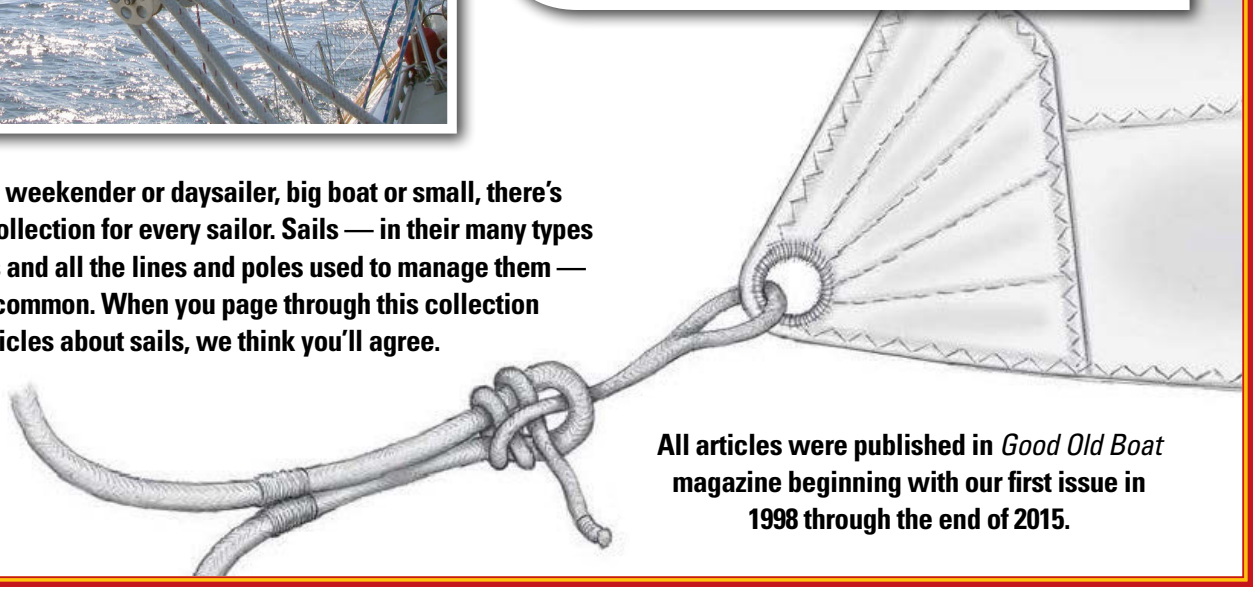
GOOD OLD BOAT™

Archive eXtractions

SAILS

Racer or cruiser, weekender or daysailer, big boat or small, there's something in this collection for every sailor. Sails — in their many types and configurations and all the lines and poles used to manage them — have much in common. When you page through this collection of articles about sails, we think you'll agree.



All articles were published in *Good Old Boat* magazine beginning with our first issue in 1998 through the end of 2015.

Good Old Boat™

Sails

Poets have addressed the beauty of sails eloquently over the years. This collection of articles instead addresses the technical side of our sailboats' primary source of propulsion.

You can't have a sailing magazine without discussing sails and their management. Our authors offer advice on buying and making sails, roller furling versus hanked-on sails, riding sails, staysails, club-footed jibs, Code Zero sails, light-weight mainsails, dihedral twin headsails, rollaway square sails, junk rigs, and spinnakers. We go on with winch and block maintenance, selecting and taking care of boat cordage, and repairing sails in paradise. We did not forget articles about sail trim, downhauls, whisker poles, reefing lines, and mainsail tamers such as lazy-jacks, the Dutchman system, and building your own StackPack-type system.

There's something here for every sailor. We hope you'll enjoy reading the accumulated experience of many sailors sharing their wisdom about their sails. All that and they haven't even begun to touch on the beauty of sail. We'll save that for another collection of articles by sailors for sailors.

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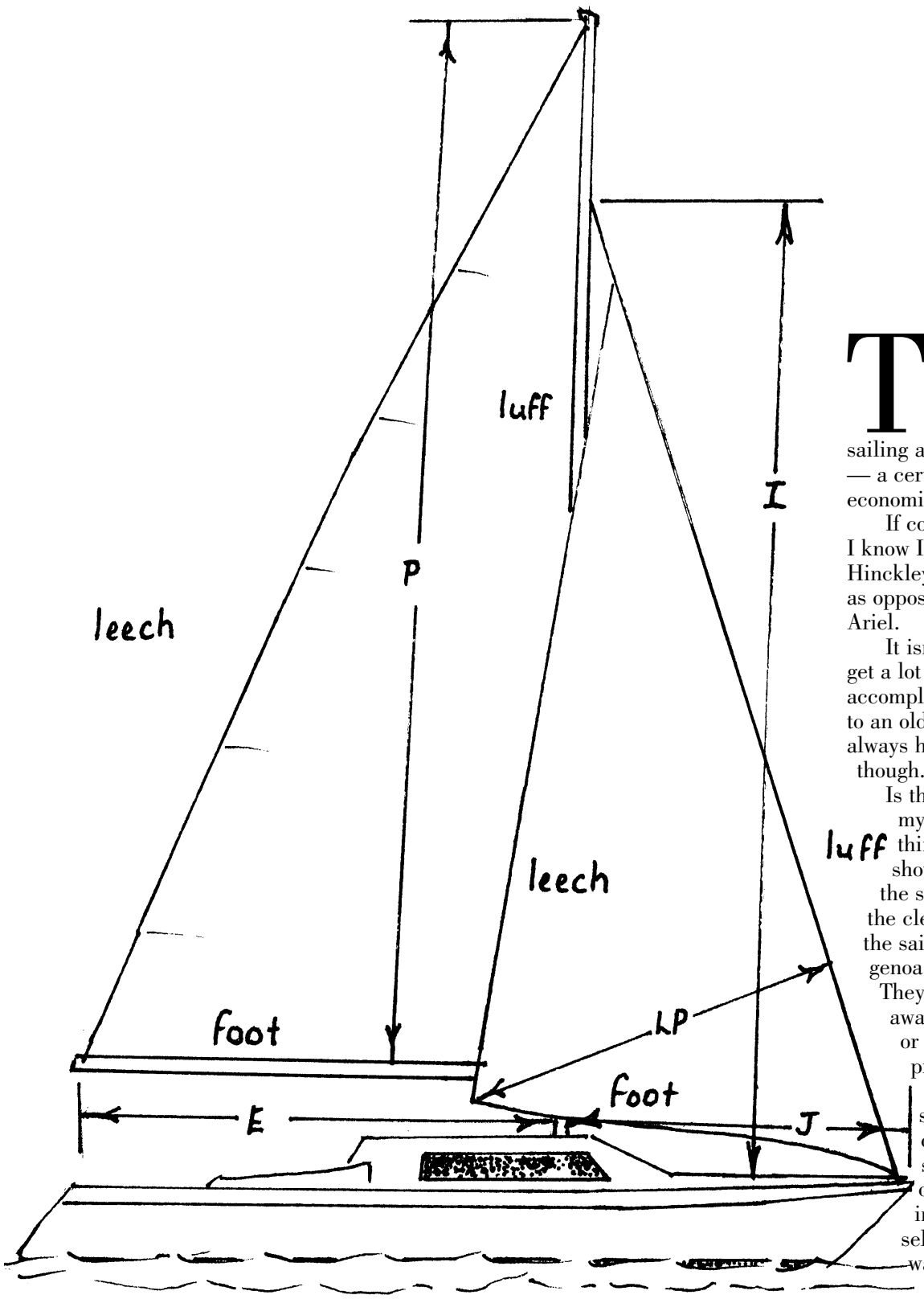
New wings at half



Those of us who love good old boats do so out of aesthetic preferences, sailing abilities, and — let's face it — a certain consideration of economic factors.

If cost were not a consideration, I know I would be sailing a Hinckley, Alden, or whoknowswhat? as opposed to my little 1961 Pearson Ariel.

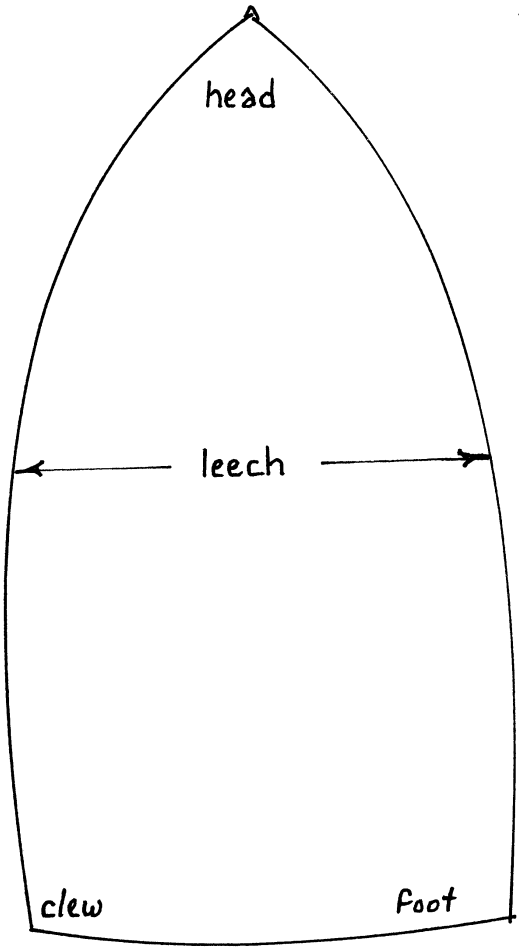
It isn't all economics, since I do get a lot of satisfaction from my own accomplishments in giving new life to an older boat. At times I do tire of always having to fix something, though.

Is there something wrong with my attitude? I really don't think so. We all go to the boat shows and oooh and aaah over the shiny new models, admire the clean new diesels, and talk to the sailmaker about that new genoa we want for Christmas. They quote a price, and we walk away. It isn't that we don't want or need the new sail, but the price is, well, "out there."

There is another way. A series of reputable companies specialize in selling new and used sails obtained from lofts and individuals who trade in or sell the sails they no longer want or need.

price

Buying, selling, new and used: Sailbrokers can stretch your sailing dollars



by Bill Sandifer

Sometimes available sails are the result of an overstock of new sails ordered by a charter company that failed to pick them up. Sometimes they come from a person like me who buys a boat with many sails when only two or three are actually needed.

Many new boat buyers are sold a "compete set" of sails including three genoas, a spinnaker, storm jib, trysail, and riding sail in anticipation of a long cruise to the islands that never comes to pass.

The boat is sold to someone else who just wants to sail on the sound, and the excess sails are sent to a sail broker who buys them on consignment or purchases them outright.

There are thousands of perfectly good sails available through these sail brokers at a fraction of the cost of the new ones. These sails are rated according to condition, useful life, and appearance. A sail with a surface rust stain can be listed as "like new" but will cost half as much as the same sail without the stain.

Sail brokers vary

I have bought and sold sails through a broker over the years, and they have been good experiences. I'm sure the representative firms listed in the appendix of this article would reflect similar experiences. Some used sail brokers sell on consignment, giving the owner a 65 to 70 percent return on the sale. They hold a sail for a set number of months and progressively reduce its price until sold or redeemed by the owner at the end of the specified time.

Some sail brokers purchase outright and resell the sails. This affords the owner instant cash flow, as opposed to waiting on a consignment sale. One might expect to receive less money for the outright purchase, but it depends on the sail, market conditions, and so forth.

Other used sail brokers will purchase or sell on consignment, or arrange for a tax deductible donation of the sail. There are sail brokers who deal mostly in new sails made overseas at a lower price than those in U.S. lofts. The sails usually come with a two-year and a limited (10- or 30-day) 100 percent satisfaction guarantee.

There can be compromises

It all depends on what you want or expect from the sails. Remember, a sail purchased from a broker was not custom-built for you and your boat. There may be compromises in the sail that you need to consider. The weight of the cloth may not be exactly what you were thinking of, or the exact luff length, foot length, batten length, etc.

The exact configuration of the sail is a compromise which you have to evaluate, based on the asking price. Quality and fit are direct functions of price.

Ordering a sail is easy, but does involve some work on your part. Although your boat may be a Pearson 26, for example, there were many Pearson 26s built over the life of the design, and the spars may not be identical, or earlier owners may have made changes. It is always best to measure your own rig and use those dimensions to decide on the sail you wish to buy.

Measuring the sail

In the drawing on Page 44:

I is measured from the top of the jib halyard sheave to the deck (actually the sheer line).

J is measured from the center of the stay at the stem to the front of the mast horizontal to the waterline.

P is a measurement from the main halyard sheave box to the main tack fitting.

E is measured from the main tack fitting to the "black band" on the end of the boom.

Headsail luff is easily measured by attaching a tape measure to your halyard, raising the halyard to full hoist and measuring to the bearing point of your tack shackle horn. In the case of a furling system, measurement is from the sail attachment points when the system is fully raised. Main leech may need to be measured in special circumstances (bimini clearance, etc.)

LP = luff perpendicular. This determines the percentage (i.e., 150 percent genoa) your headsail overlaps the mast. The formula: J x % = LP.

In order to fit well, a sail must be able to be tensioned on the luff and foot and not be "too big" to allow for adjustment and stretching of the sail over time.

If a sail requires re-cutting to fit your needs, you may lose the price advantage, and your local loft may not want to work on a used sail purchased elsewhere.

Changes in hardware from hanks to luff tape or sail slider to bolt rope or slugs will increase the price of the sail to you.

There are literally thousands, if not tens of thousands, of sails out there in the discount new/used marketplace. Your local sailmaker may have used "trade-in" sails also. Check out his inventory. If you need to alter a sail you propose to purchase, look around some more. There may be another sail at a different broker that is just what you want without having to make the changes.

Working with sail brokers

When looking for a new/used sail, use proper terminology and know your sizes. Usually, you can ask for a list of sails by type and size, and the broker will send you a list of all sails he has in that range. As an example, assume the mainsail luff is 20.8, the leech is 22.8, the foot is 9.7, and the weight is 5 ounces.

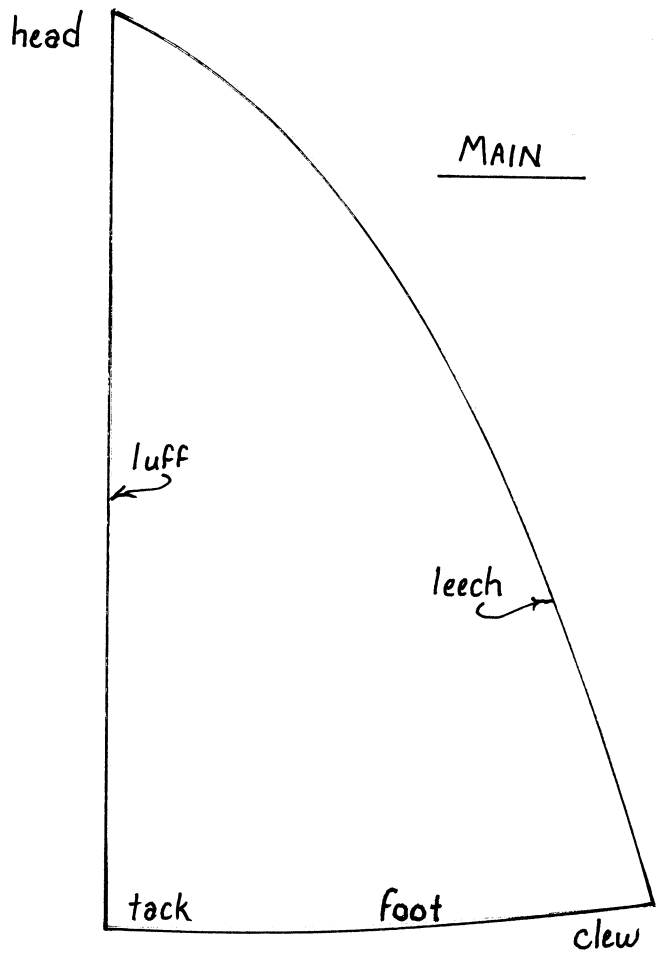
The broker will send you a list of mainsails with a luff of perhaps 20 to 24 feet, leech of 21 to 26 and a foot of 9 to 10 feet. The weight of the sailcloth usually corresponds to the size of the sail, so that does not need to be specified unless you are looking for a storm sail or other specialized sail.

The same holds true for the genoa, spinnaker, drifter, blooper, etc. Don't be in a hurry. The sail broker's inventory is changing all the time, and brokers will usually send you two or three updated lists on one request. If you don't see what you want, go to another broker or request the list in a month's time.

When you decide to buy a sail from a broker, be sure you understand the descriptions. "New," "like new," and "excellent" are self-explanatory. "Very good" usually means 65 to 75 percent of life is left in the sail. "Good" has 50 to 60 percent of its useful life left. "Fair" means wear and stains with some life left. "Usable" is — well, it isn't ripped, but it is probably bagged out, in need of repairs, and available at a bargain basement price. Some brokers use definitions that are slightly different but similar to the above.

Check that the hardware will fit your spar and that the dimensions are correct. Brokers usually allow the purchaser to hoist the sail to assure proper fit, but they don't allow you to take it for a sail. Some brokers allow 10 days for evaluation, while others allow 30 days. Some brokers pay the freight to have an unsatisfactory sail returned, while others will expect the purchaser to pay the return freight. Be sure you understand and are happy with the "conditions of sale" before you buy.

For many of the firms advertising as sail brokers, sails are only a part of their business. They may also handle furling systems, used winches, winch handles, and rigging needs. If you have other sail-related



needs — from a boom vang to a rope clutch — ask the broker. Winches, in particular, can be a good buy from a broker as you may be able to obtain a self-tailing pair in very good condition two sizes larger for the new price of a smaller non-self-tailing set.

As a common practice, major credit cards and checks are perfectly acceptable methods of payment.

Other alternatives

Finally, if you have all the sails you need but they are just a little tired, there is an economical way to breathe new life into them. SailCare, Incorporated at 410 9th Street, Ford City, Penn., will take your old sails, inspect and measure them, determine if any repairs are needed, and check the cloth for sun damage and deterioration.

Your sails are cleaned and impregnated with new resin. SailCare saturates the cloth with the resins and sets the resins with controlled heat. A fungicidal agent is added to inhibit mold growth. A water repellent as well as a UV protector is also added.

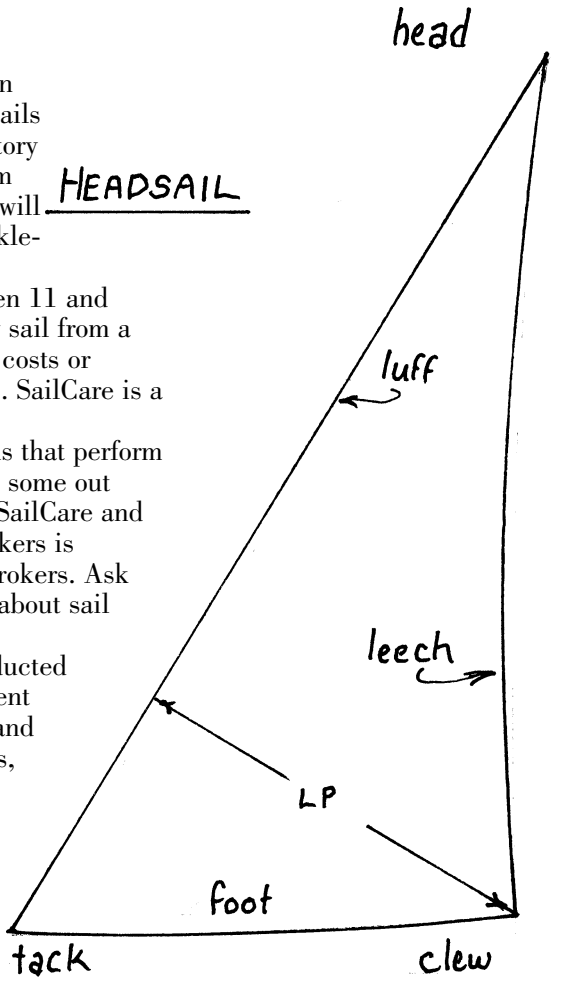
Remember that this process will not restore a bagged-out sail to its original shape. It will just clean and resin the existing shape. Sails must be setting with a satisfactory shape to be worth sending them off for this treatment. The sail will be returned clean, nearly wrinkle-free, and much stiffer.

The cost of treatment is between 11 and 12 percent of the cost of a new sail from a U.S. loft (excluding any repair costs or modifications made to the sail). SailCare is a full-service loft.

I am unaware of other firms that perform similar work, but there may be some out there. Contact information for SailCare and a representative list of sail brokers is listed below. There are more brokers. Ask your local loft or yacht broker about sail brokers in your area.

Most transactions are conducted over the telephone with shipment via UPS. I live in Mississippi and brokered my sails in Annapolis, Md. The sails were sent to whoknowswhere.

If you must have new sails with the latest technological advantages, or if you race, visit your local loft. But if you need a deal on new wings for your good old boat, contact a sail broker.



Resources

The Sail Warehouse
Phone: 408-686-5346
Fax: 408-646-5958

Masthead Enterprises
2202 1st Avenue South
St. Petersburg, Florida 33712
Phone: 800-783-6953
Phone: 813-327-4275
Fax: 813-327-5361
Email: Mastheadus@aol.com

Second Wind Used Sails
100 SW 15th Street
Fort Lauderdale, Florida 33315
Phone: 800-273-8398

Atlantic Sail Traders
2062 Harvard Street
Sarasota, Florida 34237
800-WIND-800
Phone: 941-351-6023
Fax: 941-957-1391
Email: Traders@usedsails.com
Web: www.usedsails.com

Bacon & Associates, Inc.
116 Legion Avenue
P. O. Box 3150-CS
Annapolis, Maryland 21403
Phone: 410-263-4880

National Sail Supply
Fort Myers, Florida
Phone: 800-611-3823
Fax: 941-693-5504
Email: NewSails@aol.com

Sail Exchange
407 Fullerton Avenue
Newport Beach, California 92663
Phone: 800-628-8152

SailCare, Incorporated
410 9th Street
Ford City, Pennsylvania 16226
Phone: 800-433-7245
Fax: 412-763-2229
Web: www.sailcare.com

Sailsource
Phone: 800-268-9510
Fax: 914-268-9758
Email: Sailbroker@aol.com

Somerset Sails
Phone: 800-323-9464

A homebuilt sloop gets a homemade sail

by Susan Peterson Gateley

My elderly 23-foot *Ariel* was running wing-and-wing when a following sea gave us a rude shove on the quarter. *Ariel* rolled sharply to starboard, her main slatted, and I noticed we had suddenly acquired a large window in our sail. As I peered through the space where a seam had once joined the two bottom panels, I knew it was time for another main.

Because my little homebuilt sloop dated from the 1930s, an era of stubby masts and long booms, locating a used main from a broker was not an option. I had to spring for a new sail. That winter I called several lofts for quotes and then sent off for Sailrite's literature. With time on my hands in upstate New York's off season, the idea of a do-it-yourself sail (at about half the cost of a professionally built sail) was extremely appealing. However, I also knew my own standard of craftsmanship at the sewing table. I wondered, given my inability to measure something twice and come up with the same number, if I could produce a decent looking sail. It had been, after all, 30 years since those 4-H sewing lessons — could I still thread a needle?

Sailrite's literature and phone contact assured me I could and, to my surprise, they were right. The finished mainsail set beautifully and looks great, though there are a few slightly crooked stitches here and there. I made a few goofs and learned a few lessons.

Lesson number one is if you are going to tackle a sailmaking job, follow Sailrite's directions exactly and in the sequence they recommend. Their diagrams and directions are generally quite clear, and, if you are stumped, they do a good job of helping you over the phone. (They also say, mostly I think to reassure the faint of heart, that if you get partway through the job and give up, they will salvage/finish the sail for you for an additional hourly rate charge.)

I erred in not placing the reef points at the stage of construction they suggested. I waited until the main was stitched together and then couldn't feed the bulk of the sail through the machine and so had to hand stitch the points' reinforcing patches. I also had my customary difficulty in measuring — a key requirement in sending them the proper dimensions of your old mainsail. Follow their directions exactly in the measurement of your old sail; it is a little tricky, and you'll need a space to stretch the sail's luff out.

Lesson number two is do the practice project first. Sailrite provided a sailbag kit as a warmup for use before tackling the actual mainsail. With my customary impatience, I plunged right into the sail itself. However, doing the small project first would be wise, as you'll gain a feel for feeding the slippery cloth through your machine at a constant rate so your stitches go where you want them and come out straight and even.

Lesson number three is if you can find a large space with a clean wooden floor and no helpful supervisory cats and dogs, use it. This will make the whole process much easier and more enjoyable, and the end result will look better. I assembled the precut panels (assisted by three very interested cats) and taped and sewed them on my out-of-the-way carpeted closed-in porch, where I could leave things lying about between sessions. However, the cloth did not slip and slide easily on a carpeted surface, and my 15- by 30-foot porch was too small to lay out the 23-footer's main. I ended up finishing the job of assembling the panels at a friend's wood shop with the help of two dogs and another very curious cat.

I found that a standard well-used Singer portable, capable of making a zig-zag stitch and equipped with a new sharp needle, was easily up to the task of stitching through two and three layers of Dacron. However, for reinforcing patches, such as at tack and clew where more than three layers were sewed together, I had to resort to some handwork.

My project turned out quite well, despite my mistakes and limitations; however, I wouldn't recommend tackling a mainsail for a 30-footer as your first sailmaking project unless you have a nice heated hayloft or gymnasium floor to work on. I would be willing to try another smaller sail from a kit after my first project. Sailrite kits for dinghy sails or for lightweight sails for larger boats have been successful first projects for many novices. Sailrite also sells kits for making sailbags and other canvaswork. This winter I put together a sailbag to allow the jib to remain hanked on the forestay, and the project went together very well in a decidedly small workspace.

Laying out mains and jibs for pocket cruisers like my 23-foot *Ariel*, whose mainsail area runs about 160 square feet, would be feasible in most attics or other normal-sized house spaces, but the weight of cloth on the larger sails might present problems for a standard sewing machine. Many amateur sailmakers start out with a lighter weight drifter or cruising spinnaker for their first project. The cloth is much easier to bunch up and feed through the machine than the stiffer, slippery, heavier weight Dacron.

It took a half dozen winter weekend afternoons plus several additional half days to complete my main. Despite a few stretches of a slightly squiggly seam, the finished product was a vast improvement over the old made-in-Hong-Kong main.

The club-footed jib

Tacking's so easy you won't know what to do with yourself

by Donald Launer

I'm alone in the cockpit of my schooner, *Delphinus*, short-tacking up a narrow section of the bay. Half aloud, I say to myself, "Ready about. Hard alee."

I remain seated by the wheel as the bow comes up through the wind. The club-footed jib swings over, then the foresail changes sides, and finally the mainsail follows over to the new tack. I think of all the years I have spent sailing without the luxury of cruising with everything self-tending. Sometimes I feel a bit guilty, as if I should be doing something.

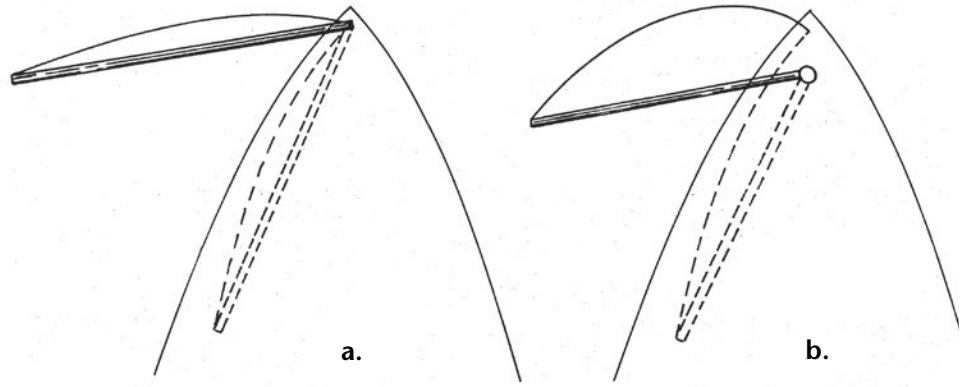
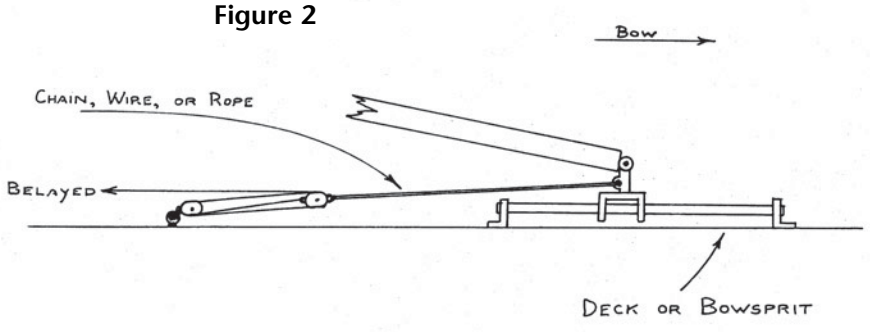


Figure 1

Figure 2



Many sailors have never encountered the club-footed jib, and are unfamiliar with its operation. With an understanding of the theory and terminology behind the basic jib-boom system, it should be obvious that the club-footed jib is truly an underestimated headsail.

Basically, the club-footed jib is a non-overlapping headsail set on a boom. The sail itself has a sailcloth weight and clew height similar to that of a normal headsail. The sail is fastened to the boom loose-footed, with only the clew of the sail attached to the after end of the boom. The boom has a gooseneck fitting at its forward end, so it is free to move horizontally and vertically.

The gooseneck is attached either directly to the forestay or to a pedestal just aft, the latter being the optimal system, in my experience. The placement of the pedestal aft of the sail's tack automatically allows the sail to become fuller when it is eased out on a broad reach or run. This is more aerodynamically efficient than if the boom were attached to the headstay, which would make the sail flat on all points of wind unless the clew were retrimmed *(see Figure 1)*.

Pedestal mount

The advantage of the pedestal mount was disputed by world voyager Eric Hiscock in his book, *Cruising Under Sail*. His contention is that such a method causes the belly of the sail to move too far aft, and the upper part of the sail to lose efficiency when the boom lifts. I have never observed this problem and tend to follow the recommendations of other experts such as Jeremy Howard-Williams, who, in his authoritative book, *Sails*, stresses the importance of mounting the jib boom on a pedestal aft of the forestay.

As shown in Figure 1, the system provides the headsail with a built-in whisker pole for downwind work, without the pole's inherent disadvantages in handling.

Although not generally used today, in years past the fullness and shape of the

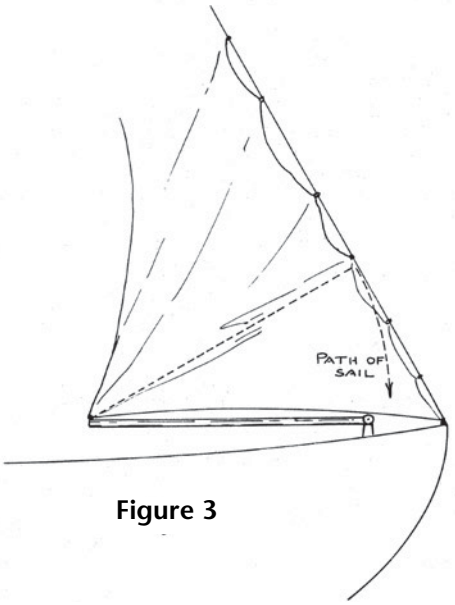


Figure 3

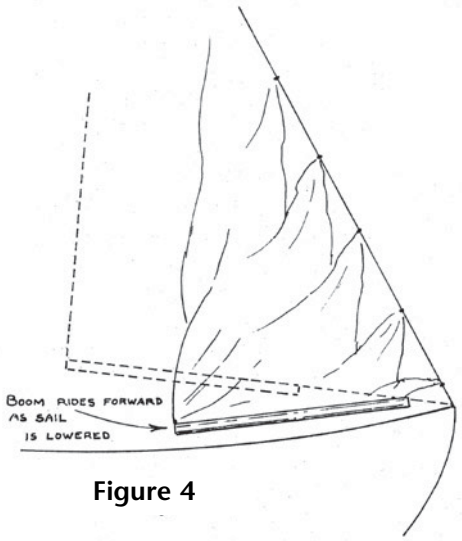


Figure 4

eased club-footed jib could be controlled by adjusting the pedestal fore and aft *(see Figure 2)*. The equipment to do this consisted of one or two rods, used as tracks, fitted with a sliding gooseneck fitting to which the boom was attached. Various names were used for this arrangement. In Gloucester, "boom horse" was usual. "Boom rider" and "horse rider" were other labels.

With the headsail hanked to the stay in the normal manner and the clew securely fastened to the boom's aft end, we now have encountered our first potential problem: the lower part of the sail cannot be lowered down the stay. Because the sail will not stretch and is attached to the clew and luff, it will not pass a perpendicular line between the clew and the headstay unless one of several measures is taken. Figures 3 and 4 illustrate the problem. The solution lies in either moving the clew forward or the luff aft. This can be done in several ways:

1. Unsnap the lower hanks from the forestay.
2. Loosen the clew from the jib boom.
3. Use a short jib boom, unattached to the deck or headstay, that rides forward as the halyard is eased off.
4. Fasten the lower jib hanks to an artificial stay (called a jackstay or relieving line) that automatically becomes slack when the sail is lowered, allowing the luff to move aft.

Artificial headstay

Solution 4 is the most practical. The relieving line is attached to the luff of the jib *(see Figure 5a)*. The other end of the relieving line is fastened to the tack of the sail, so that with the jib raised, it is under tension, providing an artificial headstay.

Figure 5b shows that, as the jib halyard is eased and the upper part of the jib drops down the stay, the relieving line becomes slack enough to allow the lower sail luff to move aft, allowing that section to be lowered.

The self-tending aspect of the club-footed jib is accomplished with a car for the jib sheet. The sheet is led from multiple-part purchase on the traveler car through a block on the boom's aft end, then to a block on the forward end, and finally back to the cockpit *(see Figure 6)*. Leading the jib sheet forward before going aft to the cockpit is necessary to prevent the pull on the jib sheet from restricting the athwartship movement of the traveler car.

The foredeck traveler track should be wide enough so the jib sheet has enough athwartship travel to prevent back-winding of the mainsail (or, in the case of a schooner, the foresail). This usually requires a track that stretches nearly from rail to rail, and is a potential hazard on the foredeck. Recessing the track into the deck, while seldom done, is one solution. Being aware of the hazard and avoiding it is another.

Roller furling may be used in conjunction with the boom headsail, and is as easily adaptable as with a conventional headsail. One method of roller furling (that ultimately will present multiple problems and is, therefore, unsatisfactory) leaves the clew of the sail fastened to the boom's end. When the sail is rolled up, the boom rises vertically off the deck *(see Figure 7)*.

Better rig

A far better rig is shown in Figure 8. The drum furling line remains standard. The clew outhaul line, however, is routed through a sheave on the boom's aft end, then forward to the pedestal, then back to the cockpit in the normal manner. With the sail unfurled and the clew outhaul belayed, the self-tending feature of the club-footed jib remains unaltered.

Although considered archaic by many, lazy-jacks, when used on a club-footed jib, can be a fine asset. This is especially true when the headsail is set on a bowsprit. This allows strolls along the clear bowsprit to hand a jib that is already under control and not spilling onto the walk area. Lazy-jacks also provide the additional advantage of serving as a jib-boom topping lift, so that the

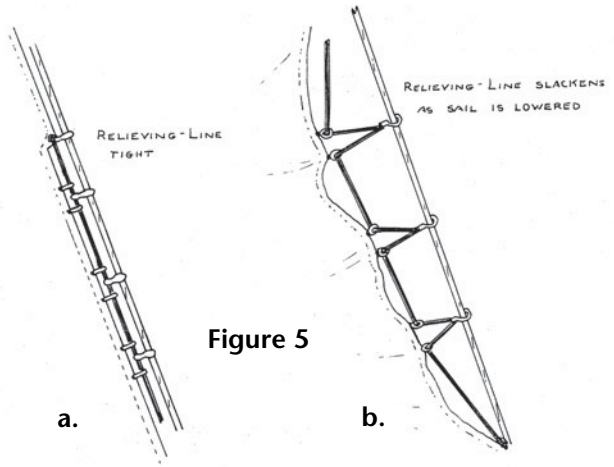


Figure 5

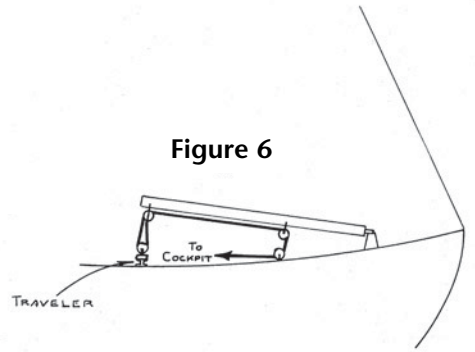


Figure 6

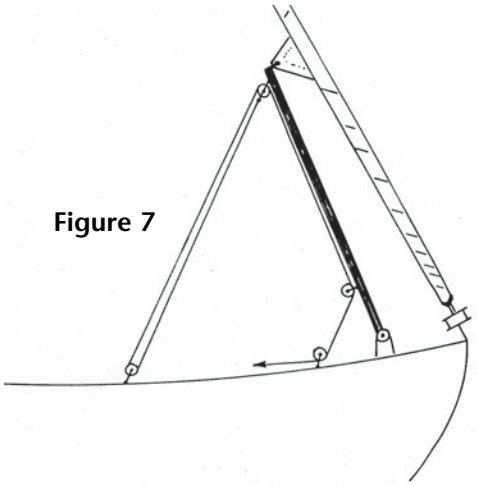


Figure 7

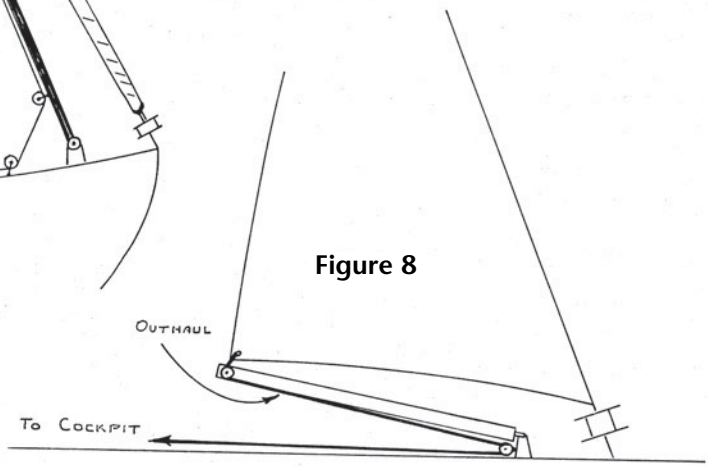


Figure 8

boom will not fall onto the deck when the headsail is lowered.

There are several different ways to rig jib-boom lazy-jacks. Figure 9 shows one method. An alternative method calls for the lower section of the lazy-jack to be fixed, with the upper section led through a mast-head block and down to the deck, as is done with many topping lifts.

My preference, due to rigging simplicity, is the method shown in Figure 9. Once adjusted and in place, further adjustments of the lazy-jack are infrequent.

Another important item used with club-footed jibs is the jib downhaul. When turning up into the wind to drop the jib, the club foot naturally tends to swing across the foredeck. Trying to lower the jib under these conditions invites a smack on the shin, even under mild sea conditions, which doesn't make for pleasant sailing.

Downhaul line

A jib downhaul line, led from the jibhead cringle, down through a block at the tack and aft along the deck, allows the jib to be pulled down from well aft of the swinging boom. Once down, the jib boom can be secured in a fixed position on deck. Some prefer to secure the aft end of the boom with a short halyard to the mainmast, others like to fasten the boom to a port or starboard lifeline, leaving the foredeck clear.

It is generally not wise to lead the downhaul line through the jib hanks; even though the line is of small diameter, there tends to be a binding problem. For those who prefer not to see the downhaul line blowing free in the wind when the jib is up, small lanyards, or "lizards" may be used at several intervals along the luff of the sail to keep the downhaul line shipshape *(see Figure 10)*.

Those are the basics of the club-footed jib. At first it may seem overly complicated, but it is actually designed to remove complications and, in practice, becomes very simple. The convenience for the short-handed cruising sailor of sailing with a self-tending rig has to be experienced to be appreciated.

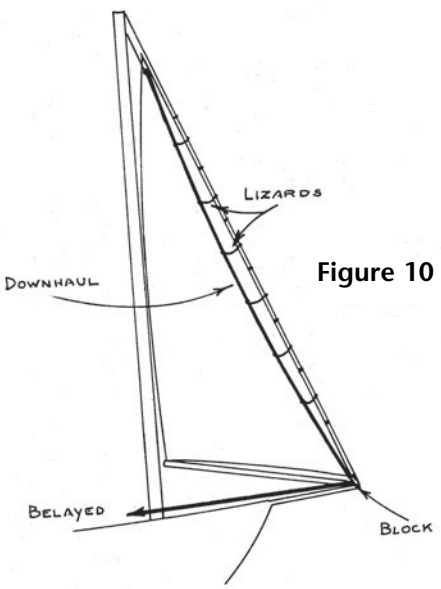


Figure 10

A group of sailing friends who frequently join me for an afternoon on my schooner have come up with a routine that tells the whole story. At the command, "Ready about. Hard alee," all the seated guests stamp their feet as if wildly running about.

They say it sounds more like a racing boat.

Don Launer is a frequent contributor to boating magazines and holds a USCG captain's license. His schooner, Delphinus, *which he built from a bare hull, is berthed next to his home on Barnegat Bay in Forked River, N.J. He is the author of* A Cruising Guide to New Jersey Waters.

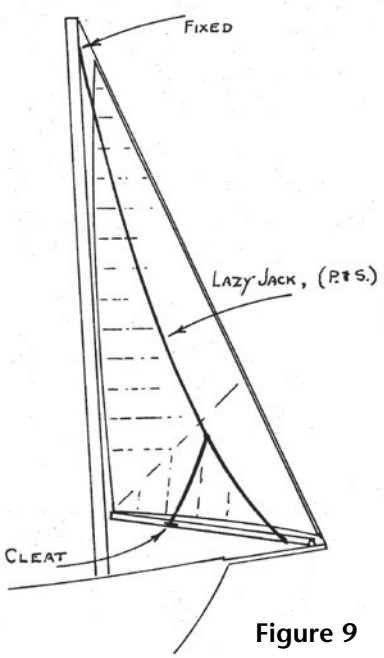
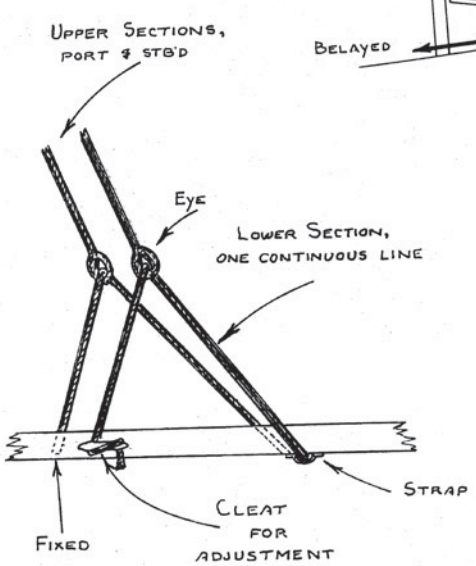


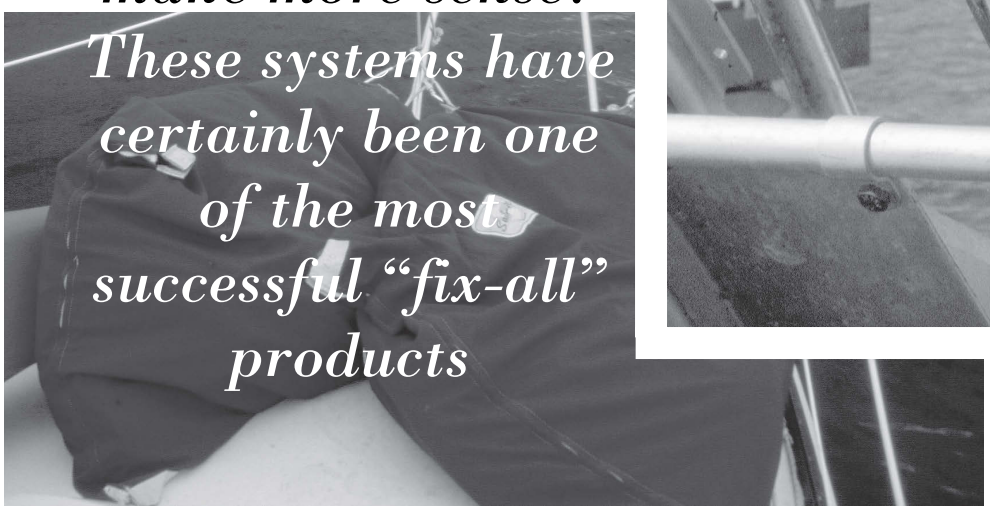
Figure 9



DETAIL

Roller furling or bags on deck: which system is right for you?

Does the "new" form of reefing, the reefing/furling unit, make more sense? These systems have certainly been one of the most successful "fix-all" products



by Matt Grant

Cruisers are always looking for ideas which will make sailing easier, and there are a multitude of products on the market to do just that. It is interesting how often we lose sight of simple solutions when a new "fix-all" product hits the market. For instance, today when we want to reduce headsail size, we automatically think of using an elaborate reefing/furling unit instead of simply installing a line of reefs in the sail. Let's compare the merits of both methods.

The simple solution to reducing headsail size is to add a line of reefing points. Reefing points are grommets spaced about 12 to 30 inches apart on a line roughly parallel to the sail's foot edge. The row of grommets is placed high enough to remove from 15 to 25 percent of the overall sail area. To reduce sail area, the foot of the sail is rolled and tied, and the grommet holes are used to secure the roll.

This is not unlike reefing a mainsail. In fact, the installation and use of reef points in a main and headsail are practically the same. The one notable difference is that with a mainsail, the boom can be used to attach blocks and cleats to allow for single or dual line reefing which can usually be accomplished from a cockpit location. With a headsail, the foot must either be tied up before bending the sail on or the headsail must be lowered and shortened under sail. The difficulty

of the latter method is in direct correlation with wind and sea conditions. Weather conditions may require several trips to the foredeck to set or shake out the reef.

In addition, this form of manual reefing does not look too good and, when you're done sailing, the sail must be lowered and bagged to protect it from ultraviolet and wind damage.

So does the "new" form of reefing, the reefing/furling unit, make more sense? Reefing/furling systems feature an extrusion to which the sail is attached. The extrusion is made from a plastic or aluminum tube that has a small slot on the aft edge into which a taped rope, placed on the forward edge of the sail, is fed. There are no hanks on the sail's edge, just this small line that feeds into the slot. Once fed into the slot, the reefing/furling unit is made to roll causing the sail to wrap or roll up.

These systems are certainly popular. From a reefing standpoint the amount of sail reduction is variable and easily accomplished from the safety of the cockpit. And it is neat: nothing can come loose to flap in the wind. At the end of the day the entire sail can be rolled onto the headstay and stored that way, as long as the leech and the foot have been protected with a sacrificial cover.

Reefing/furling units sound great but they do have some disadvantages. The wraps taken in reefing tend to "bulk up" (because of hems and patches) at the top and the bottom of the extrusion and, thus, the sail becomes fuller in the middle (the opposite of what is desired). Several methods of improving this situation are promoted. One of these is adding a foam luff (essentially a pad of foam along the luff in the middle part of the sail). A foam luff helps to "bulk up" and decrease the fullness in the middle of the sail. But it adds cost and its effect varies depending on how much the sail is furled. Even when the sail is not reefed, boat performance may be affected since sail designers tend to make furling sails flatter than normal in order to help the sail roll onto the extrusion without creases. And a furling sacrificial cover adds a good deal of weight to the sail, making it less effective in light air.

Other issues to consider have to do with the use of the reefing/furling unit itself. These units are complicated by comparison to the standard wire and hank arrangement. Maintenance can be an issue. Some systems require lubrication and replacement of ball bearings from time to time. The reefing/furling systems can make trailering more difficult for smaller boats and yearly mast stepping and unstepping more complicated for larger boats.

The units are also expensive. The price range for a 30-foot boat can be from $600 to $2,000. And in most cases, furling line and deck hardware must be purchased and installed.

Cost considerations include more than the reefing/furling unit itself. Any sail to be used on the unit must have that small taped rope edge installed. If the boat has an extensive headsail inventory and all will be used, they must all be modified.

The process is further complicated if each sail is also to have a sacrificial cover to protect the exposed sail edges when the sail is fully rolled. These conversions are expensive and add weight to the sails. An average sail conversion for a 30-foot boat will run around $375.

Costs are low with simple headsail reefing points. Adding reefs to an existing headsail can cost as little as $40. And there is no cost in making the boat ready for use of the newly modified sail.

Sail versatility is maintained. Indeed a sail with one or more rows of reefing points can be thought of as a replacement for two or more sails. And all headsails in the boat's inventory can still be used since no rigging modifications have been made (of course they cannot be reefed unless reef points are added).

But, perhaps the biggest advantage of the simple headsail reef is that the intended shape of the sail need not be compromised. The sail can be designed for its best performance instead of flattening it to allow for roller reefing.

There is no really right or wrong way to go. The issue is what makes the most sense on each individual boat. The reefing/furling unit certainly does a lot to make sailing easier and safer, but if reefing and sail performance are the primary concerns, take a second look at the downsides. Often a simple, elegant, and inexpensive row of reefing points is the perfect solution to reefing a headsail.

Editor's note: *We're not done with roller furling. This is a very popular option, one we'd like to cover in more detail in future issues. Send your comments and questions, and we'll come back with another round.*

Point *(on behalf of hanks and bags)*

by Jerry Powlas

My personal preference is for hanks instead of roller furling. The concept of being able to easily roll your jib to different areas without leaving the cockpit is compelling. The execution is less so.

In general, a partially roller-furled jib will exhibit a sail shape so poor that if the same shape were found on a non-roller-furling sail, a competent sailmaker would recommend that the sail be retired from service. Further, even before the purpose-built furling sail is roller furled, it will necessarily be excessively flat and high cut.

Issues of safety would be more compelling if roller furling always furled. It does not. It is, in fact, least likely to work in high winds when the safety considerations are most pertinent. Some failure modes leave the crew with a jib that cannot be furled or lowered. I've seen extrusions twisted into a helix that reminded me of a sheet metal screw … probably didn't happen in light air. Roller furling is convenient. Only that, and nothing more.

Most good old boats were built with hanked-on jibs. Hanked-on sails have good shape, so they perform well, and the sail handling system is extremely reliable. If foot reefing is added to the smaller jibs, these sails will perform well with the reef in. This is because a well-designed jib is flatter at the top.

If you already have roller furling, you can enjoy the convenience. However, if you want really good performance, you will need to carry almost as many sails as we do and change them almost as often. Even then, they will be overly flat and high cut. Maybe you don't want good performance, but if you give away a quarter of a knot too many times you will have the same speed potential as a mooring buoy. It takes more sailpower to punch through the big waves that are encountered when reefing is necessary.

If you don't have roller furling yet and it tempts you, sail around on a windy day and look at the sail shape of other boats. Pay attention to the shapes of the roller-furled sails and compare these shapes to the shape of sails without furlers. If you still want roller furling, don't undersize it when you buy. Fit the largest furling gear you can to your boat. While more expensive, it will be much more reliable and less likely to jam in high winds.

Just my opinion …

Counterpoint *(for furlers)*

by Scott Perkins

I have a Fammet roller furler with a 130 Yankee jib on our Downeaster 32 cutter *Chip Ahoy*. This is a good setup. The internal halyard does add weight, but it also adds convenience. Having a halyard for the spinnaker is nice, too. The furler works just like it is, rolling the jib in and out to full size. (Now, if they could make a sail that has shape when it is half out that would be a trick …) With my cutter rig I use the roller furling either all the way out or completely rolled up.

Despite its inherent limitations, use of a roller furler must be looked at from a safety and speed vantage. The roller furler makes taking in the sail from the safety of the cockpit fast and easy. Then I usually go forward on deck to manually raise the staysail, as I generally use one or the other.

In downwind conditions the sail works well enough partially furled — but then I haven't had to reef much going downwind. Going upwind in a stiff breeze is another story. The partial jib can't begin to compare to the staysail's shape and its stability with the lower center of effort and the way it will go into the wind.

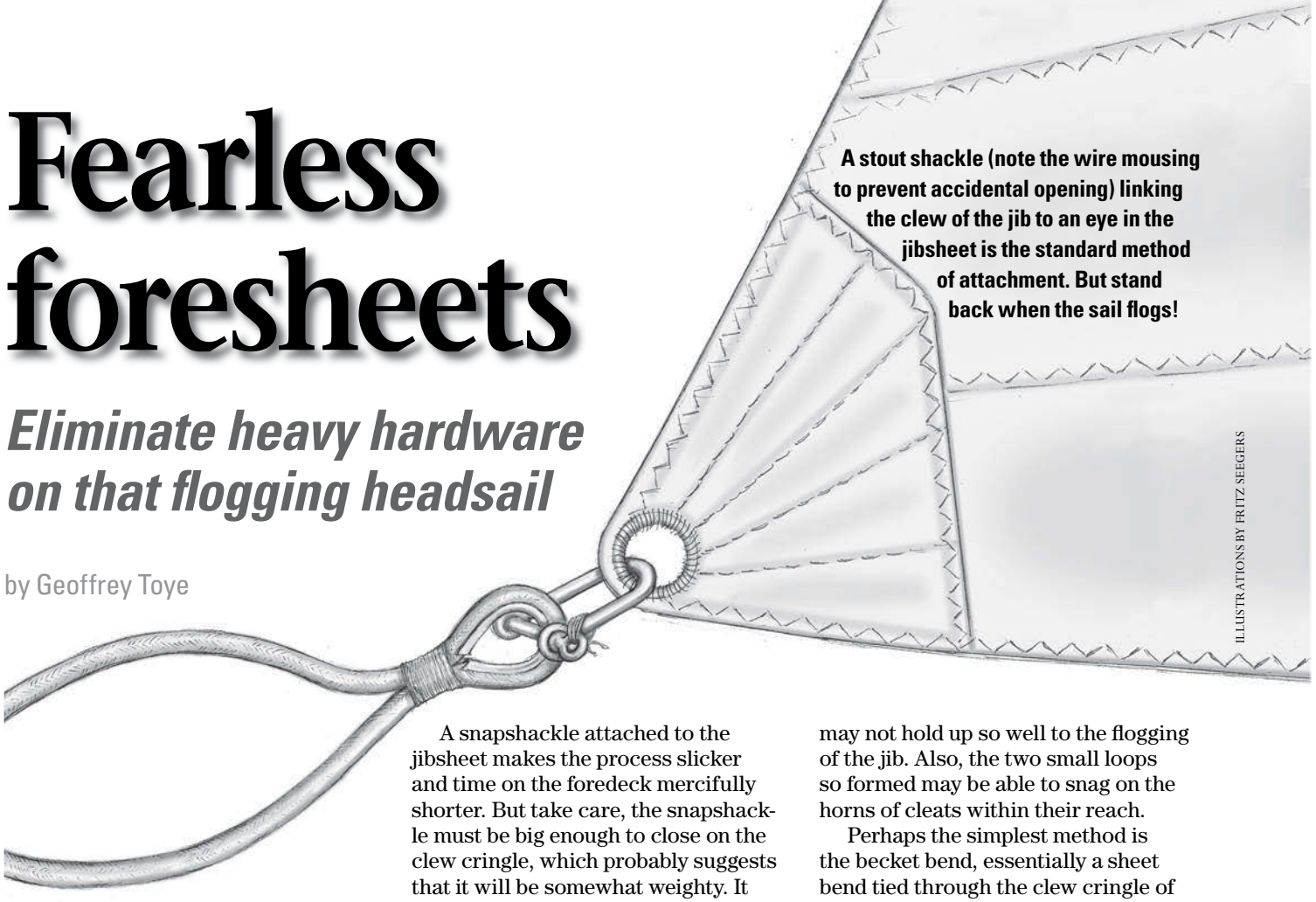
Although it would be "quaint" to hank on sails, and have bags of them everywhere we look, I still prefer roller furling and the reduced clutter on deck as well as below, where storage space is precious.

We sail on Lake Superior long into the fall season when the weather can change in an instant. Having the ability to roll that thing up quickly is real handy. Many times we have been caught in squalls when visibility was nonexistent — not the best of times to be out raising or lowering sails on deck. We also do a lot of night cruising. Going on deck at night for a sail change while my wife is asleep below is not that appealing to me … but then, neither is waking her. Roller furling gets my nod of approval.

Fearless foresheets

Eliminate heavy hardware on that flogging headsail

by Geoffrey Toye



A stout shackle (note the wire mousing to prevent accidental opening) linking the clew of the jib to an eye in the jibsheet is the standard method of attachment. But stand back when the sail flogs!

ILLUSTRATIONS BY FRITZ SEEGERS

DIFFERENT SKIPPERS, DIFFERENT long-splices, they say. Bending on jibsheets is a task that allows for considerable variety from boat to boat. Some simply have a stout shackle linking a hard eye in the sheet to the cringle in the clew of the jib. In terms of secure fastening, that is hard to beat as long as the pin is moused. But is that a realistic requirement?

Visualize the horizontal sleet of a stormy night on a foredeck that thinks it should have been on a submarine, straining to hold the clew and shackle together while also trying to thread a recalcitrant pin into a shackle which seems suddenly to have grown a different thread. This can lead to all manner of horrors, not the least of which may be having the assembled gear tear itself from cold hands to return with a swift and skull-cracking vengeance.

I've known people to lose a tooth from those things. Square-riggers and shellbacks might be up to this, but when your modern first mate crawls back to the cockpit with that thoughtful expression on her face unique to those who have just swallowed a shackle pin, she might not respond with enthusiasm to, "You did remember to mouse the shackle, didn't you, darling?"

A snapshackle attached to the jibsheet makes the process slicker and time on the foredeck mercifully shorter. But take care, the snapshackle must be big enough to close on the clew cringle, which probably suggests that it will be somewhat weighty. It will certainly seem so when it gets you in the eye.

Other options

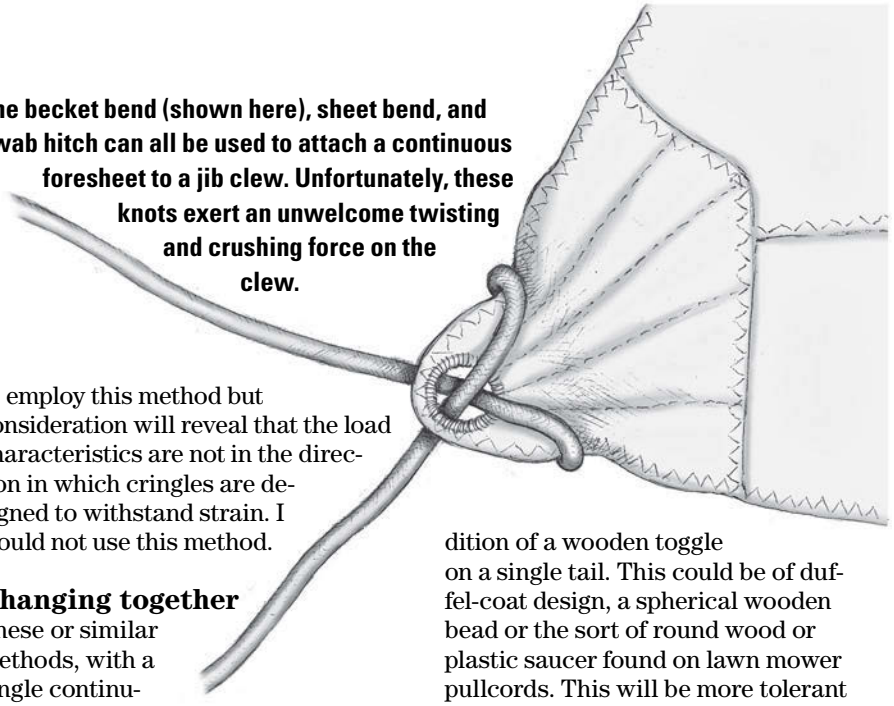
Let's explore non-shackle options I've encountered on vessels while the years, the sea miles, and the odd shackle pin slipped by beneath the keel. Consider first the ideal system. It should be secure, strong, quickly and easily bent to the sail, and unbent… even in darkness, heavy weather, or both. It should have no loose parts. It should be as safe as possible for anyone either using it or being struck by it. It should not get snagged on the ship's gear, nor knock expensive lumps out of spar anodizing or brightwork.

> **"…non-shackle options I've encountered… while the years, the sea miles, and the odd shackle pin slipped by beneath the keel."**

One popular choice is separate sheets, each with the bight of a bowline through the cringle. This is simple but can be bulky: there are two rope ends to locate, two knots to tie, and the bowline in modern synthetic ropes may not hold up so well to the flogging of the jib. Also, the two small loops so formed may be able to snag on the horns of cleats within their reach.

Perhaps the simplest method is the becket bend, essentially a sheet bend tied through the clew cringle of the sail. Since we need two sheets to the same clew, our single becket bend should be tied in the middle of the jibsheet, having what would otherwise be its end continued through to form the full length of the sheet. This is ungainly in my view, apt to crush the clew into wrinkles, and it would imply that the sheet could not easily be unbent from the sail.

Two stopper-knots in a single continuous sheet passing through, one knot either side of the clew cringle, achieves pretty much the same effect with a neater appearance. But appearances can be deceptive. The stopper knots can jam to the point of permanence, thus become ever smaller, which may defeat their purpose, and the cringle had better be very strong and secure because the two-stopper-knot method depends heavily on the cringle not pressing out of the sail. Many, particularly smaller boats, seem



The becket bend (shown here), sheet bend, and swab hitch can all be used to attach a continuous foresheet to a jib clew. Unfortunately, these knots exert an unwelcome twisting and crushing force on the clew.

to employ this method but consideration will reveal that the load characteristics are not in the direction in which cringles are designed to withstand strain. I would not use this method.

Changing together

These or similar methods, with a single continuous sheet threaded through the clew at its mid-point, require that the sheet remain bent on to the sail, so sail and sheet get changed as one. This is not a problem where the vessel has only one roller-furling jib, but if several headsails are used, a disconnection point at the clew is preferable. By getting rid of the ironmongery we have reduced the anti-personnel component. However, re-reeving the sheets with each sail change would not be workable on my boat.

The rope-toggle and the Dutch shackle have no metal parts and each provides a disconnection point at the clew. To make a rope-toggle, find the center of a continuous jibsheet. At its center form an eye with a strong round seizing. The size of the eye, which we will call E1, will be determined by the size of your headsail cringle. Take a short length of rope and form another round seizing, E2, such that this one is captive to the one in the jibsheet. As an alternative, an eye-splice might also be used for E2.

Push eye E1 through the clew cringle. When the eye of E2 prevents it from going any further, there should be just enough of eye E1 showing through so that the tail of the rope-toggle E2 can be threaded through it and held firmly in position across the cringle and preventing E1 from withdrawing, like the cross-bar on a fortress door. The diameter of the sheet when doubled should be a firm fit in the cringle, the rope toggle tail should be long enough to be in no danger of shaking loose.

It will be more secure with the addition of a wooden toggle on a single tail. This could be of duffel-coat design, a spherical wooden bead or the sort of round wood or plastic saucer found on lawn mower pullcords. This will be more tolerant of variation in design or dimension but slightly more troublesome to unbend from the sail. Be aware that wooden toggles can shatter if the sail flogs against something hard. A solid toggle is tougher on the skull than rope but more forgiving than a metal shackle.

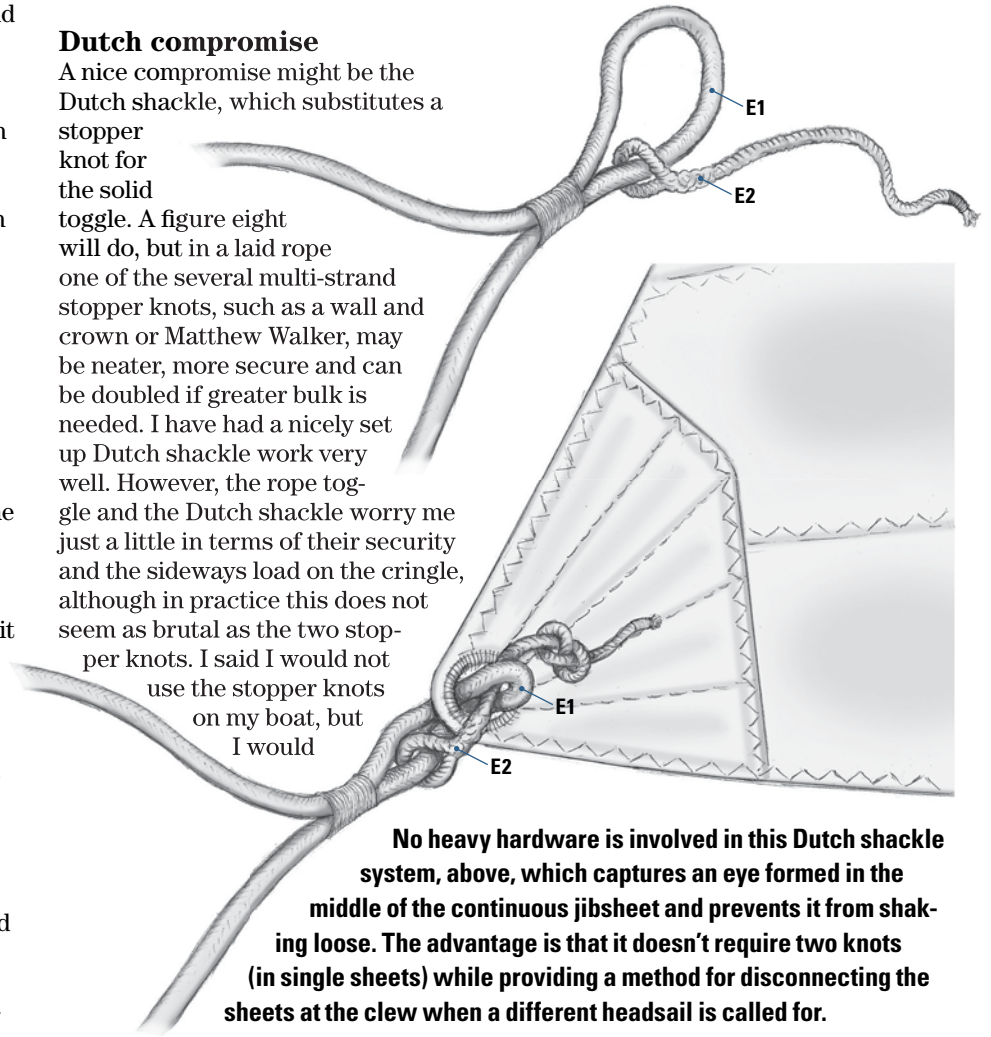
Dutch compromise

A nice compromise might be the Dutch shackle, which substitutes a stopper knot for the solid toggle. A figure eight will do, but in a laid rope one of the several multi-strand stopper knots, such as a wall and crown or Matthew Walker, may be neater, more secure and can be doubled if greater bulk is needed. I have had a nicely set up Dutch shackle work very well. However, the rope toggle and the Dutch shackle worry me just a little in terms of their security and the sideways load on the cringle, although in practice this does not seem as brutal as the two stopper knots. I said I would not use the stopper knots on my boat, but I would consider the Dutch shackle, which is more seamanlike.

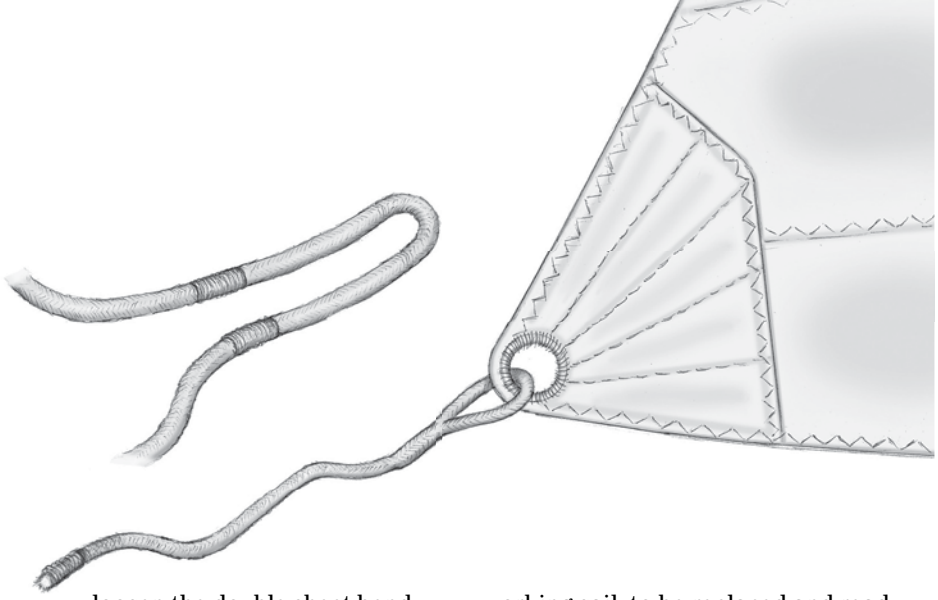
My preferred system, tried over many years, so far without failure nor, as far as I can judge, any downside at all, is the permanently bent-on tail, one for each sail. This comprises an eye-splice made through the clew cringle with a simple rope tail of a few inches finished with a strong whipping. It will surely be tested when the sail flogs in a blow.

