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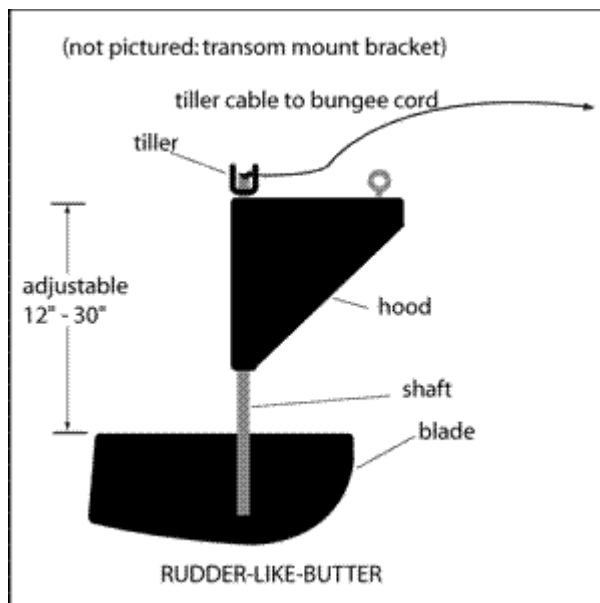
A Rudder Like Butter

To steer or not to steer: that's part of the question . . . perchance to dream: aye, there's the RuB Hamlet (sort of.)

I've been a regular contributor to Small Craft Advisor over the past few years. My most recent series of articles for that publication has covered the trials and tribulations of building and sailing a canoe.

But I'm returning to my MAIB roots now, because it's the perfect place to launch a new product targeted to the cost-conscious, experimental-minded boating audience. The new product is a rudder designed to mount on bow or stern. It allows any small boat—whether propelled by sail, paddle or oar—to be steered without lifting a hand. Its operation is so smooth, we've decided to call it Rudder-Like-Butter. Michael O'Dougherty, a pump manufacturer by trade, will be in charge of production. I'm responsible for sales and marketing, and as such, I take full responsibility for the undignified, Saturday-Night-Live-inspired label. For those who might feel somewhat sheepish owning an object named Rudder-Like-Butter, feel free to shorten the name to "RuB"; it's so, like, Shakespearian.

My latest article in SCA describes the making of a 75 square foot sail—cut from nylon-reinforced, UV-resistant polyethylene—to power my 15 foot plywood canoe. With a homemade sail on a homemade canoe, with my Rudder-Like-Butter mounted on the stern and with self-tending leeboards mounted just forward of amidships, I was able to achieve a speed of 6 knots. Now this may seem unremarkable, but consider the fact that hull speed for a boat with a 15-foot waterline is only 5.23 knots. Displacement sailboats rarely achieve their nominal hull speeds, if ever. But my experimental craft can. Does the rudder deserve *all* the credit for this performance feat? Certainly not. But some credit? Definitely.



The RuB is a balanced rudder consisting of four main components: blade, shaft, tiller mechanism and a bracket for mounting the rudder on a boat. For use on a canoe, Michael and I have designed a plastic bracket we refer to as a hood, which slips over the stern and bolts to the stern deck. The hood hinges on the shaft, which allows it to be adjusted to grip the gunwales securely. Since the rudder was originally designed for use on a canoe, the hood-like bracket was developed first. But we also offer a bracket for a transom mounted rudder.

The rudder blade is slightly under 1 square foot in area, fairly typical for a sailboat and sail of these dimensions. Less typical is this rudder's aspect ratio; a puny 0.5 or thereabouts. The blade's horizontal dimension is roughly twice its vertical dimension. In theory, a low AR fin is a drag. Quite literally. Foils with high aspect ratios promise higher efficiency, generating more lift with less drag. In practice, however, the low aspect foil has a major compensation: it allows for a shallow draft, and a boat that will continue to perform well in shallow water.

A balanced rudder is not usually seen on a small boat either. For most small craft rudders, the blade's area falls aft of the rudder shaft. With the RuB, in contrast, approximately one-third of the blade's area is forward of the shaft. While there are some minor practical drawbacks to a balanced rudder, it has a major virtue in that very little force is required to change or maintain course.

