Practical Sailor®

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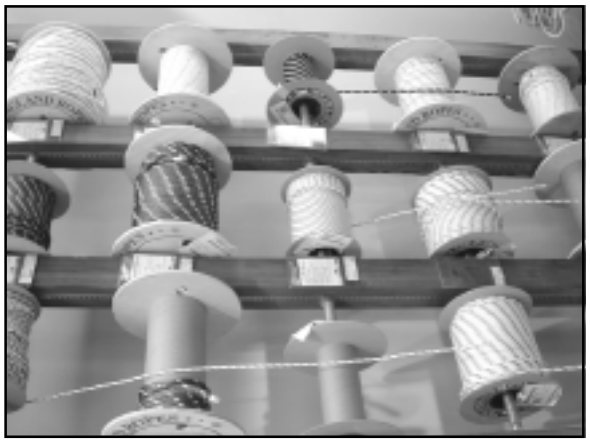
DOUBLE ISSUE

SPECIAL SECTION: ROPE



Rope Market Scan ...page 6

Spotlights for dark nights...page 30

Little plastic boats everywhere... page 35

Also in this Issue

Give Me Enough Rope

Left to their own devices, some sailors buy rope the way Imelda Marcos used to buy shoes—impulsively, profligately, with a kind of bulemic urge. Even today when some of us go to a boatshow we have to stand for a long time next to the booth with the stacked coils of multicolored climbing rope and odds-and-ends in all lengths and diameters, wishing we could come up with a reason to get just a little bit more. There's no such thing as too much. We're melded with Imelda.

In the basement I have everything from spools of whipping twine and tarred marline (which, when you put your nose to it, takes you directly to the fo'c'sl of the *Charles W. Morgan*) to big coils of nylon anchor rode waiting for a project.

If you have enough rope, projects suggest themselves all the time. Last winter, the morning after shoveling off our 57th snowstorm, I got out the gantline I used to use in a four-part tackle to go up the mast. It's a nice soft blue braid, about 160 feet, and I made a rope-tow with it up the little hill in the back yard—put a snap hook in it with a cow hitch so I could pull the lighter kids and their sleds up the hill. The top end went through a block tied to a tree up the hill, the bottom end through a snatch block hooked into a loop around another tree at the bottom. The loop was closed by two rolling hitches, so the whole thing could be adjusted easily. I had more fun than the kids.

Chris Caswell, in a commendable column in *Sailing* a couple of months ago (extolling the habits and skills of seamanship that make sailors so handy—nay, almost godlike—on land) told the story of a friend who needed some furniture moved out of a second-story apartment. Someone retrieved a mainsheet system from a boat in the harbor, and bingo, out the window and down the stuff came.

Rope, rightly rove, can make you look devilishly clever. The more you know about it, and the more you practice with it and rely on it, the more projects and jury-rig solutions will pop up and demand to be tried out. This can actually lead to some hairbrained schemes, like the time someone who shall remain nameless managed to lash a trailer to a hitchless car bumper with something that became, in the space of a mile or so, both Gordian Knot and Fender Bender.

On the other hand, rope, arguably the most versatile tool in the sailor's chest, can and should be used in a lot of places where plastic or metal fittings are now installed in the name of convenience, but at the cost of weight, corrosion, and holes in the boat.

Truly there's nothing so important, so familiar, so comforting to sailors as rope. It's nice to sit down on a winter's night with Clifford Ashley or one of his disciples, and 10 feet of three-strand rope, and work things out. For many, a well-made knot board is a fascinating sculpture, and a Carrick Bend is an example of symmetry and strength to rival the most sacred geometry.

Before I wax maudlin, though, there's business at hand: It's tough to make sailing systems work without rope, and that's a big concern in this month's issue—specifically the stuff we use for basic running rigging. It was time to take a close look at high-tech line . What we learned (see page 14) was not a shock, thanks to Brion Toss and some others, but if you haven't heard about the very great differences in the properties of high-modulus line and double-braid Dacron…

Not to give away the story, but even as the ropemakers strive to work the kinks out of the high-tech stuff, the rest of us are going to have to learn some new marlinespike tricks. It won't be easy. We will need handy references with all sorts of diagrams, and we will knit our brows in perplexity. But we can bear in mind what Hervey Garrett Smith said in his introduction to *The Arts of the Sailor*, back in '53: "In the final analysis, the pleasures that I have derived from the practice of these skills more than compensate for the endeavor."

—Doug Logan

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EPIRB Replacement Batteries

I read with great interest and concurrence the July 15th J.D. Bitzer and Pompas' letters regarding the Litton EPIRB battery and the policy of Guest. I've run into the same situations and refuse to pay half the price and hazardous shipping of a now out-of-date gizmo just to replace the battery. When it no longer passes a test run or I'm going on a serious passage I will buy a new one and will try to avoid Guest products.

I have gone so far as to prepack and test my own liferaft, and felt vindicated when the last certified packer had screwed in the tapered valve after hydro enough to crack the CO2 bottle neck. A sympathetic distributor was kind enough to supply a tested, used one at no cost. Getting the raft to a packer is inconvenient and expensive, and it shrinks my soul to pay $4 for the same D-cell I can buy at Walmart for 89 cents.

There is a vast difference between the liability incurred in the case of a commercial boat and private cruisers who simply want to be safer. The fact is, the restrictive policies that some of these suppliers hold to actually reduce overall safety by inconveniencing and overcharging customers to the point that they use sub-optimal maintenance intervals or skip them altogether.

I have no problem paying for good expert service when I need it, but I have a clear idea when I'm being overcharged and unnecessarily inconvenienced.

The EPIRB batteries should be available with precise instructions at a competitive price. If they want a liability waiver, no problem here. I would suspect they could just as well be sued for failure to provide a needed battery.

Bruce Stewart, MD
Ithaca, NY

The discussion in the July 15 issue was rather timely for me— I had sent my ACR 406 in through Mike's Marine Supply, 24910 Jefferson, St. Clair Shores, MI (810/778-3200) in June and received it back the day I read the article. Much to my pleasant surprise, including shipping, my battery replacement by ACR came to less than $200 and was done with pleasant interactions by very professional sales/service people at Mike's Marine. This appears to be a completely different experience than those described in the Guest/Litton situation. I was, however, without the service of that EPIRB for the time it was in for exchange, something I had timed to coincide with a period of no sailing.

Michael G. Altmann
Marquette, MI

After reading your PS Advisor regarding EPIRB battery replacement and the most current issue of the Commodore's Bulletin of the SSCA with another EPIRB horror story, I think *Practical Sailor* could do all of us cruising sailors a big service by doing a speedy evaluation of the new ProFind 406 from Seimac Ltd. If this is a good unit I'm sure the other EPIRB manufacturers will suddenly discover that they can produce an inexpensive user serviceable unit with a sub $100 replacement battery. I believe that I will have a ProFind 406 aboard when I depart this fall.

Ray Seiffert
Niantic, CT

Editor's Note: Thanks for the tip, Ray. Seimac is a well-established company, based in Halifax. They specialize in "data acquisition and telemetry systems for oceanographic, safety of life, meteorological and defence applications." We're not familiar with their ProFind 406 EPIRB yet, but their website (www.profind406.com) does indeed offer an owner-replaceable battery for the ProFind 406 at $99 U.S. or $150 Canadian.

Boat Evaluation

Your do-it-yourself article on boat valuation (June 2001) was well done. and I would like to add some comments to what you presented.

Another source for determining a vessels value is a marine surveyor. Many surveyors regularly value vessels for insurance interests with a Condition & Valuation (C&V) survey, and for purchasers/financial institutions with a Fair Market Value (FMV) survey. There are marine surveyors who specialize in marine appraisals.

The American Society of Appraisers (ASA), a multidisciplinary appraisers group, offers a designation for specialist appraisers as Marine Survey-Commercial and Marine Survey-Yacht. Candidates, most of them marine surveyors already holding a NAMS or SAMS designation, must have five years of appraisal experience, then must pass an ethics test, a test on the Uniform Standards of Professional Appraisal Practice (USPAP), an ASA comprehensive examination that covers technical and appraisal areas, and, finally, a peer review and approval of their appraisal reports in order to get an Accredited Senior Appraiser (ASA) designation.

The biggest difference between a "normal" appraisal and an ASA appraisal is the compliance with USPAP, a set of standards developed after the Savings and Loan debacle that can be compared to the standards set forth for boat design/construction by ABYC. An ASA/USPAP appraisal is not yet required by law but it is rapidly becoming the benchmark for courts and lending institutions.

The real estate mantra is "Location, Location, Location," and for marine equipment we know it is "Condition, Condition, Condition." You cannot value a vessel without knowing what is normal, what is above normal, and what is below normal, and how each of those translate into dollars. And this changes by vessel type, vessel make, and vessel location, which you pointed out.

Getting information from BUC, NADA, brokerage ads, etc., is only one of the steps in arriving at a value. The best appraisal information is market information, or, comparable sales. That is what BUC and NADA sell. But how do you know what is comparable? Commercial "sister ships" are very rarely the same and production

yacht "sisters" are only similar in their early years. The older a type of production boat gets and the more owners it has had, the more "custom" it gets, via real or questionable improvements. When you look at asking prices you really don't know what lies behind the ad. Two sister boats in adjoining slips can have significant differences in asking prices because one owner wants to sell and the other will sell only if someone is willing to meet the asking price. The best way to know comparables is to have good widespread contacts where a phone call will provide you with details.

Your inclusion of graphing is great. The larger the number of comparables the better, statistically, your trend lines, and the more anomalies stand out. As one who has done a number of graphs, I think your graph on the Catalina 30 shows a typical "tight" trend and not flawed data. I don't think that the Marshall 18 or J/24 are typical boats bought by typical sailors, so I am not surprised that their graphs show the effects of "personality" rather than economics in buying decisions. That said, the tracking guides, BUC and NADA, should be more accurate. The only excuse is that they may not have had enough sales information to provide a statistically accurate picture and would rather not present too many blank years.

Your point on indexing historic cost was also good. Annual inflation multipliers are satisfactory for the do-it-yourselfer, but the professional also has industry specific trend tables available for indexing.

I appreciate you covering this esoteric subject. I am not a yacht appraiser but I am an appraiser of commercial marine equipment, so forgive my enthusiasm . I am also the owner of a "cult" sailboat and know about the artificial market that boat owners can build against their own interests.

Norm Laskay NAMS-CMS; ASA
Mandeville, LA

Pilot 35 Review

Your excellent review of the Hinckley Pilot 35 was most timely. Shortly after the article appeared in PS, *Jupiter*, my 1966 Pilot 35, won the 66.7 nm Lake Michigan Queens Cup Race on corrected time over 198 boats. Included in the fleet were several Santa Cruz 70s, a new Open 50, and a number of other hot race designs. The race conditions were perfect with 10-15 knots of breeze from just forward to just aft of the beam, allowing us to carry a spinnaker almost the entire race. On the ride home to Milwaukee from Muskegon, MI we had winds 30-40 knots from the north and 6-8 foot seas. My crew, all of whom were experienced fin keel racers, were amazed at her comfortable motion in the seaway. She's much more than a pretty face.

Bob Fritz
Milwaukee

Personal Strobes

Just a couple of weeks ago I showed up as crew for an ocean delivery, pointing out my new acquisition, an ACR RapidFire light (PS July 1). Our very experienced captain quickly pointed out its one major drawback: yes, it lasts for eight hours, but you can't pick which eight hours. If you fall into the ocean in the morning and it activates from the PFD's inflation, it will be useless by the time night comes! A strobe that can be turned on and off at will seems like a much better choice.

Thanks for your excellent publication.

Dan Costin
Via e-mail

Editor's note: That's a good point, Dan. However, readers should be reminded that the ACR RapidFire can be operated manually (independently of the auto-inflatable PFD) as well.

Small Batteries and Chargers

A very helpful and generally accurate article (PS June), but I have a question, an observation, and a recommendation. Although you state that NiCads should be discharged to absolute zero (e.g. "wrap in tin foil"), I've read that NiCads are hurt by absolute discharge and can even change valence if you do it; I read that you should discharge to the drop-off point where a light dims or a tool loses power, and then STOP, not drain to "absolute zero." What is correct?

Although you state that you "don't believe manufacturers' claims that their batteries perform best when charged in their own chargers," I'm not sure if your belief is correct. After reading your article, I put 8 AAA Accucell batteries in my older Ray-O-Vac Renewal Power Station (not the 3 in 1) and not one light came on. Same for 4 AAs. I then made sure I had discharged the AAAs and still no charging light. Then I put the identical batteries in the Accucell charger, and the charging light came on until they were charged. I don't think you can mix types among chargers. I can, however, put Renewal batteries in the Accucell charger, but not vice versa.

Finally, a suggestion. It would be great if you tested the life cycle or "life energy" of renewable batteries, i.e., how many times they can be charged and the total power produced after say 15 cycles. That would help us decide among the trade-offs. For example, it may show that the rechargeable alkalines have low self-discharge and high initial voltage, but little life after a few charge/discharge cycles.

Keep up the good work.

Bill Beery
Via e-mail

Author's response*: I can only speak from experience: I've gotten many years of life out of NiCads by making sure they were discharged to zero before recharging. What upsets NiCads with this procedure is they don't like to be short-circuit discharged when they are fully charged or near full charge. The discharge currents are high and ugly stuff happens to the crystal structure internally. The cells need to be well discharged before being further discharged.*

Tin foil is a kind of last resort. Incredibly, it's actually difficult to maintain good terminal contact with tin foil; the wrap has to be tight, and it's a pain. I much prefer using a utility flashlight

left on to discharge NiCads.

As for recharging in the competition's chargers, your reports aren't consistent with what I found. I worked primarily with D and AA cells and both chargers handled both the Ray-O-Vac and Accucell batteries. The older model Ray-O-Vac Renewal Station took considerably longer than did the Accucell charger where the Ray-O-Vac 3 in 1 unit was more competitive.

One thing I did notice was that the Accucell unit would charge fully charged batteries where the Ray-O-Vac units would not. The time the Accucell unit would show charging varied from just a few minutes up to 30 minutes, which was curious because the batteries didn't need it. When I saw this, I was prompted to see if the Ray-O-Vac units would respond in the same way, and they didn't (no lights). I didn't think it was a serious issue, so I didn't report it.

I liked the Ray-O-Vac 3 in 1 because it showed me a bad cell where the Accucell charger could not.

Rechargeable alkalines need to be pulsed to be charged and the voltage has to be measured to shut off the charger when the charge is complete. There's a wide latitude in assigning the frequency for this pulsing, which is demonstrated by these manufacturers. Either way works just fine for both manufacturers' batteries.

The main gripe I had was with so-called "camera battery" chargers. They pretend that the camera battery is different from the off-the-shelf NiMH or NiCad battery and they simply are not. So, why pay more for a camera battery charger when a cheaper charger will serve the same purpose and maybe even do it better?

Regarding your suggestion: I did some of this, but quit when I realized I could be at it for years. I recycled a Ray-O-Vac cell every day for a couple of weeks and was amazed when the clock would stop on exactly the same minute day after day. For now, suffice it to say these things have a lot of life in them. The more popular they become, the greater the need will be for some serious testing.

Better Boat Bags

I'd like to add another manufacturer to your list of superior boat bags. Boat bags (dry bags) made by Jack's Plastic Welding stand head and shoulders above the rest. In addition to offering a number of differently sized bags made of raft fabric, they will make a custom bag exactly to your specifications.

I have been using their products for years in canoes, rafts, and sailboats. The bags are moderately priced, tops in quality of construction and materials, and all but bombproof. You even get a color choice.

The source is Jack's Plastic Welding, 115 S. Main, Aztec, NM 87410, phone: 505/334-8748, fax 505/334-1401.

Walt Hodge
Stone Mountain, GA

Customer Service Credit

I recently returned from four months cruising in the Out Islands of the Bahamas, Turks and Caicos. Now searching for weather fax for laptops, I asked *Practical Sailor*'s customer service for input on these systems. Customer service responded with a great reference (May 1, 2001 issue). I had the issue in my 'to be read pile.' It was precisely what I needed, even citing the specific systems I was considering and including significant cost savings re. some systems I had not considered. *Practical Sailor*'s research will give me the confidence to go forward with these systems and save me untold hardship in "tuning" the systems for use at sea. Thanks.

Richard L. Coleman
Via e-mail

...WHERE CREDIT IS DUE

To Wells Marine Tech, Brielle, NJ: "I have had a Battmax 70 battery relay switch on my J/120 in the Caribbean. It failed and the mounting brackets broke on a recent delivery from Tortola to St Vincent. I e-mailed Wells Marine Tech, the makers, to enquire about the location of my nearest distributor and whether a Battmax HD would be a better model for my use. I fully expected to pay—the unit had had nearly three years of service. Imagine my surprise when I promptly received a return e-mail from the president of the company, offering to ship the upgraded model (Battmax HD) to the address I specified!

"Truly knock-your-socks-off service. Apparently Battmax products are now standard on all J-Boats. I can understand why."

David Martin, Youngstown, NY

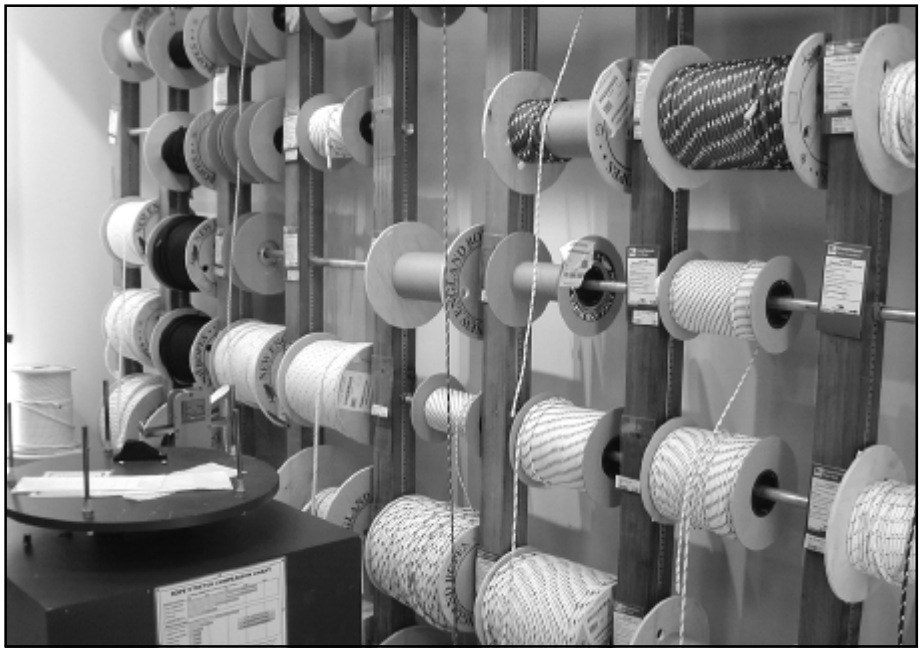
To Wilcox-Crittenden, Waterford, CT: "I took my Skipper MSD apart over the winter for servicing. When I took it apart I realized that after 18 years of service, more than the regular replacement parts needed evaluating. I called Wilcox Crittenden and asked them if I could bring in my buckets of parts and get their help in reassembly and evaluation on some of the bronze fittings. Although they do not have a repair shop or offer repair services, they were still exceedingly gracious and helpful in assisting me. They charged me for one large bronze item and refused my offer to pay them for assistance with reassembly.

