamination. In reality, the shearing likely occurred at the critical interface between the glass filaments and their chemical finish.

AXES OF ATTACK

In order to achieve a lighter but stiffer structure, low-density foam or other core material may be sandwiched between inner and outer FRP skins. In essence, these laminates are stiff and can have a great strength-to-weight ratio in two of the three planes often referred to with X, Y, and Z coordinates. The X and Y planes are aligned with the warp and weft of woven or stitched reinforcing fabrics, and they cope nicely with loads aligned in the same plane. The nemesis of FRP construction is the Z axis, a plane that is solely reinforced by the resin's adhesive quality rather than by reinforcing fibers aligned with the axis. Metals, on the other hand, are isotropic in nature showing equal strength in all directions. Bond failure due to stress along the Z axis is one of the most common causes of FRP deterioration, and the term "de-lamination" is part of the boatyard lexicon all over the world. Boats driven hard at sea, or inadvertently grounded, often display critical failures that are partly due to the physical nature of the material from which they are made and partly due to the actual building process.

It's important to note that high loads migrate through a structure and focus where the stiffness is the greatest. For example, global sailing loads create energy hot spots around the keel stub, mast step, chainplates and rudder bearing points.

Most skilled marine surveyors carefully inspect these locations, especially when storm damage or grounding-related problems are an issue. Point loads associated with collisions and grounding can subject FRP structures to loads that they may be incapable of weathering. When it comes to toughness and abrasion re-



Dering Harbor, on tiny Shelter Island, N.Y., is protected by the forked eastern end of Long Island. Even so, the anchorage has about a mile of fetch open to the north quadrant. When Hurricane Robert's Category II winds did a 180-degree shift into the north, many boats chafed through mooring pendants.

sistance, a resin-fiber composite will prove to be less than an ideal material. Ironically, it's often an external lead ballast keel that saves a fiberglass sailboat in a serious grounding. As long as the hull pounding is mitigated by malleable lead making contact with a hard, tough planet, the chance of survival is good. Once the FRP hull skin starts taking the punishment, the odds for survival drop significantly.

Aluminum, though tougher than FRP and wood, also has a proclivity to tear eventually. Compared with wood and fiberglass, its tolerance for pounding against a hard surface is superior, but its durability is also directly linked to design scantlings. Sailboats with thicker plate and closer spaced frames do better than lighter alternatives. But, as the military and commercial sides of the marine industry have long known, steel is the only material that can give those prone to hitting things a fighting chance.

Ductility is one reason that steel resists being holed. It is known as a high-yield material, which means that there's a wide range between the point where its elastic quality ends and where its plastic deformation ability finally ceases and a crack occurs. This property of steel is much greater than what's found in wood, FRP, and even aluminum.

The engineering term "yield" is a measure of a material's ability to cope with loads that exceed its "spring back" point, and defines how much permanent distortion it will go through prior to failure. This range of deformation leads to dents and caved in sections of the hull, but often keeps a boat from being holed. Ironically, in engineering terminology, steel has a greater range of plastic deformation than fiber-reinforced plastic happens to have. Unfortunately, steel is heavy, rust-prone, and expensive to keep in Bristol fashion, not to mention its unsuitability for fast production-boat building. Consequently, it remains on the fringe of recreational boating—more of the material of choice for high-latitude expeditionary cruisers than for casual inshore sailors.

Designers use computer-aided design and finite element analysis to engineer increases in baseline laminates for hull and deck areas where highly focused loads occur. For example, carbon-fiber deck beams and chainplates, molded grid structures bonded to the keel stub, and rebated cores with solid laminates can be added to stiffen and strengthen specific areas. One of the most important tricks of the trade is the art of building it in accordance to the design specs, and over the years, there have been many examples of errors between the "as designed" and "as built" aspects of boatbuilding.

Unfortunately, the material that offers immense stiffness, light weight, and high yield plus construction simplicity is jokingly referred to as "unobtainium." Chemists continue their quest for the ideal boatbuilding materials, but in the meantime, racing sailors want light, stiff sailboats, cruisers want rugged, easy-to-maintain hulls, and when either fetch up on a rocky ledge, they wish they had a stout steel boat. The right compromise continues to be debated, and each builder promotes his own solution to the challenge of structural adequacy. Building a boat to take surf-swept groundings in stride would lead to a sailboat that behaves like a boulder, and at the other end of the spectrum are race boats that simply lose their keels under the load of sailing.

For the average cruising sailor, there's value in a reasonable length of garboard joint that allows keel loads to be dissipated through a larger portion of the hull. This can be aided with floor frames, grid structures, and a well-tapered laminate build-up near the keel stub. Cored hulls that continue all the way to a keel stub create a stress riser that does not dissipate loads as effectively as a heavier, more gradually tapered laminate.

LESSONS LEARNED

For too long, there's been an enduring misconception that rudders attached to the trailing edge of a keel are more protected in grounding situations and consequently suffer less damage. The truth is that these rudders reach down almost as deep as the keel itself, causing both the heel gudgeon and rudder to be quite

vulnerable in a grounding situation. Shoal-draft vessels also have rudders extending nearly as deep as the keel, and they too will collide with the bottom, even in minor grounding scenarios. Ironically, deeper-draft vessels tend to have a larger offset between their max draft and the draft of a separate rudder. This offset often prevents bottom contact by the rudder during serious groundings.

Some older cut-away forefoot designs had their fore-and-aft center of gravity far enough forward to cause the vessel to rotate bow down as the tide ebbed, and the vessel would heel and rotate forward, holding the rudder out of harm's way. Centerboarders with a separate rudder face the same grounding problems affecting shoal-draft vessels and can suffer serious rudder damage in a grounding.

Keel attachment has proven to be a critical factor in surviving a heavy-weather grounding. Wave action causes the full weight of the hull to act like a jackhammer, creating massive energy transfers between the keel and hull. Lead and iron keels are well-suited to such pounding, but hull skins do not have the same tolerance for intense impact loads. In addition to the forces generated, the hulls of modern sailboats often have a near-90-degree change in shape exactly where the keel/hull interface occurs. When these modern hull shapes pound on hard bottom, the critical junction between the hull and keel becomes a focal point for stress loads. The shearing that occurred at the keel-hull interface on the Beneteau on page 24 shows the location of stress risers on a flat-bottom, fin-keel hull when subjected to pounding that is far from ordinary. Wayne Burdick, of Beneteau USA, commented that, based on his observations of other storm-damaged boats, the photographed boat was clearly the victim of a "remarkable force."

"This is, for the most part, the standard keel attachment for the majority of the industry," Burdick said.

High-stress areas such as winch base pedestals and chainplates must be well-engineered and able to take significant loads. A well-made yacht is capable of being lifted by its chainplates—the loads imposed are equal to the displacement of the vessel. *Practical Sailor* believes the chainplate structures should be the strong point in the rig, able to support any load that the rig might be capable of transferring to the hull before some other element of the rig itself fails. FRP-bonded chainplates, like those that are missing from the Island Packet 44 pictured on page 25, can present a special engineering challenge in this regard. Island Packet's Bill Bolin pointed out the extreme conditions that led to the rig's demise, and that not too many hulls would have survived being crushed beneath the steel beams of a bridge and pounded stern first against rocks, the event that befell the IP44.