The rudder shaft consists of two telescoping lengths of aluminum pipe. As a result, the shaft can be adjusted in length from 12" to 30". A hacksaw and about five minutes worth of sawing will be required if a shaft length of less than 18" is desired.

The tiller mechanism consists of a plastic U-channel that bolts to the top of the rudder post. Quarter inch braided nylon steering cables extend forward through the cockpit where they fasten to bungee cords. The forward ends of the bungees hook on to eyebolts which I've mounted to the gunwales well forward. This allows me to operate the rudder from anywhere in the canoe. Pull on the windward line, and the canoe turns to windward. Pull on the leeward, and she heads downwind. Touch neither and she sails straight; assuming, of course, the cable tension has been properly adjusted. Bungee cords are not included in the RuB package, but they are very inexpensive and available from just about any hardware store in the nation. I prefer bungees that are 18" in length. It doesn't bother me to have the tiller lines running through the cockpit. But the fastidious sailor might want to install a couple fairleads to keep these lines closer to the boat's rail.



With my Rudder-Like-Butter, I can sail without lifting a hand for ten or fifteen minutes at a stretch. I cleat the mainsheet, hike out on the rail and let the canoe take care of herself. If I want to nose upwind, I shift my weight forward or leeward. To head downwind, I do the reverse, never having to touch the tiller cables. This is analogous to the way surfers steer, or kids on a toboggan, for that matter. The direction you lean, and where you put your weight determines your

course. This leaves ones hands free to bail, to uncap a water bottle, or to practice knot tying.

I believe that virtually any small craft equipped with a RuB can be made to steer via ballast

shifts. The trick, of course is to effect the proper helm balance in your boat. This might involve altering the rake of the mast or changing the location, size and/or shape of the centerboard. But with a little patience and a bit of tinkering with the tiller cable tension, I suspect any sailboat can become self-steering with a RuB.

Once the trick of helm balance has been mastered and you've found your boat's "sweet spot"—to borrow a phrase from tennis—something else, equally significant, occurs. The boat will optimize it's own course to take maximum advantage of the wind. The boat automatically finds the course that fills the sail to its fullest, optimal capacity. There is nothing magic or mysterious about this phenomenon. Think of your centerboard as a fulcrum and your boom as a lever. The wind will seek to orient the boom until the pressure forward of the fulcrum equals the pressure aft. But since the boom is sheeted to the hull, wind pressure is transferred to the hull; swinging it to a course until the forces are again equal. Not only can you steer through weight shifts, in other words, you can also steer by varying sail trim. Ease the sheet out, the sail's lead edge flutters, the boat noses downwind a bit until the sail fills again. She then strikes off on the new course. Harden the sheet and the reverse occurs: she noses higher into the wind.

A similar self-correction or self-orientation occurs during wind gusts. When a gust hits, my canoe heels. This automatically points her higher into the wind. Aimed higher, the sail's leading edge luffs, and continues to luff as long as the canoe remains at that angle of heel. Once the gust passes and the heeling angle lessens, the boat falls off a bit, and resumes her original heading. Meanwhile, during the entire encounter with the gust, boat speed remains consistent. Think of it: entirely on her own with no guidance from me, the canoe has worked her way upwind of where she otherwise would have been, all the while maintaining a steady speed.

Fritz Fenger characterized this feature of the well-balanced sailboat as an ability to "eat its way to windward." Fenger, designer and owner of the famous sailing canoe "Yakaboo," praised his little boat for her capacity in this regard. Fenger achieved this capacity in a different way: a centerboard that could slide forward or aft. Effectively, Fenger devised a lever system in which the fulcrum was movable. In either case, the consequences are the same: a boat with the ability to look after herself, to optimize performance and to work her way upwind.

