

# SKIPPER'S MATE

Short-handed and solo racers demand far more from their autopilots than any other boat owners. **RUPERT HOLMES** analyses



**T**he past few years have seen significant development in this field, so if you have an elderly system, or are contemplating starting two-handed or solo racing, then an upgrade may be well worthwhile.

To get started on the short-handed scene, the pilot you already have may suffice, especially for shorter distance inshore races. Granted in strong winds you won't be able to push the boat as hard as with a better pilot, especially if singlehanded, but this approach will enable you to jump onto the learning curve and get a taste of the short-handed scene without needing to commit significant expenditure up front. If you get hooked on short-handed racing,

when you do upgrade the pilot, the existing unit can be kept as a back up.

The simplest electric pilots are the basic all-in-one tiller pilots (or on-deck equivalent for wheel pilots). The lack of both a rate sensing (or gyro) compass and rudder angle sensor mean you can't respond quickly and will struggle to keep a boat on course, especially downwind under spinnaker in a quartering sea.

#### KEY INPUTS

For basic functionality of a decent system, the pilot computer needs the boat's compass heading, plus rate of turn and rudder angle (via a rudder reference sensor). True wind angle and apparent wind angle are also needed to enable the boat to steer to wind angles,

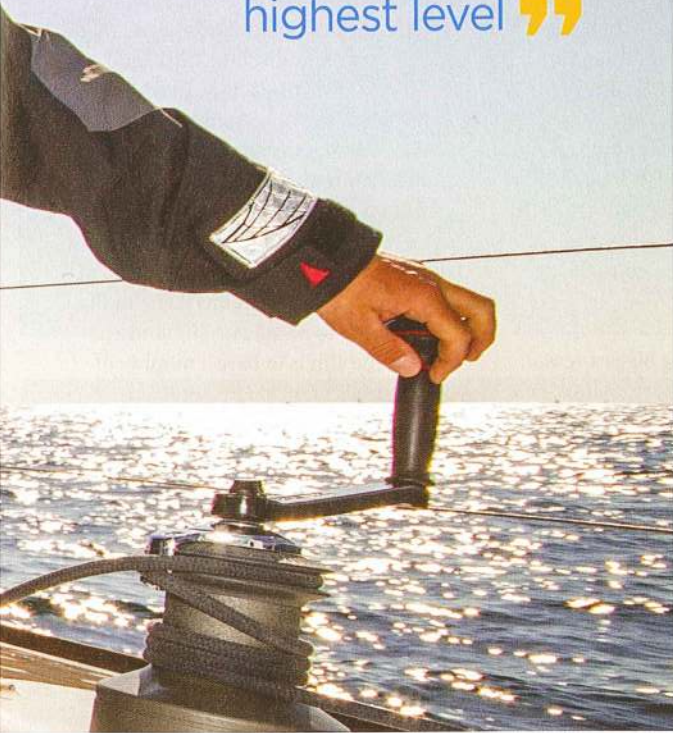
which is important both upwind and when running with a spinnaker set.

Heel angle sensors further improve the accuracy of steering by moving the helm in response to changes in the boat's angle of heel, rather than waiting for the boat to change course and then responding to that. Until recently this tended to be available on only high end systems. However, recently units have been developed with combined compasses/multi-axis sensors, such as B&G's Precision-9 compass that also provides accurate rate of turn, roll, pitch and heave data to the system. Raymarine's Evolution autopilot and Garmin's Reactor series go one step further in combining a 9-axis sensor with the pilot computer. These systems stand out compared



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“ Much of this training technology has come from the highest level ”



Above  
An autopilot is a must for solo or short-handed sailors

to older units as the interface has deliberately been kept as simple as possible. This means there are no settings to tweak for different conditions. While those who are new to short-handed sailing may welcome this, old hands may rue their lack of ability to tweak the parameters in challenging conditions.

While some early versions of these systems showed initial teething problems when pushed very hard when racing in boisterous reaching conditions, there have been numerous software updates that have solved the early problems and users now report these as being reliable, even in long-distance events such as the 610-mile SORC single-handed Round the Rock Race. Nevertheless, this highlights an

important point – that it's important to update software on a regular basis, especially with recently launched models.

While in most cases you have to add extra hardware to gain additional functionality, in the case of some NKE systems, you simply have to buy keys to unlock advanced software for features such as heel angle input and steering to wind angles. While this may, at first sound a clumsy solution, it means you can start with a relatively basic system that can easily be upgraded at a later date.

#### DRIVE UNITS

There are two key options here – either a hydraulic system or a mechanical 'linear' drive. Both enable the unit to be permanently attached to the quadrant, but allow for instant transitions between using the pilot and hand steering without disconnecting any hardware. Advantages of the hydraulic option include fast lock to lock times and incredible power, especially on larger models. They are well proven in the field, with excellent levels of intrinsic reliability, but tend to be more power hungry than mechanical drives.