Similarly, winch pedestals, bow cleats, and mast partners must be heavily reinforced because these structures may be called on to keep a vessel off a surf-breaking reef or to tow it to safety.

No boat can be built to withstand the worst of a stormy pounding on an unforgiving reef, jetty, or breakwater, but every designer and builder should give serious thought as to how the garboard region of a vessel should be structured in order to endure more than just average sailing loads. Thickening panels or plate, removing core, and adding more units of FRP in this region, and bonding in or welding up a reinforcing grid are options that can make the hull-to-ballast keel connection the most rugged part of the vessel. External lead ballast can act as functional shock absorber, accepting the cutting and grinding effect on the keel and spreading the load over the entire garboard joint. A thick FRP hull skin and sealed, encapsulated ballast effectively transfer the rig and righting moment forces throughout the hull, but FRP's lack of toughness in comparison to external lead or iron make it a poor material to put in contact with a reef or rocks.



Hurricane Gloria pounds a CT-51 in Oyster Bay, N.Y., ripping its mizzen to shreds. The popularity of roller furling sails adds another point of vulnerability for boats, moored or at sea.

CONCLUSION

It's easier to become a proficient navigator, install a secure storm mooring, or transit to safe shelter before a storm, than it is to build or buy a catastrophe-proof vessel. And with the busiest part of the hurricane season dead ahead, followed up by the promise of violent fall nor'easters, it's time to make sure that mooring pendants are in tiptop shape and anti-chafe gear is used wherever line contacts the rail or other hard surface.

Whenever there's a warning of severe weather, all efforts should be made to double up lines, beef up chafing gear, and reduce your boat's windage. More and more sailboat damage is associated with unfurling headsails and the windage that they create. Stripping headsails from furling foils during the proverbial calm before the storm ups the odds of survival and helps keep your boat where it belongs. And with some luck, in one piece.





Testers found both the Garmin 498C (left) and the Raymarine A65 (above) easy to use. An active cursor makes function selection simple on the Garmin, while the Raymarine's rotary knob enables precise adjustments.

Plotter/Sounders Update: Garmin 498C and Raymarine A65

Testers rank discontinued Garmin highly, and it can be had for cheap.

In an effort to keep our readers informed of happenings in the marine electronics field, *Practical Sailor* is constantly on the lookout for new products and those that are a good value, even though they may have been on the market for several years. This update to our list of tested plotter/sounder combo units does just that as we look at one unit that has recently hit the market and another making its final march.

We've discussed before the many advantages that fishfinders have for cruising sailors. It boils down to having the benefit of a visual representation of bottom contours. This can be priceless information in an unfamiliar harbor or a backwater anchorage.

WHAT WE TESTED

In the April and June 2006 issues of *Practical Sailor,* we reported on nine plotter/sounder combo units. At that time, our test was divided into two groups based on screen sizes of approximately 5 and 6.5 inches. In this update test, we review one unit from each category—the Garmin 498C (5-inch screen) and the Raymarine A65 (6.5-inch screen)—against the 2006 top performers in their respective categories. The Garmin faced off with the Lowrance LMS-337C DF, and Raymarine A65 was compared to the Navman Trackfish 6600.

The Lowrance got testers' top pick in the previous test based on its fine sounder detail, high-resolution screen, powerful software, top-notch MOB function, NMEA capability, and its reasonable price.

The Navman was tops among the big screens in the 2006 test thanks to its sharply defined display, user-friendly and powerful software, and the ease with which split screens can be re-sized.



ELECTRONICS

HOW WE TESTED

Both units were mounted on a portable base for side-by-side comparison and then temporarily strapped on a skiff. We reviewed and rated the viewability of each unit. In the daylight, each screen was viewed from various angles, with and without polarized sunglasses, and from differing sun angles. Night viewing was done after sunset with an eye toward the quality and adjustability of the unit's backlighting. Testers viewed these displays from 2 to 3 feet away.

We rated each chartplotter for user-interface based on the unit's buttons, cursor pad, and most importantly, software. The easier and more intuitive a unit was to use, the higher we rated it. We used each unit's supplied GPS antenna to receive satellite position signals. Both of our test units were equipped with external antennas; they were mounted in close proximity to minimize variations in position data. As we maneuvered our skiff, testers entered waypoints, edited them, deleted them, and checked man-overboard functionality. We also set up a 15-waypoint route from a

creek out in to the Gulf of Mexico to assess route building and usage abilities.

Sounders were evaluated over known bottom structure in water depths from 2 to 35 feet. We used the transom-mount transducer that was shipped with each unit to accomplish our review. All sounder testing was done in 80-degree salt water. Sounders were judged on their ability to show bottom detail, their ease of use, and their array of features.

Power usage was measured with a Sperry multimeter with the sounder pinging away and the screen set at maximum daylight brightness.

GARMIN 498C

Our test version of the Garmin 498C was factory-equipped with an external GPS antenna, an integral sounder, and a dual-frequency transducer. Other models of the 498C are available with an internal GPS antenna. The unit is pre-loaded with Garmin BlueChart cartography that covers U.S. waters in great detail.

We used the supplied bracket to mount the 498C display unit to the test board and found the installation to be straightforward and secure. All wiring for power, interface, and transducer leads attaches to the back of the unit with a single multi-pin twist-lock connector. The transducer branch connects to the transducer with another inline twist-lock connector while the GPS antenna connects via a pre-wired BNC connector. We found the installation simple and straightforward.

The Garmin 498C screen measures 4 inches high and 3 inches wide. It has a 320 x 240-pixel resolution, so details are not as sharp as on higher-resolution screens like the Lowrance LMC-337C DF.

Fourteen levels of control are available for screen brightness. In daylight conditions, we found the 498C easy to see and read. However, it showed a moderate amount of screen darkening when viewed through polarized sunglasses. We rated the screen Good for daytime viewability and Excellent for night-time viewability. Pushbuttons and the cursor pad are backlit.

Typical of Garmin devices, most of the 498C's functions are reached through multi-layered menus. Holding the menu key in for a couple of seconds brings up the main menu with its long tab list of items on the left side of the screen. Selecting a tab with the cursor opens another menu