"Although I expect my Skipper to outlast me, I will make every effort to patronize Wilcox Crittenden whenever I can. They support their products 100% and I haven't met a better group of people in the marine industry."

Joseph M. Ballerini, Stamford, CT

Market Scan: Running Rigging

Finding the right rope for the job used to be easy: polyester braid served almost every purpose on board, except for anchor rode. For most of us, it still does. But it's worth having a close look at some of the fancier rope. It does have its uses.



A good-sized chandlery, like the West Marine store pictured above, will have a standard variety of spooled rope that will serve all the purposes of most sailors. They may or may not carry the full spectrum of the lighter, fancier stuff, so if you're interested in experimenting with something exotic aloft, do your homework online or in catalogs.

Do you occasionally contemplate replacing the frayed, stiff, dirty running rigging on your boat with some of the beautiful new stuff that hangs in reels on the wall of your chandlery?

Unlike having the luxury to replace all the furniture in your house at one time, which few of us ever can afford to do, replacing running rigging is within the realm of most nautical wallets.

As a guide to how close you can come to reality, this *Practical Sailor* market scan takes a look at cheap, medium-priced, and expensive approaches to fitting out a 32-foot sloop. For a different boat size, you can ratchet the figures up or down proportionally and still get close to the actual cost to do that glorious renewal of the lines that hoist, trim, lower or control the sails aboard your boat.

For actual tests for abrasion, splicing, and ease of handling, you can consult the many reports in *Practical Sailor* on rope intended for halyards, sheets, anchor rodes, etc. If you keep back issues, consult the annual indexes (published in the last issue of each year) or call *PS* for a steer to whatever interests you. (The Customer Service number is 800/424-7887.)

You can call it rope, line, braid, cable, plait, cordage—they're all correct, although some purists like to use "rope" to refer to the stuff in a generic sense, and "line" when referring to rope that has an identified purpose; e.g. a jib sheet is a line made of rope. The main exception is the anchor rode, which is occasionally called a line, or even a cable, but never a rope. The names of the lines themselves are of course based on function. To the unanointed, it may seem like jargon or overblown nonsense, but when a sailor asks for some action to be taken with a halyard, sheet, rode, pendant, topping lift, lazy guy, or after-spring, it may make a considerable difference in what happens next to you and everyone aboard the boat.

The little cords that landlubbers call string or twine? Sailors call it "small stuff," or "sennet" if it's braided. If it's marled in bundles, it's called "selvagee." Aboard big sailing ships, it was anything less than about 5/16" in diameter.

Whatever you call it, rope was one of mankind's first tools. Long before learning how to spin or weave, man created rope of leather, vines, sinews, grass, hair… anything long and stringy. Papyrus rope found in the Great Pyramid in Egypt and dating from 4000 BC has exactly the same twist and "lay" as modern rope.

In what might be regarded as a "middle" period, rope was made of natural fibers—Abaca (a member of the banana family), sisal (also known as henequen), jute (it's that soft stuff of which fuzzy, brown twine still is made), hemp (*Cannabis sativa,* and you know what else they get from that...), flax (a.k.a. linen) and even cotton (as in ordinary clothesline).

Abaca was for several hundred years the most often used to make what was commonly called "Manila."

The Philippine Islands produced 90% of the world's supply. Manila is murderous on the hands, as in splicing, because it extracts all the skin's oil and leaves the skin dry and vulnerable to manila's sharp-edged fibers.

In that era, rope was made on 600-foot ropewalks—long, low narrow buildings in which the rope maker, a bundle of stuff round his waist, walked backwards while twisting up strands in his hands. Henry Wadsworth Longfellow described it in his poem "The Ropewalk."

In 1793, about 40 years into the Industrial Revolution, an Englishman, Joseph Huddart, invented the first rope-laying machine. John Tolman, of Boston, came up with a braiding machine in 1854. John Good, in New York City in the late 1800s, made practical improvements and patented his machines. By 1900, most of the world's rope was made (and still is) on machines based on Good's work.

Rope's next metamorphosis came with nylon, which was developed by DuPont to reinforce automobile tires. Without the need for better automobile tires, sailors wouldn't have had this marvelous new rope.

For sailors and their boats, nylon did to manila what rayon, the first man-made fiber, did to silk.

With the genie out of the bottle, the chemists quickly produced a string of thermoplastic (meaning flexible) filaments with bewildering names. (There are 17 official classes of such long-chain arrangements, one of which is called spandex, without which rock-stars and health-clubbers might as well head home.)

Four Basic Types

So, for a boat, which ones are best for what jobs?

Basically, there are four varieties. Good old nylon is a long-chain **polyamide**. In other countries, nylon is called polyamide, Perlon, Lilion, Brinylon or Enkalon.

Traditional-appearing, three-strand, laid nylon is readily available. It's still heavily favored for anchor rodes; its stretch makes it an ideal shock absorber.

Dacron, a name owned by DuPont but slowly slipping into common usage (we'll probably get a letter from DuPont's lawyers about taking this liberty) is **polyester**. In other countries, you might find it called Terylene, Tergal, Trevira, Wistel, Diolen or Fortrel.

Basic Dacron (polyester) is available in braid and in three-strand. In three-strand it's smoother and slipperier than nylon, which calls for an extra tuck when splicing or another half-hitch on your clove hitch.

Whether nylon or Dacron, any of this traditional "twisted" rope is easiest to splice.

Olefin, a family that includes **polypropylene** and its near cousin **polyethylene,** was once rather scorned for marine usage, but is increasingly being worked into very high-tech line. Despite the fact that it's lousy for lines (it's slippery, difficult to knot or splice, and deteriorates in sunlight), its light weight pleases the dedicated racers. Polypropylene is the lighter and more buoyant cousin, used mainly for water skier towropes and as rescue lines on some throwable devices.

Finally—and that's a poor choice of a word in this magic new world of manhandling the atoms—there are **high-performance fibers**, lots of them, a new one every year or so. Their generic names have fancy handles like HM (high modulus), polyester-polyarylate, para-aramid, PBO, or UHMWPE (ultra high molecular weight polyethylene).

They're more commonly known by trade names like Kevlar, Technora, Spectra, Dyneema, Twaron, Vectran and Zylon, which get used in rope with proprietary names like Vizzion, Z-Tech, Crystalyne, V-12, Tech-12, Aracom, Spectron 12, Ultra-Tech, T-900, Spectron 12 Plus, Vectrus, SM Ultra-Lite, Warpspeed, Spectrum, HRC, Marstron. (See the accompanying table for the names and properties of these man-made fibers.)

For some reason, it's popular right now to include "12" in a trademarked

Man-Made Fibers Used in Ropemaking

Trade Name	Owned By	Specific Gravity	Break Strength*	Modulus**	Elongation at Break	Abrasion Resistance
Vectran	Celanese	1.40	22-27	525-585	3.3-3.6%	Very good
Kevlar	DuPont	1.44	18-29	432-1100	1.5-4.4%	Fair
Twaron	Teijin Ltd.	1.44	20-29	432-983	1.8-3.6%	Fair
Technora	Twaron, Inc.	1.39	28	590	4.6%	Good
Spectra	Honeywell	.97	25-41	790-1450	2.8-3.9%	Excellent
Dyneema	DSM Fibers	.97	32-39	1025-1190	3.5-3.8%	Excellent
Zylon	Toyobo Ltd.	1.54	42	1300-2000	2.5-3.5%	Fair

*Measured as grams per denier; denier is the fineness of a fiber, with 1 being a fiber that weighs one gram per 9000 meters. Higher numbers indicate higher break strength.

** Modulus indicates stretch resistance and stiffness. Stretch may be good or bad, but stiffness would be undesirable.

English-Metric Conversion Chart

English	Metric
1/8"	3mm
3/16"	5mm
1/4"	6mm
5/16"	8mm
3/8"	9.5mm
7/16"	11mm
1/2"	12mm
9/16"	14mm
5/8"	16mm
3/4"	19mm
7/8"	22mm
1"	25mm

Because so many of us haven't made it yet into the long promised (or threatened) metric world, here is a handy guide for use with cordage. The only easy one to remember is that, using the numerals 1 and 2, 1/2" equals 12 mm. Don't use the table in the 2001 BoatU.S. catalog; it contains errors.

name. Hyphens are hot, too.

Progress never stops. The United States Army has a high-security laboratory in Massachusetts that is spinning atoms into something it calls "Spider Silk" that is twice as strong as Kevlar. Go fish.

How Much It Costs

Rope prices vary radically. For example, for 1/4" line you can pay as little as 8¢ a foot for stranded polypropylene made by Crowe Rope Industries, or 20 times as much, well past $1.50 a foot, for the exotic stuff.

For general comparison purposes, here are some basic, easy-to-remember figures:

For 1/2" line, the best three-strand nylon is about a half a buck a foot. Good Dacron double-braid is about twice as much—75¢ to $1 a foot. The exotic stuff can be five times as much as Dacron, right up around $5 a foot.

Whatever line you like, *Practical Sailor* long has considered 1/2" or 7/16" a good all-around size for bare hands. When some pulling is called for, the smaller the line diameter, the tougher it is on the hands. A piece of quarter-inch Yale Vectrus Single Braid ($1.60 a foot) has a breaking strength of 8,000 pounds, but bare hands couldn't tolerate a hundredth of that load.

About Breaking Strength

In the rope industry, there's an international move underway to clarify what "breaking strength" means. In the United States, it means "spliced breaking strength." Rope is tested with the ends fixed with eye splices. In other countries breaking strength is a calculated figure based on individual yarn strength times the number of yarns; it yields a good comparative figure but it doesn't hold up when a line is clamped, knotted or spliced. Use of the "spliced breaking strength" figure would deflate somewhat the foreign manufacturers' claims.

The exotic lines, in those sizes that make it easy to handle, present different problems. They're far stronger than is usually needed for sheets and halyards. With a 1/2" piece of really fancy line, something like New England Ropes' Z-Tech PBO Zylon ($10.50 a foot), you could pick up your whole 32-footer—plus the one next to it. (If you have a curious chemical bent, you might like to know that PBO is poly-paraphenylene-2 6 benzobisoxazole fiber made by polymerizing diaminoresocinol dichloride and trephthalic acid in polyphosphoric acid. With this chemical stuff, maybe it's better not to ask.)

However, because it might help you in the selection of line, an accompanying chart displays the properties of seven of the chemical fibers used in marine rope.

The fancy lines made from these fibers have made a big difference to hardware manufacturers. Gear like blocks, padeyes, sheaves, cam cleats, track, and clutches rarely used to fail—and then usually only when hit with a huge shock load. More often, excessive loads resulted in parted lines. Now, with such strong line, it's the hardware that's at risk. Blocks with nylon ball bearings are found with ground-up remnants. Far more expensive Torlon balls are better. Solid metal bushings often are needed.

Because some new fibers don't like to go around sharp bends (Kevlar, in fact, is so bad at it that most ropemakers have given up using it), sheaves have tended to become larger. To get long service from these lines, one must heed the sheave size recommendations.

Most of this powerful, modern line is made as braid. The braids first appeared as "double braids," which were a loosely-braided core contained in a more tightly-woven cover. They could be hard or soft, stiff or pliable, fuzzy or shiny. They could rely completely on their cores for strength, or share the loads between core and cover . Such characteristics were controlled in the manufacturing process.

Nowadays, braid comes as not only double-braid (sometimes the core isn't braided but is laid in "parallel" strands); it can be single braid, a.k.a. plait, multi-plait, eight-plait, 16-plait, or even (and we consider this one a misnomer) plait with a three-strand core. It could be called "strand/plait," but try saying that fast three times.

By the way, if you're of a curious mind, don't ever pass up a chance to see ropemaking machines in action. It all happens in the open, right before your very eyes, but the high-speed machines are perhaps the most perplexing and noisiest devices known to man.

How are the high-tech braids to splice? From "not easy" to "very difficult." Some are almost impossible to cut. A hot knife is useless. The common approach used by riggers is to use an old knife, sharpen it, hack away at the line, then sharpen the knife again.

Because most of the really exotic braids do not take kindly to ordinarily-reliable knots (see our story on page 14 for some eye-opening figures), it's best to learn to make eye splices.

The Players

Samson was the bellwether in this

Left: *Eye splices in Sta-Set, Yale Light, and MaxiBraid Plus. While the polyester Sta-Set will hold standard knots like the bowline fairly well, high-modulus lines like Yale Lite and MaxiBraid+ should always be spliced. If they must be knotted, use a good stopper like a constrictor knot or buntline hitch to help make sure the original knot doesn't slip.* ***Above:*** *Because of the slipperiness between core and cover in Yale Light and other high-tech double braids, riggers like Aramid Rigging in Portsmouth, RI have some tricks up their sleeves. Here they've removed the core from the bitter end, whipped the buried part, and melted the cover together to encapsulate it.*

technology, and for a couple of decades had most of the yacht business. As part of something called The American Group, it still is the biggest rope maker in the Western Hemisphere.

Other big manufacturers are Columbian (which used to give Samson some competition), Crowe and Wellington. Wellington very recently bought the 132-year-old premium rope maker named Hooven Allison in Xenia, Ohio, also owns U.S. Rope and Gladding Braided Products (more widely known for fishing line) and claims to be the biggest US manufacturer.

In the halcyon days in the 1970s and 1980s, when pleasure boating ballooned, two smaller companies (New England Ropes and Yale) appeared and worked their way to the head of the parade. They were aided by Samson, which for some reason, decided to downplay its recreational line and concentrate on industrial business. (Most rope made is used by utilities, commercial fishing, and the construction business.) Several years ago, Samson decided to get back in the recreational fray.

There are some small makers—like Pelican in California and Novatec in Yarmouth, Nova Scotia—who turn out beautiful line, some of it favored by mountain climbers. There's a company, Pigeon Mountain Industries in Lafayette, Georgia, that specializes in safety ropes and another, Whitehall in Lima, Pennsylvania, that makes line up to 11" in diameter—with breaking strengths up to 2,200,000 pounds!

Good line also is made in Germany by Gleistein, in France by Lancelin, and in Britain by Marlow and Bridon.

However, the most conspicuous suppliers of rope for pleasure boaters in the U.S. currently are New England Ropes, Yale, and Samson.

The Processes

All modern line is engineered to a fare-thee-well. The filament usually is coated not only to give it color and protect it from sun, water, and wear but to equalize the loads during the manufacturing process. The tension on each filament should be as nearly equal as possible.

As little as a quarter century ago, low-stretch line merely meant that a line had been stretched crudely and perhaps heated to make it less elastic. Rope-making has become intensely technical, with many different sorts of material and many designed-in characteristics.

It can be made hard (meaning tight and dense), soft (meaning flexible and easy on the hands), or stiff (a cowboy's lariat is difficult to bend). The design can concentrate on straight-line strength, flexibility, durability or abrasion resistance—and, of course, the so-far impossible dream is to make a single line that is tops in all categories.

Again, there are problems attendant upon any such specialization—bending around sheaves and resisting the degradations of sunlight, to name two. As we found in our rope test this month (see page 14), not only are some of the high-tech ropes devilishly slippery, but they weaken considerably when knotted. And, as mentioned earlier, some line is almost impossible to cut with a knife, hot knife, hacksaw, or anything else, and

Topping Lift (1)

LEAST COSTLY
NER 3/8" Sta-Set……$39
Yale 3/8" Portland…...$37
Samson 3/8" XLS……$25

MIDDLING
NER 5/16" Sta-Set X……..$40
Yale 3/8" Yacht Braid……..$39
Samson 1/4" Ultra-Tech…$43

EXPENSIVE
NER 5 mm V-12…..$60
Yale 3/8" ULS…..$37
Samson 5/16" Spectron 12 Plus…$75

Main Halyard (1)

LEAST COSTLY
NER 7/16" Sta-Set……$80
Yale 7/16" Portland….$81
Samson 7/16" XLS……$57

MIDDLING
NER 8 mm T-900……..…..$161
Yale 7/16" Vizzion…..……..$176
Samson 7/16" XLS Extra...$135

EXPENSIVE
NER 8 mm V-100…….$188
Yale 3/8" Crystalyne…….$220
Samson 3/8" Warpspeed…$144

Mainsheet (1)

LEAST COSTLY
NER 7/16" Sta-Set…..$53
Yale 7/16" Portland.....$55
Samson 7/16" XLS….$38

MIDDLING
NER 7/16" Sta-Set X…..$59
Yale 7/16" Vizzion……..$118
Samson 7/16" XLS……..…$40

EXPENSIVE
NER 10 mm Spect-Set II……$150
Yale 7/16" Maxibraid…….. $177
Samson 7/16" Ultra-Tech….$137

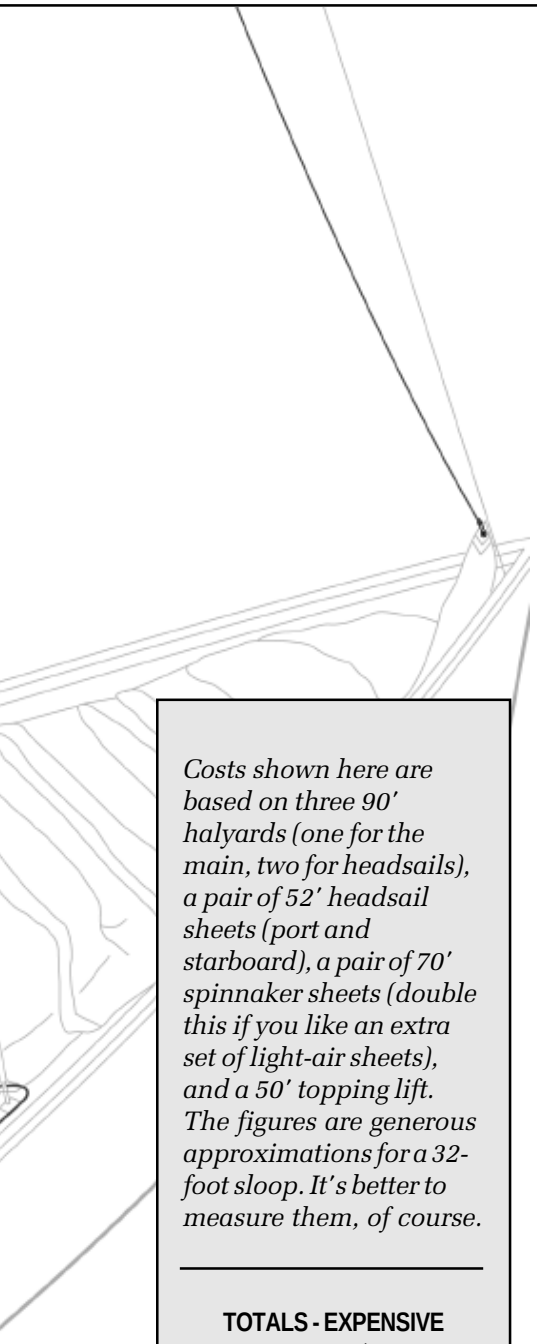
Headsail Sheets (2)

LEAST COSTLY
NER 7/16" Sta-Set……$217
Yale 7/16" Portland……$222
Samson 7/16" XLS……$153

MIDDLING
NER 7/16" Sta-Set X…..$242
Yale 7/16" Vizzion……..…$478
Samson 7/16" XLS……$144

EXPENSIVE
NER 10 mm Spect-Set II……..$607
Yale 7/16" Maxibraid……..$722
Samson 7/16" Warpspeed…..$560

Paul Mirto illustration



Costs shown here are based on three 90' halyards (one for the main, two for headsails), a pair of 52' headsail sheets (port and starboard), a pair of 70' spinnaker sheets (double this if you like an extra set of light-air sheets), and a 50' topping lift. The figures are generous approximations for a 32-foot sloop. It's better to measure them, of course.

