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Sailing With Self-Steering

Boat Handling, Part V — Balancing your boat's trim gives the wind vane or autopilot an extra advantage

The pleasure and freedom of sailing with a self-steering wind vane or autopilot is often extolled by the manufacturers of this equipment and by most cruising sailors experienced with the gear. Yet many sailors, when first using self-steering equipment, have difficulty in achieving satisfactory performance and often blame this on the equipment or the boat. Comments like, "This gear will simply not steer my boat," frequently are heard.

The primary reason for this is that, while a self-steerer can be more "attentive" than a helmsperson, it cannot anticipate a necessary helm movement as can a person and it usually has a more limited range of helm movement. So in order for a self-steerer to keep the boat on an acceptable course the boat must be made as easily steerable as possible before the gear is even engaged.

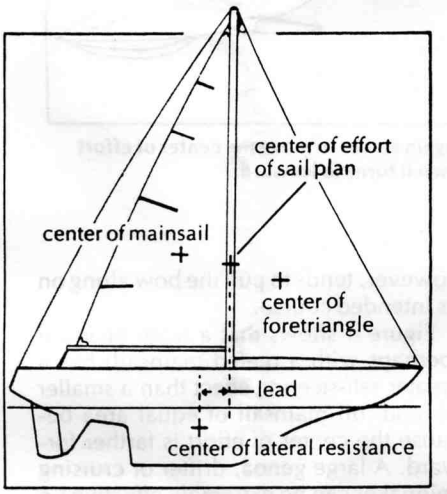

Fig. 1 For proper balance, the center of effort (CE) of the sail plan is located forward of the center of lateral resistance (CLR) of the hull by a distance called 'lead.'

Balancing The Boat

Balancing the combination of sails and their trim so that the course is maintainable with a minimum of helm movement and effort should be learned by all cruising sailors, yet many fail to do so until given the incentive and instructional feedback provided by a self-steerer. Whether you own a self-steering unit, are thinking of buying one or simply want to make hand-steering less strenuous, learning how to balance your boat in various conditions and on various points of sail can be a valuable exercise.

The term "balance" implies correct relationship between the lateral or sideways force of the wind acting on the sails and the lateral force of the water acting on the hull. The force of the wind on the sails normally is taken as acting at the center of effort (CE), or geometric center of the sail plan, and the force of the water on the hull is taken to act at the center of lateral resistance (CLR), or geometric center of the underwater profile of the hull.

For proper balance, the center of effort must be forward of the center of lateral resistance by a distance called the lead, as shown in Figure 1. If the lead is too great, that is, if the center of effort is too far ahead of the center of lateral resistance, the boat will tend to bear off, or turn away from the wind. If the lead is too small, the boat will turn toward the wind.

The overall force and center of effort of the wind acting on the sails is the combined total of the forces and centers on the individual sails. By reefing and changing sails, and by trimming them in various ways, the sailor can control both the magnitude and the center of effort of the forces on each sail and thus the total balance.

The best way to learn about and get a feel for this balance is to go sailing and experiment with sail combinations and trim. Choose a day with a constant breeze of 10 to 15 knots and relatively flat seas, and bring an energetic crew so that one can steer and the others change and reef sails. Basically you want to carry just enough sail to maintain a decent speed but not so much that the boat heels sharply or is overpowered. Also, sails should be trimmed so that they have a natural tendency to bring the boat back on course if it deviates.

Beating

Most boats self-steer best when beating to windward. By easing out the mainsail a little more than normal so that it luffs slightly and using a vang to reduce twist in the sail, the self-steering tendency can be enhanced as shown in Figure 2. In Figure 2a the centers of effort and lateral resistance are in balance and the boat will hold its course.

In Figure 2b, the boat has deviated from its course and turned slightly to windward. Because the mainsail is undertrimmed, it luffs significantly, losing much of the force exerted on it by the wind. This shifts the center of effort forward toward the jib, increases the lead between the centers and turns the boat away from the wind and back to its desired course without any helm movement.

In Figure 2c, the boat has deviated from its course in the other direction. Here the mainsail stops luffing, experiences a greater wind force and moves the center of effort aft. This tends to turn the boat back to windward.

As the wind and angle of heel increase so too will weather helm. A greater lead is necessary to counteract this. If the mainsail is reefed,the center of effort of that sail is moved forward and down, both reducing heel and moving the total center of effort forward to combat the increased weather helm.

You can tell how well the boat is balanced by the amount of rudder movement and effort required to maintain a course. Give the boat time to settle into a pattern; resist the temptation to move the helm too frequently; observe the relationship between sail set and self-steering. Try reefing and unreefing sails, changing headsails and altering trim.

Close And Beam Reaching

Reaching is usually the most difficult point of sail on which to balance the helm and achieve a degree of natural self-steering. On a beam reach (Figure

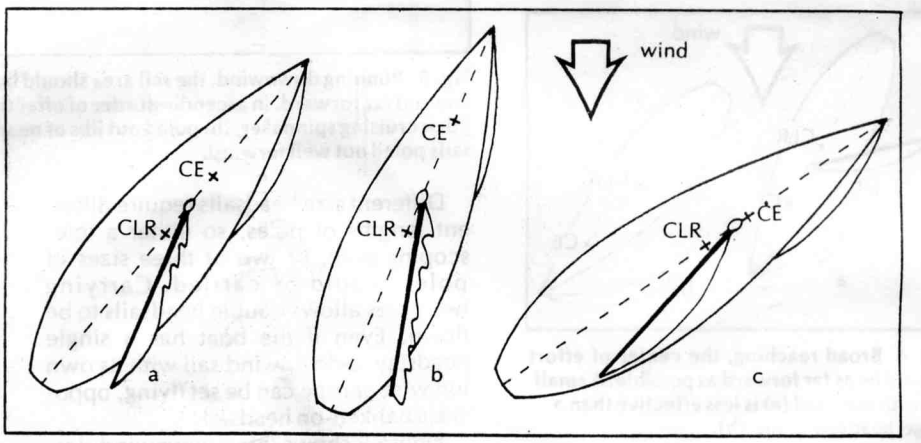

Fig. 2 Beating to windward, in (a) there is a slight luff in the undertrimmed mainsail and the centers of effort and lateral resistance are in balance. In (b) the boat has turned to windward, the mainsail luffs extensively and the center of effort shifts forward to increase lead and cause the boat to bear off. In (c) the boat has turned to leeward, filling the mainsail, moving the center of effort aft and causing the boat to head up.