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Practical Sailor

Sydney 36CR

A wolf from Down Under takes aim at the American racer-cruiser market.

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ALSO IN THIS ISSUE

Polluting Yachties Destroying Planet!

Last summer, my son and I made the mistake of taking our 14-foot O'Day Javelin for a spin on Sarasota Bay, Fla., near *Practical Sailor*'s editorial office. A stench filled the air, and the bay was littered with the floating carcasses of dead fish—rotting cowfish, triggerfish, snappers, and some very big redfish. We had seen the future . . . and it was horrifying.

The culprit was red tide, a toxic algae that can kill marine life and set off a chain reaction that turns large stretches of water into "dead zones," areas so deprived of oxygen that fish literally suffocate.

Some experts link red tide blooms in Southwest Florida to the nutrient runoff from cane fields, lawns, and golf courses. Given the political clout of Big Sugar and developers in Florida, I expect boaters will soon be blamed for the mess. I am always amazed at how easily politicians can dilute the intentions of the Clean Water Act and shovel the burden onto sailors. How people who rely on the wind for propulsion and the sun for their power have become easy targets for enviornmental legislation says volumes about the way our political system works.

In Rhode Island, boaters—not an antiquated municipal sewage system—took the hit for contaminated shellfish beds. In the Florida Keys, boaters—not the plague of leaky septic systems—were pounded for polluting the reefs. And in California, bottom paint—not the state's vast chemically enhanced farms—are being blamed for the pesticides that are leaching into bays.

What's next?

Come September 2008, the U.S. Environmental Protection Agency may start regulating the few activities on recreational boats that are still exempt from the Clean Water Act—using a sink, taking a shower, rinsing the hull, pumping out the bilge, and running the engine. Effectively, anything that is not yet regulated, and involves putting something in the water from a boat, could require an EPA permit.

How did we wind up in this fix? Blame it on a troublesome little hitchhiker called the zebra mussel.

Notorious foulers that can effectively clog power-plant cooling systems, the mussels presumably first came to the U.S. via ship's ballast water. Because it is incidental to a ship's normal operation, ballast water discharge has long been excluded from the permitting process established under the Clean Water Act.

As a result of a lawsuit brought by some states and environmentalists to stop the spread of invasive species, a U.S. District Court recently ruled that the EPA did not have the authority to exclude such "operational discharges."

This ruling is under currently under appeal, but I'm not holding my breath.

House Bill H.R. 2550, introduced by Senator Gene Taylor (D-Miss.) and currently in sub-committee, aims to stop this runaway train in the station. If you'd rather not pay for a permit to rinse your deck, I'd encourage you to write your congressman, expressing support for H.R. 2550.

The bill does not roll back existing environmental laws, or exempt big ships from laws restricting the discharge of ballast water. It applies only to *recreational vessels*, exempting those discharges that are incidental to the vessel's operation—including deck runoff, engine cooling water, gray water, and *oil-free* bilge water. Laws prohibiting the discharge of oil, trash, and waste will remain in full force.

If enacted, the bill won't bring us any closer to the truth about what's killing our oceans, but we will be able to brush our teeth without being branded outlaws.

Darrell Nicholson
Editor

On the cover: The Sydney 36CR feels the draw of its assymmetrical. Photo by Andrea Francolini/ Sydney Yachts

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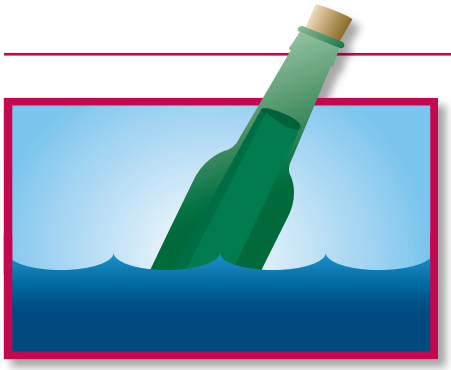


Volunteers put their toes to the test on our grip-measuring device. One interesting fact we found: The bigger the feet, the better the grip. But on average, bare feet did as well as our favorite shoes: The women's Teva Atrato and men's Timberland Eurus Low II.

BARE FEET vs. BOAT SHOES

Your article on men's and women's boat shoes was very informative, and for reference, I would like to see the wet and dry grip angles for bare feet, which many of us "use" during hot weather.

Rob Ransone
Great, Herreshoff 19 cat boat
Chesapeake Bay, Va.

We subjected some volunteer bare feet (and the individuals to whom they are attached) to the same test used in the comparison of men's and women's athletic-style boating shoes (June and July 2007, respectively). On average, bare feet gripped as well as the top performers in our shoe test: Bare feet lost grip at a 35-degree angle on fiberglass (wet and dry) and 40 degrees on teak (wet and dry). We suspect the "grippiness" of bare feet can vary greatly according to each individual, so these conclusions probably cannot be applied broadly. Several readers also inquired about other style boat shoes, including sandal-style and the familiar Sperry Topsider moccasin style. We will compare those in future tests.

VERTICAL WIND TURBINES

I am reading with great interest your very well written article on wind turbines in the June 2007 issue of *Practical Sailor*, and want to make sure that you are aware of another type of wind turbine that does not employ blades, but works on a vertical axis principle. While somewhat more costly than the traditional types, the maker claims there are numerous advantages (especially for boaters) to this design, some of which include: less noise (vertical wind turbines produce 0 db of sound); more efficient (vertical wind turbines begin to produce electricity at 3-6 mph of wind); less dangerous (vertical wind turbines have no blades); greater ease of installation (vertical wind turbines do not require the horizontal space turbines with spinning blades require); less harmful to birds (birds perceive vertical wind turbines as solid objects and do not fly into them).

The current higher price will be mitigated somewhat in the future when the vertical wind turbines are manufactured in the U.S. At present, they are manufactured in Europe.

I hope that in a future article, you will be able to review this type of wind turbine and compare it to blade versions. A link to one brand of such turbines is: *http://www.tangarie-energy.com.*

Joe O'Hara
Via e-mail

We consulted James Johnson, the senior mechanical engineer at the National Wind Technology Center on this topic, and here was his take: "From an aerodynamic perspective, a nearly pure drag device [such as this] cannot come close to other types of lift-generating wind devices used to make electricity. It may be relatively quiet, but I guarantee that it makes sound, all wind machines do, especially drag devices... Drag devices start easily in low wind speeds, but generator output, if any, is very low. There just isn't enough energy in the really low wind speeds for any machine to make much (or any) power... We've spent several million dollars over the last 10 years looking at avian interaction with wind turbines, and there is no scientific evidence that birds don't fly into things that they can see, partially see, or not see at all. This type of wind generator may work fine to produce a small amount of electricity to keep batteries charged. The thing to look at would be a published authenticated power curve (power output vs. wind speed). That and cost are the most general way all wind machines are compared.

PENETRATING EPOXY AND VARNISH

I'm redoing my teak rails. I intend to use varnish to refinish. A fellow boatowner suggested when I get down to the bare wood, I should use a "penetrating epoxy" after sanding and before applying the varnish. He said it will prevent moisture, the culprit in deterioration. Is he right?

Brad Brown
Eagles Nest, Beneteau 36 CC
Chula Vista, Calif.

Teak does not like nor need to be epoxy coated. Its high oil content both protects the wood and can cause adhesion problems if epoxy encapsulated. Epoxy rot treatments are not intended to be primers for varnish. Not only do they make an inferior substrate for such a purpose, but when it comes time for removal, the process can be daunting.

The Practical Sailor *mooring chain test continues. The chains are still in the drink, but at the six- and 12-month marks (September 2006 and July 2007), we liked the Acco Grade 30 proof coil.*

CHAIN TEST

As a metallurgist, I wish to comment on your article regarding immersion testing of mooring chains ("The Crusty Proof," July 2007). I do not believe the slight staining will affect the performance of the AISI 316L alloy. Had the chain been fabricated from AISI 304 stainless, crevice and pitting corrosion can be experienced, particularly with welded non-stabilized alloys.

Use of chain made of stainless steel that is inferior to 316L is flirting with possible disaster. The consequences of chain failures can be very costly, since they frequently occur when the boat is unattended.

In addition to normal corrosion that occurs in aerated or still salt water, fretting corrosion is also a major concern. Fretting corrosion occurs when the chain links rub against one another, removing, in the case of coated chains, the protective zinc coating rather rapidly. This results in relatively high rates of corrosion. Stainless alloys resist normal corrosion through the formation of a thin layer of protective oxides that form naturally on the surface.

When immersed in a corrosive medium like salt water, this oxide film forms at high initial rates, then drops to near zero when the oxide thickness reaches a value where oxygen can no longer reach the metallic surface. Fretting at contact points can remove this coating, resulting in higher rates of oxidation and increased loss of material.

Your upcoming test where the chains are suspended with an applied load should prove interesting. One caution, having the various grades of chain in contact with one another can produce skewed results. Stainless alloys can corrode more rapidly when in contact with carbon steels. Mutual contact between the carbon steels may also mask individual corrosion performance.

Dr. Charles F. Barth
Crazy Horse, 1982 C&C 37 TR
Lorain, Ohio

FIELD REPORT ON WAECO 52

Unfortunately, your articles about portable refrigerators (*PS* April and May 2007) are too late to help me. I bought a Waeco 52-quart portable refrigerator several years ago for my older Bristol 35.5. I chose a portable refrigerator because rebuilding the ice box and cabinetry for an efficient built-in was going to cost me many thousands of dollars. For my boat, I think I made the right decision even without considering the cost difference.

The unit doesn't use much energy. We've spent the past two years in the Sea of Cortez. With two 85-watt solar panels, we can be at anchor indefinitely without running the engine. The portable unit allows us to turn the former ice box into a large storage area, a real boon on a small boat.

The best that I can figure is that the control unit adjusts the temperature in 8 to 10 degree increments. We set our unit so that the bottom is about 32 degrees and the top is around 40 degrees. The side pocket, which we use for beverages, is somewhere between 45 and 48 degrees. At this setting, we can keep meat almost frozen (almost) on the bottom for five days.

I might have purchased another unit if I had read your article first, but so far, I am very happy with the Waeco.

Carl Hunt
Sarmiento, 1979 Bristol 35.5
Boulder, Colo.

Although a well-insulated built-in box will be more efficient, these portable compressor fridge-freezers offer a quick, hassle-free way to add a fridge or even a freezer on a boat that lacks one. We were able to freeze water with all of the units we tested. Several readers who use these units recommend that a folded towel over the lid-top helps improve efficiency.

GLACIER BAY ON PROPULSION

As a staunch environmentalist and the founder of a company focused on developing environmentally friendly marine products, I welcome the discussion of the potential fuel efficiency afforded by the move to diesel-electric propulsion ("Propulsion of Tomorrow," July

2007). The potential for savings is real, and we typically expect a reduction of around 30 percent for most users of our OSSA Powerlite system. Nevertheless, I am concerned about the intense focus this subject is beginning to garner.

I am increasingly seeing even well-respected marine technical writers trying to simplify a fuel efficiency comparison. The only way to compare the fuel efficiency of different electric systems with each other, or electric systems with conventional systems, is when referenced to a standardized course. The same is equally true of cars and home refrigerators. Otherwise the EPA could simply publish the fuel efficiency of a particular engine or electrical efficiency of the refrigeration compressor used in a given model. On our website is a paper that explains that the potential to obtain superior fuel efficiency with electric drive must be viewed in light of the performance of the fully integrated system, not simply a tally of losses at a particular engine load.

My second concern is that all this concentration on fuel efficiency misses the big picture of the advantages gained with electric drive. When Toyota decides to move its entire product line to hybrid-electric propulsion (they started with the Prius), better fuel economy was not the main reason for doing so. Rather, Toyota recognized that conventional technology had reached the limit in its ability to provide a superior user experience without increasing cost. Moving to electric drive changes the equation at a very fundamental level. Freed from the constraints imposed by conventional drive systems, innovative designers now have a path to creating vehicles that are quieter, more comfortable, safer, more reliable, better handling, more convenient, cleaner and, ultimately, cheaper than would otherwise be possible.

Founder/CTO Kevin Alston
Glacier Bay Inc.

HALF-BAKED EDITOR

The "No-Bake" Oatmeal cookies [with raisins and nuts] in your July editorial ("If You Can't Take the Heat . . .") sound like a wonderful addition to a long cruise. However, your directions did not use all of the ingredients! You only used the first four ingredients; you never used the peanut butter, vanilla extract, nuts or, most importantly, the oatmeal!

Arnold M. Flank
Via e-mail

The editor's ineptitude with all things cooking-related apparently extends to the editing of recipes. With all due apologies to his long-suffering wife and PS *readers, Theresa's recipe (adapted from similar recipes from various sources) for No-Bake Oatmeal Cookies is reprinted at right.*

TWO BURNERS ARE ENOUGH

Regarding your recent test of three-burner stove ovens, you really don't need more than a two-burner stove. Also, it is important to see how much space there is between the burner and the stove's sea rail to make sure your pots fit centered over the burners.

Corinne Kanter, Author
"*The Cruising KISS Cookbook II*"

TRY A TASCO

I read over the article about seagoing galley stoves with great interest. I have cooked across a large portion of the Pacific using a Force 10 stove, and frankly, I'm not sure that I would cook on one, willingly, again. I ordered one for my own boat and was very dissatisfied with the quality of the construction, the fold down/fold under door, and the height of the sea rail. In fact, one Force 10 salesperson told me that if I needed a proper sea rail, I shouldn't be cooking. (There have been times when I've wholeheartedly agreed, but I still had to cook).

Tasco 755LP

It would have been nice to include whether the insulation is sufficient to keep the outside of the stove reasonably cool. In practice, I found that the Force 10 got hot enough on the outside of the oven to burn the cook. Another feature that I found troublesome is that if you have something cooking on the top of the Force 10, you have to either move it or hold it on while you open the oven door, or you could end up with a lot of something boiling down

NO-BAKE OATMEAL COOKIES

INGREDIENTS

- 2 cups granulated sugar
- ½ cup evaporated milk
- 2 tablespoons cocoa
- 4 ounces butter (canned butter)
- 3 tablespoons peanut butter
- 1 teaspoon vanilla extract
- ½ cup chopped peanuts (or any available nut)
- 2 ½ cups quick-cooking oats

PREPARATION

Combine sugar, milk, cocoa, and butter in a medium saucepan. Bring mixture to a boil over medium heat, stirring constantly; boil for about 1 minute. Remove from heat, stir in vanilla, peanut butter, and nuts; add oatmeal and mix well; spread into cookie pan or casserole dish; let cool into one giant cookie; cut in squares.

Weems & Plath recommends using its brand of oil for its Yacht Lamp (at left). Typically, these refined fuels burn more cleanly than lower-grade liquid fuels like K-1 grade kerosene.

your front. This can be a problem with all stoves, but with the Force 10 this issue is intensified because the door slides under. And yes—as the testers pointed out—you can unlock the door all too easily. Even a good bounce off a wave can do it.

Virginia Jones
West Tisbury, Mass.

All of the stoves fell short of our ideal, but we yet hold hope that Tasco, Force 10, and others will yet come up with better ways to meet the cooking needs of the cruising sailor.

As described in our stove review, in addition to liking the Force 10, testers found the Tasco to be a very practical unit with many of the features we liked. The excellent sea rails, large oven, and efficient stovetop burners scored highly in the comparison, and sailors who value these features should not overlook the Tasco as a viable option.

Testers did check temperatures on the outside surfaces of each stove when it was heated to 350 degrees F. The Tasco was cooler at the front (83.3 F), by about 2.5-degrees F, than the Force 10. Only the front of the Origo 6000 was noted as being "too hot to touch."

LAMP FUEL

I just picked up a Weems and Plath Mini Yacht Lamp, and Weems and Plath recommends its brand of fuel. I recently read somewhere about a lower-priced alternative. Any suggestions?

Andy Araneo
Catalina 25
Humboldt Bay, Calif.

Your Weems and Plath Mini Yacht Lamp will burn on a wide variety of fuels, but it is primarily meant for use with highly refined kerosene (also called paraffin). Generally, highly refined or "pure" paraffin such as the Weems and Plath potion ($35 a gallon at West Marine) burns cleaner and has less odor than the much cheaper option, low-sulfur kerosene (K1 grade) that is used in some kerosene heaters and is also used in oil-burning lamps. We presume that some of the many other brands of lamp paraffin available at major retailers, candle stores, chandleries, and the Internet will burn as clean as the Weems and Plath variety, but have not tested this. If there is a reader who is happy with an inexpensive, clean-burning lamp oil, we'd like to hear about it. As is the case with all fuels, you'll get a better price buying larger volumes.

The editor lived quite happily for many years using mostly low-sulfur kerosene in his Weems and Plath lamps. Yes, soot buildup and smoke stains were problems, but regular cleaning, and keeping wicks clean and trimmed helped minimize this. Not surprisingly, the closed-type "hurricane" lamps like the Mini Yacht Lamp seemed more susceptible to soot buildup than open-chimney type lamps. One chief difference between highly refined "pure" lamp oil and K1 grade kerosene is that the paraffin will gel at about 40 degrees F, while you can still pour kerosene at below-freezing temperatures. Otherwise, the choice between lamp fuels like the Weems and Plath oil, K-1 kerosene, or any of the other suitable fuel, depends on availability, your own threshold for odor and soot, and what you're willing to spend. If there is enough interest in this topic, we could certainly compare lamp fuels and costs.

TETHER TANGO

In regards to your recent tether review ("Sailing on a Short Leash," January 2007): When I tried to purchase the recommended West Marine tether with Kong Tango clips, West Marine was back-ordered for weeks on tethers.

So, with my summer cruise approaching, I got a little desperate. During a late-night Google session, I found a tether being sold by Defender Inc. (*www.defender.com*) that turned out to be an absolute winner. It is a dual tether with elastic stretch and a safety hook (product number 000272). It is actually manufactured by Kong, Italy (*www.kong.it/*). The Kong carabiners are things of beauty. They are lightweight, extremely well built, and do not leave any marks on the topsides as they shuttle along the jacklines. I am tempted to buy a few of them to play with at the office, they are that cool.

The other great thing about this tether is it is being sold for $100, $50 less than the West Marine version.

The Kong tether as a whole is an extremely robust build. Also, one respondent to your review stated that the double tether was a pain, and inevitably one leg or the other had to be cut off or taped. I single-hand my Freedom 30 and use the

Since our last tether review in January, PS has been putting the new Kong safety hook through its paces. After immersing it in seawater for three weeks to check corrosion resistance, we found a lot of barnacles but only minor corrosion (on one rivet). Otherwise, the hook was not affected. Its load-bearing capability does not appear to have been compromised. Stay tuned for a full report in a future PS issue.

Kong safety hook

Kong safety hook after 3 weeks in seawater

long leg in the cockpit where I clip into a deck pad eye and the short leg to go forward on the jacklines. There is just enough stretch in my configuration to allow me to stay clipped in while I switch from one to the other. It worked out perfectly.

Regarding what to do with the unused leg: The Kong Tango carabiner has a tapering hook end. There is enough room on the tether side of the quick release shackle to allow the unused leg to be clipped into it.

This puts it completely out of the way (even the long one) and does not interfere with the operation of the quick release in any way.

I believe that folks should get in the habit of setting their quick-release lanyard on the same side all the time. In a stressful situation, you should know where your quick release is.