A round seizing at the center of the continuous jibsheet can be bent to the tail with a double becket bend. This would be more secure, I suppose, than simply bending on to the center of the sheet and it would be easier to locate in the dark. But I have never found the need for it.

On my boat the center of the sheet is indicated as the span between two American whippings, about 18 inches apart. When they are pressed together, the bight is formed for a double sheet bend. The draw of the sail should not



No heavy hardware is involved in this Dutch shackle system, above, which captures an eye formed in the middle of the continuous jibsheet and prevents it from shaking loose. The advantage is that it doesn't require two knots (in single sheets) while providing a method for disconnecting the sheets at the clew when a different headsail is called for.

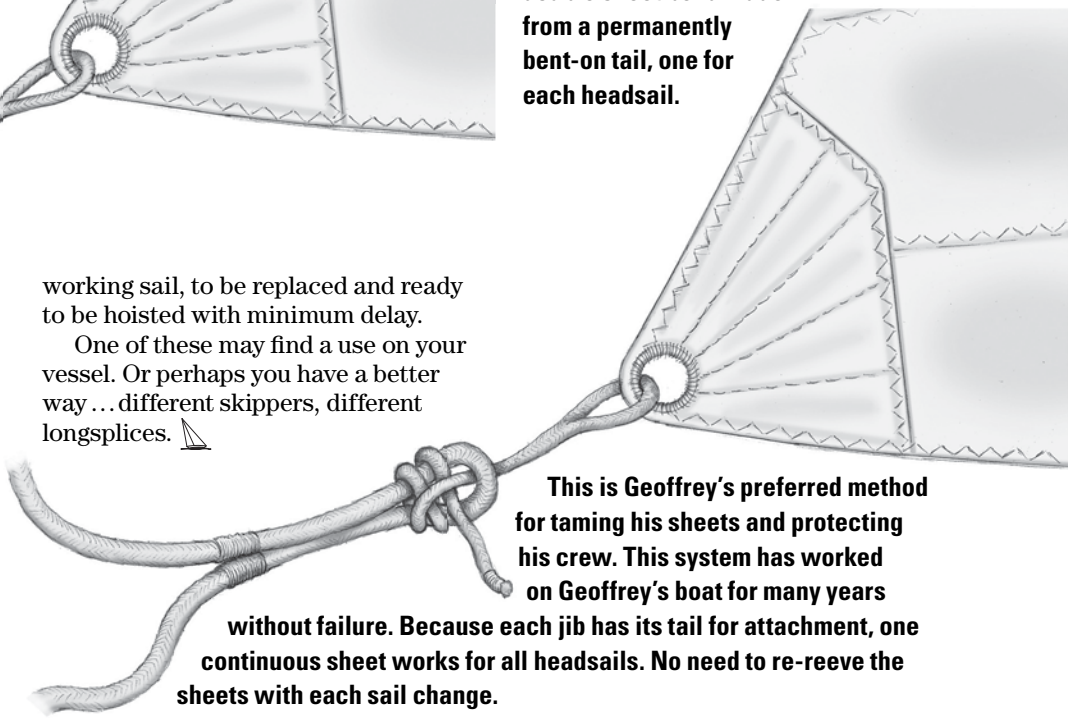


The center of a continuous sheet can be located by a pair of whippings about 18 inches apart. Pressing them together forms a bight which can be used with a double sheet bend made from a permanently bent-on tail, one for each headsail.

loosen the double sheet bend since, unlike the single sheet bend, it has no left-handed form and seems to be able to take the strain equally well on either standing part, in this case port or starboard sheet. Like the shackles and bowline, this method places the strain along the proper axis of the cringle.

A possible bonus of the continuous sheet and use of the double sheet bend is that it might make it possible for the tail of the replacement jib to be bent to the lazy part of the sheet beside the tail of the working sail, to be replaced and ready to be hoisted with minimum delay.

One of these may find a use on your vessel. Or perhaps you have a better way… different skippers, different longsplices.



This is Geoffrey's preferred method for taming his sheets and protecting his crew. This system has worked on Geoffrey's boat for many years without failure. Because each jib has its tail for attachment, one continuous sheet works for all headsails. No need to re-reeve the sheets with each sail change.

New sails for good old

Get maximum value in replacement mains and jibs

by Sven Donaldson

Let's face it, most of us who sail older boats do so, at least in part, because the new ones are so darned expensive. Few sailors are entirely immune to the allure of the latest yachts and their ingenious design features. But when it boils down to an objective assessment of functional value versus dollars expended, good old boats keep coming up the winners.

It's rare to encounter an "experienced" sailboat with no serviceable sails whatsoever. Boatowners buy new sails to fill gaps in the inventory as their sailing plans become more ambitious or to replace key sails that are gradually wearing out. But there's a third reason — equally rational and sometimes overlooked — for buying another sail.

Many of our boats were designed 20 or 30 years ago, when rigs and sails were often quite crude by today's standards. For this reason, the purchase of a new sail (or sails) can be a golden opportunity to take advantage of recent thinking and some genuinely superior technology, which may well enhance the performance of an aging boat so it's literally better than new.

Racing sailors with long-term experience in one-designs — such as the Thistle, Lightning, and Star — are fully aware of the substantial increases in speed these classes have achieved over the years. Better boathandling techniques have, of course, contributed; but the biggest accelerator has been steady improvements to sails and associated spars and rigging. The same principles apply to larger sailboats. With good planning, improvements can be dramatic.

Performance, for the purposes of this article, means an optimal combination of speed, easy handling, and seaworthiness. By and large, the owners of older, cruising sailboats will fall into one of four camps, each with distinctly different needs when it comes to sails.

Coastal cruiser — The first and largest group are the inland/coastal cruisers — folks who use their boats to travel and explore without ever making open-water passages that put them more than a day or so from a safe harbor. By watching the weather, the risk of getting caught out in Force 6 or worse conditions can be almost eliminated, so dedicated storm sails will ordinarily not be necessary. This sailor's working sails are unlikely to rack up high hours quickly.

Offshore cruiser — A second and increasingly sizable contingent are the bluewater sailors — those who make offshore passages. These cruises can be anywhere from weeks to years. In every case, offshore sailing puts heavy demands on sails. Chafe problems are greatly exacerbated by the motion of a yacht at sea. UV exposure is generally more prolonged. And sooner or later, there's sure to be heavy weather. On most of the popular voyaging routes, close-hauled sailing is rare. However, upwind capability in very rough conditions may be essential at times to escape a tight spot.

Cruiser/racer — A third set of sailors are those who mix racing and cruising. In most cases the racing will be fairly casual competition at the club or regional level; but racing is racing, and the aim, as always, is to finish ahead of the other guy. Many older boats can be highly competitive, particularly under PHRF (the Performance Handicap Racing Fleet system). In some regions, the owners of certain popular boats have organized as one-design classes and enjoy good, close racing with restrictions on sail purchases to control costs. More than any other equipment-related factor, sails spell the difference between top finishes and mediocre results. Unfortunately, it's become very easy to spend a bundle on modern racing sails — perhaps defeating the purpose of buying that "economical" older boat in the first place. Without the protection of one-design class sail restrictions, a casual or occasional racer may find it difficult to achieve competitive speed while keeping sail expenditures at a reasonable level.

Racer — Finally, there are the gung-ho owners of older boats whose primary passion is racing. There is nothing contradictory about this — quite often the most affordable way to achieve fairly lofty racing goals is to "recycle" a retired raceboat and upgrade her sails, gear, foils, and bottom to near-perfect condition. *(See Block Island 40 story on Page 44.)* New raceboats often depreciate even faster than automobiles, and used ones regularly sell for a small fraction of their original cost. On the other hand, the ongoing expenses of campaigning an older racing machine will likely be about the same as competing with a new boat of comparable size. Suffice it to say, a full-bore program requires state-of-the-art racing sails, and unless a good supply of fairly fresh sails comes as part of the package when a used boat is purchased, they certainly won't be cheap.

Sailors in each of these groups need to approach the complicated business of sail shopping with their goals and expectations clearly in mind. In general terms, the aim of the first three groups is to achieve acceptable performance across the range of anticipated conditions without buying or carrying more sails than strictly necessary and without spending too much on each sail. Dedicated racers,

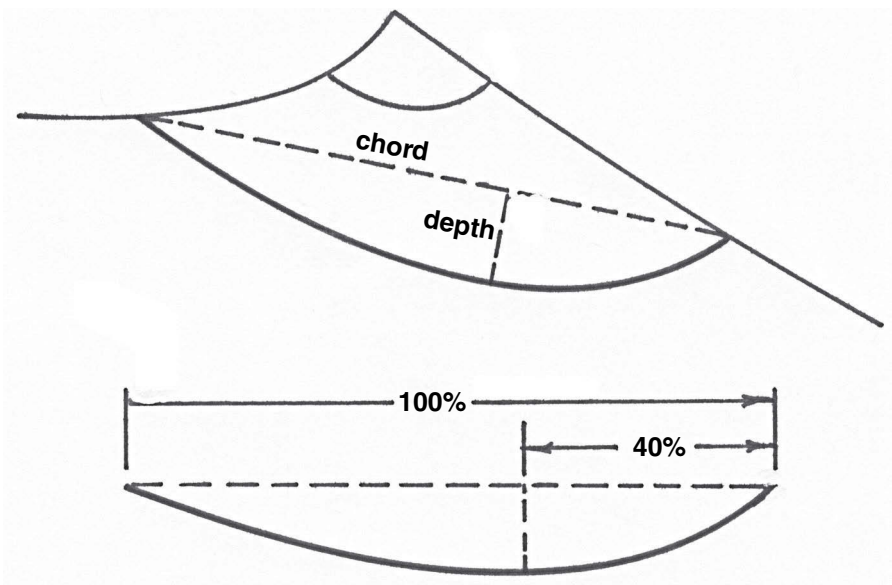
however, must be prepared to spend more freely but may still be able to achieve some savings through principles outlined in this article.

Stable sail shape

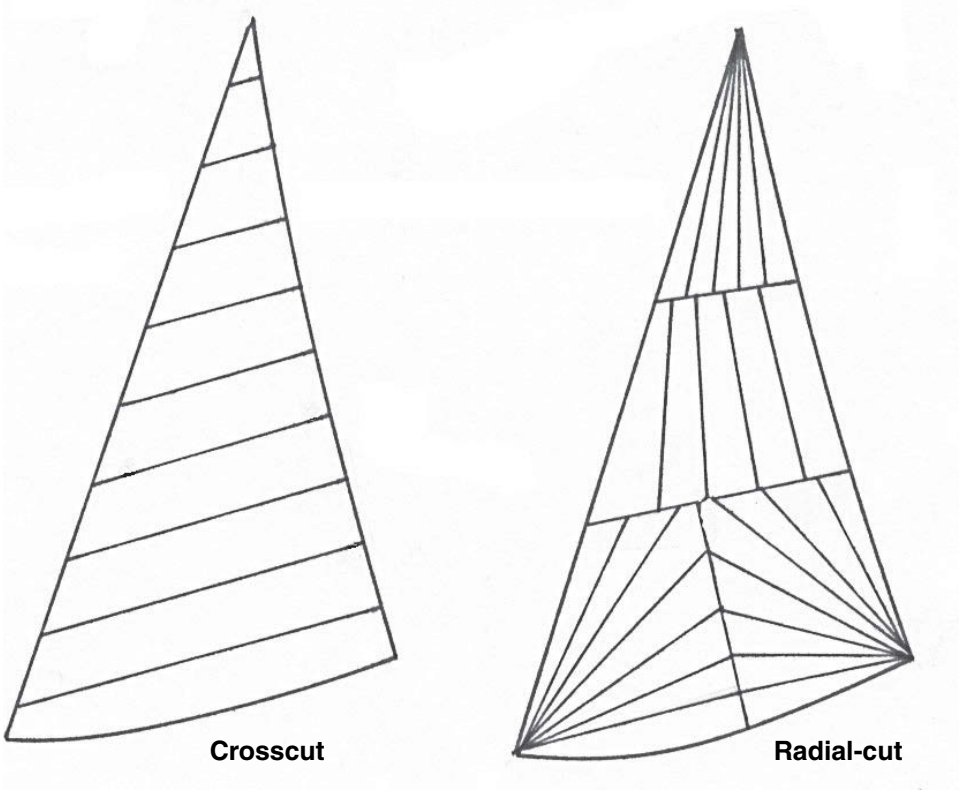
The wind makes no distinction between racing and cruising boats, so for similar sailing conditions, the ideal "flying shape" for any particular sail will be almost identical. The popular notion that cruising sails can be designed with a "wider groove" to better accommodate inexperienced helmsmen is mostly just a sales pitch. In reality, many cruising sails — especially flat-cut headsails made from relatively stretchy cloth — are less forgiving than their more sophisticated racing counterparts (and considerably less efficient to boot).

The description of a sail's flying shape begins with its draft — the depth of its curvature as a percentage of the distance from luff to leech. The difference between a "flat" sail and a "full" one is quite subtle — rarely more than about 4 percent. Efficient upwind headsails are typically between 9 and 12 percent draft, while mains range from 8 to 11 percent. Also very important is the so-called draft location — the position of greatest depth in a sail's horizontal curvature as viewed from the windward side. For headsails (or cat-rigged mainsails), the draft location should normally be fairly far forward, around 40 percent of the distance from luff to leech. Due to the effect of the jib, the optimal draft location for most mainsails is a little farther aft, around 45 percent, but it should never stray aft of the 50 percent position. In principle, a deeper sail can generate more power, but too much draft leads to flow instability and a dramatic reduction in drive, even when the boat is not overpowered.

The typical crosscut genoa made of fairly soft, stretchy "cruising cloth" is a serious compromise for allround use — too flat, particularly near the luff, for good light-wind performance, yet prone to becoming excessively full and draft-aft when loaded up in a brisk breeze. To some extent, it's possible to "drag" the draft forward by winding up halyard tension, but trim adjustments will seldom induce anything close to an optimal shape all the way from head to foot. The real solution is a sail which retains its built-in shape over a wide wind range. This calls for some form of radial construction plus a durable, low-stretch sailcloth that's compatible with a radial panel layout. More often than not, the most suitable materials are laminates rather than traditional woven Dacron fabrics *(see illustration on next page)*.



Horizontal draft stripes on a sail make it feasible to determine sail shape. The draft of a sail at any given level is the depth divided by the chord, expressed as a percentage. Draft location is the distance between the luff and the deepest point in the sail's curvature, again expressed as a percentage of the chord. These measurements are most easily obtained from a wide-angle photograph taken with the camera almost directly against the foot of the sail.

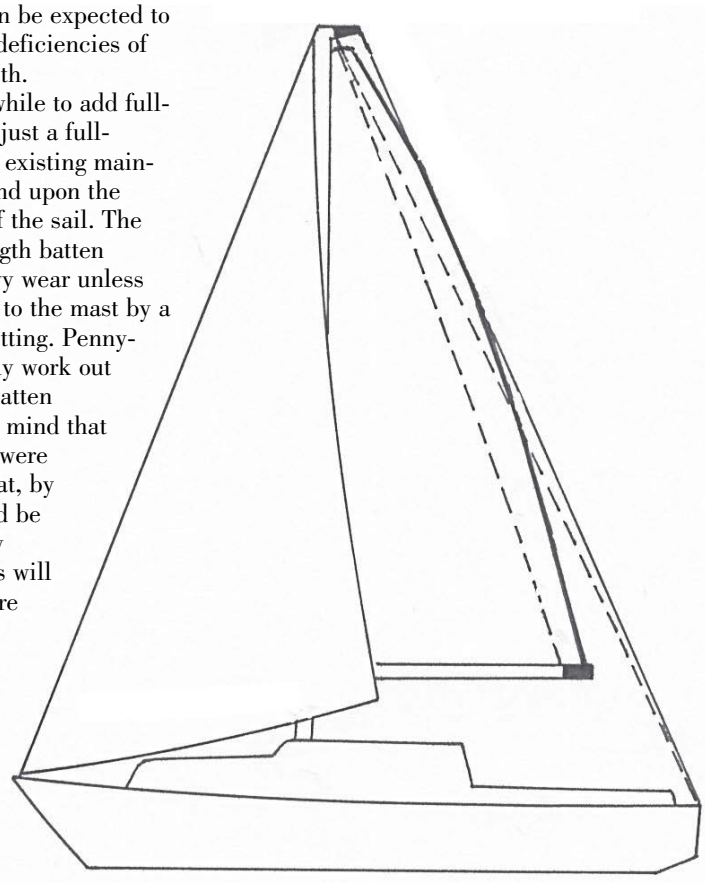


A low-tech crosscut sail is easily assembled and wastes little material. A radial layout does a better job of aligning the strong fibers in the sail material with the actual load paths in a working sail. More fabric is wasted, however, and computerized sailmaking technology is almost essential.

Aside from lost boat speed, a stretchy genoa with a "draft-starved" luff and a tight leech will be prone to backwinding the mainsail. When this happens, the crew will tend to oversheet the main which will induce excess weather helm. Another common indication of sub-standard genoa shape is the behavior of the yarn telltales (normally positioned on either side of the headsail luff at various heights, and from 12 to 15 inches behind the luff tape). If your boat goes to windward best with the telltales on the leeward side drooping and the windward ones streaming straight back, it's a sign that the front quarter of the headsail lacks sufficient curvature.

The typical crosscut mainsail handles a wide range of wind speeds more successfully than its headsail counterpart, primarily because its luff is supported by a sturdy mast instead of a sag-prone headstay. Long battens, especially the luff-to-leech variety, also help a great deal by maintaining fair, uniform curvature as the mainsail ages. However, no battens can be expected to overcome the inherent deficiencies of an overly elastic sailcloth.

Whether its worthwhile to add full-length battens (or even just a full-length top batten) to an existing mainsail will naturally depend upon the condition and quality of the sail. The forward ends of full-length batten pockets will suffer heavy wear unless each batten is attached to the mast by a small gooseneck-type fitting. Penny-pinching solutions rarely work out well when it comes to batten hardware. Also, bear in mind that quite a few older boats were designed with mains that, by today's standards, would be considered significantly undersized. These boats will often speed up with more mainsail area and, surprisingly, it's often feasible to add to this area without major changes to the rig itself. In many cases, the easiest way to get this extra area is to bite the bullet and buy a new main that employs long battens to support a larger roach.



Many older cruising boats came with rather skimpy mainsails as original equipment (inner dashed line). The purchase of a new main can be a great opportunity to gain worthwhile sail area supported by full-length battens and/or an extended boom. Adding to the backstay crane may help to minimize backstay interference.

All-weather inventory

Aerodynamic forces increase exponentially with flow velocity, so even if sail shape could be "cast in stone," you can expect a fourfold increase in propulsive and heeling forces when the wind speed doubles. The fact that most sails stretch and get fuller as they load up makes these forces escalate even faster. This, of course, is why we reef or change down to smaller, flatter sails. Trim adjustments, such as altering mast bend, headstay sag, luff tension, lead/traveller position, and sheet tension can certainly help a sail function more efficiently across a range of wind conditions. But no advancements in sailmaking will probably ever allow a single sail to perform effectively in everything from a light-air day to a gale. So for most sailors, the challenge is to assemble a

When do you need new sails?

Most sailors choose to replace their working sails before they literally fall apart, so deciding when to pull the plug becomes a judgment call. Signs that it may be time for a new sail (or sails) include:

1) Weakened sailcloth resulting from years of sun, salt, and mechanical stress. Heavily worn sailcloth tears easily and stretches much more than when new. Note that when seam stitching chafes or fatigues, it's not expensive (or difficult) to have the sail re-stitched. However, when the cloth itself gets too tired, there's no practical fix short of a new sail.

2) Underbuilt sails with skimpy corner/reefing patches, inadequate reinforcements, or sub-standard hardware can sometimes be beefed up to extend their service lives. However, "bargain sails" were rarely made with quality sailcloth to begin with, so upgrading may not be worthwhile unless there's no affordable alternative.

3) Poorly shaped sails may conceivably be suffering from nothing worse than improper trim. In other cases, it's possible for a sailmaker to "re-cut" a sail to correct minor deficiencies. On the other hand, if the shape problems are rooted in excessive or uncontrolled fabric stretch there's rarely much that can be done short of replacement. Basically, you'll have to decide first, how much performance are you giving up; and second, how much does it bother you?

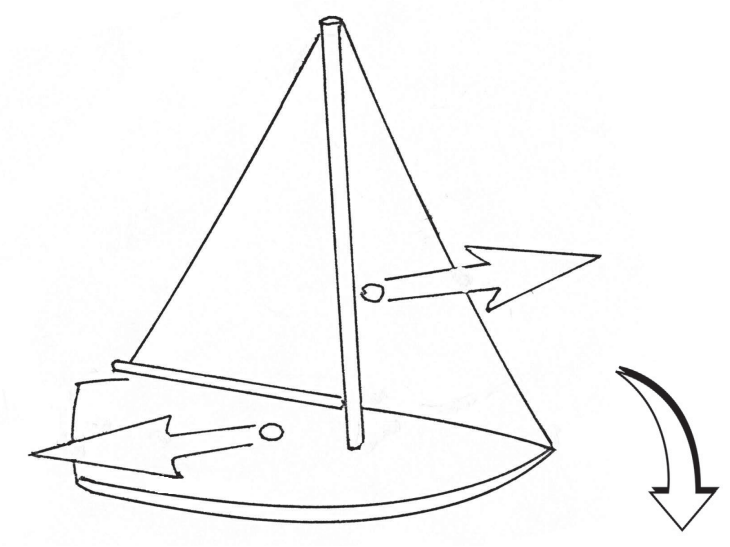
4) Existing sail (or sailplan) is hindering the boat's performance or inconveniencing the crew. If you decide to modernize the rig, add furling gear, or make other upgrades, your used, but serviceable, sails can often be sold through sail brokers or marine consignment outlets to partially offset replacement costs.

5) Extensively patched, stained, or otherwise unattractive sails may be candidates for replacement for aesthetic reasons. After all, most sailors want to take pride in their boats.

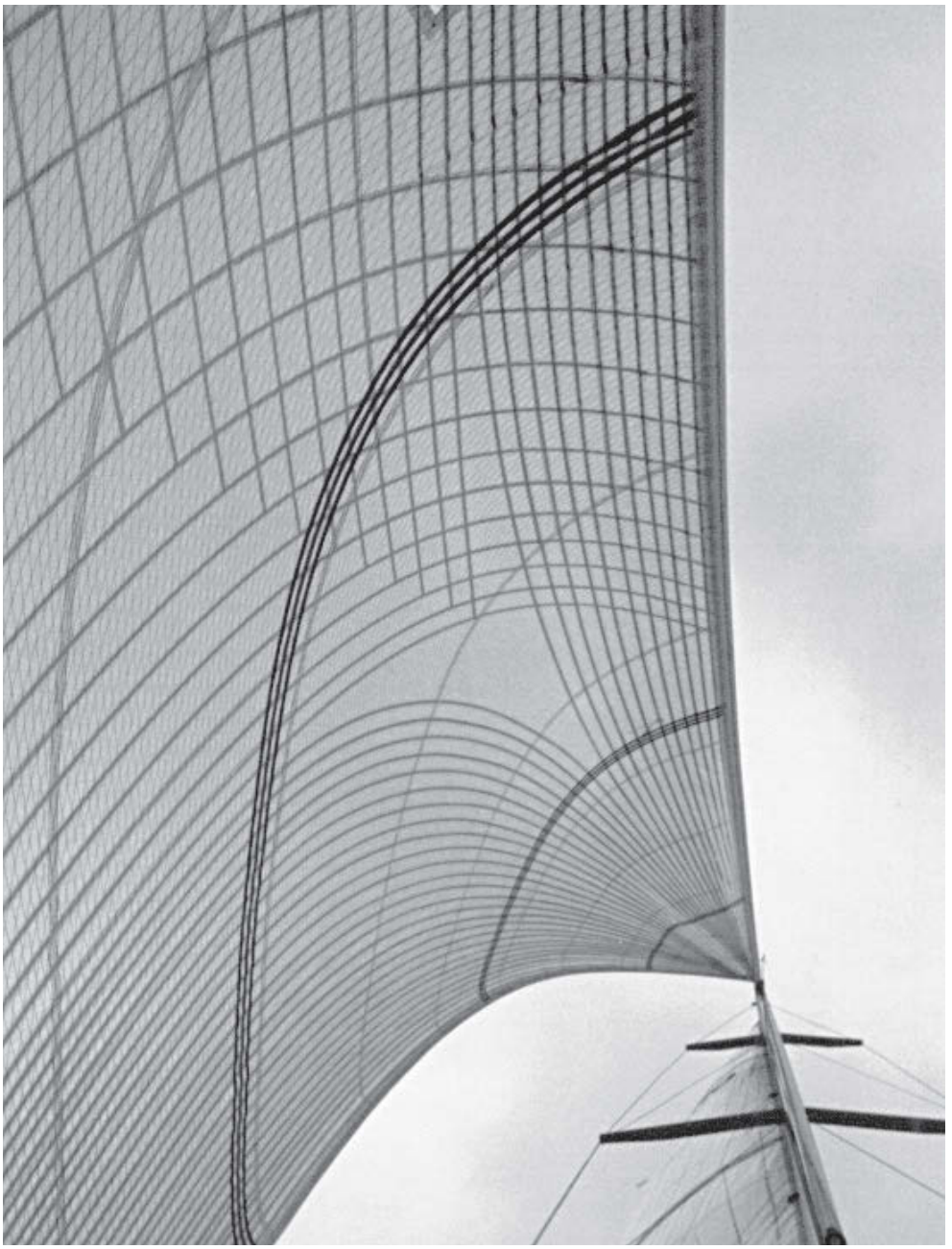
modest inventory — typically three to six sails — that can handle all anticipated conditions with competence.

Coastal cruisers should begin by deciding whether sailing efficiently in winds under 8 knots is important enough to justify the cost of specialized light-air sails. If you'd just as soon motor when boatspeed drops below 4 knots (and I don't mind admitting that I usually do), you can save a bundle by optimizing your sail plan for medium-to-brisk conditions. Many masthead-rigged cruiser/racers from the late '60s through the mid-'80s were designed with an eye to the IOR (International Offshore Rule) which favored tall, narrow mainsails set on very short booms. The foretriangle of these boats is disproportionately large by today's standards. If you set a genoa with substantial overlap (greater than 135 percent) in an effort to enhance performance in light air, the big headsail becomes a bear to handle in a breeze, especially when tacking repeatedly.

On the other hand, the same older boats with big foretriangles will often perform beautifully in 8 to 10 knots when powered only by a "lapper" of 105 to 110 percent, in combination with a big-roach mainsail for added power and enough extra sail area toward the back of the rig to prevent a lee helm problem from developing when there isn't enough force in the breeze to heel the boat to her normal sailing lines. Remember, because the typical keelboat is designed to sail upwind at a substantial heel angle, the forward force from the rig will normally be quite far to leeward of the center of resistance for the hull. This creates a couple which tends to pivot the bow into the wind *(shown below)*. Therefore, to compensate for the reduced heeling force associated with a smaller headsail, the center of effort of the



When a sailboat heels, the forward propulsive force from the sails is offset to leeward of the backward resistance created by water flowing past the hull. More heel produces greater lateral separation between these opposing forces and generates more weather helm.

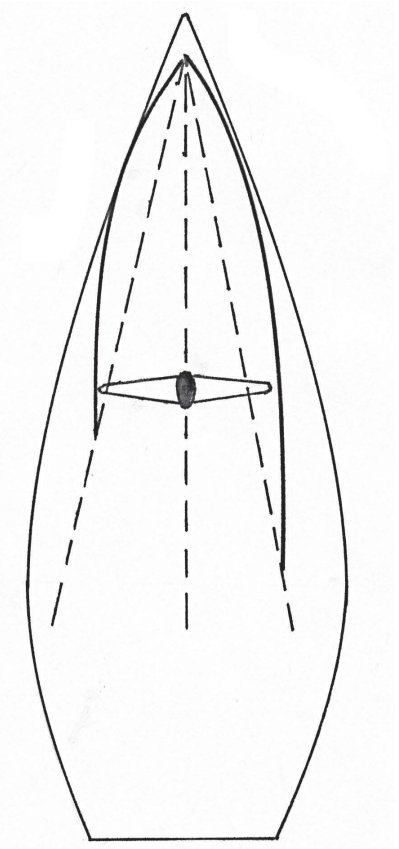


entire rig will usually need to be shifted aft — hence the enlarged mainsail roach. Conversely, when the boat begins to heel too much in a stiff breeze, the rule is always to de-power from back to front; readily accomplished in most cases by flattening the main, easing down the main traveler, or putting in a reef as required.

Another key to success with the "smaller jib approach" is getting a lapper with enough built-in draft to set well in moderate air. A #3 heavy-weather jib that's as flat as a board in anything less than 20 knots true, simply won't do the trick. What you want is around 10 percent average draft just as soon as there's enough breeze for the sail to fill. The challenge, of course, is to prevent the narrow lapper from becoming too full once the breeze builds enough to induce appreciable headstay sag. This is where an adjustable backstay and contemporary, low-stretch sail construction will really pay off. A good modern lapper in combination with a big-roach, reefable cruising main will enable most keelboats to sail upwind or close reach with good speed in winds from around 7 knots up to the mid-20s.

Another necessity for good results with the "small jib" approach is a low-drag propeller. Replacing a fixed prop — still the norm on a majority of cruising sailboats — with a folding or feathering model is typically worth at least half a knot in light air and, unlike a big genoa, will pay speed dividends in strong winds as well. In terms of expense, upgrading the prop generally falls in the same ballpark as replacing a genoa.

One caveat: the sailor who races and cruises needs to approach the headsail size decision with extra care. Boats that were sold as racer/cruisers in the '60s and early '70s were often designed for monster 170 percent genoas that overlapped almost the entire length of the main boom. It's difficult to justify carrying a sail of this size. Its effective wind range is too narrow because the mainsail traveler cannot be eased down without choking the slot, and the outsized genoa is laborious to grind in after tacking. Still, traditions die hard in sailing, and the



Bands of super-strong Kevlar are bonded to the surface of this high-tech sail in a pattern that highlights the actual load paths within the sail membrane (above). A genoa with substantial overlap (right) will wrap around the shrouds and spreaders allowing it to be sheeted to a tighter angle (starboard side). A "lapper" (port side) is limited to a wider sheeting angle, which may, to some extent, impair its pointing ability.

history of big overlap genoas goes back to the CCA (Cruising Club of America) rule which pre-dated the IOR. CCA rule-makers recognized that overlap area is considerably less efficient than headsail area within the open foretriangle, but erred in allowing this overlap area to be almost "free" in handicapping terms. Naturally, when the wind is light, even inefficient sail area will contribute a bit more speed. On the other hand, as soon as there's a significant rating penalty involved, the benefits of this minor speed gain tend to dim.

Later, as the IOR gathered steam in the late '70s, standard genoa size became fixed at 150 percent. Today, most PHRF organizations continue to adhere to this template, although the trend in modern lightweight raceboats is to even smaller overlaps. If you race from time to time, and a 150 percent genoa is the norm in your fleet, then you'll probably need one, too. In addition to extra area, an advantage of the 150 percent genoa, as opposed to say, a smaller 135 percent sail, is that it wraps around the shrouds to a greater extent and can, therefore, be sheeted to a tighter angle for higher pointing *(see illustration at left)*. However, this extra height (pointing ability) is a subtle thing, and will only be noticeable if the boat also has a clean bottom, efficient foils, and a satisfactory arrangement for inboard sheeting.

Finally, if you routinely sail downwind in "no flying sails" mode (without spinnakers, Gennakers, a-symmetrical spinnakers, and so on), you'll need to consider the suitability of your big headsail for running, as well as for upwind work. Downwind speed using white sails is mainly determined by the projected area because, when sailing wing-and-wing, the rig functions in a stalled condition. A larger sail can potentially generate more power, but only when propped out by a whisker pole about equal in length to the sail's LP. A standard spinnaker pole (equal to the length of the foretriangle base or J measurement) is considerably too short to make an efficient whisker pole for a 150 percent genoa, although it works well with a lapper.

Furling sails

A great many cruising boats these days are equipped with headsail furling gear, and sailors who do not already enjoy this convenience will, more often than not, put it high on their wish lists. Mainsail furling has become a popular option for new boats but is rarely considered for old ones, because retrofitting generally involves either a complete new mast or an expensive in-the-boom system.

Most hank-on headsails can be readily converted for furling by cutting off the luff tape and replacing it with a boltrope luff. Depending upon the age and condition of the sail, it may also be worth adding UV-protective strips along the leech and foot. However, this addition is fairly expensive, especially when costly acrylic fabric (such as Sunbrella) is used; and it adds considerable weight to the sail's leech. Often, it's better to let the sun do its worst to the old rag for a season or two while saving up for a new sail designed specifically for the furling system.

Roller furling is easier on sails than dropping and bagging them. It also pretty much eliminates the perceived need for soft, flexible sailcloth, because these sails are rarely handled on deck. Unfortunately, many new furling genoas are still being built from soft, relatively stretchy fabrics which are essentially identical to those used 20 years ago, despite the fact that superior materials, such as cruising laminates, are now available.

Roller reefing using headsail furling gear is not without its problems despite numerous attempts to develop an "ideal" system. A partially-rolled headsail typically becomes baggy and distorted because the head and tack areas get wound in a little ahead of the center of the sail, and because there's no effective way to retain luff tension once the sail is "reefed." Some high-end furling systems now feature double swivels at the head and tack, so only the aluminum extrusion is linked directly to the furling drum.

Alternatively, some sailmakers will sew tapered foam luff pads or a staggered array of extra bolt ropes just behind the luffs of their furling sails. These approaches can improve the reefed shape of a purpose-built furling headsail, but the results won't compare to a second, smaller sail designed specifically for brisk winds. On the other hand, cruisers have been known to circumnavigate using just a single furling/reefing 135 percent genoa. I wouldn't feel comfortable with this choice.

A decade ago, the notion of racing with furling gear was considered almost laughable. This attitude has changed, thanks largely to the near-universal acceptance of this gear for high-profile single-handed events like the Around Alone (former BOC) and the Vendée Globe. True, these are predominantly offwind races that put a premium on simplified sail handling, but the speed losses associated with furling headsails are smaller than you might think. A reduced luff length is unavoidable, but can usually be kept in the neighborhood of 18 to 24 inches, if care is taken to mount the furling drum close to the deck.

Because sewn-on sunstrips are expensive and add extra weight toward the back of the sail, sailcloth manufacturers have developed UV-resistant finishes. This alternative is

An excessively low clew makes this genoa difficult to trim correctly, especially in light air.

probably most suitable for seasonal sailors in temperate climates, or as secondary protection for working sails that experience heavy use on offshore passages. Another solution is the sock-type sail cover with a full-length zipper that can be hoisted on a spare halyard after the headsail is furled. This kind of cover will protect any sail you set from the furler now and in the future.

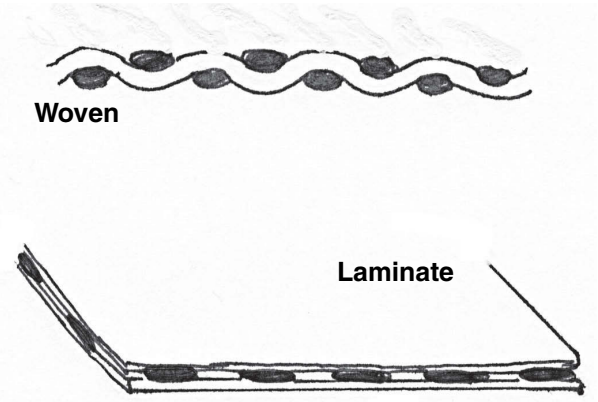
The inevitable gap between the foot of most furling headsails and the deck/cabintop is often cited as a strike against furling sails, but in reality, the importance of an "end-plate effect" is generally overrated. To effectively restrict cross flow beneath the headsail, the front half of the foot needs to literally lie on the deck. Even a six-inch gap eliminates most of the benefit. A low-clewed racing sail will achieve this extra measure of efficiency, but at the cost of poor visibility to leeward and the risk of blowing out the sail from a solid wave impact.

High-clewed sails are also less prone to twist excessively when the sheet is eased off for reaching and are generally less "twitchy" to trim. Just remember that the lead position will be further aft with a high-clewed sail of equal overlap, so be sure that the deck hardware can accommodate this. In most cases, the jib tack should be as close to deck as is feasible, and the clew as high as can be reached conveniently. The old-style furling genoa with a foot that parallels the deck will neither set nor furl as well, but some sailmakers still favor them because they are easy to build using a basic crosscut panel layout.

Dedicated racers often favor twin-groove furling systems, with split drums that can be removed when the boat is in competition mode. With multiple halyards and a twin-groove foil, the crew can perform inside/outside changes to maintain full racing speed at all times. By recutting the luff, a retired racing genoa can often be converted into a satisfactory furling sail for cruising (perhaps freeing up funds for a new racing sail).

Sailcloth and sailmaking

Sails are tensile structures similar to a mesh hammock which supports a person's weight using a network of strong cords. Even when one edge of a sail is uniformly supported by a stay or mast, the stresses tend to radiate from the corners and are most concentrated near the head and the clew. Sailmakers deal with this concentrated load by adding extra layers of material (corner patches); different fabrics for different parts of a sail; and, in some cases, bands of strong fibers which are applied directly to a lightweight foundation material during sail fabrication.



The crimp in the yarns of a woven sailcloth will inevitably tend to straighten under load, causing an extra measure of fabric stretch. In contrast, the primary reinforcements in most laminates are sandwiched between layers of plastic film and are virtually crimp-free.

Hot racing sails these days are reinforced by exotic stuff like Kevlar, Vectran, and PBO (phenylene benzobisoxazok) — super strong, stretch-resistant materials that have pretty much superseded polyester (i.e., Dacron) except where restricted by racing-class rules. These fibers are many times more costly than polyester, and with materials typically representing around 30 percent of the price for even a basic crosscut sail, the use of advanced fibers can lead to rather terrifying price quotations. Too often, club-level racing deteriorates because one or two fleet members are prepared to spend a bundle on high-tech sails, thus buying a major competitive advantage.

On the other hand, there's now a strong case for building sails out of the more economical polyester laminates as an alternative to traditional woven Dacron. Laminates ordinarily incorporate a layer of Mylar film (polyester in thin sheet form) which forms a stable foundation for the material and greatly enhances resistance to stretch on the bias (i.e., diagonal). Furthermore, in a laminate the principal load-bearing yarns lie flat on the surface of the film in contrast to a woven sailcloth with yarns that zig-zag over and under one other (*see above*). By eliminating this crimp, the laminate gains superior stretch-resistance, even when similar materials are used. In terms of both cost and performance, there's less benefit to using high-tech fibers to construct woven sailcloths so, little by little, laminates are gaining favor.

In most racing laminates, the primary reinforcements are flattened fiber bundles sandwiched between two films. In most cases they take the form of an open mesh or scrim, with spaces between the yarns to promote secure adhesive bonding between the outer layers. So-called cruise laminates usually substitute a layer of taffeta — a lightweight woven polyester fabric — for one of the outer films. The taffeta boosts tear resistance, but also increases weight and cost while contributing almost nothing to bias stability. What it does do is create a laminate that more closely resembles conventional sailcloth, and for this reason some cruising laminates have taffeta layers on both outer surfaces, plus at least one Mylar layer inside. From the viewpoint of sail performance, this is not the best way to go, except perhaps for offshore sails that are likely to suffer exceptional chafe and weathering.

Since the early '80s, computerized design and panel-cutting systems have become important tools for many sailmakers. With a computer-aided design system feeding information to a full-scale plotter or automated cutter, the speed and accuracy of sail production — be it crosscut, bi-radial, or whatever — is significantly improved. On the debit side, this specialized equipment and software is

expensive, as well as challenging to use, update, and maintain. Even in the computer age, there remains a niche for the "cottage industry" sailmaker, largely because there's still demand for basic crosscut Dacron sails which can be built inexpensively using nothing more than some hand tools and a good sewing machine.

Although the majority of the small lofts now use a computer for design work, quite a few have not yet taken the more costly step into automated cutting. Nearly all the heavier woven Dacrons favored for cruising sails are fill-oriented styles with the largest yarns extending across the width of the sailcoth roll. These materials are only suitable for conventional crosscut sails. By and large, if you want the superior shape retention of a bi-radial or tri-radial panel layout, you'll need to abandon all-woven materials in favor of laminates. These more complex layouts can only be constructed efficiently with the aid of computerized sailmaking tools, and even so there's greater fabric waste and more assembly time involved. These factors help explain the higher cost of laminate sails, despite the fact that laminating is actually quicker and potentially less expensive than weaving. The price premium ranges from about 25 percent using all-polyester laminates to 50 percent and up when advanced materials become involved.

There is, however, one group of "high-tech" reinforcing material that deserves serious consideration by mainstream owners of larger boats: the ultra-high-modulus polyethylenes, including Spectra, manufactured by Allied-Signal, and Dyneema, made by DMS. These fibers are stronger, pound for pound, than Kevlar and far superior in terms of fatigue, chafe, and UV resistance. Their main shortcoming is a tendency to "creep" or stretch permanently when subjected to high, sustained loads — a real problem for minimum-weight racing sails that are often pushed close to their limits. On the other hand, for a more conservatively-built sail, brief load peaks caused by knockdowns or other mishaps will not cause creep and permanent deformation.

Hard-core racing sails need to be as light as possible so they will fill more easily in zephyrs, and contribute less to speed-sapping weight aloft when the wind pipes up. However, the cruising sailor or casual racer shouldn't worry much about sail weight — shape stability and robust construction are far more important. There's no question that Spectra laminate sails offer both superior shape stability and much larger safety margins than polyester sails of similar weight.

Choices

The owners of older sailboats are as diverse as their vessels, making it extremely difficult to generalize about sail needs. Inshore cruiser, bluewater sailor, casual racer, or serious competitor — each must evaluate the existing sail inventory, set priorities, and come up with an affordable schedule of sail replacements. A first-rate modern main or jib has the potential to give good service for 15 to 20 years of seasonal, inshore cruising, so it's not unreasonable to regard good sails as long-term investments.

Laminate sail materials and radial layouts represent a genuine improvement over traditional cross-cut Dacron sails, but have been slow to gain popularity within the cruising community due to a 20- to 50-percent price premium and nagging concerns about durability and repairability. This is not to say that a conventional Dacron sail will necessarily have a longer useful life, or that a "high-tech" sail will be impossible to repair at sea. However, the first of these "new generation" cruising sails have not yet seen a decade of use, and despite some positive indications from solo marathon racing, the longevity issue has not been settled to the satisfaction of most cruisers. Sailmakers generally sell what their customers want, and many are happy to keep building sails the "old-fashioned way" as long as there's a call for functional, economical sails and personal service.

At one end of the size spectrum, a small-boat sailor with a microscopic budget will likely have a hard time rationalizing anything but basic Dacron. Boats over 45 feet will nearly always be better served by laminate radials (although offshore voyagers may still elect to play it safe for a few more years). That leaves the owners of the mid-sized good old boats with the difficult decisions . . . but at least we have more, and better, sail options than the original owners ever did.

Many cruising boats, both new and old, will perform very nicely in moderate air using just a well-cut lapper and a large-roach, full-battened main.

Quit

by Steve Christensen

You're all settled in for the night in that well-protected cove, when the wind picks up. What had been a nice quiet anchorage is now alive with motion as the wind causes the boats to weave back and forth on their anchor rodes. Your boat rolls and jerks from one "tack" to another, and you begin to worry about what all this motion is doing to the set of your anchor. Your nice quiet evening is now anything but restful.

Most people call this weaving back and forth "sailing at anchor." But my favorite nickname for the activity is "horsing around" because the image it creates is so descriptive of the motion. And while the name may sound like fun, the motion it describes can lead to real problems.

What causes this phenomenon? For most boats, the center of effort (or windage) of the topsides and rigging is well forward of the underwater center of lateral resistance. This means the boat is out of balance while on the hook, and doesn't really want to weathercock. Whenever the boat drifts backward during a gust (or there is a slight change in the wind direction) the bow will fall off faster than the stern, putting the boat broadside to the wind. Once that happens, the bow continues to fall off, and the boat will "sail" away in the new direction, up to as much as 30 to 40 degrees off the wind, until brought up short by the rode.

It seems as if the boat should eventually settle down, given a steady wind. But in reality, the wind is never steady in either direction or strength for very long. During the lulls, the boat is drawn forward by the weight of the rode (creating slack), only to fall back and turn broadside during the gusts.

Why all the concern? Well, at the very least, all this weaving back and forth can make things uncomfortable down below. More importantly, it is quite possible for two boats anchored side by side to get "out of phase" while sailing at anchor and actually collide. We witnessed this a few seasons ago while anchored in Bear Drop Harbor in the North Channel on a day with gusty 25-to-30-knot winds. Two nearby anchored boats began to sheer, on opposite tacks, and exactly out of phase. The boats kept getting closer and closer with each tack as the skippers looked on helplessly. A collision was avoided only when one skipper broke the cycle by letting out more rode.

By far the biggest concern of "horsing around" is the effect it has on the set of your anchor. The shock loads

horsing around!

Use a riding sail to steady your boat at anchor

on the rode from coming up short on opposite tacks are practically at right angles to each other, and all this stress can eventually break the anchor free. Even if the anchor holds, the sideways motion at the bow can chafe right through a nylon rode in a few hours.

So, if you want to sleep better at anchor, you need to do all you can to reduce this sailing at anchor.

But what *can* you do? While we've never tried it, a couple of skippers we have met swear by anchoring *stern-to*. This places the center of effort behind the center of resistance, and keeps the boat steady. (It also looks *really* weird.) The downside is that some boats are not very seaworthy stern-to, and most companionways are not designed to be very weatherproof from the stern. So I would worry about being caught in a storm anchored backward, but in fair weather it seems to work quite well.

The best thing you can do to reduce "horsing around" while at anchor is to use a riding (or anchor) sail. We first learned about riding sails by reading Steve and Linda Dashew's *The Bluewater Handbook*. It seemed like a good idea, so we had a local sail loft make one for us, and have used it every night at anchor since. The ability of a riding sail to reduce horsing around is just amazing and has to be seen to be appreciated. On that day in Bear Drop Harbor when many of the other boats were sailing up to 40 degrees off the wind, our riding sail kept the bow of our Ericson 38 to within five degrees of the wind direction. Considering how well they work, it is surprising that you don't see more of them being used. (We've only seen *one* other riding sail in 10 seasons of cruising the Great Lakes.)

Just what is a riding sail? It's essentially a small and heavily built mizzen, rigged on the backstay, and sheeted forward. The added windage of the sail brings the overall center of effort well aft of the center of lateral resistance. Now when the boat drifts backward during a gust and the bow begins to fall off to one side, the effort of the wind on the riding sail quickly pushes the stern in and brings the boat back head to wind.

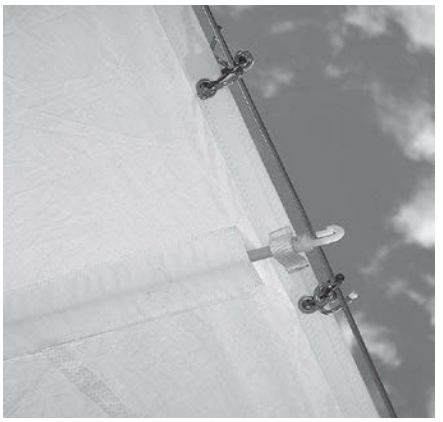
A riding sail should be constructed board-flat, of heavy (4- to 8-ounce) cloth, with a hollow foot and leech to reduce flutter, and a straight luff with hanks for attaching to the backstay. Adding full-length battens to the sail is also a good idea to reduce slatting in high winds. As for size, a good rule of thumb is to have the sail made about the same size as a storm jib, or from 5 percent to 10 percent of the total sail area. In fact, you can use a storm jib on the backstay as your riding sail. And for that matter, ketches and yawls can achieve the same effect by just leaving their mizzen up (perhaps with a reef or two). But since whatever you use will be left up constantly while at anchor and exposed to a *lot* of ultraviolet radiation, it's a good idea to have a dedicated riding sail, and not subject your storm jib or mizzen sail to all that abuse.

How do you rig a riding sail? First, attach a pendant between the stern of the boat (the top stern rail works well)

Contacts

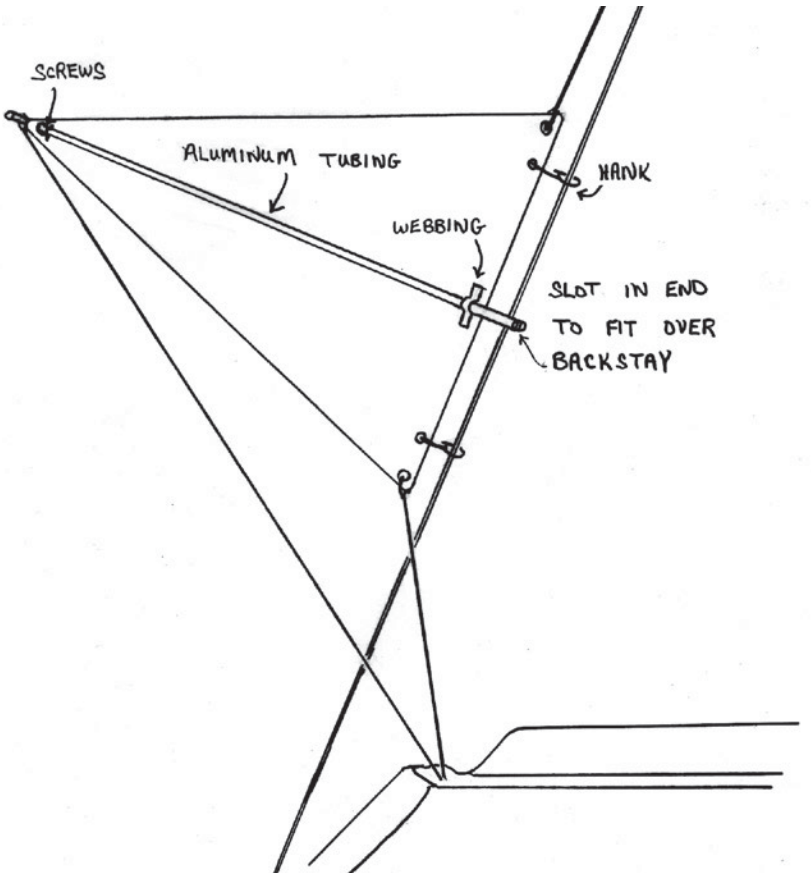
Kent Sails Co., 35942 Jefferson, Mount Clemens, MI 48045; 810-791-2580.

Sailrite, 305 W. Van Buren St., P.O. Box 987, Columbia City, IN 46725; 800-348-2769; <http://www.sailrite.com>



Rag Doll ***at left at anchor. Detail of her riding sail above.***

and the tack of the sail, long enough to keep the sail well clear over the cockpit. Then attach a halyard to the head and hoist the sail aloft. Finally, rig a sheet from the clew to a place on deck amidships, or — better, but more work — run a sheet to each side of the deck or cabin house. You can leave the sail flying free like this, but it will tend to slat a bit in high winds. So it's best to attach the luff of the sail to the backstay with a number of hanks.



Riding sails may not be common, but any sail loft can make one up for you. Or you can contact Sailrite, which markets a basic anchor riding sail kit with a 75-inch leech, a 58-inch luff, and a 72-inch foot (15 square feet) designed for boats over 20 feet. It costs between $68 and $73, depending upon the size of the snaps needed to fit your backstay. This kit was just upgraded to use Top Gun sailcloth, rather than Dacron. This makes the sail hold up much longer.

Our riding sail came from Kent Sails, in Mount Clemens, Mich., and is 150 inches on the luff, 124 inches on the leech, and 62 inches on the foot (26 square feet) with seven hanks along the luff.

Kent Sails designed our current riding sail with a fiberglass rod running between the backstay at the luff and the grommet at the clew. This rod does a nice job of stiffening the sail, and keeps it quiet in high winds. But more than that, this unusual design has the interesting feature of holding the clew out away from the backstay, in much the same way a wishbone boom on a sailboard holds the clew of the sail out from the mast. With the clew held out taut, you can swing the sail around on the backstay to point aft, which not only gets it out of the way of the cockpit, but has the advantage of putting the sail's center of effort even farther from the bow, making it even more effective at keeping the boat steady.

If you already have a riding sail with hanks on the luff and would like to try this arrangement, it's a simple matter to modify the sail to be able to point aft. All it takes is a few feet of hollow aluminum rod, a short piece of webbing, and a couple of sheet metal screws.

First lay out a line between the luff and the clew, perpendicular to the luff, and mark where the line meets the luff. Then buy a length of hollow aluminum rod that is at least 6 inches longer than this line, and slightly smaller in outside diameter than the clew grommet (so the rod will slide through the grommet). Using your sail repair kit (you *do* have one aboard, don't you?) sew about 4 inches of 1-inch webbing to the side of the luff at the position you marked, with

Modifications to the aft-pointing sail.

enough slack to hold the rod. (The purpose of the webbing is to keep the rod in position on the backstay.) Then cut about a half-inch-deep slot into one end of the rod so the end fits over the backstay.

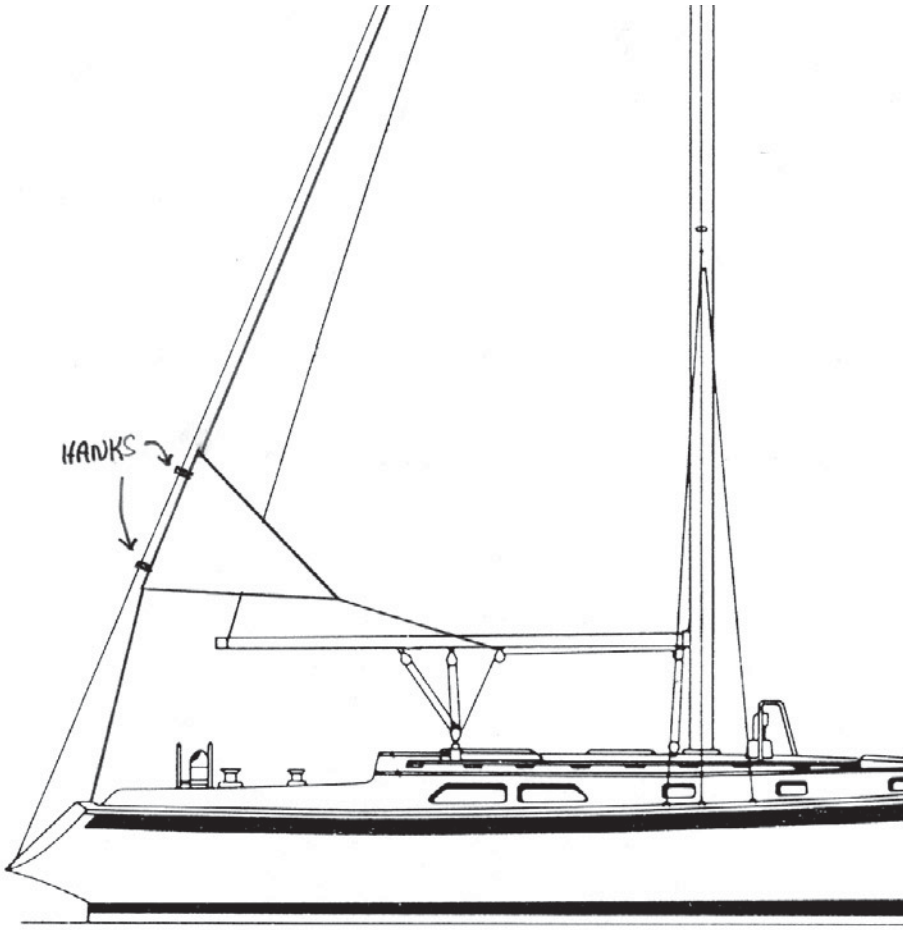
The final step needs to be done with the sail hanked onto the backstay and hoisted taut. Slide the slotted end of the rod through the clew grommet, through the luff web loop, and over the backstay. Then pull the clew out taut, and mark the point on the rod where it enters the clew grommet. Remove the rod and mount a couple of sheet metal screws at that point on the rod, which will keep the clew from sliding down the rod toward the backstay. Next, cut the excess rod off about 4 inches beyond the screws.

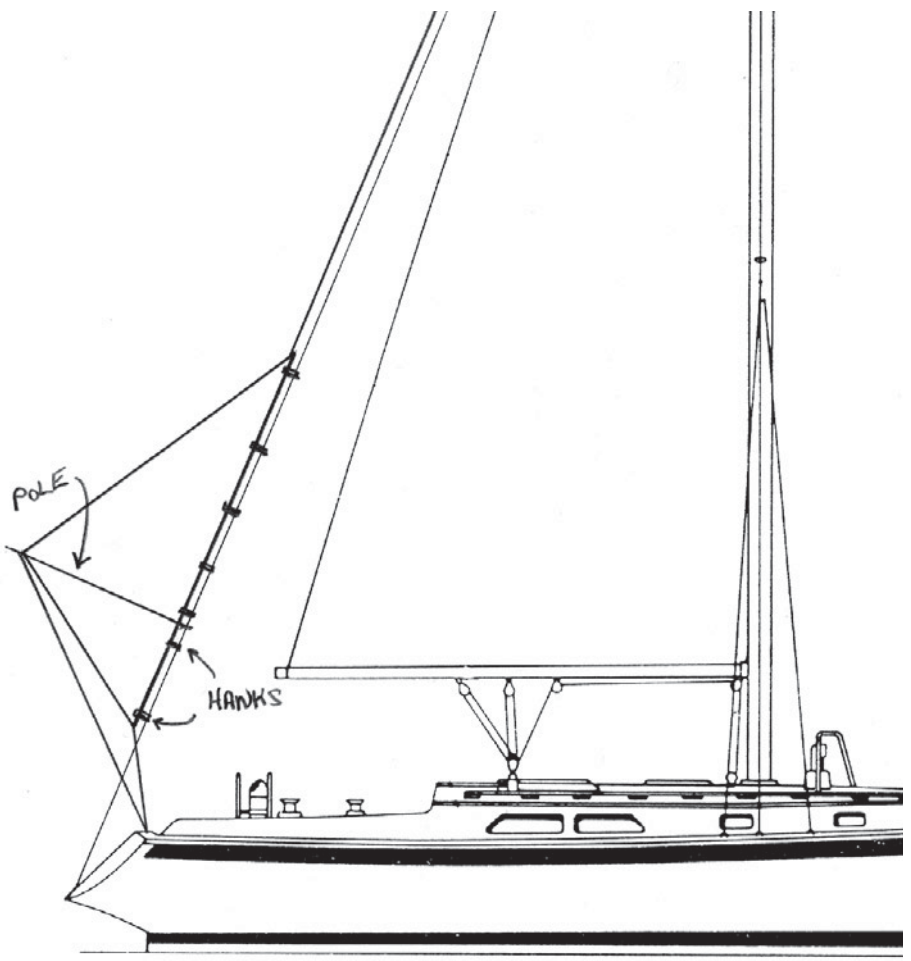
When you now place the slotted end of the rod through the web strap, then the other end through the grommet up to the screws, and finally slide the slot over the backstay, the clew should be held out nice and taut. Finally, just rotate the whole sail aft, and add a sheet from the end of the rod to each corner of the stern rail. Using rolling hitches for each sheet makes it easy to adjust the centering of the sail. And that's it — you're done.

A nice side effect of any riding sail is that it makes your boat easier to find in a crowded anchorage, as there aren't too many boats out there with big white triangles at their sterns. (This has come in very handy when returning by dinghy from a late evening ashore and trying to find our boat by flashlight.) Our unusual aft-pointing rig is also very sociable, in that we usually have at least one sailor in each anchorage stop by to ask about it. Last summer we even had the skipper of a nearby Alberg 30 so intrigued that he spent an hour trying to construct a similar rig using his storm jib and a telescoping awning pole. At one point when things weren't going too well and the pole fell to deck for the second or third time (there was no webbing at the luff to hold the pole in place) he good-naturedly called over, "Look what you started!"

Whether you choose the traditional forward-sheeted arrangement, or the unusual aft-pointing rig, I highly recommend you consider using a riding sail to steady your boat at anchor. Leave the "horsing around" for on shore.

Steve Christensen and his wife, Beth, sail their Ericson 38, Rag Doll, *out of Saginaw Bay on Lake Huron and spend each August cruising the North Channel . . . with their riding sail.*





Traditional riding sail top right. **Rag Doll's** ***aft-pointing riding sail at right.***

The small convenience of a whisker pole

Petite pole packs plenty pull

by Ken Textor

Whisker poles have come a long way since I sailed up the Pleasant River, in Addison, Maine, using a battered broomstick to hold out the jib of my leaky little flat-bottomed skiff. It was fun, but this equipment and technique had it limitations. That was in 1980, and since then a lot of thought has gone into whisker-pole technology and construction. Today, even the best-equipped good old boat can benefit from another look at whisker poles and their uses.

If you've never used a whisker pole, don't be put off by a piece of equipment that seems designed for racers. You don't have to be an America's Cup champion to get the most out of your whisker pole. Cruisers can benefit tremendously from using them. And, even if you're already hooked on your aging, non-adjustable wooden whisker pole, you should use it properly, know what size is right for your boat, and understand the options you have if it should ever come to grief.

Whisker-pole basics seem deceptively simple at first. Basically, the function of a whisker pole is to extend the clew of the jib to windward when you're sailing off the wind. This prevents the jib from being blanketed by the main and helps shape the jib to get the most power out of it. Although a jib usually is not as efficient a down-wind sail as a spinnaker, when it is projected outboard to windward, it can add a significant amount of boat speed. While whisker poles are simple in concept, improvements have made them easier to use.

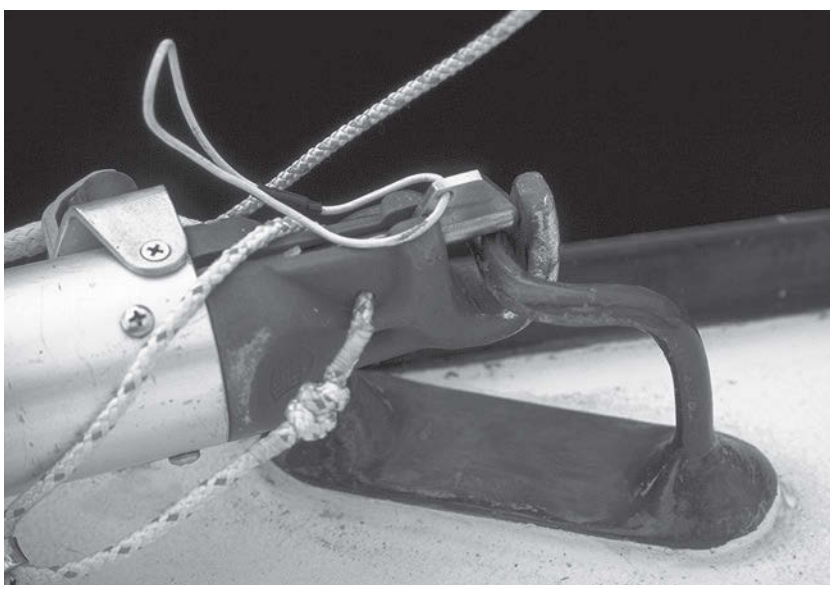
The basic set-up

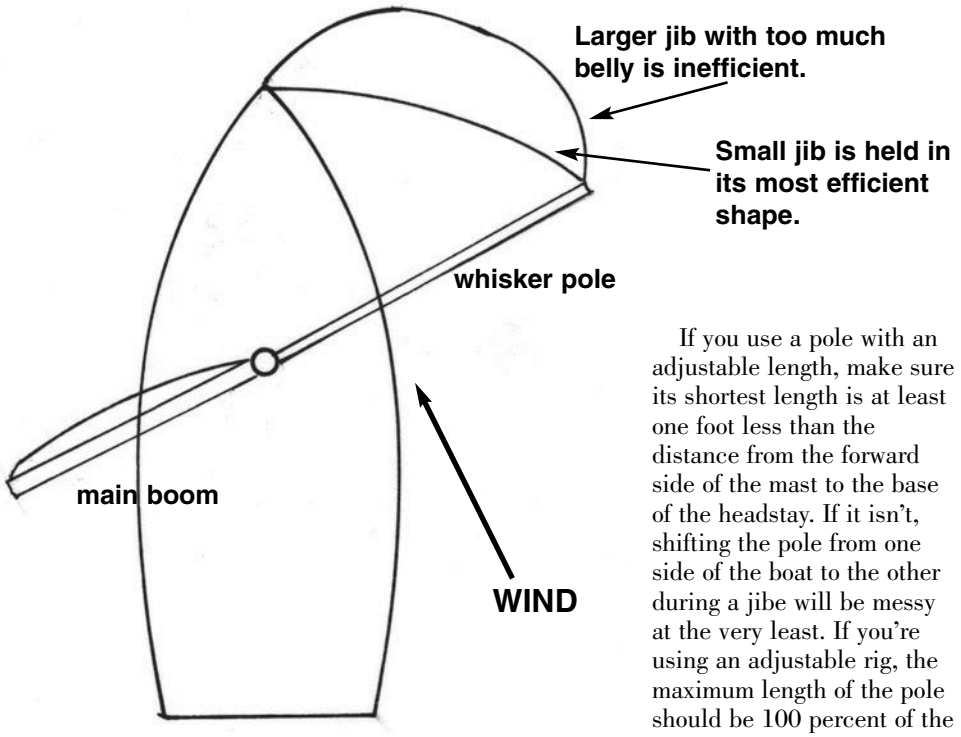
The first indication that you need to set up your whisker pole is a slackening of the headsail sheet. In most boats, this occurs when you're about 150 degrees off the wind. When the jib droops in the lee of the mainsail and the boat slows, it's time to put the whisker pole to work.

Occasionally, I've found wind or sea conditions too rough to set up the whisker pole, even though the sheets and foresail are drooping. A whisker pole is basically a light-air device, useful primarily in winds of 18 knots or less. Stronger winds make whisker-pole work too dangerous. Also, even in light air, I've learned rough seas from an offshore storm make it wiser to postpone the use of a whisker pole. Except for times when a highly skilled crew is aboard, the whisker pole should be employed only when the foredeck is relatively stable and dry.

When you're setting it up, first clip the whisker pole into the foresail clew or clew bowline. Then push the sail out to windward and attach the inboard end of the pole to the mast. The pole's narrow end should always be outboard; the thicker end, inboard. On larger boats, a whisker-pole topping lift is also attached to the outboard end before the clew is pushed out to windward. On most good old boats, however, the topping lift is unnecessary.

I'm not a spinnaker kind of guy. But using a whisker pole makes me think that somewhere in my subconscious lurks a spinnaker zealot. That's because it's always best to have the jib and whisker pole set on the side opposite to the main boom, just as a spinnaker pole is. This wing-and-wing setup offers the best results when the pole is trimmed so it lies essentially in the same plane as the boom, making it all look like a two-part spinnaker, as illustrated on the next page.





Keeping the whisker pole and the main boom on the same plane and perpendicular to the wind yields best results. Without a telescoping or properly sized fixed whisker pole, larger jibs work inefficiently. Fixed poles are best used in boats less than 35 feet in length.

Although the jib sheets are used for most adjustments, a topping lift and a downhaul (usually a foreguy) will help keep the pole in a fixed position and help shape the foresail for best results. On bigger boats, a pole car affixed to the forward side of the mast will help keep the pole precisely perpendicular to the mast.

Once the pole is rigged, you immediately get good news from your speed-indicating instruments. Normally, I can add nearly one full knot of speed to my aging wooden sloop's efforts. Although I still use an old-fashioned, fixed-length pole, I've been on boats with modern telescoping poles that often add more than a knot. For a long-distance cruise of, say, 300 miles, a whisker pole can get you to your destination a half day ahead of when you would have otherwise arrived. That may just get you into a safe harbor ahead of a nasty storm or at least in time to grab a cold one at the local sailors' safe haven.

If you use a pole with an adjustable length, make sure its shortest length is at least one foot less than the distance from the forward side of the mast to the base of the headstay. If it isn't, shifting the pole from one side of the boat to the other during a jibe will be messy at the very least. If you're using an adjustable rig, the maximum length of the pole should be 100 percent of the length of the foot of the largest foresail you plan to use.

When jibing with a whisker pole, the maneuver is best done by taking the pole down completely, adjusting the boat's course, and then reattaching the whisker pole on the new windward side. To take the pole down, simply reverse the procedure you used to put it up, detaching the foreguy first, then detaching the pole at the mast, taking off the topping lift, and so on. Be particularly careful taking down a pole that has come under increased load. In such a situation, the jib may try to yank the pole right out of your hands. To prevent that, the helmsman may have to bring the boat up a bit before turning off the wind.

To get the most out of the jib, be sure as much of it as possible is exposed to the wind. This is why some good old boats carried two whisker poles. One was for a large jib, the other for the small jib. Using an undersized pole is counterproductive.

Which pole and why

With the days of all-wooden whisker poles not that far behind us, I still believe they have a place on good old boats. For a boat less than 30 feet in length, a hefty, modified closet pole can make an inexpensive whisker pole. At a marine junkyard, you can always scrounge up appropriate fittings for each end of such a pole. For $30 or so, you can make a fixed-length whisker pole to practice with. Then you can decide whether something fancier, and more expensive, is worth it.

Once you're ready to move to expensive ($200 to $1,000) manufactured aluminum whisker poles, proceed cautiously. Make sure the whisker pole you buy is strong enough to handle the largest headsail on your boat in conditions that you would expect to encounter with that headsail. You can get load limits from the pole manufacturer and your sailmaker. If your boat's designer is still around, contact him. As a general rule, though: when in doubt, always choose a pole with a slightly larger diameter. Whisker poles get most of their strength from having larger tube diameters, not from small-diameter, heavily built tubes. So this is one case in which girth is good. Additionally, most adjustable poles have the maximum working length clearly labeled on the pole.