TOTALS - EXPENSIVE
NER.....$1,381
Yale.....$1,552
Samson.....$1,204

TOTALS - MIDDLING
NER.....$760
Yale.....$906
Samson.....$632

TOTALS - LEAST COSTLY
NER.....$422
Yale.....$431
Samson.....$386

so would not be a good choice for a life harness or liferaft tether.

Mix and Match Options

Now, let's return to the original proposition, which was a complete replacement—on three different cost levels—of basic running rigging for a 32' sloop. Included are halyards, main sheet, headsail sheets, and topping lift. Not included is an anchor rode (a subject all in itself) and short lines used as outhauls, downhauls, barber haulers, reef pendants, cunninghams, preventers, vangs, etc.

The sailboat profile shown at left contains suggestions for the kinds and sizes of line that might be used and the approximate costs that are involved in cheap, medium, and expensive refits. If you wish to mix and match—expensive halyards but inexpensive sheets, for instance—a bit of arithmetic is in order.

For the three-level estimates, only the three major manufacturers of recreational marine line will be used. They are New England Ropes (NER), Yale and Samson. They are the rope makers favored, respectively in the order listed, in the discount catalogs of West Marine, BoatU.S. and Defender.

What's involved here is more than 600 feet of line. That's a heap of expensive spaghetti. To make price comparisons reasonable, lines from each manufacturer were chosen according to the makers' recommendations or the lines' rated breaking strengths. In some cases, the strength match-up was about 10% off. Many of these lines come in a choice of white with a bit of color coding or solid colors; for pricing purposes the lower-priced white always was selected.

Even with only three manufacturers, the choices, although logical, must be considered quite arbitrary; the lines were chosen primarily to illustrate three cost levels available to a boat owner interested in renewing running rigging. The totaled figures for New England Ropes, Yale, and Samson are intended only to show the price range.

If you wanted to keep things very simple you could, for $343 (55¢ a foot), rig the whole boat with the original Samson double-braid. Once called Parallay, it's now called LS. Twenty years ago, many racing and cruising sailors were delighted to be rigged with Parallay (or perhaps Columbian's Intrepid). Because you need 624' of line, you might even get a special price on a 600-foot reel.

As shown on the sailboat diagram, the price to replace the running rigging with some good-to-beautiful line can be as little as $299 or as much as $1,552—a five-fold difference.

Every rope manufacturer listed below offers printed material describing its offerings, and most have excellent websites, some of these have rigging guides showing what kinds and sizes of line they suggest for various purposes. ■

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*Contacts—**Aamstrand** Ropes (Intrend), 629 Grove, Manteno, IL 60950, 800/338-0557. **Buccaneer** Rope, 22319 AL Hwy. 79, Scottsboro, AL 35768, 800/358-7673. **Columbian** Rope, 145 Towery, Guntown, MS 38849-0270, 800/821-4391. **Crowe** Rope Industries, Box 600, Waterville, ME 04901, 888/848-4405. **G&B** Ropes, 2921 Oro Ctr., Oro, ON LOL 2X0, Canada, 800/643-6350. **Gladding** Braided Products, Box 164, South Oselic, NY 13155, 315/653-7211. **Marlow**, 7600 Bryan Dairy Rd., Largo, FL 33777, 727/545-1911. **New England Ropes** Inc., 848 Airport, Fall River, MA 02720, 800/333-6679. **Novatec** Braids, 234 Water, Yarmouth, NS B5A 4P8, Canada, 800/856-6259 or R&W Enterprises, 404 Nash Rd., New Bedford, MA 02746, 800/260-8599. **Pelican** Products, 23215 Early, Torrance, CA 90505, 800/473-5422. **Samson**, The American Group, 2090 Thornton, Ferndale, WA 98248, 800/227-7673. **Sunshine** Ropes, 7520 N.W. 41st St. Miami, FL 331666799, 305/592-3750. **Unicord**, 12010 Paulina, Calumet Park, IL 60827, 800/929-3110. **Wellington** Puritan Marine, 1140 Monticello, Madison, GA 30650, 800/221-5054. **Yale** Cordage, 6 Morin, Biddleford, ME 04005, 207/282-3396.*

Spread Ad - "10 Things"

Spread Ad - "10 Things"

High-Tech Rope Test

Tortured on the rack, various examples of high-modulus rope show enormous straight-line power, but give up alarmingly fast when subjected to The Knot.

The Knot really isn't something that should make rope run screaming from the deck. The knot is something we're used to. It's a good thing.

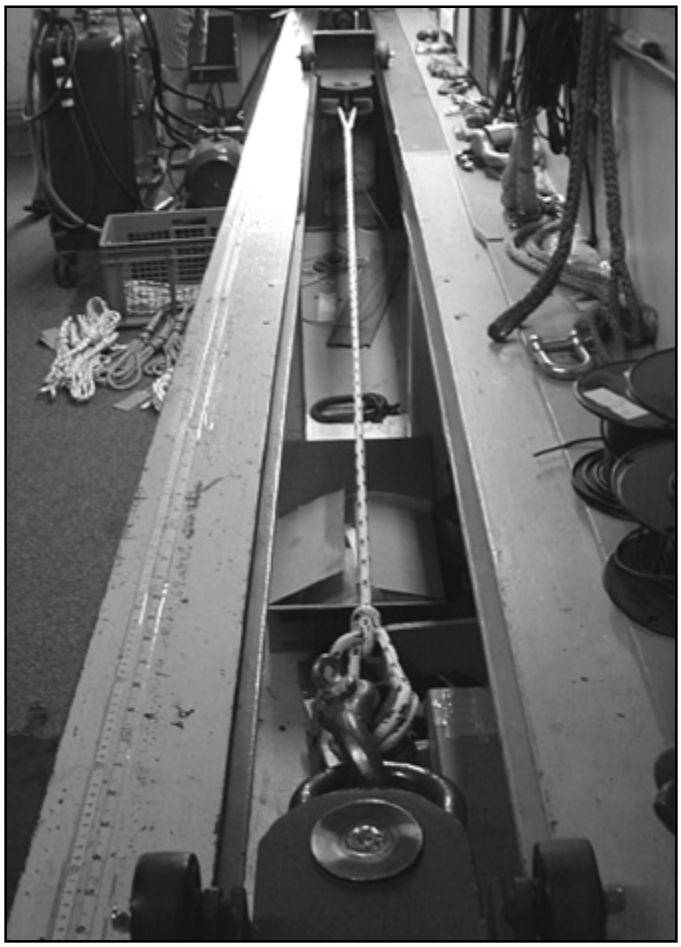
Most experienced sailors know that any rope, when knotted or even rove over a bend (like a sheave in a block), undergoes some stress that detracts from the strength that its maker claims.

The part most likely to come close to the rated breaking strength is the straight, middle of the rope. Unless abraded in some unusual fashion, rope almost never breaks there. What fails are the secured ends.

A generalization on which you can rely almost universally is that the strongest end treatment on any rope is a splice. A neatly done splice, with a properly sized thimble, cuts the breaking strength of a line only about 10%. However, when knotted, the deterioration in a rope's breaking strength is much more severe. (Proper terminology calls for distinguishing between knots, bends, and hitches; but in this report all will usually be called knots.)

Although you'll see minor variations listed here and there, the figures for the percentage of retained strength for commonly used knots are said by the Cordage Institute to be: bowline, 67-75%; square knot, 43-47%; fisherman's knot, 50-58%; sheet bend, 48-58%; Carrick bend, 55-60%; two half hitches (on a 5/8" ring) 60-70%, and (on a 4" diameter post) 65-75%; and an anchor bend (on a 5/8" ring) 55-65% and (on a 4" diameter post) 80-90%.

It gets more complicated. The Cordage Institute figures are for new rope and straight, static (slowly applied) loads rather than dynamic loads—what you might call shock loads. Further, in the market scan article on page 6 there are several references both to the difficulty of splicing mod-



Left: *The hydraulic pulling rack at Aramid Rigging in Portsmouth, Rhode Island. Aramid's professionals set up many sample lines with eye splices at the stationary ends. The working (pulled) ends included eye splices, bowlines with two round turns, anchor bends, constrictor knots, and clove hitches. Knot-induced weakness notwithstanding, it soon became clear that these common high-techs are just too slippery to hold standard hitches at any reasonable pressure—so buntline hitches were added to many, just to keep them in place to be broken.* ***Below:*** *Aramid's production manager Brian Fisher gathers read-outs after putting the screws to the ropes.*

ern synthetic rope and about the danger of using time-honored knots to belay these slippery lines.

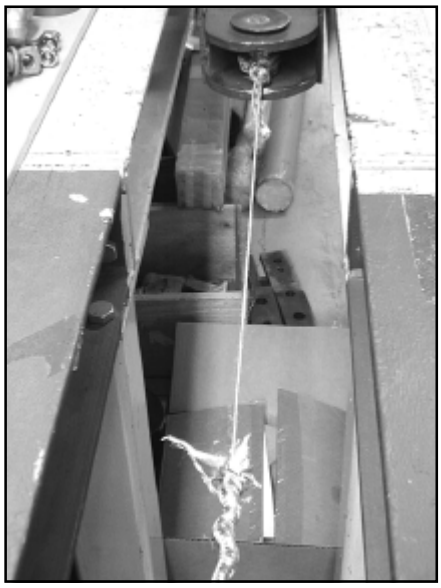
Another warning came from Brion Toss, one of the world's most respected riggers, in an article in a recent *Sail* magazine. Toss threw up a large red rocket about knotting any rope made of what he called "HM fibers," meaning high-modulus fibers.

Speaking of the great all-purpose bowline, Toss said that its strength isn't reduced by a mere 30% in high-modulus line, but more like "60, 70 or 80 percent." As an example, he said a piece of 3/8" line made of Spectra, with a breaking strength of about 8,500 pounds, would, when formed into a bowline, have a breaking strength of but 2,000 to 2,500 pounds. He said that with some HM line subjected to heavy loads near their breaking strength, the core would snake out of a bowline. That's downright alarming.

His observations (including "…there simply is no way to tie a knot in an appropriately-sized HM line and still have any factor of safety…") sent a lot eyebrows skyward around here.

Toss suggested that sailors go back to splicing or, if they wish to tie knots in high-tech line, they accept that the line must be "massively oversized, in which case it is far bigger, heavier, and more expensive than necessary; or it is the right size and probably on the edge of breaking."

For those of us who have, for a handful of years now, been knotting, hitching and bending line like Yale's MaxiBraid, New England Ropes' T-900, and Samson's Ultra-Tech, this was a piercing call for for a *Practical Sailor* bench test.



Left: *5/16" Yale Light, with a rated breaking strength of 5,000 lbs., secured to a smooth pin with an anchor bend finished by a buntline hitch as a lock.* ***Right:*** *Bang. The failure occurred at 2,652 lbs., at the outside round turn of the buntline hitch.*

The Planning

The goal, really, was to see for ourselves just how much knots really do rob high-tech lines of their breaking strength.

Practical Sailor in years past has been given the use of pull-test equipment at both Tillotson-Pearson (the boatbuilder in Warren, Rhode Island) and at New England Ropes (now in Fall River, Massachusetts.) This time, *Practical Sailor* engaged the facilities of Aramid Rigging in Portsmouth, Rhode Island. The company, owned by Alex Wadson, does all kinds of rigging—from conventional to very high-tech approaches for large yachts and racing boats. As implied by the company name, Wadson and his crew know much about the advantages and limitations of man-made fibers.

After extensive discussions, it was decided to use line of four different categories.

To serve as a sort of base, we chose New England Ropes' Sta-Set, a double-braid (Dacron cover and Dacron core) that is very popular with sailors. It was expected that our various end treatments (knots) would fare best with this "traditional" line.

As a example of moderately high-tech line, the choice was Yale's Aracom-T, which has a Technora core and a Dacron cover. If there were problems with knots, it might be with line of this type. (As a rope component, Technora, which is similar to Kevlar, is fading and being superceded by Spectra and other even more technical and forgiving fibers.)

Moving up the line, the next choice was another popular line, Yale's MaxiBraid Plus. It has a braided Spectra core and a smooth Dacron cover.

For a very exotic line, Yale Light was chosen; it has a composite polyethylene-Spectra core and a cover of braided polyethylene. It seemed most likely that Yale Light would be trouble.

Finally, to test a specific splice recommended by Brian Toss, a piece of Samson's most expensive line was chosen. It is Spectron 12 Plus, a 12-strand single braid made of coated Spectra.

It must be emphatically noted that this was *not* a test of one company's line against another. New England Ropes, Yale, and Samson (and other companies, too) all market line that would fit in each of the three categories.

The size of the lines, six in each category, 18 in all, seemed not very important. The sizes were chosen for approximately equal breaking strength—with no consideration for cost. The 7/16" Sta-Set (89¢ a foot) has a listed break strength of 6,600 pounds. Yale rates its 5/16" Aracom T ($1.44 a foot) at 9,700 pounds. Yale's 5/16" Maxi-Braid Plus ($1.70) has a break strength of 5,700 pounds. The 3/8" Yale Light ($1.26 a foot), the largest size made, is rated at 5,000 pounds. Samson's 1/4" Spectron 12 Plus has a break strength of 9,200 pounds.

Next, it was decided to pull test most of these lines with five kinds of

Bench Test: High-Modulus Rope

KNOT	7/16" STA-SET Rated @ 6,600# Failed at	% of Break Strength	5/16" ARACOM-T Rated at 9,700# Failed at	% of Break Strength	5/16" MAXIBRAID PLUS Rated @ 5,700# Failed at	% of Break Strength
Bowline w/double turn	3,768#	57%	3,106#	32%	3,380#	59%
Anchor Bend w/2 half hitches	5,184#	78%	4,222#	43%	1,800#	31%
Clove Hitch w/1 half hitch	1,802#	27%	674#	.07%	722#	13%
Constrictor Knot	3,992#	60%	2,744#	28%	2,824#	49%
Eye-to-Eye Splice	5,926#	89%	10,036#	103%	9,030#	158%

terminations. They are a bowline with a double turn, an anchor bend, a clove hitch with one half hitch, a constrictor knot (also known as an Ashley's hitch, and said by Brion Toss to be the best of the knots), a plain eye splice, and, for the one piece of single braid, a Wadson adaptation of the multiple Brummel splice (which Toss said was developed by Margie MacDonald, a rigger in his Port Townsend, Washington, shop).

With one exception, one end of each of these pieces of line had conventional splices, as specified by each line's manufacturer. And in some cases, some extra line samples were pulled to destruction with knots in both ends.

The Test Equipment

Working with a very patient Brian Fisher, Wadson's production manager, the game plan called for mounting each piece of line in Aramid Rigging's giant stretching machine, which runs 88 feet, from the front to the rear of the shop.

Basically, the machine is two 5" I-beams, with trolley cars (secured by huge pins) and a pneumatic ram mechanism in the box-shaped space created by the beams. It applies the load very gradually.

The assorted rope spices and knots were tied over or slipped on smooth 2" pins, to minimize the damage done by severe bending. (Our first couple of tests used a section of 3" steel pipe around the shackle pin, but this quickly deformed and we discarded it.) No thimbles were used on the splices, because it was the knots that were expected to fail.

Everything in this linear line-up is firmly anchored. Along with intermittent snaps, cracks, and groans as knots and splices draw tight, the testing gets noisy (like rifle shots) when a good piece of line lets go.

Coupled to a computer read-out, the machine permits on-the-spot observation and also records data about properties like strength, elongation, creep, snap-back, hysteresis failure, extensibility, residual strength, and whether Michelle Pfeiffer is more beautiful than Deborah Kerr.

So, besides being observed visually, each of the pull-to-destruction segments produced a graph paper chart clearly showing at what poundage the breakage occurred—as well as a broken piece of rope to examine and photograph.

The Test Results

The data, shown in the chart, does not fall in patterns as neat as one might prefer. *Practical Sailor* suggests a careful look at both the chart and the boxed-off information entitled "Added Thoughts."

The test figures certainly support the position of Brian Toss, which is that these HM lines lose a great deal of their strength when knotted.

The figures don't do much to lend credence to his position that the Brummel splice solves the problems. The Brummel splice is a difficult splice, not known to many sailors and not even shown in most books on rope-work. In addition, it is used mostly for single braid of the type used primarily by racing zealots or by removing the cover of a double braid and making the spice in the core. (On double-braid with, for instance, a Spectra core and a Dacron cover, the core has all of the strength.)

The test data shows which knots are best and that splices are better than any knot—except that in very slippery line (like Yale Light) splices tend to pull out.

So, it's tempting to shout, "Don't tie knots in exotic line!" However, that would be both an exaggeration and over-simplification.

If you like generalities, here are several: The more expensive the rope, the more strength is lost when knotted, and the more likely a knot can be expected to slip.

3/8" YALE LIGHT Rated @ 5,000#		COMMENTS
Failed at	% of Break Strength	
2,241#	45%	With Yale Light, the spice broke at 2,241#. Secured with bowlines at both ends, Yale Light went to 3,162# before one of the bowlines broke.
2,652#	53%	Good performance by Sta-Set. Even with half hitches, Yale Light slipped at 890#. Figures shown for Yale Light was with the bend backed by a buntline hitch.
250#	5%	In Sta-Set, this hitch held but broke quickly. In other lines, it invariably slipped at low figures. With buntline hitches, Aracom T went to 5,424#, Yale Light to 4,800#
2200#	44%	Aracom-T slipped twice before taking hold. With constrictors at both ends because splices pulled out, Yale Light slipped badly and knot pulled out at 2,200#. This was not, strictly speaking, a failure of the line itself.
N/A	N/A	Aracom-T broke in the middle of the line, the only sample that did so. Splices quickly pulled out of the Yale Light, so buntline hitches were tied at both ends. The first failed at 4,354 lbs., or 87% of breaking strength.

Mind you, all of this fancy rope is freely recommended, by the makers and in marine catalogs, for use in situations where knots are commonly used by most sailors. These include halyards; main, jib and spinnaker sheets; vangs; topping lifts; guys, and travelers. They're often called "ideal" for winches and stoppers.

If you use these ultra-strong (and ultra-expensive) varieties of line for such purposes, there's a way out of the dilemma that is created: It'll take you to a black hole—the one in the most remote reaches of your wallet.

