

You've got the plan, you've got the boat, you've got the time window – you're set to hit the ocean. Almost. How much thought have you put into your spares and tools inventory? And have you considered how you might maintain and repair all the key equipment?

Shipping the right spares and considering how you'd affect makeshift repairs at sea before they happen can make the difference between a trouble-free crossing and being forced to seek assistance or make unplanned diversions.

Thankfully we can learn from the experience of skippers who have already completed ocean passages. During the 2016 ARC crossing, 60 per cent of the 290-strong fleet reported a breakage of some sort. So, after last year's ARC, we quizzed the 254 skippers specifically about which spares they carried and what repairs they made at sea. The tips and feedback for what they'd do differently, make invaluable reading (see 20 tips/lessons learned, page 35).

PART 1: THINKING ABOUT SPARES

In the six months leading up to the 2017 ARC last November, an average of nearly €12,000 per boat was spent on spares – a significant investment that represents the value skippers place on carrying back-up solutions. We asked skippers on the 2017 ARC and ARC+ what spare parts they carried, in particular for steering/autopilots, power generation, engines, sails, cooking, plumbing, refrigeration and navigation.

Of immediate note from their replies and comprehensive lists of spares is just how well-prepared most yachts and skippers are these days. The World Cruising Club (WCC) is partly to thank for this with its thorough guidelines and minimum gear requirements.

But, however prepared you think you are, there will always be niggles or problems that can expose gaps in your spares inventory and call upon resourceful measures for repairs. Ripped sails and damage caused by chafe are the most common casualties on a tradewinds crossing, but the variety of problems the last ARC fleet encountered were widespread.

Steering/autopilots

The high number of yachts carrying a second autopilot shows how much skippers value having an electronic helmsman. Over 20 skippers noted that they had at least one back-up autopilot, with many shipping comprehensive spares and service kits, from rams to hydraulic fluid.

The Jeanneau SO49 *KALU' III* had two steering systems and two autopilot systems, for instance, and the Berckemeyer 48 *GreyHound* carried a windvane and autopilot, plus spare autopilot drive and computer.

At least ten yachts carried windvanes that they could use as back-ups to autopilot failure. The Shannon Pilothouse 38, *North Star*, found their Windpilot indispensable when their house batteries failed to hold enough charge to run the autopilot.

Barracuda of Islay, a particularly well-prepared Ovni 395 (they didn't have to make any repairs and did not lack any tools required), had a Pacific Windpilot as the primary means of steering control, with a hydraulic autopilot as back-up.

"The Windpilot can cope with nearly all steering conditions that we have with the exception of coloured

ARC BY NUMBERS

212
Number of monohulls

15.1
Average length (m)

43
Number of multihulls

14.4
Average length (m)

24
No of double-handers

54
Average skipper age

64%
Yachts with reported breakages



ARC entrant Erol Toprak's X-Yachts X46 Jarramas

sails in gusting winds (ParaSailor or asymmetric)," skipper Graham Walker explained.

Our 2016 ARC gear survey on breakages showed how skippers who reported steering linkage problems favoured replacing steering lines with Dyneema – and recommended carrying suitable lengths of line as back-ups. It is sensible to go through your steering system and evaluate how you would replace each part if it failed. Have you tried using the emergency tiller? What would you use for an emergency rudder? Do you carry a drogue?

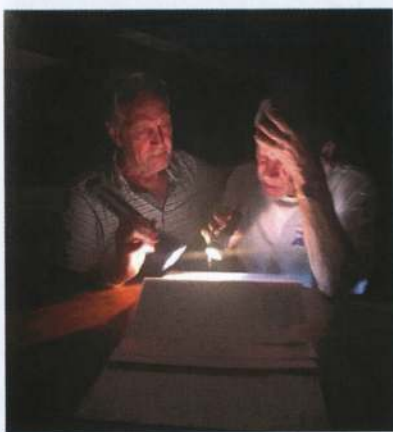
"In the event of rudder failure we have a Seabrake drogue system that we can use for emergency steering," *Barracuda's* Walker continued. "We carry a spare blade, spare bolts and a tool kit for the Windpilot, and a maintenance kit and fluid for the autopilot."