William Cunningham
Jacqueline, Freedom 30
Stockton Sailing Club, Calif.

CORRECTIONS

The president of Container Yachts is Bernie Blum. His last name was misspelled in our review of the Far Harbour 39 in the July 2007 issue.

Titanium dioxide and zinc oxide used in sunscreens are inorganic compounds, contrary to what was stated in the Mailport section of the August 2007 issue.

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.

WHERE CREDIT IS DUE

GO GARMIN

Garmin GPS 48

I have a 10-year-old Garmin GPS 48 whose internal memory battery was low and wouldn't recharge. I contacted Garmin to ask what type internal battery the unit used and whether I could replace it myself. They suggested I return the unit to them to have the battery replaced, but I didn't think the unit was worth their minimum service fee. When I couldn't figure out how to open the case and submitted a question on *www.Ask.com*, one of the half-dozen hits I received was for *www.sailnet.com*, where I learned there was a problem with the recharging circuitry in the GPS 48, and Garmin would repair the unit for free. I returned the unit. Garmin sent a refurbished unit and even transferred all my stored waypoints to the new unit at no cost. With customer support like that and their willingness to stand behind such an old product that is no longer in production, they have won my lifetime loyalty and I will always buy Garmin products.

Ed Giles
Pearson 26
Portsmouth, Va.

PROPS FOR POLY PLANAR

I want to commend Poly-Planar, manufacturer of waterproof marine and audio systems, for excellent customer service. Two and a half years ago, my wife purchased an MRD 60 marine stereo FM/CD player for my birthday. I installed the unit per the instructions. Recently, the unit stopped playing CDs and displayed an error message instead. I called Poly-Planar, and they asked me to return the stereo unit. The warranty had expired six months prior to my contacting them. As requested, I shipped the unit. To my great and happy surprise a new unit arrived two days later. A one-day turnaround, no questions asked—now that's great service.

James Calver
Moonlight, 1970 C&C 40
Stamford, Conn.

Poly Planar MRD 60

Photo by Andrea Francolini/ Sydney Yachts

Second Wind

Call it a cruiser if you want, but the exterior of the Sydney 36CR says "at home on the start line."

The Sydney 36CR represents the latest incarnation of a pedigreed Aussie racer.

There's no evidence that the first caveman who paddled off on a log was into racing, but virtually ever since then, the idea of a dual-purpose boat has been afloat.

Introduced to the U.S. in February of this year, the Sydney Yachts 36CR (Cruiser Racer) is an instructive take on that time-honored idea that you can have your cake and eat it too. Designed by the Aussie firm of Murray, Burns, and Dovell, the 36CR was developed by folks who have long operated at the highest levels of the racing universe. The boat is built by Sydney Yachts, a division of Azzura Marine born from BH Boats/Bashford International, which claims its boats have "strength-to-weight ratios that far exceed anything else available in the boatbuilding industry in either Australia or the rest of the world."

Looking at the boat with its 60-inch carbon-fiber wheel, open cockpit, and utterly clean foredeck, we couldn't help but wonder whether it earns that "C"? What kind of cruising do they do down in Australia?

The term "performance cruiser" has gone through a dramatic evolution over the last few decades. Back in the day of Bob Perry's Valiant 40, "performance cruisers" progressed mainly through the water. "Performance" today, it seems, is more about moving over the water. Few designers have been more involved in that evolution than Iain Murray and company. Six-time world champion (designer/builder/skipper) in the flying "Eye-deen" skiffs that race for cash off Sydney, Murray went on to world titles in varied classes (12 meter/Etchells/maxi) and offshore racing (Sydney-Hobart). He also devoted decades to the America's Cup wars. His partner, Andy Dovell, point man on the Sydney 36 design, was designer of record for the past three Aussie AC challenges.

Sydney Yachts grew out of BH Boats, a company founded by J-24 and multihull wizard Ian Bashford in the 1980s, which morphed into Bashford International when it began to produce semi-custom offshore racers. Its first Sydney 41 was a Murray, Burns, and Dovell design named *Raptor*, a boat that won the 50th Sydney-Hobart despite being delivered to the line "out of the box" from the factory. The BH36 was launched in 1995. Like *Raptor*, it enjoyed early racing glory (winning Melbourne's Nissan Regatta). Designer Dovell recalls the BH36 as "one of my favorite designs." In 1996, Bashford died at 37 of a heart attack. The company became Sydney Yachts, and the 36-footer lived on.

THE DESIGN

When the 36 debuted, it was very much in the shadow of the 41. "She never got much of a blast at the time, but ever since, I've been getting great feedback from around the world," Dovell said.

The 36 began life as a masthead racer, short-ended and relatively beamy by modern proportions. It weighed 9,500 pounds and carried 743 square feet of sail. Later, around 2000, it resurfaced with a new rig as a sportboat. Sailmakers who campaigned this version on the Great Lakes for a season reported it was a sweet sailor.

Toward the end of 2005, Sydney Yachts asked Dovell to revisit the design. He gave it a modern rig with swept-back double spreaders, a totally new deck, and, most importantly, a new and heavier keel.

"It was a question of taking a nice set of lines from a hull that had more than proven itself and making it better," Dovell explained. "The

cockpit shrank, though the closed transom of the earlier design was traded for the proven advantages of an open aft-section; the interior grew; the rig became more efficient and easier to handle; and, most of all, we dramatically increased her stability with a modern bulbed keel." Voila—the Sydney Yachts 36CR.

Adding weight to a raceboat might seem strange. Dovell explains, "the 36 is relatively voluminous compared to a dedicated racer. Her sections are rounded and clean, so she can accept a reasonable payload. Balance and distribution of volume are keys. She's not what I'd call 'cruisey,' but she is far more forgiving than lighter, narrower boats."

Over 90 percent of the weight added to the design (almost 2,000 pounds, according to Dovell) is in the cast lead keel. Its 12 percent (thickness/chord) fin is hardly a blunt instrument, but the designer chose it for efficiency through a wide range of attack angles to give the boat a relatively wide groove.

The bullet-shaped bulb at the bottom concentrates the majority of the weight 7.5 feet below the waterline, where it will do the most good. Form stability is important, as is a low vertical center of gravity, but having one of the highest ballast/displacement ratios (43 percent) among modern racer-cruisers means that owners won't have to depend on "rail meat" to keep it upright.

Like other Sydneys, the 36CR carries an oversized wheel in a well. Available in assorted colors, of composite construction, and engineered to withstand a fair amount of abuse, the big wheel is nothing if not "racey." Dovell used a NACA section on the rudder; and reported that it tends to stall gradually instead of all at once, like some more aggressive shapes. "It all comes back to making the boat genuinely easy to sail," he says.

The same theme governs the rig. A pair of swept back (22 degrees) spreaders makes the backstay a sail adjustment tool rather than a structural necessity. Small and tall, the foretriangle accommodates a non-overlapping jib with a long, lift-producing luff. The lion's share of the power is in the 36CR's generously roached mainsail. The result is simplicity and ease in tuning, adjustment, and shorthanded sailing, with no significant penalty in performance potential.

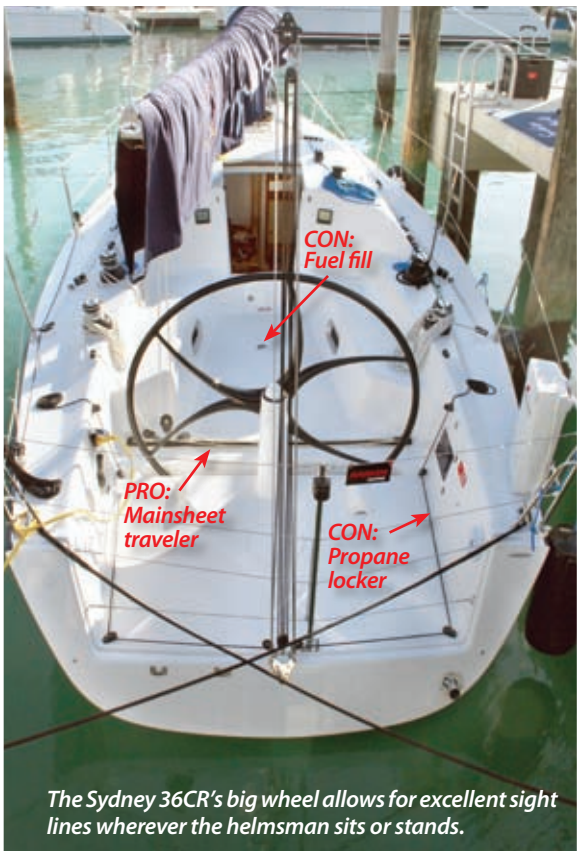
CRITIC'S CORNER: SYDNEY 36CR

PROS

- *Efficient mainsheet traveler design.*
- *Well-placed sheet winches.*
- *Clean, ergonomic deck layout.*
- *Wide, clear side decks.*
- *High bridgedeck, tight companionway.*
- *Bare lifelines permit easy inspection.*

CONS

- *Installing emergency tiller is unnecessarily difficult.*
- *Side-opening propane locker.*
- *Fuel tank fill in cockpit sole prone to water intrusion.*
- *No dedicated life raft locker.*



The Sydney 36CR's big wheel allows for excellent sight lines wherever the helmsman sits or stands.

ON DECK

The new deck was designed to foster "all-round" sailing. Seats in the cockpit offer a respite from rail-sitting while leaving the space open enough for a racing crew to work. The coachroof was lengthened, widened, and raised to provide a roomier interior. Styling has been updated via smoked glass "swoosh" side windows, rounded corners, and a profile that slopes integrally into the foredeck.

Call it "cruiser" if you will, but the Sydney 36CR looks like a raceboat. Its big wheel, open cockpit, thicket of winches, clear sidedecks, and flat-sheer/low silhouette profile say: "at home on the starting line."

Look closer, and the impression deepens. Our test boat was rigged with Dyform shrouds, Spectra lightweight running rigging, adjustable jib cars, and a removable, fixed carbon bowsprit designed to facilitate both fractional and masthead asymmetrical spinnakers. Dave Tomlinson, who oversees Sydney sales in the U.S. and hosted our test sail, says that some owners have opted for conventional spinnakers as well. One-design rules have yet to be codified.

Perhaps the supreme accomplishment of the layout is the 36CR's mainsheet arrangement. A Harken windward-sheeting Big Boat Traveler (6:1) recessed athwartships in the cockpit sole, just forward of the wheel, offers the maximum in accessibility and fine tuning, by virtue of both gross/fine tackles and a "German" two-sided purchase system

INTERIOR NOTES: SYDNEY 36CR

True to the boat's primary mission, the Sydney 36CR's interior reveals a boat that is better suited for day racing than comfortably cruising or ocean racing for more than a few days. A small galley, mediocre lighting and limited stowage space offset its one clear plus—four good sea berths. A family of four would be comfortable for a week-long cruise, and the saloon offers a convivial place to gather after racing, but cruising comfort is not the boat's strongest feature.

via the gooseneck that permits both high sided and double-winched mainsheet trim. All of this without creating a toe-stubber in the cockpit. Though a dedicated mainsheet trimmer could work easily while racing, the setup is one of the best answers we've seen to making solo or short-handed sailing less of a gymnastic challenge.

The 36CR's spar is tapered aluminum. A carbon-fiber mast is available as an option. Having Harken two-step (40 x 2 & 44 x 2) self-tailers as halyard and primary winches is a plus. The additional spinnaker winches on our test boat were an option. Any (or all) of the winches can be electrified. Clustering halyards and control lines at housetop clutches port and starboard is efficient, as is the 36CR's telescopic adjustable vang. All work stations seem to honor (as well as possible in a 36-footer) ergonomic reality. She has been set up for "hassle-free" operation, no matter how competitively you are sailing.

ACCOMMODATION

The big thing about the boat's interior is that it's big. While the Sydney 36CR doesn't match most boats in its size in cruising niceties—like tankage, (29-gallon fuel tank/26-gallon water tank), stowage, privacy, or even convenience—it does offer a remarkable amount of space to live in. "What I like about my boat is her openness. She's not cluttered," one Florida owner told us. "There aren't the nooks and crannies that cut up other boats." While the head is small, ventilation might be better, and the galley is a bit cramped, there's space enough for sailors to adapt to their own style of cruising and to make weekending and limited passagemaking attractive realities. Living aboard or taking it well offshore would involve substantial modifications.

Generally, the impression below is crisp, clean, and tasteful. The molded headliner masks deck hardware, but permits efficient wiring runs and appears easy to clean. Faux seams etched into the hull sides break up the "ice-box" feel. Joinery is production quality, but the touches of wood (southern myrtle for the most part) on door and locker frames, plus a large wooden drop-leaf table in the saloon work well.

The layout provides sleeping for six (two quarter-berths aft, two in the saloon, and a forecabin double). The saloon makes the most of the room afforded by the boat's exterior chainplates, and there is surprisingly ample space for all aboard to dine and socialize below.

Tucked well outboard, the galley suffers from squeezed headroom and a rather small centerline sink. Cruising essentials like cooking, dishwashing, refrigeration, and electricity are not exactly afterthoughts, but the innovation and intensity reflected in the 36CR's set-up for racing seems not to have been carried belowdecks.

Some plusses in the details, however, include well-placed and copious gear lockers; high-quality positive push-button closures on their doors; see-through Plexiglas sliders to maximize transparent stowage; an attractive wooden shower grate; and a simple, serviceable Whale manual bilge pump.

Still, even with the (optional) cockpit ports, we thought ventilation for the after-doubles was minimal. Cabin lights seemed randomly placed, in awkward spots, and too low for reading. The convertible combination of nav seat and ice chest seemed far from convenient, though the chest was deep and well-insulated. Lifting the companionway steps provides superior engine access, but dealing with the unshipped housing at sea might prove a problem.

PERFORMANCE

During our test sail on Biscayne Bay, Fla., in February, the breeze never topped 6 knots. Beyond re-

When Sydney Yachts grew out of the Bashford International speed shop, its object was to "achieve exceptional strength/weight values at a low cost." Mark Rowed oversees production of the boats, and he says, "We have made internal reinforcement less intrusive and at the same time stronger. That keeps weight competitive while opening up as much of the interior as possible."

Hull: Built in accordance with the American Bureau of Shipping Guide for Classing Offshore Yachts, the hull is cored with end-grain balsa except around the keel. Around the keel, the laminate is solid (1.5-inch thick). The keel (a solid lead casting with bulb) is bolted in place. An internal grid formed from floors, longitudinals, and beds of glass-encased timber takes the strains from the rig. Vinlyester resin is used with the exterior gelcoat (to retard osmosis). Polyester resins are used on the interior. A main fiberglass structural bulkhead is glassed fore and aft to hull and deck. Chainplates are carbon fiber, fiberglassed to the hull at the sheer

Keel bolts fasten through a large load-bearing plate recessed beneath the floors, part of a structural grid that absorbs sailing loads.

Deck: A molded headliner with detents for bulkheads is glued to the deck. The deck itself is a double-bias E-glass laminate cored with balsa. Nonskid surfaces are molded into coachroof, decks, and the cockpit. Bosses in the deck mold capture the chainplates in a leak-proof joint. All secondary bulkheads are composite and vacuum-bagged and affixed to the deck with epoxy glue.

Hull-deck joint: The out-turning flange atop the hull is captured by the overlapping deck. The two flanges are glued together, and the joint is mechanically fastened with stainless steel bolts on 8-inch centers.

Rudder and keel: The standard keel is a lead casting (over 5,900 pounds) with bulb that gives the boat a 7-foot, 6-inch draft. A shoal keel (6 feet, 6 inches) is also available. The keel is suspended from a large load-bearing plate recessed and bolted through the hull and linked to floors and internal plates with stainless steel bolts. The rudder is a NACA foil high-lift section with an elliptical planform. It is foam-filled with fiberglass skins over a stainless steel stock with horizontal framing.

Rig: The mast is anodized aluminum, fractionally rigged, with double, swept-back alloy spreaders, Dyform wire rigging, tangs, sheaves, and rigging screws. The boom is clear aluminum. The vang is of a telescopic configuration operated by a tackle.

Spinnaker attachment: A 3-foot cantilevered carbon pole with positive stemhead attachment is available for flying asymmetrical spinnakers. To accommodate a Code 0, the boat needs to be fitted with a bobstay.

cording our pleasure at how much speed the 36CR wrung from so little pressure and noting it was markedly quicker than any of the two-dozen multihulls or cruiser-racers around us, it was hard to attach much significance to the experience. Certainly the boat is laid out with creditable efficiency, and it is undoubtedly a joy to get behind its 60-inch wheel.

In such instances with boats of this ilk, we turn to race records, owner feedback, and hope for another chance to sail the boat and amend our performance report.

There's limited data on the 36CR—it's too new. However, the Sydney 38 One-Design, a Murray, Burns, Dovell design that came after the BH36, has had a brief career in the U.S. Introduced around 2000, the boats finished first through fifth overall under Americap in the 2001 Chicago-Mackinac.

Said a Chicago sailmaker: "The Sydneys are optimized for Aussie conditions. That means breeze. Summertime around here is pretty drifty. The class never really established itself as a vibrant one-design. Some of the original boats have migrated to San Francisco though, and they seem to be thriving there."

Here's what we've been able to gather from existing owners.

"My boat approaches 7 knots uphill in 25 knots of wind through a Golden Gate chop," said an owner in San Francisco, whose comments regarding stiff-air performance were echoed by others.

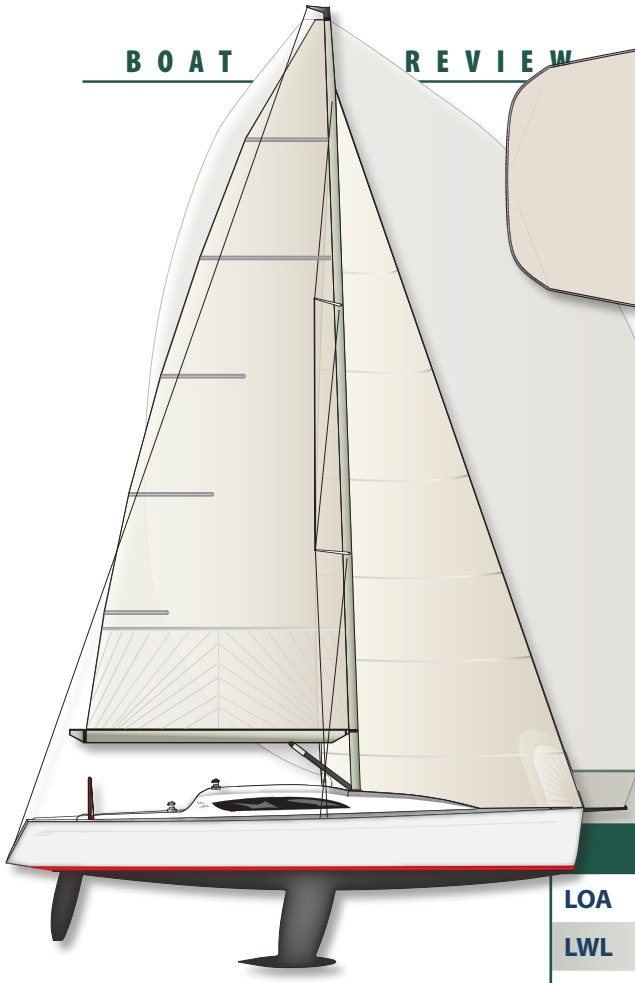
"The sense of something solid, almost bulletproof, is what I like best about her," another owner commented.