Whisker poles come in two basic varieties: fixed-length and telescoping. If you plan to sail with several jibs, you should consider a telescoping pole because you can adjust the length to get the most out of each sail. A telescoping

Resources

For more information on whisker poles and related equipment, contact these manufacturers:

Amco Marine Co., P.O. Box 915, Dover, DE 19903; 302-730-4566.

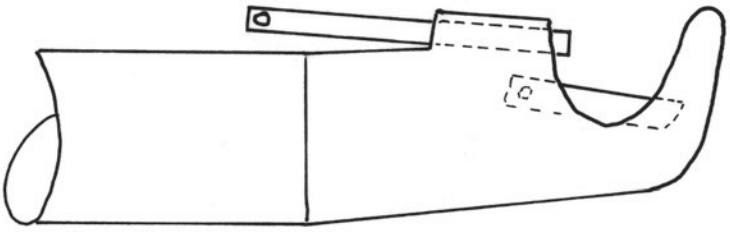
Atlantic Spars, 317 Chester Ave., Annapolis, MD 21403; 410-269-6042.

Forespar Products Corp., 22322 Gilberto, Rancho Santa Margarita, CA 92688; 714-858-8820.

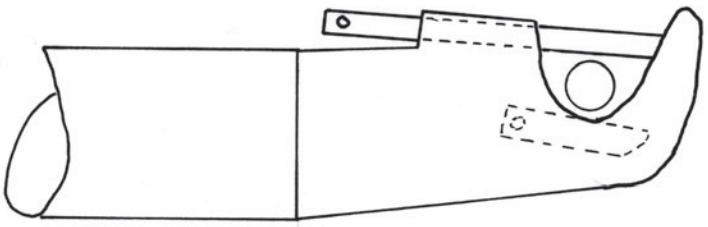
Hall Spars, 17 Peckham Dr., Bristol, RI 02809; 401-253-2552.

Harken Yacht Equipment, 1251 East Wisconsin Ave., Pewaukee, WI 53072; 414-691-3320.

Offshore Spar, 5200 E. Russell Schmidt Blvd., Chesterfield, MI 48051; 810-598-4700.



With the securing pin pulled back, the triggering mechanism moves up into place.



When the line drops into the whisker pole end fitting, the triggering mechanism is depressed, and the securing pin snaps shut.

Trigger-actuated whisker pole end fittings make setting up the gear quicker and safer.

pole consists of two tubes, one inside the other, and it will have one of three mechanisms to adjust the outer end of the pole: a pin lock, twist lock, or a line-controlled system. The line-controlled system is probably the best because it allows you to adjust the pole when you are standing close to the mast. The other two adjustment systems require that you stand somewhere near the middle of the pole to make the adjustment. This may not be a problem in light air, but when the wind is blowing a little, it becomes a more precarious location.

Additionally, a line-controlled adjustment system allows you to make an infinite number of settings. In contrast, the pin-lock system allows incremental adjustments of 8 to 12 inches. The pin-lock system features a spring-loaded button that pops into a preset hole in the outer tube of the pole. Of course, the line-controlled poles are the most expensive type, followed by the pin locks, then the twist locks, and the fixed poles.

A twist-lock pole operates on a "jam" system that wedges the two sections of the pole together. Like the line-controlled pole, this feature allows the pole to be adjusted to any length. Both the pin-lock and twist-lock poles are harder to adjust under load than the line-controlled pole. Be particularly careful when using pin- or twist-lock whisker poles. There are points at which you can get you fingers jammed in the mechanisms. Always relieve compression loads as much as you can before making adjustments or taking the whisker pole down.

For best results

Most whisker-pole tips have some sort of spring-loaded locking mechanism at either end. Although you can still find a pole with a blunt-pointed end that is inserted either into the clew grommet on the headsail or into a clew ring of some sort, most of these are used aboard small racing boats. They are also used aboard boats like mine, where the owner is a cheapskate and doesn't mind an old-fashioned mechanism that has no moving parts to break down.

Still, most poles these days have spring-loaded locking fittings on either end that are either hand-actuated or "trigger" style. A hand-actuated mechanism requires that you pull a pin back and hold it there while you attach the pole end to a jibsheet or to a mast fitting. A trigger mechanism lets you pull the pin back and set it there. The fitting's slot will remain open until it makes contact with a line or fitting, then the pin snaps shut.

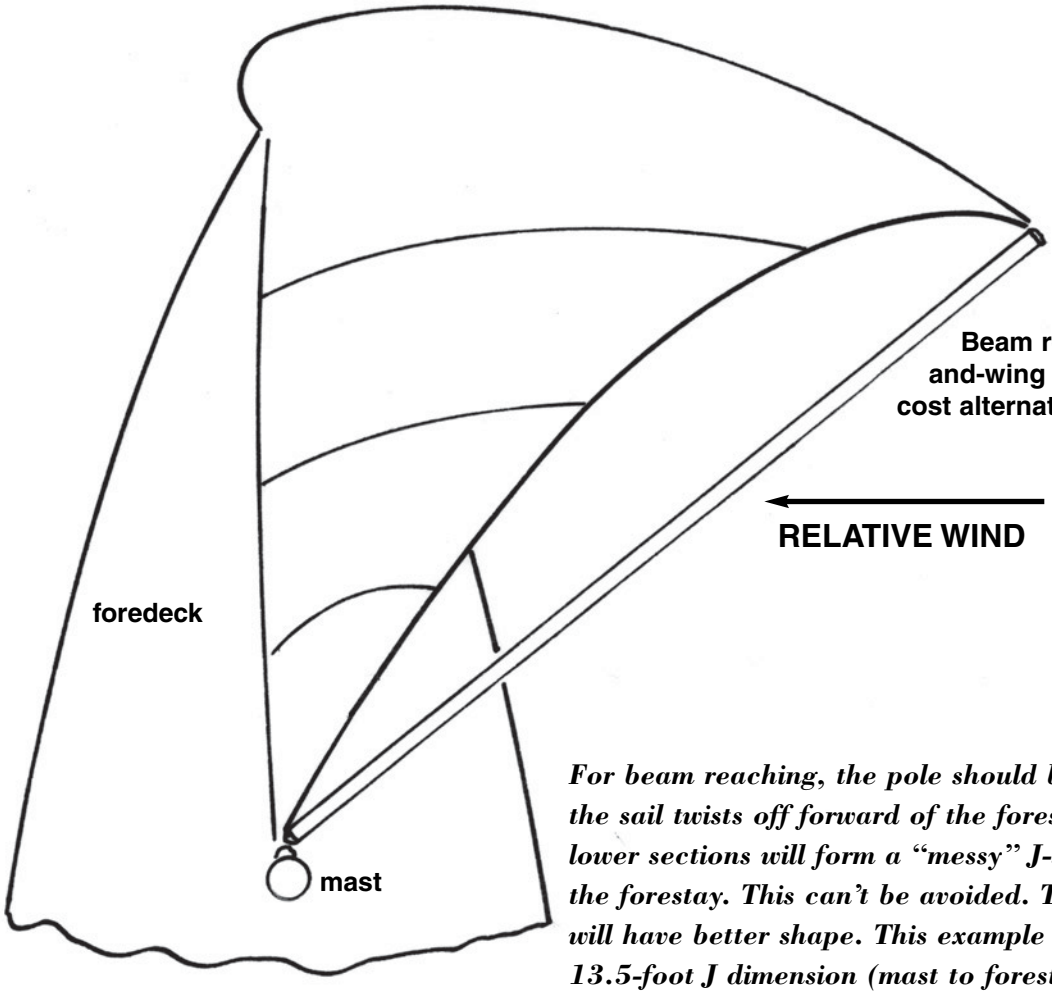
The majority of whisker-pole end fittings used to be made from cast aluminum with stainless steel springs and pins. But the newer poles made by Hall Spars and Forespar have composite machined aluminum end fittings that are as strong as, and half the weight of, the older cast aluminum devices. Carbon fiber fittings and poles are available but make little sense on any boat other than a dedicated racer's vessel.

For boats less than 35 feet in length, you may be able to use a large fixed pad-eye mounted on the forward side of the mast. However, for larger boats, a far better installation is a pole car mounted on a track attached to the mast. The more reliable pole cars use ball-bearing track systems.

Proper stowage of the whisker pole is also important. Many whisker poles are stored vertically on the mast. This has the advantage of placing it in service quickly, and the disadvantage of exposing it to salt crystal build-up which, if not cleaned regularly, can affect the pole's performance. To make cleaning easier, store the whisker pole attached to the inboard side of the boat's lifeline stanchions. Fittings to accomplish both of these stowage arrangements are readily available in most marine catalogs.

As noted, the bottom line for a new aluminum whisker pole can vary from just under $200 to well over $1,000, depending on your boat size, the pole's construction, adjustment features, and so forth. Also, you should add another 20 percent or so for additional gear you'll need to properly set up, control and stow the pole. Thus a whisker pole can be a major investment in your good old boat's rig. But once made, it's one relatively small pole that's guaranteed to vault you into the ranks of faster boats.

Ken Textor has lived and worked aboard boats for 22 years. In addition to work he did for the former Small Boat Journal, *he contributes to a number of sailing magazines and has written a book,* Innocents Afloat: Close Encounters with Sailors, Boats and Places from Maine to Florida.



Beam reaching with a jib set wing-and-wing is an interesting and low-cost alternative to specialized head sails.

For beam reaching, the pole should be carried well forward so the sail twists off forward of the forestay. The foot of the sail and lower sections will form a "messy" J-shape which hooks back into the forestay. This can't be avoided. The upper part of the sail will have better shape. This example shows a 17.5-foot pole with 13.5-foot J dimension (mast to forestay at deck level).

Not just for running anymore

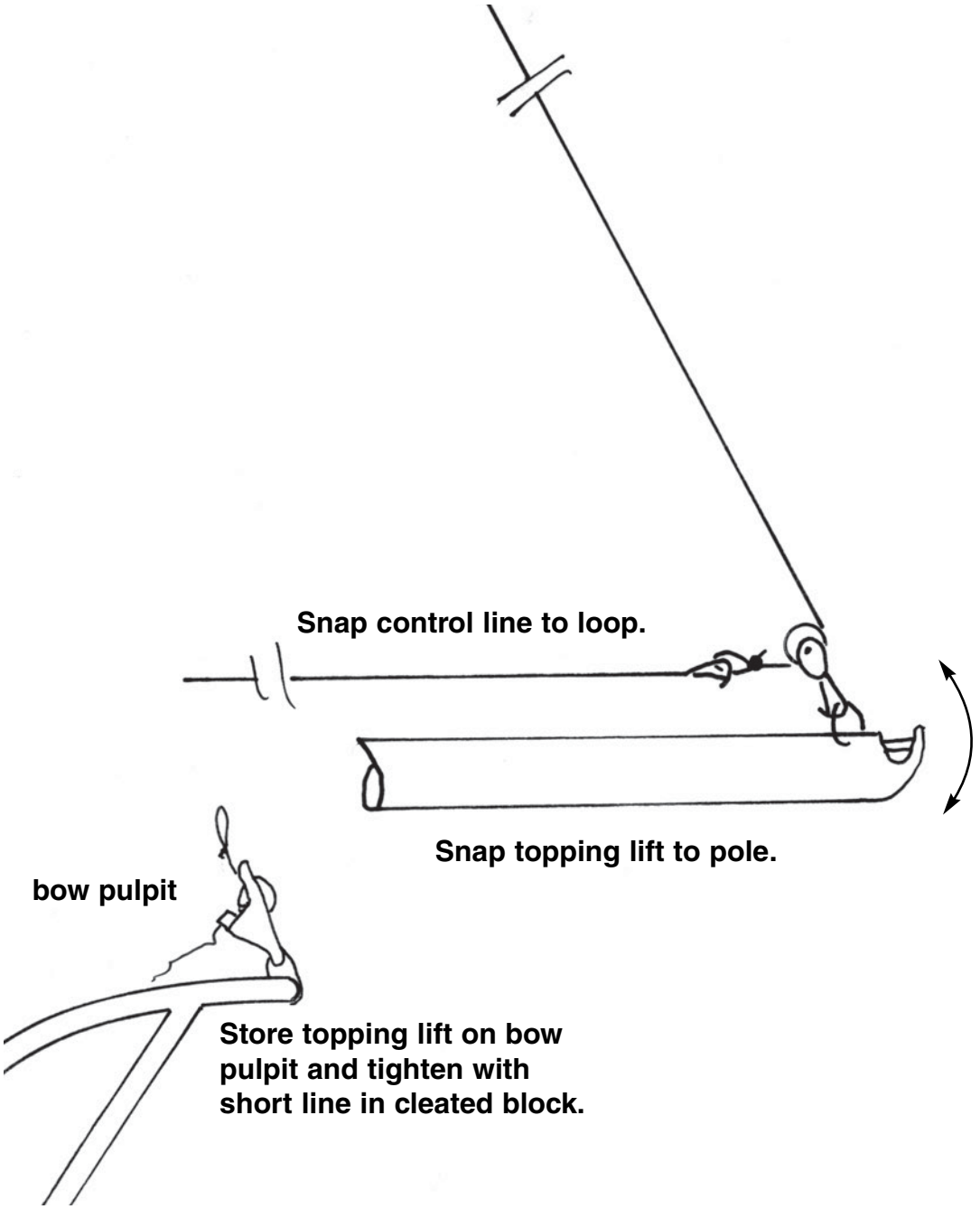
by Jerry Powlas

While normally thought of as a downwind technique, it is possible to sail wing-and-wing as high as relative wind abeam. Not only is it possible, it is quite desirable to do so. The boat will be very fast, and there will be a nice overlap in the highest sailing angle using wing-and-wing and the lowest effective sailing angle with the jib eased off and carried to leeward. Near wind abeam, the boat will be quite fast with the jib on either side.

You need a topping lift and some form of downhall to achieve this high pointing angle wing-and-wing. Neither of these needs to be complicated or expensive. When sailing at high relative wind angles, the pole must be quite far forward. The normal luff of the sail becomes the leading edge, and proper sail shape requires that the pole be topped quite a bit to allow the leading edge of the sail to form a fairly deep smooth curve all forward of the forestay.

The trailing edge of the jib (what is normally called the luff when flown conventionally) will look very bad, being hooked back out of the fair curve of the middle of the sail into the stay. Don't worry about that too much; there is nothing you can do about it, and the jib will pull very well even with this imperfection. Sheet the main in to something more like a close reach. It is sailing in the flow from the jib, and that flow will be from much farther forward.

Steer the boat as high as possible until the sail is on the verge of backing. There is no great loss of control if it goes aback, and a slight alteration of your course will bring it back. If you must sail higher than wing-and-wing will carry, head up, let the jib back, and then ease the windward sheet and let it blow through the foretriangle. This is a nice easy transition. Pull the pole last, or leave it up, if you think you may be able to roll down again soon.



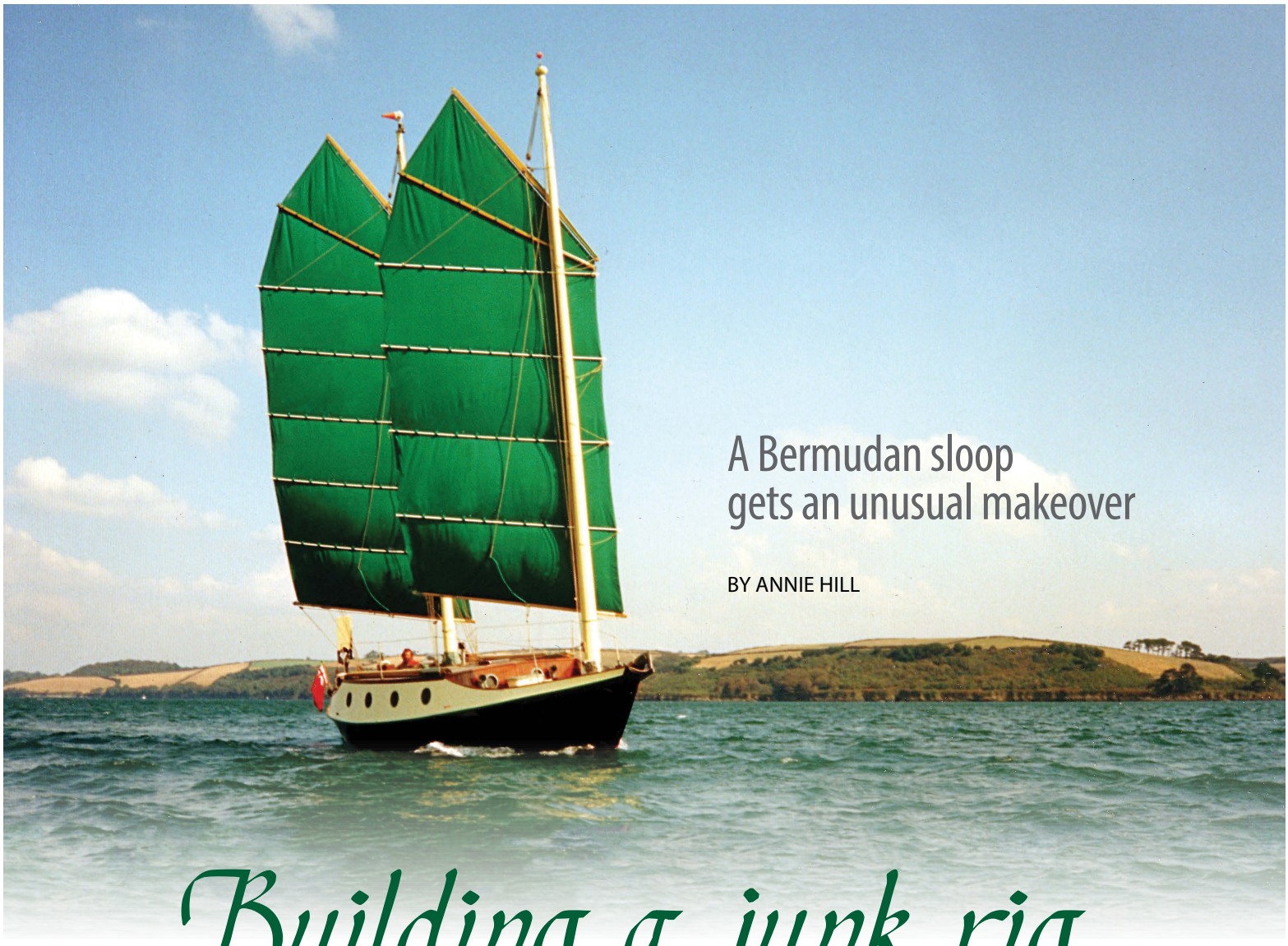
The normal way to install an adjustable topping lift is fairly invasive. I don't like to drill new holes in my spars because over the years most of the spar failures I've seen on most boats have started at holes that were added for new gear. Instead, we ran a line from a spare attachment point on the masthead crane down through a small block attached to a snap shackle. This line is stored on the bow pulpit ahead of the forestay *(see illustration above)*. When we set the pole, we snap the shackle to a loop on the pole end and snap another control line to a loop in the line from the masthead where it comes out of the block. This effectively extends the line from the masthead.

This second control line is led to a cleat on the mast or through a fairlead at the mast base to the cockpit depending on just how serious we really are about flying the pole. If a lot of pole adjustment is anticipated or we expect to be able to sail wing-and-wing for a long time, we run the control to the cockpit.

As the force of the wind increases, it pushes the middle of the sail forward and to leeward and makes the pole rise. This changes the sail shape and causes some loss of control and performance. We move the windward jib block well forward when sailing wing-and-wing so that it is more in opposition to the topping lift. The higher we point, the more forward we move the block. In this way it acts more like a foreguy downhaul on a spinnaker rig. This is particularly important in giving good control at high pointing angles.

I really enjoy flying spinnakers on racing dinghies, but in my opinion a spinnaker on a 30-foot boat would be a handful for the two of us, while sailing wing-and-wing on a beam reach is easy, safe, simple, and almost as fast.

Jerry Powlas is technical editor of Good Old Boat *magazine.*



A Bermudan sloop gets an unusual makeover

BY ANNIE HILL

Building a junk rig

For many years and more than 110,000 miles, I happily sailed aboard a 34-foot, junk-rigged plywood dory. This rig was brought to the attention of small-boat sailors by Blondie Hasler when he sailed his modified 25-foot Folkboat, *Jester*, in the first Single-Handed Transatlantic Race with a single junk sail. *(**Note**: For more about Blondie and* Jester, *see our article in the September 2002 issue. –**Eds**.)*

Although the rig bears many similarities to those used in Chinese working boats, Hasler's genius was in seeing how it could be adapted for singlehanding. In its ultimate setup, the sailor does not have to do any deck work at all: sail can be made, lowered, and controlled from one place with the operator almost entirely sheltered. Self-steering controls are also led within reach of this area.

The junk rig has so many advantages that, to those of us who have sailed with it, it's a continuing mystery as to why it has never caught on. The ease of reefing is incomparable — it takes longer to describe than to do. The sail is divided laterally by a number of battens that take the stress off the fabric. These battens are generally used to delineate each reef (although there is no reason to be pedantic about this) so the right amount of sail can be set for the prevailing wind. The ease with which this can be done means that, when sailing into or out of an anchorage, the boat can be maneuvered under easy canvas at a pace that allows time to think. As the sail is fully automatic, all that's required when tacking is to put the helm down, so the helmsman can concentrate on positioning the boat exactly where he wants it. This makes one much more likely to do things under sail, a source of great satisfaction to most sailors.

Junk-rigged boats have no wire standing rigging, thereby reducing cost, windage, and worry while enabling the sail to be fully squared away when running. This minimizes the chance of an inadvertent jibe and makes it possible to sail by the lee to an astonishing degree, making downwind sailing in a narrow, winding channel more relaxing than with other rigs.

Because the battens support the sail, the sailcloth needs to be neither strong nor particularly dimensionally stable, so fabric can be chosen for longevity and ease of sewing. This makes it easier for an amateur to make a sail. The lower battens along the straight leech of the sail are controlled by sheetlets controlled by the mainsheet. This reduces the loads on sheet and sail, so smaller rope sizes can be used.

Annie Hill and Trevor Robertson sail *Badger* off Falmouth, England, at the beginning of a cruise that lasted many years and covered many miles and instilled in Annie the love for the junk rig that she harbors to this day.

When it's lowered, the sail falls into lazy-jacks; all that's required is for the sheet to be hauled in to stop the sail bundle from being a nuisance. There's no need to tie the sail down (or to tie in reef points, for that matter) or even to cover the sail if it's made of waterproof, sun-proof cloth.

The junk rig's only drawback is that when the sail is made with flat panels and fitted to the typical short, fat cruising boat's hull, performance to windward is less than startling. Many people insist on citing reduced speed to windward as a disadvantage of the rig, but since the overwhelming majority of sailors appear to reach for the iron topsail when the alternative is to beat, I don't understand why people make such a fuss about it. In recent years, sailmakers have started to introduce camber into junk sails, making them much more powerful when close-hauled. Boats with these sails perform as well as their Bermudan-rigged sisters when beating to windward.

A yen for a junk rig

Since that unhappy day when *Badger* sailed out of my life, I had missed sailing with a junk rig. I am, I suspect, the world's laziest sailor. I enjoy the way of a boat under sail, maneuvering the boat in close quarters, even steering when daysailing, as long as the boat is going more or less in the right direction and there's lots to look at. What I don't enjoy is fiddling with bits of string or physically handling sails. I get frightened on the foredeck and a flogging sail turns my knees to jelly.

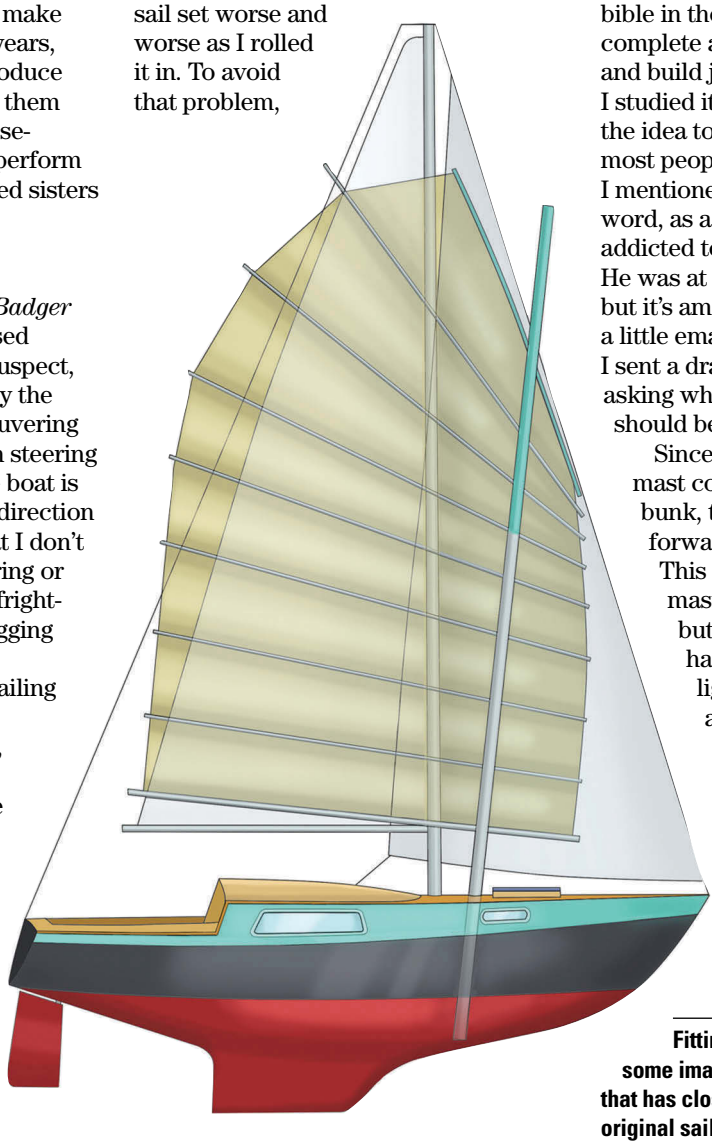
Alone after 35 years spent sailing as part of a couple, I decided it was time to have my own boat, to be able to do with it as I chose, and to be able to make my own decisions without compromise. Although boating is very popular in New Zealand, I was living on South Island where few boats were for sale. Reducing the choice even more, I had a very limited budget. At the time, there were very few junk-rigged boats in the country and the only one for sale was way beyond my means. Some will say my devotion to the junk rig borders on obsessive, but I included Bermudan rigs in my search. I found a boat, delightful in all other respects, that was only about 10 percent more than I could afford and, within a few weeks of first seeing her, became the owner of a Raven 26.

The boat was moored in Waikawa, more than 100 miles away, and to get her home I had to undertake a winter passage in the Cook Strait. Already during this first small adventure I had privately condemned her rig. While the roller-furling headsail was easy to use, the genoa car was not. If I didn't adjust it, however, the sail set worse and worse as I rolled it in. To avoid that problem, I put a reef in the mainsail instead. What a performance! The so-called "jiffy" reefing took forever. The internal halyard was led back to the cockpit and several trips were required to lower sufficient sail and then raise some of it back up. The logic of the system failed me. Surely it would be much easier to handle the halyard from the mast, as I had to go there anyway to wrestle with sail slides and hook the cringle onto the boom. By the time I had finished, I was contemplating alternatives.

A conversion is hatched

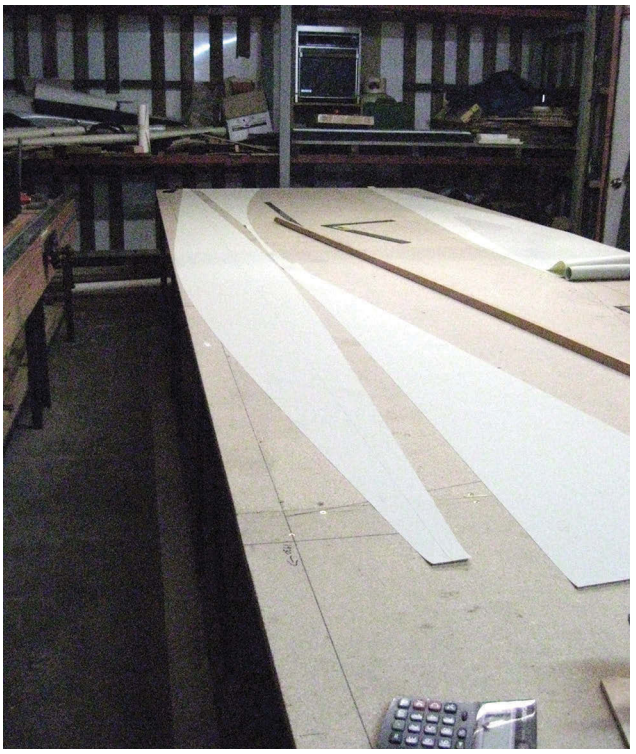
My onboard library contained a copy of *Practical Junk Rig* by Jock McLeod and Blondie Hasler. It's considered the bible in the world of junks. It shows complete amateurs how to design and build junk rigs for their boats and I studied it in detail. I generally kept the idea to myself, knowing what most people would think, but when I mentioned it to another junkie (an apt word, as adherents of the rig tend to get addicted to it), David was eager to help. He was at the other end of the country, but it's amazing what can be done with a little email and a lot of text messaging. I sent a drawing of the hull and rig, asking where the mast and mast step should be located.

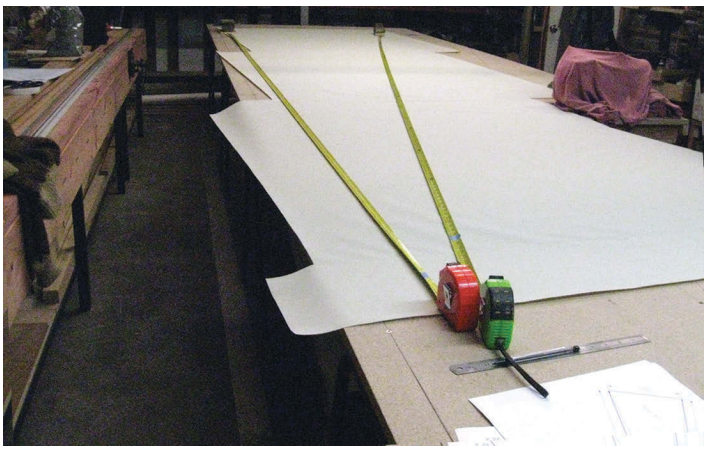
Since I was reluctant to have the mast come through the head of my bunk, the design was less straightforward than it might have been. This arrangement meant that the mast needed to be raked forward but, as this would help the sail hang out when running in very light wind in a slop, this was an advantage. I tend to emphasize this reason when asked about my forward-leaning mast. (To a friend who was shocked that I put comfort in harbor before sailing considerations, I pointed out that I would spend more time lying in my bunk in harbor than under



Fitting a junk rig on a Raven 26 took some imagination, but the result is a sail that has close to the same area as the boat's original sails and is much easier to handle.

ILLUSTRATION BY FRITZ SEEGERS





The panels of a junk sail of the type Annie made are joined together with lens-shaped pieces of fabric to give them camber, at left. When Annie was lofting the sails on the workbench by herself, at right, she used lead weights to hold down one end of each tape measure.

way!) As I find forward-raking masts on junks enchanting, I was delighted with this solution.

While David pondered, I toiled away at my drawings. I kept *Practical Junk Rig* at my elbow while working up a sail plan. One morning I opened my inbox and there was a PDF document with a perfectly executed sail plan. (David understands CAD programs.)

I had intended to do everything myself, but am not so foolish as to turn down the best of help for the worst of reasons. Another junkie, in the midst of refitting a 32-foot steel ketch in Auckland, offered me the use of a good sewing machine, a large table, and some "spare" sailcloth . . . enough to build the sail David had designed.

Suddenly, from toying with a future plan, I was committed to an imminent project.

I was shown to a superb workshop that included the large table on which I could lay out fabric. Then Paul, my kind host, went back to his boat. The first hitch came when I realized the table was insufficiently long for me to cut full-length panels from the sailcloth (a polyester awning material called Odyssey). As there was just enough material, I wanted as little scrap as possible. Paul (also at home with CAD programs) reckoned he could knock out patterns to minimize waste. This he did, and I got out the scissors and started cutting and sewing. This was fairly straightforward.

Loft and cut

I am not good at planning too many steps at a time, and I can find myself reaching a stage where I am unable to see where to go next. When I started to cut the material, I didn't know exactly how I would get to the end result. But once the material for the panels was sewn together, I could begin to see the whole process.

The latest thinking in the junk rig world is that it's possible and beneficial to put camber in the sail, eliminating the weaknesses that plague flexible battens. But things are not as you might expect: instead of the camber being along the *height* of the sail, it's along its *length* between the battens. There are several ways of achieving this. I used a method whereby lens-shaped pieces of fabric are sewn to the straight edges of the generally asymmetric panels.

The lenses decrease in size as they go up the sail and therefore require some basic lofting techniques, but the panels were more demanding. I started with the lenses to get the feel of things.

As the sail grew in size, Annie found herself shoving ever larger bundles of assembled fabric across the table as she sewed, at left. When she had completed most of the sewing, she suspended the sail from the boom, at right, to check her handiwork. The material is used for awnings.

This went well, so I began to loft and cut the panels. To do this, I had to measure the diagonals and — as the sail is more than 16 feet long from leech to luff — this was not straightforward. I found a couple of lead weights and weighed down one end of the tape measure while moving the other end.

As I cut the panels, I marked "top," "bottom," "luff," and "leech." For good measure, I added such notes as "to lens number 4." I tried everything I could think of to ensure that nothing went wrong with the assembly. Odyssey is coated on one side; the coated side is shiny and the other is matte. I also had to take into account that the panels could not be accidentally reversed. In fact, I only had to undo one seam: a batten pocket that I sewed on wrong-side-up. All my graffiti paid off.

The final cutting job was the batten pockets. I had decided to fit them full-length. Because my mast was to have a 6-degree rake, I had difficulty working out just where the battens would lie against the mast. This made it impossible to be sure where the batten parrels (that hold the battens against the mast and stop the sail from blowing away from the mast) would have to be tied. I opted to forget about this problem for the moment and cut away the necessary material when I bent on the sail. Because Odyssey is coated, it doesn't tend to fray.

Sew and finish

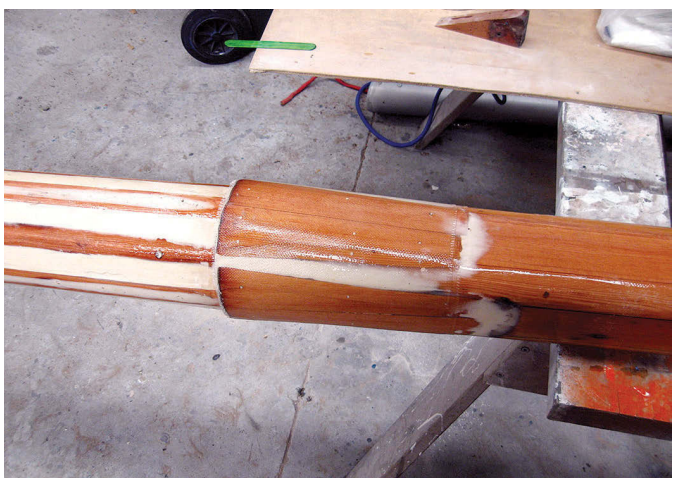
Once my pieces were cut, I was ready to sew. I started at the top, because those panels are smaller and easier to handle. In addition, the top of the sail is cut flat (as this is the area that stays up in heavy weather), so there were no lenses to sew. After that, I would sew a panel to a lens, sew on the next panel, then sew a batten pocket over the middle of the lens.

This way, I was working on the edge of the sail. It all went surprisingly smoothly, although my stitching was far from straight or regular. When I first started joining the panels, I rolled the sail I had already made into a tube, thinking this would be easier to push along the table, but it was reluctant to slide over the rough chipboard surface. Eventually I just shoved mountains of material back and forth. While this technique allowed the machine's foot to do its thing and feed the fabric through, it was far from perfect.

I attached boltropes at the foot and head, to enable the sail to be slid into the slots on yard and boom, and sewed webbing on the luff and leech. Then I reinforced the corners and cut off all the long ends. The sail was finished. I hoisted it up on its boom and was not displeased with the result. I should have added grommets above and below each batten so I could lace them together should a batten break or a panel tear, but I had none available and put it off for another day.

A new mast

Now that I had a sail, it was time to think about the mast. It might seem that the sloop's mast, longer than that required for a junk rig, would be ideal. Sadly, a junk's mast, being free-standing, needs to be of heavy wall thickness and, if aluminum, has to be free of holes. The mast section also has to be



Annie built the upper part of the mast of Douglas fir, top of page. To make the butt of this topmast round to fit tightly into the aluminum bottom part, she built it up with wood and epoxy, at left. She built up a shoulder the same way. Painted her favorite color, the topmast is complete, at right.

A friend with a large ketch helped Annie pull the old mast out of the boat, at right. The unstayed junk mast puts a lot of load on its partners, which must be built strongly and well supported, below.

more or less circular so stresses will be distributed evenly. I had to create a new mast for my boat.

I investigated new and secondhand lumber, alloy poles of various shapes and sizes, and even fiberglass. When the owner of a neighboring boat presented me with a broken Oregon (*that's Kiwi for Douglas fir* **–Eds.**) mast and a large beam of the same lumber nearly 5 feet long, I decided to go for a "hybrid" mast with an alloy base and wooden top. The longest length of 6-inch aluminum tubing I could buy was 19 feet 8 inches. I needed a 31-foot 2-inch mast and the topmast would need a bury of 1 foot 4 inches. I had just about enough wood. (If these measurements seem a bit odd, it's because I've converted them from the metric numbers I used.)

The local boatyard let me use their shed and they cut the old lumber for me. I went over each piece with infinite care because the boatyard owner had made it quite clear that if he damaged his saw blade or planer, I would have to pay for the resharpening or replacement of a tooth. Once it was sawn, we were all impressed with the quality of the wood. I scarfed the shorter lengths of wood together and glued them into two long lengths. I then glued these to the two lengths sawn from the old mast.

The next stage was to pull out the screws, fill the holes, and sand the whole thing down. I then had to shape the mast. Because of the way I had put it together, there was plenty of wood at the top, so I could remove excess weight there to create a pleasing taper. I worked down the mast, planing off more wood as I turned the sharp edges into well-rounded corners, ensuring that there was still adequate thickness of wood to maintain the spar's strength.

I now had a square-based mast that would have to fit in the round alloy tube. I filled out around the base to create an almost-circular section by fitting pieces of wood roughly to size and filling the gaps with thickened epoxy. Then I sanded the whole butt. I had bought an offcut of alloy tubing of dimensions similar to my mast and used this to ensure a good fit.

I filled screw holes and imperfections in the secondhand lumber and coated the mast with epoxy. The old wood soaked up plenty. Once it was well coated, I sanded it all down and covered it with a layer of glass and epoxy. This makes a very hard finish that can withstand the sawing back and forth of the batten parrels.

The next stage was to make a shoulder for the topmast, so it could rest securely on the alloy tube. Offcuts created when I scarfed the wood were useful here. This was then planed, filled, sanded, and glassed.

Low-labor singlehanding

I am 55 years old and 5 foot 1, so it's hard to overstate how essential the junk rig is to my ability to sail singlehanded without pushing myself beyond my comfort limit. Perhaps an example of a not-untypical sail will show this.

I left my anchorage one morning at 5:30 to sail 44 miles to another beautiful harbor. The wind was very light and I hoisted full sail. Once out of the harbor, I had to pass around an imposing headland, and in its lee the wind was very gusty. Some of the gusts were quite strong, so I dropped a reef. A couple of miles farther on, the wind settled down and I shook out the reef. About an hour later, I could see showers building. The first was preceded by a strong gust that had me dropping a couple of reefs. A little later, an even stronger squall hit and I dropped a further two reefs, but 10 minutes after that, the wind had eased and I shook one out. (To save the arithmetic, I now had 3 reefs in the sail!) I carried on like this for a couple of hours and, as I passed about the halfway point, the wind eased again and I shook out two of the reefs.

Half an hour later, we were under full sail but, 5 minutes after that, another squall pounced on us and back in went the reef. We stayed this way until the end of the day. We sailed the final 7 miles close-hauled while pointing as high as possible in about 15 knots of wind. Finally, we arrived at our destination and turned a corner to run toward the little nook I'd chosen. To reduce speed, I gradually dropped the reefs, sailing in and rounding up under just the top panel.

To have done all this with a Bermudan rig would have been exhausting. To have been in the same situation while never having too much or too little canvas set for more than a short while would have been impossible.

I ran a couple of wires up the mast — one for a tricolor light and one for an all-round steaming light — and painted the mast with pigmented epoxy, slightly thickened with silica, as an undercoat. Instead of making a masthead fitting, I glued some large hex-head bolts into the top, head down (I had left extra wood for this) and a large eyebolt for the halyard. I screwed stainless-steel eyes onto the bolts. (This caused a certain amount of tooth-sucking among various parties, with dire warnings about fatigue because the eyes are not meant to be used in this way. But they're very big!) Finally, I used the eyes to suspend the mast while I painted it my favorite shade of turquoise, the color I later used on my boat when I repainted her.

Out with the old

While waiting for glue to dry, I prepared for the removal of the old rig. New Zealand yacht clubs and marinas rarely have their own mast cranes, so masts are left in boats for decades, apparently without problems. The usual plan should have been to hire a crane, but this was going to cost several hundred dollars. Instead, I consulted with my friend Dick, who knows how to use low cunning instead of raw power. We brought my boat alongside his *Irene* — a large gaff ketch — and used her gear for pulling my mast.

Now I had to reinforce the deck, make a large hole in it, and fit substantial partners to take the side load from the mast. As the mast is a cantilever, the greatest loads are taken at the partners. I also needed to fit a mast step at the correct angle and distance from the bunk bulkhead to give the mast a forward rake of 6 degrees.

Had I made the mast step and partners out of wood, I would have ended up with very large structures, so I bit the bullet and asked a local metalworker to make them of stainless steel. Galvanized mild steel would have been as good, but there were local issues making that option just as expensive. So with plywood on deck, a hefty piece of mahogany below, and plenty of thickened epoxy, I fitted the partners.

I now had to line up the step. I dithered and measured and worried and fretted. Finally, I got the alloy part of the mast, stepped it through the partners, and marked as well as I could where the step should go. The mast seemed to have an excessive forward rake, but I took photos and measured the angle and it seemed to be about 6 degrees. With help, I got the heavy tube out again and started another round of fretting and worrying as the marks I'd made didn't match up with my earlier measurements.

I finally forced myself to bolt the step down. This was tricky because a previous owner had added some trimming ballast just where I wanted to fit my step and these random-shaped pieces of lead were very firmly secured with Sikaflex. Eventually, I filled in the gaps with huge amounts of epoxy until I had a solid layer into which to set bolts. Using the Gougeon method, I drilled oversized holes and set greased bolts into these, held in place by the step itself (also greased). When the glue had set, I backed out the bolts and cleaned up the step. Then I spread Simson's Marine Glue, stuck the step down, and replaced the bolts.

Stepping the new

This done, I brought the topmast out of the shed and spread Simson's glue over the butt. Using pieces of copper tubing as rollers, I moved it into the alloy base, which I had wedged securely on the pontoon. I had to get the mast into the boat quickly to avoid upsetting the marina management. I roped in several

While a boat alongside took the weight on a halyard, Annie and her helpers coaxed the new mast through the partners, top of page. In a marina populated largely with Bermudan-rigged boats, the junk sail stood out, at left. *Fantail* spreads her wing and shows her new livery on Pelorus Sound, facing page.

strong and willing friends. One moved his boat alongside mine, and we used his main halyard to get things started.

As his boat is smaller than Dick's *Irene*, we needed far more brute force and bad language, but at last we had the heel of the mast over the hole and quickly slacked away a little on the halyard. More pushing and pulling on deck and then we went below to haul the heel back. Once it was past the half bulkhead, it gave up the fight and, as it was slowly lowered, moved gradually down and into its step . . . to my profound astonishment. Rejoicing, we released all the lines, I tapped in some temporary wedges, and we all stood back to admire The New Mast.

Next was the exciting bit: bending on the sail. A friend came by as I was feeding battens into their pockets and offered to help. He was amused by my refusal and explanation that I was enjoying doing it on my own. I had a lot of fun playing with new rope, knotting, and whipping. There is plenty of string on a junk and my cambered sail required some lines I hadn't used before. The folds had a natural tendency to hang in diagonal creases and it took a bit of time to remove these. But finally I felt all was ready for a trial sail.

On a calm morning in early April, I started the motor, cast off the lines, and chugged out of my marina berth. I turned up the harbor and, with the last of the land breeze, shut off the engine and hoisted sail, ghosting through the marina and its rows of silent boats. Once in the Haven, we headed into the little breeze and the boat took herself to windward quite satisfactorily. We went through the entrance and out into Tasman Bay where the new sea breeze greeted us. As she lifted to the swell coming down from Cook Strait and heeled to the increasing wind, I looked up at the lovely sail, thrilled at what I had created. I tacked and jibed with nothing to do but move the tiller across. I dropped reefs and shook them out again. I felt in control and confident. The great fan rose above me and, like the little bird she is named for, *Fantail* ducked and swooped over the water.

I felt a profound mixture of relief and contentment . . . relief that it all worked, contentment because I was once again sailing with the rig I love so much.

Annie Hill has lived aboard boats since 1975 and doubled the Atlantic before the age of 21. She has sailed more than 160,000 miles and crossed the Atlantic 17 times. After crossing the Pacific in 2006, she settled in New Zealand in 2009 and bought her 26-foot Fantail. *After some time in South Island, she sailed to North Island where she happily lives and sails singlehanded. Annie is a fan of the junk rig and vows never to sail anything else again. Follow her adventures with her "junkie" friends at http://anniehill.blogspot.com.*

I've got the New sail

Happiness is finding a sailmaker who understands

by Bill Sandifer

Talk about confused! I've never been offered so many contradictory opinions in answer to one question. All I wanted was a new sail.

The boat I purchased recently came with a brand new mainsail and three headsails of different shapes. One was about a 150-percent genoa, very long on the foot with a leech that swept up to the head in a long curve.

Next was an 80-percent working jib that was notable for its high-cut clew. Last was a really small Yankee of unknown age. All of the headsails were old and in need of washing and repair. The Yankee was mottled with numerous rust stains. Its sailmaker has been out of business for more than 20 years, so the sail was at least that old.

After flying all three sails, it was apparent that not one was really usable for everyday use. They were either too large or too small. What I needed was a good, roller furling 125-percent cross-cut genoa. I had come to rely on the Schaefer 1000 roller furling on my previous boat and wanted the same level of safety and ease of handling on this new, larger boat. Adding impetus to the project was my wife's reaction to the 150 genoa the first time we flew it: "Get rid of it!"

My wife's a good sailor, but this sail, with its strange shape and long foot, was more than she wished to deal with. We decided to buy a new roller furling system and a new 125-percent genoa.

I called sail lofts. They supplied quotes based on their recommendation for sailcloth and weight. But here is where it gets complex.

Not so plain

Each loft uses a trade name and a weight for the cloth it proposes to use. We're not talking about exotic cloth here, just plain Dacron. But it turns out not to be so plain after all.

All sailcloth in the U.S. is manufactured by one of five companies: Challenge Sailcloth, Contender Sailcloth, Dimension Sailcloth, Performance Textiles, and Bainbridge-Aquabatten. All except Performance Textiles and Dimension Sailcloth originated from a single parent, Howe and Bainbridge Company, of Boston, which was the biggest original purveyor of sailcloth. People left Howe and Bainbridge to form their own companies. Dimension has a Dutch connection and Performance Textiles a Spanish one.

There are other overseas companies making sailcloth, and it varies in quality and type. To limit my confusion, I stuck to the U.S. suppliers. Given the fixed dimension of my rig and my preference for a 125-percent genoa, the dimensions of the sail and its area were determined to be about 300 square feet, plus or minus 10 percent. After that, nothing was easy.

"Given the fixed dimension of my rig and my preference for a 125-percent genoa, the dimensions of the sail and its area were quickly determined to be about 300 square feet, plus or minus 10 percent. After that, nothing was easy."

The sail lofts quoted Dacron cloth weights between 6.30 and 7.62 ounces with a 6.77 thrown in for good measure. Various cloths were offered: a 4800 Cruise from North, a Sails 5400 NorDac, a Challenge High Modulus, a Challenge High Aspect, a Marblehead and more. What is the difference and what does it all mean?

First, the weight of the sailcloth will vary, from lot to lot, as much as half an ounce, so you might be quoted a 7.3-ounce Challenge High Modulus and actually get a cloth that weighs 6.8 ounces. Half an ounce is about as close to the designed weight as the manufacturer can make it. Second, weight within a range is a relative factor. True, a 5.4-ounce Challenge High Modulus will be lighter than a 7.3-ounce Challenge High Modulus, but a 6.77-ounce Marblehead may serve as well or better for a particular sail than the 7.3 Challenge. It may also set better and feel softer.

More expensive

High Modulus cloth is used for headsails and mains. High Aspect is used for mains, roller mains, and high aspect jibs. It's more expensive than High Modulus but serves better in particular sail designs. Marblehead cloth is more expensive still, but it serves well for gaff mains and miter-cut genoas because it has a softer "hand." To further confuse the issue, there are laminated cloths made for racing and performance cruising, but we will not consider them here.

Usually, a cruiser wants a durable, softer sail that will hold its shape and last a long time. The racer will want a faster sail with a smoother, harder surface even if it will not be long-lasting. The answer to sail life lies in

blues

material itself and the way the sail is designed and built.

Sailcloth may be woven as balanced or unbalanced. In balanced cloth, the yarn is close to the same denier (a measure of density or weight) in the lengthwise (warp) and crosswise (fill) width. The warp yarns run in the direction that the cloth runs through the loom. Because the yarns are so long (the length of the roll of cloth), it is more difficult to control the tension of the warp yarns, so warp strength is lower for a given yarn size. The fill yarns are shorter (only the width of the loom) thus it is easier to control their tension. It may seem confusing, but by using fewer heavier yarns in the warp, which is not generally as highly tensioned, it is possible to make unbalanced cloth that has more nearly equal strength properties in both directions.

To increase warp strength it is normal to decrease the count and increase the size of the warp yarns. This cloth is often used to take greater loads which radiate up from the clew along the leech, and it is often used for radial cuts. Cloth with opposite characteristics may be called high-aspect fabric. High-aspect jibs and mains need this strength. High-aspect cloth is often selected when the sails are of cross-cut design. The manner in which the sail is designed dictates the way in which the loads will be distributed within a sail. Sail lofts now use computers to design sails, but there is still a bit of art in knowing how to apply the computer results to building a good sail. The choice of sail cut and appropriate material is part of this process.

The standard cross-cut sail is the simplest and lowest cost sail to build. With the proper material selection it is a very satisfactory sail indeed. The miter-cut sail is really only a valid alternative when the buyer wants a certain "look" on older boats and replicas. The cut served a purpose once in the history of sail design and manufacture, but it is no longer an appropriate choice for best use of modern fabrics. The radial-cut sail is a more difficult sail to build, and when it is made from modern laminates, it may offer some performance advantages. It is argued by at least some sailmakers that the radial cut offers little advantage in cruising sails made from woven Dacron.
Pick your expert, take your choice.

Recommended cloth weight

Boat length in feet	Cloth weight in ounces
<11	3
12-15	4
16-20	5
21-26	6
27-31	7
32-38	8
39-48	9

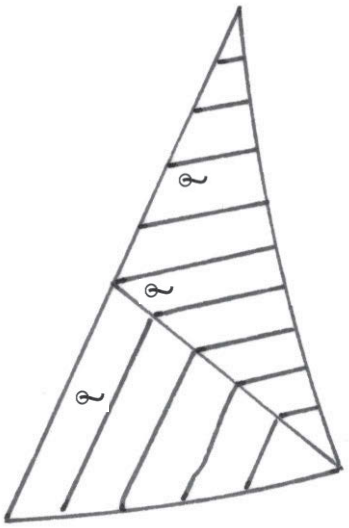
In detail

What, then, does all this mean? It means you can purchase exactly the sail you need only if you communicate in detail with the sail lofts.

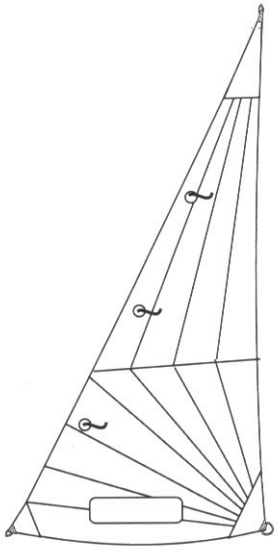
The first important question to answer is what use you wish to make of the sail. Is it for day-sailing, club racing, coastal cruising, or bluewater sailing? Approximate recommended sail weights for boat length are shown on the table as a guide to start a discussion with your sailmaker, but it is only a guide. The table is useful if you want a lightweight sail, and the sailmaker suggests a 9-ounce cloth for a 30-foot boat. You will be able to challenge his choice and maybe consider another sailmaker.

The value of the table is to allow you to talk sensibly to a loft. In my case, I am now able to say I'm seeking a 7-ounce genoa for bluewater sailing for my 31-foot boat.

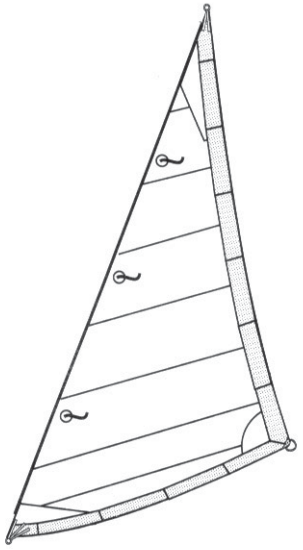
The next question concerns my expectations for the sail. Is it long life, low price, speed, UV resistance, roller furling, and/or finally, size? Do I want a 150-percent genoa, a 125-percent



Miter cut



Radial cut



Cross cut

Vendor experiences

Loft	Size	Material	Delivery	Price	Comments
A	135%	6.3-oz Dacron	3-4 wks	$1,653	Unknown loft, foam luff, Sunbrella
B	130%	7.62 HA	5-6 wks	$1,583	Excellent discussion from the loft, foam luff, Sunbrella
C	125%	7.62 HA	3-5 wks	$1,552	Foam luff, Sunbrella
D	125%	6.77 Marblehead	6 wks	$1,612	Miter cut, foam luff, Sunbrella
E	130%	4800 Cruise	3-4 wks	$1,733	Cross cut, foam luff, Sunbrella
F	120%	6.53 HM	3-5 wks	$1,459	
G	125%	Hayward 7-oz English cloth	6-10 wks	$1,800	Foam luff, Sunbrella

genoa, a blade jib, a light air spinnaker, or drifter? My own requirements are for a long-lived, UV-resistant, roller furling, 125-percent genoa.

Once I had defined my needs and communicated them to the sail lofts, I asked them for quotes. It's up to the sailmaker to make a recommendation to meet my requirements. The second table shows the wide variety of sails offered in response to my inquiry.

Price ranges

The prices ranged from $1,190 to $1,800, with an average price of $1,495. Out of eight lofts quoting, three were near the average price. If I excluded the highest and lowest price, the average price became $1,598 which left five lofts to consider (A, B, C, D, and F). I eliminated the lowest-priced sail based on the experience of a fellow sailor who had used the loft's services in the past and was not pleased. I also eliminated the highest-priced sail based on price. It did not offer anything the others didn't offer and was just plain expensive. The loft was full, I guess.

Now here's the tough part. Of the five, one was quoted through a discount house and the actual loft building the sail was unknown (A); one sail was smaller than 125 percent (F); one was a miter-cut sail that I decided I did not want (D). This left B and C as finalists. Both offered 7.62 High Aspect cloth, cross cut with a foam luff and Sunbrella UV protection on the foot and leech. One loft was six hours away, and one was two hours away. In addition, the nearer loft spent considerable time on the phone discussing my requirements and explaining their approach to building a sail. A fellow sailor who does lots of offshore racing also recommended them. I placed my order with loft B.

You may ask: "Why didn't you just go to this loft in the first place?" I have greater confidence in my choice of sail. I know the price was fair, and the sailmaker understood my needs and will be available if I have a problem.

No discussion

The discount lofts were only a little cheaper than the selected loft, did not offer detailed discussions of my sail, and seemed to say, "Here — buy it."

An interesting note is that another of the unsuccessful lofts, even nearer to my home port, quoted a lower-grade cloth for a higher price with little or no discussion. It is a well-known loft, but I got the feeling my order was "small potatoes" and did not merit much effort.

Mine may not be the large order craved by a large loft, but **my** sail is very important to **me**. The selected loft treated me as if my sail was also very important to **them**.

I know I did not select the cheapest, fanciest, or most expensive. I selected the sail and the loft that best suited my requirements, and this gives me confidence that the finished sail will provide weeks and months of good service in the years to come. As I was writing this, I received a call from the selected sailmaker saying he will be near my marina this weekend and would like to stop by my boat to check all of my sails and answer any questions. This was an unsolicited, but welcome, call and reflects the level of service I expected but had not requested. I believe I'll have a satisfactory relationship with this loft for all of my sail needs.

Yes, the time I invested to gather information and quotes on my new sail was worth it.

Bill is a marine surveyor/boatbuilder who's been living, eating, and sleeping boats since he assisted at Pete Layton's Boat Shop in the '50s. He's worked for Charlie Morgan (Heritage) and Don Arnow (Cigarette). And he's owned a commercial fiberglass boatbuilding company (Tugboats).

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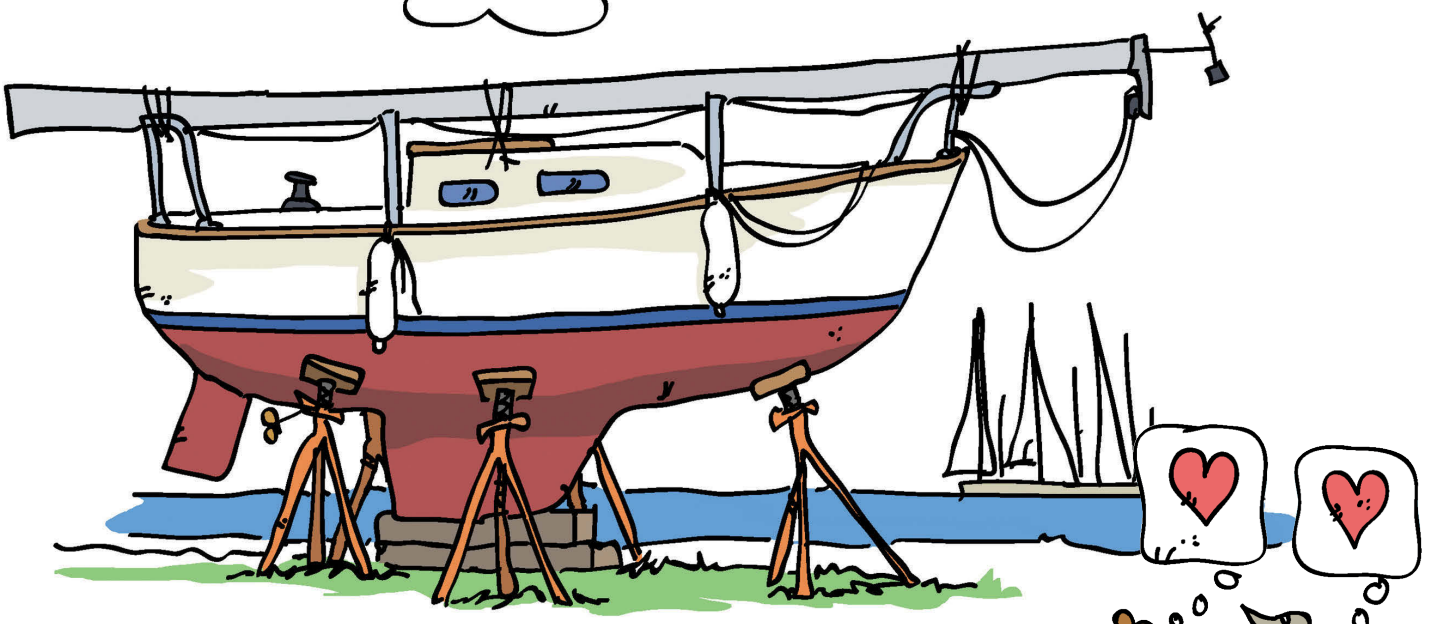

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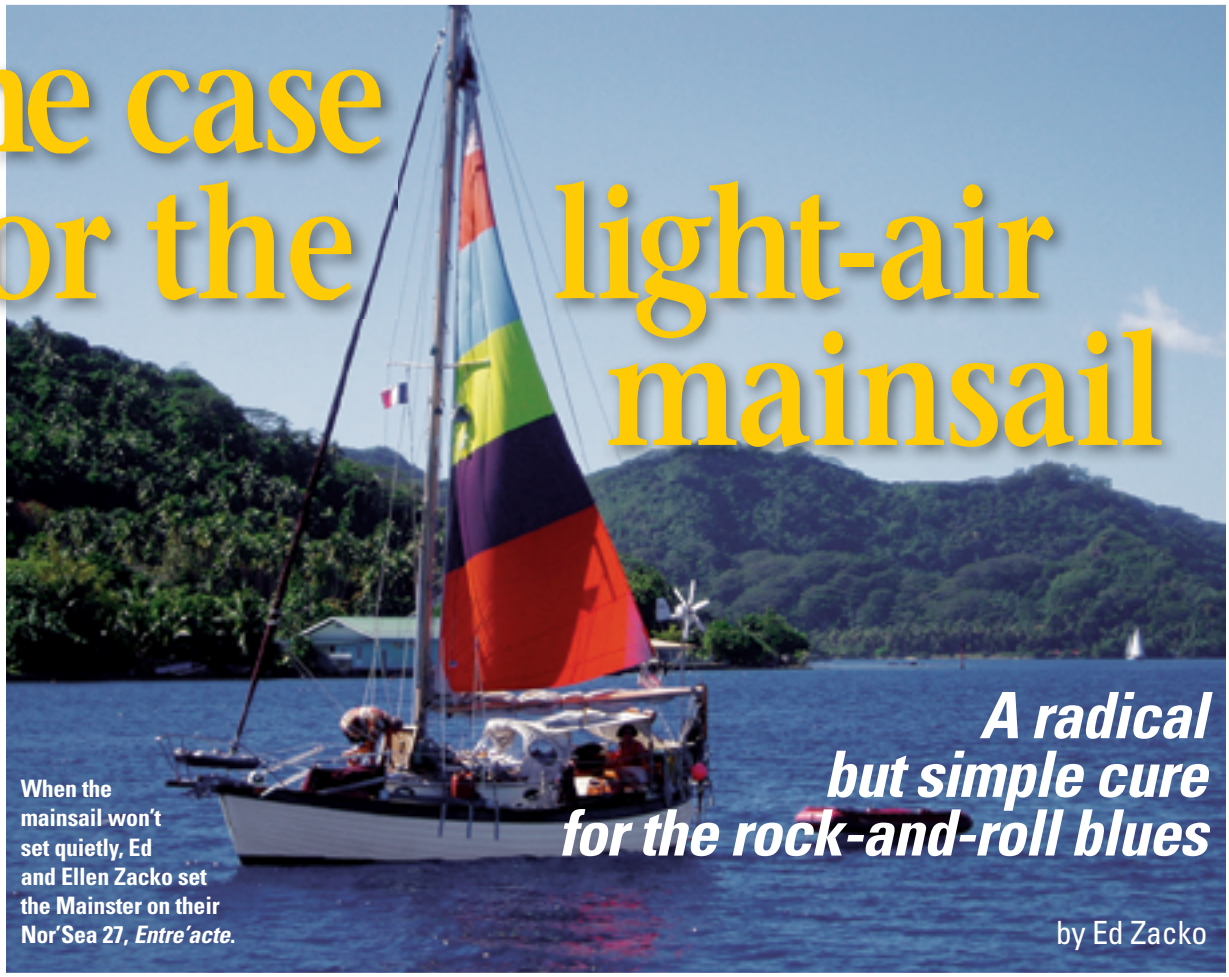
The case for the light-air mainsail



When the mainsail won't set quietly, Ed and Ellen Zacko set the Mainster on their Nor'Sea 27, *Entre'acte*.

A radical but simple cure for the rock-and-roll blues

by Ed Zacko

"The sails flapped and banged — about the ugliest sound a sailor can hear. Apart from nearly driving me crazy, the conditions were hard on the sail seams."
– Excerpt from *Dove* by Robin Lee Graham

Cruising books admonish us to carry clouds of sail for light air. They go on at great length describing large genoas, drifters, and cruising spinnakers. But, other than describing vangs and preventers, they seldom suggest a solution to the mainsail problem.

Countless words have been written about "the violence of calms," warning that more instances of rigging failure, dismasting, and torn sails occur during calms than in storms.

Sails work efficiently only when full and drawing quietly but it takes surprisingly little swell to start the mainsail slatting. Not only does this stop the sail from working properly, the noise it makes is unnerving and the damage from the slatting is cumulative and insidious. Because the material does not give, a slatting Dacron sail imparts severe shock impacts, on itself and on the rig. Each time that sail snaps, several things happen.

First, when sails slat, the cloth works and jerks on its seams. This working and jerking enlarges the holes around the stitching, wears out the sailcloth, and weakens the thread. The less a sail slats, the longer it lives.

Second, repetitive shock loads are transferred to the standing rigging. Chainplates, mast tangs, turnbuckles, and rigging wire are all affected. Swage fittings and fully battened mainsails are particularly vulnerable to these shocks. Like sails, the standing rigging is designed to withstand constant steady stress rather than sudden violent shock loads. The stainless steel will work-harden over time and break when you least expect it to.

Third, as you're already in a calm and not moving well, if at all, the slatting makes things worse. In any swell, as the boat begins to roll, the mainsail winds up like a pitcher on the mound. The momentum of the impact, along with the leverage of the boom, causes the boat to roll down farther in the opposite direction. As this process repeats, each cycle further hampers your forward progress.

Fourth, the constant rolling compromises the headsail you're flying. Large genoas will also slat and bang, imparting tremendous side loads to the forestay at the terminal fittings and contributing further to the problem. Nylon drifters and spinnakers will eliminate this shock but, when working alone without the mainsail, their effectiveness is severely compromised.

As offshore cruisers, we have tried all the known solutions over the years. Sheeting in the full main will not quiet the sail because of its draft. Tying in a double reef will flatten the main, and

sheeting it amidships can stop the slatting, but it also eliminates a major portion of the boat's horsepower. To make any real progress in light air, we need to fly as much sail as possible.

Enter the nylon mainsail

Our introduction to the nylon mainsail came through Dean Wixom, the father of the Nor'Sea 27. Dean carried one on his Nor'Sea 27, *Chinook*, for several years and loved it. On one of his visits to our home, he elaborated on the merits of this sail. But we argued against it, mainly due to lack of space on board. Frankly, it seemed like a wacky idea. Dean was not offended. He just smiled and went on his way. Subject closed. Or not quite!

On his next visit, Dean arrived at the airport weighed down with several sail bags. He brought all of his light-air sails for us to try on our upcoming Bahamas cruise. We resisted, but Dean persisted until we gave in. Weeks later in the Bahamas, as we sat with little wind, the noise and frustration overcame our reticence and we set the light-air mainsail. After only 10 minutes, we agreed: "We must have this!" Throughout the summer, we played with the rest of Dean's light-air sails as well, but the nylon mainsail completely absorbed us.

The concept of a light-air mainsail is simple. How could sailors as a group have missed something so logical? Aside from Dean, we know of no other person who has ever had and used one. Strangely, every sailor or cruising writer we've talked to has refused to discuss it. Just as we did in the beginning, others tune us out when we broach the subject.

Meet the Mainster

The sail that we've affectionately named the Mainster is very simple. The *idea*, by the way, is open to anyone, but the *name* belongs to us. Our Mainster is built of 1.5-ounce ripstop spinnaker cloth. It has simple broad-seaming, a wire luff, and drawstrings to shape the luff, foot, and leech. It is set "flying." That is, it's attached only at the

The Mainster, stowed in its sock in its own sailbag, takes up very little space.

On passage, the sailbag is lashed to the deck and Ed (or Ellen) hoists the sail directly from it.

In light air, working at the mast is no problem.

The Mainster's wire luff hooks to a snap-shackle attached to the gooseneck.

A downhaul controls luff tension.

Foot and leech lines allow for infinite variations in sail shape.

The clew outhaul stays rigged through its cheek block on the boom, always ready for action.

PHOTOS BY ELLEN ZACKO

The working mainsail is ready to be hoisted at any time and the Mainster can be doused with its sock on short notice. Moreover, the Mainster's flexibility allows it to be flown with a variety of light-air headsails; a cruising spinnaker, above left, or a hanked-on nylon genoa, above right.

head, tack, and clew. It can be hoisted with the main halyard or a dedicated spare. The tack is fastened to the boom gooseneck with a snapshackle and the clew is run out along the boom with an outhaul that runs through a cheek block at the end. Everything happens at the base of the mast. The topping lift supports the weight of the boom and allows for some basic sail shape. A vang prevents the boom from hopping around in the swell. Gross trim is accomplished with the mainsheet, fine trim with the outhaul and drawstrings.

Over our past eight years of cruising, we have refined our system. The main halyard remains attached to the mainsail on the starboard side of the boat while we hoist the Mainster with its own halyard on the port side. My wife, Ellen, has made a spinnaker sock that greatly simplifies the process.We stow the Mainster in its sock in a bag attached to the main hatch, always ready for use. We hoist the Mainster directly from the bag, sometimes even before lowering the main. As the Mainster unrolls, we connect the tack and clew to the snapshackles and simultaneously pull on the sock line and clew outhaul.