Power generation

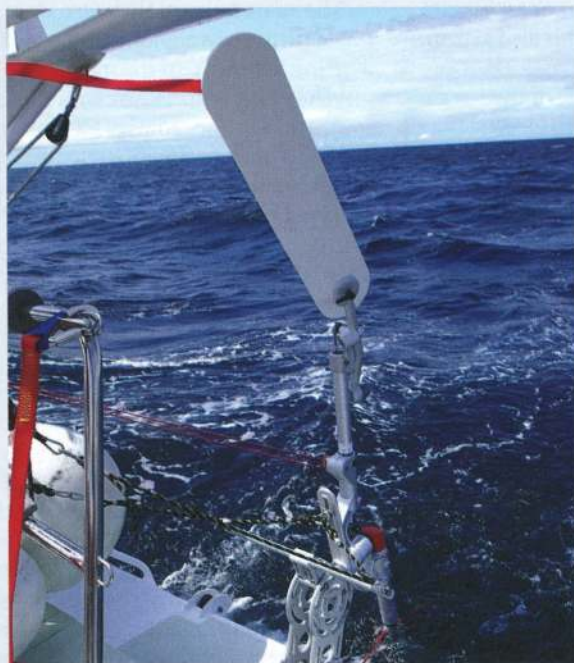
What happens when the lights go out, when you lose power? How do skippers best prepare for that?

Catamaran sailors will know the benefit of having two engines of course, but a variety of alternative means to generate power is prudent. Whether diesel power (engine or generator), wind, hydro, solar, or fuel cells, many skippers had a choice of at least three means of electrical power generation.

The Allures 40 *Passepartout* and the Hallberg-Rassy 46 *Shepherd Moon* took no chances and used a mix of engine/alternator, generator, wind, hydro and solar



Steve Butters (left) and Simon Timm aboard Oyster 53 *Nutcracker* trying to figure out why the Westerbeke generator won't start. "We couldn't get it to go – it was a failed oil pressure relay in the start sequence," said Timm. "No generator equals no watermaker, so we had a 5lt per day per person ration and no showering for the remaining 18 days to Saint Lucia."



Windpilot self steering gear coped with almost all steering demands aboard *Barracuda of Islay*



Left: the radome came adrift on *Umoya of London* during the first night of the ARC. Crewmember Jerry Norton went aloft to remove the sharp-edged remnants of the remaining fitting on the mast. Below: the damaged radome and broken parts of the shattered mast bracket



power. The Watt&Sea hydrogenerator continues to increase in popularity, with 17 listed as a spare means of power generation in the ARC fleets.

As we saw from the 2016 survey, generator problems are largely caused by a lack of routine maintenance and cooling issues (typically impeller or water pump failure).

And there was overriding advice from the 2017 skippers to make sure you have enough spares to maintain and service diesel engines and generators adequately: reserve oil, filters, impellers, belts, fuses, coolant, etc. Some ARC skippers also advocate carrying a spare water pump, diesel pump and alternator.

The ultimate back-up to engine failure is, of course, your sails. The feedback shows it is wise to take spare sails and plenty of rope and also to learn how to repair sails.

A comprehensive set of spare sheets, halyards, blocks, Dyneema strops and soft shackles are also recommended. A thorough sail repair kit as well as the time and patience required to fix sails can also negate the need to carry too many spare sails on an ocean crossing.

Navigation/instruments

The majority of ARC yachts were extremely well-equipped with electronic navigation and back-up systems. Most had at least a couple of alternative means for electronic chartplotting, as well as handheld GPSs and VHF's. Sextants were also carried by at least 24 skippers.

Steve Jobs probably had no idea his Apple products would one day be considered a viable means for sailors to navigate across oceans, but some skippers simply listed an iPad and iPhone as their spares for navigation.

Others were more comprehensive in their alternatives, such as the Beneteau Oceanis 55 *Julia* which recorded: "Sextant, supporting books, iPad with iSailor and separate batteries, handheld GPS, two handheld VHF's and a spare satphone." And the Bowman 48 *Tairua* carried "SSB, Satphone, two VHF's, two iPads, charts, sextant and tables".