The Bitter End

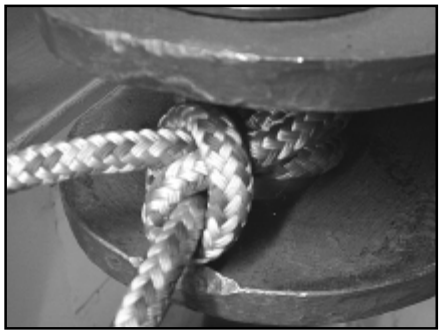
It's fine to say that all rope terminations should be splices.

Amateurs who do their own marlinespike work learned with the introduction several decades ago of three-strand nylon that a couple of extra tucks were called for—to counter nylon's slipperiness.

The appearance of Dacron double-braid called for even more skill—and usually a diagram to keep track of the fid-length markings and the points at which the cover goes in the core and the core goes in the cover. At first, it all seemed very mysterious, but plenty of dedicated sailors set themselves to the task and overcame the problems.

But the times, they keep changing, and the question is, how long can the amateur be expected to keep up? How many sailors will be able or willing to take the next step and fit splices in the fancy line now available? Splicing the HMs can be very difficult, even for a professional rigger in his shop.

Left: The bowline (King of Knots) with two round turns was middling strong—it held to about 48% of breaking strength on average (well below the 67-75% for bowlines in traditional line, as suggested by the Cordage Institute). Middle, a constrictor knot, shown around a piece of pipe that was quickly deformed, is a tenacious little number that did roughly as well as the bowline, holding to an average of 45%. There are several variations of constrictor, including the Ashley's Hitch used by Toss, which he scored at 47%. Right: a buntline hitch with two round turns. It's nothing more than a clove hitch around the standing part, with the first turn taken outside, so that the bitter end is locked in the inside hitch. Shown here in the end of some Yale Light, it was a useful locking hitch throughout the testing, and in fact held to 87% of Yale Light's breaking strength in a sidebar test of end-to-end buntline hitches.



The sailor faced with the occasional need to attach a shackle to a halyard or attach a pair of sheets to a self-tailing jib, can stop by the rigger's shop and pay to get it done. The rigger will even select the proper line—subtracting from its rated strength the weakness (which he should know) induced by the splice.

An alternative is to buy oversized line and tie knots in it. Although severely weakened even by knots like the bowline, over-sizing will take care of the problem. With this approach, the already-high cost could double.

As Brian Toss observed, you wind up with line that is "far bigger, heavier, and more expensive than necessary." And you still have slipperiness to worry about.

The last alternative: Unless you are a fierce racer and intend to banish at any cost any excuse for losing, equip the entire boat (except for that nylon anchor rode) with any of the excellent varieties of Dacron double-braid.

Conclusions and Observations

• In virtually all cases when a knot held, the rope broke at the very front of the knot, at the first turn compressed by an overlay. If you have an important connection made with a knot of any kind, re-tie it occasionally in a slightly different place.

• Although rigger Brian Toss said he has seen the core crawl clean out of the cover of a line subjected to heavy loads, the PS tests turned up no similar instance.

• The only test made of the Brummel splice was on a piece of Samson's Spectron 12 Plus. It's an all-Spectra single braid with a rated breaking strength of 9,200 pounds. With splices in both ends, it broke at 7,078 pounds—77% of its rating.

• In defining a rope's strength, manufacturers and catalogs currently tend to use "breaking strength" instead of "safe working load," as they used to do. Breaking strength defines the load that produces a break or rupture. Long before a rope breaks, it undergoes severe and permanent damage. A better term from the user's viewpoint is "safe working load" or simply "working load limit," which is the load that can be endured repeatedly without doing damage. Unfortunately, the preferable term gets so complicated by things like "design factors," dynamic loading, age, wear, UV attack, etc., that manufacturers no longer routinely specific the SWL.

• In the slippery lines (especially Yale Light), the splice occasionally pulled out before the knot broke. The splices failed when the cover broke, which released the splice enough to free the core.

• When synthetic line undergoes heavy stress, it heats up—sometimes dramatically—and creates a small welded mass of plastic. You can perhaps tell if a knot is getting near its breaking point by feeling it.

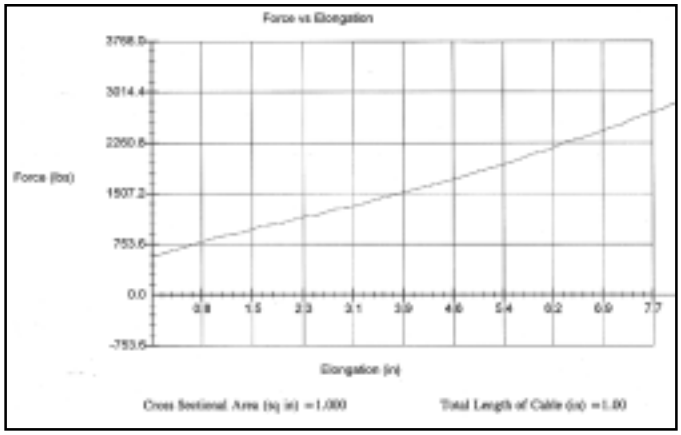
• The double turns over the pin used on the bowlines were useless, as they probably would be with any knot. Unless there is abrasion, the turn is *not* where the break occurs.

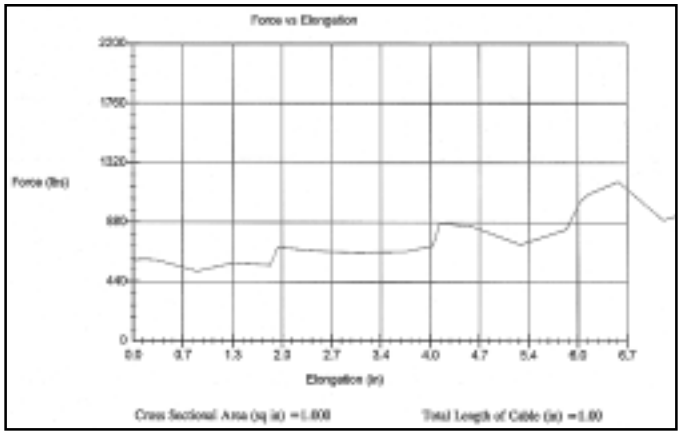
• Unless it's used on a surface with some friction, like a rough piling or mooring bitt, the clove hitch shouldn't be considered a reliable knot, even with an added half hitch. The figures on the chart are for this configuration. Early in the testing, *PS* took to adding a buntline hitch to get it to hold. That made it a different ballgame. The lines so secured then broke (at fairly respectable loads) at the buntline hitch.

• The most unusual result was with a piece of Yale's Maxi-Braid Plus. With splices in both ends, the line broke the core (but not the cover) in the middle of the piece. Rated at 5,700 pounds, the break came with a load of 9,030 pounds. Why, we do not know.

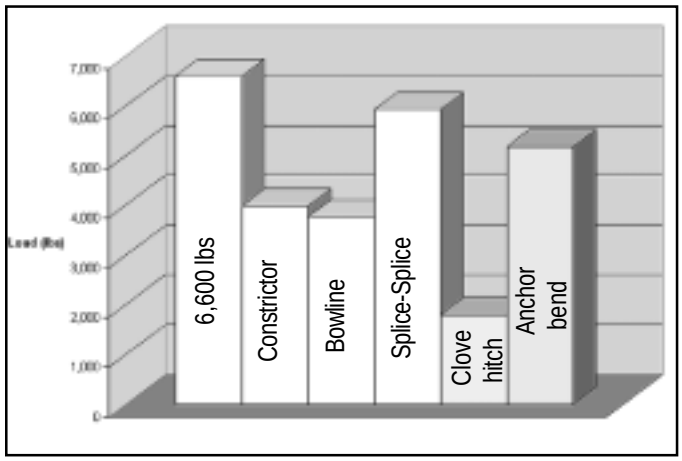
• When using slippery line, it's strange and unpleasant to watch a well-made knot like an anchor bend slowly but surely snake its way free when a load is applied.

Demonstrating how a knot grabs and holds steady until the line breaks, Aramid Rigging's print-out below left is for Sta-Set line with a bowline. Note the stalwart straight-line march to destruction. The stepladder display in the print-out below right shows the progression for slippery Yale Light line with a constrictor knot, which seems to hold momentarily, slip a bit, grab again, slip again until finally something breaks.

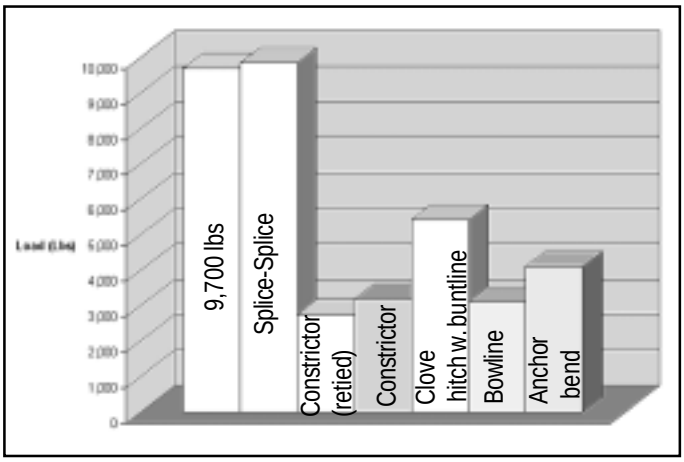




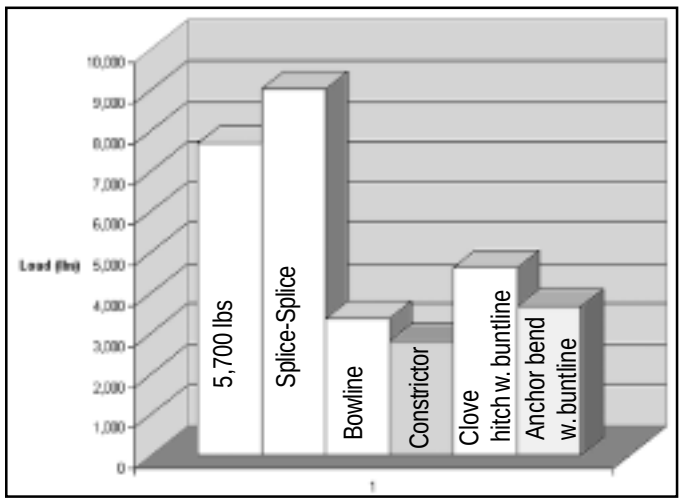
7/16" Sta-Set, rated at 6,600 lbs. breaking strength



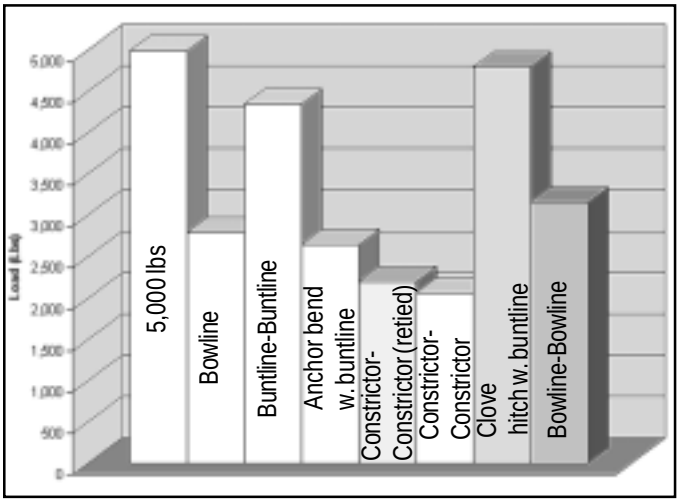
5/16" Aracom-T, rated at 9,700 lbs. breaking strength



5/16" MaxiBraid Plus, rated at 5,700 lbs. breaking strength



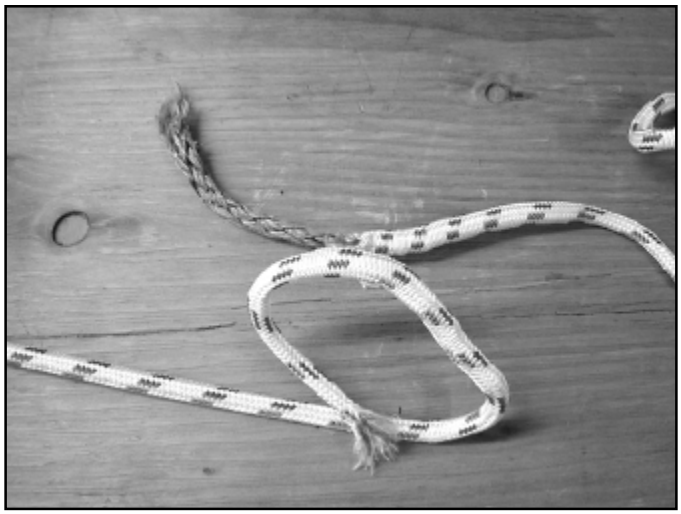
3/8" Yale Light, rated at 5,000 lbs. breaking strength



Above: *Four Excel charts generated from the testing software at Aramid Rigging show, from left to right, top to bottom, the general progression of* Practical Sailor*'s tests, including efforts to shore up the slipping high-modulus line with locking hitches, and to try various knots and hitches just to see what would happen.*

Below: *After the demise of an Aracom-T eyesplice. Rated for 9,700 lbs., it held out to 10,036 lbs. We're talking about a piece of light line 5/16" in diameter—no wonder we want this high-tech stuff to work. But for true love to blossom, we need to be able to knot, hitch, bend, and splice it without fear that we've dealt it a fatal blow.*

• *Practical Sailor*'s seat-of-the-pants reaction to all of these readouts is simple: High-modulus fiber already has an accepted place in the standing rigging of high-performance boats, where all terminations are professionally made. It can and most likely will have a place in shackle-ended running rigging (mainsail and headsail halyards, topping lifts, maybe heavy-air spinnaker sheets) aboard a lot of weekend handicap racers, where 20 pounds of weight saved aloft can add several seconds per mile on the course. It can make a difference in the same way to performance-minded cruising sailors. But until the ropemakers figure out a way for this stuff to face up to The Knot without sacrificing The Wallet, it's just can't be a trusted mate on deck. Brion Toss, not surprisingly, is absolutely right. ■



Webbing: Match Quality to Usage

The flatware of rope and rigging is particularly suited to several uses on board, and is terminal-friendly. Keep a roll or two in your arsenal.

It began with a question from a Chicago reader, Carl Beyer, who said he's currently cruising in the West Indies: "On anything more than a quick passage of a few hours aboard our 35' ketch, we like to get the hard dinghy aboard and not worry about it riding along behind us. This is particularly so when the weather is brisk or better. I say, 'better' (rather than 'worse') because with a ketch you can stand a good bit more wind than can those 'sloopies.'

"Our problem is lashing down the dinghy. It's not easy to tie it tightly. We've tried both three-strand nylon and Dacron braided line, but no matter how well we snub the hitches, they always seem to loosen up and provide some undesirable slack. We don't trust shock cord. Can you think of an option?"

Practical Sailor's search for options turned up, repeatedly and most often, a solution called Webbing.

Webbing is greatly favored for life harness tethers, sail ties, dodger straps, to lash battcars to sail cringles and to "spider web" the heavy loads at the clews and tacks of sails.

Still, webbing is sometimes called the most overlooked material available to sailors—by those who make and sell it, of course.

Who makes it? There are literally hundreds of web mills turning out everything from 12" slings to pick up construction equipment being helicoptered to the top of skyscrapers to puny little straps on kids' backpacks. Most manufacturers, fled from New England, are in the South. One of the biggest is Tapecraft in Anniston, Alabama. It's owned by YKK, the big Japanese zipper company.

The biggest supplier to the marine industry is Bainbridge International in Canton, Massachusetts. While most of its business is sailcloth and sail fittings, its webbing and web hardware business is an important adjunct.

Speaking for Bainbridge, Richard Morell and Scott Sartrys explained that tubular webbing, manufactured in the same way as the cover on double-braid rope, is stronger than flat webbing. The best tubular webbing is called, in the trade, maxi webbing and the 1" size can have a breaking strength of 11,000 pounds. It can be identified by a black tracer along each edge and down the middle.

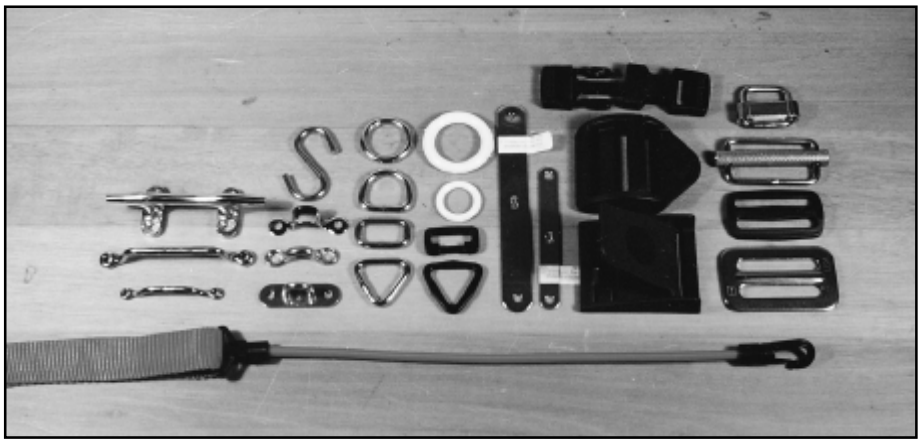
From left to right are six samples of webbing. Purchased from West Marine and fine for light duty are the 1" dark-colored piece and the 1-1/2" white piece of flat webbing. Third from the left, with a nickel in the end to show its construction, is a good piece of tubular webbing. Shown securely sewed to a Wichard snap hook is an even better piece of white tubular webbing made up as a life harness tether; note the generous and excellent sewing. Second from the right is a piece of flat webbing glued and sewn, (in a questionable way), to the relatively new Wichard double-action hook. On the far right is a piece of thin, very cheap webbing glued (not even sewn) to a sliding bar buckle. This was taken from an old child's backpack. The terminal here is much sturdier than the webbing; today it would be replaced by a plastic clip.

"If you're buying webbing for use on a boat," says Sartrys, "... or anything else, be advised that there are many grades, and you must match usage to quality. Basically, the heavier it is, the better."

Along with proper webbing, you need proper hardware. A fair portion of the marine hardware business is devoted to making metal and plastic fittings for webbing.

Basic to attaching webbing to a deck or bulkhead are what are called footman's loops, a.k.a. bridges. They are important to provide the webbing with a good even bight, which prevents edge-loading (perhaps leading to tearing) of the webbing.

The ends can be fastened with shackles, D-rings, triangles, side-release buckles, sliding bar adjustors or aircraft-type buckles. Lengths can be changed with three-bar slides. There even are fittings that permit the use of a short piece of shock cord on the end of the webbing. It might be handy in low-load applications.