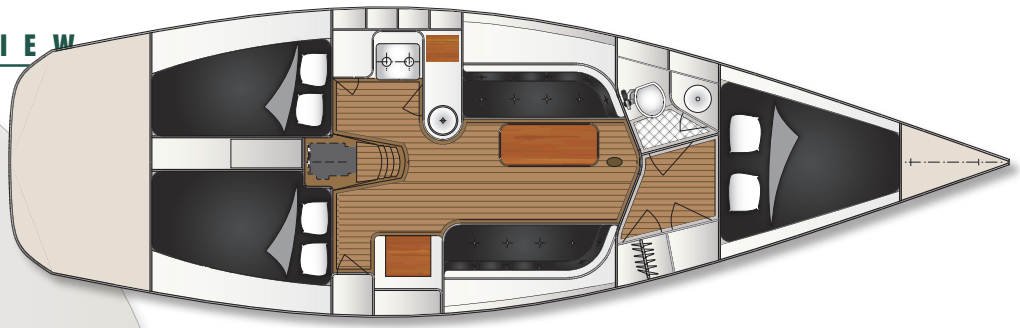
"She's much less of a handful in a breeze than the 38, for instance," Dovell says.

We asked Dovell if his 36CR was well-suited to the sort of light-air racing that characterizes many parts of America: "It depends, of course, what sort of competition you're talking about, what sort of fleet you're racing against. In the under-8-knots portion of the wind range, I'd say that a weakness is there. Still, masthead asymmetricals and creative use of Code 0 type headsails can really juice up light-air performance."

With its relatively high prismatic coefficient, generous wetted surface, and small foretriangle, the 36CR would hardly be an ideal "drifting machine." Efficient, easily driven, and stable, however, the 36 seems to possess a quickness that doesn't disappear as the wind diminishes.

The Southern Florida (a quite typical American sailing ground) PHRF handicappers rate it at 63. Using the J-109's rating of 72 (or a handicap of 9 seconds/mile) for comparison, it seems there are some who believe her potential, even in lighter airs, to be noteworthy.





The Sydney 36CR's high-aspect sailplan and deep bulb keel offer long leading edges to develop lift to windward. The interior (above) isn't short on berths, but water, galley essentials, and cruising comforts are limited. Design ratios for four modern racer-cruisers show just how competitive this niche has become. The Sydney 36CR's additional sail area and waterline length offer an edge over the J-109. The C&C 115, which comes with a carbon-fiber spar as standard, has the waterline advantage over the Sydney, and more creature comforts. The Beneteau 10R, also with a carbon spar, is handicapped by its length, but minimal wetted surface, an easy-to-set asymmetrical and an attractive price work in its favor.

SYDNEY 36CR IN CONTEXT

	SYDNEY 36	J/109	C&C 115	BENETEAU 10R
LOA	36′	35′ 3″	37′ 9″	32′ 9″
LWL	31′ 4″	30′ 6″	33′	28′ 8″
Beam	11′ 4″	11′ 6″	11′ 11″	11′
Draft	7′ 6″	7′ (5′ 9″)	6′ 8″	6′ 7″
Displacement	11,244 lbs.	10,900 lbs.	11,800 lbs.	9,715 lbs.
Ballast	3,800 lbs.	3,900 lbs.	4,200 lbs.	3,693 lbs.
Sail area (100%)	753 sq. ft.	644 sq. ft.	781 sq. ft.	570 sq. ft.
Engine	30 hp.	29 hp.	28 hp.	20 hp.
Water	26 gal.	35 gal.	70 gal.	26 gal.
Fuel	29 gal.	20 gal.	26 gal.	20 gal.
SA/D ratio	24	21	24.1	19.3
D/L ratio	163	172	147	208
Price	$255,000	$212,750	$200,000	$136,000

* Sailaway U.S. price, standard features may vary greatly between boats.

CONCLUSIONS

The Sydney 36CR reflects the agony and the ecstasy of modern handicap racing. What better way to "get into the game" than a durable, sexy, rocket that's fast, forgiving, and manageable? On the other hand, how close to the top do you expect to get with a 12-year-old design optimized for Antipodean breezes and marked as a "ringer" by the handicappers? Does the life of chasing regattas and sleeping aboard appeal or appal? And is the 36CR enough of a cruiser to make it the "dual-purpose boat" of your dreams?

Sailed hard and well, it can win races in most places and fleets. But that's not unique. It also offers limited but realistic cruising that expands its use. It is solidly built and intelligently designed.

However, it addresses a relatively small niche in the market. That limits its ability to hold its price. Comparing winners' lists is a black art; predicting performance potential and outlining what's needed to deliver the silverware are patently risky. Getting the most for your money depends a lot on your answer to "most of what?"

Last year, we reviewed the C&C 115 (August 2006) and Beneteau 10R (November 2006). Billed as "racer-cruisers," they nonetheless combine cruising and competitiveness in about the same proportions as the Sydney 36CR. Costing considerably less than the Sydney ($255,000 FOB San Francisco), they make greater use of strength/weight technology (both have carbon spars) and modern design thinking. In a heavy-air area like San Francisco, we like the Sydney's stability and good manners, but it's hard otherwise to set it above those other two choices.

CONTACT

SYDNEY YACHTS
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Outboard Mounting Bracket Field Test

Garelick mounts get the nod for ease of use and quality workmanship.

Garelick's 71092 manual engine bracket (above right) was one of testers' favorites. The unique pumping action made raising and lowering an engine easy and fast. Twelve pumps of the handle moved the bracket plate a full 14 inches.

In the wake of our recent test of four-stroke 9.9-horsepower outboard engines ("9.9 Outboard Rumble," June 2007), it seemed logical—if not necessary—to revisit a perennial small sailboat topic, outboard engine brackets.

During the course of that test, it became abundantly clear that the move toward quieter, more efficient four-stroke engines had many admirable benefits, but providing much needed relief for our backs and shoulders is not among them. Our top choice in that test, the Mercury F9.9M, tips the scales at 84 pounds.

Ever since Ole Evinrude first attached his little gas-engine "outboard" to the transom of a small rowboat nearly 100 years ago, people have been designing and building brackets to make the chore of lifting and lowering them easier. Over the years, larger and sturdier brackets have become available to handle the larger and more powerful engines that are being found on today's sailboats. Some are better than others.

These brackets generally use mechanical advantage, or electrical power to reduce the amount of effort required to get the propeller out of the water. Some tilt; some provide vertical lift; some do a little of both. For the purpose of comparison, they can be divided into three categories: fixed or stationary, retractable manual lift, and electric trim and lift/tilt.

The type and characteristics of the mounting bracket that's best for a certain boat will depend on the horsepower and weight of the outboard to be used, the length of its shaft, and where it is to be mounted. Larger sailboats should use a motor with a longer shaft. Steering is done through a rudder, but consideration of whether the motor is manual or electric start and ease of getting to the motor may influence the type of bracket needed.

Fixed brackets are appropriate for smaller boats with low or cut-away transoms like the Balboa 26 and the Grampian 26, which allow for the engine to be tilted over them. Some are simple, inexpensive, extruded aluminum while others are heavy-duty cast bronze devices specifically designed for a particular boat. Retractable manual lift brackets typically are spring-loaded to allow manually raising or lowering the motor. Each spring-assist bracket has a narrow range of motor weight at which it operates best. Matching the number and size of the springs to the weight of the motor is one way of figuring out which retractable manual bracket will work best. Electric trim and lift brackets use

Up. Down. Up. Down.

We mounted all the test brackets on a 2-foot-by-12-foot board about four feet off the ground. All units came boxed and completely assembled, but some included mounting bolts and hardware, and others did not.

Testers hooked the electric models up to a 12-volt battery, and operated the up/down switch. None of the instructions mentioned electrical amperage loads or fuses required to operate the lifts. The two electric Panther brackets and the JR Marine unit had built-in circuit breakers. The clarity of the manufacturers' instructions was noted as was the ease of mounting and hook-up.

We mounted the Honda and Mercury 9.9s, one at a time, on each bracket. We then tested for sturdiness by shaking and wiggling the motor up and down and side to side, and also operated and measured each bracket's actual range and ease of vertical lift and tilt. To test on-the-water applications, we remounted the brackets, one at a time on a powerboat and evaluated their ease of operation and the effect of engine torque on the bracket while running the motor at different speeds.

It should be noted that most manufacturers recommend removing the engine from the bracket before trailering the boat for any distance, to avoid damage to the motor, boat, or bracket. The Panther No. 35 included a heavy-duty shock cord and the instructions showed it holding the motor snug to the bracket when trailering or running the boat with motor in the up position.

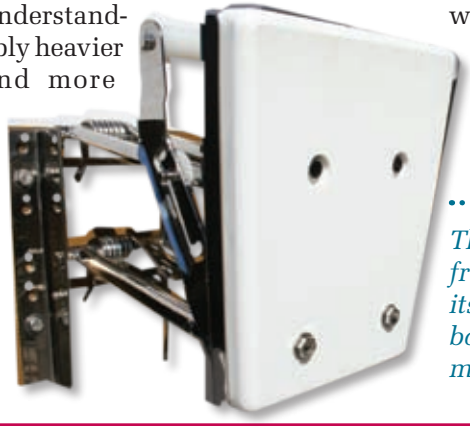
With the 9.9-horsepower outboards mounted on the brackets, testers took turns lifting and lowering each one to gauge the brackets' ease of operation.

Most of the instructions noted that not all boat transoms are perpendicular and that various trim accessories and wedges or shims are available to obtain the proper angle of the motor shaft in the water. All mentioned the possible need for backing plates or reinforcement material for thin transoms.

hydraulic or electric pumps that operate off a boat's 12-volt battery.

WHAT WE TESTED

We asked eight manufacturers to submit brackets that could handle a current production, four-stroke, 9.9-horsepower outboard. Our test engines were a four-stroke Honda BFP 9.9 horsepower weighing 92 pounds and a Mercury ME 9.9 horsepower weighing 84 pounds. Since four-strokes are usually heavier and produce a higher torque than two-stroke motors, these brackets are understandably heavier and more ruggedly built. Testers figured the 9.9 engines to be the middle road between the commonly used 5 horsepower and 25 horsepower.



The Garhauer Z2275 stood out from the other test brackets with its shiny, electro-polished stainless body and white marine-plastic mounting plate.

Five manufacturers responded—Fulton, Garelick, Marine Tech (Panther), JR Marine, and Garhauer—with eight different brackets, four manual and four electric. All appeared stouter, better-constructed, and more heavy-duty than the last time *Practical Sailor* tested outboard brackets (Oct. 15, 2000 issue).

The main test criteria were ruggedness, quality of materials and workmanship, ease of assembly and mounting bracket on a boat, clarity of instructions, ease of mounting a motor on the bracket, ease of operation, and price. Other considerations were the number of trim options, hardware and accessories included, clearances and tolerances, maintenance considerations, corrosion resistance, and warranty coverage.

MANUAL
FULTON MB1820

The MB1820 is the strongest of the Fulton line of brackets, but it was also the lightest and least expensive of the eight *PS* tested. The metal is lightweight, unpainted anodized aluminum with stainless steel (SS) fasteners and a polypropylene mounting board. The SS balance springs are smaller than those used on the other manual units tested.

During our initial testing of the bracket, both testers had trouble lifting the 9.9s using the Fulton, despite Fulton's claims that the MB 1820 handles motors up to 130 pounds. At second glance, testers realized this particular unit was de-

PS VALUE GUIDE OUTBOARD MOUNTING BRACKETS

TYPE	MANUAL				ELECTRIC			
MAKER	FULTON	GARELICK	GARELICK	GARHAUER	GARELICK	PANTHER	PANTHER	JR MARINE
MODEL	MB1820 $	71091	71092 ★	Z2275 ✓	71095 ★	35	40 $	2500
PRICE	$170	$310	$1,130	$319 (4 spring)	$1,250	$607	$470	$999
PRICE SOURCE	westmarine .com	cabelas .com	marine engine.com	catalina direct.com	shipstore .com	iboats .com	westmarine. com	jrmarine products.com
HYDRAULIC LIFT	No	No	Yes	No	Yes	No (electric)	No (electric)	Yes
WEIGHT	15 lbs., 10 oz.	28 lbs., 4 oz.	31 lbs., 3 oz.	21 lbs., 5 oz.	72 lbs., 3 oz.	29 lbs.	21 lbs.	36 lbs., 4 oz.
CONSTRUCTION MATERIALS	Poly, aluminum	Poly, aluminum	Poly, aluminum	Poly, stainless steel	Poly, aluminum	Cast aluminum	Aluminum	Wood/ Aluminum
MAXIMUM MOTOR HP	9.9 hp	25 hp	Unlimited	15 hp	25 hp	35 hp	40 hp	25 hp
MAX. MOTOR WEIGHT	130 lbs.	175 lbs.	175 lbs.	125 lbs.	148 lbs.	150 lbs.	150 lbs.	200 lbs.
VERTICAL LIFT	9 in.	15.5 in.	14 in.	17 in.	13.25 in.	None	None	14 in.
TRIM POSITIONS	5	5	Unlimited	3	Unlimited	7.5- or 13-in. setback	8-in. setback	Unlimited
EASE OF OPERATION	Good	Good	Excellent	Good	Excellent	Excellent	Excellent	Excellent
CONSTRUCTION QUALITY	Good	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good
WARRANTY	3 years	3 years	3 years	10 years	3 years	1 year	1 year	3 years

★ Best Choice $ Budget Buy ✓ Recommended

Note: All are rated for 4-stroke outboard engines.

fective as its bottom springs would not engage. A phone call to Fulton, and another bracket was on the way the same day. The replacement unit was easily installed following the simple, well-written instructions, and the four-spring unit operated much better.

The lifting handle is small, only 3 inches wide, but it includes five lift-position notches with a unique set of springs that assist in keeping the notches engaged. The Honda motor has a hinged lifting handle that interfered with the bracket's lifting handle, making the Fulton basically unusable with this motor unless the Honda handle is removed. Lowering and lifting the 84-pound Mercury was easy, and the Fulton springs had just about the right tension for this size engine, in testers' opinions. However, its lightweight, narrower mounting footprint and overall looseness does allow for some wiggle, so we would not recommend it for heavier motors.

Bottom Line: An inexpensive, no frills bracket that will get the job done, the MB 1820 is our Budget Buy among the manual brackets.

GARELICK 71091

Garelick offers a wide selection—the catalog lists 16 different models of stationary, manual, and electric brackets—to accommodate various style and weight motors.

The 71091 manual lift model is designed for four-stroke motors up to 25 horsepower and 175 pounds. A high-tensile-strength safety cable and four 5/16 x 3-inch carriage bolts are included. The instructions were limited but simple, and the unit was easy to install.

The bracket has a wide boat-mounting plate that has 12 pre-drilled square holes for mounting flexibility. Construction is heavy-duty black anodized aluminum, with four stainless steel springs, stainless steel hardware, and a large, 2-inch-thick, 11½-inch-wide, polypropylene motor-mounting board.

The stainless steel springs are quite strong, a requirement for coping with the heavier motors. The 6½-inch lifting handle is wider than others we tested, and it has four locking positions with unique safety knobs on each side to tighten

The JR Marine 2500 was the only outboard bracket tested that had a wood motor mounting plate.

BEST CHOICE ELECTRIC:
Garelick 71095

BEST CHOICE MANUAL:
Garelick 71092

BUDGET BUY ELECTRIC:
Panther 40

BUDGET BUY MANUAL:
Fulton MB 1820

it in place and a spring mechanism to hold it in the notches. However, testers were not able to get the motors down and locked in the final notch. The springs seemed too strong (tight), as if they were designed for heavier motors. Also, operating the bracket without a motor attached could cause serious injury as the lifting mechanism abruptly snaps back to the up position. Garelick does offer other models for lighter, two-stroke motors.

The 71091 and all other Garelick models tested each came with a 4-foot, vinyl-covered safety cable with a stainless steel carabineer to secure the motor to the boat. The other product instructions only mentioned safety cables as a good idea.

Bottom Line: This unit is well-constructed and hefty. It's a little more expensive, but the value is there and it would be our choice for the really heavy motors.

GARELICK 71092

This unit looks similar to the Garelick 71091, but it has a unique manual hydraulic pump and handle. It also comes with mounting nuts and bolts and a safety cable. Testers found its 26-inch long removable aluminum handle very easy to use. The side-to-side pumping action takes the strain out of raising and lowering the heavier motors. It takes about 12 pumps to go the full 14 inches of continuous vertical height adjustment, and the 92-pound Honda came up with little effort. To lower the motor, the pump handle's notched end is used to turn a relief valve, and the motor slowly drops down. (Note: The valve must be retightened or hydraulic oil could leak out.)

However, we do have some concerns about where to store the handle and the possibility of losing or dropping it overboard. We'd like to see a locking pin, screw-in bushing, or optional tether cable. A piece of 7/8-inch pipe or a broom handle would make a handy backup.

Also, the pump handle moves to the right about 20 inches when facing aft and could be a problem bumping into a main motor, rudder, or swim ladder. Buyers should carefully consider where to locate the bracket on the transom before purchasing and mounting it. However, *PS* found this pump action to be a really nice feature over standard manual lift brackets.

The 71092 also includes a stainless safety strip that easily latches on a bolt to hold the bracket and motor in the up position.

Bottom Line: The Garelick 71092 manual pump model is *Practical Sailor*'s Best Choice. It got a lot of attention because of its unique pump action, smooth operation, and ease of lowering and raising the test motors.

GARHAUER Z2275

Garhauer is an OEM manufacturer that sells the Z2275 exclusively through Catalina Direct. The manual, adjustable bracket is sharp looking, with all electro-polished stainless steel tubing and a white UV-stabilized marine plastic motor mounting board that has a curved metal lip on the back for the engine fasteners.

The lifting handle is 4½ inches wide, enough to fit a man's fist. The bracket is fairly lightweight at 21 pounds, but Garhauer claims it can handle a motor up to 15 horsepower with a minimum weight of 125 pounds. It has four stainless-steel springs, 17 inches of vertical lift, and three lift positions.

The pivot points have bronze bushings and compression tubes to allow clear, friction-free lifting movement. The unit did not come with any instructions or mounting hardware, but the long mounting bracket does have 12 pre-drilled 5/6-inch boltholes for maximum mounting flexibility.

We found the up-down operation a little rough, with no extra springs to hold it in the notches and the main springs a little too tight for lifting/lowering both test motors. Testers had difficulty getting the loaded bracket into the down position. Once locked down, it was difficult to release it for lifting primarily because the test mo-

tors were too light for the four-spring bracket.

We contacted Catalina Direct, who sent us a three-spring bracket (Z2274) designed for smaller motors. This one operated much better with the test motors. Garhauer also makes a two-spring model for even lighter engines.

Bottom Line: Testers found the three-spring Garhauer easy to use and priced right, not to mention it has the longest warranty (10 years) of any mount tested. We recommend it for budget-minded boaters with small, lightweight engines.

ELECTRIC
GARELICK 71095

The 71095 electric power-assisted motor bracket is one of Garelick's larger models. It was the heaviest and most expensive bracket we evaluated, weighing in at about 72 pounds.