Many skippers carried spare water pumps or repair kits for each of the heads aboard. A solar shower is also a useful back-up.

An electric hob or microwave is a good alternative to gas – if you have sufficient principal and back-up electric power sources. Most yachts carried between three and six spare bottles of gas.

A cockpit barbecue is a good alternative for cooking in the open and acts as a back-up solution if there is a problem with the galley hob.

PART 2: CARRYING OUT REPAIRS

Breakages can still happen even aboard the best-prepared yachts, so how do you deal with them when they do occur? The answer is to carry the right tools and spares, and be creative and resourceful.

Measures to combat chafing

Chafing issues and anti-chafe measures were once again the most common repairs made during the 2017 crossing. Using Dyneema sleeves on sheets and baggywrinkles on the rigging is advised to combat chafe on long downwind passages.

A galley chopping board was used creatively aboard the Beneteau Oceanis 55 *Julia* to help reduce chafe. "The spare halyard was moused and replaced as it was worn at the top of the mast," skipper Louie Neocleous explained.



A spare mainsheet (top) was used for support and a red IKEA kitchen chopping board was cut into strips to stop ratchet strops chafing when pop rivets failed on *Indian Summer's* boom vang



A plastic chopping board was called upon for a makeshift repair aboard the Beneteau Oceanis 55 *Julia*. Skipper Louie Neocleous said the spinnaker halyard exits the masthead and runs down the mast about 100mm to a metal fairlead. "Despite having a chafe sleeve... there was nothing to stop the metal snap shackle being hoisted too high up onto the metal fairlead. We knew we had to install some sort of stopper, so we improvised using a plastic chopping board."

"The spare halyard then also wore, so a plastic bush made from a sawn chopping board was fitted to stop wearing at the top of the mast."

A chopping board also came in handy on *Indian Summer*, a Hallberg-Rassy 42, when the crew had to fashion a boom vang repair.

"The pop-rivets collapsed on the port side where the boom vang is fastened onto the mast," Cecilia Hellner told us. "It probably happened when we accidentally dipped the boom into the sea during a night watch in strong winds when sailing goosewinged."

"We took three straps and tightened the boom vang fastening onto the mast as much as we could. The red plastic you can see on the photo (above) is a soft plastic cutting board from IKEA that we had in the galley, cut into pieces to avoid chafing on the straps."

"To release the forces on the boom vang further we connected a spare mainsheet from the boom to the very bottom of the mast."

Innovative rigging repairs

The crew of the Rival 38 *Haji* had a busy crossing. They replaced three different sheets, repaired a hole in the mainsail, recut the thread in a heavy shackle, and adjusted the rig set-up to fly twin headsails.

Meanwhile, aboard the Sweden 45 *Wild Iris*, the snap shackles on three 10mm rope blocks broke under load. ➤



Sailing by instruments: back-up navigation systems and a reserve means to power them are key considerations

Graham Walker



Graham Walker, skipper the Ovni 395 *Barracuda of Islay*: "We strengthened the masthead fitting for the spinnaker and ParaSailor and installed a second block at the masthead with a pre-moused line so that we could pull a new halyard through without going aloft if the main spinnaker halyard failed."

Graham Walker



Aloft in a bosun's chair to install pipe lagging on the spreader ends aboard *Barracuda of Islay* – a move to combat chafing of the sails

Graham Walker



Dyneema chafe sleeves installed over the first 2m of *Barracuda of Islay's* genoa sheets help to reduce sheet wear when running downwind



Mark Pollington reported that they replaced the shackles with Spectra.

When the D1 shrouds snapped aboard the 72ft *Challenger 2*, both sides of the rig were stabilised using lines taken to winches. Aboard the Bordeaux 60 *Tommy*, a spare Dyneema strop was used to repair the genoa's electric furling system. The Wauquiez 43 *Khaleesi* had to cut their spinnaker pole down, drilling and bolting the top to create a shorter but usable pole. And the Seawind 1160 *Victory Cat* "used aluminium bars to build a temporary rudder guide after track/car bearing failure."

Most useful tools

A comprehensive tool set is key to being able to fashion repairs at sea. Standard domestic DIY tools rated consistently highly in the survey – screwdrivers, a power drill, spanners, wrenches, pliers, Allen keys, a socket set, vice grips, wire cutters, a hacksaw, duct/rescue tape, a soldering iron, a multimeter, etc.