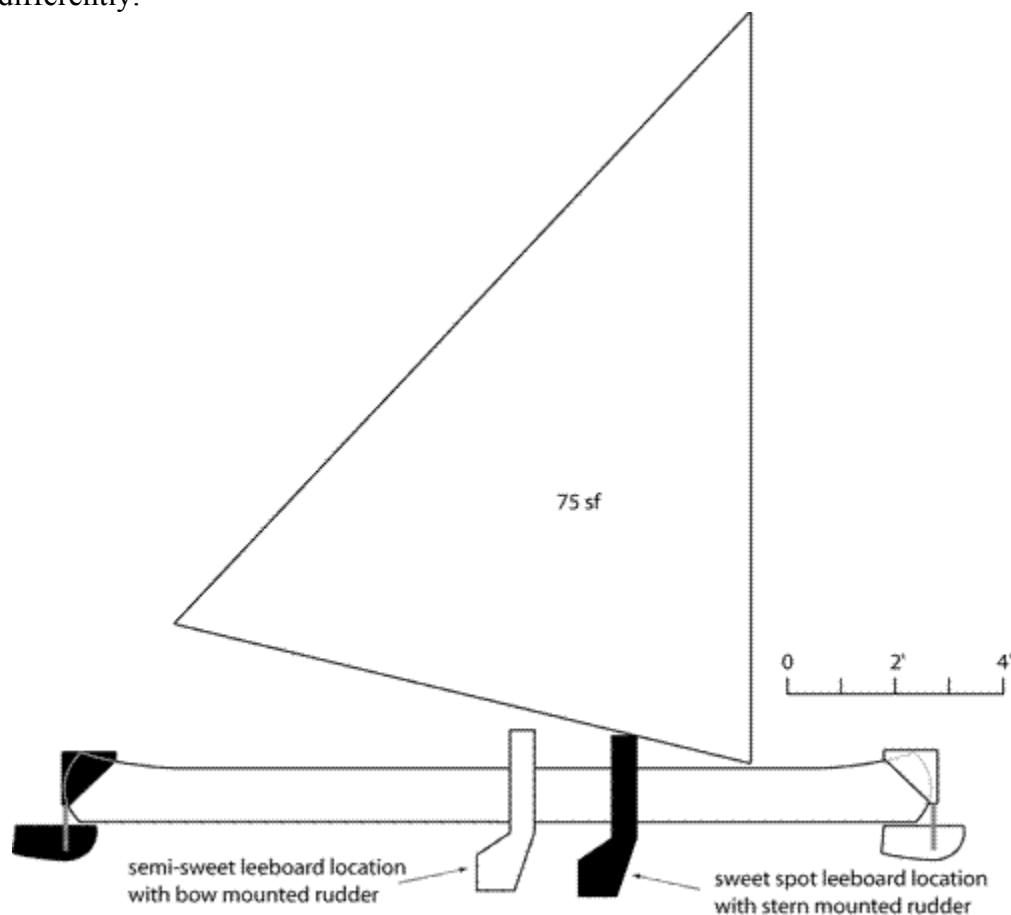
Sometimes, of course, I need to ease the sheet to prevent capsize. But I find that if I can resist my natural impulse to dictate events, my canoe, fitted with her Rudder Like Butter, does much better when left entirely alone; thank you very much.

Well, if Rudder-Like-Butter it works well on the stern, would it work on the bow? Philip Bolger at one time speculated that a bow mounted rudder might offer some significant performance advantages over a conventional stern rudder. Bolger even went so far as to run a few experiments. My memory of his account is vague, but as I recall, he ran into technical difficulties which prevented him from concluding the tests. But he still thought the idea had merit.

After 30-40 hours of my own experiments, I can confirm Bolger's original optimism. It took a good deal of tinkering with the leeboard location, but once I mounted them exactly on the boat's midline, a RuB on the bow works very well, indeed. The canoe is more responsive to her rudder, and she comes about more smartly. In addition, operating a bow-mounted rudder is much more

intuitive; one is much less likely to pull the wrong cable which then sends the boat off in the direction opposite of what was intended.

Unfortunately, however, I could not find a sweet spot with a bow rudder. Constant tension on the leeward tiller cable was required to stay on course. For some perverse reason of her own, the laws of physics notwithstanding, my boat always wanted to luff up; always wanted to head up into the wind. I could slide the leeboards all the way aft to the stern seat, and the result was the same. Why? It might be a function of where the mast and sail are located. If both were further aft, the result might be different. Or maybe there's an unavoidable physical reality at play: you never see fin on the bow of a surfboard, after all, only on its stern. Or if the rudder's balance were adjusted, say, by moving the shaft forward relative to the blade; might that have an effect? Or maybe a more conventional sailboat hull with more beam or more rocker in her keel would respond differently.