PS VALUE GUIDE — PLOTTER/SOUNDERS UPDATE

MANUFACTURER/ MODEL	GARMIN 498C $	LOWRANCE LMS-337C DF ★	NAVMAN TRACK-FISH 6600 ★	RAYMARINE A65
PRICE (W/ TRANSOM MOUNT TRANSDUCER)	$559	$699	$1,499	$1,749
PRICE SOURCE	defender.com	vielectronics.com	defender.com	boatersworld.com
FEATURES	**DISPLAY UNIT**			
UNIT DIMENSIONS (IN.) W X H X D	6.25 x 6.1 x 3	6.9 x 5.4 x 3.4	7.5 x 8.0 x 2.8	9.5 x 6.75 x 3.6
SCREEN DIMENSIONS (DIAGONAL)	5	5	6.4	6.5
SCREEN RESOLUTION	320 x 240	480 x 480	800 x 400	640 x 480
SCREEN ORIENTATION	Portrait	Portrait	Portrait	Landscape
SPLIT SCREENS	Yes	Yes	Yes	Yes
PUSHBUTTONS	10	8	10	11
SOFT KEYS	0	0	0	5
ROTARY ENTER KNOB	No	No	No	Yes
CURSOR INPUT DEVICE	Cursor Pad	Cursor Pad	Cursor Pad	Cursor Pad
POWER USAGE (AMPS) (SOUNDER ON, FULL BRIGHT)	0.69	0.84	0.90	1.19
INTERFACE	NMEA 0183	NMEA 2000	NMEA 0183	NMEA 0183
WARRANTY PERIOD	1 year	1 year	2 years	2 years
FEATURES	**PLOTTER**			
GPS ANTENNA AS TESTED	External	External	External	External
CARTOGRAPHY	Preloaded Garmin Bluechart	Lowrance or Navionics	C-Map	Packaged w/ Navionics Silver
NO. OF CARD SLOTS	1	2	2	1
WAYPOINT STORAGE CAPACITY	3,000	1,000	3,000	1,000
ROUTE STORAGE CAPACITY	50	100	25	495
NO. WAYPOINT SYMBOLS	68	42	48	6
MAX CHARACTERS : WPT NAME / COMMENT	10 / 20	40 / 0	8 / 0	16 / 32
FEATURES	**SOUNDER**			
INTERNAL OR BLACK BOX NUMBER	Internal	Internal	Internal	BB - DSM25
POWER OUTPUT (WATTS RMS)	500	375	Variable, up to 600	500
TRANSDUCER USED FOR TESTING	Garmin	Airmar P66	Radarsonics	Airmar P58
RANGING	Auto + 17 manual	Auto + in 5-foot Increments	Auto + 19 Manual	Auto + 22 Manual
GAIN	3 Auto + Manual	2 Auto + Manual	2 Auto + Manual	3 Auto + Manual
ZOOM	2x, 4x	2x, 4x	Marker	2x, 3x, 4x, Adjustable
BOTTOM LOCK	Yes	No	Yes	Yes
A-SCOPE	No	Monochrome	Full-color	3-mode full-color
SHIFT	No	No	No	Yes
WATER TEMP	Yes	Yes	Yes	Yes

$ Budget Buy ★ Best Choice
All are waterproof and dual-frequency: 50/200 kHz; none have alphanumeric key pads.





Both the Raymarine A65 (right) and the Garmin 498C offer split-screen viewing.

page, where you can make and execute specific selections.

A waypoint can be saved at the boat's present position by pressing and holding the Enter/Mark key until the New Waypoint menu appears or at the cursor position with a quick press of the same button. The waypoint information box lists the symbol selected for the waypoint (a long list of named symbols are available); a name up to 10 characters long; a 20-character comment; latitude/longitude; and bearing/distance. The user can modify any of the information.

Route entry can be accomplished using a text listing of waypoints or by selecting points on the map page. We used the quick route navigation function to quickly create a route on the map page using only the cursor and the enter button.

Garmin's man overboard function is activated by pressing the MOB key. The unit then asks the user to confirm whether he wishes to navigate to the MOB point. When you answer in the affirmative, the unit executes the command. No really useful information is offered on the map page unless you have already set up appropriate data blocks. We had not done this, so we found it easiest to switch to the compass page to navigate back the MOB position

A number of different pages are displayed by pressing the page button. The factory-setup includes map, map/sounder split screen, sounder, compass, and 3D highway. The map can be oriented north up, track up, or course up. Additional options for the displayed page can be selected by hitting the menu key once. This brings up the page-specific menu.

The 500-watt sounder integral to the 498C includes a dual frequency transducer (50/200 kHz) and a list of features including auto and manual depth ranging, zoom, bottom lock, and water temperature display. A desirable feature found on the 498C, as well as other Garmin sounders we've tested, is the active cursor control. Pushing the side arrows on the cursor allows the user to quickly select an array of functions and then adjust them with the up/down arrows.

Six functions are available with the active cursor: gain, color gain, depth range, frequency, Ultrascroll, and Whiteline. We rated the Garmin 498C sounder Good for presentation and Excellent for ease of use.

Bottom Line: At $559, the Garmin 498C earns our Budget Buy pick with good functionality, decent screen resolution, pre-loaded cartography, and an easy to use sounder at a low price.

RAYMARINE A65

We received our Raymarine gear in the A65 System Pack, which includes the A65 display unit, a DSM25 black box sounder, a Navionics Silver U.S. All-In-One Marine chart card, and a dual-frequency transducer.

We used the supplied metal bracket to mount the A65 display unit to the test board. The black black-box sounder module was screwed to the test board, too. A flush-mounting kit is available as an option. All the wire connections from the black box, power cable, and GPS unit are made with multi-pin twist-lock connectors. Installation was simple.

The A65's landscape screen measures just under 4 inches high by 5¼ inches wide and has a high resolution of 640 x 480 pixels. Details appear to have very sharp edges when viewed from within 3 feet. At farther distances, some fine details get too small to discern easily. We viewed the unit with the white background color selected during daylight operations. A blue background is also available, and several other colors are available for the sounder view. Brightness is controlled from 0 to 100 in 20 steps. Viewability was fine even with very high levels of sunlight. We did, however, notice some screen darkening when we viewed the screen through polarized sunglasses. We rated the A65's viewability Good for daytime and Excellent for night-time.

Frequently used functions are launched with page-specific soft keys, a rotary entry device, and an enter-key-equipped cursor, leaving little need to go into the menus. Soft key functions are displayed above each



The Garmin 498C (far left) has 14 levels of brightness to choose from. It and the Raymarine were both rated Good for daytime viewability and Excellent for night-time viewing.

of the soft keys and change to reflect the displayed page controls.

In the A65, first pressing the Wpts (waypoints) key and then choosing a course of action using the soft keys allows the user to save a waypoint at the current position or at the cursor position. A double press of the Wpts key shortcuts the process and creates an instant waypoint at that position. The waypoint list shows the selected symbol (one of six can be picked), a name up to 16 characters long, a 32-character comment, latitude/longitude, and bearing/distance for each waypoint. Any field in the waypoint data list can be modified as needed.

Route entry can be accomplished using stored waypoints, newly created waypoints, or a combination of new and stored waypoints. Up to 50 waypoints can be used in one route. We used only the cursor and soft keys to create a route. It was quick and easy. Routes can be tracked in either direction, and a user can select an orientation of north-up, course-up, or heading-up. All worked well in our test. The course predictor is a thin line and can be somewhat hard to see on a fully detailed map page.

Holding down the MOB key on the A65 sounds an alarm, marks the MOB position, and switches the display to a split screen showing the way back to the MOB. Data boxes show course over ground, heading, bearing, and distance, as well as cross-track error back to the MOB position. Holding the MOB key down again turns off the function.

This is the type of MOB function we like to see. Everything you need to get back to the MOB happens automatically, and it is virtually impossible to press any button on the machine that would screw things up.

The first push of the page button on the A65 yields two choices: chart or fishfinder. Hitting either of these soft keys allows the user to choose between full screen and a variety of split-screen configurations. When both the chart page and fishfinder are displayed in a split-screen arrangement, the active key switches control between the screens. The active window is outlined in red.

The DSM25 black-box sounder pushes 500 watts of power through an Airmar P58 dual frequency (50/200 kHz) transducer. Standard features include auto and manual depth ranging, zoom, bottom lock, and water temperature. Zoom on the A65 is very capable with 2x, 3x, 4x, and user-adjustable options. Bottom lock is also user adjustable in depth and presentation. Some more powerful features normally found only on high-end sounders are three-mode, full-color A-scope and shift. Gain has three auto settings as well as a manual range of zero to 100. Testers really liked that it can be adjusted with the rotary knob. We rated the Raymarine A65 sounder Excellent for both presentation and ease of use.