As for less common tools, a rivet gun and a large selection of rivet sizes are consistently singled out as useful to carry – as were ratchets and webbing straps for gooseneck repairs.

Among the bosun's gear rated most handy were a good torch/headtorch with long battery life, a trusty multitool, a cutting knife and snorkelling gear.

A hot knife is "great for rope alteration," said Richard

Savage, who had to re-run the spinnaker halyard three times aboard his HR46 *Shepherd Moon*.

Equally, a good sail repair kit from sewing kit/needles and palm to a sewing machine was recommended (for more on practical sail repair, see page 88 this issue).

Shipping a thorough selection of glues and lubricants makes sense. The skipper of *Nikita*, a Beneteau Oceanis 60, advocated taking a glassfibre repair kit and long bolts in case of broken portholes.

As the crew of *Mood Magic*, a Moody Carbineer 44, wisely commented, a 'creative ability to fix things' is key.

Perhaps the most significant recommendation for tools, though, came from Stephan Mühlhause, after he had to cut away the rigging when his Hallberg-Rassy 46, *Lykke*, was dismasted. "The most important tool was the cordless angle grinder. I cut all wires [shrouds] in 15 minutes, when it happened during the night."

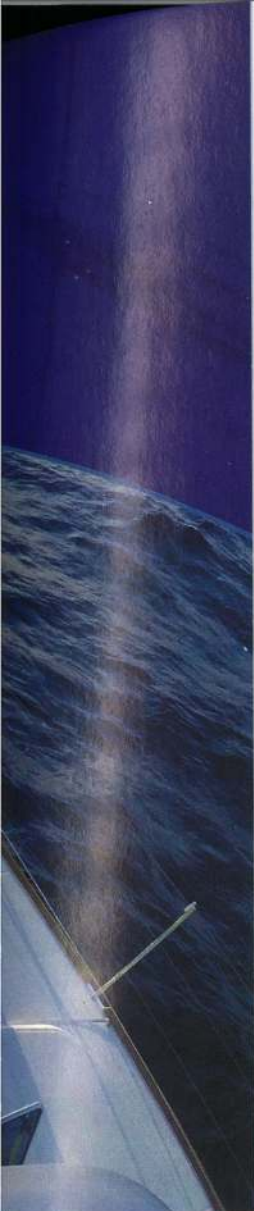
Mühlhause and his family had enough fuel to motor the final 300 miles to Saint Lucia. "We rigged our second spinnaker boom as an emergency mast, but only for the VHF, antenna and a light."

PART 3: LESSONS LEARNED

An overriding message of advice from the skippers' feedback was to bring 'more' – more fuel, more sail repair kit, more medical supplies, more adhesive, more shackles and blocks, more alternative power

Skipper Rik Farrer said they were lacking in downwind sails on their Lagoon 620, so "created running backstays to allow for more downwind sail area to be flown"





Top: making baggywrinkles aboard the Lagoon 620 *Moose of Poole*. Above: using a baggywrinkle to help prevent chafe of canvas



Right: before and after 'the day our spinnaker became two spinnakers'. Relative novices Dave and Haley have a vlog called 'The Daley Adventure', and went from RYA level 1 dinghy sailing to an ocean crossing in under a year – 'and are now happily at anchor in the Bahamas living our dream'