With a 15¾-inch by 14-inch, double layered (polypropylene and aluminum) motor mounting board and a hefty 12¼ inch by x 9 ½ inch mounting bracket, this thing is big. The heavy-duty aluminum frame has a triple-coated finish (anodized, E-Coat, and black-powder coated). It comes with large half-inch SS bolts and washers, bronze bushings, and brass locknuts. The instructions and diagrams are well written, and the electric hook-up was straightforward. The unit quickly raised and lowered our motors smoothly and without difficulty.

Bottom Line: The 71095 is our Best Choice among electric brackets, but it's pricey. It handles the big motors smoothly and without effort, and it was easy to mount and hook up to the power source.

JR MARINE 2500

This is a well-built, boxy looking electric bracket with ample lifting capacity, a 19-inch setback, and infinitely adjustable vertical lift up to 14 inches (3 inches down and 11 inches up from horizontal).

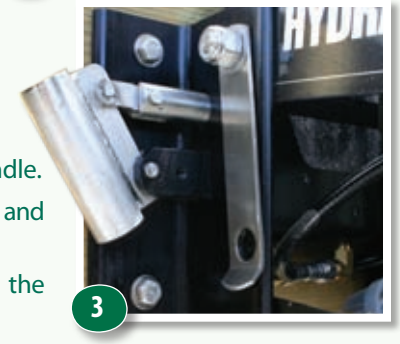
It is made of heavy, extruded structural aluminum with double layered, powder-coated paint, stainless steel bolts and hardware, and a laminated-maple mounting board.

The instructions were thorough, and it was easy to mount with its 5/16-inch stainless steel nuts and bolts, although we did have to drill open the mounting holes a little. Also included were a rocker lift switch, a breaker, solenoids, and 8 feet of electrical cable.

The electrical hookup is simple and easy to follow. The mounting plate comes with eight pre-drilled holes, but the manufacturer's literature states the plates can be custom drilled, if required. We did have a problem with a wire coming loose from the resettable circuit breaker. We suggest not using crimp connectors, especially for marine use. We had to solder in a new fuse holder. Operation was smooth and effortless with both our test motors.

Bottom Line: The JR Marine 2500 is a well-built unit, and it operated flawlessly. It is offered direct from the manufacturer, which allows some customizing and cost savings.

A CLOSER LOOK



1. Testers had a hard time mounting the Honda test engine on the Fulton MB 1820. The Honda's hinged handle interfered with bracket's lifting handle.

2. The Garelick 71091 employs a spring mechanism and unique safety knobs to hold the bracket in position.

3. A stainless safety strip hooks on a bolt to hold the Garelick 71092 in its up position.

PANTHER 35 and 40

These are heavy-duty, electric trim-and-tilt auxiliary motor brackets. They both can handle four-strokes up to 150 pounds. The main difference between the two is that the newer, less expensive Panther 40 has one 8-inch setback position whereas the Panther 35 comes with a 7.5-inch setback and can be adjusted to a 13-inch setback. However, the 40 could conceivably have six permanent vertical positions by changing the location of the pivotal bolts. Neither one allows adjustable vertical lifting.

Continued on page 39

The electric Panther 35 (at right) and the Panther 40, which have no vertical lift capability, are better suited for small to mid-size boats with low transoms.

Continued from page 17

The 14-page instruction book is excellent, including a template for the mounting screws. However, we could find no explanation for two extra holes on both the bracket plate and motor mounting plate.

Both units come with a "breather tube" to allow the electric actuator pump to operate. This tube must be run into and fastened inside the motor housing to prevent water entry. The rugged 35 is made of powder-coated cast aluminum. The 40's transom plate is powder-coated 3/8-inch extruded aluminum, and the motor mounting plate is ¼-inch formed channel. The mounting holes are large and require ½-inch bolts and large washers (not provided).

Bottom Line: *PS* found these to be very rugged electric motor mounts, with smooth operation to tilt good-sized motors, but they don't have any vertical lift, and so may not be appropriate for most sailboats. For those who have low transoms and light motors, the Panther 40 is our Budget Buy.

CONCLUSIONS

At first, testers struggled to get our motors down and locked in place with all three spring-assisted manual brackets. It would be nice to be able to adjust the tension of the springs for a specific weight motor, but that not being possible, it is very important—when using a manual lift—to select the right model for the actual weight of your motor.

Among the manual brackets we tested, the unique pump-action Garelick 71092 was as nearly as easy to use an electric, but doesn't require all the fuss and maintenance of running electric cables. When considering today's heavier motors, it is a nice innovation for those with bad backs who don't want to go electric. It's our Best Choice. Fulton's MB1820 is our Budget Buy for lighter motors. It is an inexpensive, no frills unit that does the job. The Garhauer Z2275 is a good choice for those looking for a mid-priced bracket for a small outboard. For boaters seeking a heavy-duty manual lift for a larger motor—and who don't want to spend the extra money on the hydraulic 71092—the Garelick 71091 is a good choice.

The four electric outboard motor brackets *PS* tested were all quite different. If you have trouble lifting and lowering the heavier outboard motors, or if your transom is hard to get to, and you can spend a few extra bucks, you should consider these power-assist brackets.

The Garelick 71095, the *PS* Best Choice for electric brackets, is a hefty, easy-to-use unit that would serve well in extreme conditions. For the budget conscious, the JR Marine 2500 is well-constructed with precision-machined aluminum, a large wooden mounting board, and it operates smoothly. The Panther 40 is a sturdy, compact electric bracket with smooth operation. It can handle heavy motors and is well suited for small to mid-sized boats with short transoms. Designed for auxiliary outboards, these units have only tilting action and no lifting power, so they would have real limitations on most sailboats. But they are mid-priced and definitely a Budget Buy if you have the right boat.

CONTACTS

FULTON (CEQUENT PERFORMANCE PRODUCTS)
715/693-1700
fultonperformance.com

GARELICK
651/459-9795
garelick.com

GARHAUER (CATALINA DIRECT)
800/959-7245
catalinadirect.com

JR MARINE PRODUCTS
860/770-3502
jrmarineproducts.com

PANTHER (MARINETECH PRODUCTS)
651/210-3651
marinetech.info

Evans Starzinger uses SailMail to check e-mail aboard Hawk. *Whether using radio, cell-phone, or satellite phone, a reliable data-compression software is essential for keeping communication cost-effective.*

Photo by Beth Leonard

Cruising Software

For offshore voyagers, a handful of programs stand out as truly essential.

By BETH LEONARD/*SV Hawk*

A wealth of software exists to assist the offshore cruiser in everything from communicating with the outside world to determining the most efficient course given a five-day wind forecast. Those who can afford it often leave with a laptop loaded with dozens of programs, some of which cost thousands of dollars. Once on passage, though, most cruisers realize that these programs aren't very useful offshore and aren't worth the energy required to run them. My partner, Evans Starzinger, and I, like most other offshore sailors we meet, have ended up using fewer than a half-dozen programs regularly, but these are applications we would not choose to do without. Software for downloading e-mail or weather information from the Internet over a high-seas radio or a satellite phone gets used most frequently aboard cruising boats. Weather fax software is still important despite the increasing popularity of GRIBs (Gridded Binary files), and tide software provides essential information when making landfall. Finally, we carry some specific information resources that have proven valuable while on passage.

OFFSHORE E-MAIL

To send and receive e-mail when out of reach of Wi-Fi and out of range of cell towers requires a computer and either a satellite phone with a data kit or a high-frequency radio with a modem, a data cable, an antenna, some software, and specialized land-based servers. Whether using a satellite phone or a high-frequency radio, transmission rates for high-seas e-mail systems are agonizingly slow by shoreside standards. (See "Communications Cost" table, page 20.)

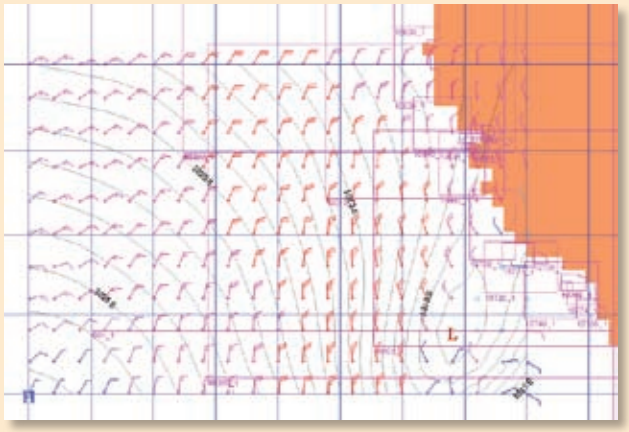
These transmission rates are significantly slower than using a dial-up connection over a low-speed landline. For this reason, high-seas e-mail systems are designed to accept only short to medium-length, plain-text e-mails. Specialized Internet Service Providers (ISPs) have created e-mail services and software programs designed for the limitations of low-bandwidth communications. E-mails are composed offline using a standard e-mail program like Microsoft Outlook. These are then forwarded to the high-seas e-mail program which dials in to a specialized server, retrieves any mail waiting there, passes along any messages to the outbox, and then shuts down. Servers for high-seas systems generally strip off any attachments and use complex compression algorithms to increase transmission efficiency.

To do e-mail over a high-seas radio, a Pactor modem must be installed. This may cost as much as $1,250 and must be configured for the protocol supported by the land-based servers. The system uses a backstay SSB antenna, and the Pactor modem will come with a data cable for connecting to the computer.

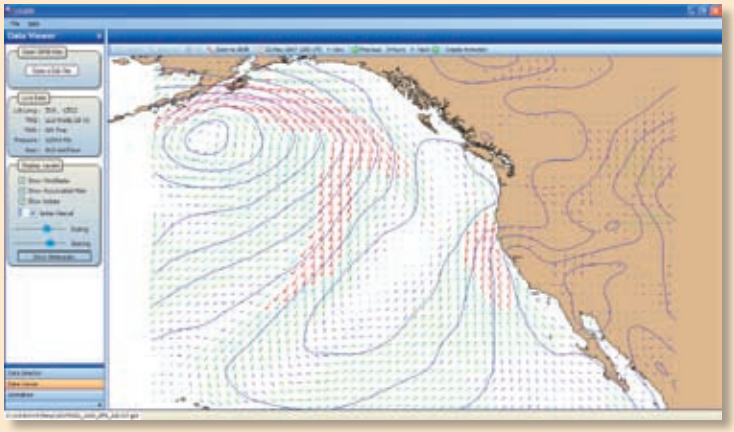
Though your modem may come with a software package, most ham-radio users prefer **Airmail (*www.airmail2000.com*)** which can be downloaded from its website. Ham users can be patched into a **Winlink (*www.winlink.org*)** or Netlink server by a shore-based ham. The Winlink website provides complete information on configuring to do e-mail over a ham radio.

If using a marine SSB, you can access land-based "host" stations run by a nonprofit cruising group directly on designated frequencies. Users pay a fixed fee of a few hundred dollars annually for this service, called **SailMail (*www.sailmail.com*)**. Detailed information can be found at the website along with the downloadable SailMail software.

Radio-based systems are extremely inexpensive, but they are also dependent upon the propagation of radio waves through the atmosphere to work. There may be times when atmospheric conditions will not allow you to get through, or when others broadcasting in your vicinity with a stronger signal block you from getting onto the system in the first place. In addition, SailMail restricts the size of messages sent and received and total use per week.



ViewFax GRIB file



Grib U.S. GRIB file

Options Abound for Grabbing a GRIB Weather File

GRIB files and various GRIB readers can be downloaded from several different sites on the Internet. We currently use ViewFax reader, developed Jim Corenman, who also wrote the software for SailMail and AirMail. We access the GRIBs for free through SailDocs as described below.

Anyone using GRIB files must remember that these files are sent without review by any meteorologist. They are automated and prone to a variety of failures and errors. For an accurate summary of the risks involved in using GRIB-based forecast send a blank e-mail to GRIBWarning@saildocs.com.

- **ViewFax GRIB reader**—*www.siriuscyber.net/wxfax*; free download.
- **SailMail**—An easy way to use SailMail to receive GRIBs is by sending a coded message indicating what GRIB data you want to SailDocs. For information on how to do this, send a blank e-mail to info@saildocs.com.

There are several other sources (free and commercial) for weather. Some are marketed along with particular software or hardware, although the files will likely work with most GRIB-aware programs.

- **Global Marine Networks**—*www.globalmarinenet.net/grib.htm*; free wind forecasts and good info on GRIB.
- **Grib U.S.**—*www.grib.us*, free Windows software for downloading, viewing and animating GRIB data.
- **Expedition Navigation Software**—*http://effil.tripod.com/Weather.htm.*
- **Frank Singleton**—*www.franksingleton.clara.net*; Former U.K. meteorologist provides a list of free and commercial GRIB services.
- **National Weather Service**—For information on how to request free text forecasts directly from the U.S. National Weather Service, send an e-mail to ftpmail@weather.noaa.gov, and in the first and only line of the message put "Help."
- **Nav Center**—*www.navcenter.com*; marketed in connection with MaxSea software.
- **OCENS WeatherNet**—*www.ocens.com*; a subscriber system designed to optimize the download of weather products via wireless connections.
- **Raymarine**—*http://www.raymarine.com/raymarine/Default.asp?Page=149&Section=3*

To e-mail over a satellite phone, you'll need a data kit, including a data cable and software for allowing the phone and computer to communicate. The **Iridium (*www.iridium.com*)** phone comes with a small antenna attached, but for e-mailing, a separate external antenna mounted on the outside of the boat will make it possible to e-mail from the nav station without taking the computer outside. While not essential, this is certainly convenient and saves wear and tear on the computer.

Several Internet service providers cater to the satellite phone market. Although it is possible to use a satellite phone just as you would a cell phone or a phone on shore to browse the Internet or to check e-mail, the incredibly slow data rate and the cost per minute make this highly inefficient and prohibitively expensive. Just downloading a single web page can take 10 minutes or more. The most sophisticated of software systems for satellite phones have been carefully designed to cut airtime to the absolute minimum.

We have used **XGate (*www.globalmarinenet.net*)** for the last several years. This program reduces transmit time by using ultra-high compression rates, stripping off all attachments, filtering all spam and sending and receiving at the same time. Using this program, we can upload and download a half-dozen e-mails in about a minute over our Iridium phone as opposed to eight minutes or more when going directly to a normal ISP, making it affordable

PS VALUE GUIDE COMMUNICATION COSTS

TYPE	RADIO	SATELLITE PHONE
EXAMPLES	Marine SSB or Ham	Globalstar, Iridium Inmarsat Mini-M
HARDWARE COST	$500-$1,500 for Ham; $2,000-$3,000 for SSB $800-$1,250 for Pactor modem	$500-$6,000
TRANSMISSION RATE	2,700 bps (5,000 with compression)	2,400-9,600 bps
COST FOR DATA TRANSMISSION	$200 annual fee for SSB, free for ham	$1-$1.60 per minute plus monthly fee; special plans can reduce cost

for us to e-mail daily. Quite a few of our friends use and recommend another satellite phone ISP, **UUPlus (*www.uuplus.com*)**, which uses its own proprietary software.

Our Iridium phone is set up to communicate with the computer through a serial port. Our newest laptop did not come with a serial port, so we needed a USB-serial port adapter for e-mail. When getting ready to configure your system, check adapter requirements and make sure you have the necessary connections before heading offshore. Thoroughly test the system before setting out. Some marine software will not work with the new Microsoft Vista operating system.

Whether using a high-frequency radio or a satellite phone for e-mail, you will end up with a new e-mail address associated with the dedicated ISP for your onboard e-mail system. This address should be distributed very selectively to family and close friends with strict instructions on its use, including no e-mails over about 30 KB (a half-page of plain text), no attachments, no jokes, and no photos. The address should never be included in a distribution list except as a blind cc.

WEATHER FILES

Once the boat has been set up for offshore e-mailing, it becomes possible to download weather information from the Internet to your e-mail address. Marine text forecasts for your high-seas forecast area can be downloaded directly from the National Oceanic and Atmospheric Administration (NOAA) or via e-mail request through **Saildocs, (*www.saildocs.com*)**. In addition, most sailors download the GRIB files.

GRIB files are compressed weather maps specifically designed for efficient transmission to offshore vessels equipped with low bandwidth receivers—high-frequency radios (Ham or SSB) or satellite phones. These special-request files are obtained by accessing NOAA weather databases to retrieve information tailored to the user. They offer almost unlimited flexibility in selecting weather information, with the user specifying the reporting area, the type of information required, and the forecast period.

The information that can be downloaded includes wind speeds and directions displayed as wind arrows, surface pressure, 500-millibar charts, and wave heights for up to 15 days ahead (though accuracy declines markedly after the first 24 to 48 hours). To download them on the boat requires onboard e-mail capability and software to read the GRIB files.

GRIB files can be downloaded from several different sites on the Internet (see "Options abound for grabbing a GRIB weather file," page 19). Each of these sites includes an explanation of how GRIB files work and how to access them through that site, and the sites provide software for reading the GRIB files once downloaded.

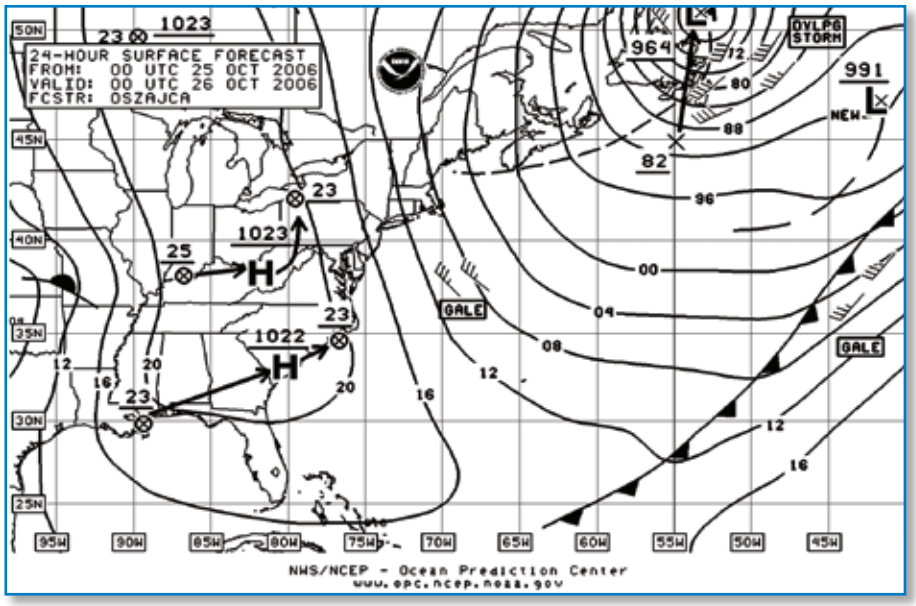
We currently use **ViewFax (*www.siriuscyber.net/wxfax*)**, developed by Jim Corenman (who also wrote the software for SailMail and AirMail). Corenman has generously made this program available for free. We access the GRIBs for free through SailDocs by sending a coded message detailing the type of information and the area. For detailed information about requesting GRIBs from the SailDocs robot, send a blank e-mail to GRIB-info@saildocs.com.

GRIB files are raw data plucked from NOAA databases without human intervention. They are not quality controlled, and they require interpretation by the user. They may not show compact systems such as meteorological bombs and tropical depressions and they don't show local land influences on the weather. As a result, we have found them much more useful in the open ocean than when coastal cruising. Even at sea, we have learned to be skeptical of any GRIB "forecasts" beyond 24 hours. Despite these drawbacks, they have often given us several days' warning of large, well-established, intense high- and low-pressure systems, giving us time to maneuver as these approached.