Instant silence! As soon as we raise the Mainster, it blankets and silences the working main. Once the Mainster is drawing, we lower and furl the mainsail.

The procedure for dousing the Mainster can take many forms, depending on conditions. In an emergency, the fastest way is to cast off the clew outhaul and pull on the sock downhaul. We don't recommend this method as the very thin cloth can become fouled on spreaders, shrouds, and mast steps. Fortunately, there is usually sufficient warning to make such a maneuver unnecessary. A better way is to ease the clew a little while pulling on the sock downhaul. We simply let the sail hang enclosed, like a sausage, until the worst passes. At that point, we can either open the sail once more or lower it completely.

As we ease the halyard, we roll the sail from the bottom up. This makes for easy and compact storage and prepares it for the next deployment. The beauty of the Mainster is that it's a one-person sail. One person can make the change from mainsail to Mainster or the reverse in less than three minutes. Snuffing the sail in an emergency takes less than 20 seconds.

It tacks and jibes silently and takes up almost no space on deck or below. The nylon cloth has a lot of stretch and absorbs the shock of slatting. Instead of the dreaded crash, all we hear is an occasional gentle "phump" with no shock or banging.

Unlike a spinnaker, a light-air mainsail is constrained by the mast, tack, and boom, so it can't get out of control as the boat swings in the swell. Another advantage over a spinnaker is that the center of effort remains constant as the boat moves around, so our windvane and autopilot love it.

"When the wind is on the beam, the combination of the Mainster and cruising spinnaker is dazzling."

We have no fear of flying the Mainster at night, as it can be doused in seconds. Coupled with our large hanked-on nylon genoa, it brings us as close to a "set it and forget it" light-air rig as we can get. When the wind is on the beam, the combination of the Mainster and cruising spinnaker is dazzling. As I write this, we have been sailing wing-and-wing for two weeks with the Mainster set to port and the drifter poled out to starboard. We have not touched the tiller, sheet, or halyard in 14 days. Yes, we still move about in the swell but both sails are driving. In this light air, we are moving slower than a worm, but we *are* making progress and it's *quiet*.

It takes very little wind to keep nylon asleep, and the tension in the sailcloth is quite apparent, above left. Having both sails drawing reduces roll and contributes mightily to balance and drive. In this light air and in this sea state, a Dacron mainsail would never sleep, above right.

Drawbacks

There are only two problems with the Mainster. The first leap, it seems after watching other sailors wrestle with the concept, is to *accept the idea* in the first place. We sailors seem to be slow to accept any radically new idea that has not been heavily advertised and hyped.

Once past that hurdle, the second problem is finding someone who will build one for you. We were turned down flat by seven sailmakers, one with a resounding "No!" as he slammed his clipboard onto the table. Fortunately, Dave Thompson of Eggers Sails in South Amboy, New Jersey, inspected Dean's sail, listened to our idea and, though skeptical, agreed to build such a sail for us if we would accept all responsibility for the result. No problem there, since we had already spent a summer using one just like it and had no worries. The results were wonderful; we could not be more pleased.

The only complication that we can foresee for some rigs is with the use of lazy-jacks or a Dutchman system. With these systems, you *can* use a Mainster but you will have to snuff the sail whenever you come about and re-deploy it on the other tack outside the lazy-jacks. Some lazy-jack systems allow you to detach the lines and lead them forward and out of the way. With a little creativity, it would be easy to set up a clew outhaul that would work on either tack outside of these lines.

The Mainster is not a substitute for a working mainsail. It is designed for specific conditions that we encounter all too regularly: a swell together with a breeze so light you can barely feel its presence and much too light to fill your working main. For one thing, you will not be able to point high with *any* nylon sail. As the sail fills, the stretch of the nylon will cause the draft to move aft and the luff to sag to leeward. These factors are detrimental to windward performance but, at about 50 degrees apparent wind and greater, you will have two sails driving the boat. So, if the mainsail will fill and draw quietly,

The wind generator is still, but the Mainster and cruising spinnaker are full and pulling hard enough to give *Entre'acte* a bone in her teeth.

Resources

Dave Thompson, John Eggers Sailmakers
7076 Highway 35 N, South Amboy, NJ 08879
732-721-4667; www.johneggers.com

The Mainster has lines in its luff, leech, and foot with which to make the sail full or flat. Luff sag is not a problem when sailing off the wind.

we use it. If it fails to draw and begins to slat, we fall off and use the Mainster. Our philosophy is to keep the boat moving as comfortably as possible.

Make your own

This sail is simple enough that you could make one yourself, provided you have the basic skills, inclination, and a machine that will handle V-69 thread.

When you measure, use the topping lift to set the boom at a working height that will allow you to tack and jibe easily. Make certain that your boom will clear any boom gallows, and dinghies stowed on your cabintop.

If we were to make a new Mainster, the only changes we can think of would be to substitute one of the new non-stretch ropes, such as Amsteel or Spectra, for the wire luff and to relocate the foot-line Clamcleat from the clew to the tack. This way, the halyard tension, luff, and foot shape could all be set from one place at the base of the mast.

For eight years, the Mainster has been our first line of defense in the battle of the calms. At the first slap, up it goes. The cloth is rated up to 20 knots and, while we have never tested it to that extreme, when the wind returns we continue to fly it as long as we are comfortable. We often leave a first reef tied in the mainsail. If a squall threatens, we douse the Mainster with the sock, raise the already reefed mainsail, and let the sock hang in the lee of the main until we decide what to do next — very civilized.

The Mainster is perfect for those conditions when the headsail is blanketed by the main and fails to draw. In those conditions, the motion of our boat is much better with the Mainster alone than with a poled-out headsail. We have also enjoyed great success on a reach with the Mainster coupled with our large drifter sheeted to the end of the main boom.

In light air, nylon is king. With a light-air mainsail you can carry maximum sail and, while the swell will not go away, at least be moving in comfort.

Light air is indeed a challenge. Light-air sailing tests your ingenuity and patience, but these last two weeks aboard *Entr'acte* have been an absolute delight. Even if we had enough fuel to motor the vast distance involved, the sound of the engine would destroy this special experience. It's true that we are moving only as fast as a baby can crawl, but it is in these calms that the ocean comes alive. There's an astonishing variety of activity in the sea that we often miss because of the wind, waves, and motion. But when the wind and sea die down, we truly slow down, relax, and witness everything.

Ed Zacko, a drummer, met violinist Ellen while playing in the orchestra of a short-lived Broadway musical. Their own show is still running after 32 years. They built their Nor'Sea 27, Entr'acte, *from a bare hull and, since 1980, have crossed the Atlantic to Europe and back four times. Their current voyage has taken them through the Panama Canal and across the Pacific. Follow them at <http://www.enezacko.com>.*

From *Entr'acte's* log

With two sails drawing, *Entr'acte* has more horsepower, and also presents a colorful sight.

Thursday, January 6, 2006. Latitude 14° 43' N, longitude 47° 51' W. Speed 1.5 knots. Day 25. Destination: Trinidad.

For the past two weeks, the wind has been non-existent with only the long slow ocean swell to remind us that we are, indeed, at sea and not sitting in a boatyard. We departed Santa Cruz in the Canary Islands mentally geared for a very fast trade-wind passage, but the usually steady trade winds have disappeared. It seems as if every bit of wind in the world has disappeared.

The SSB radio is alive with tales of spinnakers wrapping and mainsails slatting, banging, and finally furled to prevent self-destruction. There are complaints of drifters unable to provide power as they try to work without the mainsail. Few are moving as they're low on fuel with more than 1,000 miles to go. Everyone is irritable from lack of sleep and the slow progress.

On board *Entr'acte*, things are different. With the slightest breath of breeze, barely enough for steerage, *Entr'acte* has been knocking off a steady 40 miles a day for 14 days. All ports and hatches are open, and Ellen is happily sewing clothes in the cockpit. Max, our Aires windvane, is steering faultlessly. The sea is absolutely flat. Not a ripple disturbs the water, save that long ocean swell. We have had long conversations with turtles as they swim with us. Our big treat is the family of dorado that has been accompanying us for 10 days. Mom and Dad are teaching Junior how to fish, and today the little guy managed to score his own meal. As we cheer in the midst of this absolute silence, Dad dorado actually makes eye contact with us; the water is that calm and clear. Who would believe that these conditions are possible in mid-ocean and for so long?

All is perfection, at least for us. *Entr'acte* is moving along steadily and comfortably, albeit very slowly, with the secret weapon we have affectionately dubbed the Mainster.

Cinderella and the Dutchman

This compatible couple makes mainsail handling a snap

by Homer Shannon

Homer's lines lead aft through a deck organizer. The starboard group, in order from the top, includes the second reefing line, the first reefing line, the topping lift, and the main halyard.

When sailboat owners upgrade their sail-handling systems, the first thing they usually do is add a jib roller-furler system to the boat. When my wife, Dee, and I purchased *Cinderella*, a Bristol 29.9 sloop, it came with three good hanked-on jibs so it seemed a shame to waste that resource by going to a single-sail furler. The main, however, was completely blown out, probably original, and more than 20 years old. It had to be replaced. Our top priority was a new mainsail.

After negotiating a few dollars off the purchase price of the boat, we spent the savings on a Doyle 2+2 cruising main. This presented us with a new problem. Our previous boats had worn-out mainsails that could be easily dropped and quickly tied off to the boom. The new Doyle sail was hard and stiff and simply refused to be tied in the same manner. We needed to flake the sail every time it was dropped. Flaking the sail involved hanging off the boom, swaying around in the wakes of passing motorboats with some risk of being tossed overboard. When the sail was down and in the process of being flaked, it blocked the helmsman's view.

At the beginning of our second season with the boat, I fashioned a set of lazy-jacks to catch the main as it was dropped. This wasn't much help. The lazy-jacks ("lousy-jacks," Dee called them) would catch part of the sail, but some of the sail still spilled off the boom. Additionally, they caught the battens when the sail was hoisted unless you were pointed absolutely dead into the wind. They did not assist in flaking the sail; in fact, they made it more difficult. The lazy-jacks needed to be tensioned for dropping the sail then loosened to flake the sail. Once they were loosened, the sail would fall onto the deck again. At best, they allowed us to delay flaking until we were safely on a mooring.

Several drawbacks

Several of our friends' boats are equipped with the Doyle StackPack system. We looked into this option and decided the system had several drawbacks. It's expensive to retrofit to the sail (about $650). It's complicated, having significantly more hardware and rigging than the lazy-jacks. It would have some negative effect on the performance of the mainsail, a minor issue to us since we don't race often, but why give up any performance? Lastly, the StackPack system is a "stuff and zip" device that pretty much precludes proper flaking of the sail, a practice that I wanted to continue since I believed it would extend the life of the sail.

"The Dutchman system solved our sail-raising, sail-dropping, and sail-flaking issues."

An alternative solution was the Dutchman sail-flaking system. I had heard of this product but had never seen one and did not understand how it worked. After making several phone calls and studying Dutchman's webpage <http://clients.sailnet.com/dutchman/

sailflaking/sfindex.htm>, I realized it's a simple and elegant concept. To understand it, take a piece of paper and fan-fold it four times. Punch a skewer through the folded paper and voilà! You have the principle of the system. The Dutchman achieves the same effect by adding droplines that come down from the topping lift to the boom, weaving through the sail at points even with the track slides and parallel to the mast. As the sail drops, it fan-folds onto the boom and is held in place by the vertical droplines. In terms of implementation, its most complicated and expensive component is the set of special grommets that have to be placed on the sail. It also requires the sail cover to be modified to allow for the droplines.

"Flaking the sail involved hanging off the boom, swaying around in the wakes of passing motorboats with some risk of being tossed overboard."

Plain grommets

Once I understood how the system worked, my initial thought was to build the system myself using plain grommets in place of the special Dutchman-provided grommets. The cost of the system, installed by a professional sailmaker, however, was quoted at $425, and building it myself, which would probably cost $200, would put a nearly new $1,500 mainsail at risk. It seemed a better idea to let the professionals do this job. We had Doyle Sailmakers of Marblehead, Massachusetts, do the work, and they did an excellent job.

One complaint I would make about the Dutchman system is that it comes with a replacement topping lift that forms a continuous loop with special fittings that attach to the vertical droplines. This special topping lift provides for adjustment of the droplines so they can be positioned directly above the line of grommets in the sail. While achieving the desired function of adjustability, the double line and associated fittings are quite heavy and flap and bang around on the sail, catching the roach and otherwise cluttering things up. Once I had the adjustments completed, I solved this problem by removing the Dutchman-provided topping lift, taking measurements for the droplines from it, and replacing it with a standard single-line topping lift with the droplines tied in at the appropriate points. This much lighter system works fine and does not interfere with the roach.

The Dutchman system solved our sail-raising, sail-dropping, and sail-flaking issues. I had more grandiose objectives in mind, however, and decided that a single-line reefing system and lines led aft, combined with the Dutchman, would provide us with the ultimate in mainsail control. Both of our previous boats had traditional slab reefing, as does *Cinderella*.

The reefed mainsail on Homer Shannon's Bristol 29.9, *Cinderella*.

Not well-shaped

I know how to lower the main onto the reefing hook and then tension the main halyard and outer reefing line to complete the reef. The problem is that this never achieves a very well-shaped sail, and it requires some pretty fancy footwork at the mast just when conditions are deteriorating and staying in the cockpit would be advisable. It also requires close coordination between the helmsman and the reefer, a subtle set of commands that always seemed to break down between Dee and me.

A single-line reefing system works by using one continuous line to tension the luff and the leech of the sail simultaneously. This line starts at the end of the boom, goes up to the reefing cringle on the leech of the mainsail, down to a turning block on the boom, then forward to a second turning block on the forward end of the boom. It continues up to the reefing cringle on the luff of the mainsail, down to the deck, and back to the cockpit where it can be controlled. Tensioning this line, while lowering the mainsail halyard, causes both ends of the sail to come tightly to the boom and the reef is achieved (see illustration on Page 60).

To build the system I would need to lead four lines back: two reefing lines, the main halyard, and the topping lift. I studied the problem for several months. I wound up purchasing three turning blocks, a double cheek block for the boom, a three-line rope clutch, a four-line deck organizer, one cam cleat, and a small winch. I also needed two, much longer, reefing lines and a new topping lift. All this hardware was not cheap. The total cost of materials came in at about $700.

Plan carefully

I don't think there are any set rules for how you go about planning and placing all of these items. The only rule I used was to plan carefully and think ahead as far as possible to avoid mistakes. One concern I pondered over at length was whether to through-bolt

Two lines lead through the sail, causing it to fold like a fan.

The Dutchman sail-flaking system on *Cinderella*.

all the components to the coachroof, which would involve cutting into the headliner, or to use screws that are screwed directly into the outer layer of fiberglass. I decided to compromise on this. All hardware with a vertical load (turning blocks) would be bolted using long bolts and large backing washers. Any hardware with side loads would be secured with screws and caulking. (All, that is, except the winch, which was located in a position where I could use bolts.) My reasoning was that a vertical load creates tension while a side load creates sheer. Screws work well in sheer-load conditions but bolts better withstand tension.

I also worried about the size and strength of each of the components I was installing. I had no guidelines as to what the actual loads on any of these components would be. I was particularly concerned over the loading on the upright double turning block that would handle the two reefing lines. This component would be handling loads somewhere near the load of the mainsheet. Line size (5/16-inch yacht braid) and deck space dictated a small block. The component I ultimately chose had a working-load rating of only 600 pounds. I'm still concerned this may be too weak, but Dee and I don't cross oceans or sail in hurricanes. If I underestimated the loads and wound up with materials that are on the light side, I can at least say that nothing has broken yet and we have sailed many times in reefed conditions.

Little winching

The completed system works very well. We can hoist the main from the cockpit by hand-pulling the halyard. A little winching is required for the last 2 feet. The boat does not need to be pointing into the wind, as there are no lazy-jacks to foul. Dropping the sail requires only that the topping lift be tightened so the Dutchman droplines are tensioned. Once you've found the right position for the topping lift, a mark on the line allows you to get the tension right every time.

Getting the main to drop and flake perfectly does require that someone go forward and pull down the sail. Without assistance, the sail drops about halfway, then stalls out. By standing at the mast you can assure a full drop and start each fold of the sail, left-right, left-right, as the sail comes down. And it works so well! Dropped in this manner, the sail is nearly perfectly flaked onto the boom at the time of the drop, and the helmsman never loses forward visibility. I can do it by myself quite easily now. I come into the wind, secure the helm, go to the mast, drop the main, go back to the cockpit, and resume course with a perfectly flaked main — in less than 20 seconds.

"Dropped in this manner, the sail is nearly perfectly flaked onto the boom at the time of the drop, and the helmsman never loses forward visibility."

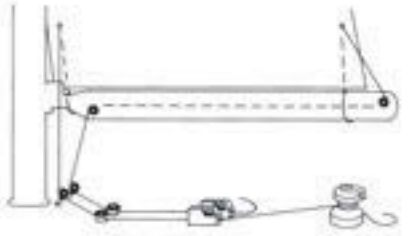
The combination of the Dutchman with the single-line reefing system shows its mettle when the wind comes up and it's time to put a reef in the main. Without coming off course, I ease the mainsheet until the main luffs. I then ease the main halyard and slowly lower the sail while simultaneously pulling in on the reefing line. When the forward reefing cringle comes down to a prescribed point on the mast, the point where the boom normally rides, I lock the rope clutch for the halyard. The reefing line is then put on the winch and tightened until the aft end of the sail is fully tensioned and the boom is pulled up to the reefing point on the luff of the sail. At this point I can retighten the mainsheet; the reef is complete.

Ease and crank

Shaking out the reef is just a matter of easing the mainsheet again, putting the halyard on the winch, releasing the reefing line, and cranking the sail back to the top of the mast. The advantage of the Dutchman is that as the sail drops, the lines catch the flakes and keep them right on the boom. There is no need to tie in reefing points unless I know we are going to be sailing for days in crazy conditions.

Dee is still pushing for a roller-furling headsail for the boat, and I admit it would be a big convenience. Changing the headsail when the conditions change is a hassle, but I know we have our problems half solved. The mainsail controls work wonderfully, adding convenience and safety. When it's time to reef the main, we do so immediately, secure in the knowledge that we can shake out the reef or add a second reef quickly and conveniently. When it's time to drop and store the main, we have the solution for that too. The single-line reefing system, combined with the Dutchman sail-flaking system, has greatly improved our boat.

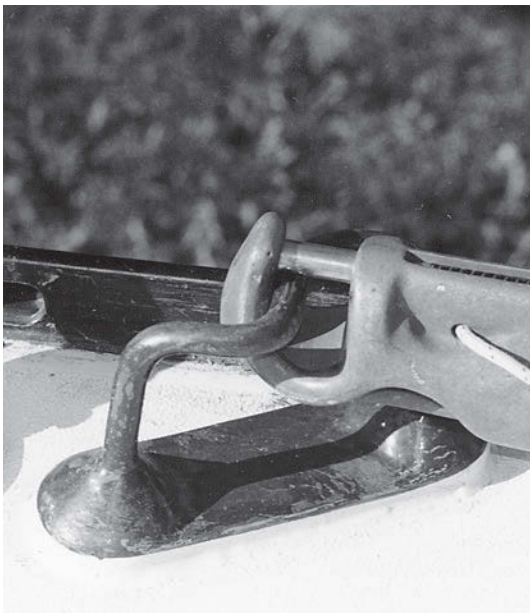
Single-line reefing



Double-line reefing

Illustrations by Jim Sollers

Pole control



by Jerry Powlas

While most of the rigging on our boat was very satisfactory when we bought it, the whisker pole and mast pad-eye were not particularly reassuring. The pole was a small-diameter, twist-lock affair that did not lock and unlock reliably, and the pad-eye did not fit the mast well. The pole collapsed under load. I bought and installed a twist-lock repair kit, but then the pole took a frightening bend when it was under much of a compression load. It didn't have the strength for the job.

It took awhile to get over the sticker shock of a new line-control whisker pole, but when I worked for Corporate America, nothing was too good for little *Mystic*. I spent a season figuring out how to get a decent-sized pad-eye that fit the mast and exactly how I wanted to stow the pole on deck. I didn't consider stowing the pole vertically on the leading edge of the mast. A friend had done that on his boat, and I found it incredibly awkward. I suspected it didn't help performance much to mess up the leading edge of the spar and put that much weight up high.

The stronger pole was more than twice as heavy and, when fully extended, was awkward to use. The line-control system also worked poorly. The control line was too small and jumped off the sheave frequently. A good friend machined a much wider sheave, and I installed a larger line and a cam cleat. That made the pole work nicely. I think the vendor has made some similar improvements since then. The need and the solutions were obvious. But the pole was still heavy.

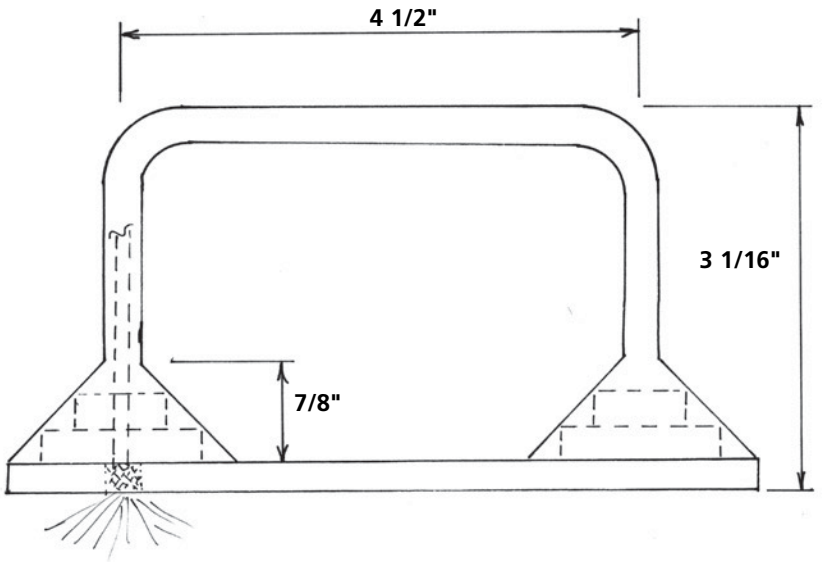
With one hand

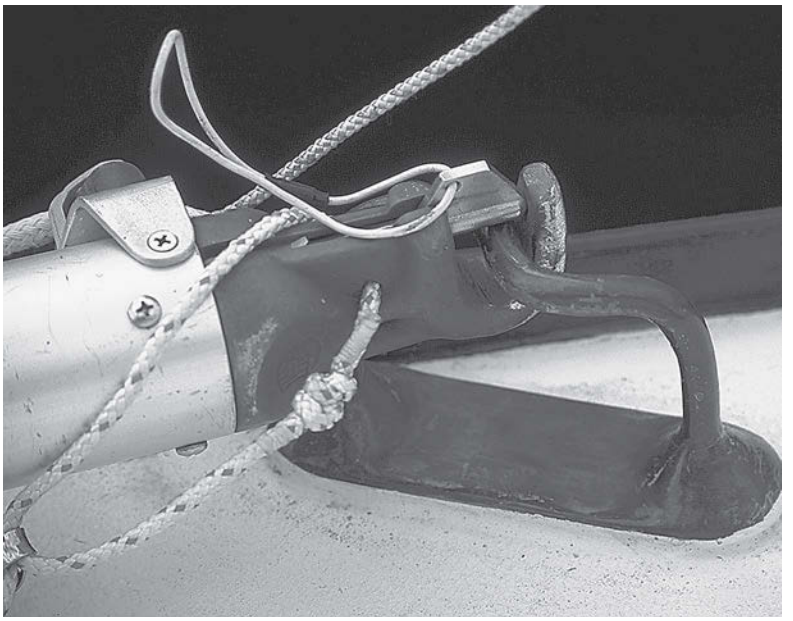
If you take the "one hand for yourself and one for the ship" rule seriously, you should be able to handle the pole with one hand for almost all operations. I worked out the choreography that first year and concluded that I needed chocks that would allow enough movement so I could pick up the after end of the pole, snap it into the pad-eye, then rig the topping lift and jib sheet to the forward end and lift it with the topping lift. Then I could go back to the mast and extend the pole. At no time did I have to lift the pole like a "free weight." Roughly half the weight of the pole was always taken by either the forward chock or the pad-eye. The same applied when striking the pole, only in reverse.

"One hand for yourself and one for the ship" means you should be able to handle the pole with one hand

That winter, I brought the pole home and flopped around on the basement floor with it trying to visualize the kind of chock I needed to buy. Then I went looking at chocks. None allowed the degree of freedom at the forward end that I needed to make the process a true one-handed affair. The available chocks were heavy and needed to be screwed to the deck. I don't much like putting screws into my balsa-cored deck. It can be done properly but not simply. I went back to the basement floor.

I made wire models of what I thought the chock that I needed would look like. The ones that looked promising were duplicated in full-sized mock-ups and tried with the pole movements I wanted. I will not admit here how many models and mock-ups I made. I wasn't a publisher yet, so there was leisure time available for such mindless and soothing puttering.





Finally, when I had the ideal shape, I moved on to making the "production parts."

Soft wire inside

I made the complex shapes from New England Ropes' Regatta Braid line with soft aluminum wire inside. The 1/8-inch wire allowed me to form the rope to the desired shape and to keep it there while I completed the assembly. The rope and wire were not strong enough to actually hold the pole in place, but they were strong enough to keep the desired shape while I assembled the chock. The chock base was made from 6-mm marine plywood skinned with glass cloth on both sides. The conical shapes were made from a stack of plywood disks. A hole down the center of the disks and through the base allowed the rope to extend out the bottom.

I combed the rope out into a flat disk under the base and glued the whole thing with epoxy. I soaked the rope with epoxy as well, and when the first course of epoxy had kicked, I added filler to the next course and filled in the rope and the edges of the disks to make cones out of them. I happily filled, trimmed, and filled some more. I mixed some graphite and aluminum powder with the epoxy to give the finished assembly some UV resistance. Painting would have achieved the same thing.

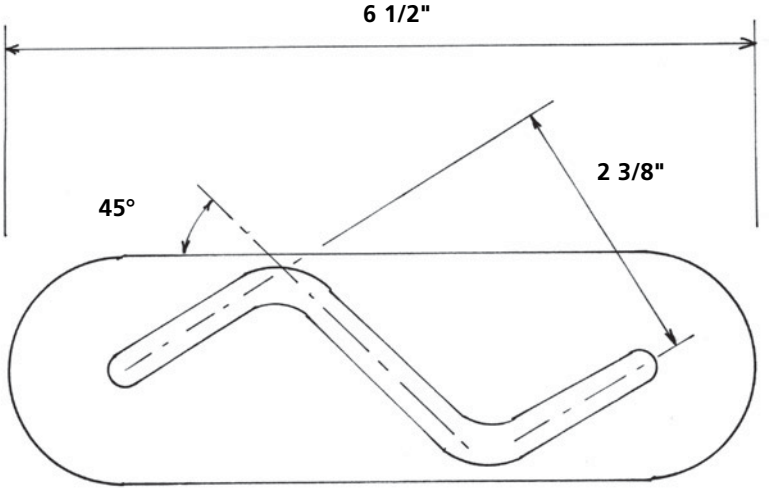
In the spring, I mounted my special chocks on the deck after measuring to make sure the pole would pivot from the aft chock to the new mast pad-eye. I sanded the gelcoat of the deck where I intended to mount the chocks, sanded the chocks, and glued them to the deck with more epoxy. After the epoxy kicked, and I had done some unscientific tug-tests to make sure I had a good secondary bond, I painted the sides of the chocks and the glue line at the deck to protect the epoxy from UV degradation.

Chock strength

How strong are the chocks? The rope has a breaking strength of 3,000 pounds. It is attached to the deck in two places, and the direct rope-to-deck-bond area is about 3 1/2 square inches. The total bond area is about 7 square inches per chock. The bond strength probably would never degrade to less than 1,000 psi and probably would be more like twice that in most cases. Not to put too fine a point on it, the parts will take some abuse, and a boarding sea will not take the pole. The chocks and their attachment to the deck are certainly stronger than the purpose-made aluminum alternatives, because the aluminum chocks are mounted to the deck with fairly small screws. I would not want to lift the boat with these chocks, but I think in an extreme loading, the rope would distort and break the epoxy-resin stiffener while staying attached to the pad and the deck. The chocks have been in service for three years and have needed no attention other than an occasional coat of varnish to protect the epoxy from UV.

If you choose to do something like this on your boat, note that the forward and aft chocks have shapes that are mirror images. One shape will not work for both. *(See pictures and drawings.)*

The aluminum wire was purchased in a hardware store. It had a .010-inch vinyl coating that I removed. I chose 5/16-inch Regatta Braid because I knew from other projects that it would take the epoxy well, and was soft enough to accept the wire. Other ropes might work as well, but I know some ropes are too stiff, and do not take epoxy well.



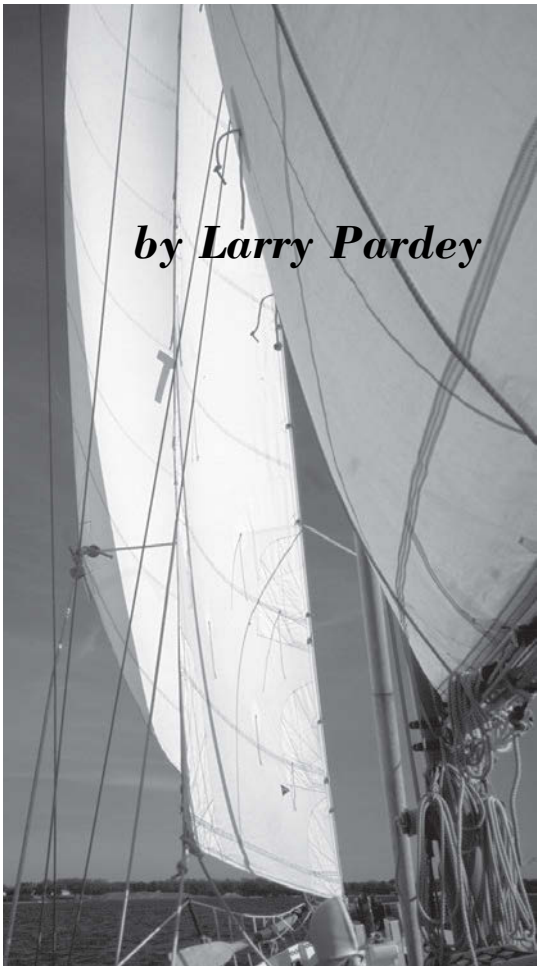
Jerry is Good Old Boat's *technical editor.*

Your staysail, key to

It's a versatile workhorse with many uses

by Larry Pardey

Like the majority of voyaging sailors, we are sold on the cutter rig. As we gunkhole around the rivers and bays of the U.S. East Coast, short-tacking into hidden coves on the Chesapeake Bay or Long Island Sound, we are reminded that for local cruising, this rig absolutely shines, especially for short-handed crews. The three smaller sails of the cutter rig are easier to handle and reef than the two larger sails on a sloop (all things being equal). And the cutter provides better windward performance than a two-masted rig while costing less and being easier to maintain. A windvane for self-steering can be installed more easily on a cutter than a ketch because the boom usually doesn't overhang the transom. But most important of all, the cutter rig gives you the most versatile sail found on a cruising boat, the staysail. Getting the full potential from this special sail requires attention to rigging details, design, set-up, and sail trim.



The staysail is sheeted inside the forward lower shroud.

The staysail we use on *Taleisin* is constructed of eight-ounce U.S. Dacron (probably two ounces heavier than sailmakers normally recommend for a 150-square-foot sail on an eight-ton boat). It has two rows of reefs and is set on a moveable stay. This gives us a sail that can be used in an amazingly wide variety of wind conditions. We have found it to be effective from Force 2 (5 to 8 knots of wind) all the way to storm Force 10 (50 to 55 knots). Since it is kept permanently attached to the stay, it is ready to use instantly when wind conditions change.

Sail combination

When one of us is alone on deck at night, it is easy to keep the boat moving well in any wind above 8 knots by using a combination of main and 100 percent lapper with the staysail set in between (double-head rig). The staysail can be dropped on deck if the wind increases or, conversely, we can hoist the staysail when the breeze drops. This easy increase of sail area improves our average offshore passage times and keeps us sailing faster when we are simply puttering around on the Chesapeake. Everyone is eager to reduce sail area as the wind increases. But when I am sailing on a boat with a single headsail rig, I find myself putting off sail increases, especially when I am alone on watch or when port lies only a mile or two away. This reluctance to change up can easily cut 10 or 20 miles off a day's run. For local sailing, it could mean deciding to start the engine instead of prolonging the pleasurable silence of continuing under sail.

A staysail adds flexibility to your life. If you are reaching at top speed with the full three-sail rig as you come into the lee of the land, and you find you have to short tack into the anchorage, you can drop the jib and use your staysail to tack easily into the bay. If we find we need more power once we get inside the anchorage, the jib is ready to go.

We often use the staysail/mainsail combination while we scout out the perfect spot to anchor. We can slow the boat down to about quarter throttle by coming about and leaving the staysail secured to the windward winch. The backed staysail and fully drawing main cuts our boat speed dramatically, yet gives us sufficient steerage so we can throw the leadline or spot our anchor where we want it among other anchored boats. If we want more speed, we release the sheet that holds the staysail in its backed position, sheet it in on the proper side and get under way.

Backed staysail

Even after we are anchored, we find the staysail handy. We pay out the appropriate amount of anchor chain, then let the boat settle back with the wind. If the wind is more than 10 knots, we hoist the staysail with the sheet secured snugly to windward (with the sail backed). The wind in the staysail pulls the bow off, tightens the chain, and makes the anchor dig in for a firm set.

In strong winds, the staysail really earns its keep. When you use a staysail with a reefed-down main, your sailplan is moved inboard, toward the center of effort. In effect, you go from a big triangle of sail to a small one with the same proportions, the same fore-and-aft balance, and the same leads as with a

the cutter rig

Reaching under all working sail.

full rig. Compare this to the deeply reefed, single-headsail sloop. *(See diagram below.)* You'll notice the reefed sail area on the sloop moves forward. This often causes lee helm. A boat with lee helm has difficulty holding her bow up to the strong wind and seas and is usually a poor windward performer. Moving the sail area inboard helps reduce pitching in heavy seas.

About 90 percent of our sailing on *Taleisin* is done with three sails: the seven-ounce 100-percent lapper, which has one row of reefs in it, the eight-ounce staysail with two rows of reefs, and the eight-ounce mainsail with three rows of reefs. (This gives us about the same total sail area as a sloop would have with a 150-percent genoa and mainsail set.) To do this we depend on our staysail which, unreefed, can be a heavy weather staysail. Reefed once, it can be a storm staysail, or in a hard flog to windward it becomes a spitfire staysail that can be set with the triple-reefed main. In extremely heavy conditions, it can be set with our trysail.

Another reef

Is this overkill? I was once down to triple-reefed mainsail and single-reefed staysail on *Seraffyn* as we reached into Malta in storm-force northwesterlies. I remember thinking, "If we get headed, if I have to beat into Marsaxlokk Harbor instead of reaching, I could use another reef in this staysail." After another 100,000 miles of sailing, we still have never used that second reef in *Taleisin's* staysail but we have been tempted a time or two. The older I get, the more reef points I collect. I've even got two in the sail of our 8-foot dinghy. When Lin teases me, I call it cheap insurance.

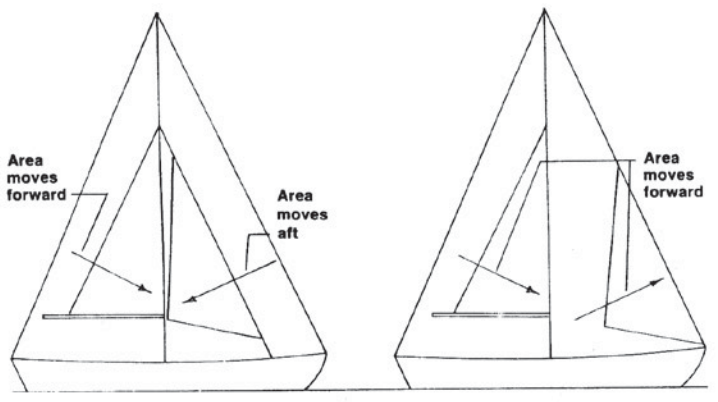
Why reefs, rather than roller reefing? I personally would not have roller reefing on any sails that the yacht or crew rely on for heavy weather, for two reasons. First, in winds above 20 knots you need flat-cut sails to keep the boat on its feet and driving well into head seas. A properly cut reefed sail becomes flatter as you tie in its reef, whereas roller-reefed sails become fuller. This is why class racers don't use roller-reefed headsails — they just don't work well to windward. Second, damage to sails usually occurs along the highly loaded leech or clew area. If your sail is damaged along its lower section, you can simply tie in a reef and sail on, using the undamaged upper section. If the leech, foot, or clew is torn on a roller-furling sail, it is completely out of business.

Although boomed staysails offer some interesting advantages for local cruising, we would not go this route because with a loose-footed staysail we can conveniently release the staysail stay and move it aft when we wish to short-tack in winds under 15 knots. Clearing away the staysail stay allows the jib to pass across the foredeck without hanging up on it. This means one person can tack the boat easily in light winds, freeing the other person to navigate and watch for coral heads, rocks, or fairway buoys.

Better efficiency

Another advantage of the boomless staysail is that it can overlap the mast a bit. This gives you more sail area and increases the slot efficiency of the sailplan. Furthermore, if you eliminate a club on your staysail, you will save the expense of tackle, traveler, gooseneck, and the spar itself. Your foredeck will be clear, which makes it easier to change sails, work the anchor windlass and ground tackle, or handle docklines as you come into a marina berth.

I can appreciate why so many daysailors love self-tending staysails on booms. They allow them to tack in and out of creeks, rivers, and narrow inlets with only the jib sheets to handle. But the boomless staysail works fine for open-water cruisers for whom short-tacking is not the norm. Our solution to the occasional short-tacking we have to do is using one headsail at a time. It is safe to sail with the staysail stay released in flat water or until the mast begins to bend aft, that is, to develop a curve toward the mainsail — a straight mast is a safe mast. Then the staysail stay should be set up again. This is



A cutter rig balances better than a sloop when the wind pipes up, and it is time to reduce sail.

The staysail can be hoisted or lowered easily to add or remove area.

especially true if you are rail-down, punching into a head sea.

There are times when we do want to short-tack using both headsails, such as when we are racing (that seems to be whenever there is another boat within sight) or when we are trying to reach an anchorage just before dark, and the winds are growing lighter. Rather than have two winches on each side of the cockpit, we have installed a fairlead on the aft corner of the deckhouse, port and starboard. We use these as aft staysail sheet fairleads so the leeward sheet can be led across the cockpit to the windward winch. Then, to make tacking with the double-head rig easier, we release the jib sheet first. Since the staysail is blocking the inner foretriangle, the jib will slide forward without hanging up on the inner stay. Once it's around, you can release the staysail sheet and easily tack this smaller sail.

This is not the way a serious racing sailor would do it, but it does work well: no hang-ups, no need for someone on the foredeck to help the jib around, less wear and tear on sail fabric and nerves, too.

Trouble and expense

A question some people will be asking is, "If I had a sloop that met all my other cruising needs, would I go to the trouble and expense of converting it to a double-headsail rig?" I most definitely would add a staysail with a release lever if it met the following requirements:

1. It was a masthead-rigged sloop.
2. It had a generous distance between the jib stay and mast (J measurement), a distance about as long as the mainsail boom.
3. It had a healthy beam, so the staysail could breathe easily in the open slot between main and jib.
4. The staysail could be designed so that it was at least 22 percent of the total working sailplan (main, working jib, and staysail). Otherwise it would not have sufficient drive when the staysail and main were used alone.

Within these parameters, a staysail could be effectively added, and the extra sail area forward might even reduce that common fault, weather helm. In fact, if you had a sloop with a stiff weather helm, I would even consider the addition of a bowsprit to correct the bad balance and effectively lengthen the J measurement to give room for a staysail.

Connections aloft

The addition of the staysail stay would require a tang and halyard connection aloft, along with two supporting intermediate shrouds led to chainplates that are at least two feet aft of the mast (called swifter stays). On larger, more powerful boats, say 35 feet and more, running backstays might be required. The connection at the lower end of the staysail stay needs to be attached securely to the stemhead of a boat with a bowsprit, or if the stay is attached to the middle of the foredeck, a rod or wire below decks should tension the stay to either a bulkhead or the forefoot. Add to this some deck fairleads, and you have quite a hardware bill, not to mention the cost of labor. But I think it's well worth the effort and cost if the boat you own now can gain the subtle, but important, advantages of a cutter rig.

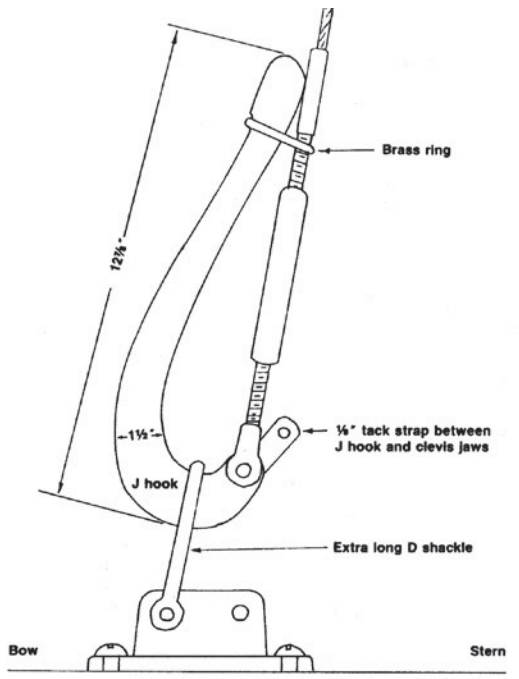
It pays to get professional advice on this standing rigging addition and on the design of the sheet leads (inside or outside your lower shrouds). Some time spent with a rigger and then with a racing sailmaker will help you get your double-head rig working well to windward. The goal is to have both the staysail and jib break (start to luff) at the same time. This means the two sails should have a close-hauled sheeting angle of about 11 to 13 degrees from the centerline of the boat.

On *Taleisin*, our jib leads right to the bulwark rail, and the staysail lead is about two thirds of the way outboard of the centerline of the deck. The lead is about three feet aft of the chainplates. On a narrower hull, or one with a shorter J measurement, this lead could change substantially. Even if all the design and installation of the staysail is done by professionals, it could pay to try out different fairlead positions before fastening anything through your deck. One way to do this is to hoist your new sail while you are tied to a dock with a wind of about 6 or 8 knots. Set all three sails, then ask a pal to step on the new sheet.

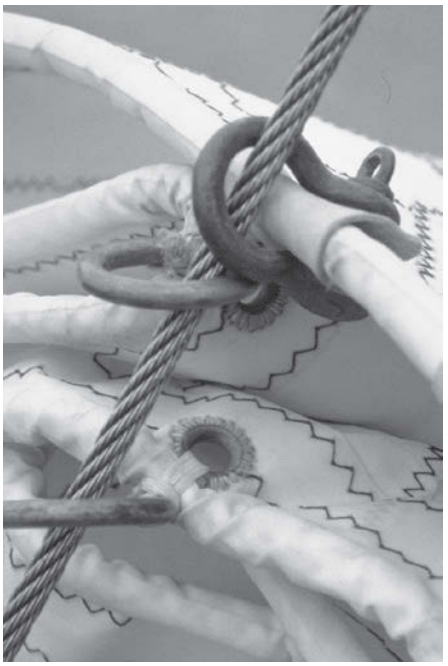
Watch the twist

When you sheet in the three sails, check to make sure the upper leech area of the staysail twists off smoothly to open the slot between the staysail and main. Then try easing all sheets until the headsails start to luff — if they break at the same time, and the luff becomes soft all along its length, mark your fairlead position. If the upper part of the luff breaks before the lower part (a common fault), move your lead forward. If you see the mainsail backwinding when all three sails are set close-hauled, try moving your fairlead a bit more outboard.

A short lanyard on the tack of your staysail can eliminate the need for



Build your own tension release lever, J-hook.



At left, the staysail stay has been released and the bagged sail moved aft to make short tacking with the lapper go more smoothly. Note the shock cord hitched to the wire with a rolling hitch and secured to the forward hatch hinge to prevent the stay from flopping around. At center are the bronze bow shackles which were the Pardeys' solution to the problem of wear. At right, the Highfield lever, two-foot long tack pennant and quick-release fast pin.

fore-and-aft track and adjustable staysail sheet cars. The lanyard will let you adjust the sail up and down the staysail stay, and it effectively tightens or loosens the leech. This is the system we use on *Taleisin*. It allows us to use simple deck fairleads without blocks. We also like having the two-foot long lanyard right in place, since we use it when we reef the staysail to tie down the clew. *(See photo above.)*

You can eliminate the need to adjust the staysail sheet lead when you reef by having your sailmaker angle the reef patches so they are higher at the clew and lower at the tack. This keeps the lead angle constant.

To be able to move the staysail stay out of the way in light wind, you will need some type of over-center tension release device (a staysail stay release lever or Highfield lever) with a drop-down ring to keep it from opening accidentally. Several companies make these. We use a stainless steel fast pin (quick pin) as the attachment link to the staysail stay fitting. This pin is attached to the lever assembly with a retaining lanyard, so it is always available. You can also make your own tension release lever from a quarter-inch plate of bronze, aluminum, or stainless steel (listed in my order of preference and for ease of working). The diagram on Page 14 shows a type of J-hook that would work for boats up to about 35 feet.

More flexible

The best wire to use for this staysail stay is 7 x 7 stainless steel. It is far more flexible and less likely to work harden than 1 x 19 wire. This is important because the staysail stay will flop around when it is moved aft. This will bend the wire back and forth and from side to side and eventually cause metal fatigue right where the wire enters the swage fitting. A toggle or shackle at the mast tang, in conjunction with shock cord, secured with a rolling hitch to hold the stay tight when you bring it aft, will help minimize wire bending and the subsequent metal fatigue. *(See photo above.)*

We stopped using normal jib hanks for our staysail a few years after we began cruising with our first cutter rig. We had been doing a lot of light-air sailing and either our big genoa or nylon drifter was in use a high percentage of the time. We noticed small semicircular holes developing on these two sails and upon looking into this mystery, discovered the hanks were responsible. We changed to hank rings and solved that problem, only to find we'd created another. Now we could not remove the staysail when we put the boat away for a month or two unless we cut the seizing on each ring, then re-seized them again when we wanted to go sailing. So, on *Taleisin* we switched to bow shackles, using bronze ones to cut down on the wear you get when stainless steel rubs against stainless steel. This has solved both problems. *(See photo above.)*

A key sail

The staysail is not only the key to the cutter rig, but the most used and — in extreme conditions — the most important. If your mainsail blows out offshore, you have a storm trysail as a back up. If your jib goes, you probably have a genoa you can use in its place. The staysail rarely has a back up. Because of this, we tend to watch this sail more closely than any other. Once we begin to see signs of fatigue (usually after three to five years of offshore passagemaking, or 20,000 miles of sailing) we have a new staysail built. We check it to see it fits, then stow it below so it is in reserve. That means we always have the two most important sails we need, the rugged storm trysail and the multi-purpose staysail that could allow us to beat free of the classic sailors' nightmare, storm-force winds blowing onto a lee shore.

At 9, Larry Pardey had an Indian dugout canoe; at 17, a self-restored El Toro; and at 20, a self-restored Colin Archer cutter. His first racing boat was a self-restored 27-foot Tumlaren sloop. He and Lin met in 1965 while he was building Seraffyn. *The rest, as they say, is history.*

Cordage for the rest

All you need to know about ropes for

by Gregg Nestor

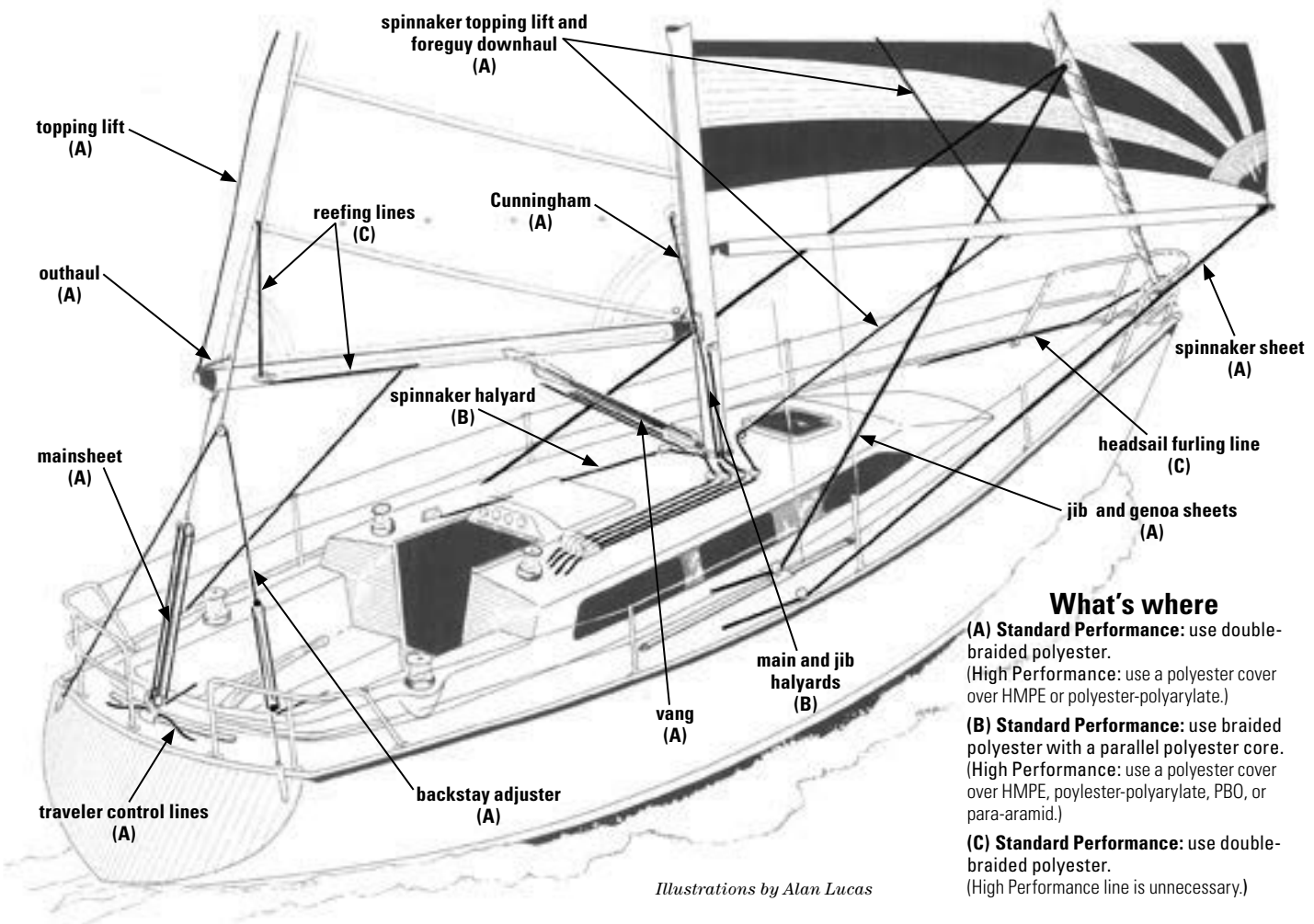
A FEW YEARS AGO, AFTER CAREFULLY inspecting my running rigging, I decided it was time to replace much of it. I identified each line and recorded its diameter, length, and color. (Regarding color: long ago, I found it a lot easier to tell a non-sailor, eager to help, to release the yellow line rather than the boom vang.) With my list in one hand and checkbook in the other, I arrived at the local marine store. I was soon standing speechless in front of a wall of spools of rope. Just about every color of the rainbow was represented, as well as a variety of diameters and materials of construction. I was amazed at the selection of cordage available. While I was comfortable with the basics — nylon, Dacron, three-stranded twist, and double-braid — I was at a loss when it came to the newer high-modulus fibers. I decided that, before I opened my checkbook, a bit of research was in order.

Types and construction

All rope (other than wire rope) begins as individual fibers. In the manufacturing process these fibers are first twisted into yarn. Following the formation of yarn, a number of yarns are then twisted into strands or plaits (braids). Finally, the strands or plaits are combined to form rope, either by being twisted or braided.

The most common of ropes is the three-stranded twist. Three-stranded twist rope maintains its form because it's always under self-tension. This self-tension results from the alternate twisting of the individual fibers, yarns, and strands. This creates internal friction among the components and, as they work in concert with each other, forms the rope. Three-stranded twist is inexpensive and easy to splice. It can become difficult to knot and coil properly, especially when it stiffens with age. Its twisted form of construction makes it the ideal candidate for docking and mooring lines as well as anchor rodes. In these applications, stretch and shock absorption are valued attributes.

Like three-stranded twisted rope, braided rope is also made up of fibers, yarns, and strands; however, they are laid out differently and are not under self-tension. Single-braid is braided with 12 strands. Half of the strands revolve to the right and half to the left. In the case of double-braid, the cover can comprise 16, 20, 24, or 32



Illustrations by Alan Lucas

What's where

(A) Standard Performance: use double-braided polyester.
(High Performance: use a polyester cover over HMPE or polyester-polyarylate.)

(B) Standard Performance: use braided polyester with a parallel polyester core.
(High Performance: use a polyester cover over HMPE, poylester-polyarylate, PBO, or para-aramid.)

(C) Standard Performance: use double-braided polyester.
(High Performance line is unnecessary.)

# of us

your boat

strands with half revolving to the right and the other half to the left. A rope constructed from 8 strands is called plaited rope. While braided rope is round, plaited rope is flat. Polypropylene ropes are often plaited.

Easier to coil

Single-braid exhibits less stretch than three-stranded twisted, is easier to coil and store, works better in self-tailing winches, and is kinder on the hands. However, it can be difficult to splice, is more expensive to produce, and has limited popularity.

Double-braid, which is a hollow braided cover over a braided core, makes up the bulk of all running rigging used aboard contemporary sailboats. This construction method produces a softer and more flexible rope that exhibits greater strength and less stretch. The core and cover share the load equally, assuming that the materials of construction are the same. Or the core can be composed of a host of different materials to take advantage of differing properties. A high-strength core material can carry 90 percent of the load.

The core can also be woven at low angles or even laid-up as parallel fibers to further reduce stretch and increase strength. There are ropes with low-twist three-stranded cores that are claimed to be 40 percent stronger than double-braid and with only half as much stretch. Double-braids are the easiest on the hands, afford excellent grip, and can be woven in a multitude of colors for quick identification. The cover of double-braided rope also can be finished as smooth or fuzzy. Fuzzy ropes won't be as strong as smooth ones, though they are easier to handle and work better in rope clutches and jam cleats. Double-braided rope is a bit more expensive to manufacture than three-strand, and splicing takes some practice.

Construction materials

Rope used to be made of natural fibers. These included such materials as cotton, flax, sisal, hemp, and manila. These days, synthetics rule the high seas.

"While there may be some high-tech racers rigged entirely with HMPE or polyester-polyarylate, the majority of cruisers coming off the assembly line are rigged mainly with double-braided polyester."

The evolution from natural fibers to synthetics started in the late 1950s with the application of three-stranded twisted nylon as halyards and sheets. For halyards and sheets, nylon was soon replaced by polyester. Nearly half a century later, advancements in synthetic-fiber technology continue to put new cordage aboard sailboats. While none can equal the durability of polyester, when it comes to ultraviolet and saltwater exposure, these new breeds of synthetics have each found a niche in this complex arena of sailboat rigging.

Nylon

Nylon can be chemically described as a polyamide (a polymer of amines). Its basic ingredients are coal and water. Nylon was developed by E. I. du Pont de Nemours and Co. Inc., in the 1930s and has the honor of being the very first synthetic fiber. The name became instantly generic; DuPont declined to register it as a trademark. Nylon is strong, affordable, and offers excellent resistance to abrasion, rot, and flexural fatigue. Nylon is prone to stretch. Three-stranded nylon will stretch 16 percent of its loaded length at 15 percent of its breaking strength. This stretchiness can be useful when it comes to absorbing shock loads imposed on mooring lines and anchor rodes. Nylon is susceptible to UV-degradation and readily absorbs water. This latter tendency can reduce the rope's strength by as much as 10 to 15 percent. Also, when soaked, the individual nylon fibers swell, and the rope temporarily shrinks a little in length.

Another downside to nylon's absorbent nature is that, over time, impurities are drawn into the rope. This results in discoloration and a progressive stiffening of the rope. Nylon has a specific gravity of 1.14 (meaning it weighs 1.14 times the weight of fresh water) and, when dry, is lighter than

A brief review

For jib, genoa, main, and spinnaker sheets, control lines for traveler, Cunningham, outhaul, vang, topping lift, foreguy downhaul, and backstay adjuster:
SP: (FOR STANDARD PERFORMANCE) use double-braided polyester
HP: (FOR HIGH PERFORMANCE) use HMPE or polyester-polyarylate covered with polyester

For main, jib, and spinnaker halyards:
SP: braided polyester cover with a parallel polyester core
HP: use polyester cover over HMPE, polyester-polyarylate, PBO, or para-aramid

For the preventer, lazy-jacks, and flag halyards:
nylon or double-braided polyester

For the headsail furling line, fender lines, topping lift, reefing lines, and headsail downhaul:
double-braided polyester

For docklines:
nylon (three-stranded twisted or braided)

For anchor line:
nylon (three-stranded twisted or braided)

For the mooring pendant:
nylon (braided) or nylon covered with polyester (Polyon)

For Lifesling line, heaving lines, rescue lines, and dinghy painter:
polypropylene (plaited)

polyester. Nylon is not recommended for running rigging. It makes great docklines and anchor rodes. When protected from ultraviolet rays by means of a polyester cover (Polyon), it makes the ideal mooring pendant.

Polyester

Dacron is the U.S. trade name for polyester fiber, another synthetic created in the DuPont laboratories. While nylon has become a generic term, Dacron has not; it is a registered trademark. It is not as strong as nylon, but polyester performs very well in high-stress applications, such as running rigging. It is resistant to rot, abrasion, and flexural fatigue. Unlike nylon, polyester is UV-stable, does not absorb water, and stretches much less. Even greater stretch-resistance can be achieved by pre-stretching the rope to its elastic limit and heat-setting it. However, this leaves the rope markedly stiffer and more difficult to splice.

Polyester takes to coloring very well and is ideal for color-coding lines, making them instantly identifiable. While polyester has a specific gravity of 1.38, making it a heavy material, it is usually the first and most economical choice for virtually all running rigging. Pre-stretched polyester ropes or ropes made from a low-twist or parallel polyester filament core with a braided polyester cover are ideal for halyards.

Rigging your boat can be as simple as making sheets and control lines from polyester double-braid and halyards from a braided polyester cover with a polyester parallel filament bundle core. Use nylon for your ground tackle and mooring lines.

Polypropylene

Polypropylene is an inexpensive, hard-wearing fiber that is weaker than both nylon and polyester. It is stiff, slippery, brittle, and hard to knot. Polypropylene is heat-sensitive and can melt if run rapidly over a winch or through a block. It exhibits poor UV-stability and is very susceptible to fading. Its low resistance to weathering further prevents it from being widely used. However, polypropylene has stretch characteristics approaching those of polyester. It doesn't absorb water, and it has a specific gravity of less than 1.0. Polypropylene's claim to fame is that it's extremely light…it floats. This makes it an excellent candidate for rescue lines and dinghy painters.

"Rigging for your boat can be as simple as making sheets and control lines from polyester double-braid and halyards from a braided polyester cover with a polyester parallel filament bundle core. Use nylon for your ground tackle and mooring lines."

HMPE

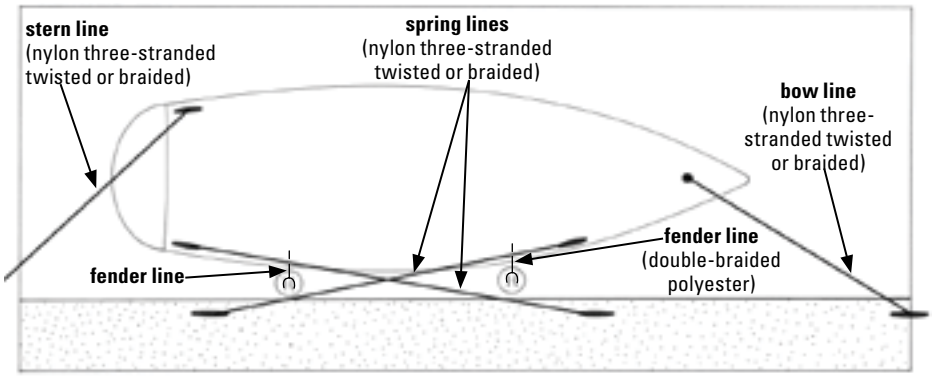
High modulus (high-strength) polyethylene is more commonly known by the trade names Dyneema and Spectra. It is a high-strength, low-stretch synthetic fiber that resists weathering and abrasion much better than polyester. Coated HMPE exhibits reasonable resistance to UV-degradation. However for the long term, a polyester cover works best. It is expensive and second only in strength to PBO (polybenzoxazole). In addition to its cost, HMPE tends to creep (elongate) under sustained loads. With a specific gravity of 0.97, it is a much lighter fiber, one more reason that it's often found aboard racing yachts. For example, a 7/16-inch halyard comprising an HMPE core with a polyester cover is not only stronger than a ½-inch double-braided polyester line but, due to its inherent lightness and smaller diameter, is 40 percent lighter. In light air HMPE spinnaker sheets might allow the sail to fly when heavier polyester ones could lead to the sail's collapse.

Para-aramids

This family of high-modulus synthetic fibers consists of Kevlar and its sister fibers, Twaron and Technora. Para-aramids are said to be stronger than steel by weight. While these fibers are quite vulnerable to UV and abrasion, they are exceptionally stretch-resistant. Para-aramids are brittle, do not bend well, and are difficult to splice. They tend to break down when flexed over small-radius blocks. Technora is the exception and can handle turns better than Kevlar and Twaron. Also, as a core material, para-aramids tend to cut through polyester covers. On high-tech racing boats, these fibers are usually sheathed in shrink-on black plastic. Even though these synthetics display outstanding strength-to-weight properties, their many drawbacks and high cost make them less practical for cruising boats.

Polyester-polyarylate

Vectran is the only brand of polyester-polyarylate high-modulus fiber used in the construction of marine rope. Its high-strength, extremely low-stretch, and little or no creep characteristics are similar to those of the para-aramids. Like the para-aramids, Vectran is degraded by UV and has a limited flex life. However, it displays much better abrasion-resistance and, therefore, will last longer when turning around sheaves. Like all the newer high-modulus fibers, Vectran is expensive. But, unlike most, when covered with polyester, it can perform most running rigging tasks aboard high-tech racing boats.



PBO

Poly-para-phenylene-2 6-benzobisoxazole (or polybenzoxazole for short) is the strongest of the synthetic high-modulus fibers. In fact, it's 20 percent stronger than its nearest competitor, HMPE.

It displays exceptional stretch-resistance and very low creep. However, it is susceptible to UV-degradation, needs chafe protection, and has a limited flex life. On high-performance ocean racers, PBO, covered in shrink-on black plastic, is used as standing rigging, where it is substantially lighter than stainless-steel rod rigging. However, considering its cost and maintenance, PBO is best relegated to boats where the pockets are as deep as the water sailed.

The bottom line

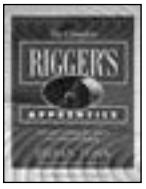
While there may be some high-tech racers rigged entirely with HMPE or polyester-polyarylate, the majority of cruisers coming off the assembly line are rigged mainly with double-braided polyester, although a few manufacturers are beginning to offer HMPE halyards.

Since most good old boats didn't come off the manufacturing line recently, they probably sport this mixture of fibers: halyards and sheets of double-braided polyester, docking and anchor lines of three-stranded twisted nylon, and heaving lines and dinghy towing bridles of plaited polypropylene.

While high-modulus fiber ropes are slowly making their way to cruising boats, they're pricey. Once the economics of scale kick in, price will probably come down.

For now, at least, most cruising sailors will be content with good performance double-braided polyester, while banking the difference between it and those high performance, cutting-edge fibers.

For further reading...



For more on cordage, refer to the classic by Brion Toss, *The Complete Rigger's Apprentice: Tools and Techniques for Modern and Traditional Rigging.* This and other books can be found at <http://www.goodoldboat.com/bookshelf.html> or by calling 763-420-8923.

Jibs *by the names and numbers*

Confused by jib nomenclature? A look at names past and present

by Ken Textor

They come drifting out of the past like the ghosts of old friends: Yankee. Spitfire. Mule. Drifter. Like specters in a dream, they are frequently ill-defined and only vaguely recognizable. But we know them, or at least think we should know them.

If you're in the market for a good old boat, you definitely should know the old-fashioned names of various headsails. Numbers too. As I found in my recent search for a keel/centerboard boat of 1960s vintage, modern boatbrokers, sailmakers, and even the sellers of the boats themselves often misuse the terms shown on listings of a boat's sail inventory. I suspect the arrival of roller furlers is the chief reason for the old terms falling by the wayside.

In any case, with only a novice's knowledge myself, I had to do some quick self-education in sail terminology. What I found were a lot of colorful terms and numbers for sails, the precise definitions of which are occasionally elusive even for sailmaking experts. Still, I was able to put together some useful rules of thumb and offer them here.

— Current Usage —
What is a genoa?

The most basic description is a headsail (in current use "headsail" and "jibsail" mean the same thing) that overlaps the mast by several feet or more and has a very low clew with a deck-sweeping foot. An LP range of 100 to 155% of "J" dimension is most common, but even sizes up to 200% make sense on a few boats with smaller foretriangles and a wide sheeting base aft. The larger the percentage of "J," the greater the overlap on the main. Because this range can vary so much and because all of these sails are termed "genoa," a numbering system is often used. A #1 is the largest genoa on the boat (often 150% on the LP), a #2 is the next smaller genoa (often 130% on the LP) and a #3 is the next smaller (often 115% on the LP). The numbers are obviously meaningful only in terms of a given boat's inventory.

From the 1998 Sailrite catalog

Jib names

Originally, a jib was any triangular fore-and-aft sail set forward of a boat's foremost mast. Jibs were usually hanked onto the forestay. Depending on their size and intended use, they developed various names as a quick means of identification. Sounds simple enough, doesn't it? Well, as with many things nautical, the more terminology, the more chance for misunderstanding.

Over the last year, the two most misnamed jibs I've encountered were the Yankee and the spitfire. I saw them in listings all the time, but everyone seemed to have a different definition. After consulting such published sailmaking and terminology-defining legends as Lenfesty, Ross, Ulmer, and some others, I found a 19th-century Yankee was originally considered a small sail for racing in rough weather only. It was set high on the forestay and more properly called a Yankee jib topsail. But eventually, the term Yankee became a standard name for other heavy-weather headsails.

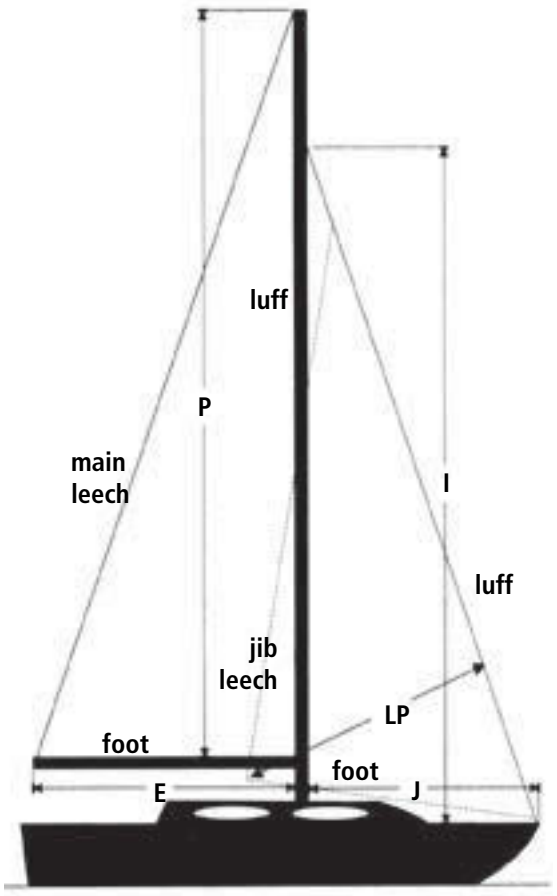
In the 20th century, a Yankee was sometimes numbered to help indicate its size and use. Or it was paired with another name, like Yankee staysail, again to indicate its size and use. Roughly speaking, then, a Yankee jib can occupy from 75 percent to 100 percent of the foretriangle formed by the forestay, mast, and deck.

The spitfire, however, is better defined. It's a storm headsail cut from very heavy material and limited to about 35 percent of the foretriangle. It is distinct from the more common terminology of a storm jib, which may be of slightly lighter material than a spitfire and cover up to 60 percent of the foretriangle. A mule is another term for a sail the approximate size and use of a storm jib.

Jibs greater than 100 percent of the foretriangle have acquired a broad range of names, some well-defined and others less so. The lapper has been a popular name for a lightweight jib which is approximately 120 percent the size of the foretriangle. As the name suggests, this sail overlaps the main mast.

But a lapper is often confused with a genoa, which was first developed in 1927 by a Swedish sailor for a race in Genoa, Italy. These days, a genoa (also known as a "genny") is often used interchangeably with the word jib. The British are particularly fond of calling nearly any jib a genny. But as a rule of thumb, a genoa is most often a larger headsail of lightweight material covering 130 percent or more of the foretriangle. Sailmakers frequently discuss genoas in terms of the placement of the clew, whether it's high or low. But in listings of older boats, genoas are most often just a larger headsail.