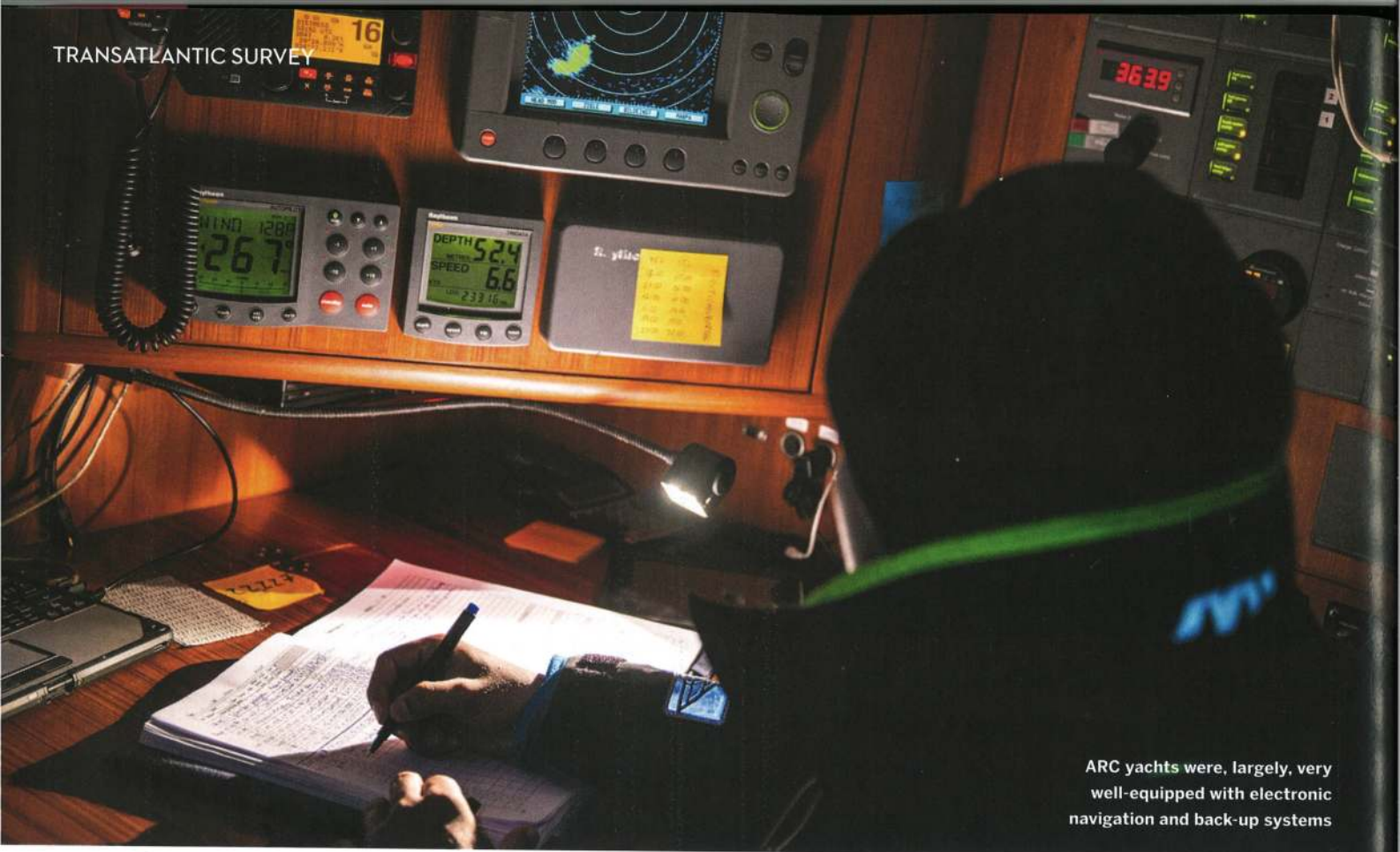


20 TIPS/LESSONS LEARNED



- 1 "If you think it needs doing, do it before you leave your home port." *Emily Morgan*
- 2 "Start preparing early – it's hard to receive parts once you have started cruising." *Umoya of London*
- 3 "Make sure you have taken everything apart, so you know what it looks like inside." *Kapalai*
- 4 "We have a lot of spares that we wouldn't have the confidence to replace." *Amuse*
- 5 "If you think you may need it, get it! The ability to dive under the boat to carry out work is also important." *Khaleesi*
- 6 "Start early and think through all eventualities seeking to build resilience into the system either through reducing probability of failure (maintenance/workmanship/practice) or by having back-ups in place – through spares, alternative equipment or alternative procedures." *Barracuda of Islay*
- 7 "We got it right, thanks in part to the ARC rules." *X86*
- 8 "It's impossible to carry spares for everything – carry more universal spares that can be adapted." *Quiset*
- 9 "Understand the system and how to repair it. It's no good having the spares but not understanding how to fit them." *Aedis*
- 10 "Think of solutions instead of single spare parts." *Salsa*
- 11 "Use new spares as primary and leave old ones as spares." *Saga*
- 12 "Keep an accurate record of the inventory of all spares. Service thoroughly all grey, black, and fresh water systems, and carry plenty of filters." *Clare*
- 13 "Make a spreadsheet with locations of all spares." *Barracuda of Islay*
- 14 "Twenty days is a long time and equipment wears – anything that rubs will chafe." *Raftkin*
- 15 "Spot the areas of rope chafing, tighten every single screw/bolt." *Gust of Wind*
- 16 "Pre-rig at least one back-up halyard." *Alamak*
- 17 "Give more consideration to chafing on spinnaker halyards – twin headsails is a much better option." *Julia*
- 18 "Find a good solution for the boom preventer and use more soft-shackles instead of steel shackles." *Quiset*
- 19 "Make bushes for gooseneck fittings to reduce wear." *Mad Monkey*
- 20 "Bring extra halyards and a rivet gun." *Shepherd Moon*





ARC yachts were, largely, very well-equipped with electronic navigation and back-up systems

means, more generator parts, more hoses, more filters, more duct tape – and more patience.

Some skippers had issues with their alternators and advised taking spare alternators and parts. A functioning alternator is essential for maintaining comfort, especially if you don't have reliable sources of alternative power.

And, whatever your means of charging the batteries, they are still the life source of power aboard. During the 2016 ARC, 15 yachts had issues with charging old batteries, and on the last crossing two yachts had to make a pitstop in Cape Verde to replace theirs.