WEATHER FAX

Most countries disseminate various types of weather information by weather fax several times per day on a specific schedule. These include synoptic charts, such as that shown on the facing page, and satellite images as well as 12- and 24-hour prognoses (with some providing prognoses for up to five days). Once the system has been set up, faxes can be received without charge. Weather faxes provide the easiest and least expensive way to receive weather information aboard, but reception depends on radio propagation. Further, the faxes cover large areas, and therefore lack resolution. Although they identify the largest systems and their movements, it can be difficult to determine the exact conditions you might experience in the following 24 hours.

Faxes can be received via a dedicated weather fax machine or through a high-frequency radio receiver attached to a laptop computer via a simple audio cable. The laptop must be loaded with a software program to read the charts. We have used both **Xaxero (*www.xaxero.com*)** and ***Mscan Meteo fax (www.mscan.com)*** and like both of them. (*PS* tested the Meteo fax in 2001. The review ran in the May 1, 2001 issue.) To get a decent fax picture, as much RF noise as possible needs to be eliminated during fax reception. We turn off instruments and autopilots and run our laptop computer off its own internal battery when receiving a fax, as almost all of the cigarette lighter adaptors and 110-volt inverters produce too much RF noise. Those with desktop computers aboard may have difficulty in downloading a readable fax. Fax schedules for the world can be downloaded from the NOAA website at *www.weather.gov/om/marine/rfax.pdf*.



Weatherfax software remains the staple product for offshore cruising sailors. Both Xaxero and Mscan Meteo fax have served well in extensive sea trials.

TIDE SOFTWARE

When making landfall, sailors need to know the state of the tide and of any currents that might affect them. Tide and current tables are perfect applications for computers—large databases of information that must be easily searched. We have tried several tide programs, but our favorite is freeware called **WxTide32 (*www.wxtide32.com*)**. It has proven accurate with more than enough reporting stations every place we have been, including areas with extreme tides and currents such as Chile, New Zealand, and the Pacific Northwest.

OTHER RESOURCES

In our opinion, using a laptop to run routing software, and even for chartplotting, consumes too much power. However, there are a couple of other resources that we turn to on occasion when offshore and find useful to have aboard. **StarPilot (*www.starpilotllc.com*)** is a celestial and sailing calculator that we use primarily for identifying stars and planets while underway. We have not used it for sextant sights in many years, but we would if we ever lost our GPS.

We use the computer's DVD drive to access various reference books. The **Seven Seas Cruising Association, (*www.ssca.org*)** sells a CD with five years of SSCA Commodore's bulletins in a searchable format. These bulletins, consisting of letters from SSCA members, include detailed information on each country including where we can get fuel and water, which anchorages offer the best protection, which areas might be unsafe, and issues with clearing in or clearing out.

Bowditch on CD answers any navigational questions we might have, and the Merck Manual on CD provides us with medical information, diagnosis, and treatment. We also carry two encyclopedias (Britannica and Encarta). These have proven tremendously valuable when we have a question about the place we are about to visit or some news item on the BBC. We prefer the DVD versions where all the information fits on one disk rather than the CD versions which require multiple disks.

While much attention is focused on routing and charting software, our primary offshore software applications are communications via e-mail and weather information. If you intend to be connected while offshore, it pays to make sure you have these two applications sorted out before investing in other expensive applications.

Beth Leonard and her partner, Evans Starzinger, have left more than 85,000 miles in their wake. They are currently bound for southern Chile aboard their 47-foot Van de Stadt-designed aluminum cutter, Hawk.

CONTACTS*

AIRMAIL, airmail2000.com
GLOBALSTAR, globalstar.com
IRIDIUM, iridium.com
STARPILOT, starpilotllc.com
UUPLUS, uuplus.com
WXTIDE32, wxtide32.com
WINLINK, winlink.org
XGATE, globalmarinenet.net
XAXERO, xaxero.com

* GRIB weather software and sources listed on page 19

The ability to angle the panels toward the sun makes the best use of the Blue Sky MPPT technology.

The Solar Stik

Flexible (but expensive) mounting package maximizes solar panel output.

Solar panels have proven themselves a valuable ally in the never-ending battle to keep batteries charged and today's power-hungry systems fed. A common sight aboard world cruising sailboats and weekend warriors alike, solar panels have many pros backing them up: They're noiseless, have no moving parts, and provide free electricity for years with minimal maintenance, all without producing harmful emissions or using up valuable natural resources.

Despite all the benefits, solar panels have issues other than their high purchase price. Their mounting location must not eat up limited cockpit or deck space (an issue in all but the smallest installations); they require adequate air flow to avoid heat buildup (which can seriously reduce power output); and they reach optimal output only when facing the sun, a limiting proposition for fixed-mount installations.

The folks at Solar Stik have come up with a product that addresses each of these issues, and then some. The Solar Stik is a unique system that combines existing technologies to overcome the problems listed above. The result: A solar-power system that, in many regards, is greater than the sum of its parts.

The Solar Stik consists of two 50-watt BP350U multi-crystalline solar panels mounted on a tapered aluminum pole. The assembly rotates 360 degrees at its base and locks into any position, while the panels fold up and down and rotate along the horizontal axis, providing full panel articulation. Also included with each complete system is a Blue Sky Energy Solar Boost 2000E MPPT (maximum power point tracking) charge controller, which pumps up the output potential of the solar panels. PS profiled this revolutionary technology last year ("Boosting Solar Output with Blue Sky," August 2006).

CONSTRUCTION / MOUNTING

The Solar Stik is robust and well made. (All materials are either 304/316 stainless steel or T6061/T5052 aluminum.) The Solar Stik can be purchased as a transom- or deck-mounted unit. The transom-mount system ($3,850) is essentially a "bolt-on" unit. However, its location can preclude the use a steering vane. According to the manufacturer, the transom mount takes about three to four hours to install, while the deck-mount system ($3,425) is a more involved installation typically requiring fiberglass work and/or welding.

In addition to freeing up deck space when mounted, the Solar Stik also serves double duty as a mount for other equipment. It can accommodate a smaller wind generator (such as the Rutland 913 or Ampair 100), VHF or GPS antennas, a radar dome, etc. It's also strong enough to support a small lifting davit.

The Solar Stik is lightweight (80 pounds, per the manufacturer) and when broken down, no single piece weighs more than 20 pounds. Panels can be deployed or secured in the down position for passagemaking or easily removed and stowed for storms or to prevent theft.

OUTPUT

As mentioned previously, all solar panels will produce more power when cool and facing the sun (the closer to 90 degrees, the better). Traditional horizontal-mounted solar panels generally reach maximum production between 10 a.m. and 2 p.m. Power output will ramp and decline on either side of this period, with maximum power being achieved only if the sun actually passes directly overhead. Deck-

Solar Stik allows the panels to fold down and lock securely into place.

PS SOLAR STIK READINGS

OUTPUT	PANEL	PANEL WITH SOLAR BOOST (MPPT)	PANEL WITH LINE SHADOW
HORIZONTAL	2.7 amps	3.5 amps	
ANGLED TO SUN	5.3 amps	7.3 amps	6.8 amps
NOON READINGS	5.9 amps	7.9 amps	
4-HOUR OUTPUT (10 a.m. to 2 p.m., with panels angled hourly)*		28 amp-hours (Ah) (7 amps/hour)	

* Note: This is in noonday sun. Clear skies until 12:30 p.m., then partly cloudy.

mounted panels also suffer from excessive heat build-up, as most are mounted with little or no clearance between the panel and the deck, resulting in poor air circulation.

Single-axis mounts found on railings or davits help address cooling issues and allow some flexibility when adjusting the panels, but the actual sun-to-panel face-time they provide is dependant on sun and vessel orientation relative to that single axis. The three axis of rotation the Solar Stik allows full-panel articulation, meaning panels can be adjusted for maximum exposure throughout the day, no matter what the boat's position is relative to the sun. Additionally, the high wing-like arms of the mount provide excellent airflow around the panel, lowering panel temperature and aiding power output.

CLAIMS AND RESULTS

A myriad of factors affecting solar panel output—cloud cover, geographical location, season, hours of daylight, etc. That being said, the manufacturer claims that by combining full panel articulation (with three adjustments throughout the day), increased airflow, and a Solar Boost 2000E, output for the Solar Stik should be roughly 70 to 80 amp hours per day in optimal conditions. We've been able to achieve 80 to 90 Ah in the Mediteranean with two 80-watt panels on single-axis mounts, MPPT boosting, with the panels adjusted six times per day.

In March, we set up a Solar Stik at a test site on the Chesapeake Bay. We tested the Terra version, which has the same pole and panels used in the marine version, a tripod mounting system, and a Power Pak 100 (a portable power unit containing a Solar Boost 2000E and a 100 amp-hour reserve AGM battery bank). A Xantrex XBM Battery Monitor was installed to measure both cumulative and real-time amp hours generated. (See table, this page.)

We began taking preliminary readings at 9 a.m., followed by a cumulative amp-hour test from 10 a.m. to 2 p.m. Panels were adjusted hourly for maximum output (according to the Solar Boost and Xantrex gauges). Spot panel outputs were recorded both with and without use of the Solar Boost. We also noted output with a single quarter-inch line draped across one panel (as an example to show how power output can be reduced by shadows, even a thin one the size of a rigging wire). Weatherwise, skies were sunny and clear from 9 a.m. to 12:30 p.m., with partly cloudy conditions thereafter until the conclusion of the test at 2 p.m.

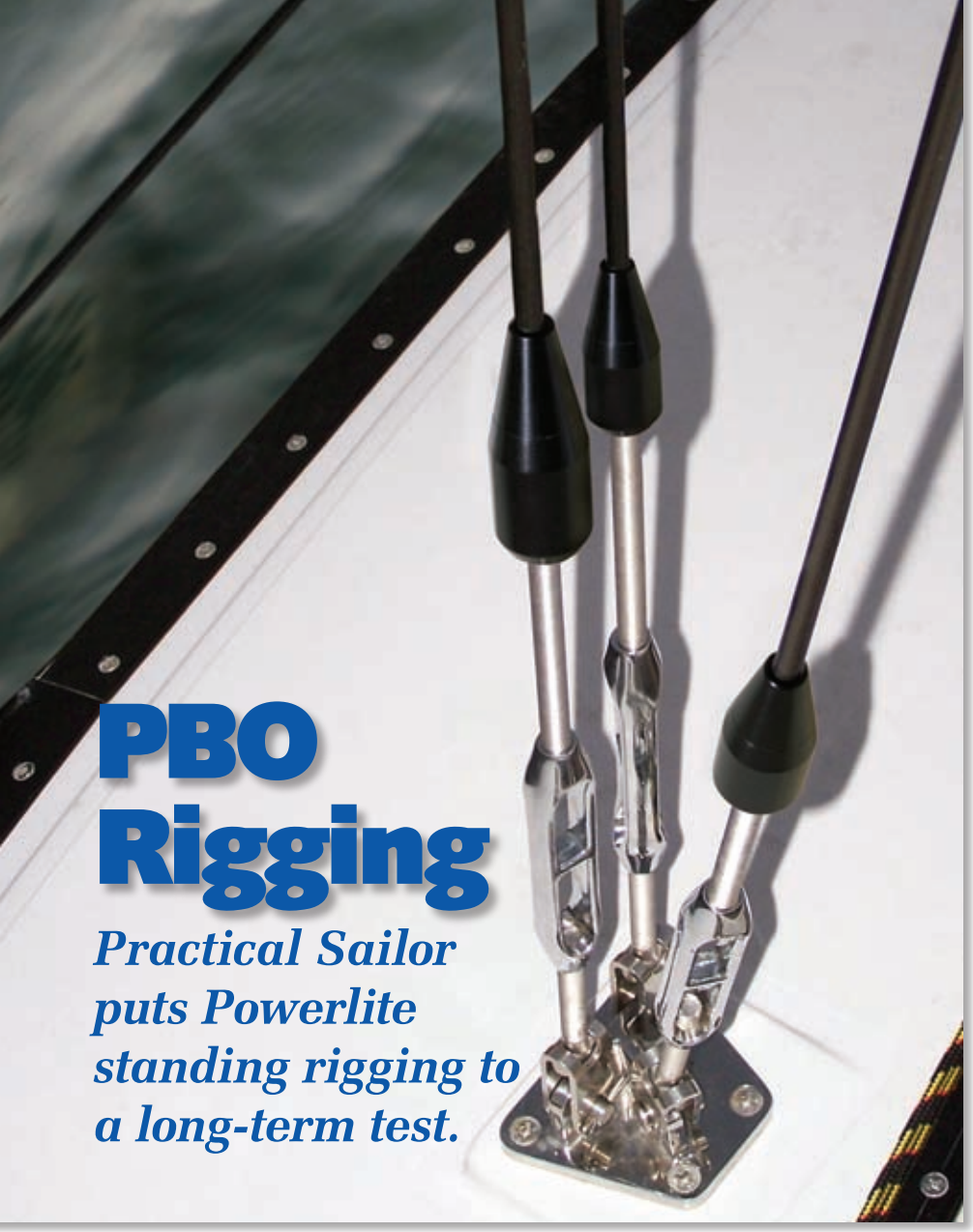
CONCLUSION

Based on our experience with the Solar Stik, the manufacturer's claim of 70 to 80 amp hours per day in optimal conditions is reasonable, but "optimal" is the operative word. Add a wind generator, and you have a good shot at meeting a 100Ah daily requirement.

PS does believe that one can match or beat the output at less cost. (We priced two 80-watt solar panels, plus Solar Boost at less than $1,600, leaving $1,800 for wiring and a custom mount.) However, the solution would be less compact, less elegant, and probably require more effort. To match the level of quality would entail some expensive custom work. In either case, the cost of the mounting system would be offset if the mount served multiple purposes—radar, dinghy engine hoist, wind generator mount, etc. We will be gathering cumulative output figures in a future test of the Solar Stik. Also on the horizon is a comparison of solar panels.

CONTACTS

SOLAR STIK
800/793-4364, solarstik.com



The Powerlite PBO terminals can be used with existing turnbuckles.

PBO Rigging

Practical Sailor puts Powerlite standing rigging to a long-term test.

Steel wire rigging dates way back. When small-diameter stranded wire rope began replacing large-diameter tarred hemp rope and heavy iron chain, it revolutionized a wide range of industries, from shipbuilding to bridge construction to railroads. By the 1880s, steel wire rope was sufficiently established to be offered by major marine suppliers in at least 23 different sizes.

In 1902, the tall ship *Preussen* was launched. At 408 feet overall, with five steel masts carrying more than 60,000 square feet of canvas, the *Preussen* was the most powerful sailing vessel ever built. *Preussen*'s steel wire rope rigging measured an astonishing 15 miles and ushered in a new century where wire rigging had become the choice for supporting masts on all ships, big and small.

In 1909, aerodynamically streamlined rod rigging was invented in Scotland. "Lenticular" shaped rod became highly sought after by the fledgling aircraft industry for streamlining aircraft tie rods, bracing, and controls. In 1917, England adopted rod rigging for its Royal Air Force, and trickle-down technological developments from the aircraft and other industries began to reach sailors, a trend that continues to this day.

In the late 1930s, rod rigging began to be found on board racing boats. Preparing for the ultimately successful defense of the 1937 America's Cup, rod rigging was incorporated aboard the Starling Burgess/Olin Stephens-designed "super J Boat" *Ranger*. A year later, rod rigging debuted on Stephens' quintessential 12-meter, *Vim*. And in 1939, Stephens' first 6-Meter design, *Djinn*, was also rigged with lenticular rod.

Just as the newer, smaller-diameter, wire rope was an improvement over older hemp rigging, the advantages of less stretch, weight, and windage made rod rigging desirable over wire rope.

Stainless steel rod as a rigging material saw limited availability after World War II, and it wasn't until the late 1960s that a new company entered the marine field and began offering stainless steel rod rigging for the general sailing public. Navtec Corp. began manufacturing round rod rigging from a high-grade stainless steel called Nitronic 50. Nitronic 50 was 20 percent stronger than wire of the same diameter.

Despite rod rigging's initial advantages over stainless steel wire rope, it had the drawback of being sensitive to surface damage, and it failed without warning. Rigging failures, usually caused by pitting and crevice corrosion or end-fitting fatigue, caused some high-profile dismastings, and initially dampened public enthusiasm for rod. But by the mid-1970s, rod rigging quietly and rapidly had become accepted as reliable by racers and cruisers alike.

Although stainless steel wire and rod rigging are still the traditional, most popular, and economical material of choice for mast rigging, metal is rapidly giving way to a new generation of synthetic rigging material. High-modulus running rigging, such as Spectra, Dyneema, and Vectran, has been in use for sheets and halyards for at least two decades. And now there are a handful of companies that manufacture standing rigging using ultra lightweight high-modulus synthetic fibers such as Kevlar, PBO ("polybenzoxazole"), and carbon.

"Modulus" describes the particular stiffness of a fiber component and that particular fiber's resistance to

Cutting Through the High-modulus Hype

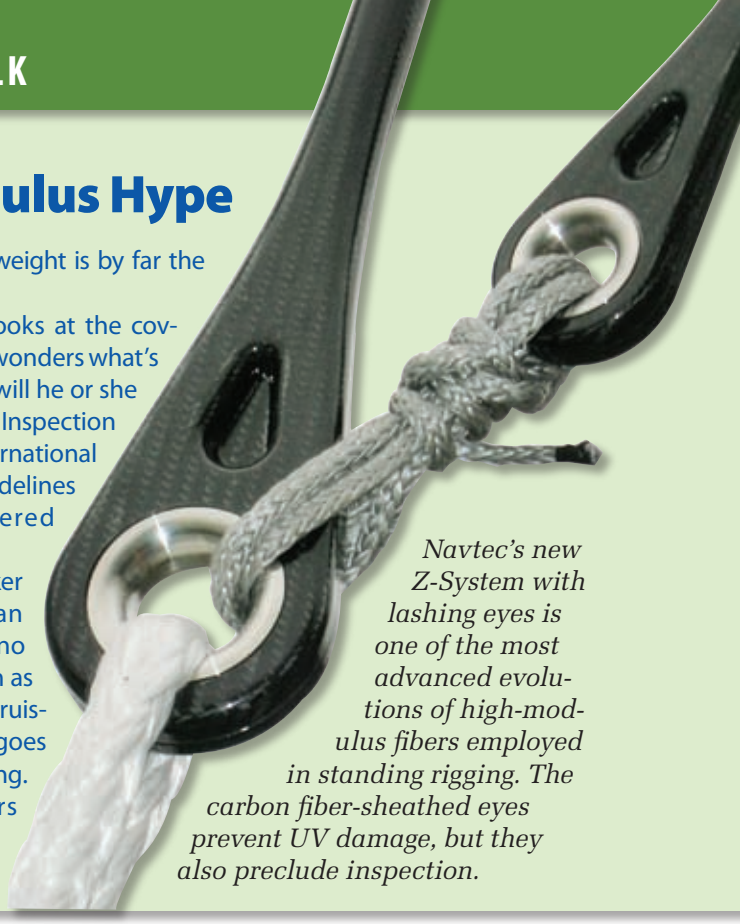
Not only does PBO rigging cost about four times more than stainless steel wire rigging, but its lifespan is highly questionable. There is a big difference between what happens in a lab and the rigors of duty on a cruising boat.