Bottom Line: A top-flight machine that garnered Good to Excellent ratings across the board. It doesn't out pace the leader though, because of its higher cost, $1,749. (It can be purchased without the sounder for several hundred dollars less.)

CONCLUSIONS

With a slew of new Garmin plotters and fishfinders hitting the market recently, older gear is getting cheap. As production on certain units ceases, prices begin to fall rapidly. One discontinued unit that's seen its price plummet is the Garmin 498C. Many of these remain in the retail distribution channel, so supply should be plentiful for months. This affords budget-minded boaters a chance to grab a highly rated unit at rock-bottom prices. Though it lacks the high resolution of our top-rated Lowrance LMS-337C DF, it makes up for it with good functionality and pre-loaded cartography. We rate it a Budget Buy, while the supply lasts.

The Raymarine A65 compares favorably to the Navman Trackfish 6600, but it does not overtake the leader, in our opinion. It has similar screen resolution and more sophisticated plotter and sounder software. The Raymarine also has five soft keys and a rotary knob. On the downside, the A65 costs considerably more, plus it has an extra black box to install.



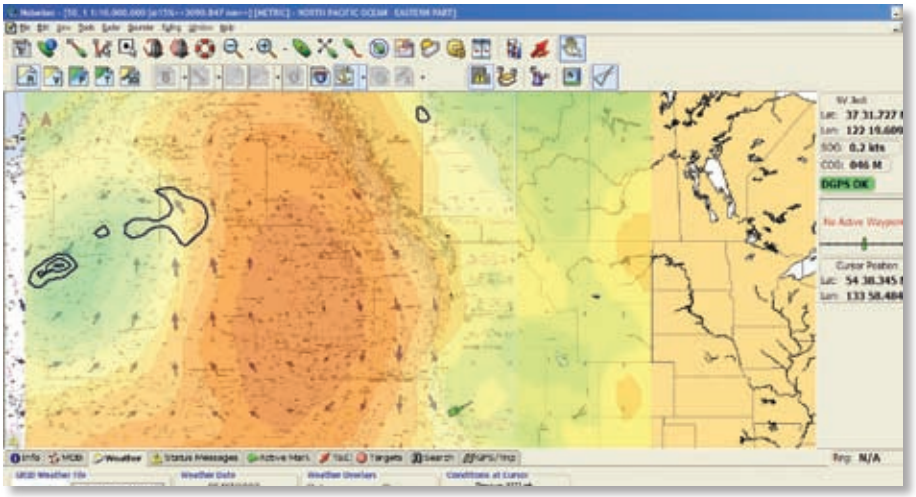


The Raymarine A65 (above) offers sharp details and easy-to-read numbers on its fishfinding screen. Testers were not impressed with the Garmin 498C's man overboard function (below). Without customizing the setup, testers found, it lacks useful information. However, the data boxes were easy to read, in testers' opinions.

CONTACTS

GARMIN, 913/397-8200, garmin.com

RAYMARINE, 603/881-5200, raymarine.com



Admiral V9 is integrated with OCENS WeatherNet software. The GRIB weather files downloaded via OCENS (left) offer little advantage over free data available to users of MaxSea, Rose Point, or Maptech software (below).

Nobeltec's Admiral 9.1 Struggles to Compete

Last fall, *Practical Sailor* evaluated and compared seven different navigation software programs ("Software Wars," September 2006), including Nobeltec VNS 8.1 and Nobeltec Admiral 8.1. Both products are made by Jeppesen Marine, a subsidiary of Boeing Commercial Aviation Services, which recently purchased chartmaking leader C-Map. Since that test, Nobeltec has released updates to both programs, and *Practical Sailor* had the opportunity to give the premium navigation software, Admiral 9.1, a comprehensive test drive. (VNS Version 9 is a $490 entry-level product that offers a few more features than the version tested in September. Rose Point's Coastal Explorer and Maptech's Chart Navigator Pro remain *Practical Sailor*'s favorites in that category.) As to be expected in the software world, a newer version (V 10) of Admiral is due out in the fall.

Admiral 8.1 was among the most sophisticated software programs we evaluated in the 2006 review. It could be a considered an alternative to RayTech RNS 6.0 ("RayTech RNS 6.0," April 2007) and Maxsea 12 (September 2006), both of which are closely allied to makers of standalone marine electronics, Raymarine and Furuno, respectively. Nobeltec has built up a loyal following and seems ideally positioned to become the Switzerland of nav software—with no firm alliance to a single hardware maker. However, an ability to seemlessly integrate with a wide range of hardware is not its strongest suit. Its radar overlay feature, for example, lags behind MaxSea and Raytech.

Admiral Version 9.1, which retails for about $1,200, improves upon VNS, adds support for a navigation network with failover and redundancy, and handles multiple monitors better. Overall, however, Admiral 9.1's new features aren't impressive compared to competitors'.

Practical Sailor spent several weeks evaluating the new Admiral, and compared Admiral V9 to V8, as well our favorites from the 2006 test. Selected add-ons that are compatible with VNS and Admiral were also evaluated.

HOW WE TESTED

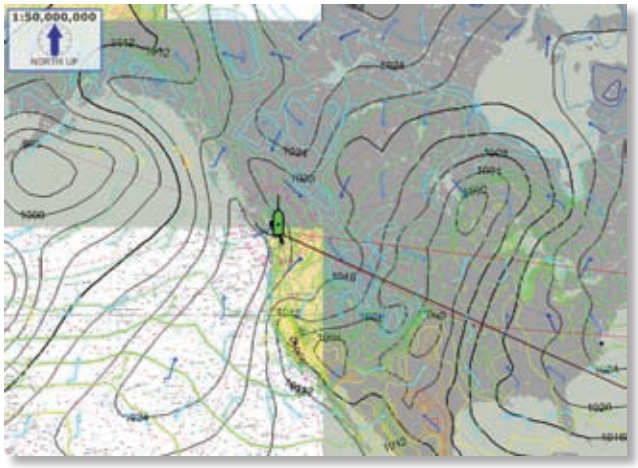
As with the previous evaluations, testing emphasized stability, ease of use, and features before focusing on specific functions.

Although evaluating user-friendliness is inevitably subjective, stability and usability are readily compared between products and versions. If the system slowed to a crawl, computing power was checked by using Windows Task Manager.

The National Marine Electronics Association (NMEA) Talker by SailSoft allowed the simulation of any desired sailing conditions and configuration of NMEA-compliant instruments.

The test computer was a new Dell Latitude D620 with a 1440 x 900 resolution screen, along with a 1600 x 1,200-resolution, stand-alone monitor to test performance with a secondary video output. The laptop had an Intel Core 2 Duo processor with 2GB RAM and a 120 GB hard drive.

Unfortunately, Nobeltec isn't fully optimized for multi-processor architecture, so that compute-intensive tasks such as 3D bathymetric renderings take longer than they should with a dual processor.



Testers preferred the Maptech Chart Navigator Pro's free GRIB weather feature (above) to that of Nobeltec.