Drifters are similar to genoas except they are not hanked on the forestay and the material often is as light as a spinnaker's. Technically, this removes it from the narrow definition of a true jib. Sometimes this sail is referred to as a gollywobbler, a ghoster, or a reacher. If the clew of these larger sails is cut low, the boat's listing may call it a decksweeper. Other names include blooper, big boy, and wind-finder.



— Current Usage —

Working jib (115%)

$$\text{Area} = \frac{\text{LP} \times (.85\sqrt{(I^2 + J^2)})}{2}$$

or:

$$\text{Area} = \frac{\text{LP (luff length)}}{2}$$

Width should be ⅓ to ½ of height.

Genoa (150%)

$$\text{Area} = \frac{\text{LP} \times (.95\sqrt{(I^2 + J^2)})}{2}$$

or:

$$\text{Area} = \frac{\text{LP (luff length)}}{2}$$

Width should be ⅓ to ½ of height.

Drifter (150-180%)

See genoa area calculations. Not attached to forestay.

Storm jib

⅓ the area of the foretriangle

$$\text{Area} = \frac{I \times J}{6}$$

Courtesy of Sailrite

Jib numbers

When jib names began to go out of fashion in the mid-20th century, jibs were then (and often still are) referred to by numbers. In brokerage listings and among many older skippers, they are frequently called, simply, the Number 1, Number 2, Number 3, or Number 4 jib. The British will often use those numbers and substitute the word genny or genoa for jib. In any case, although many brokers and even some owners get it backward, the rule of thumb is: the smaller the jib number, the bigger the jib.

Like most of the jib names, the numbers are reasonably well defined but rarely absolute. For instance, a Number 1 jib (or a Number 1 genoa) is about 150 percent or more of the foretriangle. Alternately, its size may be a percentage worked out using outdated offshore racing rules. Since most older boats are no longer suitable for offshore racing, it's best just to remember that a Number 1 is usually made of light material; it's big and best for light-air situations.

The Number 2 and Number 3 jibs are smaller than Number 1 and usually fall somewhere between the size of the lapper jib and working jib, with progressively heavier cloth in each of them. Their size is either a percentage of the foretriangle or a percentage of the Number 1 genoa. Sailmakers often differ on the way these sails should overlap the mast, with some insisting on their being decksweepers and others opting for a high clew. In any case, no one definition fits all, so it's best just to remember that low-numbered sails will vary in their cut and uses. You may be able to contact the sailmaker and discuss the exact reasoning and formulae behind the cut of a sail.

The Number 4 jib, however, is always a heavy-weather sail and rarely occupies much more than 75 percent of the foretriangle. The cloth is thick, heavily stitched and copiously reinforced. It's rare to see a Number 5 jib listed in a sail inventory. But if one is, it's likely to be of a size similar to the spitfire.

Jib miscellany

Of course, jibs are subject to myriad modifications. For instance, a Number 1 jib could be made of considerably heavier material and, with reef points sewn in it, can be used in a greater variety of conditions. There are also club-footed jibs on many older boats. This simply means the jib has a small boom attached to its clew and there is only one jib sheet to tend. This makes tacking a lot less work. Obviously, a club-footed jib must be smaller than the foretriangle, usually around 90 percent.

The cut of a jib's components may vary. Panels for headsails have been sewn horizontally, vertically, diagonally, on the miter, and bi-radially. Sailmakers can discuss the pros and cons of these technicalities for hours. Still, when buying or sailing on an older boat, it's always best to discuss first with the boat's owner the exact nature and use of each jib included in the boat's inventory. Then you can be assured you'll get the most out of sailing with your jibs, either by their names or their numbers.

Measuring the sail

I is measured from the top of the jib halyard sheave to the deck (actually the sheer line).

J is measured from the center of the stay at the stem to the front of the mast horizontal to the waterline.

P is a measurement from the main halyard sheave box to the main tack fitting.

E is measured from the main tack fitting to the "black band" on the end of the boom.

Headsail luff is easily measured by attaching a tape measure to your halyard, raising the halyard to full hoist, and measuring to the bearing point of your tack shackle horn. In the case of a furling system, measurement is from the sail attachment points when the system is fully raised. Main leech may need to be measured in special circumstances (Bimini clearance, etc.)

LP = luff perpendicular. This determines the percentage (i.e., 150 percent genoa) your headsail overlaps the mast. The formula:
J x % = LP.

Courtesy of Sailrite

Ken has lived and worked aboard boats for 24 years. He is a contributor to many sailing magazines and recently bought an Allied Seabreeze which he is restoring.

Mainsail tamers

The easiest way for the shorthanded sailor to control the mainsail when reefing or stowing is a set of well-fitted lazy-jacks. Lazy-jacks are made from a set of fixed or movable lines led from the upper section of the mast to the boom, with lines on each side. They guide the sail onto the top of the boom when reefing or dousing it and keep it there to be tied up at the crew's leisure.

When properly installed, a lazy-jack system adds to safety and sail control. Lazy-jacks function well with sails with no battens, half battens, or full battens. When installed and used correctly, they prevent chafe and tearing. A well-thought-out installation makes the lazy-jacks convenient to use, puts them out of the way when stowed, and does not require expensive alterations of sails or sail covers.

There are several varieties of lazy-jacks. The fixed systems permanently attach to the mast and are not stowed. These require altering the sail cover, may chafe the sail while sailing, and sail battens may catch in the lazy-jacks, making hoisting difficult. The better systems allow the lazy-jacks to be stowed and are deployed only when the sail is being doused or reefed.

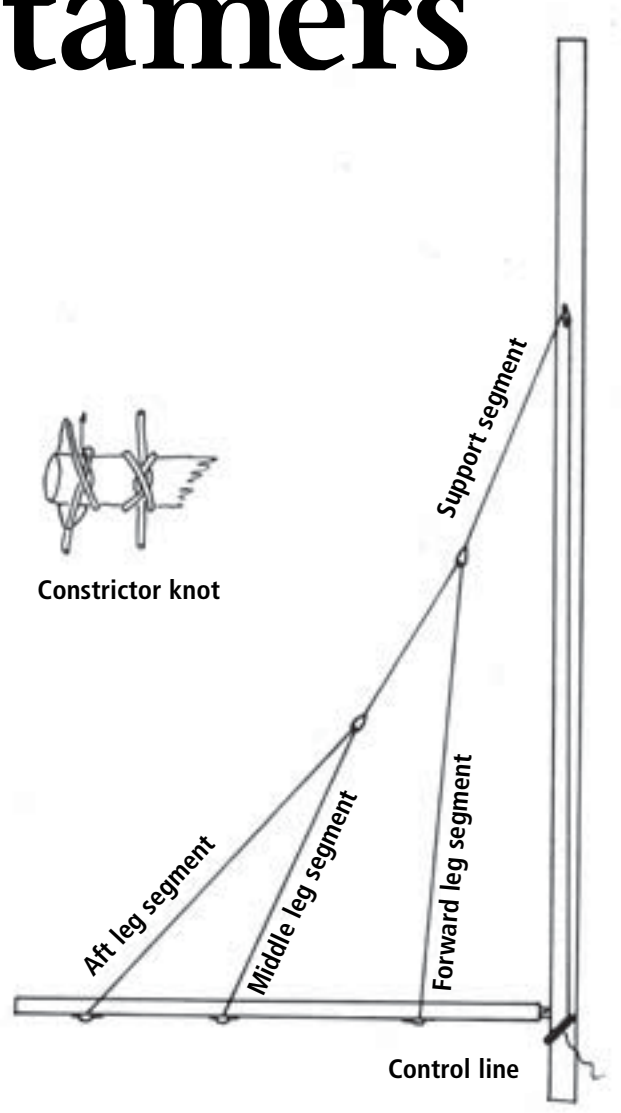
Off-the-shelf and custom-built lazy-jack systems are available. Sail-loft versions start at $200; mid-range systems cost about $400; and high-end systems can cost $1,500 or so if professionally installed. A scratch-built system can be fabricated for less than the cheapest off-the-shelf systems, and has some advantages in the way it fits and functions with your boat.

Not always better

The off-the-shelf systems are not necessarily better designs. Most off-the-shelf systems use blocks at their segment junction points. When stowed, these blocks may bang on the mast. Correcting this situation requires the installation of hooks on the mast or boom and sections of shock cord to pull the support segment away from the mast. The need for blocks at the segment junctions is questionable, and they are more costly than thimbles.

Systems that use a line through the sail can cause sail chafe and require modifications to the sail and cover. Since the average do-it-yourself sailor can't perform these modifications, the work can be expensive. These lines can also interfere with the shape of the sail when set. Changing the sail requires re-threading the lines through the sail each time it is changed or removed, neither a quick nor an easy task.

Some systems use shock cords to support the leg segments of the lazy-jacks. However, the shock cord provides too much stretch, and the sail may fall out of the lazy-jacks. Most of these systems use a plastic clip-on fitting to secure the lazy-jacks to the boom and mast. This plastic deteriorates in sunlight and often fails within a season or two.



With about an hour more than you would invest in the installation of an off-the-shelf lazy-jack system, you can make your own custom set, tailored to your boat. By buying the individual components, you can create a custom system for less than $175 *(see parts list on Page 51).*

Four choices

The line you select should match your splicing abilities and rig construction. There are four types to choose from: three-strand nylon; three-strand Dacron, standard double yacht braid, and more exotic fibers, such as Sta-Set X or Spectra line. Lazy-jacks made of three-strand nylon for the average boat can be assembled for about $91. The same lazy-jacks in Sta-Set would cost about $160. Don't let cost be the only deciding factor; each line has advantages and disadvantages.

Three-strand nylon is simple to splice, requiring no tools and little knowledge. It's inexpensive and available from most chandlers for 13 cents a foot or less for ¼-inch diameter. However it is stretchy, so it is not as well-suited for high-aspect-ratio rigs where the stretch could allow the sail to fall off of the top of the boom. It's susceptible to chafing where it contacts other lines, and it may cause twisting when deploying the lazy-jacks, necessitating the untwisting of the support lines.

While this is the cheapest line, with the most disadvantages, it served well on my 39-foot racer/cruiser for more than five years, until recent replacement

by Guy Stevens

Take the pain out of the main, make your own lazy-jacks

with double yacht braid. I've constructed a number of lazy-jack systems using three-strand nylon for people who wanted to spend as little as possible on the initial trial of the lazy-jack system. Each system I created with three-strand nylon has occasionally required some intervention to untwist the support lines. Using this line, you could first build a three-legged system, expand to a four-legged system, or experiment with other aspects. As it is the least expensive material, making radical changes in lazy-jack rigging rarely involves more than a $30 expense.

Less stretch

Three-strand Dacron is as easy to work with as three-strand nylon. It is less expensive than yacht braid or exotic fibers and has significantly less stretch than nylon: 4.2 percent compared to 16 percent when loaded to 15 percent of breaking strength. This makes lazy-jack deployment and tensioning easier. It has less tendency to twist than nylon, lasts longer, and is significantly less prone to chafe. It is also 10 to 20 percent stronger than the same-sized nylon. It looks great on traditionally rigged vessels on which the rest of the rigging is three-strand and costs about 18 cents a foot. A system constructed with three-strand Dacron for an average boat costs about $106.

Double yacht braid line has still less stretch than three-strand Dacron — only 2.4 percent. It is less prone to chafe than either of the three-strand lines and looks a lot more at home on a boat with braided running rigging. It is more difficult to splice than three-strand line, and splicing requires the use of a fid and pusher like those produced by Samson or the Splicing Wand from Brion Toss. Both come with excellent directions. Double yacht braid eliminates twist. It costs about 36 cents a foot. A system would cost about $160 for an average boat.

The exotic lines are more expensive, and there is no need to make your lazy-jack system out of these because lazy-jacks are not normally subject to the kinds of loads these lines are meant to handle. They do rate a single mention. Should your boat have an extremely high-aspect-ratio mainsail, you might wish to make the support segments out of Sta-Set X. This line is harder to splice but has the advantage of the least stretch for the money, at 1.6 percent stretch and about 59 cents per foot. This would reduce any tendency of the high-aspect-ratio sail to stretch out the lazy-jacks and fall off the top of the boom. An alternative to splicing might be a good seizing job; it's almost as strong and a whole lot easier.

Parts and price list

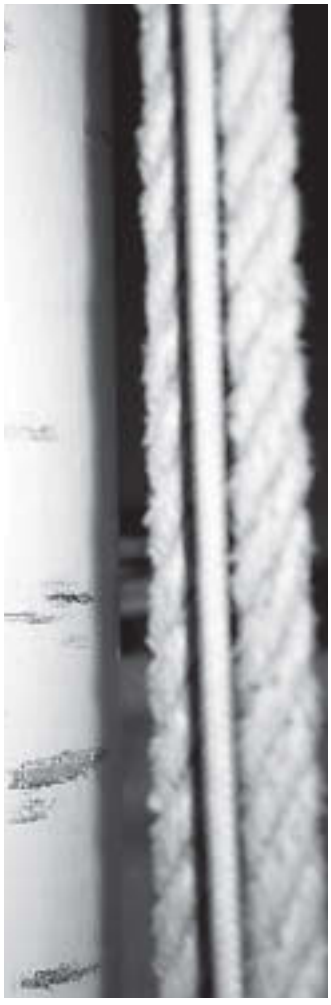
300 feet double yacht braid	$108.00
4 stainless steel thimbles	$6.76
3 eye straps for boom	$8.07
2 cleats for mast	$2.78
2 eye straps for spreaders	$5.38
2 Harken swivel blocks	$24.18
1 pkg fasteners for eye straps 10 x 24 x 1.5 inch	$3.49
1 pkg fasteners for cleats 10 x 24 x 0.5 inch	$1.79
Anti-seize compound (on hand)	
Light machine oil (on hand)	
Total expenditure:	**$160.45**

Excessive chafe

With the exception of a turning block for the support segment, blocks are not well suited to use in lazy-jacks; they cause excessive chafe on the sail and bang on any surface they contact. They also add unnecessary expense to the installation. They're prone to jamming when deploying the lazy-jacks and to sunlight damage to their sheaves. Blocks are meant to make adjusting a line under load easier, but in deploying your lazy-jacks there shouldn't be any load. The weight of the sail is placed on the lazy-jacks after they have been deployed and adjusted.

There are three types of thimbles available. These are used for the inserts that go into the eye splices to reduce the chafe and friction where the segments of the lazy-jacks meet.

Galvanized steel thimbles are really cheap, but they rust quickly and make a mess of the sails, mast, and anything else they contact. Nylon thimbles are cheaper than stainless steel, are a nice white color, and won't remove the surface coating of the mast should they come into contact with it. However, they do chafe more easily and are subject to degradation in sunlight, often being the first part of a lazy-jack system to fail. Stainless-steel thimbles last longer than nylon thimbles and have the least friction. If allowed to bang on the mast, they make a racket and remove the surface coating. I use them only when I'm certain they're not going to contact the mast. They will outlast the rest of the lazy-jack system and probably even the boat itself.



Chafe on the mast is an issue because of noise and wear.

Stainless wire

Most off-the-shelf systems use vinyl-coated stainless wire for support segments. The wires are

mounted to pad-eyes on the mast. Since both ends of the support segment are next to the mast when the unit is stowed, the segment bangs against the mast in rolly or windy conditions. A fixed-support segment requires lazy-jacks to be adjusted, stowed, and deployed from a spot on the boom. The disadvantage is that you have to adjust them from the center of the boom. If you position the lazy-jack controls on the mast, it's much easier to deploy them when the boom is moving or not centered on the boat.

Mounting control lines on the mast also makes it possible to mount the support segment blocks 6 to 8 inches out on the spreaders. This prevents banging on the mast. Mounting the support segment blocks on the spreaders works best on the upper spreader of double-spreader rigs. If your boat has a single-spreader rig, or if you are mounting to the lower spreader, three-strand nylon may stretch too much and let the sail fall off of the boom. In these cases, the easiest solution is to use a stiffer line.

For free-standing rigs, a general rule for the placement of the support segment blocks is: the higher the better. About 70 to 75 percent of the height of the mast off the deck provides a good angle. If the support segment blocks are too low, the tension is more forward than upward. In this situation, the sail pushes the lazy-jacks out of the way and falls off of the boom when it is lowered.

Spreader blocks

The parts list on the previous page is for a 40-foot boat I recently equipped with lazy-jacks. On this boat I was able to use spreader-mounted blocks for the support segment. The rig is modern, so we used ¼-inch double yacht braid for the installation. Since the support segments were spreader-mounted, I used stainless-steel thimbles. If we had not been able to use the spreaders for the support segment blocks, I would have used two Harken 092 cheek blocks at a cost of about $8.79 each.

The first step in the installation is cutting the lines for the support segments. If you're installing lazy-jacks on a double-spreader rig and are able to use the spreaders as a mount for the support segment, measure the height of the second set of spreaders to the deck. Double this measurement and add 3 feet for splicing room. You will need to cut two lines this length for the support segments, one for each side of the mast.

If you are unable to use the spreaders as a mount for the support segments, you will want to mount the support segment blocks about 70 percent of the way up the mast. Measure this spot on the mast by using a long tape and a halyard. Make sure the area is clear of other fittings and there is sufficient room to mount the cheek blocks.

If you're mounting the support segment blocks to the bottom of the spreaders, position them about 8 inches from the base of the spreaders at the mast. Double-check the location. If there are spreader lights, they must be far enough away that the line for the support segments will not chafe on them. Make sure the drill does not hit the spreader-light wiring.

Small dimple

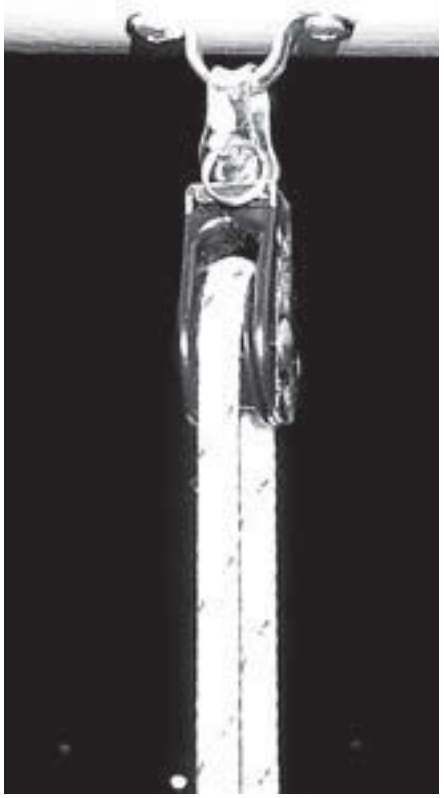
Once you are certain there are no obstacles, use a center punch to make a small dimple as the mark for the first hole. Drill the hole, using a little light oil on the bit. Then lightly oil the tap and tap the hole, being careful to start and keep the tap perpendicular to the bottom of the spreader. With each turn you should turn the tap back a quarter of a turn. This helps to avoid breaking the tap off in the hole because it clears the chips from the tap. When the hole is tapped, spread some Ultra Tef-Gel or anti-seize on the screw, and screw

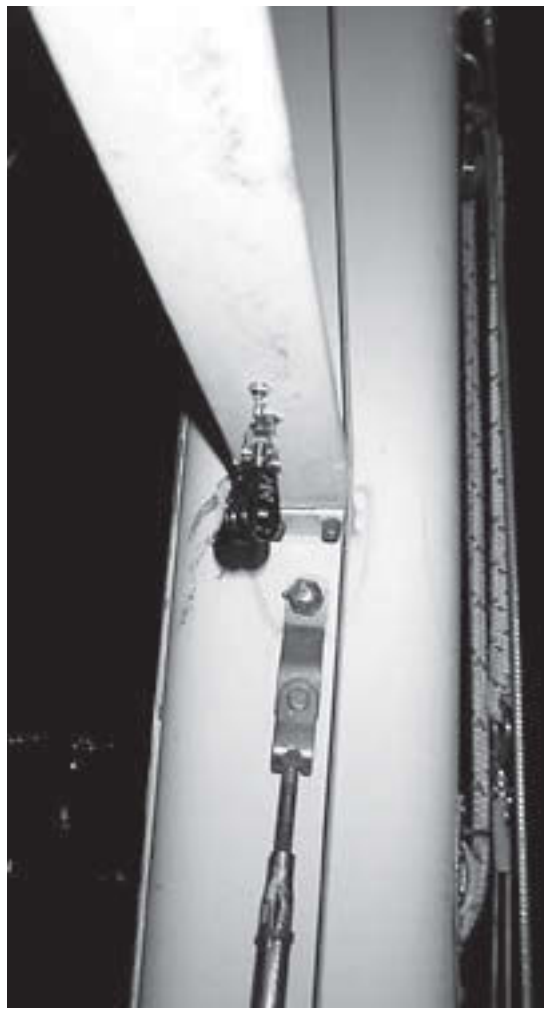
Readers' comments

What about sail containment systems:

In preparation for this issue we asked our readers what their thoughts and experiences were with sail hoisting, dousing, and reefing systems. These are some of the remarks we received.

- **Don Launer, of Forked River, N. J.,** has lazy-jacks on the jib, foresail, and mainsail of his Ted Brewer-designed Lazy Jack Schooner *(what else, right?)*. All three lazy-jack systems are simple two-legged arrangements that do not stow. Don reports that all work well, but he needs to go head-to-wind to hoist the Marconi mainsail.
- **Ron Bohannon, of Big Bear City, Calif.,** says his previous boat, a Phil Rhodes Chesapeake 32, had a roller-furling main. (This is the older rolling-boom type of reefing where the sail stows around the boom, rather than inside of it.) He says this system works fine as long as a main is cut properly and the topping lift is adjusted correctly. He adds, "It sure is simpler than any other system."
- **Fred Bauer, of Marblehead, Mass.**, says, "I have a classic boat with old-fashioned lazy-jacks, but don't miss the Hood Stow-away system." He points out that Dodge Morgan had the Hood system on *American Promise* when he sailed around the world in her. Fred says, "It's by far the easiest and most precise way to trim sails to the power of the wind I've ever used."
- **Patrick Matthiesen, of London, England,** sent a detailed opinion of the Hood Stoboom. He thinks it may work well with short booms but did not work well on the 22-foot-long boom of his Sparkman & Stevens CCA 47 yawl. He would not have another one.
- **Gary Heinrich, of Chippewa Falls, Wis.,** said that he has slab reefing on his S2 9.2 with "no furling system for the main, other than the arms of those available and, in a pinch, the deck and lifelines, followed by sail ties." He has no plans to change his S2, but has chartered larger boats with lazy-jacks and sailcovers built into the sail. On these boats it was necessary to go head-to-wind to hoist the sail, and it took more than one person to do it.
- **Larry Helber, of Rochester, N.Y.,** said he had installed a Schaefer lazy-jack system on his Grampian 28. He liked the leather-covered blocks and the one-cleat design for





Stainless steel thimbles have low friction and long life. Keep them from chafing by mounting the support segment turning blocks on the spreaders.

lazy-jacks and furlers?

storing the lines. He felt the hardware supplied was of good quality. He did say, however, that the system turned out to be a very poor design and cited problems with raising the sail and jamming of the jacks where they pass under the boom. A friend of his bought the cheapest set of lazy-jacks he could find in a catalog, and they worked better. "I would do it again (install lazy-jacks), but I would choose the cheaper version," he says.

- **Bruce Goldman, of Southfield, Mich.,** reminds us that almost every aspect of sailing is some kind of compromise. "We have an in-mast ProFurl system on our Beneteau Oceanis 300. The convenience, ease of sail handling, and ease of setting and striking the main and genoa more than compensate for the sad sail shape (and resulting poor performance). We had some initial trouble with the furling line, but a good wash and ample Sailcote solved that problem."
- **Jerry Powlas and Karen Larson, of Maple Grove, Minn.,** wondered "how complicated does all this have to be?" Our 20-foot Flying Scot had a longer boom than our C&C 30. With such a short boom, our high-aspect-ratio mainsail couldn't get in much trouble when we dropped it. It was not control that we needed, it was order. We wanted the main to flake neatly over the boom. Obviously a neat flake has alternating panels to port and starboard. We made a very neat flake in calm conditions and then marked the luff of the main with red and green permanent markers to show which side of the boom the sail should fall on at that point on the luff. We did the same for the roach.

  Now when we lower, the person at the halyard at the base of the mast guides the panels to port and starboard as they fall. The roach can be made neat at the same time by another person or later by the same person. Once the luff is laid down correctly, the roach can be made to follow with minimal effort. The main was soon so well-trained that it almost always falls correctly and unaided. We think the sail is too small to require extra gear to control it. We use the same red-green markings on our heavy 110-percent jib to help us get it flaked prior to bagging it. It works so well, we will probably mark all our jibs that way.

one end of the eye strap into place just barely tight. Use the other end hole as a guide. Center punch on this mark, drill, and tap it as before. But before inserting the screw, slide the block onto the eye strap. String one of the two support-segment lines thorough the block, one end on each side of the lower spreader.

If you are mounting the support-segment cheek blocks to the mast, the procedure is much the same, except you are going to measure up to the position you determined earlier and mark in the middle of the side of the mast. Using the cheek block for a pattern, drill and tap each hole. Exercise caution while drilling in the mast; go slowly so as not to over-drill and damage wire or lines in the mast. Thread the support-segment lines through the blocks, keeping one end on each side of the spreaders below you (if any).

Next, mount the cleats on the mast. They should be about level with the end of the boom, on the side of the mast. Make sure they are not going to interfere with other control lines on the mast. If they do interfere, moving the cleats up or down several inches might solve the problem. If the area on the mast is too cluttered, you can mount them about a foot or so aft on the boom, making sure you lead the support-segment control lines aft of any spreaders to avoid chafe and noise. I've found that moving the bottom of the cleat slightly toward the bow of the boat makes cleating the support segments a lot easier than an absolutely vertical cleat.

Various effects

Boom length, batten length, and the hand of the sail cloth all have an effect on the perfect number and placement of the leg segments for the lazy-jacks. I have had excellent performance with three-legged systems with booms up to 16 feet. Many rigs have mainsails that are shorter on the foot than the length of the boom. In these cases the sail's foot length is the critical measurement. The best way to determine the number and placement of the legs is trial and error; every rig is slightly different.

Here are some good starting points for placement, but they are only starting points; 20 minutes of testing will make sure that the lazy-jacks are dialed in perfectly for your boat. Measure 25 percent of the length of the foot of the sail, back from the gooseneck on the boom. Mark this position on the bottom of the boom. Repeat at 60 and 85 percent of the length of the foot of the sail, and mark the bottom of the boom for these points. These will be the starting position for the legs on a three-legged system.

Both the forward leg segment and the single line that makes up the middle and aft segments should initially be 2.5 times the length of the boom. The forward leg segment passes under the boom at the mark closest to the mast and is hoisted by the eyes spliced in the support segments. It, in turn, supports the after and center leg sections in a three-legged system.

The luff of the sail is held to the mast by the sail slides, so when adjusting the forward leg segment keep in mind that it should attach to the boom at about the most forward point where the sail first starts to fall off of the boom. About 25 percent of the sail's foot length aft of the mast is a good starting point. Too far

forward, and the leg provides no support for the center section of the sail; too far aft, and the top of the sail tends to fall off the boom.

Through thimbles

The aft and center leg sections in a three-legged system make a loop. They are supported by the forward leg segments where they pass through the thimbles spliced to the ends of the forward segment. The center leg segment supports the large belly of the sail so that the sail does not spill off the boom. Slight adjustments of the center segment fore and aft can have large results.

The aft leg attachment point is generally the first place to start adjusting the system. If the sail falls out the end of the lazy-jacks, you will need to move it aft; if the center section needs more support, try moving it forward to add some support to the center section.

When you are roughing in the system and testing it, attach the middle of one of these lines to the aftmost mark on the bottom of the boom, using a constrictor knot or some good tape wrapped a couple of times around the boom. Lead the ends forward to the center mark on the boom. Tie them together making a loop out of this line. Secure it to the boom with a constrictor knot or tape. You can use a loose bowline in place of all of the thimbles while testing.

On sails that have slides on the foot, it is often possible to use these slides as mounts for the leg segments of the lazy-jacks. This does, however, limit the options for placement, and does not function well in all cases. It also means that you will have to remove the leg segments from the boom to remove the sail.

Attached to boom

Now you have a roughed in lazy-jack system. The legs should be attached to the boom well enough that you can hoist and drop the sail into them. Hoist the sail on a calm day, drop it into the lazy-jacks, and adjust until the sail stays stacked on top of the boom.

Should you have a boom over 16 feet long and the sail falls out of the middle no matter what adjustments you make, you may need a four-legged system. A simple addition to the system you already are working on makes the transformation an easy one. Instead of the forward leg supporting the center and aft leg loop, as it does in a three-legged system, it is going to become a loop just like the one between the two aft segments. Connecting the two loops are two pieces of line, each about half the length of the boom, one on each side, that are supported by the support segment. Good starting positions for the boom attachment points on a four-legged system are at about 24 percent, 45 percent, 55 percent, and 84 percent of the boom length, measured aft from the gooseneck.

Once you have tested to make sure you have the legs roughly where you want them, test to see if the system stows cleanly away. To put the system in the stowed position, ease the support segments and place the aft side of the segments under the cleats on the mast, then tension the support segment halyard. At this point you may have to shorten the forward or aft leg segments to remove any excess line that drapes below the boom. Do this by simply retying your bowline on one side of the aft or forward section. The leg sections should lie parallel to the boom when stowed.

Naturally, this may change the way the segments support the sail, so hoist the sail again and drop it into the lazy-jacks, making sure that everything still looks correct before splicing the thimbles in the ends and attaching the eye straps. This is the trial-and-error part.

Anti-seize compound

Mount the eye straps that hold the leg segments, with the holes fore and aft, using machine screws drilled and tapped into the bottom of the boom. Remember to put the lines through them before attaching the second screw. Some riggers use pop rivets for these attachments, however I have not found them to hold up as well as properly tapped screws coated with anti-seize compound.

Tie a small knot on each side of the center of the leg segments under the boom to prevent having to readjust the system periodically. Alternately, a couple of stitches through the line and around each of the eye straps looks neater and serves the same function.

Splice thimbles into all of the segments where there are bowlines. Make sure that you place the line going through the thimble in the thimble to be spliced before making each of the splices.

Using the system is straightforward: simply ease the support segment halyards on the mast, remove the leg segments from the cleat bottoms, and tension the support segment halyards. The lazy-jacks are ready for use.

Deploying the lazy-jacks allows you to drop the mainsail any time the wind is on or forward of the beam. I have used them when picking up a mooring and when sliding into a slip under sail. Simply let the mainsheet out and drop the sail. Pull the mainsheet back in when the sail falls into the lazy-jacks and you have quickly de-powered without having to head into the wind.

If your sail should hang on the track and refuse to allow the sail to drop easily, check for bent sail slides, and lubricate the track and slides with a dry Teflon lubricant.

Guy and his wife, Melissa, are working on a circumnavigation aboard Pneuma, *their good old 1973 Ericson 39. Currently they're in the Marquesas.*

Better, more reliable
Furling systems

Choosing and installing a roller furling system . . . options and opinions

by Dan Spurr

Back in the late 1980s, when my wife, Andra, and I were cruising aboard our 1965 Pearson Vanguard, all our headsails were hank-ons. One of the most annoying jobs was stuffing a genoa into its bag, made more difficult because we left all the hanks on the forestay except the bottom one. To get the bag off the deck, we'd clip the jib halyard to the webbing on the bottom of the bag and hoist it. It didn't help that the bags always seemed too small.

Some years later, after Fred Cook and I had installed a new Schaefer furler on our C&C 33, I took Andra for an inaugural sail. As we returned to the harbor she said, "Don't you think you ought to drop the genoa?" I pulled the control line, which rolled the sail up like a window blind.

Andra watched in amazement, asking, "How come we didn't have one of these when we were *cruising*?"

Good question.

Roller headsail furling is one of the most significant recent advances in sailboat technology. Along with electric and self-tailing winches and windlasses, roller furling more than any other device has enabled short-handed crews to manage larger boats. Indeed, where 15 to 20 years ago most cruising couples felt that 35 to 38 feet was the maximum size boat they could handle, today older couples are routinely circumnavigating in 50- and 60-footers — thanks largely to headsail furling.

And it's not just cruisers. Single-handed ocean racers depend on roller headsail furling. You couldn't do the Around Alone or Vendee without it. The open-class 60s typically are rigged as double-headsail sloops with headstays and inner forestays, each fitted with roller furling. Where 20 years ago failure of these mechanisms was not uncommon (remember watching the battered crew of some boat enter harbor with the tattered remains of its headsail flogging in the gale?) today they are remarkably reliable. Failures are surprisingly few. An override on the drum of the control line is probably the most common problem and that can be avoided by keeping a little tension on the line as the sail is let out . . . rather than letting the sail unfurl with a bang.

Headsail furling isn't just for big boats. While it is true that the smaller the sail the easier it is to trim, drop, and bag, nothing is simpler than making the sail disappear by simply pulling on a line.

History

While various and simple means of reducing headsail areas have been around as long as the sails themselves, the first mechanical systems did not appear until the twentieth century along the English Channel. The British Wykeham-Martin furling gear is mentioned in the book, *Single-Handed Cruising*, by F. B. Cooke, published in 1924, and in the 1940s Merriman introduced its wire luff system which gave small boat owners an alternative to hanked-on sails. Swivels top and bottom permitted the sail to be furled around the sewn-in luff wire, which was independent of the headstay. Sag, however, increased terribly as the wind built, and sail shape suffered proportionally.

In the 1970s, three systems using solid aluminum extrusions in place of headstays represented a marked improvement to the Merriman-type: the Hood Sea Furl, the Hyde Stream Stay, and the Stearn Dyna Furl. While durable, the small diameter of the rod was a drawback in terms of reefing ability and sail shape.

What might be termed the modern era began with Hood's introduction of the Sea Furl II in 1978. Like most furlers today, the Sea Furl II utilized sections of hollow extruded aluminum that fit over the boat's existing headstay. Of course, there have been many refinements since, such as split furling drums for quick removal, feeders to facilitate changing sails, and a tack swivel (originated and patented by Hood Yacht Systems but now used by others) that allows the middle of the sail to make one full turn before the tack, thereby keeping the middle of the sail from bellying out. The basic idea, however, remains the same.

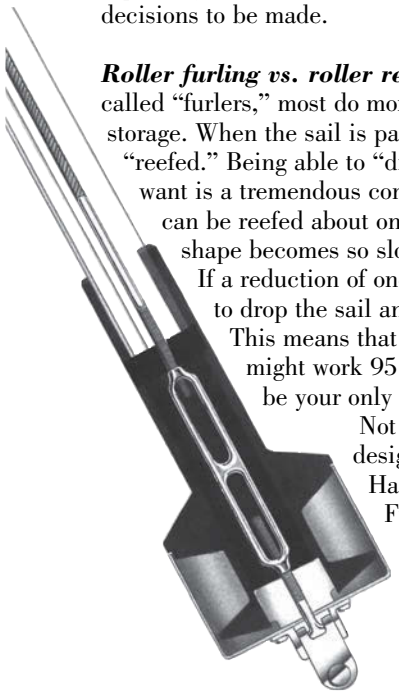
The same technology also has been applied to mainsails, though these systems are found almost exclusively on large boats because most require custom masts, which are very expensive. Recent improvements to in-boom mainsail furling gears make them viable alternatives to in-mast mainsail furling.

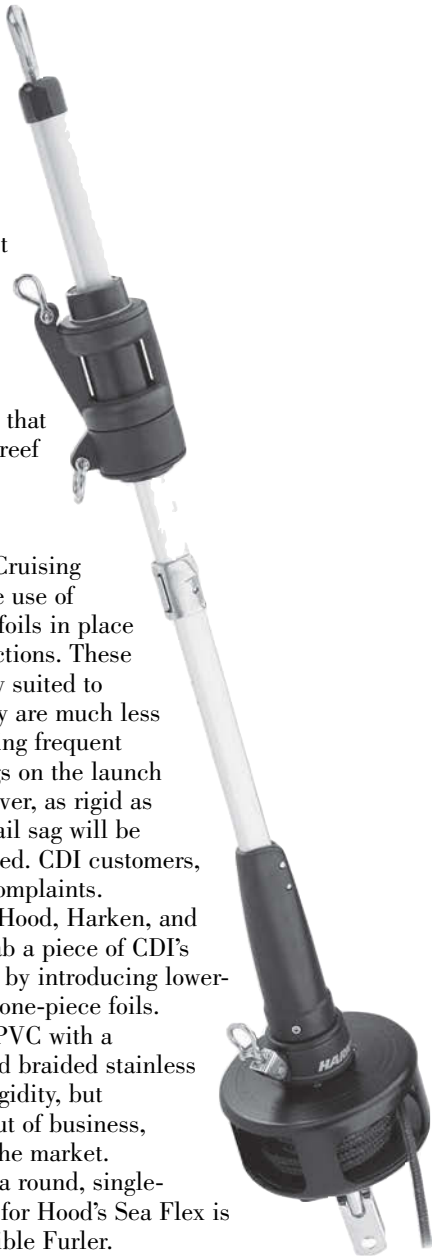
Choosing a system

If you're in the market for a headsail-furling system, and especially if this is to be your first, there are, naturally, decisions to be made.

Roller furling vs. roller reefing. Though most systems are called "furlers," most do more than just roll up the sail for storage. When the sail is partially furled it is said to be "reefed." Being able to "dial in" the amount of sail area you want is a tremendous convenience. Generally, most genoas can be reefed about one-third of their area before sail shape becomes so sloppy that it's unwise to continue. If a reduction of one-third isn't enough, then it's best to drop the sail and hoist a smaller jib or storm sail. This means that though a roller furling genoa might work 95 percent of the time, it shouldn't be your only headsail.

Not all systems, however, are designed to be reefed. Some, such as Harken's and Schaefer's Small Boat Furling Kits, which consist of drums and swivels but not luff extrusions, are for completely furling the sail only, so be sure you know what you're buying. These are best suited to daysailers with small jibs that you wouldn't be likely to reef anyway.





Opposite page, a Catalina sails with a CDI Flexible Furler. Furlers, this page clockwise from top left: Schaefer's Snap Furl, Harken's Unit 1, and CDI's Flexible Furler.

PVC flexible foils vs. aluminum extrusions. Cruising Design Inc. pioneered the use of flexible, one-piece, PVC foils in place of extruded aluminum sections. These flexible furlers are ideally suited to trailersailers because they are much less likely to be damaged during frequent steppings and unsteppings on the launch ramp. They are not, however, as rigid as aluminum foils, so headsail sag will be somewhat more pronounced. CDI customers, however, have very few complaints.

In the past few years, Hood, Harken, and Schaefer each tried to grab a piece of CDI's trailersailer market share by introducing lower-cost furling systems with one-piece foils. Harken's Heli Coil used PVC with a polypropylene interior and braided stainless steel for more torsional rigidity, but Harken's supplier went out of business, forcing the Heli Coil off the market. Schaefer's Snap Furl has a round, single-groove PVC foil. The foil for Hood's Sea Flex is flat PVC, like CDI's Flexible Furler.

Flexible foil systems are generally targeted at owners of boats up to about 25 feet, though CDI has models for boats up to about 30 feet. Limiting factors are headstay length (for example, 33 feet for CDI's FF4 model), headstay diameter (3⁄16 inch diameter) and turnbuckle pin size (3⁄8 inch diameter).

Aluminum foils are the way to go for larger boats, especially those that don't have their masts frequently unstepped, and for those owners who want premium sailing performance.

Not all systems with aluminum luff foils, however, are created equal. A few companies, most notably Hood, offer several levels of quality — the SL model is a sort of economy version of the main line Sea Furl 5. (The Hood LD or line-drive model with continuous control line has been discontinued, but parts are still available.) If you don't plan on sailing your boat long or hard, one of these systems can save you some money.

Most other major companies — Furlex, Harken, Schaefer, Profurl, Reckmann, and Reef

A Harken furler on a Pacific Seacraft 40.

Rite — incorporate the same essential features in all sizes and models.

Plastic bearings vs. steel bearings. A major reason for the improvement in modern furling systems lies in how loads are handled. Today's furlers incorporate multiple races of low-friction ball bearings, both in the bottom drum bearing and top swivel *(see cross-section drawing on Page 14)*. Engineers have experimented with various ways of orienting the races so the ball bearings aren't unduly stressed when loads come from unexpected directions. Harken says its bearing system is "omni-directional," and Furlex says its bearings "float" on pivot points to handle the "offset" loads of tack and halyard. Schaefer says its races have "angular contact" surfaces. Theoretically, such features should translate into easier furling, which is about all the average owner cares about. Unfortunately, most owners don't get to try three or four systems for ease of furling before buying one.

Bearings may be plastic or steel or a combination of both. Most plastic bearings are actually Torlon, much tougher than nylon or Delrin, but not as hard as steel, so they can compress under severe loads. That's one good reason to buy a furler properly sized to your boat. Torlon bearings won't corrode but, because they generally run in open races which can collect salt deposits and dirt, they should be periodically flushed with fresh water.

Steel bearings are, of course, harder. Furlex uses stainless-steel bearings in open races. Profurl's carbon steel bearings run in sealed, grease-packed races that should last many years before water intrudes, thereby requiring replacement and repair. In a rather odd concession to what it perceives as a consumer fondness for Torlon, Hood's Sea Furl 5 has both stainless steel and Torlon ball bearings, though the steel bearings do all the work — the Torlon bearings carry no load. Hood's bearings run in open races and require freshwater flushing.

There isn't a wrong choice here, but in my experience steel bearings make for somewhat easier furling.

Method of connecting extrusions. Especially if you're going to install your own furler, you'll be interested in how the foil extrusions connect. The methods are as varied as the number of manufacturers, each of which seems to think it has developed a better mousetrap.

Set screws, such as used by Profurl and Harken, have the advantage of being removable, but must be set in a thread-locking compound to keep them from falling out.

Rivets are strong and secure, but if you ever have to disassemble the extrusions, you'll have to grind off their heads as you may have to also on Hood's old button locks.

Others, like Furlex, use ingenious snap-together extrusions that are assembled without fasteners and can be taken apart without destroying anything.

"These flexible furlers are ideally suited to trailersailers because they are much less likely to be damaged during frequent steppings and unsteppings on the launch ramp."

PVC Foil Furlers for 24-footers

Make	CDI	Hood	Schaefer
Model	FF4	Sea Flex	Snap Furl
Average discount price	$425	$480	$500
Max headstay length	33' 0"	33' 0"	31' 1"
Max wire diameter	7/32"	3/16"	3/16"
Max pin size	3/8"	3/8"	7/16"
Cage type	Closed	Closed	Open
Extrusion shape	Flat	Flat	Round
Extrusion fasteners	n.a.	n.a.	n.a.
Bearings	Plastic	Torlon	Torlon
Adjuster	No	No	No
Tack Swivel	No	No	No

Extrusion shape: round vs. elliptical. Here's the dilemma: the larger and rounder the foil, the tighter the sail wraps around it. But there's also more wind resistance just where you don't want it, at the leading edge of the sail. So in the name of performance, some makers, like Harken and Furlex, compromise by offering elliptical foils, which are more aerodynamically efficient. Hood's Sea Flex and CDI's Flexible Furler PVC foils are nearly flat. Some companies, like Profurl, offer both shapes — cruising and racing. Unfortunately, you can't have both, flipping back and forth according to your whim.

"Aluminum foils are the way to go for larger boats, especially those that don't have their masts frequently unstepped, and for those owners who want premium sailing performance."

Cage type: closed vs. open. Cages are the drum enclosures that hide the coiled-up furling line. There's not a lot to choose from between the closed and open styles. In closed types, the line and bearings are somewhat better protected from the weather, but overrides are more difficult to clear. A polished stainless-steel cage, like the one on the Sea Furl 5, is stylish, and cages provide a place for the manufacturer to stick its logo. Profurl, Schaefer, and Harken use open drums; the legs that connect the top and bottom drum parts help retain the control line yet allow access to line overrides in between.

Headstay tension method: original turnbuckle vs. screw. A few furlers, notably Furlex, provide a headstay-tension adjuster. The others use your existing headstay turnbuckle. An advantage of the integral adjuster is the elimination of the bulky torque tube that has to fit over the existing turnbuckle. Fat torque tubes connecting to skinny foils tend to make the sail wrap up unevenly.

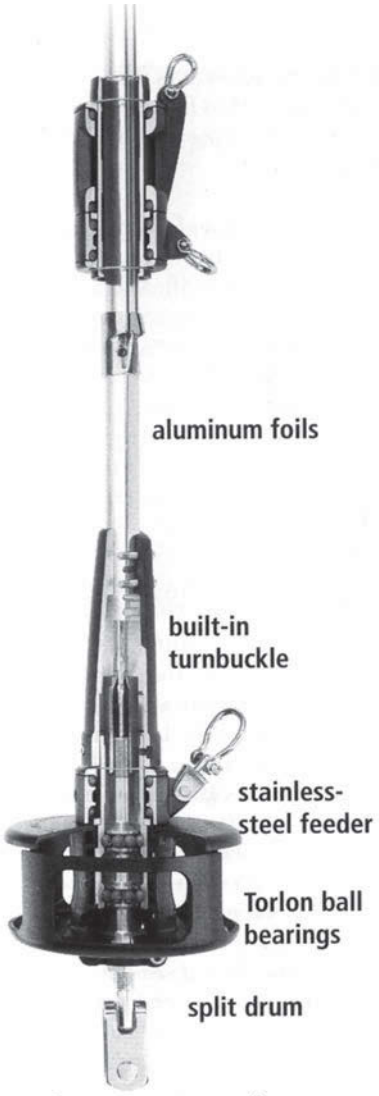
Tack swivel. Years ago Hood patented a tack swivel that allowed the middle of the sail to make one furl turn before the foot. This made for a tighter furl without as much bag in the middle. Some other companies, like Furlex and Harken, paid Hood a royalty for its use. That patent has since expired, but not all companies have adopted its use.

Split drums for racing. If you like to race occasionally (if you race a lot, you don't want roller furling) but still like the convenience of roller furling the rest of the time, you'll want to consider a split drum. This feature makes it quick and easy to remove the furling drum, allowing you to hoist the largest headsail possible, that is with its tack closer to the deck than would be allowed with a drum high off the deck. If you're not a club racer, a removable split drum probably won't be a feature worth paying extra for.

Single- or double-luff grooves. Most foil extrusions have double grooves. In race mode, with the drum removed, they allow inside-out sail changes in which you hoist a second headsail before dropping the first. In cruise mode, they enable

Aluminum Foil Furlers for 30-footers

Make	Furlex	Harken	Hood	Hood	Profurl	Schaefer	Reckmann	Reef Rite
Model	200	Unit 1	Sea Furl 5	SL 707	NC32	1100	RS 2000-10	6/40
Average discount price	$2,150	$1,850	$1,200	$849	$1,500	$1,525	$2,250	$1,734
Max headstay length	50' 6"	52' 8"	40' 0"	46' 0"	40' 0"	43' 3"	50'8"	custom
Max wire diameter	5/16"	9/32"	9/32"	1/4"	5/16"	1/4"	5/16"	1/2"
Max pin size	5/8"	1/2"	1/2"	1/2"	5/8"	7/16"	1/2"	custom
Cage type	Closed	Open	Closed	Open	Open	Open	Closed	Open
Extrusion shape	Aero	Aero	Aero	Round	Round	Round	Aero	Aero
Extrusion fasteners	Plates	Screws	Plates	Screws	Screws	Rivets	Screws	Rivets
Bearings	SS	Torlon	SS/Torlon	Torlon	Steel	Torlon	SS	SS
Adjuster	Yes	No	No	No	No	No	Yes	Yes
Tack Swivel	Yes	Yes	Yes	No	No	No	Yes	No



Cross section of a Harken Unit 1.

you to fly twin downwind sails. A few furlers have just one groove, and while most owners probably will never miss the second groove, it hardly adds to the cost of the system. Two grooves are recommended.

Can you install it yourself?

With a good manual, any reasonably handy owner can install a furling system. The most important requirement is patience. Read the instructions from beginning to end — at least once — before starting the job. Call the company with any questions; most have good customer service staffs.

Most headstays have to be shortened, and probably the worst mistake you can make is cutting it too short. The manual will tell you how to determine the correct length, but more than one overanxious owner has gotten confused and cut in the wrong place. Measure twice (or thrice!), cut once. The same goes for cutting the foil sections to the correct length.

Furlex and Reef Rite offer the most complete kits, which include a new headstay as well as furling line, blocks, and more. This explains why these companies have prices which are somewhat higher than the rest.

Most installation directions ask that you fit a mechanical terminal to the cut end of the wire headstay — Sta-Lok or Norseman. These may or may not be supplied by the manufacturer. Installing a mechanical terminal isn't rocket science, but if you haven't assembled one before, you might feel more confident asking a professional rigger for assistance; after all, the entire rig depends on this fitting.

Installation is nearly always easier with the mast down, laid across several sawhorses or other supports, but it can be done with the stick up. You'll need to rig a temporary headstay, like a halyard to a foredeck fitting, because the permanent headstay has to be unfastened at the stem for shortening and sliding over it the upper swivel, foil extrusions, and torque tube/lower bearing/drum assembly. Be sure your boat won't roll a lot; choose a dock where you won't be subjected to large waves or wakes from passing boats, and choose a calm day. Remember that most systems require you to go up the mast.

Tools required are few and ordinary — hacksaw, screwdrivers, pliers, and so on. If the extrusions fasten by means of rivets, you'll need a rivet gun, of course. Those extrusions that use screws generally must be set in Loctite or other thread-locking compound, often supplied by the manufacturer.

If you don't feel comfortable installing your new furler, a professional rigger can do the job for you. If you bought the furler from a dealer, he can give you a quote. If you bought the furler from a discount catalog, you'll have to find a rigger experienced with furler installations . . . and you may have to pay a bit more because he didn't get a commission on the sale of the furler. To be fair, and for better future service, if I planned to have a rigger do the installation, I'd buy from him, even if it cost me an extra hundred bucks.

Sails

Many sailors insist they can use an existing headsail with the new furler. Sometimes you can, but if the sail is old, chances are you'll be much better off investing in a new sail. And let's face it, one of the worst mistakes made by sailors is keeping sails far too long. Yes, they are expensive, but they are the engine that powers your boat, and good sails make a huge difference in speed, pointing ability and, therefore, safety. If your sailmaker says your old genoa is too stretched out to be satisfactorily cut down, take his advice and bite the bullet for a new sail.

If your sailmaker is willing to cut down an old sail, it still will cost you his labor and some materials. New reinforcements must be sewn in as well as a luff tape that slides up inside the luff grooves in the furler's foil. You also should consider adding UV protection in the form of a sacrificial piece of sailcloth.

An option well worth having is a foam pad sewn into the luff. One brand name is Aeroluff. A padded luff helps fill the belly of the sail so it doesn't bag out as much when partially furled. This is another approach to solving the same problem addressed by the tack swivel.

Using furling gear

A common criticism of sailors is that they have baggy sails and don't know how to trim them. Well, when you get roller furling, the onus is on you even more. At times, you'll likely be sailing with the headsail partially furled and not always the same amount. The more you roll in the headsail, the farther forward your sheet leads need to be in order to maintain proper trim. Therefore, adjustable sheet leads are important.

If your boat doesn't have genoa tracks, consider adding them. The simplest type of adjustable sheet lead is to have cars with pin stops. To move them forward or aft, you must leave the cockpit, move to the sidedeck, lift the pin stop, and slide the car to its new position.

A more sophisticated system is to have the car slide freely on the track, with a shock cord to pull it aft and a control line and set of blocks to manually pull it forward. With this set-up you don't have to leave the cockpit to adjust the sheet leads. Considering that the usual reason for adjusting sheet leads is high winds (which necessitated furling the headsail in the first place), it's a time when you don't really want to leave the cockpit anyway.

It's not quite a maxim, but it may as well be: roller-furling headsails shouldn't be furled more than about one-third. Furling them more than that results in unacceptable sail shape. So a 200-square-foot headsail can be reduced to about 134 square feet and still retain a reasonable shape. Of course, you'll notice this much more going upwind than off the wind where just about any shape works. If, with the jib open to two-thirds of the headsail area, the boat still isn't behaving the way you want, you're probably better off dropping the furling

headsail altogether and proceeding with either a smaller headsail (preferable) or no headsail at all (dubious, because it's hard to balance the boat even with a double- or triple-reefed mainsail).

On smaller boats, you should be able to furl the sail without putting the control line on a winch, assuming the system has minimal friction and the wind isn't blowing a gale. Still, it's helpful to have a winch handy. Control lines are usually of a smaller diameter, say 5⁄16 inch, which can be hard on the hands. If you don't have a winch available, keep a pair of gloves ready.

Maintenance and care

Modern roller-furling gear is relatively maintenance-free. The most obvious chore is flushing bearings in open races with fresh water. Without a periodic rinse, salt incrustations will cause more friction and more difficult furling.

When at the dock, I like to hose down as much of the system as I can reach, including the furled sail and, if exposed (as at the end of the season because I've already removed the sail), the foils, too. Salt isn't good for much of anything. Read your instruction manual and perform whatever other maintenance is prescribed.

If you take the mast down for winter layup, be extra careful handling the headstay foil — the sections are aluminum and easily kinked. For transport across the yard, tie or tape the foil to the mast every so many feet. Most foil sections come in 6-foot-plus lengths, and they can be replaced, but it will be a pain that's easily avoided with a little care.

Limitations of roller furling

So does roller furling seem like the be-all and end-all? Well, it ain't. It does have its disadvantages.

First, with roller furling you tend to make do with the one headsail, whatever size that may be. Usually, it won't be bigger than about 135 percent of the foretriangle. In light air, you may wish for a 150 percent or larger headsail. In strong winds, you can only furl it to about a 100 percent headsail, which may be too big. With hanked-on sails, you could drop, say, the #2 genoa and hoist in its place a small storm jib. With furling, dropping the sail is a bit more difficult because of the friction of the luff tape in the luff groove — you'll probably have to pull it down with some force. Then hoisting the storm jib will be more difficult if only because you have to feed the luff tape into the luff groove. A prefeeder helps, but it still can be arduous. It helps to have two sets of hands, one to feed the sail and the other to hoist the halyard. Also, you can't gather the sail at the bottom of the stay like you can with hanks; as the luff tape is fed into the luff groove, the sail has to go up, thereby catching the wind and often flapping violently and making the boat accelerate.

An alternative to dropping the regular genoa and hoisting a storm jib is to leave the regular genoa furled and hoist something like the ATN Gale Sail that has a big sort of hem that wraps around the furled headsail and is attached back to itself by means of a hook-and-loop closure.

So how do you choose?

Ah, so many details, so many decisions! Let's see if we can't simplify this a bit.

If I owned a trailersailer, I'd buy a furler with a flexible PVC foil. CDI is the pioneer here but not the only choice. Too bad Harken's elegant unit is no longer available, but the Schaefer Snap Furl is well engineered, too.

The tables on Pages 12 and 13 may help you make comparisons. If you're an occasional racer, you'll want a split drum (all models shown have them) and an aerodynamic elliptical foil. If you don't race, a round foil gives a bit more leverage furling and does a somewhat neater job.

Torlon plastic bearings won't rust but can crush more readily under extreme loads than steel bearings.

Having owned or sailed on boats with all of the major brands of furlers, I can honestly say that as a class they've evolved into highly reliable and very comparable devices. There doesn't seem to be a bad choice among them.

When price shopping, check to see what's included in the standard package. Furlex and Reef Rite include everything. Others may not give you the furling line and lead blocks, prefeeder, and so forth.

Once you've worked your way through the decision tree and actually got one installed on your boat, you'll wonder how you got along without one.

Dan was editor of Practical Sailor *for 11 years. He and his family recently moved to Montana where he continues to write books and articles for marine publications.*

Manufacturers/distributors

Anzam Yacht Refurbishing
(Reef Rite distributor)
4520 Robertson Ave.
Sacramento, CA 95821
916-489-5431
<http://www.reefrite.co.nz>

ATN Inc. (Gale Sale)
1509 SW 1st Ave.
Ft. Lauderdale, FL 33315
800-874-3671
<http://www.atninc.com>

Cruising Design Inc. (CDI)
P.O. Box 1250
Concord, MA 01742
978-922-5936
<http://www.sailcdi.com>

Euro Marine Trading
(Reckmann distributor)
62 Halsey St., Unit M
Newport, RI 02840
800-222-7712
<http://www.reckmann.com>

Furlex, Selden Mast, Inc.
4668 Franchise St.
N. Charleston, SC 29418
843-760-6278
<http://www.seldenmast.com>

Harken Yacht Equipment
1251 E. Wisconsin Ave.
Pewaukee, WI 53072
262-691-3320
<http://www.harken.com>

Hood Yacht Systems (Pompanette)
7712 Cheri St.
Tampa, FL 33634
813-885-2182
<http://www.pompanette.com>

Profurl
401 N.E. 8th St.
Ft. Lauderdale, FL 33304
800-272-9511
<http://www.profurlusa.com>

Schaefer Marine
158 Duchaine Blvd.
New Bedford, MA 02745-1293
508-995-9511
<http://www.schaefermarine.com>

by Don Launer

Tackle *your* blocks

Who's this gnome? We don't mean to frighten you, but look what happened to Don Launer before he learned to give his wooden blocks regular maintenance. Actually, he says the large one, which weighs more than 90 pounds, was used to hoist cargo aboard a World War II Liberty Ship.

Blocks, or to use the landlubber's term, pulleys, are as indispensable to the operation of a sailboat as an engine is to a powerboat. They can provide a mechanical advantage or a change in direction of the pull on the fall. Blocks have been used since sailors first hoisted sail, but in the last century the materials used and the internal parts used to reduce friction have seen a major breakthrough into high-tech. Although blocks made of wood were the first to be used and persisted for two millennia, they are seldom seen on today's recreational sailboats.

Galvanized blocks

In our great-grandparents' day most recreational sailboats used blocks and deck hardware of galvanized iron or steel. They were a practical, strong, reasonably long-lasting, and inexpensive way to set up the running rigging on a sailboat. Today, however, galvanized fittings are seen only on traditional workboats or as dock hardware. Galvanized blocks use a zinc coating to protect the underlying iron or steel from corrosion. Various processes are used to apply the coating to the iron. Of all these methods, hot-dip galvanizing, where the iron is immersed in molten zinc, is the most effective, providing a zinc coating of about .003 inch. Less preferable is electroplating, which results in a coating about half as thick. Usually the sheaves (pronounced "shivs") of old blocks were also galvanized and rotated directly on the shaft. Maintenance, in those long-ago times, consisted of an occasional drop of oil.

Make them last longer and perform better

Bronze blocks

A huge leap forward came when bronze blocks were introduced. Bronze blocks were used on the highest quality yachts from the Civil War to the middle of the 20th century. As late as the 1950s and 1960s, 12-Meter boats competing for the America's Cup used bronze blocks and hardware. But even in the mid 1900s, bronze blocks usually lacked bearings for their bronze sheaves. Legendary Nathanael Herreshoff made cast-bronze blocks in six sizes and two styles. For decades his were considered to be top-of-the-line. Bronze was universally considered to be the best material you could use, and bronze blocks were used on the finest yachts built for the richest men in the world during this period.

Although bronze was largely replaced by aluminum and stainless steel after the mid-1900s, bronze is now making a strong comeback on production and custom yachts. This is partly due to the introduction of modern materials as bearings. Bronze has the ability to last almost indefinitely in the marine environment and has several advantages over other materials such as stainless steel, which is subject to crevice corrosion and rust, or aluminum, which has galvanic surface-corrosion problems.

Although the shell of bronze blocks lasts indefinitely, the major problem with early bronze blocks was the plain bronze bearings that wore out and were not easily replaced. This problem has now been largely eliminated, and modern bronze-shell blocks make use of roller bearings that reduce the friction to almost zero — and there are some bronze blocks with easily replaceable axles, bearings, and sheaves. Roller

bearings for top-of-the-line bronze blocks are often made from such modern plastics as Delrin or the better and more expensive plastic, Torlon. Bearings made from these modern materials have proven to be highly reliable over the last 30 years and can handle loads equaling the strength of the blocks themselves.

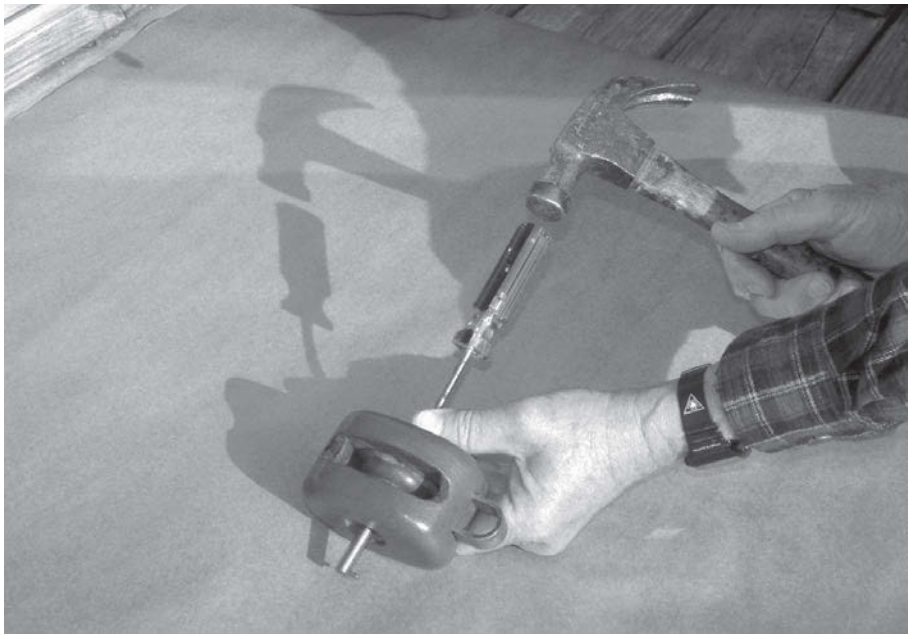
The durability of bronze in the marine environment is indisputable. Bronze artifacts that have lain on the bottom of the sea for more than 2,000 years show little deterioration. The major problem for the sailor who would like to purchase bronze hardware today is one of quality. A lot of the marine products now being sold as bronze are really brass with a high zinc and lead content, often cast overseas from scrap metal. This brass alloy is attractive to the manufacturer. It melts at a low temperature and machines like butter. This speeds up the manufacturing process, doesn't wear down the tools, and improves the profit margin. It's not a bad product for a pair of candlesticks, but it's a terrible one for important fittings in the marine environment.

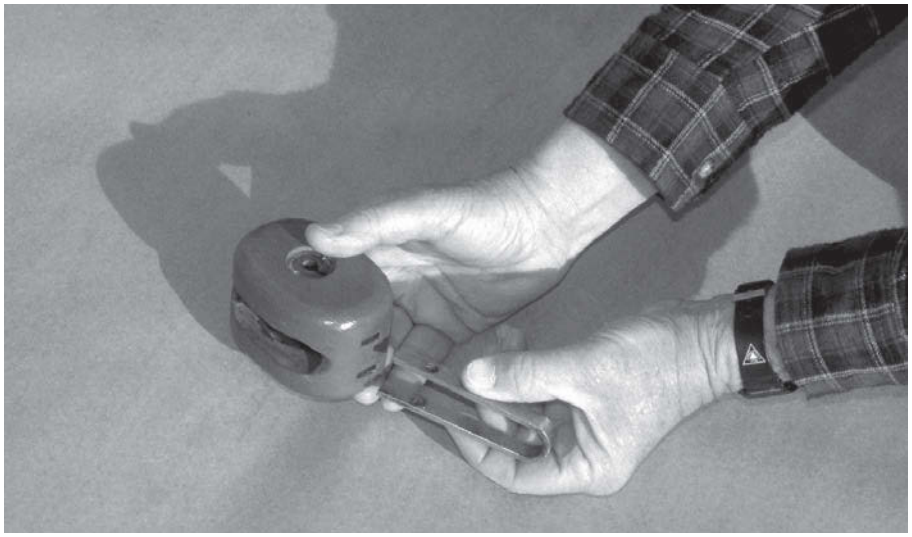
These brass fittings have a low tensile strength, which decreases even more as dezincification begins and the zinc in the alloy turns into acetic zinc oxide. The resultant white powder attacks wood, causing it to rot. (If you've every noticed wood-rot around your "bronze" fittings, chances are these fittings aren't really bronze.)

"Blocks have been used since sailors first hoisted sail, but in the last century the materials used and the internal parts used to reduce friction have seen a major breakthrough into high-tech."

But if consumers are not metallurgists, how are they to tell? Although you would hope to rely on the big-name manufacturers who distribute "bronze" products, unfortunately many are more profit-oriented than customer-oriented, and their "bronze" is really brass. Consumers could ask whether zinc is used in the manufacturers' alloy, but chances are they couldn't get a straight answer — even if the distributor knew.

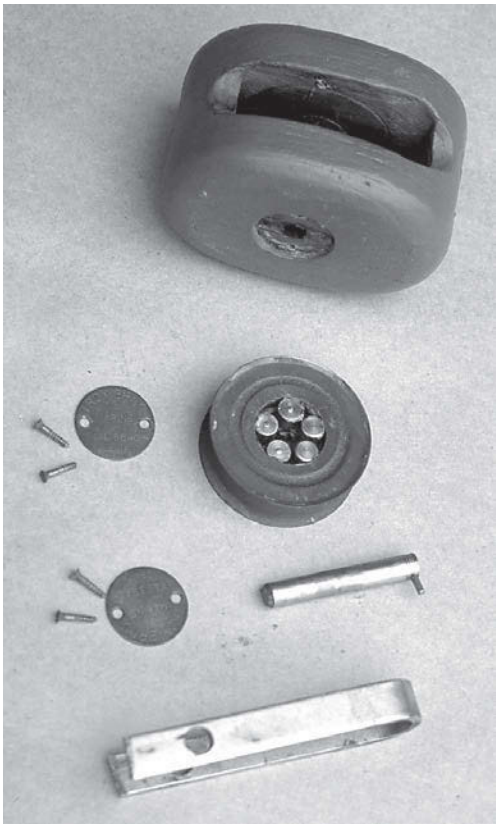
This is too bad, since real bronze blocks are maintenance-free (with the occasional addition of a drop of oil or Teflon spray). You have to sand and varnish wood-shell blocks, and stainless-steel blocks tend to bleed rust and are subject to corrosion, but a true bronze block can last the life of the owner — or even the owner's children and grandchildren.





One bronze manufacturer is Roger Winiarski of Bristol Bronze *(Good Old Boat,* May 2000). "There is no zinc in my alloys. I use silicon bronze for the majority of my castings, and springs are phosphor bronze," Roger says. Bristol Bronze has blocks with bronze sheaves and free-turning bronze axles. The sheaves and axles on these blocks can be replaced by removing the separately cast cheek pieces — this might have to be done 20 to 40 years after the block is put in service. Through an agreement with Harken, Bristol Bronze can now supply blocks with Harken sheaves that have Torlon roller bearings. Sheaves with Torlon bearings remain free-turning even under heavy loads and are superior to Delrin bearings, which can be chewed up by abrasives, change shape under load, and get brittle when exposed to ultraviolet rays. Bristol Bronze has

After the axle end plates are removed, the axle can be pushed out of the block, at top. At left, with the end plates, axle, and sheave removed, the support strap can be pulled out of the block, leaving the empty wood shell.



A disassembled Bristol Bronze block, above, and the parts of a wooden cheek block, at right.

introduced a bronze alloy that has a greater tensile strength than conventional 304 stainless steel, for those who need it in high-load applications.

Routine maintenance on bronze blocks consists of simply rinsing them out occasionally to flush away abrasives and adding an occasional drop of oil such as 3-in-1. Teflon spray may also be used and has the advantage that there is no oil to stain sails or wood. And Teflon doesn't attract dust. Aerosol spray cans of Teflon are available with small plastic tubes that can direct the spray directly into the bearings of the block.

As nearly perfect as bronze blocks are, there is one caveat: they shouldn't be used in direct contact with aluminum, due to their relationships on the galvanic table.

Stainless-steel blocks

For decades stainless-steel blocks have been the blocks of choice for most sailors and are nearly the exclusive block material in most recreational boating stores and catalogs. Most of these blocks are made by stamping out the pattern from stainless-steel sheet metal. Stainless steel has many advantages. It is strong, easily available, and good for direct attachment to aluminum. However, the name "stainless" may be a misnomer. Stainless steel is made from iron, and iron rusts. It is also subject to crevice corrosion; wherever there is a hairline crevice or crack or when the stainless steel is deprived of oxygen, rust will form (the rust we find on our topsides or sails is an example). Crevice corrosion occurs when stainless steel is deprived of the one thing that makes it stainless — oxygen. Stainless steel is also subject to failure when welded. This failure is called weld-decay, carbide-precipitation, or weld-migration, and the insidious condition usually progresses with little indication of a problem, until there is a sudden failure of that part.

Why do some of those stainless-steel fittings we bought 25 years ago still look bright and shiny while the ones we bought last year are showing rust stains? A couple of decades ago, stainless steel was treated with a procedure called passivation. In this process the stainless steel was immersed in an acid bath and the iron on the surface was eliminated, leaving bright and shiny nickel and chrome. In recent years, however, EPA rules on the disposal of these acid baths have made the process too expensive — except for parts being made for NASA or the medical industry.

