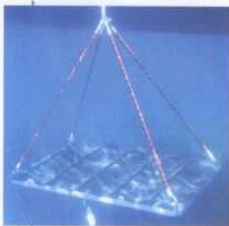


BOATMASTER: SKILLS | KNOWLEDGE | KIT
STABILISING SYSTEMS

"I MADE MY OWN"

For my 25-tonne, 58ft boat I started with two galvanised steel floor grates (like a cattle grid), with fabricated round corners and a surface area of about 0.75 square metre each. Then I zip-tied reinforced rubber matting onto the top in a number of sections – otherwise, the rubber would just lift and fall with the roll of the boat and be less effective. Then I had suspension ropes made up in Dyneema to minimise stretch, and added a tripping rope for retrieving them, and connected it



all up. I wanted plenty of weight so they would sink quickly enough, but I think I overdid it, as they weigh about 18kg each and are a bit heavy to move around the boat. I could get away with lighter floor grates.

How well do they work? Not very is the answer. They do have an effect, but I would say they only reduce roll by about 25%, perhaps because I don't have outriggers on my boat.

I have a second set to try now. Hopefully doubling the surface area will show more benefit.

Nick Houghton (Nick_H on the MBY forum)

vessels and are almost certainly the most widely used form of stabiliser. The simpler ones are only effective under way as the fins move relatively slowly and rely on the pressure of the water passing along the hull to create the upward or downward thrust needed to counteract the roll. A small gyroscope acts as a motion sensor and synchronises the movement of the fins located on either side of the vessel a few feet below the waterline.

Can fins also be used at anchor?

Yes. So called 'zero speed' stabilisers work in much the same way as conventional fins but are larger with more powerful hydraulics, enabling them to move much more quickly and generate enough upward or downward thrust through the power of the fin alone to counteract rolling at anchor. In effect they are constantly doggy-paddling to keep the boat as upright as possible. They are bigger than conventional fins, create more drag, command a healthy premium and require careful programming to suit the boat's roll characteristics. They tend to be used on larger displacement or semi-displacement yachts.

Any drawbacks?

Unless you can afford the zero-speed stabilisers, fins are only really effective over five knots. In heavy following seas there have even been reports of them being forced round in the opposite direction. Being mechanically driven there is a risk that they may break down just when you need them the most. Their inherent vulnerability to grounding or collisions with

semi-submersed objects is a small but potentially concerning risk as they penetrate the hull below the waterline. The extra drag reduces performance and increases fuel consumption even when not in use.

Who makes fin systems?

Naiad, TRAC, Wesmar, American Bow Thruster and Quantum among others produce a whole range of fins for use under way and at anchor.

What are the power requirements?

A typical stabilisation at rest system uses 9kW of power and will need the constant running of a

By using slightly longer fins and powerful hydraulics the fins effectively 'doggy paddle', keeping the boat still even when stationary

generator. This compares with the 3kW draw of a gyro system. Having said that, fins are still very effective in motion, when they are generally cheaper to run than a gyro system.

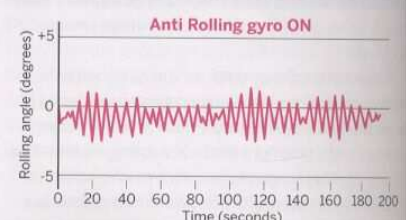
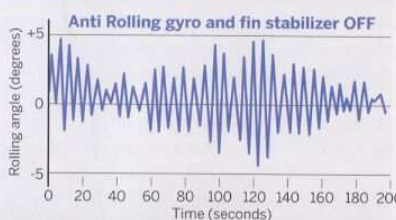
So what about gyroscopes?

Just like the spinning toys we had as kids, a gyroscope will resist any attempt to push it off its axis. When

Even planing craft like this Ferretti 510 can be fitted with stabilisers, in this case Mitsubishi's ARG system.



These two graphs show the effect of Mitsubishi's gyroscopic system on a 30m Custom Line Navetta at anchor. Both the degree and rate of roll are reduced by around 50%.



scaled up and fitted to a boat, it will do exactly the same with the rolling motion of a boat. In this case the rotor sits in a swivelling axle mounted on a support ring (or gimbal), which can rotate at 90° to the rotor. A quirk in the workings of a gimbal is an effect called 'gyroscopic precession', which essentially means that the reactant force acts at a 90° angle to the applied force. For example, if force is applied to the axle in an upward direction, the rotor will deflect force downwards. Early gyros were ludicrously heavy and could have seriously detrimental effects on a boat's speed and efficiency – the largest commercial applications often weighed over 500 tonnes. Modern manufacturers like Seakeeper and Mitsubishi have counteracted this problem by using smaller rotors while increasing rotor speed to provide similar levels of stabilising force.