PS VALUE GUIDE NAVIGATION SOFTWARE

SOFTWARE	★ MAPTECH CHART NAVIGATOR PRO V1.1 / COASTAL EXPLORER*	NOBELTEC ADMIRAL 9.1	✓ MAXSEA 12	✓ RAYTECH VNS 6.0
COMPUTER REQUIREMENTS	Windows 2000 or XP, DVD-ROM, 512KB RAM	Windows XP, 2000, 98. Pentium 4 with 512MB RAM (*PS* recommends Windows XP or 2000 with 1GB RAM or more.)	Windows 2000 w/ SP4, XP, 512+ MB RAM, 1GHz+ (faster for NavNet option), not XP Media Center edition	Windows 2000/XP, Pentium IV with 256MB RAM, monitor resolution of 1024x768 or better
INSTALLATION	A few hiccups	Easy	Easy	Good
LICENSED COMPUTERS	Two copies per person, one active at a time	3 installations, key required for instrument access	One	Two
COST	$400 / $500	$1,200	$500-$5,500 (depending on modules purchased)	$700
USER'S MANUAL	Good	Poor	Fair	Good
FREE DEMO DISK AVAILABLE	No / 10-day free demo	No	No 21-day demo to be released	Yes, but no instrument connectivity in demo
GPS SUPPORT (Route and Waypoint Transfer)	Furuno, Garmin, Lowrance, Magellan, Northstar, Standard Horizon	Garmin	Furuno, MLR (some), Magellan, NavNet & Northstar	All Raymarine chartplotter formats/ cartridges
SUPPORTS AIS	Yes	Yes	$250-500 extra	No
READS & WRITES GPX FORMATS	Yes	No	Yes	No
RASTER CHART FORMATS	BSB 4, PCX, GeoTIFF, SoftChart (NOS & GEO)	Passport Charts (Bathy, Raster, World), Nobeltec Nav Photos, BSB 1-4, SoftChart, RasterPlus, Nobeltec Navigation Photos, NDI, , Maptech raster and photo charts (BSB 4 and lower)	BSB, SoftChart, NDI	Maptech BSB (v2.0-4.0), Softchart BSB, NDI BSB, Maptech topo and photo charts
VECTOR CHART FORMATS	S-57 / S-57, DNC	Passport World Charts, Passport Deluxe, S-57	Mapmedia Bathymetric, C-Map CM-93, NT+ & NT MAX, NOAA S-57	Navionics Silver, Gold, HotMaps, and Platinum on compact flash, C-Map
USER PHOTOS	Yes (GEOTIFF)/ No	Yes	Yes	No
3D VIEWING	No	Yes	$500 extra	Yes
RADAR OVERLAYS	No / Yes	Yes	Furuno NavNet only	Raymarine SeaTalk*hs* or HSB2
AUTOPILOT SUPPORT	NMEA 0183 & 2000	NMEA 0183	NMEA 0183	NMEA 0183, Raymarine SeaTalk and SeaTalk*hs*
WEATHER GRIB	Yes	Yes	Yes	Yes (limited)
FREEHAND DRAWING	No	Yes	Yes	No
REDRAW SPEED	Good	Fair	Good	Fair
USABILITY	Good	Fair	Fair	Fair
STABILITY	Good	Fair	Excellent	Good
TECH SUPPORT	Good	Fair	Excellent	Fair

✓ Recommended ★ Best Choice

* Coastal Explorer is effectively the same software as Chart Navigator Pro, with more limited chart options.

Feature-rich Nobeltec 9.1 aims to compete with Raytech RNS and Maxsea, which have the advantage of close alliance with hardware makers. Maptech Chart Navigator Pro and its sibling, Rose Point Coastal Explorer, lack the advanced features, but are still PS*'s Best Choice for most sailors. Based on a review of recent product improvements,* PS*'s ratings for Maxsea's usability and Raytech's user manual have been upgraded since their last review.*



WeatherNet is a very comprehensive source of GRIB data. If your budget allows for a satphone, the extra cost of WeatherNet's service will seem a good value.

INSTALLATION

Testers installed to a fresh Windows XP Professional system. Testers also upgraded a previous installation of V8.1. The upgrade installation process was quick and easy, but the new installation provoked a confusing message asking for a site key, which was obtained by activating the software. (Admiral is supposed to run for 30 days without activation.)

As with its predecessor, the program covers the entire screen upon startup, an intrusive function on a slower computer.

CHARTS

VNS and Admiral are compatible with a wide range of charts, however, only small-scale world charts in vector format are provided with the program. Competitive products provide free NOAA charts with navigation software. Compared to other software products, Admiral's method for downloading Electronic Navigation Charts (ENC) is problematic.

Importing and copying raster charts required some fiddling, and importing the charts we wanted took about half an hour. To the tester's chagrin, there was no way to monitor the progress of this operation.

With Jeppesen's recent acquisition of C-Map, Nobeltec will have extensive world wide vector chart coverage. Version 10 with C-Map Max Pro data is due to release this fall.

GRIB WEATHER DATA

GRIB files are generated from computer models, and require some interpretation. These tailor-made files, downloadable on-demand, have become increasingly popular among offshore sailors. Typically, GRIBs are more useful in the open ocean than when coastal cruising. As with most weather forecasts, projections beyond 24 hours are increasingly inaccurate, but GRIBs are useful for tracking well-established, intense high- and low-pressure systems.

Admiral users can subscribe to OCENS WeatherNet, which can be installed along with Admiral 9.1. GRIB files are saved to disk and are automatically opened in the chart window. Nobeltech users may also tap a several sources of free GRIB files, such as saildocs.com, which work with a variety of GRIB aware programs. *Pracical Sailor* has previously covered some of these and will revisit the topic in our upcoming review of free and cheap nav software.

OCENS WeatherNet (*www.ocens.com*) is a system designed to optimize the download of weather products via wireless connections. It offers thousands of continuously updated weather products — text, images, charts, buoy data, radar, GRIB files, and more — that can be easily and efficiently downloaded on demand. It's not cheap. If you want weather by satellite phone, the cost is $699 for 500 minutes with activation of OCENS WeatherNet and one year of OCENS Mail, plus $1,395 for an Iridium satellite phone.

The new version also lets you access satellite weather via Sirius (see "Satellite Weather," June 2007), but, unlike GRIB data, this cannot be analyzed using routing or navigational software.

Contrary to Nobeltec's marketing materials, our tester could not see any notable improvements to the software's relatively limited GRIB data capability.

The free daily data forecast is reasonably useful, but other vendors such as Raymarine, MaxSea, Rose Point, and Maptech provide free data at shorter forecast intervals that is roughly equivalent to the data Nobeltec charges for. For example, Raymarine provides six-hour intervals, while Maptech provides one-hour intervals. With the other programs, it is interesting to watch an animated forecast—something that a daily update cannot provide.

Nobeltec doesn't have a button to return the forecast to the current date and time. After running an animated weather forecast map covering several days ahead, the only way to get back to the present is to click the back button dozens of times.

Testers later discovered that OCENS WeatherNet had replaced the test computer's host file without notice, a serious breach of installation etiquette. *Practical Sailor* used OCENS online chat to inquire about the change to the host's file, and received a response after an hour wait. The tech support person did not know what we were talking about.