Here's an assortment of hardware intended for use with webbing. In the top row at left is a 4" Herreshoff cleat—the kind of thing most of us would tie our webbing to. It's not ideal (and expensive at $20 a pop). Below it are small ($5) and large ($7) Wichard footman's loops or bridges, which are the ideal way to secure webbing. In the second row are an S-hook and 3 padeyes, none of which is a good anchor for webbing because they don't permit the webbing to make a good flat turn. In the next two rows are metal and plastic triangles, rectangles, D-rings and O-rings. Next are two Schaefer stainless tangs, which could be bent into footman's loops to fit a difficult location. Next are various buckles and adjusters, including standard snap fittings, an aircraft-type cam buckle ($1.99), an adjustment buckle ($2.99), a side-release buckle ($2.99), several other length adjusters ($7.50 for the big metal one, $1.99 for the plastic) and two sliding bar buckles ($8.50 for the big one). At the bottom is a bit of 1/4" shock cord (39¢ a foot) with a web connector ($1.99) on one end, and a hook (99¢) on the other. This could work in a low-load setting, like securing an awning or a light sail on deck.

Some of the great variety of hardware is shown in the photo above, but remember—stainless steel hardware is almost always stronger than plastic.

Ronstan, Schaefer, Wichard, and Suncor make excellent web hardware. If you want to see an amazing variety of hardware available for webbing applications, check with an English company called Sea Sure for a catalog.

Jacklines

The most prominent use for webbing on cruising sailboats is in jacklines for safety on deck. They should run port and starboard from the bow cleats, or from shackles on the toerail forward, back to the cockpit, but should stop far enough from the transom that you don't get swept overboard and dragged behind the boat.

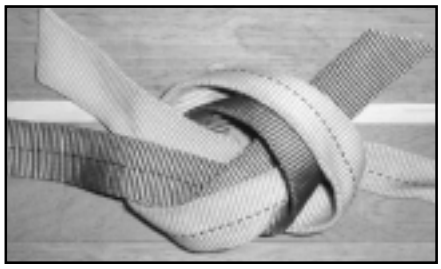
John Rousmaniere, in his *The Annapolis Book of Seamanship*, says that webbing is best for jacklines, pointing out that it won't be confused with other line on deck. Likewise, in the *Offshore Sailing Encyclopedia*, Steve Dashew writes, "Ideally, jacklines will be made from flat webbing (which doesn't roll under your feet like line or wire)."

Both these points are correct, but there's a bit more to consider: Plain nylon jacklines stretch considerably when soaked and worked hard, as most people who have spent a few days on a wet passage will confirm. Rousmaniere has pointed out that some of the injuries in the disastrous 1998 Sydney-Hobart Race were the result of people being thrown long distances after their jacklines and tethers had slackened.

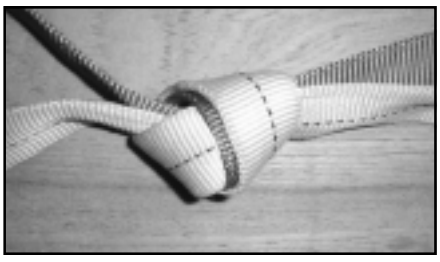
Minimum-stretch systems made of wire or high-tech line like Spectra offer greater support to a crewmember leaning against them at the mast or on the foredeck, but these, too, have their bad points: Fetching up at the end of your tether on a bar-taut jackline can be just as injurious as being thrown loosely. Plus, the stresses and shock-loads when that happens are more likely to damage or break terminals and knots somewhere along the line in the system.

As is often the case aboard sailboats, the best solution is probably either a matter of seamanship habits or a well-considered compromise purchase: Either go with the nylon and make sure you have it cinched up tightly when it gets wet (or better yet, set it up when it's wet and let it dry taut), or buy polyester (Dacron) webbing, which will stretch under load, but not as much as nylon. ■

*Contacts—**Bainbridge**, 255 Revere, Canton, MA 02021, 800/422-5684. **Ronstan**, 7600 Bryan Dairy Rd., Largo, FL 33777, 727/545-1911. **Schaefer**, 158 Duchaine, New Bedford, MA 02745, 508/995-9511. **Sea Sure**, Shore Rd., Warsash, Hampshire SO31 9GQ England, 44 (0) 1489 885401. **Suncor**, 7 Riverside Dr., Pembroke, MA 02359, 800/394-2222. **Wichard**, 47 Highpoint, Portsmouth, RI 02871, 800/852-7084.*



If you're lacking a terminal, here's an elegant and simple knot (bend, really) favored by paddlers, who use webbing to make carrying loops and for lashing boats and gear. It's called a Water Knot—simply two overhand knots tied through each other in exactly opposite directions (above) and pulled tight (below).



Offshore Log

The continuing voyage of Nick Nicholson's Calypso

Mediterranean Idyll

Calypso *rubs gunwales with some of the Med's mega-yachts in a cosmopolitan port that caters to the European trade.*

On turnaround day, dozens of German-flagged bareboats line the marina docks.

The central Turkish port of Marmaris is the heart of the burgeoning eastern Mediterranean charter boat business. Netsel Marmaris Marina is filled with hundreds of squeaky-clean bareboats from half a dozen charter agencies that specialize in European clients. Our dock was the home of the German-owned Sun Charter fleet.

Several dozen boats—primarily French-built Jeanneaus—are turned around by this company every weekend, disgorging hundreds of logy, sunburned Germans on the docks. They are replaced the next day by planeloads of pale German sailors trundling cases of beer and wine down to their charter boats. More Turks in this area speak German than English.

The local crewed charter boats, called gulets, are purpose-built descendants of sail-powered coastal freighters. Varying in length from about 35' to 80', these are massive boats for their length, like their cargo-carrying ancestors. Most are exquisitely maintained, lavish with varnish and polished stainless steel. With huge, canopied cockpits, even small gulets have comfortable lounging areas.

While they all maintain rudimentary sailing rigs, these are really motorboats. The canvas rigged on the booms may look like sails, but the "sails" are more likely to be awnings, unfurled at anchor.

Some gulets are graceful, others clunky. All have the basic characteristics of wooden construction, wide beam, relatively shoal draft, lots of varnish, huge engines, and tons of cabin space. They are usually operated at full throttle, with little attention paid to the rules of the road.

The town of Marmaris has well over 100 gulets catering to the tourist trade. These are primarily Med-moored in front of the dozens of small restaurants lining the waterfront. Between the restaurant hawkers, the Turkish string bands, the aggressive rug merchants, and the muezzins calling the faithful to prayer, the Marmaris waterfront is a cacophony of conflicting sounds, a veritable Tower of Babel in Turkish, German,and English.

As long as you keep your sense of humor and aren't bothered by music that continues into the wee hours, it's a wonderful place.

There are huge private yachts here as well. The dock behind us is used by megayachts, both power and sail, which take turns sucking big fuel trucks dry. Telecommunications and high-tech may be hurting on the US stock market, but the big-time owners are still doing well.

The 200-foot US-built *Frequency*, which dropped in for a few days, is owned by a Turkish digital communications tycoon. Smaller high-performance toys—a 40-foot catamaran and a 48' foot speedboat, both operated by American crews—follow the big boat from port to port.

With a name like *AirWaves*, we suspect that the equally large motoryacht pictured on the next page is owned by someone who has made more than a few dollars—or lira, or pounds sterling, or Deutschmarks, or Euros—in the communications field.

No matter what the nationality of the real owner, all these boats are owned by corporations chartered in tax havens like the Cayman Islands or Bermuda. It seems like every European has a digital phone in his pocket or in her

Top: *The megayacht* AirWaves. ***Middle:*** *An older, graceful gulet, now a private yacht.* ***Bottom:*** *The cockpit of this 50-foot gulet has lounging space for 10.*

handbag, and the money just keeps rolling in.

The sailing yachts are equally impressive. A half dozen sailboats over 120 feet long stopped in Marmaris while we were there. The graceful *Shamoun* and the elegant, modern *Yanneke* are almost too beautiful to believe. The crews work like dogs to keep them as perfect as possible. After the high tension of the Red Sea and the Middle East, the somewhat decadent self-indulgence of the Med is a welcome change. We may be on the fast track west, but it's a laid-back, comfortable fast track.

We doubt that Odysseus had it any better wandering across the eastern Mediterranean more than 2000 years ago, when he hung out with the original Calypso. The siren song may be a little loud, but the wine ain't bad, and the calamari is out of sight. Our *Calypso* thinks she's home at last. She doesn't know she still has one more ocean to cross this year. ■

Small Sign, Big Problem

The seas of the world are polluted with plastic waste, one of the worst byproducts of modern civilization. In the deserts of the Middle East, virtually every scrawny bush is festooned with plastic bags that have blown unimpeded across the wasteland. A lot of this ends up in the ocean, along with waste dumped by ships and garbage dumped along the coasts of many nations.

Dumping plastic in the ocean is absolutely illegal, but it continues almost everywhere. We have exported our consumer goods to the rest of the world, and we have created a huge problem for countries lacking the infrastructure to dispose of the inevitable plastic packaging properly.

Throughout Southeast Asia, the Indian Ocean, the Red Sea, and the eastern Mediterranean, we have ploughed through floating debris fields of industrial and domestic plastic waste. We met literally dozens of boats whose propellers or engine intakes have been clogged by plastic bags. Our engine raw water pump failure on the way to Thailand may have been the result of a bag temporarily blocking the engine water inlet.

We regularly shine a flashlight through the clear plastic bowl of our Groco ARG-1000 engine raw water strainer to check for debris, but because there's always a certain amount of slime on the inside of the bowl, you can't easily see what's going on. Every now and then, we open the strainer up to clean it out thoroughly.

This time, we had a surprise. The strainer basket was almost completely filled with a shredded clear plastic bag. We don't know how long it had been there, because it was virtually invisible when the strainer was full of water.

Wherever it came from, the message is clear: Make it a habit to clean the raw water strainer regularly, even if things seem normal. Above all, don't contribute to the global problem by dumping plastic at sea. ■

We were surprised to find our raw water strainer completely clogged with a shredded plastic bag.

The Ceremony of the Chain

Sailors are known as superstitious creatures of habit. One of our own little rituals is the Ceremony of the Chain. For the layman, this quasi-religious experience has a more prosaic name: end-for-ending the chain.

We carry 400 feet of 3/8" high-tensile galvanized chain. That translates into 600 pounds of steel. Once a year, we pull out the entire rode and swap it end-for-end to equalize wear on both ends of the chain.

We re-galvanized the chain last year during our prolonged stay in New Zealand. Since that time, we have anchored in Australia, Indonesia, Malaysia, Thailand, the Maldives, Eritrea, Sudan, Egypt, and the Med. We have pulled up some absolutely shocking, stinking muck on the chain in several of those places, including several anchorages that have the reputation of eating the galvanizing off the chain in a matter of days.

Despite the fact that we are religious about washing the chain as it comes aboard, you cannot possibly get all the mud off every time you haul the anchor. Mud clings to galvanized chain like glue.

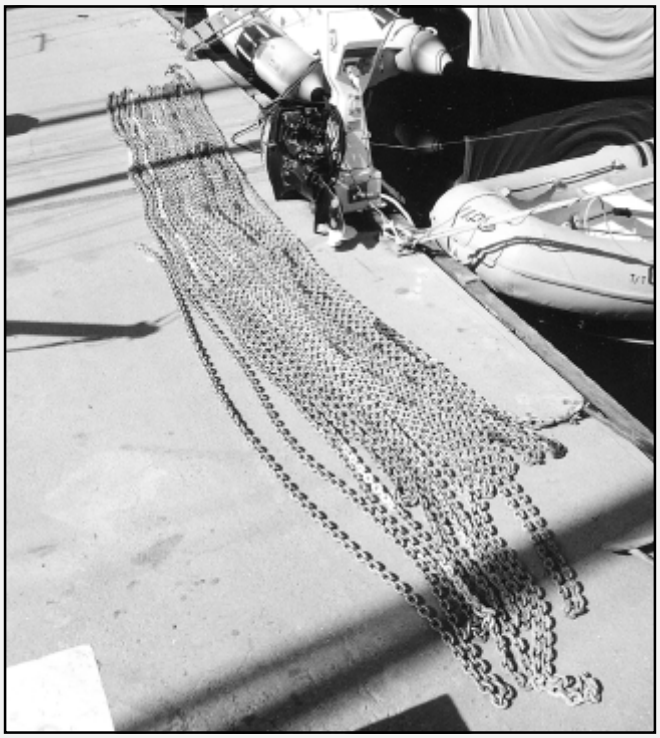
Two anchorages particularly come to mind: Langkawi, Malaysia, and Ismailia, Egypt. In both places, the chain came up looking like a three-inch diameter mud rope. In Malaysia we washed and washed the chain before it came aboard, and still the waterways ran brown as the anchor came home. In Ismailia, my attempts to clean the chain properly were thwarted by our Suez Canal pilot, who was screaming at me to get the anchor aboard and get underway while I was trying to get the muck off the chain. I was sorely tempted to plug his mouth with a big handful of Egyptian mud.

Part of the dread of the Ritual of the Chain is the mucking out of the chain locker that goes with it. Surprisingly, all that stinking mud turns into fairly innocuous sand and dirt when it dries out, and the mucking out is never as bad as you expect it to be.

With the chain off the boat, it's fairly easy to climb into the chain locker with a bucket and brush to get up the worst of the mess, followed by a wipedown of the locker with a sponge. As I cleaned out the mud this year, the anchorages it must have come from flashed vividly to mind. Were these shells from Africa, Asia, Australia? Wherever they came from, they are now mingled forever with the mud of Marmaris, Turkey, to the eternal confusion of some future geologist who might someday explore the sands of the harbor here.

After you remove the chain, of course, you have to clean and re-stow it.

We clean the chain with a high-pressure freshwater washdown to try to get mud residue off and start the year with clean chain. Unfortunately, this has the side effect of blasting off the paint markings on the chain, which are pretty much gone on the first 200' in any case.



That's 400 feet of chain laid out on the dock for its annual maintenance and inspection.

There are any number of chain-marking schemes employed by cruisers. Paint markings look great when new, but disappear quickly in use. This year, we decided to mark the chain using colored plastic electrical cable ties. They seem to run through the windlass with no problem, even without the tails cut off. Unfortunately, colored cable ties only seem to be available in the skinniest size, so we have no idea how long they will stay intact on the chain.

Reloading the chain requires some thought. This is a lot of weight to carry in the bow, and it exaggerates the boat's pitching moment significantly, not to mention the impact on trim. With the chain off the boat, the bow comes up at least four inches. The most chain we have ever deployed is about 350', during an unexpectedly hard blow in Thailand, when we were helplessly embayed on a lee shore with the engine's gearbox in the shop for a rebuild.

Reasoning that we are unlikely to need to put out more

than about 300' of chain, we decided this year to shift part of the chain to the middle of the boat during the Ceremony of the Chain, reducing the weight in the bow. We can do this by leading the chain through PVC pipe which leads from the secondary chain locker to the bilge section under the saloon. All the floorboards in the boat have strong positive latches, so that in the event of capsize we should not end up with this small pile of chain trying to exit the main cabin by pounding a hole in the deck.

We moved 50' of chain—about 75 pounds—almost 15' aft. Allowing for the additional chain which leads forward through the bilge, we can still anchor with 325' of chain at the stemhead. This is more chain than most cruising boats carry, and is more than adequate for 99 per cent of anchoring situations we have faced.

As water depth increases, you can actually get away with proportionately less scope, as the weight of the chain itself adds significantly to the holding power of the anchor. Even anchored in 75' of water in a fairly exposed anchorage, I would feel comfortable with 325' of chain out, as long as the bottom is decent.

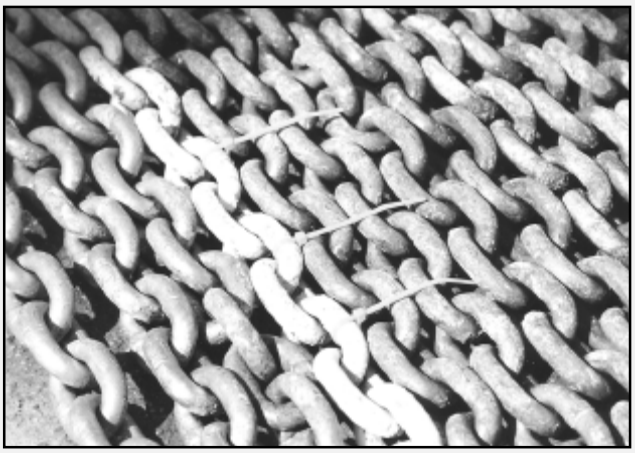
We've never met a world cruiser whose primary anchor rode is anything other than chain. This is yet another reason that a cruising boat gets inordinately heavy.

The additional weight is a tremendous burden to cruising multihulls and light-displacement monohulls. With our dry weight of about 27,000 pounds, the additional weight of chain is felt, but it's not unbearable. In a 40-foot multihull weighing 10,000 pounds—even allowing for the lighter ground tackle carried—the weight of all-chain rode, coupled with the normal amount of cruising equipment, can be fatal to performance.

We could have saved about 160 pounds in our ground tackle package by using 5/16" high tensile chain instead of 3/8" chain. The problem is that while 5/16" high-tensile chain has a working load limit of about 3900 pounds, the normal galvanized anchor shackles that you use with 5/16" chain have a working load limit of about half that. Granted, certified shackles have a six to one safety margin, but exceeding the working load limit of any part of your ground tackle system is never a good idea.

This is particularly true when you are world cruising, when your ground tackle is often the only thing standing between your boat and destruction. We have no doubt that you can find fully-galvanized high-tensile steel shackles for use with high-tensile chain, but they are not readily available, and we would be delighted if a *Practical Sailor* reader would come up with a source.

As an aside, we faced a similar problem in weighing the boats used in the America's Cup. These boats weigh



This year, we're trying colored plastic cable ties as chain markers, to supplement the quick-disappearing paint markers.

about 25 metric tons—some 55,000 pounds. Our load cell is rated for 30 tons, and normally uses 1-3/4" high-tensile shackles rated at 35 short tons—70,000 pounds. Unfortunately, our high-tensile shackles disappeared somewhere along the way, and we were forced to use standard shackles rated at 25 short tons—50,000 pounds.

Despite the safety margin, we were really uncomfortable lifting a $3 million boat that might be the core of a $50 million campaign—not to mention the $500 million in potential benefits to the home country of any syndicate winning the America's Cup—with shackles that were under-rated for the job. We have only seen one America's Cup boat dropped—not by us, thank God—but it was a sobering experience. Even though the boat fell only a few feet, it was so severely damaged that it was effectively out of the contest.

Is it easy to find 1-3/4" high-tensile steel shackles in a civilized country such as New Zealand? It is not. At the end of the day, we had Dutch-made shackles air-freighted from Singapore to New Zealand, at a cost of about $700 for freight alone. Needless to say, we painted these shackles—which might have been gold-plated, for what they cost—with day-glow paint so that no one can wander off with them by mistake.