A few skippers assumed their batteries were OK but found they would not hold charge. So double-check your batteries and measure their state of charge well in advance of heading offshore.

We asked skippers what modifications they plan to make to their yachts or systems as a result of their ARC crossing. The answers largely came down to more electrical power and better offwind sail power – and the necessary attachments/deck gear (stabilising spinnaker poles, whisker poles, extra spinnaker halyards, blocks and preventers). The crew of *Tintomara* summarised it nicely: “more solar power, an extra wind/water generator, and more downwind sails”, while *La Cigale* wanted “one more cheap secondhand downwind sail for at night”.

Many skippers intended to fit an alternative means of power generation following their crossing – hydro or wind – to improve their alternators, or to increase their number of solar panels.

Personally, I like the sound of sailing on *Mood Magic* as they only planned “small changes: more cupholders, a cockpit fridge and outriggers!”

The lessons learned with regards to spares and repairs were the most telling and useful section of the survey. As Brian Steven on the *Island Packet 420 Brag* declared: “Assume that things will break – they do!”

FINAL THOUGHTS

Director of World Cruising Club, Jeremy Wyatt, has attended all 20 ARCs since 1998

The ARC survey has shown how seriously many ARC skippers think about overcoming potential problems at sea. Their spares kits reflect this.

One area of concern to anyone planning an ocean crossing should always be how to cope with a steering failure. Often boats are heavily loaded at the start of a passage, and then encounter large tradewind waves, which puts a strain on boat and gear.

Clearly, thorough inspection and maintenance is important before setting sail.

However, plenty of ARC skippers are also planning for steering failure with a range of solutions. Perhaps the easiest is packing suitable lengths of Dyneema lines or spare cables. For hydraulic steering systems, spare hydraulic oil is essential.

Windvanes, especially Hydrovanes, with their auxiliary rudders, were popular, with 19 boats using them. Perhaps most surprising was the number of boats (30) with either dual autopilots fitted giving 100 per cent redundancy, or carrying a full spare pilot. More still had spare linear drive arms, and/or pilot computers providing a back-up. Spare fuses can also help fix an unhappy pilot – eight pilot failures were recorded in 2017.

While fully crewed boats can hand-steer if needed, having functioning self-steering is essential for short-handed crews. For them the cost of a spare autopilot, or a windvane, is outweighed by the mitigation it brings to what would be a serious problem.

This is the best way to view your spares locker on a system-by-system basis and consider the knock-on effect of any item malfunctioning.



Jeremy Wyatt, director of World Cruising Club, provides crucial support for our survey data