STRIP CHARTS

Strip charts are a new Admiral feature that enhance the NavInfo panel previously found on earlier versions. Because of the amount of space they take, they should be considered only for very high resolution monitors (1600 x 1200 or better), or multiple monitor setups. Optionally, a trip can be recorded and played back later. Racers may be the most interested in strip charts, which let you quickly correlate

performance and particular sail or heading changes.

RUNNING NOBELTEC 9

Admiral locked up and/or crashed twice when using NavInfo. The program locked up after playing with strip charts. After 20 minutes of processing, the Route Wizard was unable to plot a course between two points five miles apart in the open ocean. Clicking on the "Stop Processing" button did not work. Testers had to kill Admiral with Windows Task Manager. This buggy behavior is contrary to what *PS* found when testing the previous version.

DOCUMENTATION

Help is only available as a PDF file, but a PDF viewer is not provided, nor is there a convenient means of downloading one. Some of the chapter references in the text are incorrect, and some terms used in the program (such as "layline") are not mentioned in the documentation. A standard help file, particularly with such a sophisticated product, is sorely needed.

CONCLUSION

In *PS*'s view, Admiral 9.1 was released before it was ready. The product had stability problems that Version 8 did not have, documentation was incomplete, and it was awkward to use. In our opinion, there aren't enough new features to warrant a major version bump.

For practical, stable, economical, Windows-based software with easy interface, Maptech CNP and Rose Point Coastal Explorer remains our favorite (MacENC is our choice for Mac OS). If you want high-end features, MaxSea is tops. The clunky interface has been improved since we last looked at it, and their documentation is much better. Their online videos should be supplied on DVD with their product.

RayTech RNS 6.0 is the *PS* pick for those who want to interface with an all-Raymarine environment. The interface is similar to that of its hardware, so Raymarine gets lots of points for consistency. Furuno and MaxSea have completely different user interfaces, so the learning process is twice as long. Whether Jeppesen's acquisition of C-Map will change this overall view will be interesting to see.

CONTACT
NOBELTEC, 800/946-2877
nobeltec.com

Evaluating Nobeltec's Sailing Plus Pack

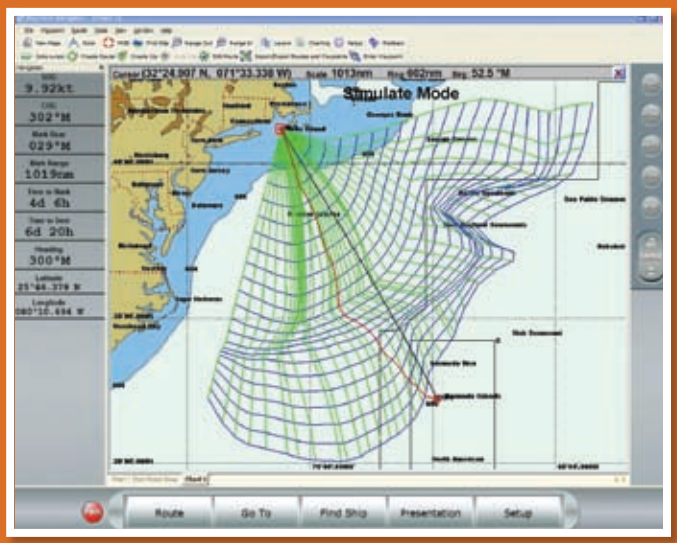
One add-on that may appeal to racers and performance-oriented cruisers is the Sailing Plus Pack, which offers the ability to match the boat's current performance against its polars. The Plus Pack is also available for Nobeltec VNS users.

Unfortunately, this feature, as implemented in Admiral V9.1, is of limited value. A "layline" is commonly defined as "an imaginary line on which a sailboat can sail directly to its target without tacking." Maximum and minimum laylines define the range of headings that one could follow in order to reach the next waypoint.

In order to use polar data and generate accurate laylines, your boat must have a GPS and a weather sensor that outputs apparent wind speed and direction. The Sailing Plus Pack combines the apparent wind information with GPS information to create true wind speed and direction.

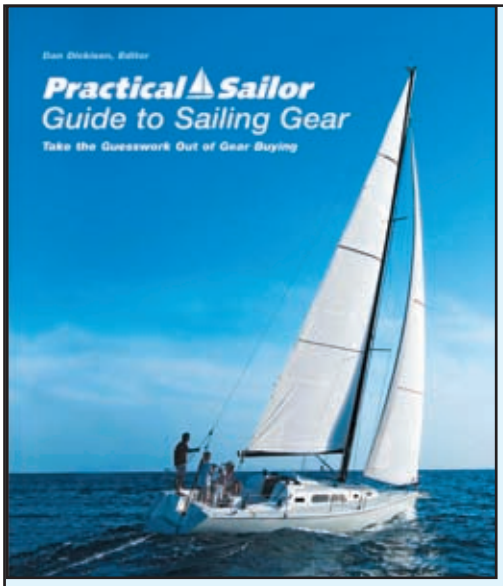
Polar data for most boats are available from US Sailing for a fee (Performance Packages, including spreadsheet with graphs and text, cost $300). However, Nobeltec does not provide the program that converts the US Sailing polar data to the proprietary binary format that the software requires, so one must laboriously type all of the US Sailing data into Nobeltec's data editing form. The Performance Packages contain polar information from 6-24 knots for every sail combination.

None of the software that use polar data for routing purposes is particularly user-friendly, but Nobeltec falls short in many respects. While MaxSea and RayTech show alternative routes between waypoints and allow for an optimized route to be selected, Nobeltec just shows several short lines emanating from the boat and the next waypoint. The company says it is working to improve route optimization function.





RayTech VNS 6.0 (right) generates alternative routes between waypoints. Nobeltec Admiral 9.1 (left) does not offer this feature.



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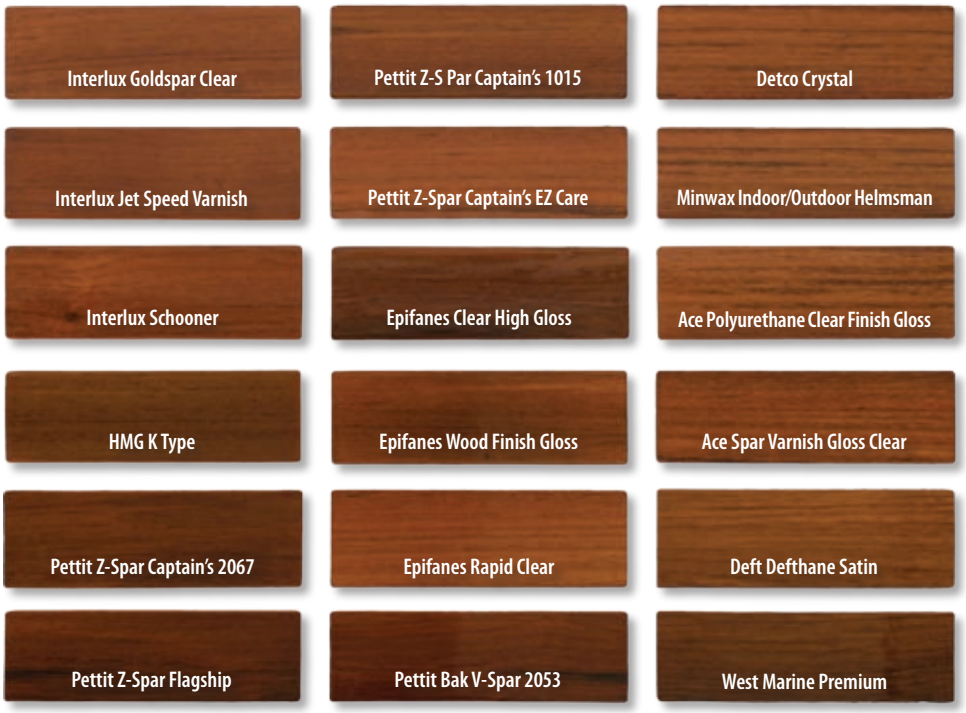
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Exterior Wood Finishes

18 one-part varnishes + 3 two-parters + 18 teak treatments = 1 massive evaluation.