Most stainless-steel blocks use metal for the high-load components and plastic for the block cheeks. These plastic cheeks serve only to keep the line running smoothly on the sheave. Although some small, low-load stainless-steel blocks have sheaves that rotate directly on the axle, most mid-range and big-boat blocks now use roller bearings made of modern, high-tech materials such as Delrin or Torlon. The one small problem with these miracle plastics is that if heavy loads are left on the blocks for extended periods of time the bearings can temporarily deform slightly. Normally the bearings will return to their proper shape after being rotated, but there may be an initial resistance to rolling. Although big-boat-block bearings are generally resistant to this deformation, as a rule of thumb it's not advisable to leave strains on any hardware when the boat is not being used.

"Bronze was universally considered to be the best material you could use, and bronze blocks were used on the finest yachts built for the richest men in the world during this period."

Most manufacturers of stainless-steel blocks who use Delrin or Torlon roller bearings recommend that no oil products be used to lubricate the bearings, since this can attract dirt and cause abrasion. The suggested lubrication is periodically flushing the bearings with water or detergent and water. Then a dry lubricant, such as a silicone or Teflon spray, or a proprietary product, such as Harken's "McLube," may be used.

Often, as stainless-steel blocks age and are exposed to the sun, their black plastic cheeks begin to turn a gray color. This doesn't affect their strength, and the discoloration may be removed with a fine abrasive. If an abrasive is used on these cheeks for cosmetic purposes, be sure to thoroughly flush out and re-lubricate the bearings after working on the block.

Wooden blocks

Many traditionally-rigged older sailboats and even some newer boats, use wooden blocks (or to be more accurate, wooden-cheek blocks). Although these blocks may appear to be old and out of date, they have several advantages over many of their modern counterparts. Not only are they beautiful and strong, but wooden blocks are designed to be easily disassembled in a matter of minutes for cleaning, lubricating, or part-changing. This can be an advantage over some of the more modern blocks, which can't be taken apart at all. A properly maintained wooden block can provide many decades of service. From the standpoint of preventive maintenance and ease of operation, these blocks should be serviced at least every few years. After wooden blocks have seen several years of use, bring them home at the end of the season. Then you can "play boat" during the winter months in the warmth of the workshop, garage, or at the kitchen table.

"After wooden blocks have seen several years of use, bring them home at the end of the season. Then you can 'play boat' during the winter months in the warmth of the workshop, garage, or at the kitchen table."

The first step in disassembling a wooden block is removing the two metal side plates that cover the ends of the axle. These side plates are usually made of bronze and are frequently embossed with the name of the manufacturer. Normally each plate is held in place with two screws. Sometimes on inexpensive or older blocks, nails are used. If the cover plate is fastened with nails, discard them at the first overhaul and replace them with screws. This will make your next maintenance job much easier. Once the screws or nails have been removed, most axle covers can be pried off, exposing the ends of the axle. Sometimes the end plates will be recessed into the wood cheek of the block. The easiest way to remove these is to pry them loose with an ice pick inserted into one of the end-plate screw holes. Infrequently, on some wooden blocks you may find axle covers that don't want to come off. This probably means that the covers are threaded onto the end of the axle shaft and will have to be unscrewed to be removed. Usually these can be unscrewed using a nail or ice pick in one of the screw holes, but for stubborn ones a "key," similar to a deck-plate key, might have to be fabricated (two nails driven through a small piece of wood usually does the job).

With the side plates removed, you can now push out the axle. The axle is supported by metal straps that run down close to the sheave on the inside the wooden cheeks. These metal straps take all of the load on the block. The wood cheeks simply keep the line from running off the sheave. In olden days, these support straps were made from iron, steel, or bronze, but in most of today's wooden blocks they are of stainless steel. The axle shaft is not supposed to rotate inside these support straps, since rotation will cause wear on both the axle and the support straps. To ensure that the axle doesn't rotate, there will sometimes be a key-pin inserted in one end of the axle shaft.

Using a hammer and a screwdriver, tap the axle out. Most axles can be removed from either side, but axles with a key-pin on one end, obviously, can only be driven out from the opposite side. With the axle removed, the sheave is free to be pushed out of the block. Sheaves can be made from various materials: wood, steel, bronze, Delrin and phenolic laminates such as Micarta. Although bronze is probably the longest-lasting and most maintenance-free, Micarta and Delrin are close seconds and offer the advantage of less weight aloft. If the sheave is bronze it will usually have stainless-steel or bronze roller bearings. Micarta sheaves generally rotate on an oil-impregnated "oilite" bushing, and Delrin sheaves frequently rotate directly on the axle or on bronze, Delrin, or Torlon bearings.

Most heavy-duty, top-of-the-line wooden blocks, have roller bearings. Usually roller bearings are locked captive into a race inside the sheave — but not always. When disassembling any block for the first time it's a good idea to do this inside a dishpan — and not on deck. We've all learned that when we drop something while on deck it has the habit of taking that one bounce, then, as if in slow motion, it neatly hops over the side.

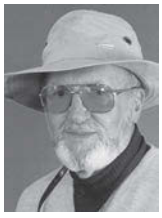
Before re-lubricating the parts, clean them of old lubricant by soaking them in gasoline for an hour or two or overnight. This will usually eliminate the old lubricant. If any of the old lubricant remains, try scrubbing them with an old toothbrush.

Once they're clean, it's time to re-lubricate the bearings. Most block manufacturers today recommend lubricating blocks with a dry lubricant, such as generic products like a dry Teflon spray. There are also specialty dry lubricants specifically designed for this purpose. If you insist on a petroleum lubricant, manufacturers suggest that just a single drop of 3-in-1 oil is an alternative.

With the end plates, axle, and sheave removed from the wooden shell, you can now slide out the strap that carries the block's load, leaving only the wood shell of the block. This is the perfect time to sand, varnish, or oil the wood, without the worry of sawdust getting into the workings of the block. When you're completely finished, the block can be reassembled, good as new.

Older wooden blocks can often be upgraded by replacing the old sheave with a modern one using Torlon roller bearings. Many block manufacturers sell these sheaves separately in a variety of diameters, widths, and axle sizes.

Regardless of the type of block you use, with just a little periodic TLC you can keep your running rigging rolling smoothly and save the expense of re-rigging. It also pays off by making it easier to hoist sail and handle sheets.



Don built his traditionally rigged schooner from a bare fiberglass hull. Its running-rigging includes 21 teak blocks with bronze sheaves, all original, all more than 22 years old, and all working perfectly.

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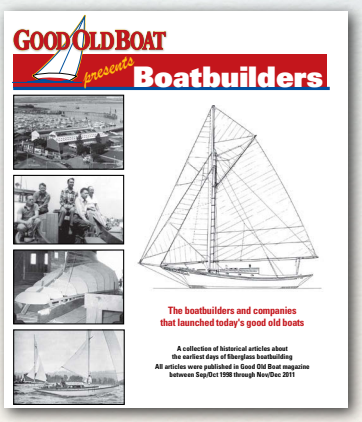

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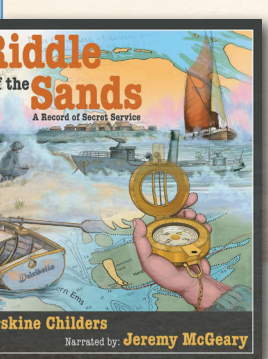

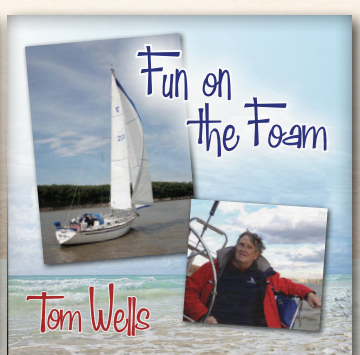

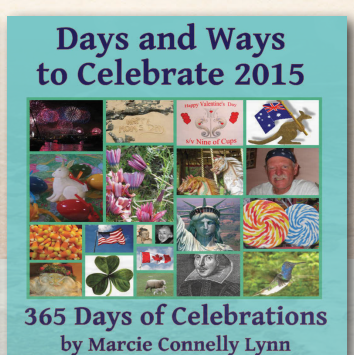

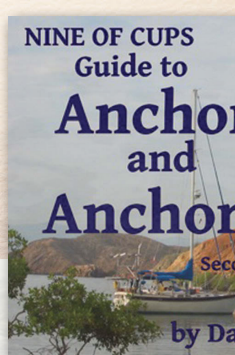

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Watch your winches

Here's how to maintain your winches for long, reliable service

by Don Launer

Illustration courtesy of Harken Yacht Equipment

In the early history of sail, all sail handling was accomplished through brute strength or with the help of multiple-part blocks and tackles. From the days of the earliest sailing ships there were, of course, capstans on board that allowed a stout crew to weigh anchor or raise spars, and later, in the 19th century, steam-powered winches came into use aboard larger vessels. But for the recreational sailor, it wasn't till the mid-1900s that sheet and halyard winches, as we now know them, finally came into general use.

Those first expensive winches appeared on the 12-Meter boats of the 1950s. Top-of-the-line blocks in those days were made of bronze, with no roller bearings, so it was a logical step to construct those first winches of cast bronze also. Those newfangled pieces of equipment were first fabricated for high-end racing yachts. They had a maximum of two speeds and no self-tailing apparatus.

By the 1970s, lighter-weight and less expensive winches with aluminum drums appeared on the scene. These could have up to three speeds. Finally, in the 1980s, stainless-steel drums replaced those of aluminum, and today we can find four-speed winches with carbon drums, titanium gears, and carbon gearboxes and shafts.

Power ratio

Small winches provide the ability to exert large forces on lines by using a combination of long winch handles coupled to small-diameter drums and ratchets to prevent lines from running free when the handle is released. Larger winches employ reduction gears and multiple speeds. Although the average sailor can exert about a 30- or 40-pound horizontal pull on a line, on larger boats this is just not enough. Sheet loads in the thousands of pounds are now common on large cruising or racing yachts.

> *"Since modern winches are so reliable, they tend to be the most neglected pieces of gear on board."*

By gaining mechanical advantage through leverage (a long winch handle turning a small drum) and reduction gears (the number of times the handle is turned to create one revolution of the drum), high "power ratios" can be developed. The power ratio is the ratio of handle length to drum radius, multiplied by the gear ratio. Thus, if you have a 10-inch handle, a 5-inch drum, and a 5:1 gear ratio, then your handle-to-drum ratio is 10:2.5 (2.5 being the radius of the drum), and the mechanical advantage is 4 (10 ÷ 2.5). When this is multiplied by the gear ratio (5) you have a power ratio of 4 x 5 = 20:1. Winches are given numbers that approximate this power ratio.

Thus, a #8 winch has a power ratio of 8:1. This 8:1 figure is, of course, a theoretical figure, since friction of the internal winch parts and the line on the drum will reduce this ideal number somewhat. With small winches lacking internal gearing, the power ratio is simply the handle-to-drum radius ratio. *(Regrettably, "power ratio" seems to be an industry standard term that is used in place of the proper and accurate term, mechanical advantage. Students of physics know that winches cannot increase power. Force is increased at the expense of distance; power is lost to friction. "Engineering" was probably not consulted when this term was coined by "marketing." **–Ed.**)*

Winch sizes

The smallest of winches are "snubbing" winches. These winches do not have handles. Their advantage is that when a line is tensioned, the winch pawls prevent the drum from rotating, which would allow the line to run out again. Thus, they give the sailor time to prepare for the next pull.

The next size up are single-speed winches with handles. Since these winches have no gears, the mechanical advantage comes through the use of a

long winch handle and small drum.

The next higher category of winches includes those that employ gear ratios and multiple speeds. These winches can multiply a person's pull tremendously (a #40 winch gives a power ratio of approximately 40:1).

New materials

Since winches have been asked to perform under increasingly high load conditions, the internal gears, bearings, and lubrication have also been upgraded. In the late 1970s, Amoco developed a plastic named Torlon. When used as roller bearings inside a winch, Torlon could take great abuse with little lubrication. Harken immediately seized on this new product and began using it in their winches. To delay copycat use by the competition, however, they called their new roller bearings Duratron. We now see winches with Torlon bearings becoming standard equipment from nearly all winch manufacturers.

Lubrication

Since modern winches are so reliable, they tend to be the most neglected pieces of gear on board. But, as with everything mechanical, winches require a certain amount of care if they are to perform their jobs and have an extended life. This care also minimizes the possibility of an unexpected breakdown and dramatically reduces the physical requirements of the crew.

There are three basic levels of winch maintenance:

1. Apply a freshwater rinse at the end of a sailing day. When you rinse down the deck, direct the hose at the winches to wash away salt water, which degrades the winch grease and corrodes the metals. Stainless-steel, chromed, and anodized aluminum winch drums should be washed with a cleanser regularly and dried with a cloth. Occasionally, non-abrasive liquid cleaner can be used on stainless-steel and chromed winches. Naval jelly, sold by winch manufacturers, can be used on stainless-steel drums to remove tarnish and protect the surface. Never use polishes or abrasives to clean the drums of aluminum winches.

"Be careful during the disassembly that the drum bearings don't stick inside the drum and go overboard!"

2. The second level of maintenance is the "quick check," which takes 10 or 15 minutes per winch and should be done two or three times a season, or more often if the boat is in constant use. Remove the drum from the winch and remove the main bearings. With a rag moistened with solvent, wipe away grease on exposed surfaces and examine the winch for wear or damage. Take special note of the condition of the gear teeth and pawls.

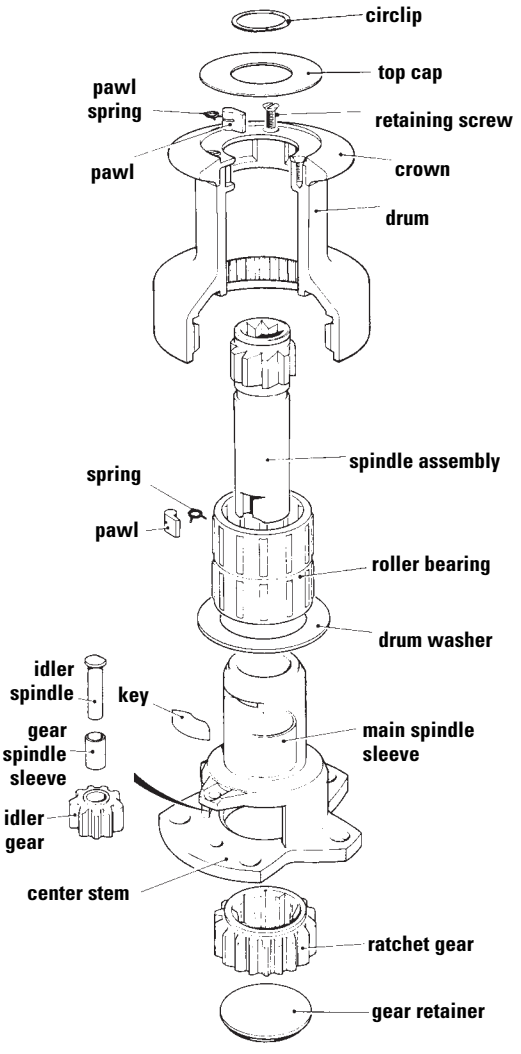


Illustration courtesy of Boatowner's Mechanical and Electrical Manual *by Nigel Calder, International Marine, publishers*

If there is any indication that the winch is dry, that the grease in the winch is gummed up and hard, or that dirt or sand has gotten inside, schedule a winch overhaul immediately.

3. A complete winch overhaul requires taking the winch down to its component parts, cleaning these parts, inspecting them for damage, replacing those damaged parts, relubricating, and reassembling. This should be done at least once a year, preferably at the end of the season. Although the first time you do this the procedure will take a while, due to unfamiliarity, for the typical winch aboard a 30- to 35-footer, it can be done in about 30 to 45 minutes.

Whenever you're doing a complete overhaul, especially for the first time, have the manufacturer's diagram of the exploded view of the winch, along with the manufacturer's service sheet, so you can follow the lubrication procedure and be certain the reassembly is correct. With this important diagram, you can identify any parts by number that need replacement.

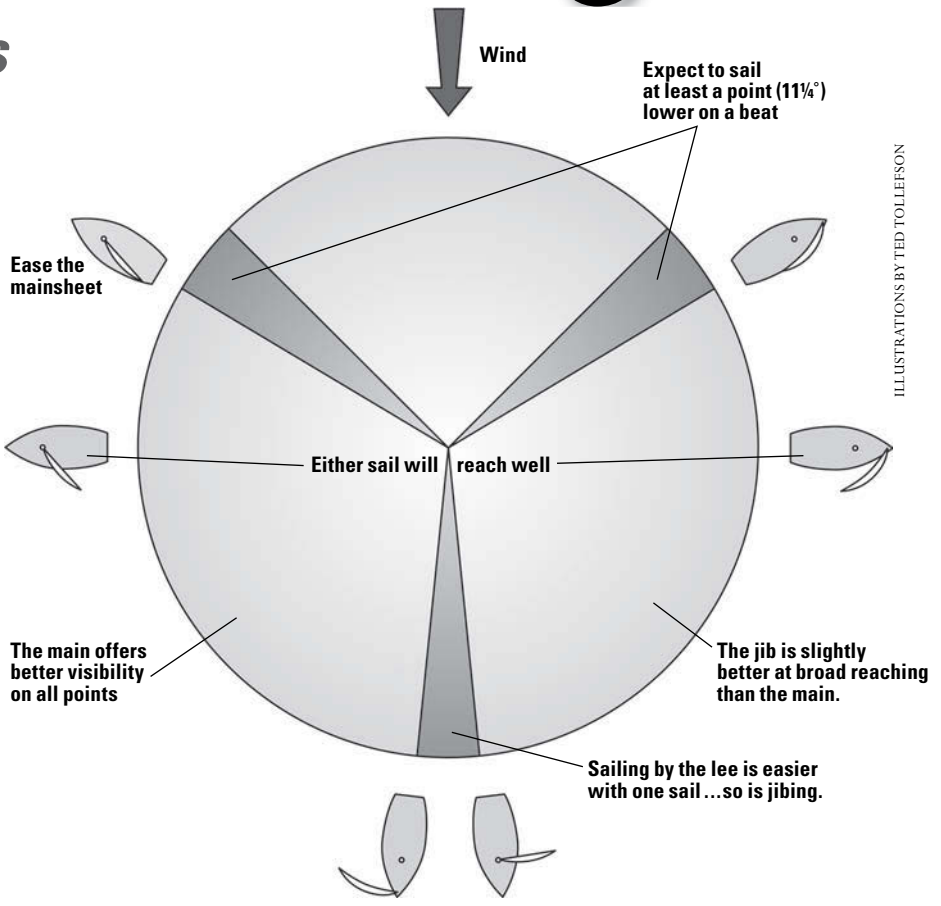
Winch manufacturers supply service manuals for each of their winches, along with kits for routine servicing. These kits usually include drum screws, pawls, springs, and winch grease. Be careful during the disassembly that the drum bearings don't stick inside the drum and go overboard! Inspect the bearings, gears, and spindles for signs of wear or corrosion. Winches should be lubricated with winch grease, but avoid over-greasing. This can trap salt and water inside the winch. Check the pawls and springs for signs of wear and lubricate them with a light machine oil, such as 3-in-1, rather than grease. Do not grease plastic roller- or ball-bearings. Never grease the pawls or the ratchets they lock in; the pawl springs can't push the grease out of the way, and the winch will fail to lock against the load. Winch grease can be purchased at marine supply stores, through marine catalogs, and from winch manufacturers.

With simple and regular maintenance procedures, your winches can give you decades of reliable service.

Sailing *with* one wing

Get to know your boat's capabilities

by Jerry Powlas



ILLUSTRATIONS BY TED TOLLEFSON

We motored out of the little anchorage in the North Channel of Lake Huron into a stiffening afternoon breeze. We were beginning to learn our lessons: light air in the morning, much more wind in the afternoon. We set the 110 jib and rolled down to a broad reach. The boat stayed flat and very much in control as we flew at hull speed all the way to our marina. We never touched the main. It stayed flaked over the boom in its cover.

I used to believe that a properly managed sloop would always fly a main and jib, with offwind sails being added when the wind was abaft the beam. That is certainly how they are raced, but I have come to believe that is not how our sloop should be managed when we are cruising.

Although I loved to fly spinnakers in fully crewed racing boats, our 30-foot masthead sloop did not come with one, and I never thought Karen and I would enjoy dealing with such a large unruly sail by ourselves. I could have opted for a "cruising spinnaker" or an asymmetrical, but neither one will sail dead downwind with any grace, so I've never wanted either of these. Instead, I bought a long telescoping whisker pole and put the jib to windward when we were sailing deep enough for the main to mask the jib. The big genoas give up very little to boats with spinnakers, but it takes some rigging and is complicated to jibe. Still, I'd changed my mindset a little: we didn't need specialized offwind sails.

We moved the paradigm a little further when we began to use either the main or jib alone and found that this practice was worth considering in some situations, particularly if there is enough wind to move the boat well with just the one sail. For our boat, the bottom of that wind range coincides with the first outbreak of whitecaps. As a practical matter, particularly when you are not racing, hull speed is hull speed. Once you have reached hull speed, you can press the rig, hull, and crew much harder without gaining much additional speed. In cruising mode, there is no reason for that.

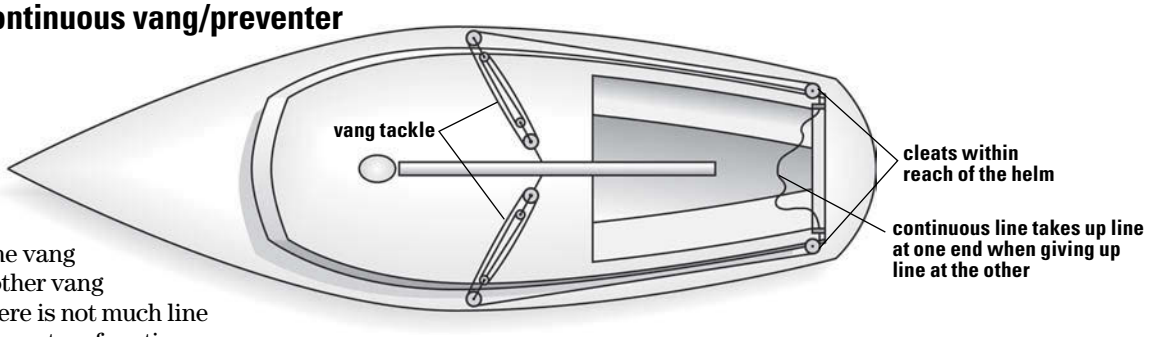
On a dead beat with both working sails, the boat will always point higher and sail faster. But as the breeze freshens, and we have to shorten sail anyway, there are times when we think our best choice is to simply drop one sail.

How and when

On our boat, either the main or jib will sail every point from a beat to a run (see diagram above). The main is frequently a better choice than the jib on points from a beat to just freer than a beam reach. When beating with the main by itself, it is necessary to free the sheet. The sail is not in the deflected flow of the jib. When beating — with a 150 or 170 and the main — we often have the boom dressed parallel with the keel. When beating without a jib we ease the sheet until the boom is almost out over the leeward corner of the transom. If we pinch up too much or oversheet, the boat slows to a near stop. We expect to sail at least 10 degrees lower when beating "bare headed." While we prefer to sail the deep courses from a broad reach to a run with the jib and no main, we will sometimes choose the main for this work if we need unobstructed forward visibility — when we are going through shoal areas marked by buoys or when we are in high traffic areas, for example.

We employ a double-vang system on our boat (see illustration on facing page). There is a vang tackle running from the boom to the toerail about two feet behind the shrouds on each side of the boat. It is attached to the boom so the fall is straight down to the rail

Continuous vang/preventer



when the boom is broad off. One continuous line is threaded through both tackles. As one vang takes up line, the other vang gives up line, so there is not much line in the cockpit. This system functions as a vang and as a preventer completely eliminating the need for a traveler. For more on rigging this system, see my article in November 1998 (available as a PDF file on our first back-issue CD). After we thought we had invented this rig, we began to find references to it in the writings of more experienced sailors. Some of them endorsed it; others were sure it was a bad idea. The detractors contended that the boom would catch a wave and take the mast down. The proponents of this rig recognized the inherent safety and excellent sail control.

Experienced sailors

Oddly, all who commented one way or the other had excellent sailing qualifications. One who liked the rig had raced around the world singlehanded. In the case of our boat, by the time our main has two reefs in it, the boom end is so high that we would have to roll beyond 60 degrees to catch a wave with it. We have used the rig for more than a decade and value the ability of the helmsman to set a preventer in only a few seconds. It is so easy we always set the preventer when the main is freer than a close reach. The inherent friction in the rig makes a flying jibe a very slow controlled evolution that is prevented completely unless the windward vang is released. I mention this here because we believe that every sailboat should have and use a preventer of some sort for crew safety. Other preventer systems require the crew to move around on deck just when it would be better if no one left the cockpit.

Of course, if you are sailing the freer courses from a broad reach to a dead run with a jib and no main, a preventer is not needed. The jib can be quite large to compensate for the lack of a main, and we find that very little, if any, speed is lost doing this. The boat simply goes up to hull speed, and that is that. Unlike sailing with a spinnaker, the boat is extremely stable and easily controlled sailing downwind with only a jib. Our boat has a very short boom and does not have much tendency to round up when sailing downwind with just the main. Even so, when sailing with a jib by itself there is no tendency to round up at all. The boat is so stable in this configuration you will need to be careful not to carry too much canvas and overload the rig or bury the bow. Your only clue may be that you are going too fast.

Easy jibing

Jibes are remarkably easy if only the jib is involved. Pull in the new sheet, turn to the new jibe or even a little beyond it, release the old sheet when the sail blows through the foretriangle, and trim the new sheet a bit. If you do choose a fairly large headsail, you could find that you have broken the very sensible rule of "never sailing downwind with more canvas than you can carry upwind." You might need to shorten sail from run to reach or beat when sailing with just the jib in heavy air.

We have read that it is not a good idea for some boats to sail without a mainsail. Boats that do not have double lower shrouds with one set led aft are thought to lack the necessary support for the mast. It is believed that, in some circumstances, the mast might begin to pump and eventually fail. Our boat has single lowers that are in an athwartships plane with the mast, so they offer no support against pumping. In fact, our mast does pump when the boat is moored in a slip in a crosswind. It is annoying if we are aboard, but the boat has been doing that for 30 years. Whenever we sail without a main I watch the mast for pumping, but we seem to have a very stout stick, and there has been none. If you sail without a main and you don't have both fore and aft lowers, make sure your boat does not have this problem.

We have come to think of sailing our sloop with a single sail as just one more option in the menu of choices that we can make to match the rig of the boat to the specific conditions of course, wind, and sea.

The masthead rig

Fortunately, by the time I had read the many condemnations of the masthead rig with its large foretriangle and small main, I had already owned such a rig for a while and knew it was fast, weatherly, and versatile. We like our big jibs and the versatility that changing the size of the jib offers. We like our small main, which does not need lazy-jacks for control when it is struck. We like the short boom, which does not tend to force the boat to round up when sailing downwind and does not tend to dip into the sea when the boat rolls. We do not argue with experts who say large mains and small jibs make a better rig. We have not had enough experience with that kind of cruising rig to say, but we do know we like the one we have.

We also think that if there is a fresh breeze, much that is *said* to be wrong with fore-and-aft rigs (they don't sail well off the wind without special off-wind sails) and masthead sloops (the rig is just a rule-beater and the area is better put in the large main and small jib of a fractional rig) is mitigated by sailing a big jib downwind without a main. And we like sailing with only a main on close to broad reaches, provided there is enough wind to drive the boat that way. A lot of good old boats have masthead rigs.

Respecting the furler

Advice for avoiding problems with your roller headsail

by Jerry Powlas

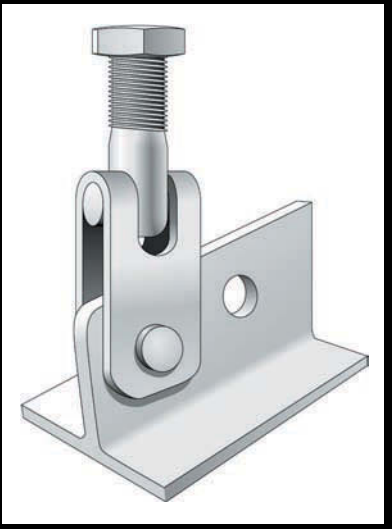
Six furlers (four are shown here) unfurled in Sewell's Marina when a big storm struck the coast of British Columbia recently.

PHOTO COURTESY OF *PACIFIC YACHTING* MAGAZINE

It was 3 a.m. The wind had reached the forecasted gale force, and somewhere in the marina I could hear the sound of a jib dying. I knew the sound before I saw the sail. I'd heard it before. A roller furler had unfurled. Fortunately, the boat was pointed right into the wind so the really bad things had not started happening yet. I grumbled, dressed, got a flashlight and a winch handle, and walked through wind and spray to the far pier where the jib was snapping like the flags on a used-car lot.

There was no saving the sail. Parts of it had already gone off downwind, and the remaining part had split from roach to luff about 7 feet above the deck. I expected that. I had come over to refurl the sail before it snagged in the rigging. If it caught the rigging, or if the sheets were still attached and the wind shifted as forecast, the boat would heel in her slip and probably tangle her mast with the boat next to her. As it turned out, the sheets were attached to the part of the sail that was hopelessly tangled around the stay and furler. There would be no refurling this one before daylight unless the wind went down first. I dropped the sail in several parts and tied them to the bow pulpit with the halyard. The tatters of cloth would never be a sail again.

Despite the high cost, roller furling is one of the most popular rigging upgrades. The arguments for it are compelling. You need have only one sail, and it will be easier to handle and much faster to furl. In addition, roller furling is typically promoted as roller reefing, meaning that one simply rolls in the sail to the size needed for the wind conditions. Treating this complex system as if it were that simple, however, would be a mistake. There are some subtle, but very important, things you should know and practice in order to make roller furling work really well on your boat.



Double toggle the furler top and bottom so it is capable of fore-and-aft as well as side-to-side movement.

Installation and maintenance

Start by comparing the installation of your furler with the manufacturer's instructions for installing it. Make certain that the instructions were followed and that any previous owners have not degraded the installation. It is critical that the connections at the ends of the furler, masthead, and stemplate be toggled so the furler can move in all directions without damaging end fittings. It is common to see furlers that can move fore and aft or side to side, but not both ways. If they cannot move in both directions, they risk the loss of the mast.

Some furlers attach the drum to

> **"The worst problem you can have with a furler is halyard wrap…a partially furled sail that will not budge."**

the lower turnbuckle instead of the stemhead. These designs need a specially designed turnbuckle with a beefed-up lower stud to take the added side loading. Attaching the furler drum to the lower turnbuckle opens the design up to two additional failure modes. If the bearings become stiff from corrosion or if the furler is rotated under heavy loads, high torsion stresses are directed to the turnbuckle. This can cause the lower stud to unscrew. These stresses can also unlay the headstay. Either of these failures can lead to the loss of the mast. Keep the bearing system running free.

While you have the manufacturer's literature out, read the section on owners' maintenance. In many cases there will be some washing and rinsing to do to keep the bearings clean and free. You may be asked to ease the halyard a little when rolling the sail in or out and when the sail is not in use. This keeps the bearings from being distorted or the races from being dented. There may be some parts that wear and need to be replaced on occasion. The plastic slides in the halyard swivel can wear enough for the swivel to cock and bind. You may even want keep some of these parts in stock aboard so you won't be caught short just before a cruise or, worse, during one.

Halyard wrap

The worst problem you can have with a furler is halyard wrap. You will be confronted with a partially furled sail that will not budge. It will not furl, and it will not unfurl. Nor can you lower the sail with the halyard. Sorting it out may require a trip up the mast, which may or may not be possible. Sailors have been known to ride out a thunderstorm or even a gale with a full genoa because they had no other choice.

Properly set up, halyards don't wrap. What is critical is that, with the sail fully hoisted, the halyard must not run parallel to the forestay. It must lead away from the stay at the top by an angle of 5 to 10 degrees (see illustration on Page 22). This is often accomplished by attaching a fairlead to the mast below the mast sheave. Ideally, the upper swivel is as far up the foil as possible but stopped just short of coming off the foil at the top. This can be accomplished by adding a pendant to either the head or tack of the sail. Walk around a marina sometime and look at all the furlers with long halyards running parallel to the forestay. These are likely to be a disappointment in just the conditions when their crews need them to work flawlessly.

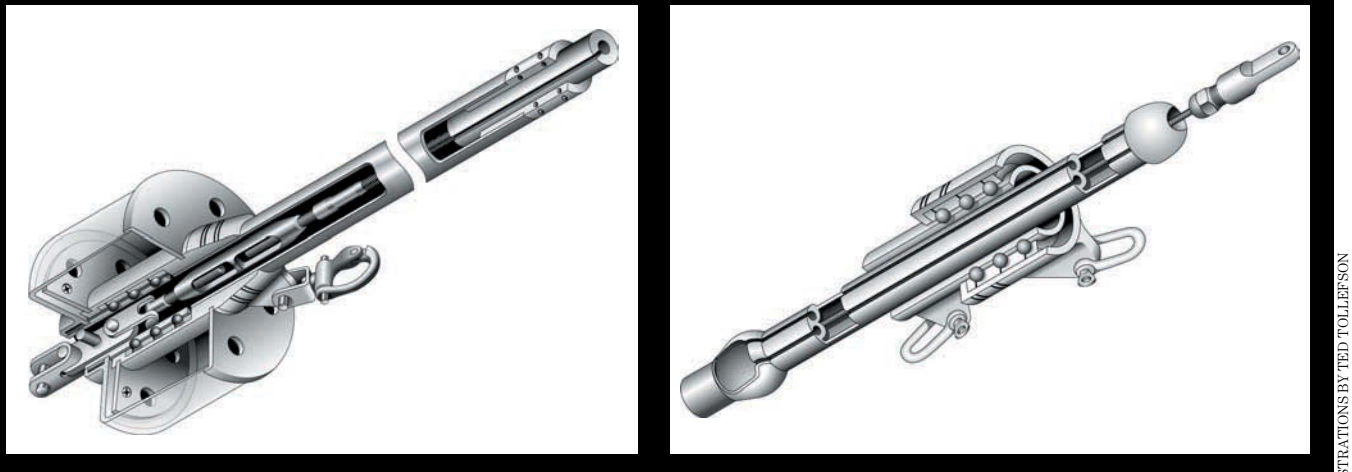
So what do you do if you are on a boat that has halyard wrap? If it happens in benign conditions, you may be able to unwrap the jib from deck level or you may have to go aloft. Once the jib has been unwrapped, you can disconnect the tack of the sail at the furler and hoist the sail up as high as it will go. Then use a short piece of line to make up the difference at that end and re-connect the tack to the furler. Control the luff tension with this line so the sail sets properly. Test for proper furling. This fix has worked for me a couple of times when I was on a boat that had a bad case of halyard wrap. The trick is that when the halyard is jammed up tight at the masthead, there is no halyard available to wrap. Don't think of this as a permanent fix. Do it right, making up the difference with a stout piece of cable when you get back to port.

If you find yourself in enough of a blow that the sail cannot be rolled, furled, or struck, and you need to reduce sail area, it is possible to force the sail to furl by powering through a dizzying series of 360-degree turns until it is rolled up on the stay. This may seem hokey, but it can be very appealing if the thing is stuck and you absolutely must get it furled.

A hanked-on sail sort of guy, I learned the hard way on a friend's boat that there must always be some tension on the halyard whenever the furler rotates. If the halyard is free (not cleated) it will wrap for sure.

Burying the furling line

Most furling units have a kinship with casting reels. A fairly small line is rolled up on a fairly large spool. Just as on casting reels, things can go wrong with this simple process. You want the line to roll evenly and tightly onto the spool. Keep a little tension on



Cutaway views of the typical roller furling unit: drum, at left, and upper swivel, at right.

ILLUSTRATIONS BY TED TOLLEFSON

the furling line as you unfurl the sail and a little tension on the jib sheets as you furl it. Inspect the furling line on the spool and refine your technique so you get the line to lay evenly and tightly as the sail rolls out. The location of the furling line fairlead block should be such that the line leads into the drum at 90 degrees to the stay (see illustration on Page 23). This will prevent backlashes and burying the line into itself as the upper coils crush into the lower coils. It is good to have this block as far aft as possible to minimize how far from perpendicular to the headstay the line is when it is rolling onto one end of the drum or the other. Although you will see sailors put the furling line on a winch, many furler manufacturers recommend against this practice.

Figure 1

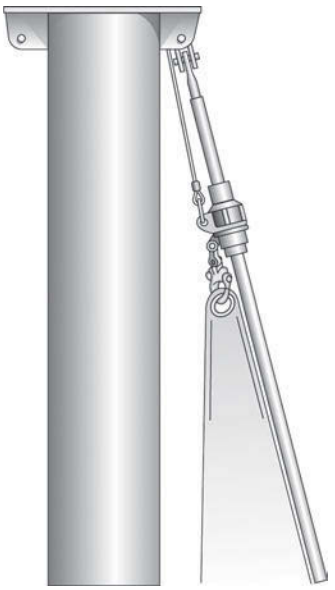


Figure 2

Figure 3

Figure 4

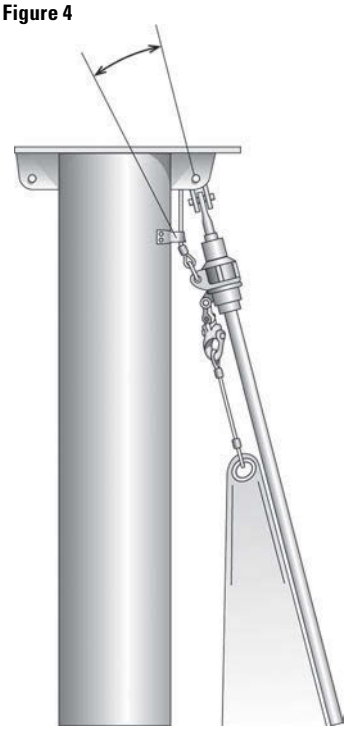
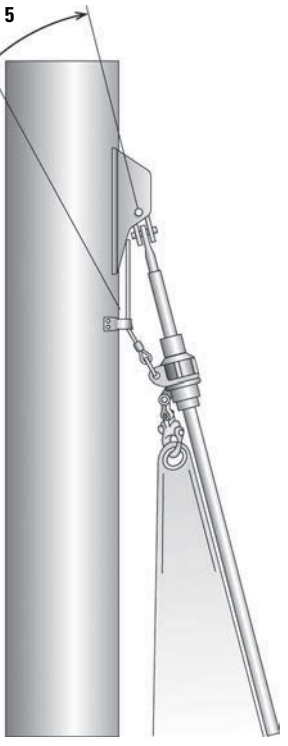


Figure 5



Prevent halyard wrap by making sure that the halyard does not run parallel to the forestay, (Figure 1). The halyard must lead away from the stay at the top by an angle of 5 to 10 degrees. Notice the angles in the remaining illustrations: a masthead rig with a long crane (Figure 2), a masthead rig with fairlead and pendant at the foot of the sail (Figure 3), a masthead rig with the fairlead and pendant at the head of the sail (Figure 4), a fractional rig with a fairlead (Figure 5).

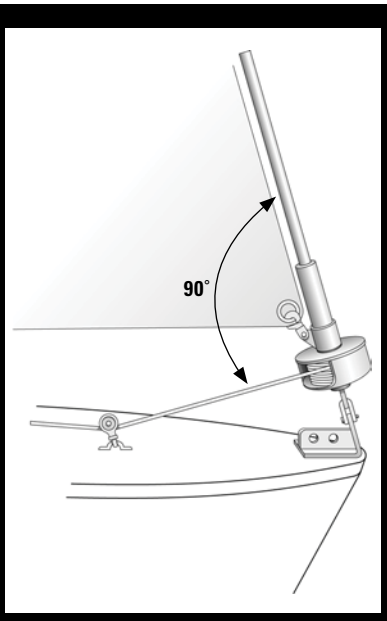
Sail trim

When the boat is close-hauled and the jib is roller reefed, the jib's sheet-lead angle may need to be changed. I'm told on good authority that this may not always be the case, but I have never been on a boat with roller furling where the sheet block did not need to be moved as the sail was reefed. If you simply roll in more and more sail as the wind speed picks up, you will notice that you can't point very high and, in extreme cases, the leech of the sail will flap about three-quarters of the way up. After a while, the sun cover may even separate from the sail in this area because of the flapping.

As the sail is reefed, the jib sheet-lead angle must be changed. Usually the fairlead block must be moved forward as the sail is rolled in, and backward as the sail is rolled out. If you do this properly, the jib will point much higher and pull much harder. Sailors with hanked-on jibs or with luff groove foils will set their jib lead blocks by watching a series of telltales along the luff of the sail. They head up and watch to see which telltales lift first. Ideally, they should all lift together. If the top telltales lift first, the jib has too much twist in the top part and the jib block needs to be moved forward. If the opposite happens, there is not enough twist so the block should be moved aft. Moving the jib lead forward as the boat turns further off the wind will also help keep the sail properly trimmed.

Roller-furling jibs are often made today with markers in several places along the foot. These are stopping points for reefing, which the sailor can use to match with jib lead block positions determined beforehand by the use of telltales.

What if you find yourself on a boat where nothing has been marked or predetermined? A few general rules will get you close. First, it is never right to have the leech flapping. Moving the block forward will correct that. When a sail looks right, it is probably close. Second, study the sail when it is full and match that look when it is reefed. Maintain about the same amount of twist. If you have the jib lead block too far forward, it won't hurt the sail. Instead, you will lose some power and the boat won't point as well. Nor will it hurt the sail if you have the block a bit too far aft, so long as the leech does not flap. You will have a bit too much twist and the boat will be somewhat depowered, which is actually a trick that racers use in certain circumstances.

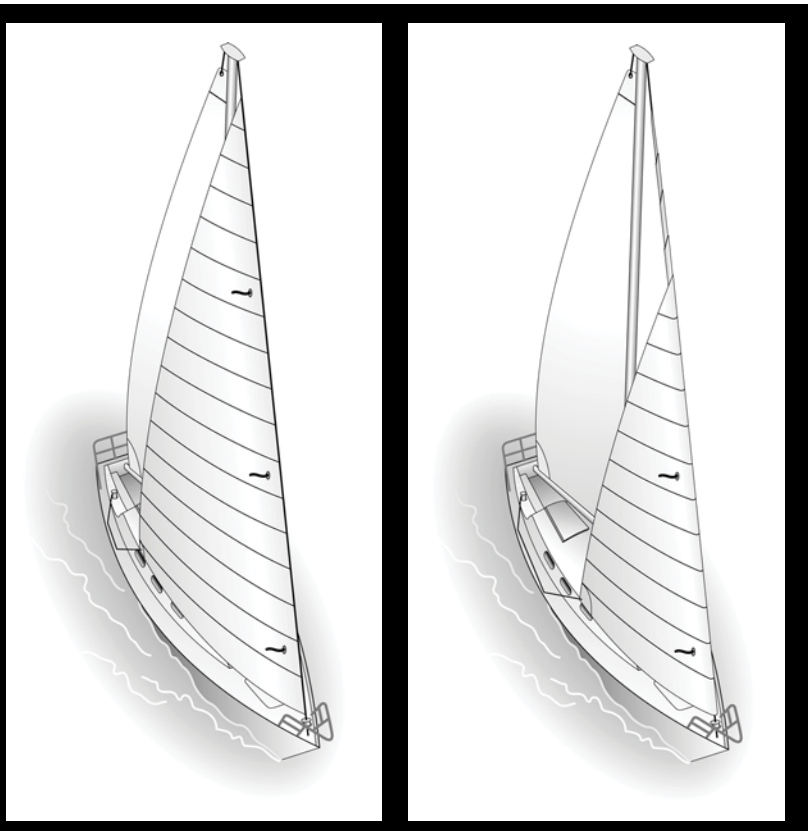


The furling line should enter the furling drum at a 90-degree angle to the foil.

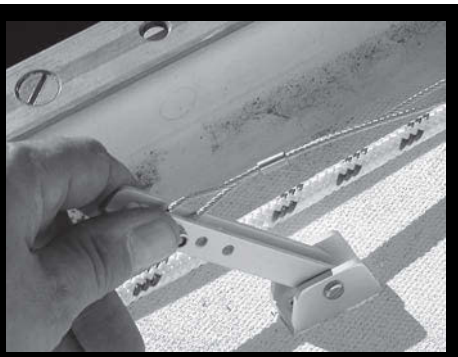
Securing for a blow

Every time you leave your boat you should secure for a blow unless you have absolute faith that you know what weather will come to her before you return. In the case of the roller furler, it is absolutely essential that the sail cannot — under any circumstances — unfurl.

When the sail is completely furled, have enough line left on the drum so you can wrap the jib sheets around the sail several more turns. These final turns — plus whatever else you can do to make sure that the furling line is securely cleated and the sail cannot unfurl by accident — are critical measures to take in storm conditions and whenever you leave the boat unattended. You may be able to mechanically lock the drum with a carabiner or drill it for a locking pin. As mentioned already, high winds can and do unfurl headsails aboard unattended boats. Nothing good happens after that. One furler design, Reef Rite, <http://www.anzam.com>, has a locking pawl and release wire. This allows a more positive locking of the drum when not in use and also takes the load off of the reefing line when the sail is partially rolled into a reef.



Move the jib fairlead forward as you reef the headsail.



If you don't have a drum which can be mechanically locked like Reef Rite's drum with its locking pin, at left, you may be able to drill yours so that it can be locked. Reef Rite's lever and cable, at right, control the drum lock.

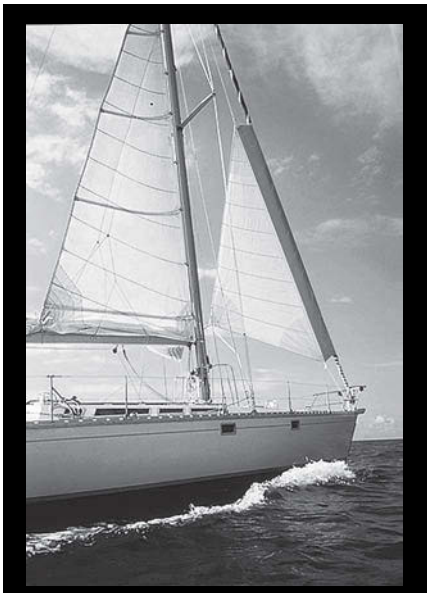
Changing sails for conditions

A lot of experienced sailors who enjoy the convenience of roller furling own several headsails. Some will mount a smaller jib in spring and fall when the winds are stronger. Some will actually carry several jibs on a cruise and change them much as a sailor without roller furling would, except not as often. There is much to be said for this. A purpose-built roller-furling jib is different from a sail designed for a luff foil or hanks. Among other things, it will have a flatter cut. No matter what the differences are, any roller furling sail will be at its absolute best when it is not furled at all, and its performance will deteriorate as it is furled. To put it another way, a purpose-built furling 110 will outperform a furling 150 rolled up to the size of a 110. By changing to the sail that will not need to be furled as often or as much, these sailors enjoy better boat performance.

If several jibs are carried, the skipper will need to plan the sail changes with a little more care. Changing up — from smaller to larger — is not a problem, but changing down takes some anticipation since removing any sail without hanks in a blow is more difficult. The sail will, at some point, be held only at the tack, head, and clew and can be hard to control in a blow. Using several crew for the change is very helpful as is ducking into shelter for the change. The Reef Rite furler departs from standard design practice by having larger grooves and "Kiwi slides," which are essentially slugs sewn to the luff at the spacing of hanks. This design allows the changing of jibs to be as simple as it is for sails with hanks.

In very high winds, a separate, dedicated storm jib is a very desirable sail. It will perform much better than the small triangle of a large jib almost fully furled. A very small jib can be carried on a separate stay if the boat has one, or a Gale Sail by ATN, <http://www.atninc.com>, can be mounted right around the furled genoa. This looks like a good solution since the sail can have good shape and can fair the luff on both tacks.

The modern roller furler is a sophisticated device that has evolved over the years. Properly installed and used, it can be very reliable and give acceptable performance. Roller furlers are seen on long-distance singlehanded racing boats and bluewater cruisers. Indeed, roller furlers are the rig of choice today for everything but racing. If you have a furler or intend to install one, you will get better and safer service from it if you take the time to understand and maintain it and use it as it was intended.



ATN's Gale Sail is a storm jib attached to a sleeve, which is secured over the furled jib.

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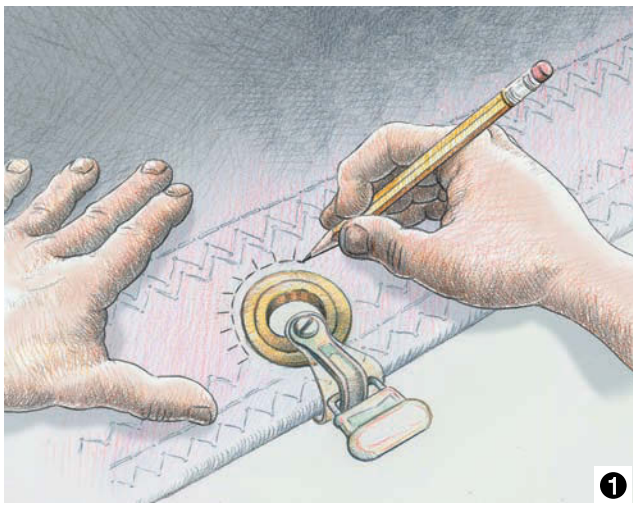
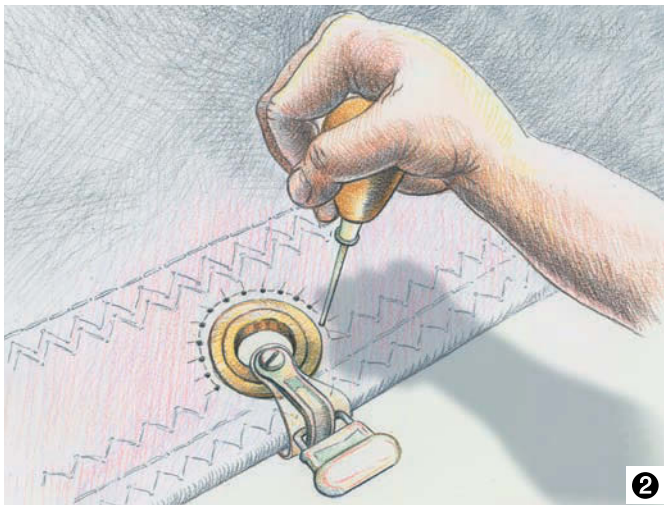




ILLUSTRATIONS BY FRITZ SEEGERS

Simple mainsail upgrade

Here's how to reinforce those grommets

by John Cochran

Many a respected sailor reinforces the grommets on his mainsail (see, for example, Larry and Lin Pardey, *The Self-Sufficient Sailor*). I decided to do it myself also.

The first step is to assemble tools and materials. Any chandler should have everything you need:

- Number 16 sail needle
- Hole punch, such as a fine awl
- Leatherworker's needle or a wire brad in a pair of locking pliers
- ⅛-inch waxed polyester floss or twine (such as #520PW-4 Bait Rigging Floss from Consolidated Thread Mills)
- Ruler for marking ⅛-inch intervals
- Scrap of sailcloth or piece of stiff paper
- Sailmaker's palm (may be handy)

The method

Make a template for marking around your grommets. Measure your grommets and mark a stiff piece of paper or sailcloth with an arc of a circle that is slightly larger (say ⅛ inch) than the diameter of your grommets. Cut out the center of this partial circle, leaving an opening on one side large enough to work this template around the shackles, webbing, or stitches that hold the slides or slugs to the luff bolt rope. Use the template to mark around the edge of the cutout at ⅛-inch intervals.

Mark your sail. Place the template around each grommet and make marks with a soft pencil (1).

Pre-punch the needle holes (2). This makes the actual sewing very much easier. Don't make the holes too big or you will weaken the cloth. I used a small wire brad gripped in a pair of locking pliers. The holes should be within ⅛ inch of the edge of the grommet.

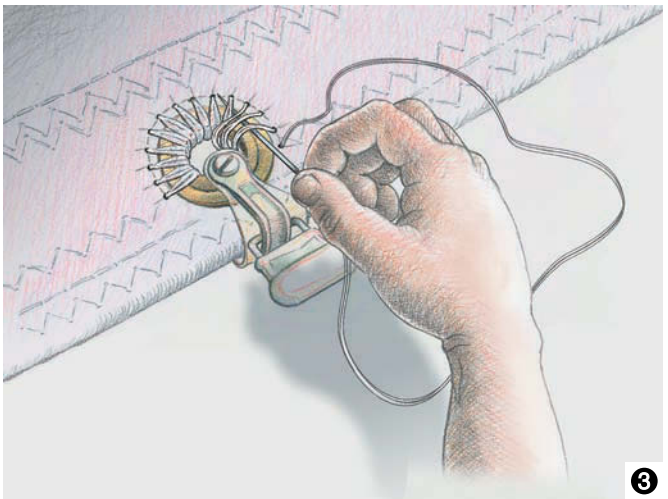
Load your needle with the waxed floss. Cut a convenient length of floss (10 to 12 feet, or two arm stretches worked well for me), thread it through the eye of the needle, pull it so the needle is in the middle, and twist the two parts of the floss together to form a doubled length about 5 feet long. This is enough for several grommets.

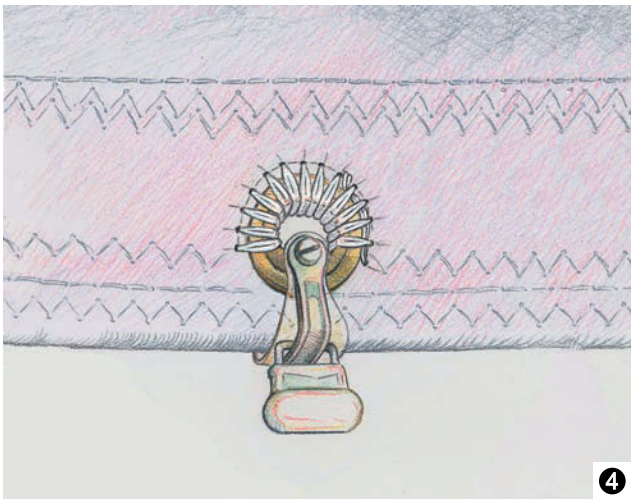
Sew around and through each grommet. Start by passing the needle through the first pre-punched hole (either end is OK). I found it easier to point my needle down into the sailcloth from above, so I could see the holes easily, then bring it back up through the large grommet hole. Pull the floss almost all the way through so there is about a 1-inch tail. Bring the needle through the eye of the grommet, pass it over the tail, and sew through the second hole.

Not too tight

Pull the floss so it is snug around the grommet and cloth, but not so tight that the tail pulls out. Continue sewing in this manner, capturing the tail as you sew, until there are three holes left. For the last three holes, leave large loops of the floss so you can grip it to pull the loops tight after securing the end. Now turn the working area over so you can insert the needle through the last 4 loops (3), like finishing a whipping on a rope, and pull it through. Back on top, pull

ILLUSTRATIONS BY PATTY SEEGERS





each of the loops tight, tightening the last loop by pulling the needle. Finally, cut off the excess floss close to the finished reinforcement (4).

Possible problems? Be sure the floss is snug but not so tight as to cause deformation of the sailcloth. If the floss gets to be too short to complete a complete reinforcement after you start around a grommet, remove the section you've already sewn, cut a new length of floss, rethread the needle, and start over.

This is an easy task that will help your mainsail stand up to the strains of sailing; it can be done over the winter or any time the sail is off the mast, and it only takes a few minutes for each reinforcement. I spent about 2 hours on the 13 luff grommets of my main.

John Cochran has sailed the Chesapeake Bay from time to time over the past 20 years and is looking forward to more. Several years ago at a pre-retirement seminar, the presenter said, "Don't forget your dreams." John's retirement project is a good old 1966 Coronado 25 that requires extensive renovation. She is aptly named An Education.

What's inside your winches?

All parts except drum, top pawls, and springs are ready for reassembly.

Keep those old primaries clicking nicely

by Jamie Harris

Back in the 1960s and '70s when many of the good old boats we love were built, Barient winches were considered the gold standard for primary sheet winches. Bold chrome-plated bronze drums and heavy-duty top and bottom gears offered owners of Barient-equipped boats a sense of confidence in their sheet handling. The solid reputation of the Barient name was helped by its origins as well as the quality of the gear. Barient was a combination of the names of two of the most famous racing yawls of the 1950s, the beautiful *Baruna* and graceful *Orient*. I still remember seeing a stirring photo of these gallant beauties racing neck-and-neck out of the Golden Gate into the Pacific.

In 2006, before I left on a summer cruise to Hawaii in my 1968 Spencer 35, *Onrust*, I took the drums off my Barient 22 winches to clean and lubricate the top gears and pawls. I sprayed a goodly amount of WD-40 on the bottom gears and left them alone, since taking them out requires removing the winch base from the coaming. (Owners of Lewmar winches will note that Lewmar made a big improvement over Barient on this point — you don't have to remove the base to clean and repack all the moving parts in the bottom gear set of Lewmar winches.)

I suspect my approach is what most people follow, but eventually the bottom gears need love and attention. In the fall, several months after *Onrust* was back in her home berth in California, I noticed that the winches were harder to turn. The accumulated salt and grime of two Pacific crossings had taken a toll. It was time to remove the winches and give them a complete servicing, top to bottom. But the Barient Company is no more and there are no parts lists, service instructions, or manuals.

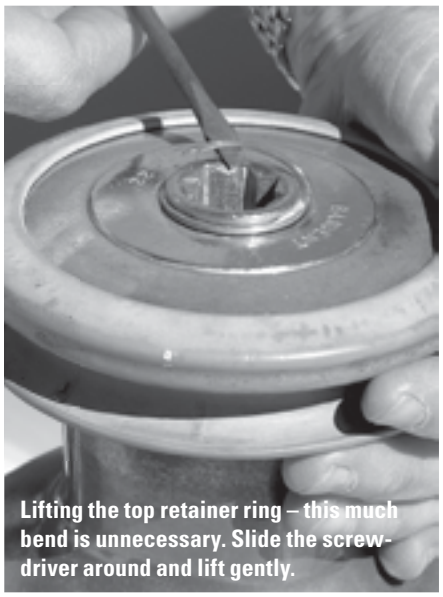
Undaunted, I removed the drums, pulled both winches off the boat, and took them home to inspect and clean. Now restored to *Onrust's* cockpit coaming, they turn smoothly as can be. Even though they are decades old, the drums gleam nicely.

What follows is a step-by-step guide. (For clarity, the photos were taken after the winches were cleaned.) The same approach applies to many winches of other manufacturers, even if the detail of the parts is different.

First, carefully remove the retainer ring that circles the top of the spindle and serves to hold the winch drum on the base. Use a small bladed screwdriver to gently pull the end of the retainer ring out of its groove and then push the screw-

Tools and equipment used

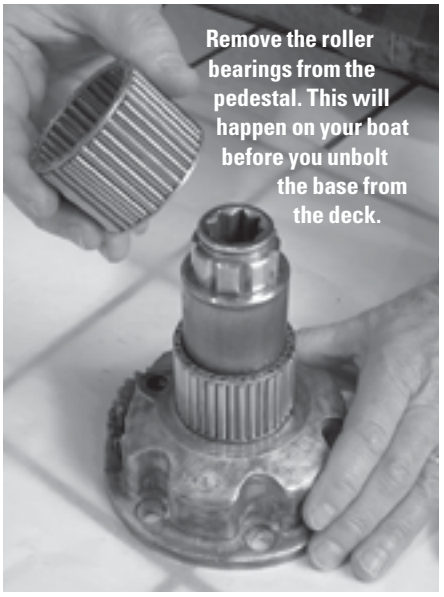
Small screwdriver
Socket wrench for through-deck bolts and nuts
Power drill with rotary wire brush (use with caution)
Kerosene
Old toothbrush
Mallet and 3-inch stainless bolt to drive bottom gear pins
1,500-grit emery paper
Metal polish
Lots of rags!



Lifting the top retainer ring – this much bend is unnecessary. Slide the screwdriver around and lift gently.

Lifting the top plate out. The retainer ring is on the counter.

Lift the drum off with your thumbs over the pawls. The springs have already been removed in this picture.



Remove the roller bearings from the pedestal. This will happen on your boat before you unbolt the base from the deck.

driver around the spindle between the ring and the spindle body, using a finger from your other hand to prevent the ring from sliding. Don't pry so hard that you bend or crimp the ring; you'll need to put it back later. (For clarity in the photo, the ring in the photo is being lifted up higher than necessary.)

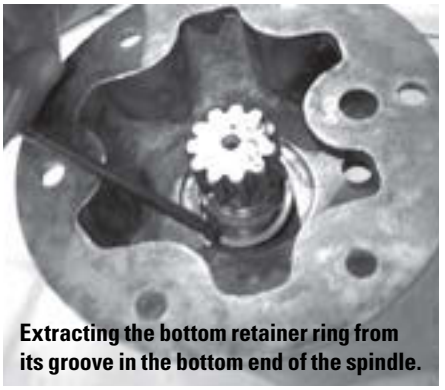
With the retainer ring removed, you can lift the top plate off. You may need to tap one side of it gently with a hammer to raise the opposite edge and then slip the end of a screwdriver under the edge.

With the top plate removed, you can lift the drum off. There are two pawl-and-spring sets in the top of the drum under the top plate, but don't worry. If you lift the drum carefully, nothing will spring out. The pawls are held in their traces by the spring pressure, but it is a good idea to hold your thumbs on top of the pawls as you lift the drum off, using both hands to pull straight up. These steps take place on your boat since the heads of the through-deck bolts are under the drum. Be careful to keep the parts together in a container. Avoid the dreaded "plink, plink, splash."

Next, slide the two stacked roller bearings up off the pedestal.

Put all these greasy parts in a box so you don't lose anything. I'd also suggest taking the pawls and springs out and putting them, along with the retainer rings and top plates, into a small sealable container for small parts. Barient parts are like treasure: hard to find and costly. Now you have left — still bolted to your boat — the winch base containing the spindle and the bottom gears. The spindle is held in place by a second retainer ring at the bottom end, inside the winch base. Get underneath the deck and unbolt the

Bottom gears out, cleaned and polished, pawls re-inserted without springs for illustration.



Extracting the bottom retainer ring from its groove in the bottom end of the spindle.

The spindle is out, cleaned, and polished, shown with the bottom gear at top of the photo.

whole thing. When you lift it off, don't worry; nothing is going to fly out, but nonetheless keep a good grip. Carefully mark the exact alignment of the winch base relative to the bolt holes so you can replace it in *exactly* the same position; what may appear to be a symmetrical set of holes probably is *not*. For the same reason, mark individual winches as port and starboard as well.

Take the whole kit and caboodle to a place where you can work on a solid bench or table with good light and power tools and where your significant other will not complain too much about solvent smells.

Cleaning the top pawls and roller gear barrels is just a matter of soaking them in kerosene or other light solvent and giving them a good brushing with an old toothbrush. You can also rub the flat sides of the pawls with a very fine (I used 1,500-grit) emery paper to polish them up and remove the last remnants of baked-on grease. Examine the pawls and springs carefully. If the springs are rusty or if the pawls show chipping, rust pits, or excessive wear on the tooth ends, they should be replaced. Refer to the sidebar for a source. The roller gear barrels are good quality stainless steel and should be in pretty good condition. A good strong metal polish on the outer drums will make them look a lot better and make you feel as if you've made progress.

Now you're ready to take the spindle and bottom gears out of the winch base. The bottom end of the spindle is held in place with a retainer ring just like the one on the top. Before you try to extract it, it's best to remove the bottom gears. They're held in place by a stainless-steel pin that is their axle. Drive it out from above. Don't use a pointed punch tool or screwdriver for this task; you may damage the end of the pin. I used a 3-inch stainless-steel bolt as a driver with

gentle taps from a mallet.

With the pin removed, the two nested bottom gears slide out easily. The smaller one on top has two more pawls in it that engage the inside of the larger gear ring. Remove and inspect. Clean and polish the pawls and springs just as you did the top ones and put them into your small-parts container.

The bottom gears will need buffing and cleaning. I used a stiff wire brush to clean between the teeth where hardened grease and salt had formed a solid cake that wouldn't yield to the kerosene and toothbrush. (I did the same on the gear teeth at the bottom end of the spindle.) I polished the sides of the gears by rubbing them on the emery paper laid flat on a tabletop. If you do this, use minimal pressure and very fine emery paper so as not to remove any metal or make any change in the clearances; you are merely cleaning.

When you have the bottom gears out, you should be able to easily access the retainer ring on the bottom end of the spindle. Extract it as you did the one on top.

I know I'm the only one who will ever see the base, but I like to know that what's underneath has been cleaned up anyway. I used a rotary wire brush on my power drill (a bench grinder with brass wire brush would have been better) to clean and polish the winch base. Be sure to wear eye protection when doing this work; little bits of the wire brush will fly off. I did this only on the raw metal, not on the machined shaft surface where the roller bearings ride; this surface must be kept free of scratches.

Before reassembling, wash down all parts with lots of hot fresh water and dry them thoroughly. This is to remove all remnants of kerosene and polish before applying new lubricating grease. Reassemble them in reverse order to the teardown, applying a very light coating of top-quality winch lubricant to all gears, the spindle, and inside the shaft. When you reinstall the bottom gears, turn the base over, grease the pin well and drive it up from the bottom. Since doing this job, I have learned that Barient's literature recommends not lubricating the springs and pawls or the ratchet teeth. However, I believe that a little bit of marine equipment grease on the pawl and spring actually makes it easier to reinstall the pawls and doesn't seem to interfere with performance. Don't put a big gob of grease in the pawls, however; they need to flip back and forth across the gear teeth smoothly. A bunch of heavy fresh grease might just immobilize them.

"I know I'm the only one who will ever see the base, but I like to know that what's underneath has been cleaned up anyway."

There is a right way and a wrong way to install the pawl springs. One arm of the spring comes off the spring straight in a tangent from the circle, while one is bent pointing into the circle. The straight tangent side of the spring should rest against the inside of the pawl and the bent arm of the spring should rest against the gear body.

When you re-mount the base on your boat, be sure to use new silicon-bronze bolts and nuts; you do not want stainless-steel bolts tight against the bronze winch base. Apply a thin bead of quality bedding compound around each bolt hole, being careful not to let any get into the bottom gears. I also dabbed some caulk under the head of each bolt so the head would be sealed nicely in its hole in the base.

Voilà! Due to this full service, your Barients should provide several more years of smooth grinding.

An afterword on mounting winches: the older-style winches addressed in this article are meant to be installed on a flat surface. Mine are placed on a molded flat-topped winch pedestal built into the cockpit coaming. If your winches are not on a completely flat surface, think about adding a proper winch pad to level it. Also pay attention to drainage from the base when mounting the winch. Water can enter the spindle from above and, unless there is a way for it to get out, it can puddle in the base of the winch. Good quality washers under the base at each mounting bolt will allow the base to drain.

Jamie Harris, a recovering lawyer who is now an organizational consultant, began sailing in high school with an old wooden Snipe on a Michigan pond. In the 1970s he crewed on a Lapworth 36, racing on San Francisco Bay before purchasing a Gary Mull-designed Ranger 26. Next he sailed a Sparkman & Stephens Yankee 30. After being boatless while raising a family, Jamie and his wife, Martha, purchased the 1968 Spencer 35, Onrust, *(Dutch for "unrest") in 2003.*

Resources

I found Barient-made pawls and springs (and bought a few extra to store away) at Svendsen's Marine Chandlery in Alameda, California, 510-521-8454.

The Barient parts, molds, and an inventory of used Barient parts, were acquired by The Australian Yacht Winch Company, 4-11 Stoddart Road, Prospect, NSW 2149, Australia. The company also advertises a spare parts list on the Internet <http://www.arco-winches.com>.

Taming the boom

Keep things under control with off-center vangs

by Bernard Heise

When we reconfigured *Momo*, our Mason 43, for bluewater sailing, we searched for a way to replace our 4:1-purchase vang with something more powerful. We also needed something that could act as a preventer and steady the boom. Eventually we developed a system of dual off-centered vangs that has proven robust, effective, and easy to use. In fact, these vangs turned out to be our most significant modification to the sailboat's rig, greatly enhancing performance and safety.

The typical sailboat features a centered vang, which is secured at the base of the mast and runs at an angle of between 30 and 60 degrees to a position on the boom a few feet from the gooseneck. The vang keeps the boom down and thus controls the twist of the main, particularly when the boat heads off the wind and that function can no longer be fulfilled by the mainsheet and traveler. Older boats like ours often employ a modest 4:1 tackle, which is barely adequate even on small boats. Skippers with deep pockets can install a masculine piece of hydraulic muscle powerful enough to move mountains but which costs more than a new mainsail. New boats increasingly sport rigid mechanical vangs that also support the boom in lieu of the topping lift, although I don't understand why anyone would trade the supple strength of rope for the rigid vulnerability of aluminum extrusions and steel. Judging from manufacturers' warnings and reports I've read from people who use them, rigid vangs seem like a heavy and expensive way to replace a fully functional topping lift with a product that offers, above all, the potential to break.

> "…these vangs turned out to be our most significant modification to the sailboat's rig, greatly enhancing performance and safety."

Any desired position

The virtue of the centered vang lies in pulling the boom down without impinging on its freedom to swing from side to side. The boom can be sheeted to any desired position while the vang's tension remains the same. But such convenience comes at a price. As much as half of the force applied to a centered vang does not actually pull the boom down but, rather, wastes itself driving the boom into the mast and stressing the gooseneck. Little can be done about that: if the boom attachment is moved forward, the downward pull of the vang increases, but leverage is lost; moving the boom attachment aft increases the vang's leverage, but decreases the proportion of force actually used to bring the boom down.

Furthermore, giving the boom the freedom to swing is not necessarily a good thing. With any kind of seaway, particularly in light winds, the boom bounces around with a violence that benefits neither the rig nor the canvas.

