EXPERT ON BOARD

A professionally qualified skipper with 50,000 miles under his belt, Will Bruton is now YM's sailing editor

Unlike an electronic autopilot self-steering needs no power to keep working indefinitely

Windvane steering

[Why it makes sense for coastal cruising]

No electricity needed, built for gale-force conditions and currently experiencing something of a renaissance amongst cruisers; windvane self-steering makes sense for coastal cruisers as much as offshore voyagers. *Will Bruton* took an in depth look at the options and how they work.

'The distance run was 2,700 miles as the crow flies. During those 23 days I had not spent more than three hours at the helm. I just lashed the helm and let her go; whether the wind was abeam or dead aft, it was all the same: she always stayed on her course,' wrote Joshua Slocum in 1895. The ability of his long-keeled *Spray* to hold course without input from the helm was instrumental in making her the first yacht to circumnavigate single-handed. Few modern boats bear these inherently balanced characteristics, so some form of autopilot is necessary to allow the skipper to rest. Even for crewed passages, it can take an enormous strain off the crew without draining the battery. Some insurance companies even count windvane steering as an additional crew member, such is its contribution to life on board.

One solution experiencing something of a renaissance, is windvane self-steering. Requiring no electricity, mechanical self-steering gear was first designed in an age when autopilots were the preserve of large ships and heavy motor cruisers. The principle is relatively simple and pure physics.

What mechanical self-steering cannot do is hold your yacht on a compass course. However, as anyone that's experienced a sudden wind shift or squall whilst away from the helm knows, steering to a wind angle is preferable most of the time as you are far less likely to crash gybe, and the sails remain correctly set. Self-steering gear achieves this by presenting a vane directly into the wind. When the wind acts on either side of this vane, it tips, transferring this action through the mechanism below to either a rudder or a servo pendulum which acts on the main rudder, altering the boat's course.

The original self-steering gear on Robin Knox-Johnston's *Suhaili*

Nic Compton / Alamy stock photo

The two main systems

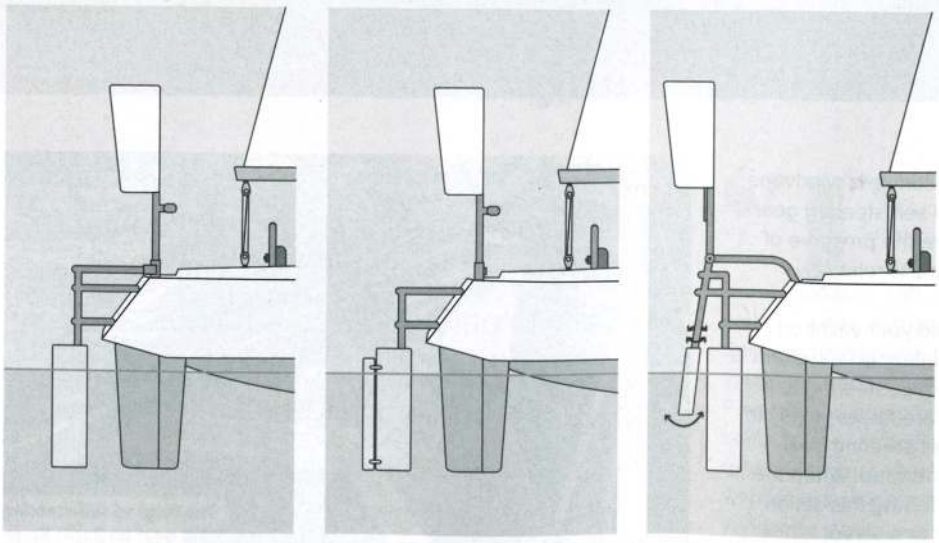
DIRECT DRIVE SYSTEMS

Wind vane steering linked to a secondary rudder is the most inherently simple of the mechanical self-steering systems, but relies on a much more powerful transmission of force between a large-surface-area wind vane and the system's own independent rudder. This has the advantage of ensuring a back up steering method is already on board but also requires a heavy-duty installation to bear the load and strain that will be exerted.

One of the most popular models is the Hydrovane, which is now available in several different sizes and shapes depending on the boat it is being installed on. The size and shape of the fabric-covered windvane is directly proportional to the size of yacht, and has been installed successfully on yachts in excess of 50ft in length, including multihulls.

When the boat veers off course, the wind hits the vane on one side or the other, deflecting it away from the vertical.

This then acts on a gear that converts this sideways movement into rotation to directly steer a relatively large rudder suspended from the boat's transom via the installation framework.



Auxiliary rudder (left); trim tab (centre) and servo-paddle (right) designs all operate slightly differently

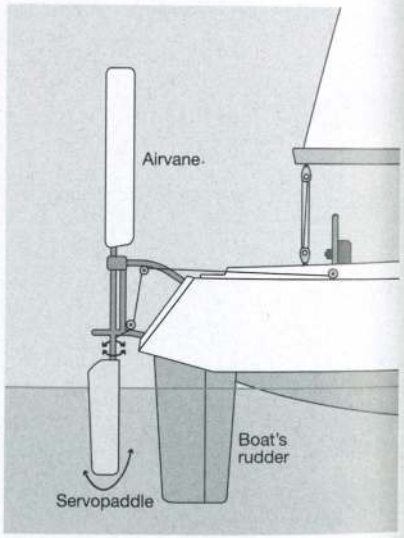
SERVO-PENDULUM

A derivative of the servo-trim tab principle invented by Blondie Hasler, servo-pendulum self steering gear uses the speed of the yacht going through the water to push against the servo-paddle, creating a substantial force, which is then transfered to the yacht's own tiller or wheel by control lines.