How do they make them spin fast enough?

Both Seakeeper and Mitsubishi use an electric motor to get the rotor up to speed and keep it rotating. This can take up to 45 minutes, although they will both start to have a useful effect within 20 minutes. This does, of course, mean that unless your boat has huge battery reserves you will need to keep the generator running, somewhat negating the near-silent operation of the gyroscopes themselves. Both systems can be mounted as a single unit in a smaller boat or in multiples for larger ones.

What's the difference between the two systems?

The key difference is that Seakeeper mount their rotor in a vacuum inside a sealed globe so there's no air resistance. This enables the gyro to spin faster using less power and a lighter weight to create the same stabilising force as a larger, slower-spinning gyroscope. The Seakeeper weighs 455kg, spins at 10,000rpm, takes 45 minutes to get up to the rated RPM and draws 1.5kW of power once up to speed. Azimut formerly had sole rights to the Seakeeper system but it can now be retrofitted to any boat with sufficient space (realistically from 40ft upwards).

Mitsubishi offer two different rotor sizes, the ARG2000 weighing 300kg and the ARG4000 weighing 700kg. This larger unit spins at 3,500rpm and takes up to 45 minutes to reach full speed. It draws 3.5kW of power. The Ferretti group have the sole rights to the Mitsubishi ARG system until 2011, and fit it (often as an option) to everything from small planing boats such as the Ferretti 470 up to big semi-displacement craft such as the Custom Line Navetta 33. The bigger the boat, the more units they fit.

The main benefits of gyroscopes are that they are just as effective at anchor as under way, and that they don't create any drag, making them particularly suitable for planing boats. But they are heavy and take up quite a lot of space.

What do boat owners say?

Boat owner Bruce Turner upgraded to a Linssen 500 because it had fin stabilisers. "The system we have is only really effective over three knots, but when it does kick in it is very impressive. I would say the boat rolls 75% less with the stabilisers active. A strange side-effect is that in a following sea the fins can sometimes flip around and face in the wrong direction, seriously



Folding outriggers on this Nordhavn 47 are used to deploy the paravanes.



The paravanes stow neatly on the transom when not in use.



The Seakeeper gyro is mounted in a vacuum to reduce air resistance.



Computer-controlled fins deflect water flowing past the hull to reduce roll under way.



The main issue with fins is the drag.

compromising the boat's steering and stability. It's quite unnerving," he says. But he adds that cruising has been vastly improved by the addition of stabilisers and has broadened his horizons.

Paravanes have their fans, mainly on account of their price and simplicity, and are said to reduce roll by around 25 to 40%.

We spoke to the owner of a Nordhavn 55 who had a stabilisation-at-rest fin system fitted, and it seems it has proved quite a revelation. "I would say that they reduce roll by roughly 80%. We spent a week at anchor recently and it was as comfortable as being in port," the owner says.

From our own experience of gyroscopes, they are most appreciated at anchor. Planing hulls tend to be stable at speed without any assistance but are vulnerable to rolling at rest or when running in displacement mode. The main issue is that long start-up time.

How much do they cost?

As a guide, the options price for fitting the Mitsubishi ARG4000 system to a Ferretti 560 is currently around £55,000. The stabilisation-at-rest fin system on the Nordhavn 55 is more like £30,000. Paravanes become too cumbersome above 50ft so looking to fit them on

a boat around that size will cost just under £10,000, and flopper-stoppers will be more like £2,700 – unless you make them yourself (see panel facing page).

Any other stabilising devices?

There are some lesser-known devices such as rudder roll stabilisers, which rely on the very fast movement of the rudder to counteract roll, and interceptors, which work on the same principle as trim tabs but on a much larger scale. There are also more primitive solutions, such as ballast tanks but fins and gyroscopes seem to be the current favourites.

Any future developments?

The control, combination and efficiency of all of these systems are the main target for designers as they seek to reduce their size, start-up times, power consumption and price. **MBY**

WITH THANKS TO

Naiad Dynamics: www.naiad.com
Nordhavn Europe: www.nordhavn.com/europe
Seakeeper: www.seakeeper.com