And the further the vessel points downwind, the greater danger it faces from an accidental jibe. Inevitably, measures need to be taken to steady the boom. Often, however, such measures are awkward and unsafe. One common recommendation, for instance, is to rig a preventer to the end of the boom, lead it forward to a block on the bow and bring it back to the cockpit. But that is easier said than done, especially after a jibe at night or in heavy weather. Another way to rig a preventer is to change from a centered to an off-centered vang – by releasing the bottom of the vang from its position at the base of the mast and moving it outboard so that the vang constrains the boom. But a vang that always needs to be moved from one place to another is a nuisance.

Vangs on each side

On *Momo* we decided to set up an off-centered vang for each side of the boat, with both sides controlled from the cockpit. Not only are these vangs more effective than a centered vang at pulling down the boom, they also act as preventers and help steady the boom in a seaway. Jibing and tacking are easy and, using the vangs and mainsheet, we can secure the boom in any position we desire within seconds.

Due to the difference in leverage, any tackle that controls the boom from the middle encounters substantially more force than tackle, which controls the boom from the end. Generally speaking, the tackle for an off-centered vang should be at least as strong as that which you might use to rig your boat for mid-boom sheeting. Consider that blocks always fail before lines do and that a multi-part tackle is only as strong as its weakest block. Also pay attention to the size and strength of your boom.

If your boom has a particularly small cross-section, an off-centered vang might not be appropriate. If you have any doubt, try vanging your boom to the leeward rail, using your center vang tackle, and watch for bending. If there is much bending of the boom, you need a stouter spar to make this rig safe.

The vang's attachments to the boom and deck are critical. The forces faced by an off-centered vang, especially the shock loading from a slatting main,

Facing page: We use webbing straps for all of our boom attachments. Made by Grip-Sure Manufacturing in Richmond, B.C., they have a working load of 3,200 pounds, accommodate shifting directions of load, and are easy to inspect and replace. The red lines, led through holes in the boom, keep the straps from sliding back and forth. This page at left: running under triple-reefed main alone off Cape Mendocino, California.

On *Momo* we are equal-opportunity employers. The blocks are from Wichard, Harken, and Schaefer – whatever will do the job for the most reasonable price.

can overwhelm hardware, pull fittings through decks, break stanchions, and lift genoa tracks. This applies not only to a boat like *Momo*, which has a displacement approaching 30,000 pounds and a mainsail of 434 square feet, but to smaller boats as well. Faced with rolling seas and a slatting main, the ill-conceived vang we once installed on our 28-foot Pearson Triton, for instance, tore a hole in the deck.

Webbing attachment

On *Momo* we secured the vangs to the boom with a webbing strap. In fact, ever since a stainless boom attachment for our mainsheet sheared while we were motoring through a windless stretch of sloppy seas, we have used webbing straps for all of our boom attachments. They absorb shock and accommodate shifting directions of loads; they are easy to inspect and replace; and they are light and incredibly strong — the 1-inch-wide straps we use have a working load of 3,200 pounds with a safety factor of 5:1. They are also inexpensive — after asking a boatyard crane operator where he purchased his straps, we went to the same place and discovered that they could custom-make any kind of straps we wanted at very reasonable prices. The 2-foot-long straps we use on the boom were made by Grip-Sure Manufacturing in Richmond, British Columbia, and cost less than $8 each. Compare that to the $40 we might otherwise have spent for a stainless-steel boom bail that, tortured by the stress of an off-center vang, would inevitably fail.

One way to assure the strength of the lower fitting is to secure the vang to the chainplates. But leading the lines fairly can prove difficult, and, for safety reasons I will explain later, we did not want vangs positioned that far forward. On *Momo* we secured the bottom of the vangs to two separate points aft of the chainplates, spreading the load between the midship cleat and a stanchion base. The points are 24 inches apart, and each is reinforced with a 4-inch by 6-inch stainless-steel backing plate.

The vang's tackle should generate sufficient force to pull the boom down in a strong wind. Smaller boats might be well-enough served by a two-block tackle with a 4:1 purchase.

More power

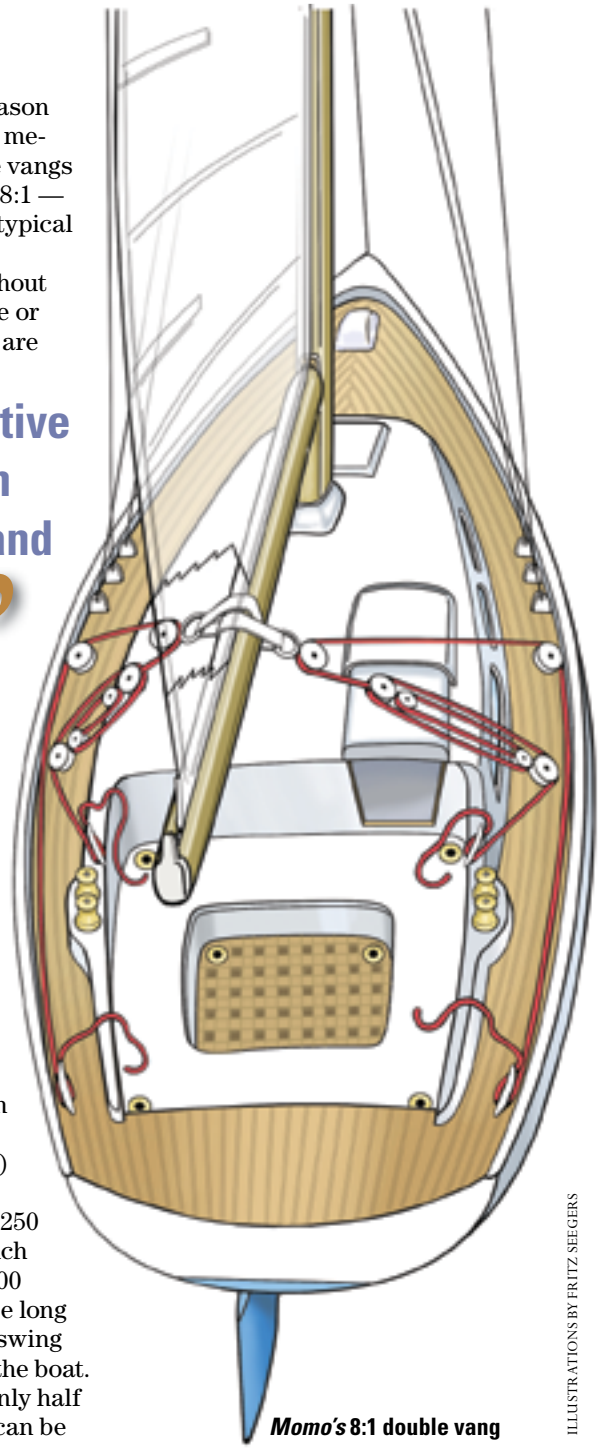
Controlling the sail on our Mason 43, however, requires greater mechanical advantage. Thus the vangs on *Momo* have a purchase of 8:1 — the same as obtained from a typical rigid vang.

To gain such purchase without using excessive lengths of line or numbers of blocks, the vangs are composed of two cascading tackles. The first tackle consists of a line, the standing part of which is fixed to a fiddle block. The hauling part is reeved through a block at the boom, brought down to a block at the midship cleat, and led back to the cockpit, where it can be made fast. By itself, it yields a 2:1 purchase. This part of the vang bears the most load, thus the blocks and line must be sized accordingly.

On our boat, we use 90 mm blocks by Wichard (safe working load of 4,400 pounds) at the boom, Schaefer's 704-5 block (safe working load of 2,250 pounds) at the cleat, and ½-inch line (breaking strength of 8,500 pounds). The line must also be long enough to allow the boom to swing freely to the opposite side of the boat.

The second tackle bears only half the load of the first and thus can be sized somewhat smaller. The standing part of the second tackle is fixed to a fiddle block secured to a stanchion base about 24 inches aft of the midship cleat. The hauling part is then reeved back and forth between the fiddle block that terminates the first tackle, and the fiddle block that is secured at the stanchion base, and

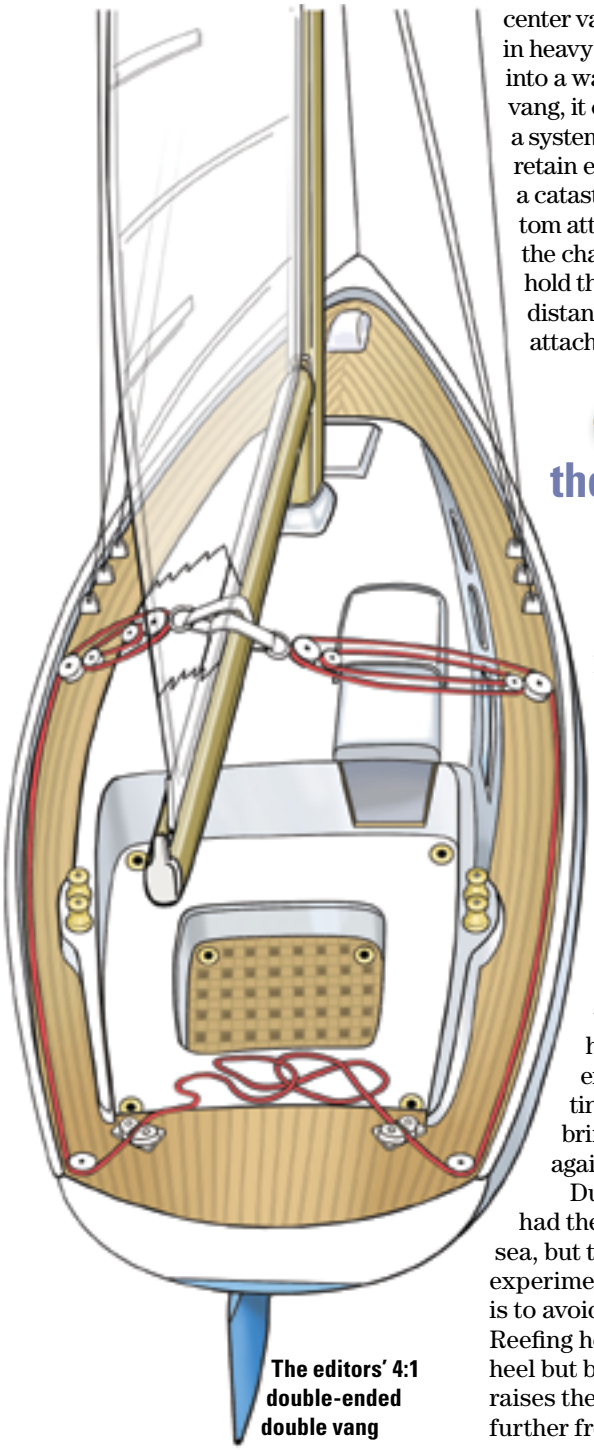
> **"Not only are these vangs more effective than a centered vang at pulling down the boom, they also act as preventers and help steady the boom in a seaway."**



***Momo's* 8:1 double vang**

ILLUSTRATIONS BY FRITZ SEEGERS

finally brought back to the cockpit where it can be made fast. We use Harken's fiddle blocks 1559 and 1560 (safe working loads of 1,800 pounds) and ⅜-inch line (breaking strength of 4,400 pounds). By itself, this second tackle yields a purchase of 4:1. Between them, however, the two tackles yield a purchase of 8:1.



The editors' 4:1 double-ended double vang

Two adjustments

Operating the vang involves two steps. First, you make a gross adjustment using the first tackle. Simply put, you haul on the first tackle until the fiddle block is brought all the way up to the boom. Then you use the second tackle to achieve the desired tension and sail shape.

The only serious danger with an off-center vang involves tripping the boom in heavy seas. If the boom digs deeply into a wave while constrained by the vang, it could very well snap. With a system like ours, the vang should retain enough elasticity to avoid such a catastrophe. Since the vang's bottom attachments are situated aft of the chainplates, it does not actually hold the boom all the way out. The distance between the vang's bottom attachments absorbs shock by allowing the boom to rock back and forth a little bit while under tension. The ropes and the webbing also stretch. Furthermore, the location of the vang's bottom attachments also help us recover from accidental jibes. When the wind catches us aback, the boom swings inward a few feet before being stopped by the vang. In this position, the boat actually feels like it's hove-to. It continues to make enough headway that, by putting the helm hard over, we can bring the stern through the wind again and resume our course.

During gale conditions we've had the boom dip lightly into the sea, but this is not something I like experimenting with. The best thing is to avoid tripping the boom at all. Reefing helps, not only by reducing heel but because each successive reef raises the end of the boom a little further from the deck (this, of course, depends upon the design of the main). Eventually, conditions might require striking the mainsail and flying a trysail without the boom. In the absence of boom gallows, the vangs can center the boom and hold it steady.

Less dangerous

In any event, even if the boom trips in the sea, the rig faces less danger from an off-center vang than from a preventer run forward from the end of boom. Whereas the vang might break the boom, the preventer might generate sufficient torque to bring down the mast.

Building a quality robust vang is not exactly cheap. Our vangs were designed to sustain a safe working load in excess of 3,000 pounds. Based on the catalog of a leading chandlery, the blocks we used retail at around $650, although a little bit of searching can yield significantly lower prices. To that one needs to add the cost of line and other incidentals needed to secure the vang and lead the falls back to the cockpit. Still, compared to other alternatives, a vang like ours is a veritable bargain and much more versatile. A mechanical vang for a boat our size retails at more than $1,800, while setting up a hydraulic vang for a boat our size costs around $2,800. With all the money you save, you can buy yourself something nice — perhaps a little rowing dinghy. And when you stow it on deck, shove it right against the mast, because there won't be a centered vang to get in the way.

> "…even if the boom trips in the sea, the rig faces less danger from an off-center vang than from a preventer run forward from the end of boom."

Bernard Heise and his wife, Michelle, lived and cruised aboard a Pearson Triton along the Atlantic Coast before heading south aboard a Mason 43 with their larger family, which currently includes two young daughters, Lola and Jana. So far, they've sailed the waters of Mexico, Hawaii, British Columbia, and Alaska. Their website is <http://www.madeonmomo.com>.

The versatile

A light-air sail simplifies

Code Zero — the term sounds like the title of a spy thriller or a military operation, but it's not. It's the name of a sail designed for use when conditions are just the opposite of thrilling. Since I added the cruising version of this sail to my inventory, short-handed sailing has become easier and less nail-biting. It allows us to sail in all apparent winds from 5 to 35 knots with just three sails.

The Code-0 is a free-flying sail that sets on its own luff rope. Developed as a light-wind racing sail for reaching and close-reaching, it's designed to sail at 45 degrees to the apparent wind in 3 to 6 knots of true wind and at up to 100 degrees apparent in 9 to 11 knots true wind speed. (***Note:*** *the first Code-0 was a "stealth" sail, built for a boat in the Volvo Ocean Race, that measured as a masthead spinnaker but was used as a jib for sailing upwind in very light air.* ***–Eds.***)

One, two, three, up! Setting the Code-0 in no breeze is a breeze, left to right above. That's what this graying sailor bought it for, as a quieter and less fragrant alternative to turning on the engine in light air. It's well behaved and stows in and sets from its own very portable bag, right.

My sail is the cruising version of the Code-0 made by North Sails, which calls it the G-0. Similar sails are available from Hood Sailmakers, Doyle Sails, and many other lofts, some of which have their own names for their versions of what is essentially a de-tuned Code-0. It's about the size of a 160- to 170-percent genoa but it looks and acts like a cross between an asymmetric spinnaker and a genoa, so it's much easier to handle than a cruising spinnaker.

The effective range of the G-0 is similar to that of the Code-0. North Sails claims it can be used in 3 to 4 knots of true wind at 36 degrees of apparent wind. However, North states that most of its customers will find acceptable speeds in 8 knots of true wind speed at 45 degrees apparent wind. Although efficiency will drop off when sailing lower than 90 degrees, North expects that the G-0 will be lugged as low as 115 to 120 degrees.

More fun than the engine

I originally bought our G-0 in 2001 to avoid turning on the engine in light air. At the time, we were sailing out of San Diego and cruising up and down the coast of Southern California. This is generally a light-wind area, and I found I was turning on the engine a lot more than I liked.

We generally sail our Bristol 35.5, a heavy-displacement boat, with a 130-percent roller-furling genoa. When the wind drops below 6 knots

Code Zero

cruising choices

by Carl Hunt

apparent, our boat speed crashes, but I am loath to take off the 130 and put up the 150 so we can sail faster. I admit to some laziness, but bear in mind that I generally sail singlehanded or with my wife. As I approached 60, I liked less and less the idea of hoisting and handing a big sail by myself. Even though the engine wasn't a pleasant alternative, it offered a better option far too often.

I have spent money on boat things before, only to be disappointed. Consequently, I was a little nervous about putting out money for something with which I had no experience. As it turned out, the G-0 has filled the light-air gap and cut down on my engine use.

Better ghosting

For me, the G-0 isn't about sailing at maximum efficiency. Instead, it offers the ability to achieve reasonable speed in light air. The G-0 is a big light-wind sail that's easier to put up and take down than a genoa, making it particularly useful while sailing short-handed. As a result, we make this sort of sail change more often.

With the G-0, we can make more than 3.5 knots in 6 knots of apparent wind at 45 degrees. With 8 knots of apparent wind, we can make 5.5 knots — not too shabby for a heavy cruising boat. If the wind speed increases above 8 knots at 45 degrees, our boat speed begins to slow. When that happens, I need to fall off a few degrees or replace the G-0 with the furling headsail. We also tend not to do well trying to sail above 45 degrees with the G-0 in any wind speed. That restriction probably has as much to do with the configuration of our boat as it does the sail.

I also use the G-0 as a downwind sail when sailing short-handed and use it to sail much lower than North Sails anticipated. It may not be as powerful as an asymmetric cruising spinnaker but it's a lot easier to use. I sail as low as 150 degrees with the G-0, even though it's not designed for this. (Below 150 degrees, it tends to be blanketed by the main and collapse.) I don't view this as a disadvantage. Fin-keel boats tend to be slower when sailing lower. The Bristol 35.5 has a modified fin keel with a big skeg, and we've found that in winds below 12 to 15 knots apparent, we can make better time toward our destination by sailing at 150 degrees

The heft of the tack eye and the reinforcing webbing emphasize the power that this light sail can generate: enough to drive a Bristol 35.5 at 6.5 knots.

> “ . . . in less than 10 minutes from the time I take the G-0 from its locker, it’s drawing wind. ”

or higher and jibing. Full-keel boats probably will want to sail lower and to do so will need to pole the G-0 out.

Easy to control

When singlehanding or when sailing with my wife, I tend to drop the G-0 when the apparent wind exceeds 12 to 15 knots. The boat moves briskly at these wind speeds, 6.5 knots or better. It’s still easy to control with the G-0, but this is a large sail and, in this range, even small increases in wind strength can have a large effect. To avoid a fire drill, I prefer to drop the G-0 and use the roller-furling genoa, even though we may lose a quarter to a half knot or more.

The G-0 expands the wind range of our working sails because we’re able to use a smaller jib. We use the G-0 in lighter winds, where it gives us a more powerful sail than a 150 genoa, and it’s much easier to set the G-0 than it is to drop the 130 roller-furling genoa and replace it with the 150.

Although North Sails designed the sail to be set outside the foretriangle, like a cruising spinnaker, I set the G-0 inside the foretriangle, which makes it as easy to tack and jibe as a 150 genoa. It’s also a little easier to raise and lower when it’s set inside the foretriangle — in less than 10 minutes from the time I take the G-0 from its locker, it’s drawing wind.

You trim the G-0 the same way you trim a spinnaker, by watching the luff curl. When close reaching, I pull the luff as tight as possible so it has minimal curvature. When running, I ease off on the halyard to give the luff more curve. I tack the sail as I would any genny. When I must jibe, I first pull the lazy sheet tight. This allows the G-0 to be self-jibing. The sail will go through the foretriangle by itself without danger of wrapping around the headstay. Meanwhile, I can attend to jibing the main. Then, at my leisure, I can trim the G-0.

If I were to make this purchase again, I would make one change to our G-0. We bought the sail with a sock. It’s easy to use, but most cruising versions of the Code-0 are now sold with a furler. I haven’t used one rigged in this way but it seems to me that it would make using the sail even easier.

Proven on passage

My crew and I used the G-0 to good advantage on passage from San Diego, California, to La Paz, Mexico. We were three old men in a boat. The youngest was 62, the oldest 67. Because we didn’t have the energy and strength of youth, we preferred ease of use and lots of rest. The G-0 helped provide both.

During the first half of the trip, between San Diego and Bahia Tortuga, we encountered mostly light winds, but periodically they were punctuated with a Force 5 or Force 6. The G-0 made it easy to change down to a smaller sail when the wind increased and to put up more sail again when the wind decreased.

From Bahia Tortuga to La Paz, we primarily encountered heavy winds. We averaged between 6.5 and 7 knots over the ground and at one point we almost reached 9 knots. Through this part of the trip, the apparent winds typically ranged from 20 to 35 knots. This is when having the smaller jib on the furler paid off, because we didn’t have to change down from the 150 genoa, although on a few occasions I considered putting up the storm jib.

The most difficult leg of the cruise was between Cabo San Lucas and La Paz. Less than two hours after leaving Cabo, we encountered what in the Sea of Cortez is called a “screaming norther.” We had winds from 20 to 35 knots on our nose all the way from Cabo to the Bay of La Paz. Most boats

When set, Carl’s G-0 makes a colorful addition to the sail plan at the same time as it adds zest to the sailing.

making the same passage stopped at an anchorage called Punta Frailes. Eighteen boats anchored there for almost a week waiting for the norther to blow itself out. My crew, however, wanted to keep going, so we did.

Under fully reefed main and genoa, we slogged on. We could have raised a 90-percent jib, as a purist would have done. This would have been more efficient but instead, to keep from beating up ourselves and the boat, we sailed between 50 and 60 degrees off the wind. As a result, the reefed genoa worked well. We tended to make about 6.5 knots over the ground, although at times we were only making 3.5 knots toward our destination. A couple of times, we even slowed the boat down because we were taking too much water over the dodger.

The point of this story is that having the G-0 as our light-air sail allowed us to carry a sufficiently small genoa that we didn't need to change to a smaller headsail. Admittedly, we couldn't sail as high or as efficiently with the reefed genoa as with the 90-percent jib, but we wouldn't have wanted to sail higher. Since most cruisers will bear off when sailing to weather in high winds, maximum efficiency is not an issue. Comfort and reducing the stress on crew and boat become more important considerations. If the going becomes too difficult, most cruisers will find shelter or heave-to.

"...having the G-0 ... allowed us to carry a sufficiently small genoa that we didn't need to change to a smaller headsail."

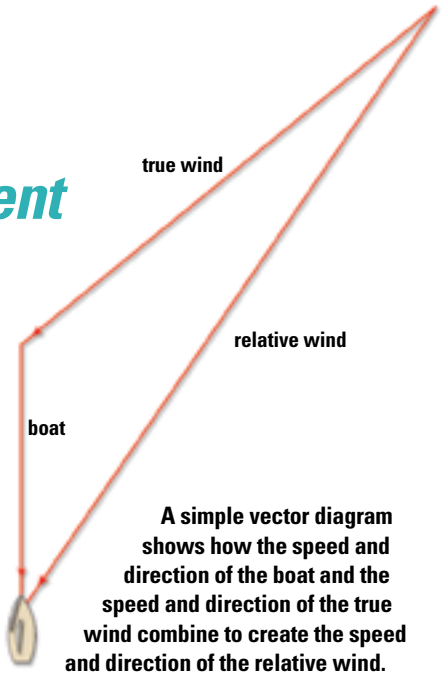
The G-0 is not for every boat. Only in limited circumstances will it drive a boat to its maximum potential. However, it can make life a lot easier for the short-handed sailor who wants to avoid turning the engine on in light air. At the same time, it can allow a smaller jib to be carried on the roller furler and thus extend the upper range of the working sails. For the short-handed (and older) sailor, these seem to be virtues.

Carl Hunt is a semi-retired economist living in Colorado. He has been sailing for 27 years, cruising his own boats from British Columbia to Mexico. He has also chartered and cruised on other people's boats on the East Coast, Great Lakes, Caribbean, Mediterranean, and other parts of the world.

Doing the twist

Trimming your sails to the wind gradient

by Jerry Powlas



TED TOLLEFSON

A simple vector diagram shows how the speed and direction of the boat and the speed and direction of the true wind combine to create the speed and direction of the relative wind.

You can have a very happy life and never understand sail twist. You can even be a reasonably good sail trimmer without understanding all aspects of sail twist. On the other hand, it *is* an interesting phenomenon, and a better understanding is certain to improve your sail-trimming abilities.

If the wind blew from the same direction and at the same speed all the way from the water to the top of your rig, you wouldn't need any sail twist. You may be familiar with the idea that upper winds — hundreds or even thousands of feet up — blow at higher velocities and often from different directions than the surface wind. This weather phenomenon, however, is not what causes the need for twist in your sails. For this discussion, we are interested only in the speed and direction of the wind from the water to the top of your mast. The characteristics of the wind in this zone are not shaped so much by gross weather patterns as they are by some simple laws of physics.

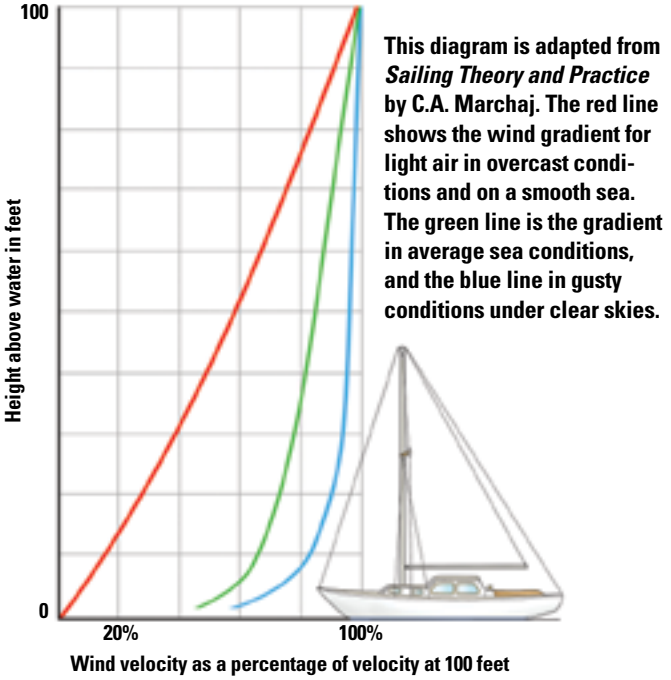
A clue to understanding this stuff is to remember that you can't characterize the wind unless you speak of both the speed and the direction of the wind at a given location. If you try to separate speed from direction in your thinking, you'll lose the concept.

Another clue is that you are dealing with true wind, boat motion, and relative wind. The interaction between these three makes for some interesting events and leads to the need for sail twist.

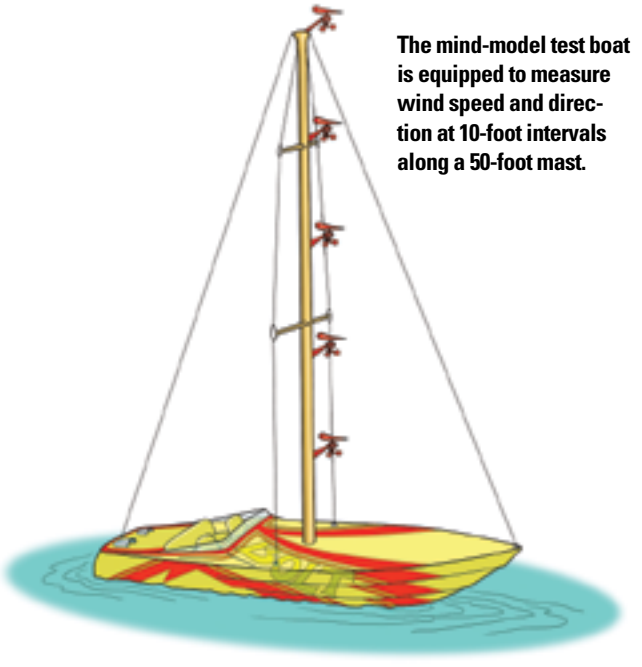
Relative wind

When you're sailing, the only wind you experience is the relative wind, often referred to as apparent wind. Someone sailing on a faster or slower boat, or just sailing in a different direction, will experience a different relative wind. The true wind is driving both experiences, but the motion of the two boats modifies the true wind and makes for different experiences on each boat.

Compounding the problem is that, even within the true wind, there is a variation in speed from the water to the top of the mast and perhaps a small variation in direction. For this discussion, let's ignore the small variation in direction in the true wind from the water to the top of your mast. The significant



This diagram is adapted from *Sailing Theory and Practice* by C.A. Marchaj. The red line shows the wind gradient for light air in overcast conditions and on a smooth sea. The green line is the gradient in average sea conditions, and the blue line in gusty conditions under clear skies.



The mind-model test boat is equipped to measure wind speed and direction at 10-foot intervals along a 50-foot mast.

variable is the *speed* of the true wind as it varies with height. The speed is slower at the water and increases as the height above the water increases.

This variation in wind speed with height is called wind shear, or wind gradient, and it is caused by the drag of the water on the air flowing over it. At the water level, the drag is caused by . . . well, the surface of the water. The air just above the air at water level experiences drag from the air at the water level. The air above that experiences drag from the air below it, and tra-la-la as the amount of drag decreases all the way up your mast and beyond. So, the general condition is that the wind speed increases as the height increases above the water. This is not a weather thing; it's just the physics of fluid flow.

Let's do a little mind model with this. Let's build a nice tall mast, say 50 feet. While we're at it, let's put anemometers and wind arrows on the mast at 10-foot intervals, so we can see the wind speed and direction at different heights. We'll put the mast on a speedboat. Remember, we can do whatever we want, since this is a mind model.

First, with the boat stopped, we observe that the wind is blowing from the north, as shown by all the wind arrows. In addition, we observe that there is some wind shear: 5 knots at water level, 10 knots at 20 feet, and 20 knots at 50 feet. The wind is blowing from the same direction but at different speeds, with the speed increasing with height.

Now, if we motor the boat dead upwind to the north at 5 knots, the wind direction (now relative wind and, in fact, the *only* kind of wind we can observe unless we stop the boat) is still from the north. But now each observation point on the mast shows an increased wind speed with an additional 5 knots being displayed by each anemometer. If we motor south, dead downwind at 5 knots, the relative wind will be 5 knots less than the true wind we recorded with the boat stopped. The wind direction is still from the north, but there is less velocity. So far this makes perfect sense and is very intuitive.

> **"The faster the wind blows from a given direction, the less the motion of the boat affects its relative direction."**

Stretching the mind

The reason for mind models is to stretch the mind, so now we're going to motor south, at 20 knots. That's why I chose a powerboat.

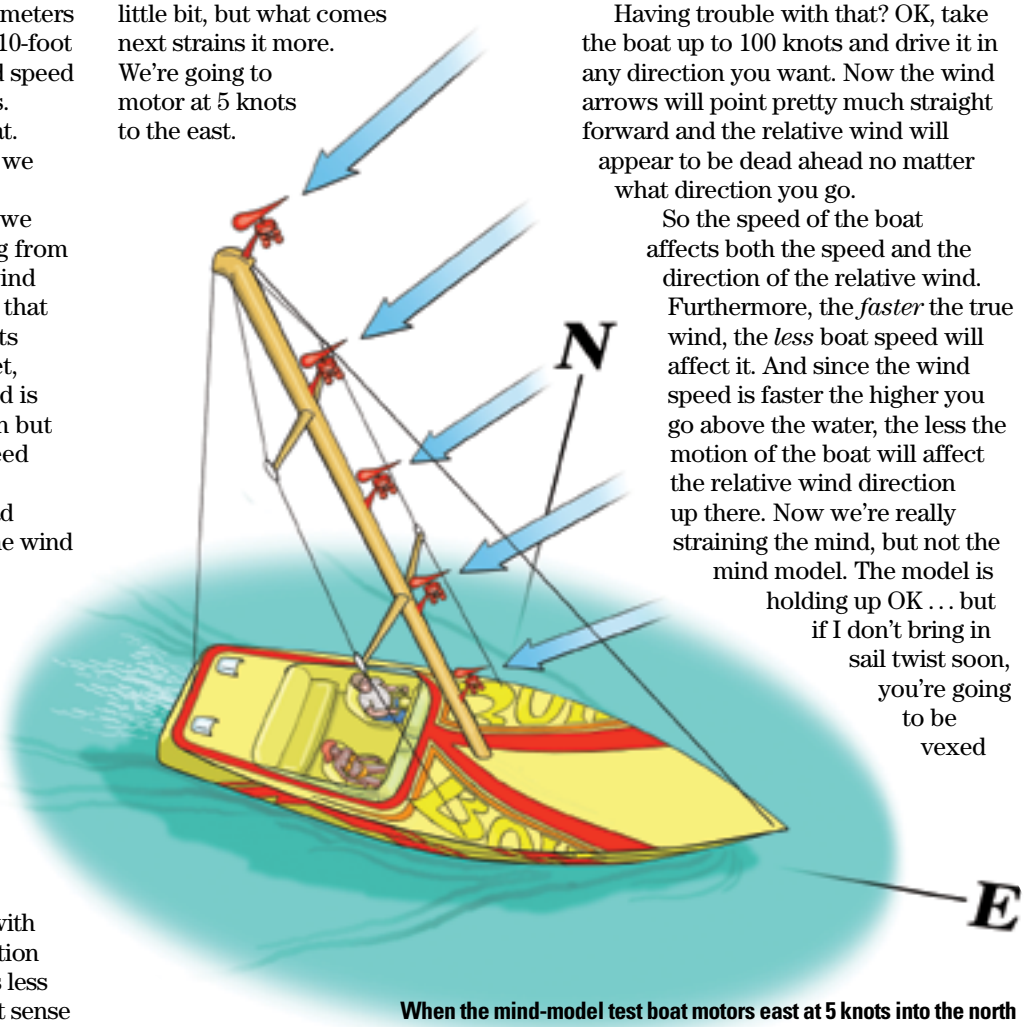
Now we observe that the relative wind is mainly from the south. In fact, it is 15 knots from the south at the water and falls off to no wind at all at the masthead. Things are getting a little trickier here, but you can see that the *speed* of the boat can affect the *direction* of the relative wind, even making the relative wind blow in the opposite direction from the true wind.

That strains the mind a little bit, but what comes next strains it more. We're going to motor at 5 knots to the east.

Now we see that the wind arrows on the mast no longer show the wind blowing from the same direction. This is not all that intuitive, but that's the way it works. The relative wind direction at the water is northeast while the wind arrows show the wind blowing from an increasingly northerly direction the higher up they are. What we are seeing is that variations in wind speed at various heights have a different effect on the relative wind. The faster the wind blows from a given direction, the less the motion of the boat affects it, or rather, the less the motion of the boat affects its apparent or relative direction.

Having trouble with that? OK, take the boat up to 100 knots and drive it in any direction you want. Now the wind arrows will point pretty much straight forward and the relative wind will appear to be dead ahead no matter what direction you go.

So the speed of the boat affects both the speed and the direction of the relative wind. Furthermore, the *faster* the true wind, the *less* boat speed will affect it. And since the wind speed is faster the higher you go above the water, the less the motion of the boat will affect the relative wind direction up there. Now we're really straining the mind, but not the mind model. The model is holding up OK . . . but if I don't bring in sail twist soon, you're going to be vexed



When the mind-model test boat motors east at 5 knots into the north wind, the relative wind is different at each station up the mast.

ILLUSTRATIONS BY FRITZ SEEGERS

for having been dragged through this. Remember, I said you can have a happy life without understanding this.

Variable angle of attack

For a given foil (read: sail of a certain shape) there is a fairly narrow range of angles of attack that will give you good effect (high lift, low drag, and other aerodynamic terms of merit). If the angle of attack is outside that range, the sail will perform badly and, at extremes, will luff or stall. So you need to set your sail at the correct angle to the wind. That would be easy enough if the relative wind blew from the same direction all up and down your mast, but you have seen in the mind model that it does not. In fact, what you need to do is have a slightly different angle of attack at each height of the sail.

Luckily for us, modern sails have a tendency to twist a little with increasing height, and that is exactly what we need. Not quite so lucky for us is that the amount of twist needed varies with conditions. Fortunately, those who've gone before us have discovered the need for twist and how to either induce it in a sail or take most of it out of a sail. They have also discovered how to read telltales to trim sails with just about the right amount of twist.

> "Those who've gone before us have discovered the need for twist and how to either induce it in a sail or take most of it out."

Telltales just abaft the leading edge of a jib and on the trailing edge of a mainsail will tell the sail trimmer if he needs more or less twist. Move the jib fairlead block forward to decrease twist, aft to increase twist. You want the lead farther forward when reaching (so it pulls down on the leech) than when sailing close-hauled.

Also, if you don't move the sheet lead forward whenever you partially roller-furl the sail, your twist will be way off. You have probably noticed novice sailors who, knowing nothing of handling a roller-furling jib, just leave the block set for full sail. Then, after furling a significant portion of the jib, they have so much twist in the sail the poor thing is flogging at the masthead. That's why the sun cover won't survive more than a couple of seasons.

Adjusting twist in the mainsail involves moving the traveler and adjusting the mainsheet so the telltales on the trailing edge stream aft, instead of being stalled. For more twist, move the traveler more to windward and ease the sheet.

Control with vangs

In theory, tightening a centerline vang will reduce twist and, in fact, this sail control does help considerably when sailing well off the wind. Unfortunately, it's very difficult to mount a centerline vang so it has sufficient strength and mechanical advantage. For this reason, centerline vangs are nearly useless for fine control of sail twist on beats and reaches. This is particularly true for most cruising boats where the centerline vang gets stuffed into a small space close to the gooseneck. This is not a good place for a centerline vang, but it is often the only place left to put one.

The radial vang seen on scows and other all-out racers does an excellent job of controlling twist, but these controls are seldom seen on cruising boats.

The off-center vang, sometimes called the double vang or vang/preventer, is amazingly effective in controlling twist. This controversial control is so effective that it virtually eliminates the need for a traveler. We have had one on our boat for 15 years. After the first year of sailing with this rig, I removed the frail and aging traveler and never missed it.

Opinion is divided on the vang/preventer. One group considers it to be a risk to the rig when used offwind as a preventer in a heavy sea. Their contention is that the boom may dip into the sea, thus suffering breakage and possibly taking the mast down. The other group is having none of this. They reason that the ability to quickly set up a preventer from the helm more than compensates for any risk of dipping the boom and taking the rig down.

I'm in the second group. In 18 years of sailing on Lake Superior I've never gone downwind in conditions that bad. If we ever encounter such large seas while sailing downwind, my plan is to strike the main and replace it with our storm trysail, or just sail downwind under the jib alone.

Some general rules

To put precise values on all this, you *could* make true and relative wind observations up and down the mast and map out a bunch of vector diagram solutions and suchlike, but I won't hold you to it. Here are some general rules to help you deal with the need for sail twist.

1. When you're moving, the only wind you can observe and the only wind

affecting your boat and sails is the relative wind. It is as real as any wind can be. It is as real as the true wind, which you could think of as the relative wind for a stopped boat.

2. Except for when you are going dead upwind or dead downwind:

   a. The relative wind is always forward of the true wind.

   b. The relative wind direction will be closer to the true wind direction the higher up the mast you measure it.

3. You need the most twist in light air, and less as the wind speed increases.

4. Moving jib leads forward compensates for partial furling and also removes excessive twist when reaching.

5. Moving the traveler more to windward increases mainsail twist, as does easing the sheet.

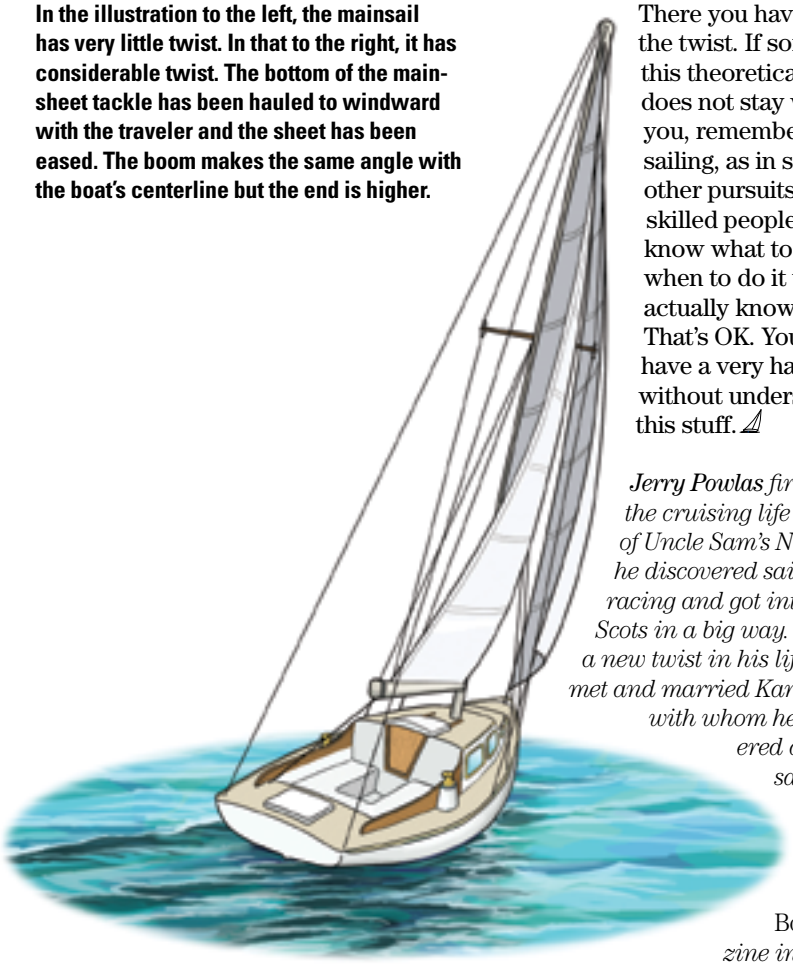
6. Local conditions will vary the amount of twist you need, but your boat's telltales are always right.

7. An old dinghy-sailor's trick is to induce more twist than is needed, to depower the rig. This makes the upper parts of the sail unload first, which reduces heel. Use this trick sparingly.

8. In heavy seas, the helmsman will have trouble holding the boat tightly "in the groove" (pointed at the best angle to the wind). Adding a little more twist than might be needed in flat conditions will allow some part of the sail to be at the ideal angle of attack as the heading varies.

9. In bendy fractional rigs, increasing mast bend by tensioning the backstay will increase mainsail twist.

In the illustration to the left, the mainsail has very little twist. In that to the right, it has considerable twist. The bottom of the main-sheet tackle has been hauled to windward with the traveler and the sheet has been eased. The boom makes the same angle with the boat's centerline but the end is higher.



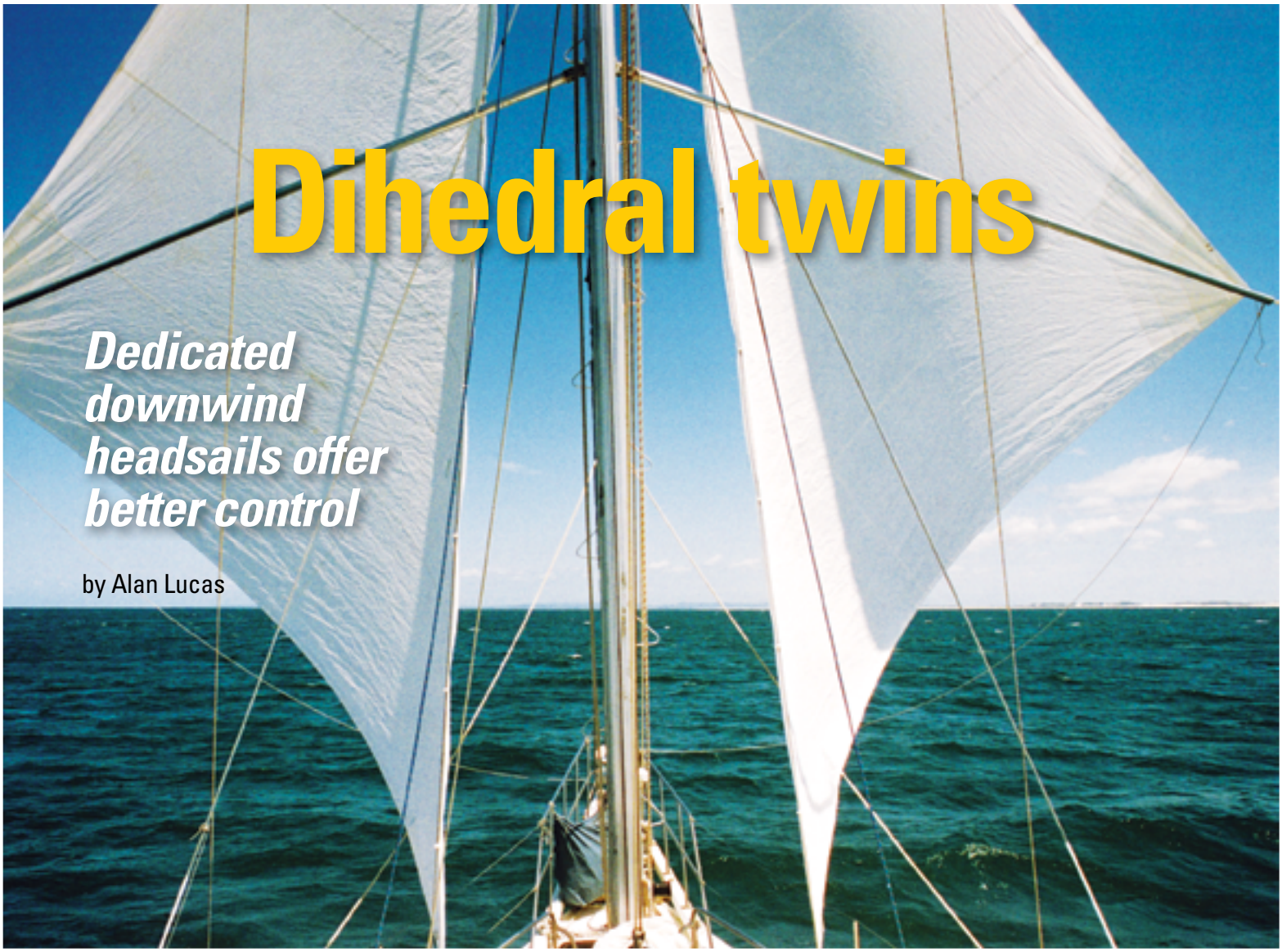
There you have it. Do the twist. If some of this theoretical stuff does not stay with you, remember that in sailing, as in so many other pursuits, good skilled people often know what to do and when to do it without actually knowing *why*. That's OK. You can have a very happy life without understanding this stuff.

Jerry Powlas first tasted the cruising life courtesy of Uncle Sam's Navy. Later he discovered sailboat racing and got into Flying Scots in a big way. He gained a new twist in his life when he met and married Karen Larson, with whom he discovered cruising sailboats. Together, these two founded Good Old Boat *magazine in 1997.*

Dihedral twins

Dedicated downwind headsails offer better control

by Alan Lucas



Soleares **runs under her twin headsails, set from permanent stays. The forward-reaching dihedral-angled sails imitate a gliding bird's wings and produce a powerful natural self-steering moment.**

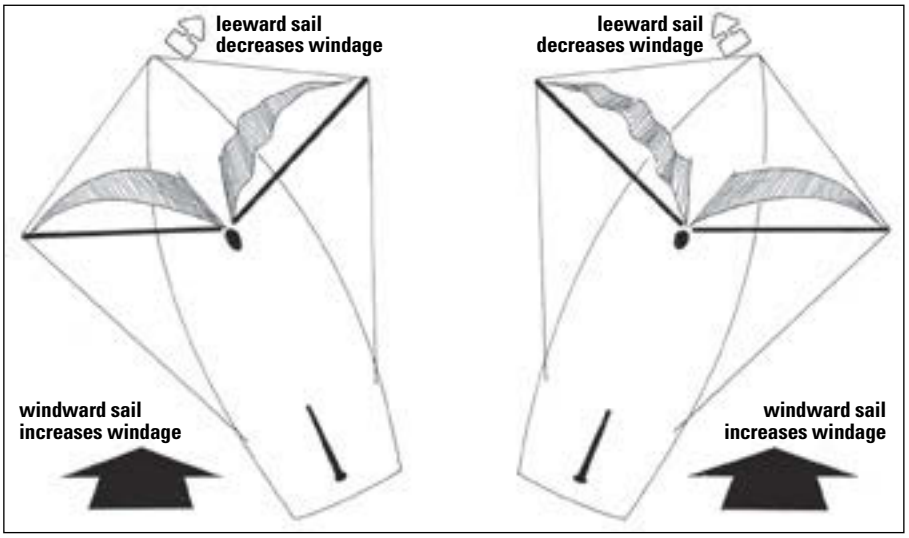
The twin-headsail rig, once commonly seen on boats running in the trade winds, has become a dinosaur in today's fleet of roller-furled and autopiloted yachts. Even a few hemp-and-tar shellbacks have sacrificed this tried-and-true system on the altar of electronic advantages. But just how advantageous is it to ignore a traditional rig that does not block the view ahead, promises no deadly jibes, will never chafe against leeward rigging, and, into the bargain, produces a natural windvane effect that resists yawing and broaching?

Since the dihedral-angled, twin-headsail rig offers all this, why has it virtually disappeared? Probably because pushbutton sailing is so addictive that we willingly bumble our way downwind with unbalanced fore-and-aft rigs. When designing the rig for *Soleares*, our 50-foot skipjack-based ketch, I took a page out of my less complicated cruising past and committed her to a boom-less, loose-footed, fore-and-aft rig that suited the various angles of reaching but collapsed when running off the wind. To compensate, I added poled-out, dihedral-angled twin headsails for exclusive use before following winds. Having used twins in the past, I was well aware of the extra work involved in setting up a dedicated running rig, but I also knew it to be a wonderfully docile arrangement with all the above-mentioned advantages.

When Patricia and I built *Soleares* in the late 1990s, we had visions of going offshore again, and this colored our thinking. However, our commitment to self-publishing two Australian cruising guides limited us to coastal cruising. This meant that the twins would be used for daysailing only, a task for which they were never intended. Yet now, 10 years later, we still willingly go through the ritual of swapping rigs according to wind and course and find the effort well worthwhile.

A system for setting

We so love our twin headsails that we never begrudge them the 10 minutes it takes to set them up, especially as we have developed a system whereby *Soleares* is never completely naked during the changeover. As we pay off to run square — just prior to the boom-less sails collapsing and being progressively dropped — we hoist the leeward twin under the lee of the fisherman. Then we drop the fisherman and hoist the opposite twin. The reduction in speed during the changeover is irrelevant to non-racers and, once set and filling, the twins more than compensate with their friendly, peaceful habits.



The self-steering dynamics of the dihedral-angled, twin-headsail rig is shown here: unlike any other downwind rig, the moment one of the twins becomes a windward sail, as the vessel tries to broach, it increases pressure and drives the bow downwind. The leeward twin is sympathetic in the way it loses pressure with equal rapidity.

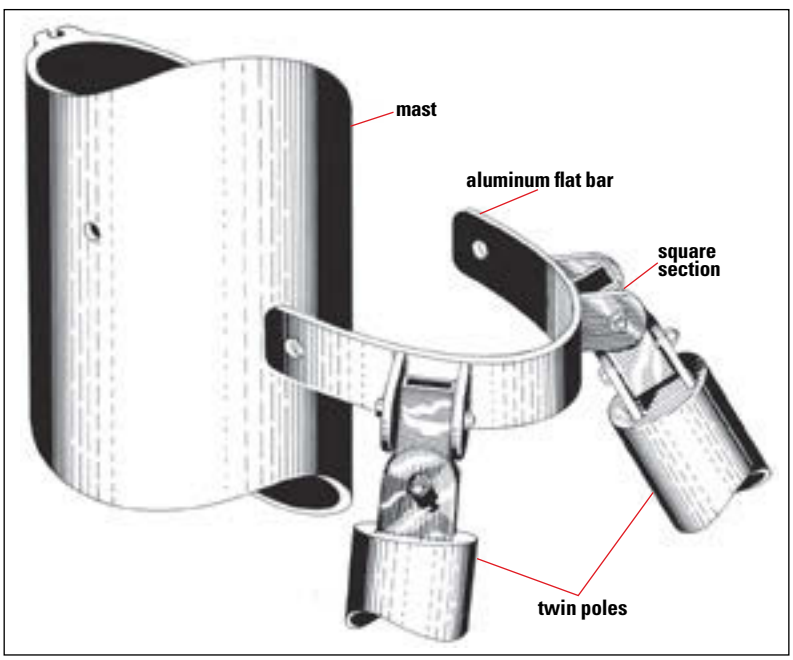
Contrary to popular assumption, the modern Bermudan rig is not well-balanced when squared away because a boomed mainsail sheeted right out easily overpowers a poled-out headsail set on the opposite side, producing a broaching moment. A boomed mainsail readily reacts to poor helming with an accidental jibe, with the possible consequences of rig and sail damage and injury to crewmembers. Preventers and vangs offset this tendency but they can let you down when least expected.

An erroneous term

The popular term "wing-and-wing sailing" is erroneously applied to a Bermudan rig running off the wind; a bird that badly balanced would never take off or, if it did, would glide like a brick.

Wing-and-wing should apply exclusively to dihedral-angled twins because they are truly balanced in the way their clews reach forward of their luffs and their entire sail area is forward of the mast, guaranteeing that the center of effort is ahead of the center of lateral resistance. This configuration ensures that a vessel trying to round up has to fight hard against strong natural correcting factors.

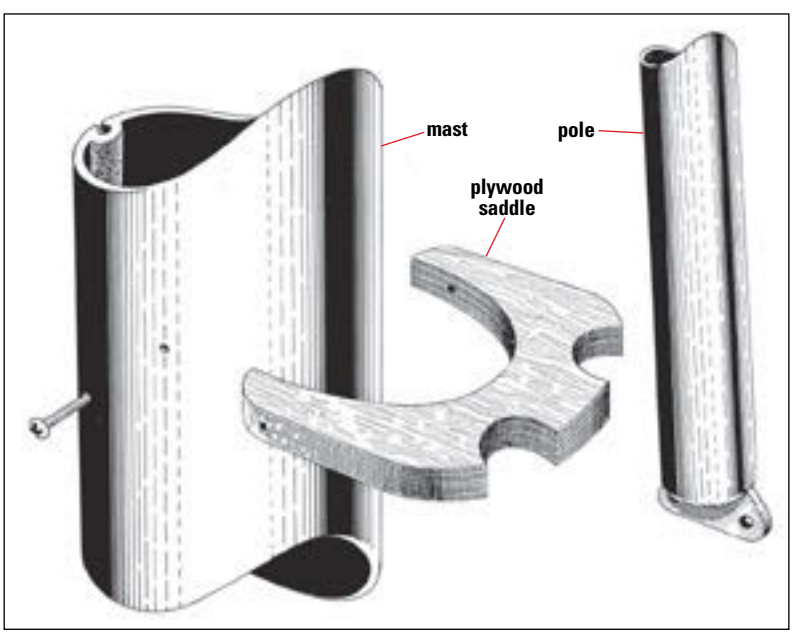
If rounding up starts to occur, the windward twin immediately experiences increased pressure while the leeward twin loses pressure and the rapid imbalance of forces brings the vessel back on course. Despite these constantly active dynamics, the course remains remarkably true with very little wandering or dependence on extreme rudder angles for correction. Indeed, the course can be so true and strong that the greatest single danger dihedral twins pose is their resistance to sudden course changes in the face of imminent collision.



Permanently hung poles

Whether employed as a long-distance ocean-crossing rig or just for daylong coastal cruising, the rig needs to be easy to set and handle, making the permanent hanging of the two poles virtually obligatory. Ours are plain aluminum pipes, foam-filled and hung from goosenecks welded to aluminum strap bent around and bolted through the mast. When not in use, the lower ends of the two poles are lashed into an easily fabricated plywood saddle that's fixed to the mast with a sealant adhesive and metal threads.

There are two ways to set the poles into their working positions, and boat size will affect the



ILLUSTRATIONS BY ALAN LUCAS

The proper way to rig twin-headsail poles is to have hoists (lifts) for the poles and outhauls for the sails. Fore-and-aft guys are vital to maintain a constant dihedral angle, at left.

Free-setting twins are OK on very small rigs. Otherwise, permanent stays are mandatory, the poles setting behind them and in front of the shrouds. The stays run from the masthead to points forward of and outboard from the mast by about 10 degrees, typically to the sides of a trunk cabin. The inverted "V" gap that results is important for wind flow, at right.

method chosen. One way is to hoist them out on dedicated topping lifts, secure them in position with fore-and-aft guys, then hoist the twins and outhaul their clews to the pole ends; the other is to clip the bottom ends of the poles directly to the twins' clews and let the sails take the poles with them as they are hoisted (sometimes helped by shoving the poles outboard to overcome inertia). Aboard *Soleares* we use the second method, but lifts and outhauls would be necessary with big rigs.

Dedicated stays

Dihedral-angled twin headsails are best set on dedicated stays to prevent the sails from blowing off when being hoisted or handed in blustery conditions. Because it's a downwind rig, always decreasing its apparent wind, the stays can be around two-thirds the diameter of normal stays with the poles passing between them and the shrouds in their working positions. In this position the poles are held firm at an angle that will keep the sails' clews forward of their luffs. This is the opposite of normal poled-out headsails whose clews reach aft of their tacks at anhedral angles.

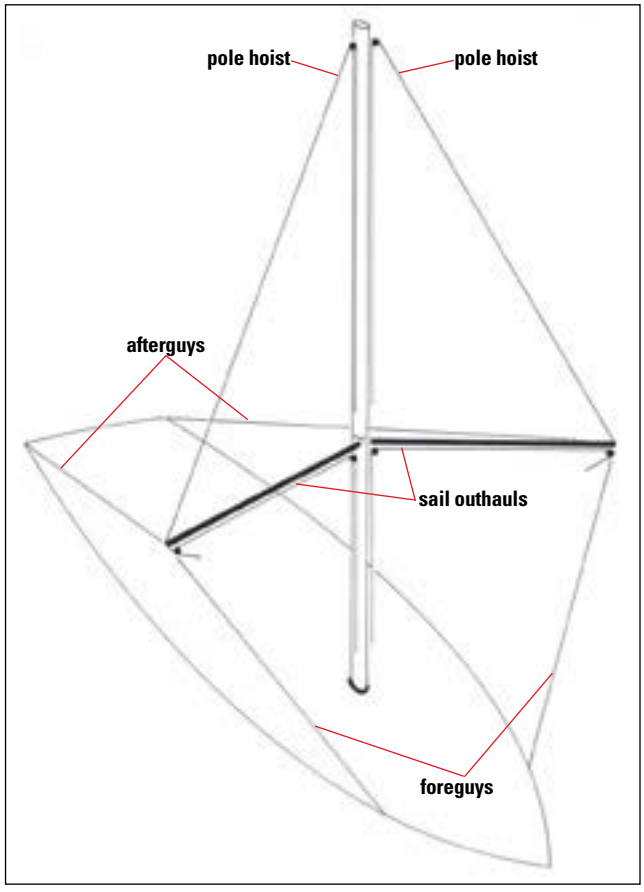
Twin-headsail stays should run from the masthead to points on deck about 10 degrees from the vertical, forward of and out from the mast. This keeps the sails' tacks well apart. The resulting inverted "V" gap between luffs increases their leverage over the ship's centerline and vents wind that may otherwise encourage rolling.

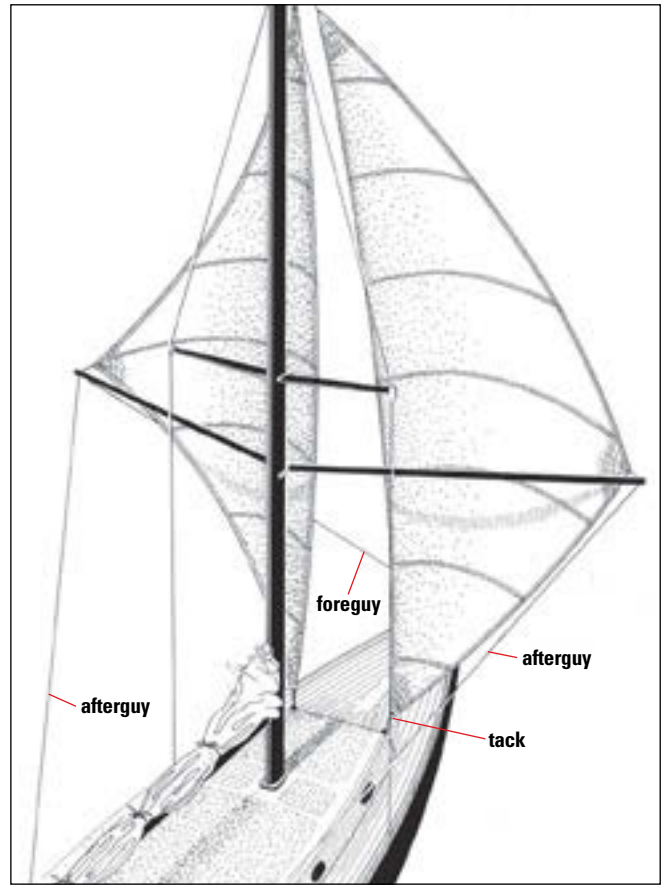
To digress a moment, it should be noted that some modern sailors deploy their sails from double-tracked roller-furling gear set on a single dedicated stay — rather like a jackstay — close in front of the mast. They say the absence of air space between the sails makes no behavioral difference. They argue that having both sails roll out from a common stay makes them child's play to handle and much easier to reef.

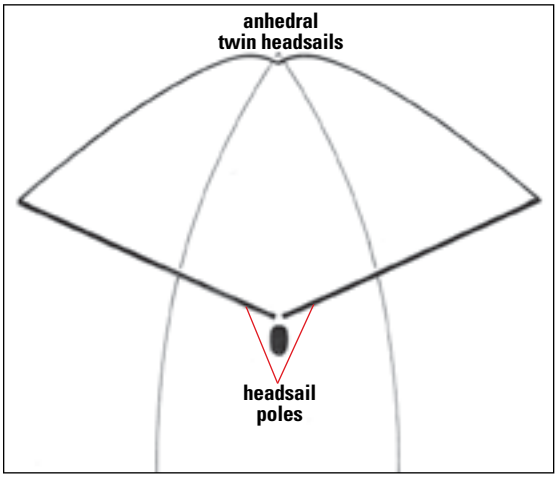
A more common method is to deploy the above-noted roller-furled twins from the standard stem-head forestay. This allows one twin to be removed whenever the other is needed for conventional reaching as a number-two jib. Such versatility is a powerful argument in favor of this variation. However, when running downwind, these twins are obliged to form anhedral angles that are detrimental to self-steering qualities (although superior to mainsail and poled-out genoa). If this rig wanders off course, pressure in the windward sail reduces while the leeward sail increases and thus denies the immediate windvane effect of the dihedral rig.

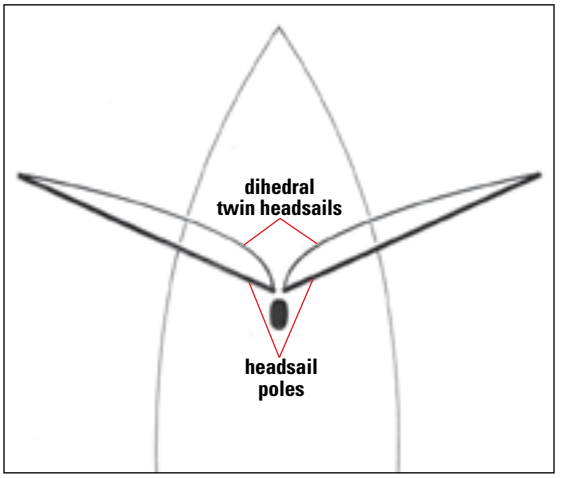
Dihedral is superior

According to Frederic Fenger, who published his experiments with dihedral twins on model yachts in 1932, it is vital that the dihedral angle be 23 degrees to the athwartships plane. I have followed this









The anhedral twin-headsail configuration, at far left, is commonly set from double-track roller furling on a single forestay. It is convenient to use but deficient in self-steering qualities. The dihedral sails, at left, set at angles of about 23 degrees forward of the beam and constitute by far the best-balanced and most powerful self-steering rig.

advice on most of my twin rigs over the decades but I confess to never actually measuring the angle, being quite satisfied with guesstimates. There is, however, one thing I can state with certainty: the dihedral angle beats the pants off the anhedral angle for its vastly superior natural self-steering influence and docility under way.

Because dihedral-angled twins produce a natural windvane effect, some vessels will steer themselves for days on end while requiring no attention from helmsman or autopilot once their rudders are locked amidships. Aboard *Soleares*, we leave the autopilot on and are content in the way its workload is reduced to the level of occasional murmurs rather than constant groans. Yes, changing from one rig to another on a daily basis is inconvenient compared to easing a Bermudan rig's mainsheet and poling out its jib, but the results are so superior that we wouldn't have it any other way.

Alan Lucas, an Australian from New South Wales, has been cruising for 50 years, primarily south of the equator. He's authored several Australian cruising guides.

As *Soleares* sails on a broad reach with most of her boom-less fore-and-aft sails filling, a windward twin is visible between the mizzen staysail and the fisherman. Alan says using just one twin to weather like this complements the rig as a whole when quartering, and was a bonus discovery.

Make your own

Mainsail control for less than $100

by Joe Orinko

The previous owner of our Catalina 30 had installed lazy-jacks to handle the fully-battened mainsail. The system was rigged so the lazy-jacks were always set up and the owner even had slots cut in the mainsail cover to accommodate them.

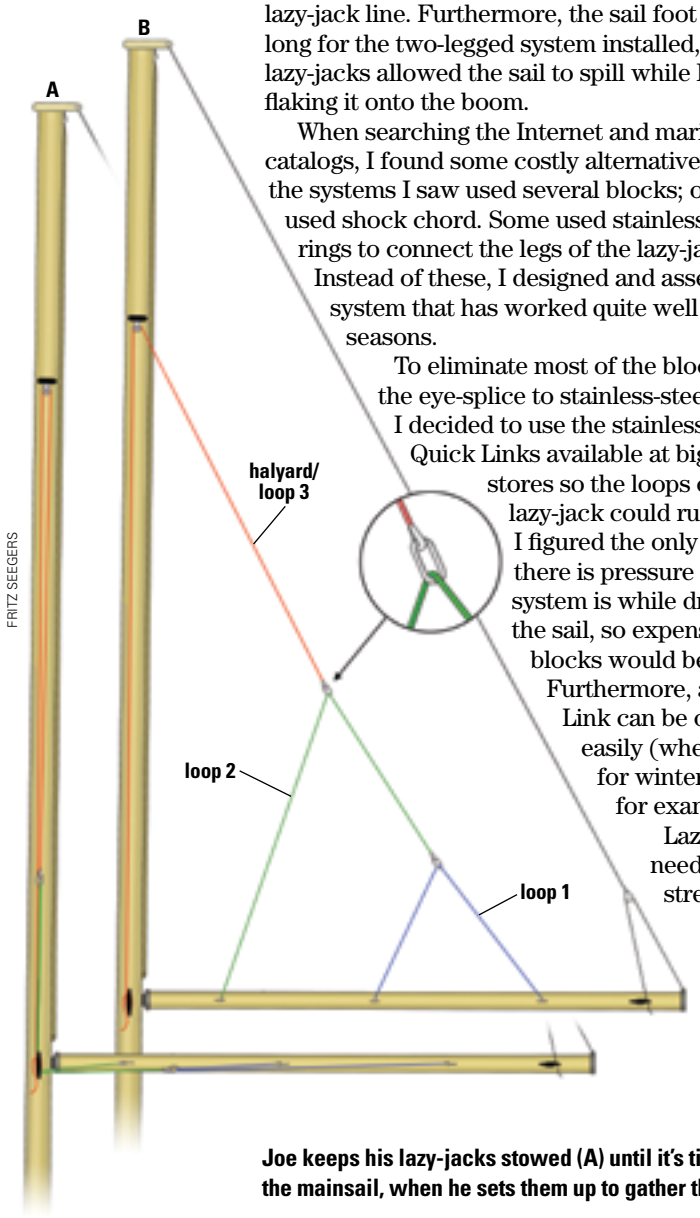
We tried to use the system for a couple of seasons. When raising the sail, a batten would get caught about a third of the time and, sometimes, when we were lowering the sail, it snagged the lazy-jack line. Furthermore, the sail foot was too long for the two-legged system installed, so the lazy-jacks allowed the sail to spill while I was flaking it onto the boom.

When searching the Internet and marine-supply catalogs, I found some costly alternatives. Most of the systems I saw used several blocks; one even used shock chord. Some used stainless-steel rings to connect the legs of the lazy-jack. Instead of these, I designed and assembled a system that has worked quite well for three seasons.

To eliminate most of the blocks or the eye-splice to stainless-steel rings, I decided to use the stainless-steel Quick Links available at big-box stores so the loops of the lazy-jack could run free. I figured the only time there is pressure on the system is while dropping the sail, so expensive blocks would be overkill. Furthermore, a Quick Link can be opened easily (when it's time for winter storage, for example).

Lazy-jacks need little strength, so I used an inexpensive ¼-inch double-braid. My initial sketch showed 100 feet of line but, as assembling it required 10 eye-splices, I ordered 120 feet of double-braid. I cut it into six segments (three on each side). Then I made splices in one end of each halyard and in both ends of the four secondary loops. The loop-end eyes are connected to the boom with stainless-steel eye-straps.