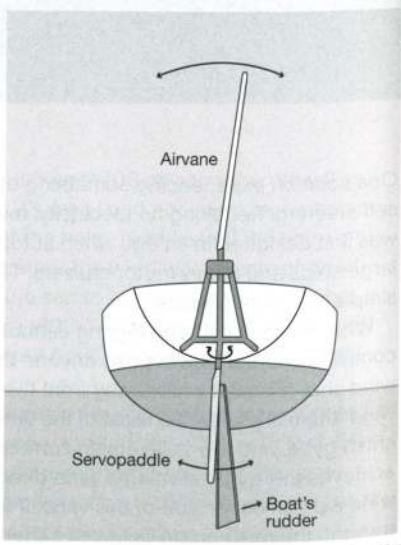
The wind itself does not provide the power for the steering; rather it adjusts the angle of the paddle, relying on the hydro-mechanical energy of the boat going through the water to do the work of steering the boat. Popular before the advent of the small craft electronic autopilot, it's particularly well suited to yachts under 40 ft in length, and can be swung out of the water when not in use.

There are now several derivatives, including some available as a self-build kit. Amongst the Golden Globe Race entrants, models included Aries, Monitor, Windpilot and Beaufort systems.

One disadvantage of the servo-pendulum gear is that it uses the yacht's rudder, meaning it does not double up as an emergency rudder should the yacht's steering be disabled, although some servo-pendulums can be adapted.



Servo-paddles work with the main rudder



The vane deflects the paddle, moving the tiller

Nick Jaffe/GGR

Self-steering relies on a well balanced boat. As the wind shifts, the mechanism corrects

1 BALANCING THE BOAT

'Before doing anything, you have to get the boat sailing well. It demands you take the time to get your boat properly balanced, correctly reefed and with no weather helm; so it actually makes you a better sailor!', explains Nick Nottingham, who recently fitted a Hydrovane to his Hallberg-Rassy 42 *Spellbinder*. Nick is about to use the system on an Atlantic circuit.

Self-steering gear works by adjusting the yacht's course in relation to the apparent wind. The first step to making this work as efficiently as possible is to balance the boat and reduce the amount of input required. Sailing conventionally, the yacht should be easy on the helm and not overpowered.

With the wind vane attached, you are ready to remove the locking pin and engage the steering mechanism

2 SETTING THE SYSTEM FOR THE CONDITIONS.

Whether servo-pendulum or direct drive, most self-steering systems have one or more methods of adjustment for the conditions. In light airs the wind vane will be exposed as much as possible to the wind, to exert the maximum force on the system, whereas in heavier weather, the vane's height can be lowered, reducing the force acting on the system. Some systems, like the Hydrovane, Monitor, and Beaufort have different sized vanes that can be swapped, while the Windpilot and Aries allow the vane to be raked aft, presenting a shorter lever.

On some set ups, the power exerted on the steering system can also be adjusted at the point where the wind vane meets its pivot, just like changing sensitivity on an electronic autopilot. By controlling the rotation of the rudder or paddle created by the windvane, you control how aggressively the system corrects the boat's course. Changing the gearing at the point where the wind input creates the steering output achieves an increase or decrease of ratio.

3 ENGAGING THE SYSTEM

To engage the system, set the yacht on course and adjust the wind vane so that the wind is flowing over it with the least resistance, like a blade. If you are using a system with its own rudder, centralise and lock the yacht's main rudder, simultaneously engaging the self-steering mechanism. Once engaged, monitor how the system adjusts and double check your sails are trimmed correctly. As the vane moves it will adjust the steering accordingly. In heavy weather, reduce the system's power to ensure the least amount of strain. Self-steering systems work effectively in strong winds but most will steer comfortably in light airs as well.

4 COURSE ADJUSTMENTS

When the wind vane is vertical, you are on course. When the vane is deflected, the system is adjusting course. Changing the direction you want to go in is simply a matter of altering the self-steering system's vane angle relative to the wind. On most systems this is achieved by a steering line that can be run into the safety of the cockpit, meaning you do not necessarily need to adjust the vane itself directly. Make small adjustments until the yacht comes onto the desired course, trimming the sails appropriately.

5 A STANDALONE SYSTEM?

Whilst self-steering systems offer a much more resilient option than an electronic autopilot for heavy weather, when there is no sailing wind, they cease to be useful. For this reason, most cruisers also have a conventional electronic autopilot on board to steer under engine.

In the case of systems incorporating a rudder, many also make it possible to easily engage a tiller pilot onto the system's auxiliary rudder for use under engine.