Bending high-modulus fibers around a thimble is no promise of an ideal termination. Moisture intrusion, UV degradation, abrasion, and inspection inability are why PBO rigging may be the "Emperor's New Clothes," rather than a sensible option for the club racer. For cruisers, it's a step backward in rig reliability, in our opinion.

Sure, PBO may simplify stepping and unstepping the rigs of small boats, but how hard is that really? A Cape Dory Typhoon has 8.5 pounds of 1x19 wire (standing rigging). Saving 3 or 4 pounds in an overall rig weight of 52 pounds doesn't make much difference, since spar weight is by far the biggest contributor.

When a surveyor looks at the covered PBO strands and wonders what's going on inside, how will he or she validate serviceability? Inspection access is why the International Sailing Federation guidelines recommend uncovered wire lifelines.

Boron-fiber spinnaker poles are lighter than carbon, but this by no means validates Boron as the pole material for cruising sailors. The same goes for high modulus rigging. Win-at-all-cost racers may view the matter differently.



Navtec's new Z-System with lashing eyes is one of the most advanced evolutions of high-modulus fibers employed in standing rigging. The carbon fiber-sheathed eyes prevent UV damage, but they also preclude inspection.

deformation under load. If the material deforms very little, the modulus is said to be "high." Trade-offs exist when you venture into fibers with high-modulus numbers. The fiber becomes more brittle, less robust, and expensive.

FIBER RIGGING TYPES

PBO, "the world's strongest fiber," was developed by Dow Chemical in the 1990s. It has the highest strength and modulus of any synthetic fiber and is made by mixing the PBO polymer while forcing it through a spinning machine. PBO is currently the gold standard of super fibers for rigging. Used in standing rigging applications, a PBO thread only 1 millimeter (1/25 inch) thick can hold 272 pounds (123 kilograms) of strain.

PBO offers good impact resistance, excellent coil-ability, and non-conductivity. Last year, continuous PBO standing rigging was developed to accommodate those rigging situations where diagonal and vertical shrouds are conjoined above the spreader tips.

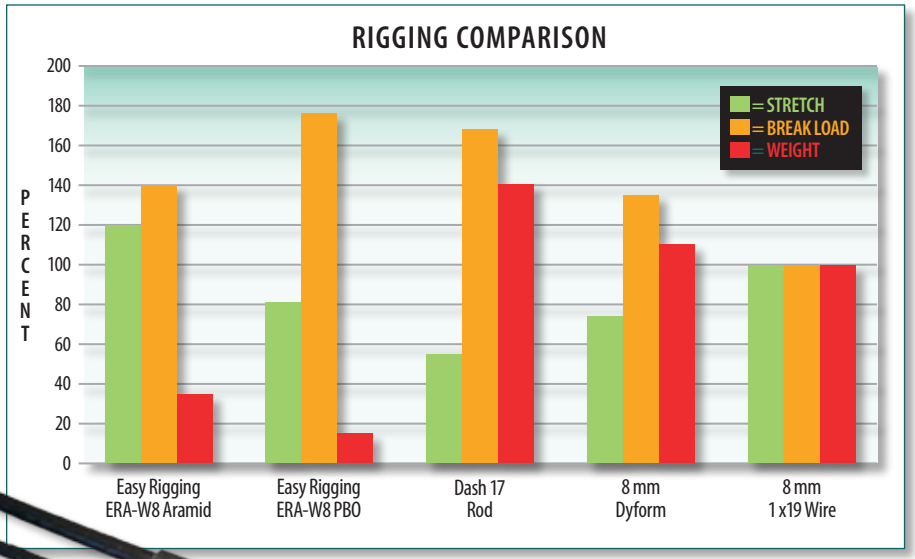
Kevlar (Aramid) is made by spinning a solid fiber from a liquid chemical blend. It is similar to PBO in flexibility characteristics, is about 40 percent less expensive than PBO, but not nearly as strong or lightweight. Kevlar has excellent impact resistance and is used as fabric in bulletproof vests as well as in yacht rigging and hull armoring for high-speed catamarans and around-the-world racers.

Carbon is similar in weight, stretch, stiffness, and strength to PBO, but substantially more expensive. Carbon, unlike PBO, will conduct electricity in a lightning strike. Carbon rigging is not subject to UV degradation or moisture, and is said to have greater longevity, higher fatigue resistance, and durability than either PBO or Kevlar. Carbon rigging such as "Element C6" from Southern Spars is a bundle of carbon fibers bonded together in an epoxy matrix. As with PBO, carbon rigging can be continuously wound rigging from masthead to deck, with no spreader end fittings or turnbuckles in between. When building custom carbon rigging, the mast dimensions are "jigged up" on a design floor so as to ensure an exact fit.

ADVANTAGES

There are many advantages of high-modulus synthetic rigging. Weight savings aloft is the primary benefit. High-modulus fiber can be up to 50 percent stronger than similar diameter rod or wire rigging, and up to 90 percent lighter. Weight savings aloft translates directly into less pitching and rolling in waves, more righting moment with less heel angle, increased performance, and ultimately, more sailing comfort. However, the actual impact of the weight savings varies greatly between boats, and is less pronounced in smaller average racer-cruisers (30 feet or less). Certainly the trade-offs you make when switching to PBO seem to make little sense for a cruising sailor (see "Cutting Through the High-modulus Hype," above).

Another touted benefit of high-modulus rigging is greater fatigue resistance. Tests in lab conditions show that high modulus has up to three times the fatigue resistance of wire, and six times that of rod. In practice, however, high-modulus standing rigging is replaced at relatively short intervals, so, currently, there isn't a lot of data supporting



In a table supplied by Smart Rigging (above), the stretch, break strength, and weight of 8 millimeter diameter PBO, Aramid, rod, and Dyform are expressed as a percentage of the corresponding specifications for 1 x 19 wire. The small-boat rigging from Smart Rigging (called Easy Rigging) uses a heat-shrink jacket (left) to protect the PBO from UV degradation. To form the terminals, the fibers are continuously wound around thimbles.

its practical lifespan. A four-year warranty is the most that manufacturers are offering. Wire rigging, on the other hand, can last twice that long or longer—although a typical warranty only runs for one year.

While the high-modulus standing rigging makes much more sense for the bottomless pockets of the Grand Prix set, PBO offers advantages for small boats. Trailer sailors—who are regularly unstepping and stepping the mast—will find it easier to coil, uncoil, and stow fiber rigging. There is also less chafe to the hull, deck, and mast when towing.

A promoted, but yet unproven benefit of PBO and Kevlar is that, when dry, they are non-conductors. However, *Practical Sailor* would strongly advise against holding onto any rigging, even PBO or Kevlar, when thunderstorms are near. When a lightning strike occurs, the charge ionizes an 8-inch diameter column of air. The ambient salt that builds up on the skin of dielectric rigging is enough to act as a lightning leader, leaving a big question mark as to how toasty the PBO or carbon will become.

DISADVANTAGES

For the average racer-cruiser, there are several drawbacks to PBO rigging, but three very big minuses stand out. These handicaps make PBO even less appealing for the long-distance voyager. (See "Cutting Through the High-modulus Hype," page 25.)

It is four times as expensive as stainless steel wire, although roughly on par with rod rigging. Should it's cover fail, it drastically loses strength in direct sunlight. Visual inspection and DIY repair under current construction technique is impossible.

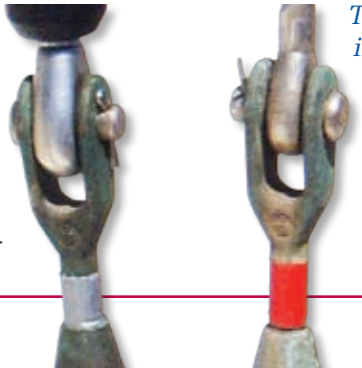
If these more serious problems are resolved, the other issues will be minor.

An initial problem with the manufacture of high-modulus rigging, as with wire and rod, was the application of terminal end fittings. Early end fittings were chemically or mechanically bonded, and problems with bending and fatigue could compromise strength and longevity. The Powerlite system uses epoxy resin-infused end fittings, which are, for the most part, adaptable to existing spars and turnbuckles.

Another approach to end-fittings involves thimbles. Using this technique, the shroud can be manufactured in any diameter and length by winding fibers around thimbles until the bundle reaches the desired size. This eliminates hard spots at terminal connections, but may require more modifications for retrofitting. Both Navtec's Z-System and the Dutch company Smart Rigging (which also has a small boat line called Easy Rigging) manufacture rigging using this approach. Navtec also makes PBO rigging with biconic end (mechanical, spike and cone) fittings. These studs, T-balls, and stem balls that are readily adaptable to existing spars and turnbuckles.

UV sensitivity and degradation, water absorption, abrasion, and chafe are serious problems for high-modulus material. Lab tests have shown that PBO can lose up to 98 percent of its strength after three weeks of direct exposure to sunlight UV. But rigging manufacturers claim to have all but eliminated potential damage to high-modulus fiber by sheathing the fibers in a variety of materials.

These sheathings come at a potential cost in windage, as they increase the diameter of most high-modulus rigging products to one and one-half times the diameter of equivalent rod rigging. Thus, a trade off comes between reducing weight and increasing windage.



The Powerlite terminal installed on Wildflower (far left) *was slightly thicker than the original (near left), and had to be filed down to fit into the fork on the turnbuckle.*

In terms of big-boat racing, the reduction of rigging weight seems to be offsetting the disadvantage of the slight increase in windage, which is only a disadvantage when sailing close to the wind.

Other shortcomings deal with rating certificates and ordering. Rigging with high modulus needs to be reported on rating certificates, and PHRF and other handicap systems may ding a yacht's rating when rigged with high modulus standing rigging. Lead time for building high modulus rigging can be quite long, often measured in weeks, and particular attention needs to be given to ordering parameters.

THE TEST BOAT

To get a better handle on the use of PBO standing rigging in a real-world application, *Practical Sailor* is currently sail-testing PBO for stretch, flexibility, UV and chafe resistance, and longevity. How long does this stuff really last?

For the test, we replaced the starboard side standing rigging on board the 28-foot performance cruiser *Wildflower*—owned by *PS* contributor Skip Allan—with Powerlite PBO rigging and terminals developed by Applied Fiber. Generic 1x19 stainless steel wire rigging has been fitted on the port side of the boat.

The wire was installed on *Wildflower* in early December 2006. So far, it has been in use for 30 hours and 120 miles of ocean sailing off Santa Cruz, Calif. To date, Allan reported, he can ascertain no difference in tuning or performance of the boat. Some problems with installation did arise, and were complicated by the fact the swap was done without removing the mast. This required going aloft and removing one shroud at a time, a time-consuming and tedious effort, in which not dropping pins and bushings while working aloft with cold fingers became a priority.

In addition, the marine eye end fittings were 1/32 inch wider than both the female mast tang and chainplate turnbuckle forks, and needed to be filed down. Another problem arose where the Powerlite PBO passes over the spreader tip. The diameter of the spreader tip rigging groove was 1/4 inch and the 1/2-inch-wide plastic protection "spreader bend" would not fit into the spreader tip without modification to the spreader end.

Comparing costs, stainless 7/32-inch wire rigging for a 16-foot port lower shroud and a 32-foot upper shroud, with end fittings, was $250. The PBO upper and lower shroud replacement, including the required endfittings, retailed for $1,110,—more than four times the cost of wire, but about the same as rod.

What did *Wildflower* gain? According to our estimates, the refit saved a little over one pound of weight. Clearly, there are cheaper ways to shed ounces. The experience suggests that anyone who is serious about shaving weight aloft should also look at a carbon-fiber spar, which might actually come out ahead in the cost-benefit analysis over the long-term. Nevertheless, manufacturers are quickly resolving the issues surrounding high-modulus synthetic rigging.

CONCLUSION

Until recently, the technology for high-modulus, synthetic fiber rigging was only available to deep-pocketed mega-yacht owners, America's Cup, and Grand Prix syndicates. As research, development and testing advances, and the need for these advanced fibers in various industries fosters competitive pricing, this type of rigging may one day be an option for average sailors.

Under the current state of technology, we can only recommend this product for the serious racer with very deep pockets, one who is looking for the maximum weight savings regardless of cost. Depending on the boat, the edge gained may be nominal, so one shouldn't expect miracles.

However, the state of development in this arena is changing fast. Whenever retrofitting an existing racing or cruising rig, or designing a new rig, the use of high-modulus synthetic fiber rigging bears a fresh and unbiased look. Only time will tell whether rod and wire-rope will go the way of hemp and chain.

PBO RIGGING DETAILS

1. Powerlite's lashing eye is designed for use with high tech fiber lashing line.

2. A variety of end-fittings connect to the Powerlite spreadertip.

3. PBO fibers are continuously wound around a thimble to form Easy Rigging terminals.

CONTACTS

FUTURE FIBRES
+34/961-452-135, futurefibres.eu

NAVTEC, 203/458-3163, navtec.net

POWERLITE, 850/539-7720 applied-fiber.com

SMART RIGGING (Annapolis Performance Sailing), 909/985-9993, smartrigging.com; (apsltd.com)

The Standard Horizon CPV350 (top) is a marine VHF radio and chartplotter with a hailer and foghorn. It also has sounder capabilities.

Standard Horizon CPV350: A Capable Multitasker

Occasionally, a product hits the market that can't be easily categorized. Case in point: the Standard Horizon CPV350. It's a marine VHF radio, chartplotter, and even has sounder capability when it is paired with the Standard Horizon FF520 black box sounder. It's a perfect fit for small boats with small instrument panels where space for electronics can be very limited.

The CPV350 has a long list of features that go beyond the ability to transmit and receive. It has an integral 30-watt hailer with automatic and manual foghorn capability, which allows for reception of VHF voice signals even while in the P.A. or Fog Horn mode. Other important features include sophisticated DSC capabilities with a second receiver dedicated solely to receiving channel 70 digital signals, an easy-to-access menu, and a large rotary knob for channel selection that doubles as a range and zoom tool for the chartplotter. The device is also AIS capable when coupled with an AIS receiver. It can be used with up to two Standard Horizon remote microphones, too. (Look for *Practical Sailor*'s test of remote VHF mics in an upcoming issue.)

Although the CPV350 can interface with the company's FF520 fishfinder, we did not test this feature.

The CPV350 has a 7-inch color display screen with a resolution of 800 x 480. The display is comparable to that of the Navman Trackfish 6600, *PS's* Best Choice among tall screen plotter/sounders reviewed in the June 2006 issue. It has the same resolution and a slightly smaller screen.

For testing, we mounted the unit using the plastic bracket shipped with it. In a permanent installation—wherever it is possible—we'd opt for a flush mount for a display unit this big.

We found the CPV350 screen to be bright and sharp in daylight conditions. The best view, in our opinion, was the Sunlight color palette. The Normal setting also worked well, but the Classic setting was a little dark in the daylight for our liking. Night Vision mode darkens the screen to reduce glare and improve low-light viewing. While viewing the screen in daylight with polarized sunglasses, we noticed it darkened slightly even when viewed from directly in front. Viewed from 45 degrees, it was just about blacked out. According to Standard Horizon spokesman Scott Iverson, blackout at severe angles is normal for most LCD screens when viewed with polarized sunglasses. We've had mixed results in our testing experience. Some, like the Furuno GP-7000F, had no darkening, while others like the JRC Plot 500F had slight darkening.

Without the glasses, the Standard Horizon CPV350's screen was usable at this angle. Testers found it necessary to be close to the screen to read small details, like depth numbers, on the map page. Screen details can be made larger via the main menu. We found that the larger size created a clutter of names and numbers. Also, the size of the mark and waypoint names did not change. This characteristic was especially noticeable at night and is the reason we rated the screen Good instead of Excellent for both day and night viewing. Unfortunately, this is a consequence of having such a high resolution displayed on a screen of this size. We'd still opt for this combination over a lower-resolution screen of the same size.

We found the CPV350 plotter easy to operate with its pushbuttons, joystick, and menu-selectable functions. We gave it a Good rating for plotter user-interface. We see the lack of an alphanumeric keypad as a disadvantage, particularly when entering data like waypoint names. Five soft keys add operational flexibility on the pages where they are functional. If their function labels are not displayed, pressing any soft key will bring up all active soft key labels. We found chart redraw to be about average, things can take a few seconds to display when shifting ranges quickly. With its C-Map Max card installed, the CPV350 ranged down to very fine detail.

The course predictor on the CPV350 works well and is adjustable; like some other fine details though, it can be hard to see. Data blocks are displayed across the top of the map page in a variety of ways that are user adjustable. Hitting the enter key, followed by another button push or two will yield a waypoint at the current or selected

cursor position. This action also brings up soft key functions that allow you to manipulate the waypoint.

A new update allows the storage of up to 3,000 waypoints and 50 routes. Waypoint names can use 10 characters and one of 16 symbols.

The CPV350's built-in GPS in WAAS capable, and its sensitivity and selectivity are as impressive as its VHF performance.

CONCLUSION

We like the CPV350 for all its capabilities that are placed so well in a reasonably sized and reasonably priced package. And it has a three-year warranty.

The main drawback we see in the CPV350 is that by having one device that handles multiple duties, system redundancy is lost. If that one device fails, you're out of luck. CPV350 users would do well to keep a backup handheld VHF and handheld GPS onboard.

CONTACT

STANDARD HORIZON
714/827-7600, standardhorizon.com

PS VALUE GUIDE STANDARD HORIZON CPV350

PRICE	$880
SOURCE	thegpsstore.com
PLOTTER FEATURES AND RATINGS	
ROUTE STORAGE CAPACITY	20
PLOTTER USER INTERFACE	Good
DAY VIEW	Good
NIGHT VIEW	Good
VHF RADIO FEATURES AND RATINGS	
MICROPHONE CONTROLS	Channel change, Quick 16/9
WX ALERT	Yes
REMOTE MIC CAPABLE	Yes
SCRAMBLER OPTIONAL	Yes
HAILER	Yes
AUTOMATIC FOG SIGNALS VIA HAILER	Yes
CHANNEL COMMENTS	Yes
DSC (Y OR N)	Yes
DSC CAPABILITIES	ITU Class D
HIGH TX POWER AT 13.8 V (RF OUTPUT)	24.1 watts
HIGH TX POWER AT 13.8 V (DRAW) AT 11.0 V (RF OUTPUT) AT 11.0 V (DRAW)	 5.2 amps 23.7 watts 5.4 amps
LOW TX POWER AT 13.8 V (RF OUTPUT) AT 13.8 V (DRAW)	 .52 watts 1.5 amps
TX POWER AFTER 2 MINUTES CONTINUOUS TRANSMIT	23.6 watts
TX POWER AFTER 4 HOURS AT 15F 2 HOURS AT 122F	 23.5 watts 23.3 watts
TRANSMITTER FREQUENCY STABILITY	Good
RECEIVE SENSITIVITY	Excellent
SELECTIVITY	80 dB
AUDIO OUTPUT (DBA	93
AUDIO QUALITY	Good
VALUE ADDED FEATURES	Excellent

All readings in DC power

HOW WE TESTED

We ran the Standard Horizon CPV350 through the same sequence of VHF radio bench tests we've used in the past. We assessed the transmitter power output. FCC regulations prohibit more than 25 watts of power output from a marine VHF transmitter as well as requiring a low-power setting, typically 1 watt, for harbor use. All power output measurements were taken directly off the radio antenna port.