On the underside of each spreader, about 12 inches out from the mast, I fastened a small stainless-steel eye-strap to suspend a block. I fitted six more small stainless-steel eye-straps to the boom, three each side, to hold the spliced eyes in the ends of the lazy-jack lines. To mount the eye-straps, I drilled and tapped holes for #10-32 stainless-steel machine screws, because that was the smallest tap I had. I used blue liquid Loctite on the threads.



FRITZ SEEGERS

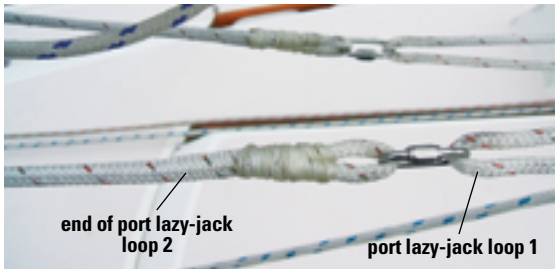
Joe keeps his lazy-jacks stowed (A) until it's time to drop the mainsail, when he sets them up to gather the sail (B).

Measurements

The dimensions I used are for a tall-rig Catalina 30. But the design is triangular and proportional to two measurements: the mainsail foot dimension and the boom-to-spreader measurement, as shown in the table below.

The actual final positioning of the connection points has to be adjusted around fittings already installed on the boom, such as reefing gear, bails, and cleats.

Dimensions	
Loop size, where H is the height from boom to spreader	
loop 1 (aftmost)	53% H
loop 2	60% H
loop 3	164% H
Boom positions for loop attachments, where E is the length of the foot of the sail	
Boom position 1 (aft from mast)	20% E
Boom position 2	50% E
Boom position 3	80% E



lazy-jacks

The loop lengths are proportional to the distance from the top edge of the boom to the spreader. For my Catalina 30, this distance is 18 feet. (This distance could be measured with a length of line attached to the main halyard.) The loops are 9.5 feet and 10.75 feet, and the lazy-jack halyard is 29.5 feet.

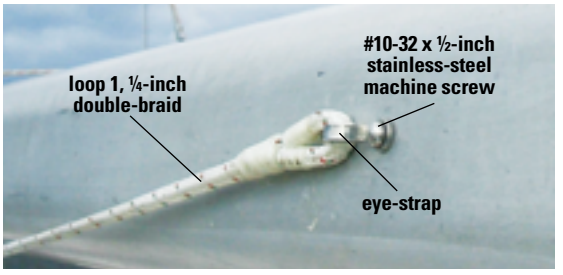
Retracted position

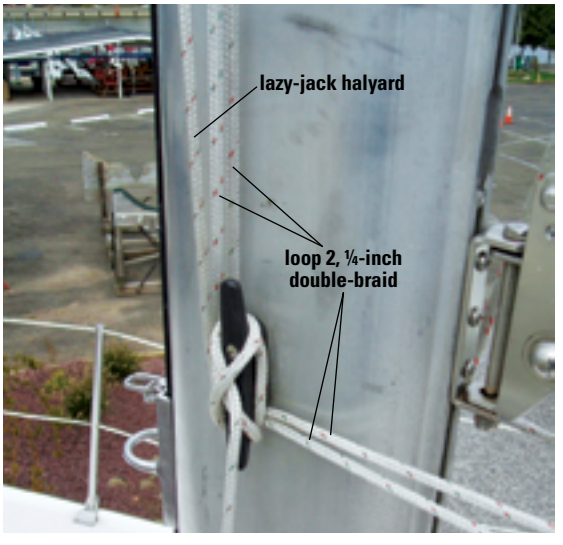
At the dock, with the sail flaked and held by sail ties, I retract the lazy-jacks. On each side, I gather the loops, pull them forward, and loop them around a cleat on the mast. I use the original halyard cleats for this since we now have internal halyards led aft to the cockpit. When looped under the cleat in this way, and with the lazy-jack halyard snugged, most of the lazy-jack is positioned below the boom.

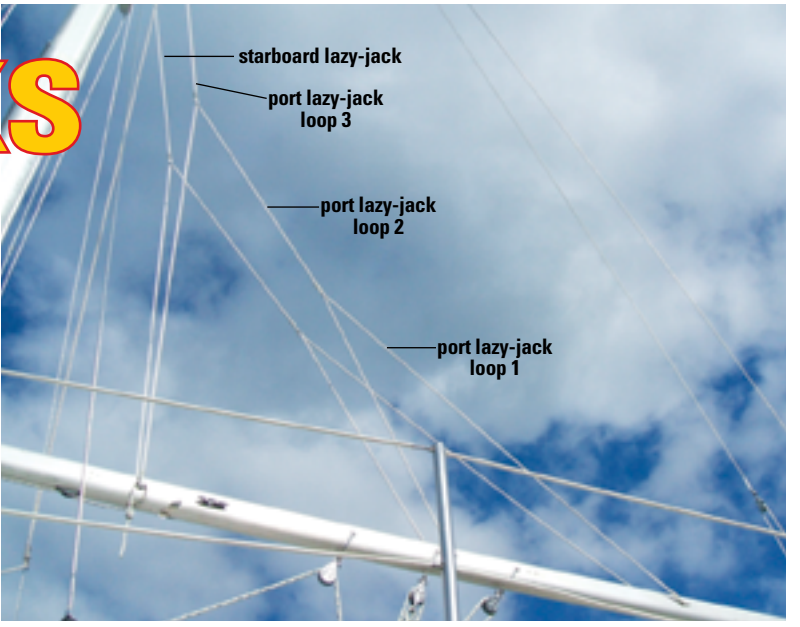
With the lazy-jacks stored in this position, the mainsail cover needs no modifications. With the mainsail cover in place, only the lazy-jack halyard along the mast is visible.

Deployed position

When we're preparing to sail, we remove the sail cover and sail ties. We leave the lazy-jacks in the retracted position when we raise the sail and while we're sailing.







When it's time to lower the sail, we release the lazy-jacks from under the mast cleat, raise them to the deployed position, and cleat them off. We can then drop the mainsail in the normal way. We flake the sail on the boom and secure it with sail ties. Once we're finished, we pull the lazy-jacks back to the retracted position.

In fresh wind conditions, the lazy-jacks can be left deployed while sailing. The smooth line and Quick Links pose no serious threat of abrasion. In this deployed position, the lazy-jacks are ready when we want to reef or lower the mainsail.

Enjoyable project

Making the 10 eye-splices was a satisfying off-season project. I use a New England Ropes Unifid. If you don't like this sort of project, perhaps you can persuade an amenable sailor, a Boy Scout, or a local rigging shop to do it for you.

Our lazy-jacks work pretty well for us. When needed, they do their job. When retracted (such as when we're sailing or when the mainsail is covered), they are invisible.

Joe Orinko has sailed the waters of Presque Isle Bay and Lake Erie for more than 25 years, 20 of them in his O'Day 23, Unicorn, *and for seven seasons on his second* Unicorn, *a Catalina 30.*

Each loop of the lazy-jack runs through a Quick Link supported by the loop forward of it, at bottom of facing page. These let the loops self adjust when the lazy-jacks are deployed, above. The lazy-jacks attach to the boom with spliced loops in eye-straps, top at left. To retract the lazy-jacks, Joe tucks them under mast cleats and takes up on the halyards, bottom at left.

Parts and costs (using Spring 2009 prices)

Qty	Unit	Description	Unit Price	Amount	Source
120	ft	¼-inch double-braid Dacron line	$ 0.35	$ 42.00	B
2	ea	Single block (such as Harken 082)	10.84	21.68	A
8	ea	Eye-strap	0.82	6.56	C
17	ea	#10-32 x ½-inch s/s machine screw	0.29	4.93	Local
4	ea	⅛-inch x 1¼ -inch s/s Quick Link	1.58	6.32	C
		Total		**$ 81.49**	

Source codes: A – West Marine, www.westmarine.com;
B – Defender Industries, www.defender.com; C – Bosun Supplies, www.bosunsupplies.com

Pitch the pole

Fly and douse a standard spinnaker like a gennaker

by Lewis Keizer

People are selling their little-used symmetrical spinnakers and replacing them with expensive cruising gennakers that can be handled without poles, hoisting and dousing them with a snuffer sock. They don't realize that symmetricals can be used the same way. As a result, inexpensive used symmetrical spinnakers are available from online sources like Second Wind Sails and Atlantic Sail Traders. For example, a good secondhand spinnaker for my 1980 C&C 34 would cost about $350.

I inherited a barely used spinnaker with poles and rigging when I bought my boat, but managing the complex pole setup singlehanded was out of the question. I thought that meant the spinnaker would sit unused in my sail locker until Kame Richards, local sailing guru and founder of Pineapple Sails, referred me to an article on his firm's website entitled "Look Ma, No Pole!" Photos showed a husband and wife sailing up and down the California coast in their Ericson 38 using an old tri-radial spinnaker and an ATN Tacker hooked over their roller-furled headsail.

For a few hundred dollars, I bought an ATN Tacker and a Spinnaker Sleeve (ATN's name for its sock). The only problem I faced was installing my spinnaker into the sock, but I didn't spend money at a sail loft having it professionally set up. I did it myself one windless morning. Here's how you can do the same:

- Find an area of lawn the length of your sock. Secure the head of the sock to something strong and stretch the sock out full length.
- Reach through the scoop at the foot of the sock and, as you walk toward the head, gather the sock over your arm. As you delve farther into the sock, pull out more of the control line that raises the scoop and collapses the sock like an accordion. When you finally reach the top fitting, place the collapsed sock on the ground with the fitting exposed. This is where you will shackle the head of the spinnaker.
- Spread out and flatten the spinnaker. Any puff of wind can hinder this process; it helps to tie the head of the spinnaker to something. Fold the spinnaker once clew to clew then a second time from mid-sail to clews.
- Attach the spinnaker head to its fitting at the top of the sock and make the halyard fitting at the top of the sock fast again.
- Pull the scoop down to capture the spinnaker. Make sure the spinnaker fits through the lines and attachments on the scoop, including the lines that raise and douse the sock. Continue to pull the sock steadily forward while these lines run freely back through their sleeves. When the entire spinnaker has been captured, the clew ends will protrude. Tie them together for now.
- Avoid twisting the spinnaker when it goes into the sock. If it does get twisted, however, the top fitting on socks like the ATN will swivel freely to undo twists when the sock is raised completely.

Resources

ATN
www.atninc.com

Atlantic Sail Traders
www.usedsails.com

National Sail Supply
www.nationalsail.com

North Sail Outlet
www.northsailoutlet.com

Pineapple Sails
www.sailmaker.com

Porpoise Sailing Services
www.porpoisesailing.com

Second Wind Sails
www.secondwindsails.com

For even more related products and services, go to www. goodoldboat.com/resources_for_sailors/suppliers_directory

A borrowed lawn and a calm day provide the ideal setting for socking a spinnaker. Lay out the sock and the spinnaker, concertina the sock, and attach the head of the folded spinnaker inside the head of the sock. Pull the sock ring to enshroud the sail, then stuff the sock into the bag so the head and clews go in last.

- Stuff the sock with the spinnaker inside it into the spinnaker bag. Start about four feet from the scoop end so you can put the scoop, the head, and the clews in last.
- When the bulk of the sock is in the bag, tie the sail's clews and the head of the sock together and lay them in the top of the bag where they'll be readily accessible when it comes time to use the sail.

Dr. Lewis Keizer began sailing in 1980 and is a licensed captain and Vice Commander of Capitola USCG Auxiliary 6-10. He is preparing for a circumnavigation in his C&C 34, beginning this fall with the Baha Haha to Mexico, when he will be using his good old symmetrical spinnaker downwind when conditions are suitable.

An inexpensive whisker pole

Raid the hardware store, not your wallet

by Clarence Jones

When I went shopping for a telescoping whisker pole, I came away with sticker shock. Like a lot of other small cruising sailboats, my 28-foot Catalina doesn't really need a monster pole . . . just a pole to hold the genoa out there when the wind behind us needs a little help. The least-expensive ready-made pole I could find online was about $100. Really *serious* whisker poles, however, can top $4,000. Instead, I made a light-duty whisker pole for about $50 by modifying both ends of a telescoping pole made for a paint roller.

For the outboard end, I fashioned a spike that fits into the genoa's clew cringle to keep the sail extended. On the inboard end, I used a small spinnaker-pole end fitting that snaps onto a mast ring.

The major parts

First, I had to decide how long I wanted the pole to be. It doesn't need to be any longer than the foot of the headsail. Shorter — depending on the boat and the sail — will probably work well. A telescoping pole is always better because it takes half the storage space and can be adjusted to sailing conditions.

Clarence's light-duty, low-cost whisker pole is just the ticket for holding out the genoa when running in light winds.

Choosing a non-telescoping alternative will *really* cut the cost of this project.

If you haven't painted a house lately, you'll be surprised at how much telescoping poles for paint rollers have improved. For this project, most sailors will probably settle on either a 4- to 8-foot or a 6- to 12-foot model.

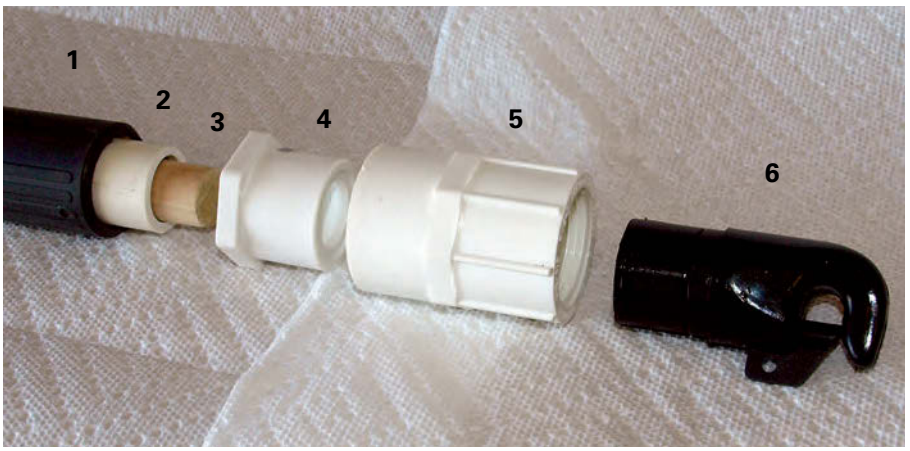
I chose a 4- to 8-foot pole with the larger, handle end of the tubing made of fiberglass. It seemed stronger and lighter than comparable all-aluminum poles. The locking mechanism was easy to twist and appeared to have the muscle it would need to hold the pole at any length it was set to. The pole cost $23 at Home Depot. There were other models for less.

The best selection of hardware I found for fittings for the inboard end of the pole was at Annapolis Performance Sailing. You'll find parts from a number of manufacturers under "hardware/spinnaker poles" and "accessories/spinnaker-pole end fittings" (many fittings for spinnaker and whisker poles are identical). Forespar's Lexan snap-on hook cost $18.

The hook attaches to a ring mounted on the forward side of the mast. The ring set me back $22. You'll need one of these, no matter what the whisker

A spike on the outboard end of the pole, at left top, fits into the clew cringle where the jibsheets are attached. At the inboard end, at left bottom, a standard whisker pole snap-on hook clips onto a ring fitting on the forward side of the mast.

Many boats already have this ring on the mast. If not, the fitting costs about $22.



Some assembly is required for the inboard module of Clarence's whisker pole, above. Once the pieces are assembled, the inboard end begins to look like a functional whisker pole, below.

pole costs. I tapped threads for screws to hold the ring in place. Pop rivets would have been easier but I thought the screws might be a little stronger.

To adapt my painter's pole, I had to assemble two modules, one that would fit to the inboard end and the other to the outboard end.

Inboard module

If you use a different pole-end fitting from the Forespar model I used, you might need a different collection of parts with which to join it to the pole. I used five components to make the inboard module, which then fit into the fiberglass end of the pole. Refer to the numbers on the photo above.

1 Paint-roller extension-pole handle
2 4-inch length of ¾-inch PVC pipe
3 4-inch length of ¾-inch hardwood dowel
4 ¾-inch to 1-inch PVC adapter
5 1-inch PVC barrel connector, slip at one end, threaded at the other
6 Forespar Lexan snap-on fitting, model FP404002 (.9-inch OD)
(***Note:*** *Forespar apparently now sells this fitting only in a kit with a spike for the outboard end. The part number is 300026.* ***–Eds.***)

The dimensions of all of these parts are determined by the inside diameter (ID) of the handle for the pole you select. When I cut away the end of my painting pole's rubber handle, I found the ID of the fiberglass tube was 1 inch. That meant I needed a length of ¾-inch PVC pipe, which has an outside diameter (OD) of about ⅞ inch and would slip into that portion of the pole. Since the fit was not as snug as I'd like, I wrapped the PVC pipe with electrician's tape.

Keep in mind that PVC pipe sizes are designated by ID. This means that 1-inch pipe has an OD of about 1¼ inches, so 1-inch pipe fits very nicely inside 1¼-inch pipe. These are the only two sizes that slip together like this. Fittings for these two pipe sizes can be adapted for most whisker-pole fittings.

The ID of a threaded female PVC fitting is slightly smaller than the ID of a "slip fitting" designed to be installed with glue. As it turned out, my Lexan snap-on fitting was so snug inside the PVC threads it threaded itself into the fitting. I could screw it very tightly into the threaded adapter.

The 4-inch length of ¾-inch hardwood dowel strengthens the assembly and holds it tightly together once all the screws are in place. To make it fit inside the ¾-inch PVC a little more snugly, I wrapped the dowel with electrician's tape.

I used a hammer to drive the PVC pipe into the PVC adapter and then drove that adapter into the barrel connector. You don't need to glue them.

With all the parts assembled, I used ¾-inch #8 stainless-steel screws to hold everything in place. All the screws except those that pierce the Lexan fitting reached the hardwood dowel. I made sure when I drilled into the Lexan fitting that the screws would not interfere with the spring-loaded clip mechanism.

Outboard module

I designed the outboard module to screw onto the male, threaded end of the extension pole. One end of the module contains a female threaded socket that I took from a wooden paint-roller extension I purchased for $4. (This 3-foot wooden extension is in three parts that screw together using two plastic threaded couplers that are female at both ends. If I messed up, I had a spare.)

Resources

Annapolis Performance Sailing
www.apsltd.com

The other end of the module is a spike that slides into the clew grommet of the headsail. Most of the parts are PVC fittings.

The dimensions for the elements of your outboard module will depend on how the male threaded fitting is mounted on your telescoping pole. The male threads on the pole end are designed to fit the female socket on a paint-roller handle. The same size threads are used on poles for brooms and mops.

First, I screwed one of the threaded wooden dowels into one of the female plastic connectors, then screwed that tightly onto my pole. With that in place, I slid a short length of 1-inch PVC pipe about 2 inches down the wooden dowel until it was seated on the end of the telescoping pole.

The next step was to measure the distance from where the PVC pipe seated on the pole to the outer end of the plastic coupler plus ¼ inch. I marked the wooden extension and cut the wood at that point.

The distance from the PVC contact point to the outer end of the plastic coupler, plus ¼-inch, was 2¾ inches, so I cut a piece of 1-inch pipe that length. I tapped the pipe onto the plastic coupler and threaded wooden stub. To make it fit better against my telescoping pole, I used a Dremel tool to taper the inside of the PVC pipe.

If you're doing something similar, you may need to adjust the length of the PVC pipe so it's flush with the wooden stub or so the wooden stub is slightly inside the pipe. You'll find the plastic coupler fits very nicely inside the PVC pipe.

With the wooden stub and coupler screwed tightly onto the pole, the PVC pipe should be firmly seated against the end of your extension pole. If not, tap the pipe or the coupler until it is. Or cut another piece of PVC pipe that's a better fit.

In use, the force should be on the extension pole itself with the PVC pipe pushing against it. The threaded wood and plastic coupler maintain the connection but are not strong enough to handle the compression force when the whisker pole is deployed.

To finish the outboard module, I drilled a ¼-inch hole in the center of a 1-inch PVC pipe cap. I then inserted a 3½-inch, stainless-steel, ¼-inch hex-head machine screw into the cap from the inside. The screw needs to be threaded its entire length. I put a nut on the screw on the outside of the cap and tightened it.

When I tapped the cap onto the PVC pipe, I made sure that the head of the screw was against the wood

Clarence measured from where the PVC pipe seated on the pole to the end of the coupler and added ¼ inch.

Parts list for a telescoping whisker pole

- Telescoping aluminum or fiberglass paint-roller extension pole
- Mast ring (if not already fitted)

Inboard module

- Snap-on inboard spinnaker/whisker pole fitting
- 4-inch length of ¾-inch PVC Schedule 40 pipe
- 4-inch length of ¾-inch hardwood dowel
- ¾- to 1-inch PVC adapter
- 1-inch PVC coupler, slip to threaded
- (4) ¾-inch, #8 stainless-steel sheet-metal screws

Outboard Module

- Wooden paint-roller extension with plastic coupler
- Approx. 3-inch length of 1-inch PVC pipe
- End cap for 1-inch PVC pipe
- (1) ¼-inch threaded hex-head stainless-steel machine screw 3½ inches long
- (1) ¼-inch stainless-steel nut
- 4-inch length of plastic tubing, ¼-inch ID
- (6) ¾-inch, #8 stainless-steel sheet-metal screws

He cut the pipe to that length (2¾ inches) and cut the dowel at the same mark.

The coupler and dowel fit neatly inside the PVC pipe.

The spike is a stainless-steel machine screw, which Clarence covered with plastic tubing to protect the sail.

in the plastic coupler and that the cap was properly seated on the pipe. If you don't get a firm fit, it may be necessary to slightly adjust the length of the PVC pipe.

Next, I put two sheet-metal screws through opposite sides of the cap. These screws must be long enough to go through the PVC pipe and into the wood inside the plastic coupler. I covered the threads of the machine screw with a length of ¼-inch-ID plastic tubing so they wouldn't chafe the sail.

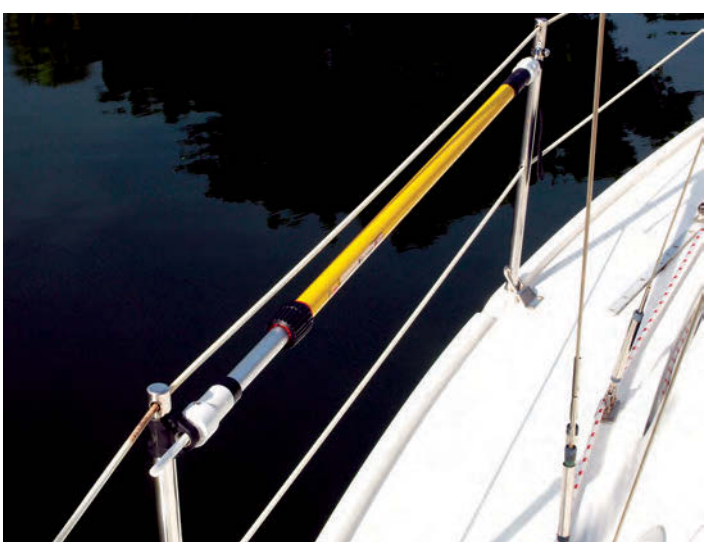
The pole in use

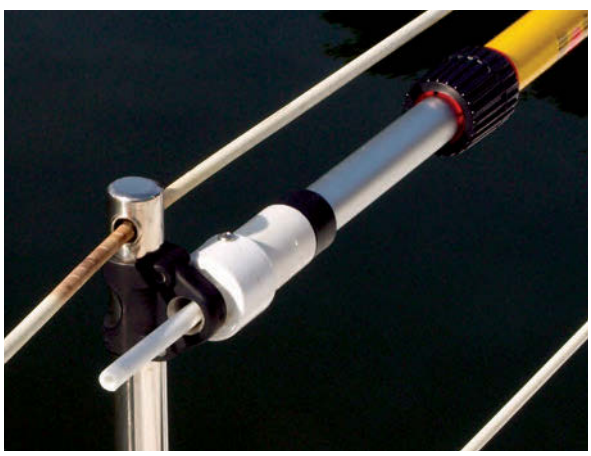
To use the pole, I put the spike through the sail's clew cringle where the jibsheets are attached. With the pole's telescoping friction loose, I clip the inboard end to the mast ring. I extend the pole to the desired length, tighten the telescoping lock, then adjust the jibsheet.

The outboard end of the pole could be designed with another snap hook, but I've found the spike to be easier to connect and disconnect.

I stow my pole on deck between two stanchions. It's easy to get to when needed. The outboard spike end goes into a line eye made to attach to a stanchion. The inboard fitting snaps onto a stainless-steel anchor shackle attached to the stanchion with a stainless-steel hose clamp.

Clarence Jones is a writer, news-media consultant, photographer, sailor, tinkerer, and inventor. He and his wife, Ellen, live and work on and sail their Catalina 28 from Anna Maria Island at the entrance to Tampa Bay. Part of the joy of sailing for Clarence is creating and building inexpensive enhancements for his boat.





Clarence stows the whisker pole between two stanchions. The spike fits in an eye on one and the snap clips into a shackle strapped to the other.

Tight and tidy tails

Tame reefing lines with neatly hitched coils

BY ED ZACKO

Mainsail reefing systems vary in detail but have one problem in common: what to do with the excess lines from the reef-clew outhauls.

We have three sets of reef points on *Entr'acte*. The clew outhaul lines are quite long: 12 feet for the first reef, 18 for the second, and 24 for the deep reef. Under full sail, these lines are not a problem but, as the first reef goes in and the clew is hauled out and cleated, three long tails must be coiled and stowed. Not only must that first reef outhaul be adjusted, but the slack must be taken out of the other two outhauls and their excess line stowed as well. That's a lot of spaghetti!

Over the years, I've seen and tried various coiling methods but found them all wanting. While the lines were out of the way, they were either not secure, too secure, not neat and shipshape, or a chore to readjust. What's worse, they always seemed to tangle when I needed to readjust them or shake out a reef.

After much trial and error, I happened upon what I consider to be a nifty way of dealing with this problem. I don't lay claim to inventing this system. It evolved over time and I'm certain a thorough search will discover it in some lexicon somewhere. I believe I managed to somehow reinvent a wheel.

Three reefs in the mainsail means three clew outhauls, above. Under a full mainsail, the outhaul tails are short, but once the first reef is tied in, the tails of all three need to be coiled and securely stowed, below.

My criteria for a good line stowage technique are that it must be simple, fast, secure, neat and, most important, easy to undo without creating tangles.

The keys to making this work smoothly are to have reefing cleats large enough to handle the loop and extra wraps and to practice until you are able to correctly judge how large to make each coil and the amount of tail you need.

The coils certainly *look* shipshape, but the beauty is in the undoing. Remember the old adage about "one hand for the ship, one hand for yourself." While making and belaying the coils, I steady myself by holding the line close to the cleat. Releasing the coil is a one-handed operation, regardless of conditions or light — I don't even need to look at it anymore. Holding onto the boom with one hand, in one motion of my other thumb I release the belaying loop and unwrap the loop from the cleat. The coil just falls apart and drops onto the deck.

Voilà! My reefing lines are ready to be adjusted and re-coiled.

Ed Zacko *the drummer met violinist Ellen while playing in the orchestra of a Broadway musical. They built their Nor'Sea 27,* Entr'acte, *from a bare hull and since 1980 have sailed thousands of miles on both sides of the Atlantic and in the Pacific. Follow their voyage at www.enezacko.com.*

Step 1: Haul the reef outhaul taut and cleat it. Coil the line clockwise, making small loops, and leave a long tail.
Step 2: Take one wrap around the coil with the tail and make a loop in the tail.
Step 3: Pass the loop through the coil above the wrap.
Step 4: Hang the loop over the cleat.
Step 5: Pull the tail to cinch the coil tight against the cleat.
Step 6: Hook the tail around the aft ear of the cleat.
Step 7: Cross the tail over the front of the coil and belay it to the forward ear of the cleat.
Step 8: To release the line, undo it from the cleat. The coil will fall apart and the line will run free as needed.

Why sails fail

We had just crossed the equator northbound on passage from the Solomon Islands to Micronesia when we saw a squall approaching from the east. We studied the squall's profile on radar and decided it was typical of what we had already endured a dozen times over the last few days and also that it would likely pass behind us. Our mainsail was already deeply reefed, so we rolled in about half of the genoa, closed the companionway, and waited.

In an instant, the wind direction shifted dramatically and the squall was upon us, bringing deafening wind, blinding rain, and sea spray. *Carina* heeled over, came up, and rocketed into the darkness with her port side deck immersed to the portlights as waves rushed aboard. When Leslie released the sheets, the mainsail and boom fell violently against the leeward running backstay. *Carina* still heeled dangerously while Leslie cranked furiously on the furling line as sails and lines flogged violently in the gale. By the time things were under control, the squall had moved on and we were flopping around in steep square waves, soaked and exhausted. Trade winds filled in behind the squall as if in slow motion and, as we prepared to get under way once again, we noticed *Carina*'s mainsail had lost a batten and its aging leech was rapidly unraveling. Suddenly we were facing a journey of hundreds of ocean miles sailing to windward without a mainsail.

This was just one more lesson for us in how the very nature of sailing is hard on boats and their gear, and especially on sails.

The materials used to make modern cruising sails are all plastics, and plastics are polymers, meaning they are composed of small organic molecules (monomers) chemically bonded together to form very large, very strong molecules. If the bonds are broken, the polymers break down and the materials fall apart. (The monomers, and hence their polymers, are called organic chemicals because they contain carbon.)

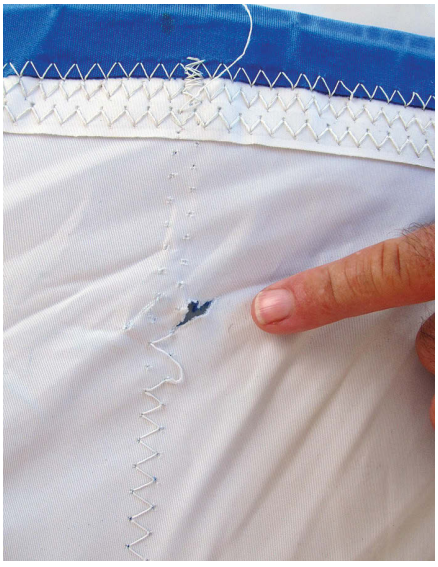
Dacron, used to make sailcloth, thread, and webbing is a polyester. Nylon, used for webbing and light-air sails, is a polyamide. Spectra is an ultra-high-molecular-weight polyethylene. Sunbrella, a solution-dyed acrylic fabric, is a polyacrylate. Damage to these organic polymers can occur from physical, chemical, radiation, and biological sources.

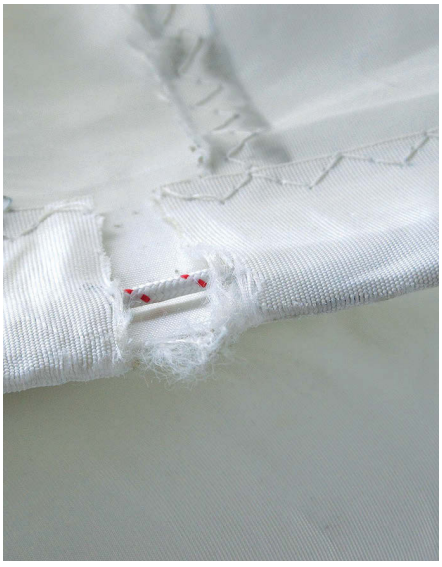
Physical damage

Physical damage occurs when sails slat against wire rope rigging in light wind or are tacked across standing rigging. They can chafe against lifelines and bow pulpits. They can collapse and then suddenly fill with a gust of wind. Sails may be allowed to flog or flutter along their edges.

In heavy winds, leech flutter, however minor, will rapidly turn a sail's edge into confetti. Once a leech tape is compromised, the leech line is exposed and can become snagged on rigging. When this happens, the leech tape will rip open end-to-end.

Chafe or the abrading of the sailcloth, stitching, or webbing can occur wherever a headsail contacts a part of the boat such as spreaders, pulpit, or





Sailcovers are intended to protect sails from the ultraviolet light in sunshine. This one, top of page, is not being allowed to do its job. Sails suffer physical damage from many causes, above left, center, and upper right. If not repaired promptly it only gets worse, above right.

Nature and lack of nurture take their toll

BY LESLIE LINKKILA AND PHILIP DINUOVO

shrouds. Lazy-jacks, with or without a stackpack-type sailcover, cause mainsail chafe. A better alternative are lazy-jacks that stow away alongside the mast and boom, such as EZ-Jax. Chafe also occurs where a sail is attached to the vessel — at the hoist and tack shackles — and at the clew where constant movement of sheets can chafe the sailcloth and unprotected webbing.

Chemical damage

Chemical damage can occur when degrading hardware leaves a residue that stains and attacks fabric by breaking down the polymer molecules. Hanks and pressed-in rings are common culprits.

Despite the aesthetics, we prefer to not attempt to remove stains if the method necessary to do so is harsh and might further damage the cloth. We prefer to remove the contaminating element, wash the area with warm soapy water, rinse it thoroughly, and let it dry. If the sailcloth has actually been breached by the chemicals in the stain, we repair it by applying a patch.

One of the more visible causes of chemical damage to sails is rust, which might arise from stowing a wet sail, upper image, or from corrosion of sail hardware, above.

Radiation damage

Exposure to ultraviolet radiation is the cause of the greatest damage we have seen while repairing cruising sails. Sails are exposed to UV while in use, but many headsails also are vulnerable to UV damage when furled. The same is true for mainsails. Stackpack covers have become popular and it's common to see a mainsail sitting for days in a sailcover of this type that has not been properly closed and secured. In short, if you want your sail to last, no key load-bearing webbing, stitching, or any amount of Dacron sailcloth of a sail should see the light of day when the sail is not in use.

Most sails are protected from UV radiation using shade cloth. Sunbrella is the most widely used, though there are others, such as Solacryl. Darker colors provide better UV protection than light colors because the dyes used to make them absorb light. Darker-colored shade cloth lasts longer too.

Sunbrella has two disadvantages as a shade material: weight and poor abrasion resistance. For working jibs and genoas on a cruising sailboat, the weight is generally not a problem, though many opt for UV-coated Dacron which, in our experience, does not last as long or protect the sail as well as dark shade cloth. The bottom line: dark-colored shade cloth such as Sunbrella provides the best protection from UV for cruising sails.

Along the exposed foot and leech edges of a furling genoa or staysail, light can sneak in while a sail is furled, so whatever UV-protective material is used should wrap around the inside of the foot and leech to the full width of the sail tape (approximately 1½ to 2 inches for sails on the average cruising yacht).

At headsail corners, there are two issues: light leakage (as with edges) and webbing damage. Light leakage can be mitigated by incorporating a patch of UV-protective material in the inside of a roller-furling sail at all three corners.

Protecting webbing attachment points is even more important. Webbing connections on all corners of a headsail should be protected from exposure to UV radiation. Better sailmakers use tubular polyester webbing inside of tubular Spectra webbing for head and tack corners and then go on to sew a leather cover over this webbing assembly. The clew-corner webbing should also be protected from UV (and chafe) by leather. Thus, all sail corner connections are both UV- and chafe-protected on these better-made sails. This type of protection lasts a long

UV light from the sun is an unrelenting cause of sail damage, degrading everything from stitching, upper image, to the webbing seizings on sail slides, above.

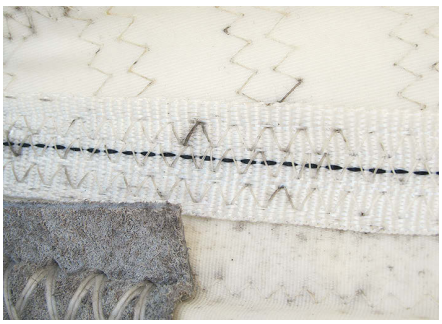
Resources

Canvaswork & Sail Repair
by Don Casey, International Marine, 1996

The Sailmaker's Apprentice
by Emiliano Marino,
International Marine, 2001

The Complete Guide to Sail Care and Repair
by Dan Neri, Beowulf Press, 2002

The Art & Science of Sails: A Guide to Modern Materials, Construction, Aerodynamics, Upkeep, and Use
by Tom Whidden, St. Martin's Press, 1990



Mildew, which often appears as black specks, degrades sailcloth biologically.

time, years in fact, before the leather degrades and must be replaced. In the interim, the load-bearing webbing is protected, retains its strength, and lasts indefinitely.

Biological damage

Creatures such as birds, bats, geckos, cockroaches, mud wasps, and the more insidious microbes can leave biochemical residue that damages sails. Salt crystals and mildew abrade sails, but the growth of mildew also rots sailcloth by breaking down the fabric's polymeric organic molecules. This is, after all, the role of fungus in nature.

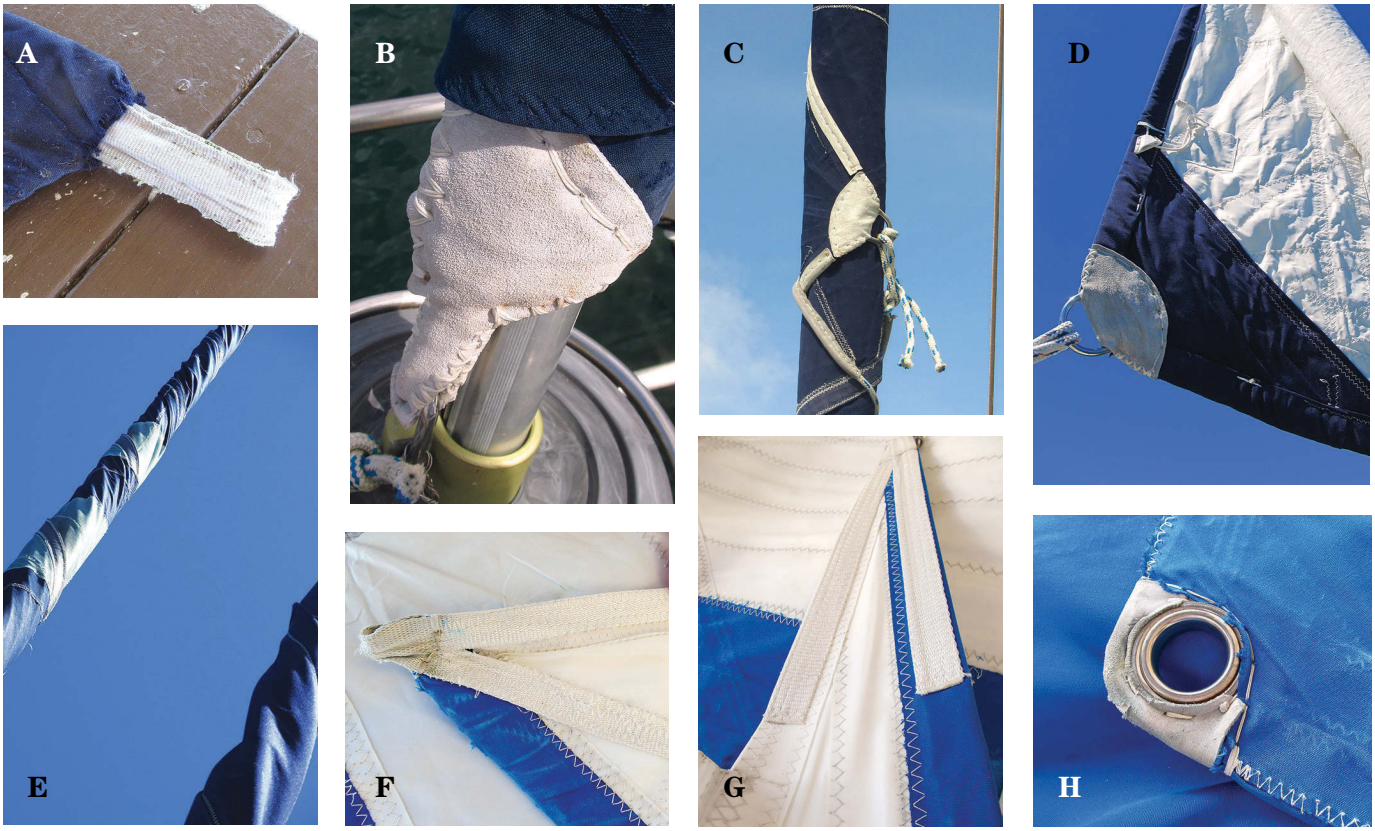
Clean, dry sails will not mildew, whereas sails that are wet or salty (and therefore continuously wet) provide a comfy place for fungus to reproduce. Mildewed sails plague sailors in temperate and tropical climates alike.

New Sunbrella shade cloth sheds water, but this property decreases with age and UV exposure. As Sunbrella ages, it begins to absorb moisture and stay wet longer, promoting the growth of mildew on the sail it is meant to protect. In rainy climates, stack-pack-type mainsail covers left open can trap water and promote the growth of fungus on the wet mainsail.

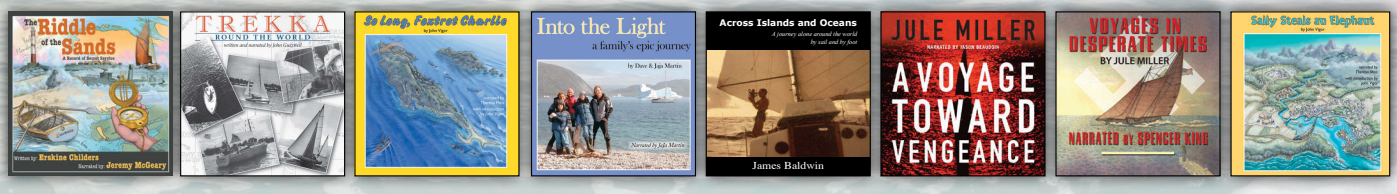
For killing established mildew, there are many recommended cocktails of water, bleach, vinegar, or baking soda followed by sunlight. Proceed with caution when applying any harsh chemical agents to your sailcloth.

Modern sails are made of high-performance plastic materials that are damaged by physical, chemical, radiation, or biological sources. By specifying sail design features when purchasing and by learning how to care for your sails, you can mitigate such damage and keep your sails pulling longer. This is especially important if you plan to cruise to distant shores where there is no sailmaker.

Leslie Linkkila and Philip DiNuovo came to cruising and boat ownership as adults and quickly developed a passion for small-boat travel. In 2003, they quit their professional jobs and left the Pacific Northwest behind to cruise the South Pacific in their Mason 33, Carina. *In April of this year,* Carina *was in the midst of a refit in the Philippines. Catch up with them at http://sv-carina.org.*



A. Layered webbing protects primary load-bearing webbing from UV exposure. B. Covering layered webbing with leather can further protect it from chafe and UV exposure. C. Jib clews take a beating, but leather over the clew webbing and along the adjacent tack and foot offer protection from UV and sheet chafe. D. Shade cloth on the inside of a sail corner further protects the webbing against damaging radiation "leaking" around the edges. E. Patches of extra fabric protect a Sunbrella sun cover from chafe against the spreader and the radome. F. Chafe and UV radiation weaken sail corners. G. In the absence of a protective cover of shade cloth, UV radiation will damage Dacron sailcloth on the inside of the hoist of a roller-furling sail. H. An unreinforced pressed-in clew ring shows deterioration from chafe.



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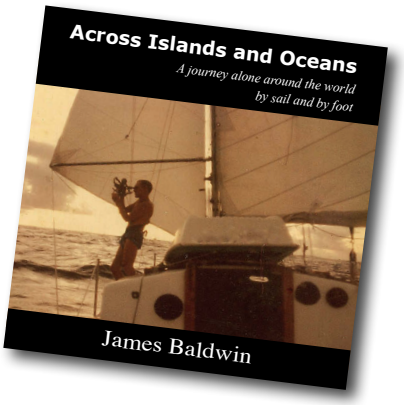

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Rollaway square sail

BY ROGER HUGHES

Downwind sailing with a new-tech nuance

Square sails have been used on sailing vessels for centuries. There is little argument that these sails, when the wind is dead astern or a few points either side, are a very efficient way to propel a boat of any size, even today. Anyone with a Bermudan rig knows how tricky it can be to keep the sails filled and to hold a steady course when running before the wind, especially when a big sea is rolling up astern. It's often necessary to set poles and an assortment of lines to hold the sails out, whether they happen to be a boat's basic plain sails or a spinnaker.

When sailing with poled-out downwind sails, the helmsman must keep a keen eye on the wind and the course to prevent the sails from collapsing and refilling with a crack and the accompanying stress on the sail. Another concern with most of these headsail configurations, especially twin headsails, is that they cannot easily be reefed and, as the wind picks up, someone has to go forward to deal with the situation.

With a square sail correctly braced, there is absolutely none of this. The boat becomes very stable yet the course can vary by as much as 30 to 40 degrees to either side of downwind. There's no concern about jibing or broaching and the helmsman or autopilot will have little difficulty holding to a steady run. The boat will also roll less with a square sail set.

However, there is a significant, almost insurmountable, drawback to having a great flat sheet of canvas hanked on a yard high up a mast — furling and unfurling, not to mention reefing the darned thing! This drawback precludes the use of square sails on all but vessels with large crews, such as sail-training ships that have lots of young people able to scale the ratlines and edge out along a flimsy footrope to secure or release the canvas from the yard. Even if they're harnessed to the yard, it's still a dangerous, not to mention strenuous, operation.

But what if you could easily furl, unfurl, and shorten a square sail from the safety of the deck or even the cockpit . . . without a single person having to go aloft? Now that would bring a completely different perspective to their use on a short-handed sailboat! I had pondered this problem ever since sailing on *Sir Winston Churchill*, the British Sail Training Association's square-rigged schooner, and later on a few other square-riggers. I wanted a system that could be operated from the cockpit of my 45-foot schooner, *Britannia*, that would convert her to a brigantine. Incidentally, a boat doesn't have to be a schooner to carry a square sail. One could be installed on any rig, including a sloop or ketch. But how best to do it?

Not many good choices

I have been on boats with different square sail arrangements. One hauled the sail outward from the mast along the yard on a track like curtain drapes. Another simply hoisted the sail at the outermost ends and in the middle of the yard. Both had a serious drawback in that they could not be reefed. The sails were either up or down, and lowering or brailing them was an on-deck operation, not unlike dropping a large hanked-on genoa on a run.

I considered another method using a regular headsail roller-furling system mounted horizontally in front of a yard. This does allow progressive reefing, but the point loads imposed on the ends of the yard require a heavier spar. In addition, the yard and sail add to the windage aloft and the sail remains exposed at all times.

Sailing downwind driven by her square sail, *Britannia* rules the waves, at top.

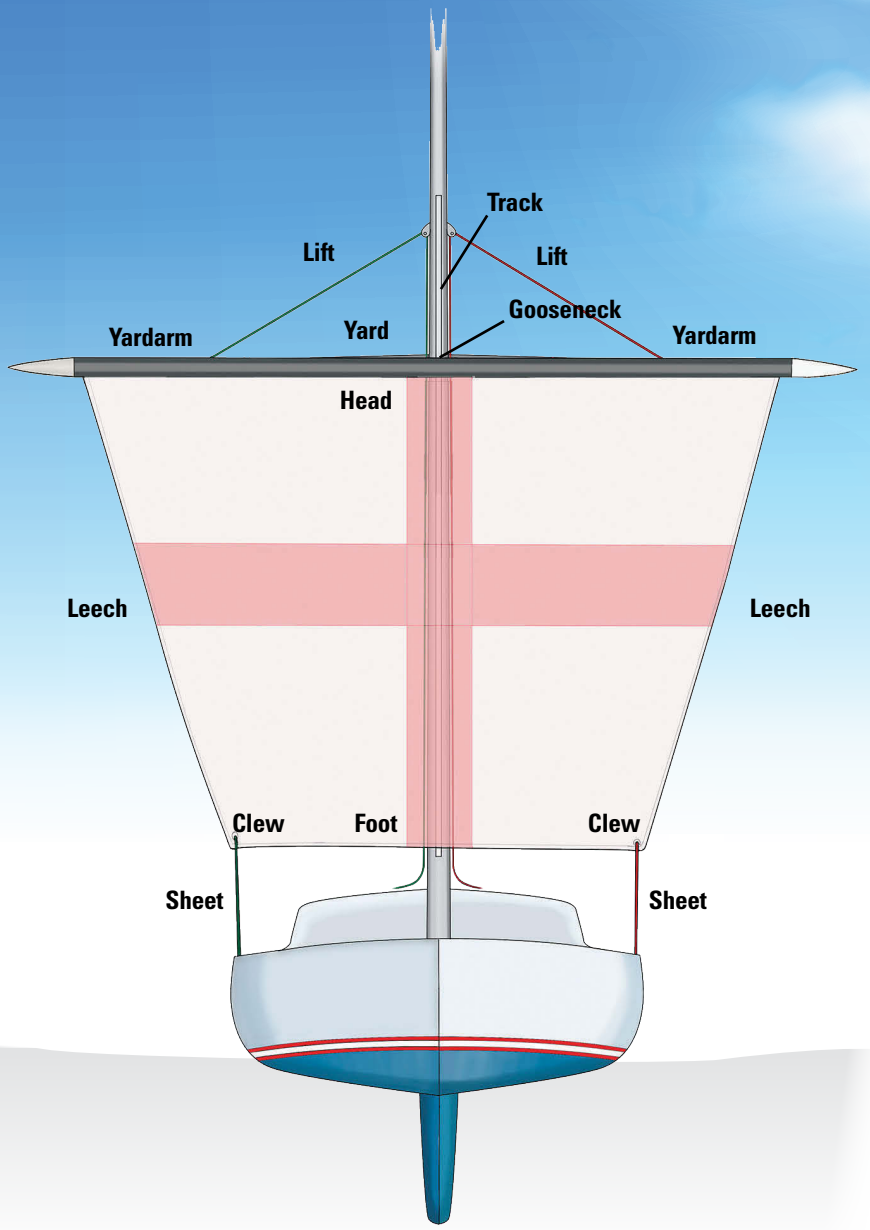


ILLUSTRATION BY FRITZ SEEGERS

- The **yard** is the whole spar.
- The lines leading up from both sides of the yard to the mast are **lifts**.
- The **yardarms** are from the lifts to the ends of the yard, (not the whole yard from the mast out).
- Up the middle of the mast from near the deck is the **track**.
- The yard joins the track at the **gooseneck**, or the old term, **swivel**.
- A halyard up the mast attached to the center of the yard is the **hoist** (not shown on the drawing).
- The **head** is the top of the sail on the yard.
- The two sides are **leeches** (except when close-hauled, when the windward leech becomes the luff).
- The bottom is the **foot**.
- The bottom edges are **clews**.
- **Sheets** come off both clews.

Inspiration dawned from the relatively recent concept of in-boom roller furling. That got me thinking: why not use the same principle, except upside down, to roll a square sail up and down like a blind? Nobody sells such a thing, of course, so I set my mind to designing and making one. My concept might be called "in-yard square sail furling."

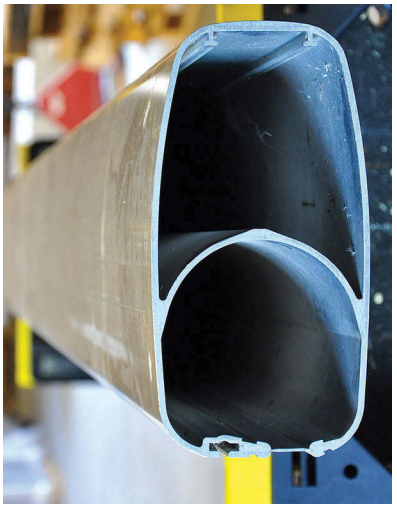
I contacted a number of marine architects and sailmakers, but none could tell me how long the yard should be for my boat nor the stresses on the yard, sail, or indeed the mast. I finished up at the Old Naval Dockyard in Chatham, England, where I found a formula for yards and sails for a British frigate. I don't have a crew of 300 or any cannon, but the formula was all I found to work with.

It took nearly two years and a lot of engineering and experimentation, but now *Britannia* has a beautiful square sail on her foremast. It's called the fore course, being the lowest athwart sail on a ship's mast, in my case the foremast. It has proved to be absolutely fabulous for sailing downwind. All furling and unfurling is done from the cockpit. The sail can be rolled up or down or reefed partway according to the wind strength. When completely furled, it presents little windage and the sail is protected from the elements inside the tubular yard and never gets wet, not even in the heaviest deluge.

First, the yard

In square sail terminology, the complete horizontal spar is the yard, the section outboard of the lifts is the yardarm, and the end of the arm is called the Flemish horse. If you have ever been out there, even in a calm sea, you know why. In heavy weather it is more like riding a wild stallion. However, nobody rides the Flemish horse on my boat nor do I have leech lines, bunt lines, bow lines, clew garnets, or tack lines, all of which are needed to handle a regular square sail. I just have a continuous line marked "sail up" and "sail down."

Before I could begin to build my design the first question was, where to find a strong 22-foot-long aluminum




An in-yard roller-furling square sail is not a stock item at most sailmakers, so Roger had to improvise. He purchased a length of section for in-mast furling, at left, and trimmed it.

tube with a continuous slot? I did all sorts of searching on the Internet, but the answer came one day as I pondered a boat's in-mast furling system. Why not remove the front section of a roller-furling mast extrusion, leaving only the sail stowage tube with its ready-made slot?

Mast extrusions are available in many sizes, but it was also necessary to find out what diameter tube was needed to accommodate the sail when wound up inside. To achieve this I wound a 19-foot strip of sailcloth around the internal mandrel that winds the sail in and out. This resulted in 20 turns of canvas with a diameter of 5 inches.

Mast suppliers sounded surprised, if not a little nervous, when I asked how much they would charge for a mere 22-foot section. These hefty extrusions are normally supplied as masts three and four times that length. Nevertheless, Charleston-Spar, in Charlotte, North Carolina, had the right section at the right price. This suited me perfectly, as I planned to fabricate the yard at my daughter's printing works in Hickory, North Carolina, only 50 miles from Charlotte.

I had plenty of room to maneuver the spar in the factory warehouse, where I first sawed off the entire front using a circular saw with a 60-tooth blade.

I found a local welder to attach lugs to carry lifts, hoist, braces, and fairleads. I also shaped a couple of yard ends out of cedar blocks. They are removable to give access to the mechanisms at each end.

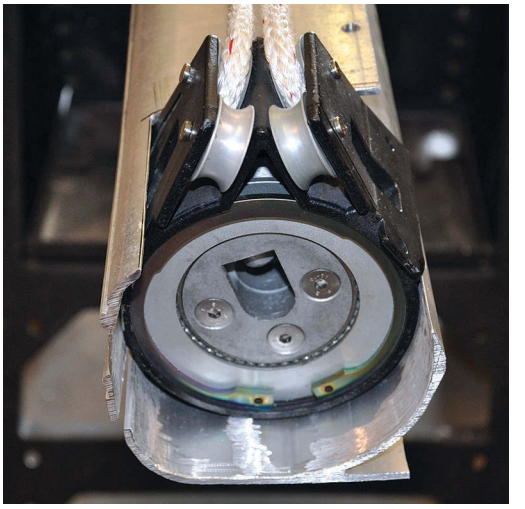
I found a rope winch driver that normally turns the mandrel on a vertical in-mast system. After some grinding, I managed to slide the driver snugly inside the end of the tube so only the furling-line sheaves were exposed. I secured the other end of the mandrel with a large thrust bearing and nut that can be tensioned to reduce sag in the mandrel. Then, suddenly, I had my yard.

A prototype sail

The next essential item in this experiment was a sail. I didn't want to buy an expensive Dacron sail without first knowing if the system worked, so I fashioned one from a cheap plastic sheet and glued the edges. This produced a pretty effective test sail, except that one side was green and the other brown, making *Britannia* look more like the *Son of Town Hall* raft than a modern sailboat.

To prevent bunching at each end as it rolled up inside the yard due to the additional thickness of the leeches, the sail is not cut square. My sail is a trapezium, 20 feet wide at the head but only 14 feet wide at the foot, with a 19-foot drop. When the sail rolls up inside the yard, the leeches barber-pole and don't overlap, so they don't bunch up and there's no risk of jamming.

With my homemade sail rolled round the mandrel and stowed inside the yard, I was itching to test it in some

Roger fashioned yard ends out of cedar blocks and painted them traditional white, at left. They are removable so he can access the rope winch driver, at right, that turns the mandrel inside the yard at one end and the thrust bearing and tension adjuster at the other.

The gooseneck, at left, is a rather intricate affair as it has to allow the yard to rotate in several directions for sailing or stowing in a marina-friendly manner. Roger tested the furling system in his daughter's warehouse, at right, with a sail made from a plastic tarp.

wind. I had my eye on a large wooden telephone pole outside the factory, but my daughter quickly put a damper on that. "You mustn't do that, Dad," she said, "You'll get me locked up!" I saw her point, but I still say that no city ordinance explicitly forbids hoisting a square sail up a telephone pole.

I settled for hoisting it on pulleys to the roof beams in the factory, and used their large electric fans to provide some wind. This worked tolerably well and we were able to wind the sail up and down quite easily. So far, so good.

I now needed a gooseneck to attach the yard to the mast. It had to be a very strong and secure connection at the center of the yard, yet it also had to be detachable in case the traveler jammed or in the case of some other emergency. It had to pivot from side to side to brace the yard left or right according to the wind, and it also had to rotate to permit the yard to cant or tilt when docking in confined marinas. It certainly would be asking for trouble to try to squeeze a boat into a normal slip with a 25-foot pole sticking out the sides. All this was achieved by modifying a spinnaker-pole end and bolting it to a traveler that slides on a track all the way up the front of the mast.

I finally transported the yard 650 miles to *Britannia* in Florida, strapped securely (I hoped) to the roof of my minivan on a wooden framework. I was relieved to finally get it up the mast.

After a lot of trial and error with my makeshift sail, we got *Britannia* sailing at 4 knots in only a light 10-knot following wind with my 11-year-old grandson steering and frequently over-steering as landlubbers often do. This would be quite unacceptable with normal fore-and-aft sails, which require skill on the part of the helmsman to keep them filled and to avoid jibing the main or mizzen.

The real thing

By this time, I was in quite deep financially, but if I was going to continue I was now faced with buying the most expensive item: a proper Dacron sail. This was not that easy either, as I couldn't find any sailmakers who had ever made a square sail, never mind one that would roll up inside a 5½-inch-diameter tube. Scott Lomas, with Doyle Sails in Stewart, Florida, showed the most interest. When the new sail arrived, the last stage of the grand experiment could be undertaken.

On the day of reckoning, the wind was an ideal 10 to 15 knots straight down the Intracoastal Waterway. We steamed upwind for a while, then turned around and cut the engine.

Practicalities

I learned through testing that the foot of the sail must be straight, not concave like a normal square sail. The system also works better with a batten inside the length of the foot of the sail to prevent it from billowing forward too much and to keep it straight when furling. We eliminated any built-in curvature or bunt in the sail so it would roll inside the yard better.

Throughout the project, I was concerned about overall weight aloft, along with the inertia effect such a protrusion might have 27 feet up a swaying mast. I had calculated the theoretical overall weight and was pleased to find, with the actual sail inside the yard, that it was within 5 pounds of my calculations, at 135 pounds. This is less than that of an average man climbing the mast, but the moment of inertia would be greater, since the yard protruded well outside the boat's roll center. To be on the safe side, I increased the foremast rigging sizes, including the two forestays and triatic stay, and beefed it up aft with two running backstays for good measure.

The tarpaulin sail proved helpful when Roger was refining the system on board.

As helpers tended each sheet, I hauled on the "sail down" line and the sail began to unwind from inside the yard. As the wind caught the canvas, it began to unfurl itself, but I controlled that by snubbing the "sail up" line around a cleat. I cautiously eased out more and more sail and soon the whole 340 square feet billowed majestically before us. We winched the sheets in as the boat gathered speed. Within minutes there was a small wave under the bow as we coasted downwind at 5 knots. It was a great sight to see the beautiful white sail filling so well.

Britannia did not heel or roll as she would have done under her Bermudan sails. The motion was more like a catamaran than a monohull and was so steady I felt no trepidation in steering straight through the narrow gap under the Titusville bridge. At least it seemed pretty narrow when our 14-foot-wide boat was suddenly 25 feet wide. A speedboat overtook us with people yelling "fabulous," "great show," and words to that effect.

Unfurling the sail was easy enough, but now came the second and more important test: would it roll back smoothly into the yard? We had experienced problems winding the plastic sheet in and out, as it sometimes overlapped itself and occasionally jammed completely. I was fairly sure this was due to the flimsiness of the material and reasoned that 8.5-ounce Dacron should be much more stable. At this moment I earnestly hoped so, otherwise we might have finished up in Miami, since you can't just turn a square sail into the wind.

There was only one way to find out. As my crew eased the sheets and spilled some wind I hauled the "sail up" line. It was harder than unfurling, but once I got it round a winch it was easy enough, and became lighter as the sail became smaller and finally disappeared into the yard as clean as a whistle. Another milestone passed. What a relief!

Changing courses

Knowing the sail can be progressively reefed — even to the point of exposing just a few feet of canvas — will be a great reassurance as the wind pipes up. I now wanted to see how many degrees we could sail off the wind with the yard fully braced.

After motoring back to our starting point, I steered a zigzag course downwind, bracing the yard first to port then to starboard. Amazingly, the sail never lost wind even when 3 points, that is 34 degrees, either side of the stern. This will allow a great degree of latitude when going downwind with a big following sea. It will also be less demanding on the autopilot.

All in all, the day's trial was a successful conclusion to a lot of hard work and expense. We celebrated with a bottle of bubbly as we steamed back to the marina. And no, I did not forget to cant the yard before entering our slip.

After I've thoroughly tested the system in all seagoing conditions, and once I'm happy with the structural and operational components, it is my intention to build a second yard to be hoisted above the fore course and carrying a sail about half the size. This will be the fore tops'l. *Britannia* will then field more than 500 square feet of athwartships canvas, which will greatly add to her downwind performance. Having a combination of two square sails will provide more flexibility in the same way that a combination of sails on a ketch or schooner permits different sails to be set according to conditions.

By the way, the red cross on the white ground is the English Cross of St. George that forms part of the Union Jack. It is also the Templar's Cross and the emblem of the Red Cross Association. But that ambiguity will just add to the mystery when my little tall ship is spotted on the horizon.

The cost

I had a stiff whiskey on hand when I added up the cost of all the equipment and parts, including sub-contractors' fees for special jobs. Overall it came to $3,736, not counting my labor. Four pieces of equipment represented about three quarters of this. The mandrel driver was $600, the yard and mandrel $400, the gooseneck and traveler $380, and the sail $1,550. Re-rigging with heavier stainless-steel wire was included in the cost of converting the boat from a ketch to a schooner, which is another story altogether.

I have nothing with which to compare this unusual project in order to appraise whether it was expensive or not. The nearest comparison is perhaps an in-boom furling system. Even a smallish in-boom furling system, not

including a sail, is more than twice the cost of my system.

Ultimately it comes down to what you want and what you are prepared to do if you can't actually buy something ready-made. There were times when I was set to quit and my family thought I was quite nuts. But now, when I unfurl my beautiful sail that I designed and engineered . . . when I see it billowing forth, I'm pleased I persevered. My small square-rigger is unique.

All we have to do now is find a following wind, instead of having it on the nose as it is most of the time.

Roger Hughes has been sailing for nearly half a century as a professional skipper, charterer, restorer, and occasional imbiber aboard lots of boats, including square-riggers. His latest project is refurbishing Britannia, *a once rundown Down East 45, and re-rigging her as a brigantine schooner with a unique roller-furling square sail on the foremast and a few other "inventions," like his over-the-top blocks (see January 2015) and a hot tub in the owner's head. Roger's website is www.schooner-britannia.com.*

***Britannia*'s regal square sail billows triumphantly before a moderate breeze.**

Taming a

Cliff stows the downhaul line on a stanchion cleat at the cockpit, far left. The downhaul leads through stanchion blocks, inset, all the way to the bow pulpit. He clips it to the head of the sail with a snap shackle, above.

A friend of mine told me about an incident he witnessed in which the jib furler on a 54-foot sailboat jammed. "You haven't laughed until you've been on a big boat in a rising wind with a jammed furler," he said, grimacing with the memory of it.

This was all academic to me until I got my next boat, *Pelorus*, a 26-foot Paceship with an old-fashioned hanked-on genoa. Because that was what I was used to on my previous and smaller boat, I thought the only difference would be that it was larger. However, I discovered that a larger sail can be a handful when it's lowered. (Now that I think of it, it was a handful on my smaller boat as well.) Fortunately, the halyard led to the cockpit, so I could raise the sail without going forward.

I kept *Pelorus* on a mooring and routinely sailed off it and on to it. I have long considered that to be a minimum standard for seamanship. That, and not hitting anything. I'd gotten into the habit of dropping the headsail first, then sailing in under the mainsail, slowly and completely under control in any kind of wind, when picking up the mooring or dropping the hook.

Pelorus had a 135 percent deck sweeper for a genoa and, even though it was an old sail, I used it most of the time, preferring to reef the main first. If I was going to windward in winds above 15 knots, I dropped the big genoa and replaced it with the 115 percent headsail that was flatter and usually OK up to 30 knots. Thinking back on that, it was a lot of work. Also, it was hard to see under or around the big sail, especially as I usually sail singlehanded.

> "It took the unsecured sail halfway up the forestay, shredding it before I could secure what was left."

The 135 destroyed itself one day right after I had anchored in advance of a squall that ripped through. I was below at the time. The first gust was well over 35 knots. It took the unsecured sail halfway up the forestay, shredding it before I could get on deck to secure what was left. Fortunately, the 115, which was as old as the 135 but not so blown-out, worked pretty well during the rest of the summer except in the lightest wind, when I flew a drifter instead.

I was able to replace the blown-out 135 with a new 110 from Cruising Direct. At first, I thought that might be a little small but, surprisingly, the 110 worked just fine. It was slightly heavier than the sailmaker suggested for a sail of that size, but I wanted it to last. The extra weight made it so stiff that wrestling it into the sailbag was almost like folding plywood, but it had the virtue of keeping its shape well in light wind and it pointed closer to the wind.

hanked-on headsail

A downhaul is a singlehander's foredeck crew

BY CLIFF MOORE

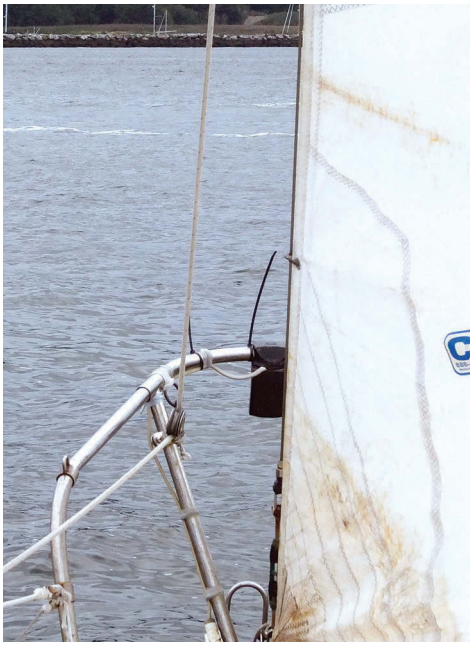
By then I'd grown used to the hazards of handling the old sail, among them getting hit in the face by the clew while trying to pull the sail down on the foredeck . . . or standing on the foredeck with the bow dipping into the sea while hauling the sail down only to have the halyard jam and having to run aft to clear it. In a fine example of the perversity of inanimate objects, halyards have a knack for kinking into knots too big to pass through a jammer.

A blast from the past

Eventually I had a thought: why not do what the old-time sailors did and rig a downhaul that I could use on whatever headsail I happened to be flying? At the next Annapolis boat show, I visited the Garhauer booth and bought four SB25 stanchion blocks. Their online catalog has them at $40 each, but I got a boat show discount.

The next time I went to my boat, I mounted a block on each stanchion, one on the bow pulpit, and a stanchion cleat next to the cockpit where I could reach it without going forward. I then ran enough 5/16-inch line to reach from the masthead, down the forestay to the first block, and aft to the cockpit, with a snap shackle at the working end. It works like a charm.

Now when I need to lower whatever happens to be flying from the jib halyard, I fake out the halyard in the cockpit, loosen the downhaul from its cleat, bring the boat directly into the wind as if tacking, then quickly throw the halyard off the winch and haul on the downhaul. Generally, the genoa falls on the foredeck right where I want it.



When preparing to hoist the jib, Cliff sets the downhaul tail on the cockpit seat, above center, so it will run free when he raises the sail. A stanchion block on the pulpit leads the downhaul aft, at left. Before dropping the jib, Cliff fakes out the halyard in the cockpit, at right.



Most of the time, once the downhaul is made fast in the cockpit, the sail will stay where it dropped on the foredeck, at left. Cliff can then secure it to the pulpit and lifelines at his leisure, center, and stow it in its bag, at right. (The wire ties help keep terns off the pulpit.)

If there isn't enough sea room to go directly into the wind, I point up as high as I can and then lower the sail. Sometimes it falls partly in the water and gets wet, but so what?

It takes very little effort to lower any headsail, including the drifter. Although I do have to keep some tension on the downhaul so it doesn't slap against the sail, after four or five years I have so far detected no chafe on any sail.

Once the genoa is down, the boat slows immediately while remaining completely controllable. Fortunately, *Pelorus* has the virtue of sailing reasonably well under main alone, even in light air. I first secure the tiller to keep her going where I want her to, using either a tiller lock or the autopilot, then go forward with sail ties and secure the genoa in the usual way. Sometimes in very light wind while motorsailing, for instance, I'll just let it remain as it fell on the foredeck. But no matter how hard it blows, the downhaul keeps the sail from heading up the stay.

Cliff Moore is Good Old Boat*'s newest contributing editor — see facing page.*