With our chain swapped end-for-end, cleaned, re-marked, re-stowed, with newly re-seized shackles, the annual Ceremony of the Chain comes to an end. It only remains to perform the final ritual libation. This calls for a glass of wine—red or white, but not too old, not too young, not too dry, not too sweet. In this case, it is not sacrificed to some ancient God of the Chain. This libation goes to the crew who have performed the Ceremony, for they're the ones sweating like pigs under the hot Mediterranean sun. ■

Com-Pac 35

Charley Morgan's design combines 'home-style' comforts, shoal draft, solid workmanship, and a good turn of speed.

Com-Pac Yachts is a Florida builder with a particularly interesting history. The company was formed back in 1957 by W. L. "Hutch" Hutchins, Sr., an entrepreneurial tool-and-die maker who operated a metal-stamping and fabrication shop in St. Louis. A successful inventor, his creations ranged from automobile accessories, including the "Ah-ooo-gah" horn installed on Model A Fords, to a unique folding high chair.

In 1970, Hutch converted a personal interest in sailing to a corporate endeavor when he commissioned Clark Mills to design the Com-Pac Yacht, a 16-footer capable of being shipped in a box. Mills is most famous for designing the Windmill and Optimist prams. Hutch's goal was to "build a small but highly efficient sailboat that could easily be trailered behind a compact car."

The first boat was finally constructed in 1974, and trailered by Hutch behind a Ford Pinto.

The company eventually introduced several small models ranging in size from 19 to 23 feet. Bob Johnson of Island Packet and Charley Morgan were employed as designers of three cruisers, the Com-Pac 25, 27, and 35 footers. A line of catboats was introduced in 1999.

Brothers Rich and Gerry Hutchins now run the company. Rich, 58, has worked for Com-Pac since childhood, once running the metal shop in St. Louis. He lives aboard a Com-Pac 35. At age 52, brother Gerry is a graduate engineer who began his career at Gulfstar.

"We consider the 35 to be a semi-custom boat, because we limit production to 4 to 5 boats per year, and allow owners some latitude in the accommodations," Rich says. The cruisers comprise approximately 25 percent of the annual production.

The Com-Pac 35 moves well with its shoal-draft Scheel keel. Despite its cruising countenance, its D/L and SA/DSPL ratios—and its tested performance—suggest that it could be a wolf in a PHRF flock.

The company appears to be a combination manufacturing and assembly plant, since hulls for the larger boats are laminated off-site by JMJ Fiberglass, specialists with whom the company has a 15-year relationship.

"We're not interested in being in the glass business because it's a specialized business and requires a huge commitment for space," says Rich. "However, we dictate lamination schedules, and store and maintain the molds between production runs."

(We found fiberglass and gelcoat surfaces on our test boat to be smooth, with no evidence of print-through or crazing.)

The manufacturing facility consists of three buildings housing assembly areas, and metal and wood shops.

Dealers are located in most major sailing ports. The company has delivered boats to the Great Lakes and all three coasts. Many 35s are currently cruising the waters of the Caribbean and Florida Keys.

The target market for the 35-footer

is the experienced sailor stepping up from a smaller boat who wants to sail offshore.

Design

Designed by Charley Morgan, the 35 was introduced 10 years ago as a 33-footer with a standard transom. However, when the market demanded the addition of a swim platform, the molds were retooled and the stern swept aft, adding one foot to the waterline.

She is a "traditional, beamy cruiser," Rich says, and is "typical of Charley's designs."

Morgan describes the design criteria as having four elements: "She had to have a shoal draft, be stable and sea kindly, and fast enough to give good results under PHRF rules." To that end he combined "a large sailplan with moderate displacement, a long waterline, generous beam, and a Scheel keel."

Her profile reflects a slightly sloping sheerline accented by a bowsprit that lends a traditional look while increasing the sailplan. The sprit also facilitates the use of large light-air sails, eliminating the need for a spinnaker pole and associated gear.

The 18-inch tall cabintop has a rather high profile that creates headroom below while providing light and ventilation through five ports.

A teak eyebrow, and two teak handrails running the length of the cabin top, add just enough brightwork to give her a cruisy look without making her a high-maintenance item.

Hutchins describes the shoal draft Scheel keel as "the perfect keel for a cruising boat, compared to a full keel." The stubby keel design incorporates a wide trunk that runs to a significantly wider foot filled with lead ingots. "The design provides excellent lift, allows the boat to turn in her length, and to access shallow anchorages."

She displaces 12,500 pounds, of which 5,700 pounds is ballast.

The SA/DSPL ratio is 17.2, typical of the breed, and the DSPL/L is 232.5—a moderately light ratio. We expect her to outperform many similarly sized "performance cruisers."

Com-Pac 35

LOA: 36' 9"
LWL: 29' 0"
Beam: 11' 10"
Draft: 4'0"
DSPL: 12,500 lbs.
Ballast: 5,700 lbs.
Sail area: 579 sq. ft.
Fuel: 30 gal.
Water: 75 gal.
DSPL/L ratio: 232.5
SA/DSPL: 17.2

Construction

The primary components of this boat are the hull, a pan that provides housing for cabinetry and the motor mount, a headliner, and the deck.

The hull construction begins with the application of a coat of Neste gelcoat. The skin coat is a layer of 1.5 ounce mat bonded with Riechold Hydrex vinylester resin to prevent osmotic blistering.

The layup at the keel consists of six layers of 17-ounce knitted fabric that produce a 1/2" thickness of solid fiberglass. Outboard of the keel the layup consists of layers of 34- oz. mat. Additional layers of 17-oz. fabric are laid up at the chainplate attachment points. Chainplates are stainless steel straps attached outside the hull, and bolted through backing plates on the inner surface. One layer of 34-oz. mat is laid up around the sheer line to provide additional stiffening.

Topsides are cored with a thin layer of Coremat.

The bottom of the hull also is coated with a coat of epoxy. With vinylester resins in the layup, and the additional barrier coat, this method should prevent blistering.

"The headliner is a solid fiberglass section that is part of the hull-deck structure," Gerry says. "It's constructed of two layers of 1.5-oz. mat and 24-oz. woven roving, bonded to the hull with knitted fiberglass."

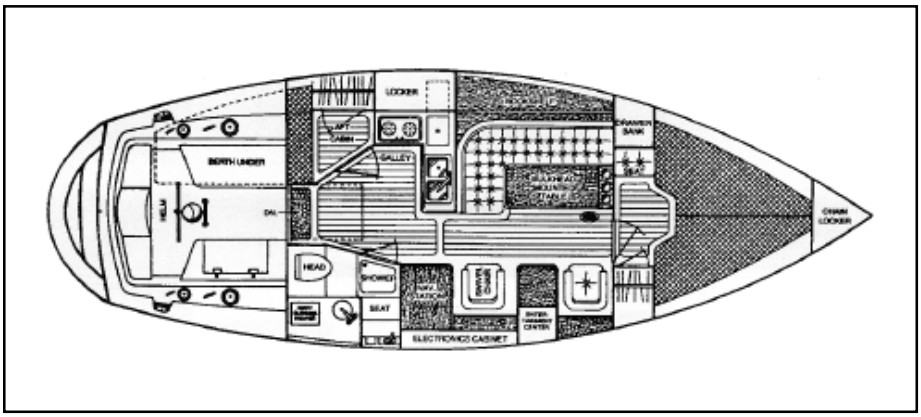
The deck is hand-laid with a skin coat of 1.5-oz. mat reinforced in high load areas with 17-oz. knitted fabric. It's cored with 3/8" Klegecell, over which are laid layers of 1.5-oz. mat and 24-oz.roving.

The hull-deck joint is fairly conventional, and should not leak. It consists of an outward flange on the hull onto which the deck is laid. The joint is secured with Bostitch 920 urethane sealant and #10 machine screws and nuts on 4" centers. This joint is also bonded on the inside of the hull with knitted fabric.

Most deck hardware is mounted in drilled and tapped holes, and secured with backing plates, a good method. Winches are attached to plywood backing built into the coaming.

Deck Layout

Sailhandling arrangements feature internal halyards, a mast free of winch-



The Com-Pac 35 interior layout favors seating nooks and an 'entertainment center.' It's not a seagoing layout, but it can provide happiness for four alongshore.

The Com-Pac's shoal draft keel and rudder allow her to venture inshore where other boats her size dare not. Meanwhile her waterline length and sail power give her good coastal cruising range.

es, and sail controls led aft to rope clutches. The single spreader spar is supplied by Charleston Spars; standing rigging is wire.

Halyards are led through Harken turning blocks installed at the base of the mast to Spinlock XT rope clutches. The main traveler sits on a heavy stainless steel bracket attached to a 6" inch-tall molded fiberglass pod at the front of the companionway. The traveler is 14 inches above the cabintop, so avoids chafing the gelcoat.

Winches on the coachroof are Harken two-speed 32s; primary winches are Harken two-speed 40s. Track for headsails is located on the rail. Its length, 68 inches, will produce proper sheet lead options for an oversized genoa or a blade.

Standard equipment includes a Hood furler, though our test boat was equipped with an optional Profurl. "Hood has done a respectable job of improving their product in recent years," says Rich, "and we're satisfied with it."

The 34" long bowsprit supports a beefy stainless steel plate 24" long and 12" wide, fitted with double anchor rollers. It looks sturdy enough to support the loads of two anchors.

There's room between the stem and the forward end of the cabin trunk for a dinghy on deck, or for lazing.

Stanchions are only 25 inches high, too short for our taste, especially since the toe rail is only an inch tall. The decks on our test boat were covered with a heavy dew, so we appreciated the very aggressive nonskid on decks, cabintops, seats, and coaming.

The boat is well-ventilated. Two 20 x 14" hatches are located on the bow, and pairs are mounted under the boom and at the aft end of the cabintop. Add a companionway measuring 38" long when open and dorade boxes near the front of the companionway, and fresh air moves easily into spaces belowdecks.

The T-shaped cockpit is well laid out and comfortable. It measures 44" from wheel to companionway, and 25" between seats. The well is 15" deep. Seats are only 50" long, adequate for seating two adults, but too short for stretching out for a nap.

Aquatronics stereo speakers are built into a recessed cubby in the coaming where they are safely out of the way; a second cubby with fiddles provides storage for winch handles and suntan lotion.

The helmsman is elevated by a slightly arched seat aft of a 36" destroyer-style stainless wheel. There's good visibility over the top of the wheel. Like many builders, Com-Pac installs oval shaped teak seats on the stern corners.

Standard equipment in the galley is an alcohol stove, which Hutchins says meets the needs of most owners and satisfies those with a concern about the volatility of LPG. As a consequence, the optional propane tank is located in the open beneath the helmsman's seat. Leaking gas will drain into a scupper below the seat. We'd like to see more protection for the tank and gauge.

The starboard lazarette is cavernous. It provides storage for sails or an inflatable dinghy, and access to the steering unit and through-hulls. A 30-gallon aluminum fuel tank is located aft of the engine, leaving space for a heater or generator.

We think that working on the engine will be a challenge, since it fits very snugly in the soundproofed compartment. Hutchins disagrees. (A three-cylinder Westerbeke 27-hp. diesel is standard.)

One owner told us that while checking the oil level is easy, changing it is more difficult, and checking the water pump impeller a chore.

In order to create space in the aft cabin below, the port lazarette is only 8" deep. However, it's 30" long and 17" inches wide, and provides good stowage for fenders, lines, and other oft-used items. This is actually a better arrangement than having to invert one's self digging for something that has migrated to the deepest part of a voluminous locker.

Considering the extensive list of standard gear, our overall impression is that the boat is well-equipped. The sailor interested in improving performance will add a vang, an inboard track for a small headsail, an adjustable backstay, and perhaps spinnaker gear.

Belowdecks

The Com-Pac is spacious, well-arranged, and nicely finished belowdecks. Standing headroom is 6'4". Access, however, is down a steep ladder designed to reduce the intrusion of the engine cover into living quarters.

The head is to starboard at the foot of the companionway, the nav station forward; also to starboard are two heavily upholstered swivel chairs surrounding an entertainment center. One chair swivels to provide a seat for the navigator, who sits opposite the L-shaped galley located to port.

The entertainment center houses a cocktail table, TV/VCR combination, AM-FM radio, and CD player, all standard equipment. Two halogen reading lights to starboard and three to port provide excellent lighting.

Sleeping cabins are to port in the stern, and in the bow.

The centerpiece of the main sa-

loon is an L-shaped settee and dining table hinged to the forward bulkhead. The table is 38" long and 24" wide, large enough for four adults. When out of service it swings up to enclose a large cabinet mounted on the bulkhead that significantly increases the space available for storage of plates and cutlery. The cabinet, 10" deep and 20" wide, with six compartments, is one of the best we've seen.

With the tabletop stowed, the space converts to a 6'x8' conversation pit. The settee also folds out to make a 47" x72" long berth.

The galley has some interesting wrinkles. A hinged board on the aft bulkhead drops to cover the stove, producing a 24"x 42" countertop adjacent to the reefer/dry locker. Double stainless sinks are standard, as is a microwave. Another unique feature is a hinged shelf at the inboard end of the counter that rotates downward to provide a drink tray for the galley slave.

Storage for pots and pans is below a stove which, on our test boat, was a two-burner Hillerange stove- oven combination, a $1,360 option.

The head is 61" long, 42" wide, and has excellent headroom. The shower is separated from the main area by a half-height plexiglass partition. A bather would need to sit on the grated bench and spray carefully to avoid soaking the main head compartment. A curtain would help.

The port stateroom aft is rather spartan, consisting of a double berth and hanging locker; it's ventilated by hatches overhead and in the cockpit. Clearance between the top of the berth and the bottom of the cockpit is 21".

The forward stateroom is enclosed by a door with an arched top, a nice touch. Furnishings include a small seat to starboard, hanging locker large enough for four sets of foulies, and storage shelves running the length of the compartment.

The berth measures 84" at the head and 76"on centerline.

On balance, we think Morgan did an excellent job of apportioning space, since two-thirds of the boat's living spaces are in the cockpit and saloon. The cockpit seats six comfortably; space for 4-6 diners is adequate, and sleeping quarters are large enough for nights on the hook, or an extended cruise.

The swivel-chairs and L-shaped settees are a poor choice for offshore passagemaking; they're better suited for sailing from port to port alongshore. This isn't necessarily a criticism; Morgan and Com-Pac were uncompromising in their direction here.

Source: *BUC Used Boat Price Guide.*
PS uses an average of the retail high and low prices reported in BUC.

Performance

With assistance from Max Heller of SeaCraft Yachts in Seattle, we tested the boat on Lake Union on relatively flat water. She motored easily, and quietly, at 5 knots; company literature indicates that she'll do 8 knots at top speed with the standard Westerbeke.

While leaving the dock with a light breeze on the beam she easily backed up in straight line. A three-blade propeller stops her quickly, and she spins 360 degrees in one boatlength.

We sailed under full main and a 135- percent genoa on the furler. However, the rig on our test boat was newly installed and not properly tuned, so there was some sag in the headstay.

In 6-8 knots of wind she sailed easily at 5-5.5 knots, and buried her shoulder and squirted forward in the occasional puff. She was surprisingly nimble considering her design and displacement, sails well to weather, and tacks quickly. The Scheel keel produced a stiff ride, a surprise on a shallow draft cruising boat.

One owner told us he cannot beat inside 100°, but we matched that number easily, and think a properly tuned rig and well-cut sails will produce 90-95° tacking angles.

Since we saw 5-plus knots of boatspeed in light air we suspect performance in heavier winds will be excellent. Morgan described a downwind sail under spinnaker in heavy seas on the Gulf of Mexico during which the boat recorded bursts of 11-knot speed. That's well outside the average curve for a 35-foot, moderate-displacement cruiser.

Conclusions

The boat's speed and maneuverability in light air was impressive. In this case the Scheel keel provides shoal draft at little or no apparent cost to performance: she certainly points as high and goes as fast as other boats in her class, which we might call "moderate-performance cruisers."

The deck layout is typical of her contemporaries, and it's easy to move about handling sails. Accommodations belowdecks are spacious, and reflect the builder's attention to detail. She's outfitted with an extensive list of standard gear that includes sails and furler, deck gear, well-equipped galley, television/stereo/CD players and speakers. Add a downwind sail, electronics package, and autopilot, and she's ready for extended cruising.

The boat is priced at $146,995, FOB the factory. ■

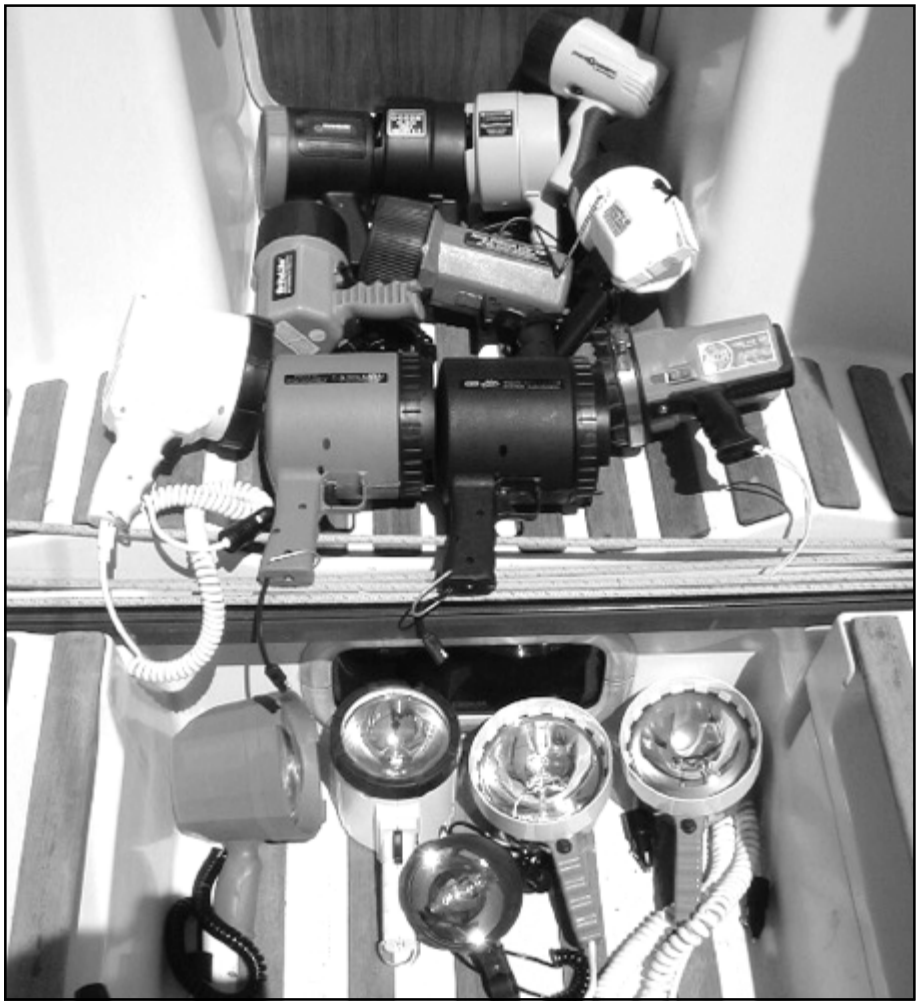
***Com-Pac Yachts**, 1195 Kapp Drive, Clearwater, FL, 33765. 727/443-4408*

Brinkmann, LSI, Optronics Shine Bright in Spotlight Test

Plug-ins and rechargeables shoot the best beams; drycell-powered lights last longer, but don't have the punch to penetrate the gloom.