OPTIMAL LEEBOARD LOCATION: BOW vs. STERN MOUNTED RUDDER

So many questions; so little time. Many more hours out on the open water will be required to answer those questions. It'll be a filthy job, of course, but a sacrifice I'm willing to make for the furtherance of science. But for the time being, we'll have to designate the optimal leeboard location with a bow rudder as a "semi-sweet" spot only.

One final benefit to a bow mounted rudder on a canoe deserves mention: paddling in brisk head- or crosswind now becomes possible. Ever try solo paddling a canoe in a 12 knot wind? Ten

minutes feels like an hour. Equipment failures occasionally oblige me to paddle home. Invariably—as Murphy’s Maritime Law would have it-- these failures occur when I’m at the furthest point downwind from my destination. When returning home under these circumstances, a Rudder-Like-Butter installed on the bow is a godsend. I can steer with my feet and having no need to constantly change sides with the paddle, I expend only half the energy normally required.

Well, if the RuB works on bow or stern, how about if rudders were mounted at both ends and we got rid of the leeboards altogether? Would that work? Yup, it does. Not only does it work, but the canoe reacquires her ability to self-steer. I again can control her course through shifting my weight. And she becomes extremely nimble. Activate both rudders, and she’ll turn on a dime. I tried to grab a drifting piece of refuse, missed it on the first pass, but was able to jibe about and pick it up on a second pass, all within about thirty seconds. So dual rudders are ideal equipment in a “hat overboard” emergency. Yet despite my canoe’s agility with two rudders, unfortunately she comes about only grudgingly. She’s likely to get caught in stays and to drift backwards. When this happens, I reverse the rudders until she slides off onto the new tack.

Eventually, I expect to prove I can hit higher top speeds with two rudders and no leeboards. But if so, it will occur off the wind. For there is another downside to the double rudder scheme: my canoe makes more leeway. Consequently, downwind performance might be better, but upwind performance is definitely worse. For a casual cruise, the two rudder configuration is wonderful. But for racing, it would leave something to be desired. While there might be some way to limit what’s given up to leeway, and there might be some way to come about more smartly, it could take additional hours, days, or even weeks of drudgery and selfless research to find answers. More filthy work, but someone has to do it.

Rudder-Like-Butter is priced to sell. The rudder--with either the hood or the transom bracket--sells for \$78.50. Plus \$14.75 for shipping and handling. If you want both types of brackets, add \$15.00.

If that’s a bit pricey for some readers, there is an alternative. You can build your own cable-activated rudder following the plans outlined in Small Craft Advisor # 41. The design calls for various odds and ends of copper plumbing parts, sheet metal, fiberglass, epoxy, polyester resin, quarter inch plywood, plastic cable ties, rivets, a short length of 3/4" dowel, a couple short lengths of 1" x 4", and a small handful of screws and other hardware. But if you didn’t have most of these items on hand, and you had to purchase them, it would probably end up costing more than the real thing.

Michael and I have developed and tested about six different versions of the RuB. At this point, I have used one form or another for two hundred hours or more. I will never go back. Of the ten sailboats I’ve owned in the course of my life, my homemade canoe with her Rudder-Like-Butter is by far the most fun. The RuB has some disadvantages, certainly: it does not kick up, it lacks traditional aesthetics, and it has an undignified name. But against that, it offers many advantages: shallow draft, excellent speed potential, steering from anywhere in the cockpit, hands-free steering through weight shifting; with it your boat gains the ability to optimize her own course and to look after herself.

At this point you are asking yourself whether you want two RuBs or only one. My completely objective, disinterested advice in the matter is to go for it. Buy two. If you decide, subsequently, that you don't like the bow and stern mounted system, give one of your rudders away as a present. That solution to the dilemma would make two people very happy: the recipient and me.

A final cautionary note. Rudder-Like-Butter takes some getting used to, even for experienced sailors. It takes a while to establish helm balance and locate the sweet spot. It takes a while to acquire the necessary feel for sailing without a tiller in hand. It takes a while to master the weight-shift method of course control. Expect to spend 10-15 hours picking up the requisite skills. Until then, observe all the usual safety precautions for sailing and then some.

Rudder-Like-Butter: the versatile small craft rudder with the undignified name.