Our newest round of testing includes the 18 one-part varnishes shown above.

As reader letters regularly point out, the hunt for the ideal wood coating is never ending, much like the chore of maintaining it. And because it's been a few years since *Practical Sailor* popped the top on them, we've launched a new round of testing to find the best looking, most durable exterior wood finish.

Most of our past reviews focused strictly on varnishes or strictly on teak treatments. In 2003, we took the top finishers in each category and tested them for an all-stars roundup to determine our overall favorites for appearance and longevity. (The results were published in the Feb. 15, 2005 issue: Epifanes High Gloss got the nod among glossy finishes, and Sikkens Cetol topped other matte finishes.) With this evaluation, we're going for both the apples-to-apples comparison our single-category tests afforded and the apples-to-oranges comparison the 2003 all-star test offered.

With 39 products in the running—18 one-part varnishes, three two-part varnishes, and 18 "teak treatments"—and more likely to be added, the data can be overwhelming. To avoid making the world of wood finishes more complicated than necessary, we'll present the products and results by category, but will test them together to ensure that they face the same conditions. This article—the first of several reports—focuses on one-part varnishes, their ease of application, and their original gloss. We'll introduce the two-part varnishes and various teak treatments being tested in subsequent articles. We've included the best known brands of marine products as well as a few off the shelves of the local hardware store.

Determining which type of exterior wood coating is best for your boat boils down to identifying your priorities, needs, and taste. Do you want high-gloss or matte finish? Are you a low maintenance-type of owner or are you willing to spend as much time sanding as sailing?

In our opinion, the ideal exterior wood coating is fast and easy to apply for even the novice brightwork nurse, and it is easy to maintain, lasts for multiple seasons, and won't break the bank.

VARNISH

Varnish is a transparent, hard coating. It gives wood a traditional, natural look by allowing its true color to shine through. It doesn't penetrate as far into the wood as other finishes, but it offers good protection due to its hardness. It tends to last the longest (multiple seasons), but is the most work to apply (many coats and much sanding).

Varnish has five main ingredients: oil, resin, solvent, dryers, and additives. And it is broken into four groups, depending on its base: alkyd, polyurethane, latex, or phenolic.

Varnishes with modified phenolics are expensive, but usually deliver top-notch durability. They neutralize oxidation, but tend to yellow fairly quickly. Oil, polyurethane,



PS VALUE GUIDE EXTERIOR WOOD FINISHES: ONE-PART VARNISHES

PRODUCT	PRICE **	SOURCE	COLOR	NO. OF COATS*	RECOAT*	SAND BETWEEN COATS	ORIGINAL GLOSS
Ace Polyurethane Clear Finish Gloss 16377	$9 / quart	Local Ace Hardware	Clear	2 minimum	48 hours	Yes	Good
Ace Spar Varnish Gloss 16373	$8 / quart	Local Ace Hardware	Clear	4	4 hours	Yes	Good
Deft Defthane Polyurethane Satin	$14 / quart	hardwarestore.com	Clear	3 minimum	4-6 hours	Yes	Fair
Detco Crystal	$31 / quart	fisheriessupply.com	Clear	10-12	Overnight	Yes	Good
Interlux Goldspar Clear	$28 / quart	ahoycaptain.com	Clear	5-6	8-12 hours	Yes	Excellent
Interlux Jet Speed Varnish $	$18 / quart	boatersland.com	Clear	5-6	4-6 hours	Yes	Excellent
Interlux Schooner	$20 / quart	boatersland.com	Warm golden	5-6	8-12 hours	Yes	Good
Epifanes Clear High Gloss ✓	$28/ quart	shipstore.com	Clear	7-8	24 hours	Yes	Excellent
Epifanes Rapid Clear	$28 / quart	defender.com	Clear	4-5	5-6 hours	No	Fair
Epifanes Wood Finish Gloss ✓	$23 / quart	defender.com	Clear	5-7	24 hours	No	Excellent
HMG K Type Varnish	$27 / quart	newfound.com	Clear	5-10	12-18 hours	Yes	Excellent
Minwax Indoor/Outdoor Helmsman Spar Urethane	$14 / quart	hardwarestore.com	Clear	2 minimum	4 hours	Yes	Excellent
Pettit Bak V-Spar 2053 ✓	$29 / quart	jamestowndistributors.com	Clear	2-6	Overnight	Yes	Excellent
Pettit Z-Spar 2015 Flagship ✓	$28 / quart	jamestowndistributors.com	Clear	4 minimum	4-8 hours	Yes	Excellent
Pettit Z-Spar Captain's Ultra Clear 2067	$37 / quart	jamestowndistributors.com	Clear	2-6	Overnight	Yes	Excellent
Pettit Z-Spar Captain's 1015 Traditional Amber	$25 / quart	jamestowndistributors.com	Translucent Amber	4 minimum	Overnight	Yes	Good
Pettit Z-Spar Captain's EZ Care 1016 (Woolsey)	$29 / quart	jamestowndistributors.com	Translucent Amber	3 (generous)	24 hours	No	Good
West Marine 5-Star Premium ✓	$30 / quart	westmarine.com	Clear	7-8	24 hours	Yes	Excellent

✓ Recommended $ Budget Buy *Recommendations for bare wood. **Per-quart prices calculated when product sold in metric sizes.

and epoxy varnishes cure quickly but tend to remain liquid even after evaporation of the solvent, going through stages of drying, from liquid to gummy, to tacky, to hard.

Alkyd varnishes are rather flexible but oxidize quickly outdoors. As resin varnishes dry, the solvent evaporates, and the coating hardens almost immediately. Acrylic and waterborne varnishes have a longer curing period; they "dry" when the water evaporates.

Thick polyurethanes typically offer less wood penetration than oil-based varnishes, because they harden faster. However, some makers slow the process by using thinning additives that allow the coating to seep further into the wood. Polyurethanes are prone to delamination or oxidation when subjected to heat.

The additives in varnishes and all wood coatings have specific functions: Flatteners result in a matte



As part of the gloss comparison, testers held a multi-bulb LED flashlight 4 and 6 inches above each coated panel. Panels with a mirror reflection of the bulbs (far left) were rated Excellent. Those with a less detailed reflection (center) were rated Good. Most teak oils do not have any gloss (right), but ratings for all coatings subsets were relative to the panels in their subset.