If you've ever tried to locate a channel marker on a dark night, or to read the number on an unlit buoy in the rain, you already know the value of a handheld spotlight. While other types of lights such as fixed-mount spotlights or flashlights have their uses, they also have their limitations. In terms of flexibility and convenience of use, there's nothing like the bright, narrowly focused beam of a good handheld unit.

In recent years, the manufacturers of these spotlights have been indulging in the optical equivalent of the old automotive horsepower race. Who can claim the highest candlepower number? Well, brightness is indeed important, but it's certainly not the only consideration in selecting a spotlight. For this report, we obtained no fewer than 16 different spotlights and ran them through their paces.



Our test group included 16 models from six manufacturers. Top row (l to r): Brinkmann Q-Beam, Q-Beam Black Max, Q-Beam Spot-Flood; Mini Q-Beam. Second row: Pelican BriteLite, King Pelican Light, Pelican Laser Pro. Third row: Optronics Night Blaster (plug-in), LSI Nite Guard, LSI Night Tracker, ACR Super Beam Gun. Fourth row: Guest Great White, Optronics Night Blaster (rechargeable), LSI Nite Tracker SU Light, Optronics Night Blaster 101, Optronics Blue Eye 3000.

How Spotlights Work

There really isn't a great deal of complexity to a handheld spotlight, which means that each part is essential to good performance. Every one has an incandescent bulb, a reflector, and a switch encased in some sort of housing with a lens. Every one operates from a battery, whether it's the boat's house battery, a rechargeable battery inside the housing, or dry cells (or a lantern battery.) Most have handgrips, although a couple are clearly intended for clamping to a rail.

The reflector used in all the lights we tested is parabolic in shape. A parabola has the unique property of reflecting all the light striking its surface from a point source in the same direction. A perfect parabolic reflector six inches in diameter would reflect light from a single source at its focal point in a beam 6" wide. That beam would illuminate a circle six inches wide at any distance. Reflectors, though, aren't perfect. More significantly, light bulb filaments are not point sources of light, so some portion of the light is reflected outside of our

theoretical 6" circle, resulting in a spread of light that has been described as scatter, spatter or glare.

For marine use, the less scatter the better. Any light is going to be reflected by fog, but a really tight beam minimizes this effect. There's been a theory that beam spread is a good thing because it helps estimate distance. While this may be true to some extent, the beam angle of any real-world spotlight is large enough to make distance estimation possible. More glare than is unavoidable is not a good thing.

In theory, again, one would expect that a perfect light bulb/parabolic reflector combination would produce a perfectly round beam. Not so in real life, for the same reasons. A concentrated circular spot of light would be desirable in that it would put all the light energy in the smallest possible area, giving maximum brightness. It would also minimize back-reflection from fog and spray. Almost as good, in our opinion, is an elongated light spot, providing the elongation is horizontal. Such an arrangement makes it a bit easier to find the object you're searching for without too great a loss of intensity.

As with any portable light, there's a trade-off between how bright the light is and how long its batteries will last. One popular way to minimize drain is to plug the spotlight into an accessory socket—the cigarette lighter socket—and run it directly from your boat's house battery. This is a fine approach but requires a cord long enough to reach the power source. Plug-in models are very light, which can be a real plus, depending on who's holding the light and how long it has to be held. At the opposite end of the power spectrum are handheld units that use dry cells. These require no connection to the boat but are heavy and not very bright.

In the middle are those models that use a built-in storage battery that can be recharged from the boat's house battery. Some of these can also be recharged from an AC source, using an adapter. These are extremely convenient and can be extremely bright.

The lights were taken out on the Powerboat Reports *test boat and shined on a green navigational buoy from about 900 feet away. We noted strength of illumination, and how much scatter each light generated.*

Their major drawbacks are that they're relatively heavy and have a relatively short operation time before requiring recharging.

Switches are a potential weak spots on any onboard electrical device. Unless special attention is paid to making it water-resistant, a switch represents a failure waiting to happen. Cases, too, present a threat. We prefer tight-fitting cases with as few joints as possible, and with O-rings to keep water out. Fastenings and metal fittings should be stainless, of course.

How We Tested

We tested each of the 16 models for brightness, beam pattern and spread, and (subjectively) for how well they seemed to light things up. We weighed each one, noted handling ease, ease of operation, and balance. We examined fit and finish of cases and quality of fittings. We noted features, power cord length, and type.

The major claim made for most of these spotlights is candlepower. The ones we tested had claims ranging from 2,200 to 3 million. We did our brightness tests, not on the output of the spotlight, but in terms of the light reaching the target. This is measured in foot-candles and takes into account the fact that a light gets effectively dimmer the farther away it is.

The relationship between candlepower and foot-candles is a simple one: a 1-candlepower light 1 foot from the target will provide 1 foot-candle of illumination. Double the candlepower and you'll double the number of foot-candles at the target. Double the distance, and you'll cut the foot-candles by a factor of four—illumination varies with the square of the distance. We measured foot-candles with a meter that measures the illumination of light striking it. We placed each lamp exactly 30 feet from a sheer stone wall, aimed the light at a mark on the wall and measured the illumination at the mark. This testing was done in virtually total darkness. There were no street lamps or traffic, and no moon.

There's always a question of what voltage to apply when testing a plug-in. With an engine running, the alternator develops about 13.8 volts. With the engine off, this can drop as low as 11.8 volts. We think that people who depend on handheld spotlights are apt to use them under difficult conditions—conditions under which the power is on. For the plug-in models, we took power from a large battery being charged by a car's alternator.

This test also allowed us to see

Value Guide: Handheld Spotlights

Lights listed in order of preference, top to bottom.

	Model	Price	Power Source	Illumination (foot-candles)	Weight	Hanging Loop
CELL-POWERED	Pelican LaserPro 4D	$55	4xD-Cells	7	45 oz	stand, lanyard
	King Pelican Light	$55	8xD-Cells	9.4	79 oz	lanyard
	Pelican Britelite #5000	$58	4xD-cell	8	*45 oz.	lanyard
	ACR Super Beam Gun	$115	Eveready 2746N	8	61 oz.	N
	Brinkmann MiniQbeam	$20	4xD-Cell	4	**2-1 oz.	Y
PLUG-IN	Optronics Blue Eye Beam	$40	Plug	61	1-12 oz.	Y
	Optronics Night Blaster 101	$36	Plug	58	1-14 oz	N
	Optronics Night Blaster	$36	Plug	146	1-12 oz.	Y
	Brinkmann Black Max	$40	Plug	84	1-14 oz	Y
	LSI Nite Tracker SU Lite	$31	Plug	62	0-14oz	clamp
	Guest Great White #235	$78	Plug	24	2- 11 oz.	N
	Brinkmann Spot/Flood	$50	Plug	51/24	2-2 oz.	Y
	Brinkmann MiniQbeam	$29	Plug	27	***1-1 oz.	Y
RECHARGEABLE	Brinkmann Q-Beam	$40	Plug/Recharge	116	2-14 oz.	Y
	LSI Nite Tracker #3800	$66	Plug/Recharge	243	3-11 oz	Y
	LSI Nite Guard	$47	Plug/Recharge	193	3- 11 oz.	Y
	Optronics Night Blaster 101	$36	Plug/Recharge	61	3-5 oz.	Y

* zero-buoyancy weights provided for diving; **with batteries; ***without batteries.

what kind of light pattern or beam shape each produced and make judgments about handling, balance and convenience features.

Finally, we took all 16 products out for a night on the water to see how well actual experience matched our measurements of performance. We anchored 0.15 nautical miles (about 900 feet) from a navigational buoy on a dark night and tried to use each spotlight to locate the buoy.

What We Found

We found enough differences among the lights, and enough similarities among lights of a particular type, to convince us that we should discuss them by groups: drycell-powered, plug-ins, and rechargeables.

Drycell-Powered Spotlights

We had five lights that obtained power from removable and replaceable drycells. Two of these, the Pelican BriteLite #5000 and the Pelican LaserPro 4D, require four alkaline D-Cells. The other Pelican product, the King Pelican Light, uses eight D-cells. ACR's Super Beam Gun uses a less commonly available 6-volt lantern battery. All four of these products, as far as construction is concerned, are superb examples of how to build seagoing equipment. Each of the four has a heavy, one-piece molded case, a shock-resistant mounting of internal components, and a waterproof switch. (The ACR uses a magnetic switch, while the Pelican products rely on rubber seals.) To get at batteries and to replace bulbs, you remove the faceplate/lens. The three Pelican products have screw-off faceplates with O-ring seals; the ACR uses a press-on/pry-off rubber ring that holds the lens and relies on a large hose clamp to seal it against the spotlight's case. Both systems work, but we found that prying off the ACR's rubber lens housing was a real nuisance: Instructions specifically warn against prying with a screwdriver or such like, and the rubber wasn't *that* flexible. Result? Installing a battery took considerably longer than it should, and our testers had some sore fingers.

The Pelican products shared a very nice feature: They use twin-filament bulbs, with only one operating at a time. This can be a boat-saver if a filament burns out in a tight situation.

The King Pelican light features a versatile handle assembly that can be attached to the light in a variety of configurations, somewhat mitigating the weight penalty of its extra four D-cells. The other four have pistol-type grips; the Pelican LaserPro also has an adjustable stand, a handy feature if you want to use it as a work light.

The fifth self-powered light was the Brinkmann MiniQBeam—a plug-in light that offers the option of dry-cell operation. It's small, light, and by far the least expensive of the five, but it just doesn't have the ultra-rugged construction of the others. We think that it's better judged as a plug-in model.

All of the self-powered spotlights have the obvious advantage of not having to rely on power cords, an arrangement that lets you move around the boat with a maximum of freedom. They're not very bright, largely a limitation imposed by using dry cells. Four D-cells provide you with six-volt power and a limited capacity for energy storage. Even the eight D-cells used in the King Pelican light, while they provide 12 volts, are limited in the amount of electricity they can store compared to the capacity of a boat's

Rated Candle Power	Cord Length	Coil Cord	Sealed Beam	Case F&F	Waterproof Switch	Warranty	Effective Duration	Comments
60k	-	-	N	E	Y	[5]	8:15 (hr:min)	2 filaments; one used at a time
100K	-	-	N	E	Y	[5]	12:45	2 filaments; one used at a time
ns	-	-	N	E	Y	[5]	12:30	*2 filaments; one used at a time
22K	-	-	Y	E	Y	[4]	15:15	
ns	-	Y	N	G	N	[4]	12:00	
400K	10'	Y	Y	VG	Y	[2]		Blue anti-glare spot in lens center
1200K	10'	Y	Y	VG	Y	[2]		
2000K	10'	Y	N	G	N	[2]		cord detaches
400K	8'	Y	Y	G	N	[4]		
300K	6'	Y	N	VG	N	[4]		clamp on (no grip) Red filter
300K	8'	Y	Y	VG	Y	[1]		
200k/100K	14'	N	Y	VG	N	[4]		2-position switch for spot/flood
ns	10'	Y	N	G	N	[4]		cord detaches
500K	10'	N	N	G	N	[4]	0:15 (hr:min)	AC or DC Charging
2000K	10'	N	N	G	N	[2]	0:17	AC or DC Charging
1500K	11'	N	N	G	N	[3]	0:14	AC or DC Charging
1500K	10'	N	Y	G	N	[2]	0:19	AC or DC Charging

[1] Lifetime on case [2] 3 years on defects [3] 90 days on defects [4] 1 year [5] lifetime

house battery. We think that they're best suited for use on a small boat or tender that doesn't have a house battery, or as a sort of super flashlight to supplement a more powerful plug-in or rechargeable spotlight. The King Pelican Light and BriteLite as well as the ACR Super Beam Gun can double as dive lights; the BriteLite even provides auxiliary weights to give it neutral buoyancy for diving applications.

Plug-ins

Eight of the spotlights we tested were powered by the boat's house battery. They have a long power cord that plugs into a cigarette lighter socket. This can be a severe disadvantage on a large boat, or in situations where you must frequently leave the helm. For most boaters, we've observed, this isn't the case, and the required power cord becomes more of a nuisance than a problem. The fact that a boat's house battery is a more potent source of electrical power than a dry cell—both in terms of higher voltage and greater capacity—shows up in the brightness of the plug-ins compared to the drycell-powered models. The brightest of the cell-powered spotlights provided an illumination of 9.5 foot-candles, while the plug-ins gave us readings ranging from 27 to 146 foot-candles. We tested the plug-ins at 13.8 volts—what you'd get with the engine on and the charging circuit operative.

The plug-in models are very light, ranging from 14 ounces to just under 2.75 lbs. Our drycell-powered lights weighed from just over 2 lbs. to almost 5 lbs.

Brightness is important, but it's far from the only consideration. The most noticeable finding was the obvious one that some lights are brighter than others, and some have a smaller, less-scattered beam. We also found that unless differences in brightness are large, they're not particularly meaningful. Our ability to discern the target marks was just about the same for a light rated at 400,000 candlepower as it was for one with a 2,000,000-candlepower rating. Due to nonuniformities in any given light pattern, the actual brightness can vary considerably, depending on exactly where in the target you take your measurements. We found that illumination could vary by a factor of 2 to 2.5 foot-candles without making much difference.

A tight beam with little scatter is an important consideration. It reduces glare from fog and makes it easier to find a target. Tightness of the beam pattern, while a difficult parameter to quantify, was one of the factors we considered in our testing. Some designs, such as Optronics Blue Eye Beam, have tinted areas on the lens to help control the beam.

There are a number other factors not directly related to optical performance but nevertheless important. We've found that the only power cords we're willing to live with are coil cords. We've tripped over enough uncoiled cords to be thoroughly disgusted with them. Of the two basic switch designs we encountered with the plug-in spotlights—the open, non-waterproof trigger or the rear pushbutton with a waterproof rubber boot—we strongly prefer the latter.

The sealed beam design of some of the units tested is ideal. Sealed beam models have the added advantage of never going out of focus. We prefer longer cords for any device that must remain plugged in when in use.

Our favorite among the plug-in models was the Optronics Blue Eye Beam.

It wasn't the brightest—the Optronics Night Blaster won in that category—but it was adequately bright, had a commendably tight beam, a waterproof switch, and a 10-foot coil cord. It weighed in at an easy-to-handle 1.75 pounds. Our sea test confirmed this opinion. Our testers found it to be the easiest of plug-ins to use.

Oddly enough, the Optronics Blue Eye Beam is rated at 400,000 candlepower; our next choice is the similarly designed Optronics Night Blaster 101. This Night Blaster is rated at 1,200,000 candlepower, but provided slightly lower foot-candle readings at our test target and proved less effective in our on-the-water test.

If you feel that you need a floodlight in addition to a spotlight, the Brinkmann 800/1302-0 has a two-way switch (not waterproof) to select between flood and spot. And if you're looking for a spotlight to clamp to a rail rather than a handheld, there's the Night Tracker Sport UtilityLight. (No, it doesn't have four-wheel drive.) In fact, that's about the only way you can use it, since it doesn't have a handle.

Rechargeable Spotlights

Rechargeable spotlights, in most respects, represent the best of all spotlight worlds. They can be charged either from 110-volt AC ashore, or through an inverter; they're among the brightest spotlights made; they don't require battery changes as do the drycell-powered models, and they can be unplugged and used without the restriction of a power cord.

On the downside, they're heavier than the plug-ins—typically 3-4 lbs. And the ones we tested, at least, lack some durability features, such as the tight-fitting cases and waterproof switches that appear on the better plug-in models.

None was equipped with a cord coil, possibly because manufacturers feel that they're not going to be used except in the cordles mode. That's a shame, because the ones we tested will operate when plugged in, without concern for the state of charge. None can be operated directly from AC power, though that's not much of a limitation, in our view.

We found the performance of this entire group to be very good, with the standard Brinkmann Q-Beam 800-1700-2 leading the way, largely due to a very tight beam pattern. Both in our lab and sea tests, this was our testers' top pick. Once again, we found that rated candlepower is a snare and a delusion. The Brinkmann, rated at 500,000 candlepower, performed just as well, if not better, than the Night Tracker #3800 (2,000,000 candlepower) the Nite Guard (1,500,000 candlepower), and the Optronics Night Blaster (1,500,000 candlepower).

Conclusions

Our conclusions are presented in tabular form on pages 34-35. We divided the spotlights into three groups: drycell-powered, plug-in, and rechargeable. (One model, the Brinkmann Mini Q-Beam, is listed twice, since it can function as a cell-powered light as well as a plug-in.) Within groups, the lights are listed in decreasing order of preference from top to bottom, based on our test results and our judgments of quality and performance.

A rechargeable spotlight is the best choice, we think, even while recognizing that none of the four we tested can be considered as seaworthy as some of the plug-ins or cell-powered models. If you have a boat where you'll never have to use a spotlight from more than a few feet away from the helm, one of the better plug-ins should suit the bill fine, even if you're not compulsive about protecting oyur equipment.

While we like several of the standard cell-powered models as flashlights/lanterns, we don't think that any of the ones we tested provide an adequate replacement for a good handheld spotlight. ■

***ACR Electronics**, 5757 Ravenswood Rd., Fort Lauderdale, FL 33312; 954/981-3333. **Brinkmann Corp.**, 4215 McEwen Rd., Dallas, TX 75244; 800/527-0717. **Guest Co., Inc.**, 95 Research Pkwy., Meriden, CT 06450 203/235-4421. **Lectro Science, Inc.**, 919 Sherwood Drive. Lake Bluff, IL 60044 800/453-2101 **Optronics, Inc.**, 350 North Wheeler St., Fort Gibson, OK 74434; 918/683-9514. **Pelican Products**, 23215 Early Ave., Torrance, CA 90505; 310/326-4700.*

***Left:** Optronics' Blue Eye 3000, a good, light plug-in option. **Right:** LSI's big Nite Guard 1.5 million candlepower rechargeable next to the Brinkmann Q-Beam, which is a bit smaller , lighter, and cheaper—and performed about as well in both of our tests.*

*For Web addresses click "Links" at www.**practical-sailor.com.***

Walker Bay Dinghies, 8 and 10

These Volksdinghies are the favorite of the marine store chains, at least partially because they nest tightly together and are easy to deliver and stock. What's tops in the chains ends up being 'popular' by default. But is there more to these ubiquitous little boats than sales and marketing momentum? As a matter of fact, there is.

It took a moment to decide whether to make this article a boat review or a Chandlery piece—but only a moment. Walker Bay dinghies are unabashedly placed, by both manufacturer and ship's store, as items to be picked up along with paint and sandpaper. They lean against the outside walls of the store. They rest in the aisles, filled with season specials like PFDs and bottom paint. They're front and center. You can just nab one at the counter on the way out.

The prices aren't shocking; in fact for such big physical items, and such necessary ones, they're cheap. If you're used to going into West Marine or BoatU.S. and dropping a few hundred dollars on a piece of navigation gear or some good-sized ground tackle, you could just as easily leave with a Walker Bay boat on your car. And many, many people do.

