

## **Sailing without touching the tiller** by Jay Varner

Learning to steer with sails alone reinforces the principles of sailing, making you a better sailor

Drive a car to Svendsen's Marine Supply, pick up a hiking stick and return without touching the steering wheel. Impossible. I would agree. Yet as a sailing instructor I often ask students to sail out of the slip, leave the harbor, hold a course, tack on command, jibe and return to the slip—all without touching the tiller.

This exercise can be done on most sailboats less than 25 feet long in winds up to about 15 knots. Boats that respond easiest have a fin keel or [daggerboard] centerboard, and are narrower of beam and lighter displacement.

Rudderless sailing requires making a few incremental, well-timed adjustments to movable ballast (our bodies) and sail trim. The drill heightens sailors' sensitivity to the dynamic duet of "**center of effort**" (CE) and the "**center of lateral resistance**," (CLR) giving a solid foundation of practice of the principles that make this phenomena work, invaluable tools in a performance sea bag.

### **Out of the slip**

Let's start with the boat in the slip, main hoisted and a 5-knot breeze blowing directly on the bow. Visualize how to sail this boat out of the slip, down the channel and out of the harbor, which will require the maneuvers of backing, reaching, jibing, tacking and holding a course. For these exercises we will be using just the mainsail. The tiller will be lashed on center.

When the CE is located well out to one side of the CLR a significant leverage arm is created. With the boom backed to starboard and held rigidly against the after lower shroud, opposing the wind, the resultant force will cause the stern to be rotated to port. By fending off, we can keep the stern from scraping along the dock as we stumble out of the slip. Also consider that the act of fending off slows the travel with an opposing force. Besides, this whole operation is unseemly, and can only result in embarrassment and scuff marks. Let's get a little bit smarter. Rigging a preventer on the boom to control back-winding of the main will solve the obvious conundrum.

By bringing the CE closer to the CLR we can reduce the turning moment that rotates the stern to port. Watch what happens when we heel the boat to port (see Fig. 1). The CE is now directly over the CLR, thus eliminating the rotating moment, and the boat will begin backing without significantly favoring port or starboard.

Next, we will need to start a turn to port to be properly oriented toward the harbor channel to the east. Take a look again at Figure 1 showing the boat rotating to port. Relocate our movable ballast toward the centerline, the boat comes back down on her lines, the CE is now well outside the CLR creating the rotating moment we need. The boat immediately begins backing to port.

The backing momentum would carry the boat too far, except that as the sail becomes aligned with the wind sail power is diminished. Gradually the boat loses way and would begin to drift with the current or be pushed leeward by the wind until the inertia (resistance to change) of the hull is overcome by the aerodynamics of push and pull on the sail. In the event you get a sudden puff while backing, luff the main to reduce way and prevent over rotating.

As the boat continues to rotate, prepare to trim the mainsheet as the heading approaches 75 to 80 degrees off the wind. The main will begin to fill on the new tack, applying forward force. Gradually the boat begins to move forward nearer 90 degrees off the true wind, reducing leeway as she gathers speed. Note that the bow falls off ahead of the stern, because of greater surface area on the hull forward of the CLR for the wind to push on.

We are actually sailing from the slip down the waterway, and we haven't touched the tiller. Oops! Spoke too soon. She's starting to head up toward the stern of that Swan 44 berthed to our northeast. Now what do we do?

If heeling the boat to windward moved the CE directly above the CLR, allowing the boat to sail a near straight course backing from the slip, why won't the same method work going forward? Hike out to windward hard. Voila! We are holding a steady course, but we're still heading for the Swan's stern. We need to alter our course a few more degrees to starboard. To hold a course we keep the CE and CLR balanced. To alter course to starboard, leeward in this situation, we need to create an imbalance by heeling the boat radically until the CE is to windward of the CLR. Starting the main gives the boat a rotating moment to leeward. Though the leverage arm will be short, it will be sufficient, although the turn will be slow and circumscribe a greater arc.

Now that we are back on course, anticipate the upcoming jibe to negotiate the turn south into the harbor channel. Again, moving the ballast to weather shifts the CE forward and closer to the CLR and thereby sends the bow down away from the wind (see Fig. 2). Starting the mainsheet accelerates the maneuver. When the boat reaches a broad reach, with the wind approximately 135 degrees on the starboard quarter, shift the boom to port. Jibe ho! Shift ballast to windward and hike out if necessary to hold her heading.

### **Tacking and jibing**

We leave the harbor sailing south on a near broad reach and on a starboard tack. The skipper calls, "Standby to reach up." The ballast is shifted inboard and the mainsail trimmed to a beam wind (see Fig. 3). When within 10 to 15 degrees of a beam reach begin to shift the ballast outboard to counter the rotation. To hold course trim the main and adjust ballast athwartship as required.

Tacking is of course always executed from the close-hauled point of sail (see Fig. 4). As the main is trimmed the CE moves to a position aft of the CLR creating weather helm, causing the boat to head up. This is a tightly timed balancing act that is best choreographed by the skipper. If ballast is shifted too late the tack fails because of a lack of power to drive through the eye of the wind. Therefore, reach up, shift ballast inboard slightly and trim the main.

As the boat approaches close-hauled, shift the ballast inboard to stop rotation. If the boat continues to head up, hike out hard and start the main slightly—watch her begin to fall off the wind. When you have a good turn of speed, shift ballast to leeward and trim the mainsheet. The boat comes up, luffs, the main begins to fill in on the new tack and ballast is shifted outboard as the main fills full.

OK, but it does not work quite that way. Here's what we have to deal with. Remember that as boat speed increases the apparent wind shifts forward, and shifts aft as the boat speed is reduced. After the tack, boat speed has been reduced to about half. That means you cannot point as high on the wind after the tack and must compensate for the new apparent wind shifting aft. If you attempt to trim to the same position as the old tack the sail will stall and boat speed will be lost.

After the tack, sail to a close reach. As the sail begins to fill start the sheets and closely monitor the sail, do not allow it to stall! Here's where you may use that old sailing aphorism, "When in doubt, let it out." As boat speed increases, and the apparent wind begins to shift forward, trim and hike as required to get back up on the edge of the wind.

The fastest way to reach off is to start the mainsheet. With movable ballast outboard to weather, the boat comes down, and will speed up its rotation as the mainsail is eased out. When the boat reaches a broad reach, prepare to jibe. Shift ballast and shift the boom. Re-shift the ballast to control direction after the jibe. Doing 10 tacking and jibing drills, then 10 luffing head to wind exercises, will reinforce the lessons.

### **Taking it home**

It's time to head back. Jibe onto starboard and sail a beam reach toward the harbor entrance. Because harbor sailing is more restricted, maneuvers must be perfectly timed. Tip: When on the last leg of your approach to the slip, do not trim or start the main through the block, instead strip out the entire mainsheet (after the last tack) and control the main by grasping all parts of the mainsheet between blocks. Allow all parts to payout through your hand so the main can immediately luff. This gives you quicker control of the accelerator. It's best to do this from a standing position.

You already know the drill that rotates the boat head to wind. The sail luffs, ballast is shifted outboard to counter rotation, and as the boat glides into the slip the main is backed athwartship and it settles to a stop. Each crewmember disembarks an advanced sailor.

These exercises are best begun in open water. Pick a time when the water is flat and the wind steady at around 10 knots. It is difficult to do this drill perfectly without practice, and not necessary. It is, however, critical to the intellectual process of applying the aerodynamic and hydrodynamic principles that are crucial to high-performance sailing.

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