To power the CPV350, we used an Astron VS-70M variable voltage power supply to produce 13.8 volts DC, simulating a boat with the engine running and the alternator powering the boat's electrical system. Radio frequency (RF) power output, frequency accuracy, and power usage were recorded using a Ramsey COM3010 communications service monitor and a Fluke 336 ammeter. On channel 16 at room temperature (75 F) the CPV350 put out 24.1 watts while drawing 5.2 amps, quite good compared to VHFs we've tested in the past. A quick press of the H/L button shifted the transmitter to low power, where we measured only .52 watts at 1.5 amps. We stepped down the voltage to 11 volts DC to simulate transmitting with a weak battery. The CPV350 still pushed out 23.7 watts while drawing 5.4 amps.

Temperature extremes were next: We put the radio in our bait freezer (at 0 F) for four hours and then used our fish smoker and warmed things up (122 F) for two hours. After each extreme, we accomplished another transmitter power output test. Performance on these two tests was good.

Frequency accuracy is defined as the ability of the transmitter to send output signals exactly on the selected frequency. Regulations mandate an accuracy of 10 parts per million (about 1550 Hz off frequency in the marine band). Industry groups typically call for half that error, which is the specification on the CPV350. We measured the frequency accuracy during every transmitter test. Our frequency stability rating, which is transmitter frequency accuracy over its entire temperature operating range, was well within specifications, though not perfect. Things like substandard boat wiring, corroded electrical connections, long antenna cable runs, and numerous other factors could limit the actual radio frequency (RF) power emitted from the antenna.

Receiver sensitivity is the ability of the radio's receiver to hear a weak signal. Typical marine VHF receiver sensitivity ratings run from .22 to .35 microvolts with industry groups recommending a minimum .50. The CPV350's sensitivity specification is .25 microvolts. We tested for sensitivity using the minimum signal the radio would receive at a specific industry standard setting between background noise and generated signal (12 dB SINAD). In laymen's terms, that is approximately half static and half recognizable signal. The CPV350 tested as advertised and has more than enough sensitivity to pick up very weak incoming signals.

Another receiver standard is selectivity, the ability of the receiver to reproduce only the signals transmitting on your selected channel. Our equipment did not allow us to test for this. Instead, the manufacturer provided us with a selectivity specification of 80 dB—a very high number ranked with the best radios we've reviewed.

To rate the audio system, we measured the sound pressure levels at max volume while inputting a 1 kHz tone with our COM3010. The sound level measurement was taken at a distance of 1 meter using a Radio Shack decibel meter set to record dBA. The CPV350 hit 93.

Dock Cart Field Test

Roleez Folding Wheel hand truck edges a slew of competitors.

Many marinas and most yacht clubs provide a fleet of dock carts for members to transport coolers, clothing and gear from their cars to their boats. The common type has big spoke wheels, three sides, and sufficient capacity for even a kid to hitch a ride down the dock. But say the above scenario doesn't describe your berthing arrangement, or you find it useful to pack a compact cart onboard, perhaps for carrying groceries and ice to the boat while cruising distant harbors. What should you buy?

To help answer the question, we procured seven folding, wheeled dollies or hand trucks, plus the top folding cart, the Foldit, from our May 1, 2000 evaluation. There's some variety in design, focusing on targeted functions, like fat wheels for pushing across beach sand, and net bags for holding loose items. We'll point these out as we describe each product. Three of the hand trucks are very similar, so we'll start with those, then move on to the other three very different trucks, and lastly the Foldit cart.

Our top pick, the Roleez Folding Wheel hand truck comes with bungee cords to secure the cargo.

The Pack N Roll dock cart (shown here) was the only test product that could be described as truly compact. Its folded dimensions are 17¾ x 17¾ x 3 inches.

To test, we loaded each with the items most commonly carried from car to boat: a cooler full of food and drinks, a duffle packed with clothes, and a 12-volt battery (OK, the latter may not be commonly transported, but when you do need to move one, a cart or truck is almost essential).

ROLEEZ FOLDING-WHEEL

This hand truck is very similar to the next two: the Sea Bowld and Dock Dolly. It's easy to imagine they were manufactured in the same factory in China, with just enough differences to throw you off. The aluminum platforms, with nonskid bumps, are configured slightly differently. The Roleez is supplied with bungee/shock cords to secure loads to the aluminum frame. It's nicely made and a few pounds heavier than the other two. No assembly is required. Just pull out the airless black rubber wheels, which are folded inward, or push down the platform with your foot (the wheels and platform are integrated to move together). Then depress the "top control cross wire" (actually it's more of a metal rod) and pull up the handle so it extends to its full length. Off you go.

SEA BOWLD

Packaging says, "Designed for deck and dock." Like the Roleez and Dock Dolly, the platform and frame are aluminum. Also like the others, the wheels fold out in concert with the platform going down. Unlike

PS VALUE GUIDE DOCK CARTS AND HAND TRUCKS

Make/ Model	★ ROLEEZ FOLDING WHEEL	✓ SEA BOWLD HAND TRUCK	DOCK DOLLY HAND TRUCK	ROLEEZ SPORTS CADDY	$ PACK AND ROLL	WONDER WHEELER	✓ FOLDIT MARINE CART
Price	$29	$50	$50	$169	$16	$45	$230
Price source	wheeleez.com	boatersworld.com	fishreports.net	wheeleez.com	as-seen-on-tv-products.ws	wonderwheeler.com	norwaycarryall.com
Capacity	200 lbs.	200 lbs.	220 lbs.	200 lbs.	150 lbs.	75 lbs.	330 lbs.
Weight	12 lbs.	9.5 lbs.	6.5 lbs.	12 lbs.	6.5 lbs.	11 lbs.	25 lbs.
Platform size	18½ x 11½ in.	19 x 10½ in.	19 x 10½ in.	14 x 14½ in.	15¼ x 12½ in.	20 x 12½ in.	38 x 22½ in.
Folded dimensions	18 x 29½ x 2½ in.	19 x 30 x 2¼ in.	19 x 28½ x 2¼ in.	18½ x 29½ x 2¼ in.	17¾ x 17¾ x 3 in.	22 x 34½ x 10¼ in.	41½ x 22 x 10 in.
Comment	Edges Sea Bowld	Vies with Roleez	Light but pricey	Best for beach	Ultra compact	Fabric platform	Heavy-duty cart

★ Best Choice $ Budget Buy ✓ Recommended

the other two, two red plastic cams lock the extendable handle in the down position, so it won't inadvertently pop up when being carried in the folded position. A central black plastic clip locks the handle in the up position. Two bungee cords are pre-strung for securing cargo. The wheels are "Non-marring EVA tires." They measure 6¾ inches.

DOCK DOLLY

It's pretty obvious this hand truck was made by the same company as the Sea Bowld, though there are differences in construction. What's similar: the packaging, basic design with folding non-slip platform and fold-out "non-marring EVA" wheels, handle lock in up position, and instructions. What's different: no bungees, no handle lock in down position, and slightly larger wheels (7¼ inches).

ROLEEZ SPORTS CADDY

Now for the specialty hand trucks. The Roleez Sports Caddy has an epoxy powder-coated steel tubular frame with telescoping handle and fold-down platform. The platform is not aluminum plate, but is mild steel, a disadvantage in our opinion. It's not as wide as the above three hand trucks, but plenty wide enough to balance a cooler or battery. What makes this truck unusual is its large inflatable polyurethane balloon wheels, which are superior to skinny wheels/tires on beach sand or snow. These doughboy wheels measure nearly 12 inches in diameter and 7 inches wide. Literature boasts they'll also cruise over "rocks, curbs, stairs, and bumps; over grass, and on other environmentally sensitive

Dock Dolly *Roleez Folding-Wheel cart* *Sea Bowld hand cart*

Roleez Sports Caddy

Our test included a look at four hand trucks. Three of the four are nearly identical, with aluminum platforms, telescoping handles, and thin plastic wheels. The fourth, however, the Roleez Sports Caddy has a more unique design. It's frame is thinner than the others, its platform is narrower, and its inflatable wheels are much larger, making it easier to haul loads over sand or gravel.

areas," whatever those are. And they do. We tried the Sports Caddy on a variety of terrain, including beach sand.

Assembly is fairly simple: remove the elastic netting that holds the wheels to the frame, free the axle from plastic cable ties, insert the axle into the frame and push on the wheels. Open the handle brake, pull out the handle to its full extension or to desired length, and clamp the brake back down. Use the bungee/shock cord and any of the four nylon webbing straps to secure your load. The big wheels hardly make for compact storage.

The Wonder Wheeler can make a day at the beach easier with its large wheels and mesh bag, but its loose shelf design makes carrying heavy loads difficult.

PACK N ROLL

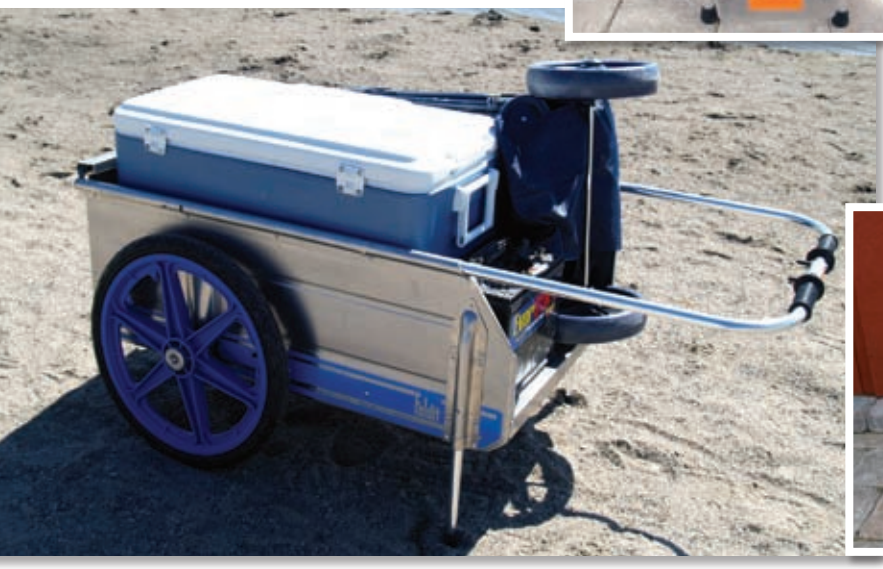
This suitcase-size dolly has what looks like a black plastic milk crate for a platform. Its wheels are small at 3 inches. The extendable handle is released by depressing a button on the end of the handle, like most small wheeled carry-on suitcases. Unsnap the two sides, shake open, and the hinged floor falls down to secure the square cargo box. There's a separate, optional ($6) lid which we suspect will be used only in the event of rain…and when all contents fit inside the box. This is definitely the most compact of all the carts. Transporting a cooler requires balanced it on top of the 13½-inch-tall crate, though a battery easily fits inside it. The Pack N Roll is the least robust of the carts tested: The handle wiggles and the wheels are small. It's advertised on television and on the Internet.

WONDER WHEELER

Styled as a beach buggy, the Wonder Wheeler opens easily and locks in position. A red plastic piece locks it in the folded position so it doesn't pop open accidentally. The front wheels snap on by depressing a plastic tab that looks a little fragile. The rear wheels push onto the stainless steel axle and are secured by a spring clip. The plastic wheels are 10 inches, and therefore better for beach sand than the trucks with smaller ones.

It looks like a baby carriage but a warning label expressly states that it is not. This misconception occurs because of the soft "seat" and the mesh cargo bag. The packaging shows a photo of the Wonder Wheeler loaded with four beach chairs, a cooler, beach ball, towels and other stuff. Other uses are touted for laundry, gardening, firewood, and trash. No cargo capacity is listed, only this encouragement: "Load it to the Max."

We can see many uses for this cart around the home, such as transporting groceries in bags, but it's not adept at carrying a large cooler. The canvas platform seems weak to support a battery over any bumps, and its loose nature makes it difficult to



The Foldit was the only true dock cart included in this round of testing. It's larger, heavier, and way more expensive than the other products tested. However, it is well made and can carry a ton of stuff.

The whole gang: (front row, from left) The Dock Dolly, Roleez Folding-Wheel cart, Sea Bowld hand cart; (back row, from left) the Wonder Wheeler, Foldit, Pack N Roll (in Foldit), and the Roleez Sports Caddy (with cooler loaded on it).

secure a heavy load. And since most people carry clothing or equipment in duffles or canvas bags, the upper mesh bag for loose items seems less convenient than it might otherwise appear.

FOLDIT

The all-aluminum construction Foldit goes together quickly. All you have to do is remove the bolt and washers from the two axles, using the triangular screwdriver provided, smear some grease (also provided) on the outside of each axle and on the plastic bushings in each wheel, slip on each wheel, and refasten the bolts and washers. It takes maybe five minutes. Before you can unfold the cart you have to extend the tubular handle. It took a minute to realize that there's a push-button on the sides of the handle tubes that must be depressed to release the handle from the rolled cart sides. Once the handle has been pulled out, the cart folds out and locks. Insert the tailgate and you're good to go.

The large size of this cart compared to the hand trucks makes it easier to transport a lot of supplies or equipment, but the downside is the larger stowage package. Whether or not that's a problem depends on the size of your boat and available lockers.

Its manufactured by Tipke Manufacturing and sold through dealers, such as Norway, listed in the Contacts box.

WHAT TO BUY?

As noted, the three similar hand trucks—Sea Bowld, Dock Dolly, and the Roleez Folding Wheel—compare favorably in terms of construction and design. But once you look at price, the Dock Dolly, as sold by West Marine, drops out of the running. At $110, it's more than twice the price of the others. Between the Roleez and Sea Bowld, we give the slightest of nods to the Roleez for its simpler operation (depressing the bar is easier than locking and unlocking the two red plastic cams). And you save a buck!

If you like to run your dinghy up on the beach and then hike half a mile to the party, The Roleez Sports Caddy is for you; otherwise, forget it. Its big balloon tires make it too clumsy to carry on board, and the $169 price tag is way above the others.

The Pack N Roll is appealing for two reasons: it collapses to a super small size akin to a portable tool kit, laptop, or briefcase; and it's dirt cheap. They're available in several sizes and are sometimes seen advertised on TV for less than $20, so it's out Budget Buy. On the other hand, they're not as well made as the other hand trucks, and we didn't find the milk crate-like box as convenient for transporting large items.

The Wonder Wheeler web site extols its versatility, showing it loaded down with beach chairs, a 48-can cooler shoved in lengthwise, and beach towels and lotion and stuff filling the mesh bag. The wheels are on the small side, but again, the beach wasn't our main interest here. Just the dock, ma'am.

The Foldit stands alone as the only true cart in this report, and we like carts. It doesn't seem fair to compare it to the hand trucks; it's bigger, heavier, and much more expensive: $230.

In the end, for dock use and stowage on the boat, we think we'd get the most for our money with the Roleez Folding cart or the very comparable Sea Bowld.

CONTACT

DOCK DOLLY
800/685-4838,
westmarine.com

FOLDIT
608/544-5000,
norwaycarryall.com

PACK N ROLL
866/584-7812, completek-12.com

SEA BOWLD,
877/690-0004, boatersworld.com

WONDER WHEELER
877/232-2498,
wonderwheeler.com

ROLEEZ
800/369-1390, wheeleez.com

Photo by Ralph Naranjo

Of all sailing gear, electronics and electrical systems are perhaps the most vulnerable in the wet, salty marine environment. Among the many products that claim to armor these delicate devices and systems are 10 sprays we recently tested, including Boeshield T-9 and WD-40 (above).

Spray-on Protection for All Things Electrical

Rust inhibitors return to the test bench to see which one protects those delicate electronics.

With few exceptions, cruising sailors depend on electricity to maintain their on-board lifestyles within certain parameters of comfort and convenience. But this comes at a price, one that isn't measured merely by amp hours. Seawater and electricity love each other with a fatal attraction of the kind that makes movie plots, and when they break barriers to get to each other, we suffer from the destruction they leave in their wakes. So, it's not surprising that a thriving market exists in products designed to keep electricity and seawater apart.

A survey of the maintenance aisle in your local chandlery will reveal several aerosol-applied coatings that claim to penetrate, lubricate, and protect electronic equipment, or prevent corrosion. Many offer to do all of these things. We selected 10 products, all of which make claims that specifically mention electrical equipment, electronics, and/or corrosion on their labels, then we set about testing how well they work.

We've included some of the same products featured in *Practical Sailor*'s test of metal corrosion inhibitors (see *PS* April 2007, "The Crusade Against Corrosion"), but we did not test Corrosion HD, LPS 2, LPS 3, or Shark Hide on the electronics. However, we did add Strike-Hold and CRC's QD.

In the April review, we tapped CorrosionPro Lube and CRC as being the best for metal protection. In the May 1, 2002 review, we favored CorrosionX MaxWax and CRC HD for metal protection, and Corrosion X and Corrosion Block to protect electronics and electrical equipment.

In general, the idea with these products is that if you spray sensitive electrical circuitry—including printed circuit boards—with them, they'll prevent corrosion from interrupting circuits and water from creating circuits where they aren't wanted. And some manufacturers claim that their products "help restore" the functionality of electronic equipment that has been immersed in seawater.

A common characteristic of products marketed to inhibit corrosion or to protect electrical circuits is that they are dielectrics. Simply, that means they are insulators. When applied to a substrate, such as metal or a printed circuit, they form a thin film of insulator over its surface. Another property common to these products is that they bind to the substrate more closely than water does, by virtue of having either a lower surface tension or by a process called "polar bonding." Either way, they physically displace water already in contact with, or prevent it from coming into contact with, the treated surface.

The high breakdown voltages of these products—from 20,000 to 38,000 volts—might suggest that they offer full protection to marine electronics operating at 12 volts. However, the ASTM D 877 standard by which these dielectrics are tested measures the voltage (alternating current at 60 Hz) at which the material's resistance breaks down between electrodes set 2.5 mm apart while immersed in the material (in its liquid form). Although the relationship between dielectric thickness and breakdown voltage isn't linear (and for some materials gets weird at very thin layers), the fact that we're working with films of thicknesses from a few micrometers down to, as some manufactures state, a few molecules, it follows that the applied potential differences they can withstand become quite small.

Also, it's interesting to note that while corrosion protection and electrical protection rely very much on the same dielectric effect, how that protection is delivered affects how well the product performs either or both functions. The best corrosion inhibitors might not be the most suitable products for protecting sensitive electronic circuitry. Those with waxy films may attract dust and inhibit heat

These cheap radios were sprayed with electrical protectants and then left to sweat it out in the humid atmosphere of an aquarium containing sea water.

Practical Sailor obtained 10 small FM radios from the American Science & Surplus catalog, and two more elsewhere that were nearly identical but lacked earbuds. (We had chosen the original 10 because the earbuds—which wouldn't be immersed—would let us hear the radio even if the speaker failed.)

Testers inserted new batteries to ensure that the radios worked. We then sprayed each one's circuit board and electrical connections liberally with the assigned product and left them to dry overnight.