EASE OF APPLICATION	COMMENTS
Good	Brush on only; oil-based polyurethane; better suited for interior wood
Excellent	Brush on only; results in amber color
Excellent	Brush or spray; oil-based polyurethane
Fair	Tung oil and phenolic resin; no sanding first 4 coats
Good	Brush, roll, or spray; polyurethane
Excellent	Brush, roll, spray; not recommended for exterior use without overcoat; quick-drying for quick buildup
Good	Brush, roll, or spray; traditional, tung-oil varnish
Good	Brush, roll, or spray; tung-oil based; phenolic resins (spar varnish); OK for all woods
Excellent	Brush, roll, or spray; alkyd/urethane resin base
Good	Brush, roll, or spray; phenolic resins (spar varnish)
Good	Brush, roll, or spray; polyurethane and alkyd resins
Excellent	Brush on only; oil-based polyurethane
Excellent	Brush or spray; tung-linseed oil/phenolic resin varnish
Excellent	Brush or spray; tung-linseed oil/phenolic resin varnish
Excellent	Brush or spray; urethane resin; same as 1015, but clear
Good	Brush or spray; alkyd/phenolic and tung-linseed oil high solids varnish
Excellent	Should not be thinned
Good	Formula identical to Epifanes Clear High Gloss

finish; other additives reflect the sun for UV protection, reduce oxidation, or inhibit cracking.

Most of the finishes we tested are one-part coatings, but, there are a few two-part systems, such as Interlux's Perfection. Once the two parts are mixed, the product has a limited "pot life," or working time. They require more application effort, but are generally regarded as being more durable than single-parts.

OTHER WOOD FINISHES

Wood oils, stains, and synthetic coatings are more flexible than varnish and will not crack or peel. Their main appeal—and the impetus behind their rise in popularity—is that they are easy to apply, requiring fewer coats than varnish, and little or no sanding between coats.

Oils dry fast and penetrate deep into the wood, but they lack the hard protection of varnish. Several coats of oil will typically offer about six months' protection. Some oils have a sheen to them, but most do not have that glossy, classic look of varnish or some synthetic applications, like Sikkens Cetol or West Marine's WoodPro Plus. The oils are good coatings for areas where "Slippery When Wet" coatings can be dangerous. Matte-finish synthetics like Cetol and WoodPro Plus, applied without their gloss overcoat, are also good for these areas.

Oils range in color from clear to dark brown. Many synthetic finishes have added pigments that can turn the wood red, yellow, or an opaque brown. Some, like Deks Olje and Cetol, are considered varnish alternatives as they combine an oil-based bottom coat and a glossy sealer coat to offer the deep penetration of an oil and a hard top layer like a varnish.

HOW WE TESTED

The focus of this test is to evaluate three things: a product's ease of application; the integrity of its gloss and appearance; and how it fares over time under real world conditions.

Testers cut dozens of 4 x 1-inch panels from the same bare teak. Each product and each panel were assigned a number so that judging could be done blindly. We coated each panel on all sides with its corresponding, numbered test product.

The panels were prepared and the coatings applied per manufacturers' instructions. When a range was given for the number of coats to apply, we went with the minimum. Three *PS* testers evaluated and rated the original gloss of each panel. The next step will be to mount the panels on a rack and set the rack at a 45-degree angle in an unobstructed area outside.



While traditional varnishes, like HMG's Type K, are transparent, most synthetic coatings include a pigment, such as the blonde Teak Lustre Satin, reddish WoodPlus Pro, and brown Sikkens Cetol Light with Gloss.

CONCLUSIONS

Based solely on original gloss and initial appearance, testers' picks so far for one-part varnishes are Interlux's Jet Speed Varnish; Epifanes' Clear High Gloss and Wood Finish Gloss; Pettit's Bak V-Spar 2053 and 2015 Flagship; and West Marine's Five-Star Premium, which is a rebranded Epifanes High Gloss. Stay tuned to see which products still look good at six months and longer.

No matter which coating you go with, the key to a durable, good-looking finish is proper preparation. For free tips on application, visit *www.practical-sailor.com*, select "Tools and Techniques," and click on "Sparkling Brightwork: Careful Attention to the Details."

CONTACTS

INTERLUX, 800/468-7589, yachtpaint.com

EPIFANES, 800/269-0961, epifanes.com

HMG MARINE PAINT, 864/578-6770, hmgmarine.com

PETTIT, 800/221-4466, pettitpaint.com

WEST MARINE, 800/685-4838, westmarine.com

DETCO, 800/845-0023, detcomarine.com

MINWAX, 800/523-9299, minwax.com

ACE, acehardware.com

DEFT, 800/682-2483, deftfinishes.com



ON THE HORIZON
FLEXIBLE WATER TANKS
OUTBOARD ENGINE MOUNTS
CRUISING SOFTWARE
BOTTOM PAINTS

Practical Sailor

Oil and Fuel Filters

OEM vs. after-market: Is there a difference?

Are there any significant differences in the quality of an OEM Yanmar Oil Filter and a Fram filter from K-Mart?

Warren Milberg
1986 Hunter 28.5
Deale, Md.



PS ADVISOR

One PS contributor, the manager of a custom boatbuilding and repair/refit yard, had this reply: "Not all filters are created equally: There are differences from filter to filter. We see no problem using after-market filters whose reputations are proven: brand names such as Fram (makes filters for Honda, Chrysler, and others), NAPA, Wix (Wix actually manufactures NAPA's Silver and Gold series filters), Fleetguard (owned by Cummins Filtration), and Baldwin to name a few.

"If you have a failure and the engine manufacturer points a finger at the filter maker, you have a better chance of obtaining restitution from a well-established manufacturer than one with a brand that's been relabeled for chain stores.

"As far as filters and other 'after-market' parts are concerned, your rights as a consumer are protected by the Magnuson-Moss Warranty Act of 1975. In short, it says, 'no warrantor of a consumer product may condition his written or implied warranty of such product on the consumer's using, in connection with such product, any article or service (other than article or service provided without charge under the terms of the warranty)…'

"This means that if an engine manufacturer claims that you must use OEM filters, or oil for that matter, or the warranty is void, he must either provide these products at no charge or he is in violation of this law. If you suffer a failure within the warranty period and the manufacturer asserts that it's a result of the filters or oil you've used, the onus is on them to prove that this is true, and if they do so, then you have a strong case with the manufacturer of the filter.

"Boatyards use after-market fuel and oil filters on a regular basis and rarely have issues with them. The 'issues' typically involve the dimensions of the filter itself. On occasion, the after-market filter is larger (not a bad thing, larger often means more filter media is inside) than the OEM part. Other than that, it's simply never presented a problem for us. The difference in price, even for the exact same part depending upon where it's purchased, can be considerable. We recently installed oil filters on a diesel engine that's no longer in production. The one remaining dealer sells the appropriate filter for over $100."

While this advice is purely anecdotal, PS has cut open many fuel and oil filters to analyze their contents, and in doing so, we've discovered that often, higher-quality after-market filters have more pleats or media than the OEM equivalent. As most folks know, few engine manufacturers make their own filters.

So, why can't you purchase the same filter, with a different label and get the same results for a fraction of the price? You can, however, you must observe some guidelines. Just because a filter screws onto the engine's threaded boss doesn't mean it's the right filter. It must be properly cross referenced. This information is available in catalogs available from filter makers. The filter must be capable of providing the correct filtration as well as proper flow rate and bypass valve pressure release (when an oil filter becomes dirty, it will allow the oil to bypass the filtration media because dirty oil is better than no oil at all) as well as an anti-drain back capability if that's called for in a particular application (horizontal or inverted filters for instance).