Walker Bay was kind enough to loan *Practical Sailor* the sailing versions of both an 8-footer and a 10-footer for a couple of weeks this summer. We rowed, towed, and sailed both boats. We trailered them and cartopped them. We pulled them on their stern wheels over hill and dale. (Actually we left Dale outof it.)

The essential fact about these boats is that they're very, very plastic. This is both their weak point, in that they have none of the warmth of wood, and their strong point, in that they're effective, no-maintenance, and virtually indestructible.

We learned quickly to suppress our Bristol Fashion Sense, assuming that those with lovely wooden boats—character boats—will generally prefer to be seen in the company of character dinghies like peapods or Whitehalls or even Dyers. Then we went on with our evaluations.

The Walker Bay 8 is nicely balanced with one adult rowing. The seat is comfortable, the oarlocks are in the right place, and feet can be braced comfortably against the after thwart. Good oars make a big difference.

Background

Founded in South Africa in 1997, Walker Bay is now based in Union Gap, Washington, with offices in Vancouver and Paris. The stated aim of the company is to bring its boats to the masses, worldwide. It's off to a good start, with sales recorded now in 50 countries.

The Walker Bay 8 was first out of the molds in 1998; the 10-footer was introduced this spring. Both dinghies were designed by Paolo Rista, described by the company as a "watersports professional and artist."

There's a lot involved in the design of dinghy hull forms, just as with any boat. There are issues of entry, rocker, freeboard, deadrise, transom width, weight and balance—and there are always scads of small-boat builders eager to debate the details. The debates will always go on because, in a dinghy, when you move something, everything changes.

Mr. Rista deserves credit not only for using a good, versatile form, but, presumably, for specifying the ersatz lapstrake construction that gives the injection-molded hulls some rigidity fore and aft. By this we mean that if you removed the thwarts you could possibly fold the boats from gunwale to gunwale, but not from bow to transom. After the thwarts are secured, the Walker Bay boats are well-supported in all directions, except, perhaps, in the 10-footer between the middle thwart and the bow. More on that later.

On both boats there's a full-length molded skeg (or keel, if you prefer) from transom to bow. This too, adds stiffness and helps the boats track straight when rowed or towed. It also houses the handy rolling wheel aft.

Solid vs. Inflatable

In a water world increasingly populated by inflatable tenders, there are still plenty of good arguments for solid

dinghies, as long as they're relatively light and manageable, which these are. Solid dinghies don't have to be blown up or deflated. They can be stowed upside-down on the decks of larger boats and lowered or tossed overboard easily. They usually tow better than inflatables, and they always row better, especially in a headwind. Size for size, they have more carrying capacity, although again, any advantage depends on the distribution of weight and the efficiency of the form when loaded.

Most importantly, some hard dinghies, like these, can be sailed, and there's nothing more fun than poking around a far-flung harbor at sunset in a sailing dinghy.

Walker Bay would of course like to see their sailing rigs used in more and more junior and community programs. A new JY Trainer costs about $1,850. A new Optimist costs around $2,325. The Walker Bay 8, with performance sailing rig, costs $920. One-design fleets? They could happen.

Construction

Both the 8 and the 10 are made of polypropylene resin, which is injected into a steel mold and pressed at 5,000 tons. With a slick mold and such high pressure, the boats emerge smooth and detailed, including molded spaces on the underside of one set of strakes to retain stainless hex nuts for the thwarts. The basic hull is born in about five minutes. Take that, Noah.

At the chandlery or at home, the solid, foam-filled thwarts are then set in place and bolted through the strakes. That's about it for construction.

Performance

It would have been most efficient to test all performance aspects of both boats at the same time. Of course, that's not how we were able to do it. Instead, over the course of two weeks we had to move them around quite a bit, on and off trailers and cartops, across yards, and up and down dock ramps. This process, while not at all convenient, allowed us to get to know the boats well. We found them easy to wrestle (usually by one person, the editorial "we") and very tough when being dragged, dropped, and tossed about. Just as importantly, they were meek neighbors when alongside other boats. They don't scrape and bang, and they don't leave traces of themselves on people's topsides. They're not much of a worry in any respect.

We sailed the 8-footer in a light harbor breeze of about 6 knots and found it surprisingly nimble and fun. It tacked and jibed easily and quickly, without being tender, and it was fairly comfortable to sit on either the center thwart or in the boat bottom.

Above: *The 10-footer under tow at about 6 knots. The painter has been passed up from the towing ring through the molded hole in the stem to help keep the bow down. Below: the 8-footer under tow at about 10 knots. Both boats tracked very well at all speeds and through turns.*

Above left: *The 10-footer sits a bit low in the stern when steered by one adult in a normal position. The middle thwart is situated better for rowing than for sailing.* ***Above right:*** *With a bit more breeze and a lean forward on the thwart, the boat moves out better.*

Left: *The little 8-footer turned out to be quite fun to sail—lively without being too tender, quick to maneuver, and even fairly comfortable to sit in. At 71 lbs. it can be whisked off a deck, tossed in the water, rigged, and launched on a twilight harbor cruise in a matter of minutes.*

A few days later we sailed the 10-footer in a stronger offshore breeze of about 12 knots with puffs up to 14. The breeze later faded to about 6 knots.

In the heavier air the 10 was not ideally balanced with one person in what would be considered a reasonable steering position; the boat sailed slightly down by the stern, and dragged water. This would probably have been helped by the addition of a five-year old child or a loaded cooler forward. Unfortunately we had neither of those things handy, and it wasn't possible to balance the boat correctly without leaning well forward on the middle thwart. Sitting on the thwart while sailing doesn't work, because the sheet is led down from the boom through a block in a clamshell-like device that clamps to the aft edge of the seat.

Moving through light chop in the heavier air, the boat's bottom oilcanned some forward of the middle thwart. This is one area where too much may be expected of thin polypropylene stretched over an unsupported area. It's not really a structural problem because the stuff is so resilient—you could probably leap into the boat with hobnail boots without hurting it, but oilcanning is not good for speed.

Despite the stern-down attitude and consequent sluggish steering, the 10 went well—4.8 knots on a reach.

The sailing characteristics we experienced in the 10-footer slightly undercut some very thoughtful design and manufacture work on the part of Walker Bay: The sail kit and fittings are first-rate: a well-cut sail of 3-oz. Dacron with a big window, a tensionable shaping batten near the head of the sail, nicely shaped daggerboard and rudder, and an excellent rudder-mounting system. The clam clamp for the sheet block is also smart, but we'd prefer to have the sheet simply come down from the boom the way it does on the 8-footer. It's perfectly possible to have it that way—just unmount that clamp.

Both boats rowed very well. Walker Bay sent along an outstanding pair of 7-1/2' wooden oars with rubber collars that set neatly in round plastic oarlocks. The oarlocks are placed fore and aft in the gunwale sockets, and as they're turned outboard they lock in. This is good, except that you have to remember to unship your oars early when coming alongside someone.

We rowed the boats with differently sized people and batches of gear in various places, and found that we could put our backs into it without fear of breaking or deforming any of the plastic parts. Most gratifyingly, the boats were balanced well enough that increased labor yielded increased speed. Nothing is more frustrating than finishing a stroke in a badly balanced dink and finding that all you've done is turn the bow into a plow. These are not pulling boats by any stretch of the imagination, but they do well enough.

Finally, we towed both boats at varying speeds behind a motorboat on long and short tethers, making arbitrary turns. Here again, both the 8 and the 10 were well-behaved, tracking straight on their skegs and planing high on the water without skittering or swerving. We weren't able to tow them in rough water, and can't speak for what they might be like in a seaway. (Some hard dinghies will follow a mother ship obediently through hell and high water, and some quickly become swamped drogues.) If we had to guess, we'd say they'd do well.

Once the boats were planing, we hand-tested the tethers for tension. In flat water behind the towboat, the 8-footer tugged back at about 15 lbs. The 10-footer pulled at roughly 20.

Walker Bay 8

Length: 8'3"
Beam: 52"
Total height: 21"
Weight: 71 lbs.
Sail Area (Marconi): 39 sq. ft.
Capacity: 2 people
Max hp: 2
Basic boat: $499 (includes oars)
W. Sailing rig (Marconi): $920

Walker Bay 10

Length: 9'8"
Beam: 57"
Total height: 24"
Weight: 115 lbs.
Sail Area (Marconi): 46 sq. ft.
Capacity: 3 people
Max hp: 3
Basic boat: $699 (includes oars)
W. Sailing Rig (Marconi): $1,290

Rowing is the first step. It should be learned in a boat like this.

Conclusions

These Walker Bay boats are already a juggernaut, thanks to a firm initial concept, good design, excellent plastic engineering and manufacturing, and the goodwill of retailers. Far be it from *Practical Sailor* to stand in the way: We like these boats just fine. They do the several things they're supposed to do very well, and more besides, all at a price that has to be one of the best values in sailing.

The 10-footer clearly has greater cargo-carrying capacity, and will be able to stay out in rougher water longer. It's a good choice for those who need to do more serious transport than harbor touring.

Our favorite, though, is the 8, not because we enjoyed sailing it more than the 10, but because it's so easy to manage: You can sling it on your back like a turtle shell and walk far with it. You can whip it up on the roof-rack. You can throw it around, leave it alone—it doesn't mind a thing. ■

***Walker Bay Boats**, 607 West Ahtanum Rd., Union Gap, WA 98903. 888/449-2553*

Re-Bunging That Teak Deck

What do you suggest as an adhesive/sealant for replacing plugs in teak decks? I have been using epoxy, but I suspect it may eventually become brittle. I am reluctant to use black caulk since it is probably difficult to remove from the wood around the holes for the plugs.

Jim Yeager
Marsh Harbour, B.I.

Practical Sailor *published in the Nov. 1, 1993 Nick Nicholson's long and thorough discussion about teak decks. As Nick pointed out, nothing is quite as beautiful as a new teak deck. The problem is that once exposed to the elements, a teak deck will never, ever look as good again. No matter what you do or slap on the teak, it's all downhill from Day One.*

On the other hand, nothing is quite as good underfoot as a teak deck. It's arguably the best non-skid surface, wet or dry, ever laid on a boat.

An entire industry popped up to repair teak decks when they got old. The repairs were necessitated mostly by bungs that started to leak or seam compound that pulled away from the wood. The aging was accelerated by owners or crews who went at the decks with acid-based cleaners. About 10 years ago, Nautor, the builder of Swans, went to vacuum-bagged teak decks. As Nick explained, most deck teaks now are glued in place with as few fasteners as possible.

You're right, Jim, in assuming that regular epoxy is not a good idea. Its consistency can be troublesome. When it kicks, it gets quite thin. Sunlight gets to it, sooner or later, and it will crack like peeling varnish. It may take years, depending on the thickness of the epoxy and the amount of direct sunlight it gets, but it'll happen. (We know one teak deck owner who, faced with recaulking and bunging the deck of his ketch, mixed powered carbon in with the epoxy, not only to make it black but to counter the sunlight. He said it's been about nine or ten years and the stuff is still tight as a drum.)

Perhaps the best-known experts

are the folks at Teakdecking Systems in Sarasota, Florida. Technician Bob Nedswick said the company offers a special epoxy that doesn't get as brittle. He said they've seen it last 15 to 18 years. The two-part, one-gallon kit costs $75, but you can mix the 1:1 components with any convenient container. Nedswick said you can buy smaller quantities (in pint and half-pint kits).

For those undertaking more extensive teak deck repairs, Teakdecking Systems also makes an interesting fitting and fairing compound made of epoxy mixed with microballoons. It's intended to level out any unevenness of the deck on which the teak is to be attached.

Jim, you can if you like call 941/756-0600 and talk it over with Bob Nedswick.

Converting to a Dual AC Voltage System

Was it really necessary for Nick Nicholson to install another inlet in order to convert *Calypso*'s AC shore power systm into dual voltage system? Wasn't it possible to use his existing inlet with just a change over switch?

What kind of set-up do you suggest for a dual-voltage system if you are to install it in a new boat? (Our AC appliances are 110 volt, with inverter/charger. A gen-set may be installed in future.)

Kazumaza Tada
Via e-mail

Nick Nicholson replies:

Although we briefly considered it, using a single, switched inlet for both 110 and 220 volts is a recipe for disaster. If you accidentally leave the switch in the 110-volt mode when plugged into 220 volts, you are likely to fry a lot of equipment and have a good chance of burning up your boat. Electrical systems must be designed to be idiot-proof, as sooner or later we all do something really stupid.

Not only should you have two shore power inlets, they should have different plug types, so there's no way you can accidentally plug the wrong voltage into an inlet. In the U.S., you can at least get shore power inlets that match in style for both input voltages, which we were unable to do when we installed our 220-volt system in Australia.

There is an additional caveat. While a step-down isolation transformer is essential for changing voltage, the frequency of the stepped-down voltage is the same as the frequency of the shore power you plug into. Most U.S.-built appliance motors are wound for 60 cycles, and will overheat and run more slowly on 50 cycles.

If we were building a new boat, we would look hard for motors rated for both 50 and 60 cycles on major appliances or systems such as microwaves, AC refrigeration, and air conditioning.

Resistance loads, such as electric water heaters, run fine on 50 or 60 cycle power. Ironically, electronics rated for multiple voltages—televisions and computers, for example—are also usually rated for multiple frequencies, and have no problem with 50-cycle or 60-cycle power.

We do not run our microwave oven or AC refrigeration directly from 50-cycle shore power, even when it's stepped down to 110 volts. Instead, we use our Heart Freedom 20 battery charger—which will run on either 50 or 60 cycles—to charge the batteries, then use the inverter to run frequency-sensitive appliances. This obviously requires a bit of power management.

We would also suggest installing a switch between the shore power inlet and the transformer, so that you can shut the transformer off when it's not in use without unplugging or turning off the power ashore.

Transformers run quite hot, even when you're not using power on the boat.

You should also carry a "blank" shore power cable, with only the boat end of the cable pre-wired, so you can install the myriad of adapters you will need for world-wide operation. We now have about a dozen adapters for various shore-side plug-ins: You just go into a hardware store or electrical supply store wherever you are and buy the local plug off the shelf.

We carry a 100-ft heavy-duty U.S.-made conventional orange exterior-use extension cord—with suitable end fittings installed—for use with 220-volt shore power overseas. In other countries, you may not be within the 50-ft distance of an outlet that you usually are in a U.S. marina, so you will either need a longer cable or multiple cables joined together.

Since for a given load the cable is carrying half the amperage at 220 volts it would at 110 volts, the cable need not be as heavy for a given length as it would be for the same wattage at 110 volts.

The ultimate shore power system is the "black box" used by big motor-yachts and sailing yachts. These devices will accept virtually any input voltage or frequency, and convert it into whatever voltage and frequency you need for the ship's systems.

The problem is size, weight, and cost. The smallest we have seen advertised, from Global Power Systems, is the size of a suitcase, weighs 180 pounds, and is rated for 12 KVA (12 kilowatts). By comparison, our transformer has a three-hour rating of 3 KVA and weighs about 70 pounds.

The Florida distributor for Global Power Systems is Yacht Equipment and Parts, 3330 SW 3rd Avenue, Ft. Lauderdale, FL 33315, phone 800/349-9224.

We're currently designing the electrical system for our next boat, and it's a real challenge to come up with the most efficient and cost-effective system for both on-board and shore power operation.

You might say that ideally you would never need to go alongside and plug into the shore, but that is a naïve assumption. In some areas of the world—Singapore, for example—you have few choices other than to go into a marina.

Once there, your neighbors will appreciate it if you don't have to run either your main engine or a generator on a regular basis.

DC-Powered Vacuums

Have you ever reviewed 12-volt vacuums? If not I would really like suggest one. I see a couple of models at BoatUS, but I was wondering how these may compare to auto vacs. Maybe a Dirt Devil would be better with an inverter. (I've been looking for an excuse to buy an inverter.)

Mark Clayton
Sudbury, MA.

A standard car vacuum with 12V cigarette lighter adapter works fine for light duty—bread crumbs and sawdust. Another option is to get the inverter (a $40 modified sine-wave model from an auto-parts store will do fine if your needs aren't sophisticated) and plug the AC adapter for a rechargeable DC hand vacuum (like a Black & Decker Dustbuster) into it. The third option, as you note, is to run a standard AC-powered hand vac (likely to be the most powerful) through the inverter, or through shore power if available.

West Marine sells a canister-type 12V Wet/Dry vacuum by C.E. Smith. It draws 14 amps, carries a 40" hose, a 15' power cord with a cigarette lighter adapter, and has various attachments. At $32.50 it's priced very well, and the ability to wet-vacuum a bilge space is appealing. It's rotund, however, and would be bulky to stow on a small boat with all its attachments.

Here's what to do: 1. Get the inverter anyway; you'll find plenty of uses for it. 2. Get a decent 12V auto vac with a lighter plug. 3. Keep the bilge clean so you won't regret not getting the wet/dry vac.

Navy Blue Topsides

I have a 1984 30' Catalina. I have admired some of the other boats in the marina with navy blue hulls. Is there any disadvantage in having a dark-colored hull? Assume that at the next haul-out, we paint the bottom with a good rust-colored copper paint. I would like to then put a red bar at and above the waterline and then paint the balance of the hull navy blue. My boat partner isn't opposed to the color scheme, but feels there is some practical advantage to a white hull above the waterline. The boat is kept at the marina in Santa Barbara, CA—so the weather is mild to warm all year and there is plenty of sunshine.

Zel Canter
Solvang, CA

Common wisdom has it that there are three disadvantages to dark topside paint: 1. It absorbs more sunlight, making the interior of the boat warmer. 2. Because it gets hotter, it deteriorates sooner that white or light-colored topside paints. 3. It shows salt, stains, and dings more than white paint.

Now that we have common wisdom out of the way... A copper-colored bottom, bright red bootstripe, and navy hull would look excellent. High-quality topside paint these days is tough as nails. It can be washed down when it gets salty, and the shinier it is, the more light it will reflect. For that matter, a blue hull looks pretty good when salt-coated, too. Go for it.

...ON THE HORIZON

In-Boom Furling. Schaefer has a new system. We'll compare it to several others we've looked at in the past.

Daytime Visual Signals. Smoke, aerial flares, and other attention-getters for broad-daylight emergencies.

Website Shopping. *Practical Sailor* hits the big online boating retailers with the same shopping list to see who has the goods, who can deliver, who can help, and at what cost.

Cavitation

On my dock, we've been arguing half the summer about propeller cavitation. A big group says the bubbles are air sucked in when the prop runs out of water. Another friend and I claim the bubbles are vacuums. There are some wagers here. We've agreed that what *Practical Sailor* says will settle it. Do you know who's right?

Erving Strauss
Portland, Maine

Well, we didn't, but we do now, after reading Nigel Warren's Metal Corrosion in Boats*, and checking with Britannica. You're on the mark, Erving: Cavitation comes from partial vacuums being formed by the prop. The water literally boils, but without heat. When the vacuum bubbles collapse, they can implode on the prop blades and actually nick out bits of metal as well as cause damage to bearings and the like. This isn't usually a problem for us blowboaters, but it can ruin a submariner's day.*

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