Tiller steered boats are unlikely to have a quadrant below decks unless the model was also offered with wheel steering, or has twin rudders. In this case, options for the drive are more limited. Most opt for the Canadian built Octopus drive – a mechanical system with a powerful electric motor driving a Bowden cable connected to the tiller. A clutch releases when the system is switched to standby, allowing hand steering with almost imperceptible additional friction from the drag of the cable. The unit can be interfaced with any NMEA2000 compatible pilots and is offered in a package from B&G (as the SD10 mechanical drive) and NKE.

#### THE RIGHT SIZE UNIT

Manufacturers of all types of self steering gear generally quote recommendations by total displacement and boat length. Solo and doublehanded racers make demands on their pilots that are far in excess of those imposed in other kinds of sailing, so don't be tempted to skimp on the specification. In this context it's important to remember the displacement shown on the IRC certificate is with the boat stripped bare and with empty tanks. The weight of sails, safety gear, ground tackle, tools, spares, sails, crew, food and kit is considerable and must be allowed for, which can easily represent a further 20 per cent of displacement. →



■ The NKE unit



■ The Raymarine Evolution system



■ B&G's Precision-9 compass



■ B&G's Automatic Steering system



■ The Octopus drive connected to the tiller



■ A solar panel on the hatch garage is worth considering



■ The Octopus drive's powerful electric motor



■ An autopilot is a useful tool for short-handed sailing

## CONTROL UNITS

It's clear that control heads need to be mounted within easy reach of the helmsman, when on either tack. However, it's often also worth looking at siting controls elsewhere – being able to change course from the pit/companionway area can be very helpful when racing short-handed.

Most manufacturers also offer remote units that enable users to change course from anywhere onboard. For short-handed racing it's best if these can be worn on the wrist or forearm – if worn on a lanyard round the neck, the unit all too often becomes buried under layers of clothing. The NKE

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remote unit is also combined with a man overboard function with different modes depending on whether you're sailing solo or doublehanded.

### POWER MANAGEMENT

Given the reliance on the pilot, power management is an important consideration for offshore races – the system has the potential to consume significant amounts of power, making it more of a challenge to keep batteries topped up on any race of more than 15 hours' duration.

Most owners have deep discharge service batteries with a minimum of 230Ah capacity. A smart charging regulator, which significantly boosts the alternator charge rate, is universally seen as being essential. For long offshore events, back-up charging options, such as a solar panel on the hatch garage or a fuel cell, are also worth considering.

### REDUNDANCY

Pilot failure is by far the biggest reason for retirement in any short-handed race of more than around 500 miles, so it's sensible to consider a plan B. Twin rudder yachts often have a second unit in the system. This makes a lot of sense, but it's by no means a fail-safe panacea if it relies on the same instrument system and charging system as the main unit. If you do fit a second unit in this manner, it's important to ensure it's kept dry, adequately maintained and used periodically to check it works. There are legions of boats with a second pilot drive that has sat festering in a damp location for months or even years and no longer has any chance of functioning.

For boats racing very long distances a wind pilot is still a popular option that provides a completely independent back up that will work even following power failure. It's worth noting that half of the overall podium winners on corrected time in the last two editions of the OSTAR were equipped with windvane systems.

### GETTING THE BEST FROM A PILOT

Even the best self steering systems struggle with an unbalanced sail plan – so it's important to make sure sails are well trimmed and are reefed as necessary to suit the wind conditions. If the pilot appears to be struggling it's

often worth hand steering for a short period – it may be that you're asking it to perform an impossible task and the sails need trimming or reefing.

It's also important to remember that an electric pilot will be only as good as its inputs, so accurate calibration of the instrument system, including compass, masthead wind angle, and boatspeed is also important.

Traditionally electric pilots have allowed users to tweak the settings in order to get as close to 100 per cent performance as possible and, a number of units including those from B&G (and other Navico Group companies) and NKE, still have this facility. In addition to the basic 'response' setting, the more advanced rudder gain and counter rudder controls are important. Rudder gain is the ratio between the commanded angle and the heading error, while counter rudder counteracts the effect of the boat's turn rate and inertia, with the two tending to be adjusted in tandem. Ideally, the aim is to have a number of base settings for different wind angles and strengths, so that when changing course you can dial in the base numbers and then fine tune from there. Don't be tempted to rush this stage – even the experts may spend up to 15-20 minutes adjusting settings after each course change/change of conditions until they are happy – it's invariably time well spent.

## TACKTICK WIND INTERFACE

The faster the data reaches the pilot computer, the better chance it has of steering a good course. This is not a problem for boats with a NMEA 2000 data bus, but has historically presented an issue for the many raceboats with Tacktick wind instruments. There was only a NMEA0183 interface for these, with the data then needing to pass through a converter that introduced a time lag. However, Raymarine has been working on a new product designed to output the Tacktick data to NMEA2000 systems without a significant time delay. It's expected to be available for the 2017 season.