After ensuring that each radio still worked, we placed them in a fish tank containing seawater, setting them atop bricks to keep them dry. Testers placed the tank in a sunny spot on a cement patio blocked from the wind, and in no time, the specimens were steaming in tropical heat—98˚F and 93 percent humidity. We left the radios to simmer for 10 days, checking them every 24 hours.

All of the radios survived this part of the test, though some were beginning to show signs of minor breakdown in the volume control and our untreated control radio was reduced to emitting only squeaks. The battery compartments on several had begun to crack. In the absence of visible deterioration of the plastic, we hesitate to attribute this to the sprays. It's likely a case of imperfect design, perhaps exacerbated by chemical reaction to the sprays.

After the humidity test, we immersed each radio for an 1½ hours in a pail of seawater. Then, we flushed them with freshwater and let them air dry for 48 hours.

After the dunk test, none was able to emit even a static buzz from the speaker or ear buds. We opened the battery compartments and saw that corrosion had taken place at the battery terminals on every radio except the one treated with TC-11. The on/off/volume-control potentiometer was reduced to a little ball of rust in each radio.

For the next test phase, we attempted to use each product to "insulate" pairs of copper electrodes (made with 18G solid copper wire). We immersed the electrodes in seawater, and connected them, in series with a flashlight bulb, to a 6-volt battery. With the exception of the two heavy, waxy coatings, CorrosionPro Lube and CRC Heavy Duty Corrosion Inhibitor, in each test, the bulb lit and gas bubbles formed on the anode. When we brought the electrodes closer together, the bulb grew brighter, and when we touched the electrodes, it lit as brightly as when we eliminated them from the circuit. It was clear that dielectric films do not protect against a directly applied voltage.

To assess the products' protection against galvanic reactions, we made electrode pairs of copper and solder (60 percent lead, 40 percent tin), submerged them a half-inch apart in seawater, and measured the voltage across them and the current generated via a multimeter.

Our treated electrodes all exhibited a potential difference, ranging from about 0.3 volts to 0.1 volts, but more interesting was the current measured. Electrodes treated with CRC QD, which makes no claims as a dielectric (and in fact leaves behind no coating), showed similar numbers to the untreated pair, but the waxy twins, CRC Heavy Duty and CorrosionPro, showed currents of zero in one spell and .001 milliamps in another. Also close to zero were TC-11 (0.002mA) followed by Corrosion Block (0.004mA) and Boeshield T-9 (0.005mA) and CorrosionX (0.006mA). We would expect those products for which we measured lower PDs and lower currents to, at the very least, retard galvanic reactions.

dissipation. Those with thin films that are gentler on integrated circuits may not withstand exposure to a hostile climate. Here's the lineup:

BOESHIELD T-9

According to its maker, Boeshield T-9 is intended to penetrate, displace moisture, lubricate, and protect from corrosion and rust. One of three products tested that have a waxy appearance, this popular spray is relatively heavy and dries slightly tacky.

We discovered corrosion at both battery terminals in the test radio (See "How We Tested," above) and white deposits on the base of the antenna (which wiped off easily). There were also white deposits all over the inside of the radio—more on the connector side than the component side.

Bottom Line: For the one-stop shopper, this product has the best combined "score" for corrosion inhibition (*PS* April 2007) and electrical protection.

CORROSION BLOCK

Advertised as a product that prevents and inhibits corrosion, this is a heavy, blue spray that dries thin and clear, but remains slightly tacky. *PS* testers discovered some corrosion at the battery terminals and white deposits on the connector side, but less on the component side. This was the third cleanest-looking radio before our immersion test.

Bottom Line: Another tacky customer, but also quite effective.

CORROSIONPRO LUBE

West Marine's CorrosionPro Lube claims to offer "excellent water resistance and superior rust and corrosive

PS VALUE GUIDE ELECTRIC SPRAYS

PRODUCT*	PRICE / SOURCE	SIZE / PRICE PER OUNCE	NATURE OF COATING	GALVANIC CELL VOLTS / AMPS	MAKER CLAIMS	APPLICATION
BOESHIELD T-9 ✓	$14 / jamestown distributors.com	12 oz. / $1.17	Thin waxy film	.24 volts / .005 amps	For marine use, recommended for electric and batteries; penetrates; lubricates	Messy
CORROSION BLOCK ✓	$19 / westmarine.com	12 oz. / $1.58	Thin film	.21 volts / .004 amps	Protects electronic equipment from moisture; penetrates; lubricates	Clean
CORROSIONPRO LUBE ✓	$7 / westmarine.com	11 oz. / .64¢	Heavy waxy film	.17 volts / .001 amps	Recommended for all corrosive marine applications; lubricates	Messy
CORROSIONX ✓	$17/ buycorrosionx.com	16 oz. / $1.06	Thin oily film	.24 volts / .006 amps	Ideal for treating electrical equipment; penetrates; lubricates	Clean
CRC HEAVY DUTY CORROSION INHIBITOR ✓	$8 / shipstore.com	10 oz. / 80¢	Heavy waxy film	.09 volts / .001 amps	Protects and preserves electrical connections subject to salt spray and high humidity	Messy
CRC QD	$6 / boatersworld.com	11 oz. / 55¢	Leaves no coating	.32 volts / .05 amps	Cleans and protects electronic components; dissolves dirt, dust, grease, flux	Fair
LPS 1	$7 / LPS Labs	11 oz. / .64¢	Thin oily film	.24 volts / .014 amps	Displaces moisture; non-conductive; penetrates; lubricates	Fair
STRIKEHOLD	$11/ sailorssolutions.com	13 oz. / .85¢	Thin wet film	.3 volts / .02 amps	Cleans; lubricates; protects	Very messy
TC-11 ★	$9 / amazon.com	11 oz. / .82¢	Thin oily film	.18 volts / .002 amps	Makes electrical systems water resistant; penetrates; lubricates	Cleanest
WD-40	$3.50 / westmarine.com	8 oz. / .44¢	Thin wet film	.24 volts / .011 amps	Displaces moisture to restore wet or flooded equipment	Messy

✓ Recommended ★ Best Choice * All products passed the humidity test but failed the seawater test.

preventative characteristics," and our test results bore that out. This product is delivered in a fine spray that leaves an amber-colored, waxy coating.

In our corrosion test, it remained intact through a week's worth of freshwater dousing. We did notice corrosion at both battery terminals on the radio, and lots of white deposits on the circuit board.

Bottom Line: Performed well with a sticky, waxy sheathing that should protect high-exposure areas.

CORROSIONX

Developed to combat rust and corrosion, CorrosionX forms a foamy, blue-green film when it is initially sprayed on, but the bubbles eventually disappear.

This product was the second cleanest of the bunch, in testers' opinions. The antenna and the entire interior circuitry were clean, though corrosion was evident on the upper battery terminals.

Bottom Line: Quite effective at protection, but tacky to the touch. Recommended, except where circuitry needs to be handled.

CRC HEAVY DUTY

According to CRC, the maker of CRC HD, this product is a "high-performance, thick-film version of CorrosionX." One of the three wax-bearing products in our test, it comes out of the nozzle as a fine spray with some bubbles and an amber color.

After being submerged, this product appeared to have foamed, and though it looked better after drying out, it still left the circuit board messy. We found corrosion at both battery terminals, a clean antenna, but lots of white deposits on both sides of the circuit board. Nonetheless, this was still one of the most effective dielectrics.

Bottom Line: A sticky, double-duty sheathing for those high-exposure areas, but take care it doesn't inhibit cooling.

CRC QD

This aerosol is a petroleum distillate/alcohol-based cleaner. It's not sold as a dielectric corrosion inhibitor, but it does dry completely, and leaves no residue to retain water.

PS testers found corrosion at each battery terminal in the radio, along with lots of white deposits inside, especially near the on/off switch assembly. But the switch itself was less rusty-looking than most.

Bottom Line: Use this as designed to clean electrical gear, and it may provide some protection in the bargain.

LPS-1

One of three corrosion inhibitors from LPS Labs, LPS-1 is a greaseless lubricant intended to displace moisture. It is colorless with a broad spray range.

We found corrosion on all battery terminals, but a clean antenna. There were also lots of white deposits on the inside of the case, but the circuit board itself was quite clean except near the IC chip. The switch still had a positive "click," but it was rusted and fragile. (This radio spent much time in surgery repairing the battery housing, during which the wires broke off. Although they were re-attached and the radio was working before it was immersed, it may not have been "hot" as long as the others.)

Bottom Line: Questionable performance and concerns about interactions with rubber make this a doubtful choice for electrical systems.

Radio Autopsy

A peek at the innards of two radios after the submersion test shows how well the TC-11-treated product (top) fared, in comparison to the one coated with LPS-1 (bottom). The TC-11 test radio was the only one without corrosion on its battery terminals. The LPS-1 radio suffered corrosion to all of its battery terminals and had white deposits inside its case. The zoomed-in photos at far right show the radios' volume-control potentiometers, which were reduced to a chunk of rust on all 10 test radios.

STRIKE HOLD

Developed expressly for cleaning and protecting military side arms, and first introduced to *PS* readers in November 2005, Strike Hold is marketed as a "fast-acting penetrant, demoisturant, and dry lubricant." It's heavier than water, so unlike lubricants like WD-40, it won't float, but moves through the water to protect metal. The manufacturer claims that it's harmless to plastic and carries a dielectric strength of 38,000 volts.

A problem occurred after spraying the radio with this product. It, or its solvent, softened the plastic body, and the springs that hold the batteries in blew the bottom off the battery compartment. (See "Are Plastics at Risk?" page 38) For the record, the plastic used for the cheap radios we employed in our test is likely not used in more expensive electronic devices. The manufacturer subsequently sent us Strike Hold II (too late for this test), but even its "milder" solvent caused a Styrofoam nugget to shrink to half its original size—not a good sign given how many plastic and rubber compounds are employed in our marine electrical systems.

We also found corrosion at both battery terminals on the Strike Hold radio, and the antenna was white, but easily wiped clean. There was also a lot of messy residue on the inside.

Bottom Line: Its appetite for plastic means we can't recommend this product to protect electrical or electronic gear.

TC-11

The manufacturer of this product—ICC Industries—bills TC-11 as "the best corrosion inhibitor…and penetrating oil on the market," "…the most compatible multi-purpose lubricant," and says that it "stops, prevents, and removes rust."

Lofty claims, indeed, but *PS* testers found the TC-11 radio to be the cleanest of all. There was no corrosion at the battery terminals or the antenna, and the circuit board was generally free of the deposits seen on all of the others. It also has the most comprehensive instructions of any product we tested printed on the canister.

Bottom Line: No messy residue, combined with effective performance, makes this our Best Choice for keeping electrical systems conducting.

WD-40

Almost as ubiquitous as duct tape, this product comes with marketing material that claims it "quickly dries out electrical systems to eliminate moisture-induced short circuits." The manufacturer also claims that it's safe to use on almost every surface, including plastic.

Our testers found that the battery terminals on the WD-40 radio were largely clean, as was the antenna, and apart from some rust-colored deposits around the IC chip, the circuit board was clean. Like all of the others, the switch was rusty, but it was by no means the worst-looking. There was certainly some degree of electrical protection, but not enough to prevent rusty residues of the switch from migrating across the circuit board.

Bottom Line: It's better than nothing, so no harm done when you use this on electrical, rather than electronic, equipment.

CONCLUSIONS

After the radios were immersed and then dried, they were still damp inside. The products that cure the driest, like WD-40 and CRC QD, appeared to retain less moisture. The wax-bearing products (Boeshield, CRC Heavy Duty, and CorrosionPro) seemed to have foamed. They looked better after they had dried, but they were still messy. And each radio exhibited a bloom of rust around the on/off switch, which was damp. Evidently, the products that leave a moister coating hold onto the water longer, thus extending the period during which corrosion, whether electrolytic or galvanic, can proceed.

Sailors should learn from this to switch electronic gear off at the main panel when it's not in use. Additionally, look for products with real on/off switches that isolate all other components from the power supply in case

Are Plastics at Risk?

Once we discovered that one product—Strike Hold—had an adverse effect on our test radio's plastic cover, we decided to test all of the products on a range of plastics, some of which are used in electrical assemblies and some not. You never know, though, what might be used for some seemingly unimportant, but ultimately critical, component.

Solvents like some of the electrical sprays we tested can damage plastics, rubber, and adhesives. It's always a good idea to test a product on a small area before applying it to the whole project.

Our test specimens included a plastic cable tie, a crimp terminal, heat-shrink tubing, insulated wire, white flexible hobbyists' styrene, black rigid polystyrene, Styrofoam, clear acrylic, polyethylene from a parts-storage box, a rubber band, and polypropylene storage containers.

Happily, apart from the rubber band, the only obvious casualties were in the Strike Hold test pail, where the Styrofoam nugget dissolved the instant the product touched it and the other polystyrene samples were visibly softened. The manufacturer sent us a sample of Strike Hold II, which has a "milder" solvent. While it didn't dissolve the Styrofoam on contact, the nugget did shrink over time to half its original size. The WD-40 seemed to have softened, though not melted, the white styrene. Several products appeared to affect the rubber band to some degree, most obviously LPS-1, which caused it to swell to twice its normal volume.

The conclusion we take from this test is: Beware! Some plastics, rubbers, and probably many adhesives, are susceptible to solvents. Before using a product, test it on a small section of your electrical or electronic target.

a user forgets to do that.

And, when using dielectrics, keep the following in mind: First, the instructions on the product labels are not always explicit. Some direct you to shake the canister, some don't, even when the rattle in the can suggests that might be necessary, as with Corrosion Block or CorrosionX.

Of course, some of the results you'll experience may be affected by the way the products are applied. The spray pattern might be wide or narrow, fine or foamy, and even when using the tiny applicator tube, surgical accuracy is not achievable. Also, a product might work best as a thin coating, but the topography of circuit boards might cause it to puddle, making more liquid products with good penetration properties better suited.

A coating's physical characteristics will influence where and how to use it, The waxy coatings—Boeshield T-9, CorrosionPro Lube, and CRC Heavy Duty—might be suitable for applications where coverage is more important than penetration, where the temperature won't cause them to run, and where you're not likely to be handling the treated parts. But you wouldn't want these in an area where they'll pick up dust, like inside the case of a PC that's cooled by a fan.

A product that is effectively dry to the touch might be appropriate in your switch panel and, if the equipment manufacturer recommends it, in and around electrical gear you might be handling.

And that brings us to an important point: Spraying the back of a fuse panel or the insides of a junction box where connections can be readily inspected is one thing. Spraying a device that's made up of printed circuits, IC chips, and other miniature components is quite another, and should not be done without the approval—preferably in writing and with specific instructions on how to do it—of the equipment's manufacturer. Avoid getting these products near LCDs and membrane switches. Also, most will lift adhesive labels.

Judging by the general cleanliness of the radio, and taking into consideration the conductance test, TC-11 was the most effective product. Though it can't prevent mixed metals from behaving badly in a saltwater environment when they have access to electricity, it's still our Best Choice.

CorrosionX and Corrosion Block fared similarly on the conductance test, but the CorrosionX radio was marginally cleaner. Both form slightly tacky films, to which water actually clings. And Boeshield T-9 finished just behind these two. All three receive our Recommended rating, as do CRC Heavy Duty and CorrosionPro Lube.

CONTACTS

BOESHIELD T-9
800/962-1732, boeshield.com

CORROSION TECHNOLOGIES
(CORROSIONX, CORROSIONX HD),
800/638-7361, corrosionx.com

CRC INDUSTRIES INC.
800/556-5074, crcindustries.com

ICC INDUSTRIES (TC-11),
877/240-7806, tc-11.com

LEAR CHEMICAL RESEARCH
(CORROSION BLOCK), 800/256-2548,
learchem.com

LPS LABORATORIES
800/241-8334, lpslabs.com

STRIKE HOLD,
866/331-0572, strike-hold.com

WD-40 CO.,
888/324-7596, wd40.com

WEST MARINE (CORROSIONPRO LUBE), 800/685-4838
westmarine.com

ON THE HORIZON
BOTTOM PAINTS
MAN OVERBOARD ALARMS
REMOTE VHF MICS
CABIN FANS
POCKET FLASHLIGHTS

Practical Sailor

Sistering Keel Bolts

A do-able project for patient, skilled DIYers.

I have a keel bolt issue with my 1981 Freedom 33. To bolt the keel to the hull, Freedom set stainless J bolts into the mold and then cast the keel around it. While I was trying to torque one of the six keel bolts (5/8-inch), it sheared off. The rest seem fine. As much as 100 foot-pounds of torque, and repeated hammer blows have not had any effect on them. However, I plan to install multiple sister bolts to be safe. Here is how: Drill bolt holes within a few inches of the old ones, then fill them with fresh water. Drill a small-diameter hole horizontally, from the outside, to intersect the bolt hole. When that "pilot hole" is in the right location, the water in the new bolt hole will run out of the pilot hole. Dig a rectangular pocket with the pilot hole in bottom center of the rectangle. (The pocket will be large enough to attach a backing plate and a nut to the bolt when it is inserted through the new bolt hole from above.) Wrap the space between bolt and nut, before tightening the bolt, with epoxy-soaked caulking. Torque the bolt, and fill the pocket with epoxy-soaked glass fiber.

Do you have any further advice?

Frank Minelli
Via e-mail

PS ADVISOR

Fiberglass and lead are easy enough to drill, but drilling straight over a long distance can be a challenge.

Keep in mind that the Freedom 33 was initially a centerboarder, and TPI wisely decided a lead ballast keel made more sense. Before trying to sister keel bolts with the keel in place, check for delamination by tapping around the garboard and using a bent nail to pick at the sides of the hole left by the broken keel bolt. If all seems solid, inspect the broken bolt for corrosion—a potential indicator of what's going on with the other bolts. The 5/8-inch size is small for centerline keel bolts, and using ¾-inch 316 SS or Aquamat 17 or 22 for sistering makes more sense.

Contact Pearson Composites for a copy of the ballast keel drawing. It will show which way the J-bolts face, and if there's any other weldment buried in the lead.

Your approach to drilling and finding the new holes is appropriate. Determining how many bolts to sister is usually done by dropping the ballast keel and inspecting the existing keel bolts. Not doing that leaves you with only a torque test to determine the structural viability, and with the bolts over 20 years old, small in diameter, and one already failed, it would make sense to sister as many as possible. Pick the easiest to access to do first. When choosing tools: a 300-500 rpm heavy-duty, ½-inch drill is good; long ¼-inch, 3/8-inch, and ½-inch bits (18 to 24 inches) for the pilot holes, and extensions for these if necessary. (Note: The longer the distance from the chuck to the drill tip, the easier it is to go astray.) The final hole for the ¾-inch bolt can be done with a ½-inch drill bit extension welded to a ¾-inch bit, rather than mechanically fastened.

Make sure the window cut point is at about the same depth as the J of the original bolt. Carpenter chisels and drilling can be used to sculpt each pocket. Square stainless steel stock 3 inches wide and 3/16-inch thick can be drilled to make 3x3-inch-square backing plates for the nuts in each window. Use Marine Tex (epoxy filler) under the plate and forget the caulking. In the bilge, use the same SS stock to make backing plates but make them wider (3x5 inches), and place them athwartships, doubling them up (2) at each bolt. It's important to fillet below backing plates with Marine Tex in order to provide a level surface, and prior to inserting the new keel bolt, coat the upper three-fourths with 3M 101 sealant. Tighten to bolt spec, and epoxy fill in the window cut. Check torque after a month of sailing.