



Which of these 14 anchors fared best in simulated Force 10 winds?

MOTOR BOATS TESTED

Pick the right hook

From classic anchors that have stood the test of time to cutting edge models that are not yet available in the UK. Which ones performed best?

REPORT BY TOBY HODGES & BILL SPRINGER

How do you choose an anchor? Are you looking for 'a lunch hook' or heavy-duty hardware on which you can stake your life – and your boat – when a storm blows up?

Choosing an anchor used to be easy – choices were limited to CQR plough types or Danforth types.

Most boaters continue to place their faith in these, but isn't it time we looked seriously at the claims of new generation anchors?

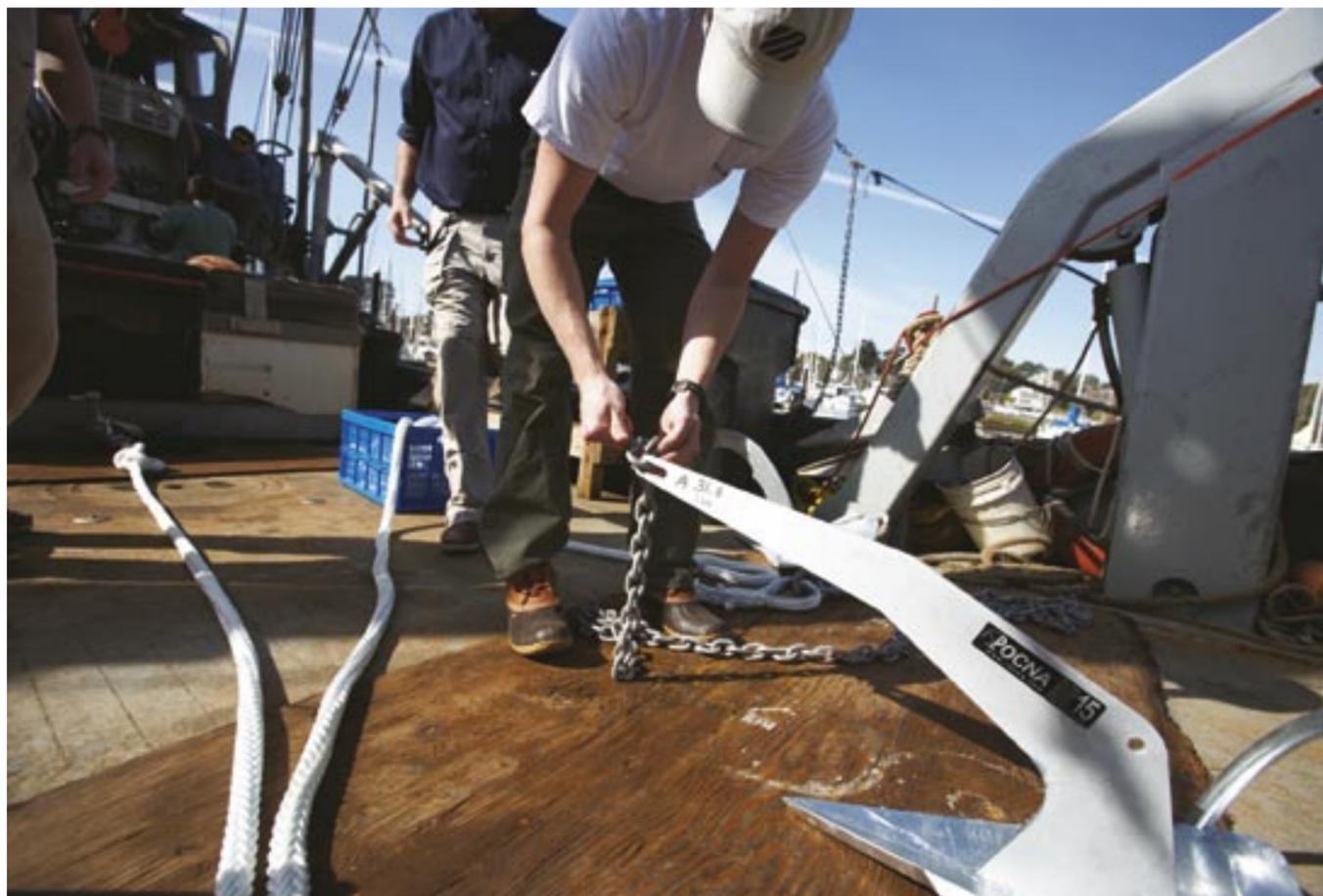
We collaborated with SAIL magazine in America and our sister publication Yachting Monthly to carry out the most comprehensive group test we have ever performed. Over three days in California we

conducted tests on 14 anchors – a mix of traditional, proven designs, several next-generation models and some futuristic newcomers.

Testing the anchors beyond normal conditions at maximum loads was our objective – because when a gale blows up, that's when anchor performance and holding power are critical.

Anchor tests are notoriously subjective. There are so many variables: windshifts, waves, currents, different seabed conditions, different cable or chain configurations, and varying scope. Our task was to keep variables to an absolute minimum. The weather was ideal with light-to-zero wind and a faint swell. We





Each anchor was attached to 20ft of 5/16 inch chain cable and 108ft of 12-strand 1in nylon rope for the 5:1 scope test, and then lowered into a depth of 20ft

What loads can anchors expect?

The load forces on an anchor cable in storm force winds on a 35ft boat equate to around 1800lb, according to the American Boat and Yacht Council (ABYC). But these values do not take wave forces into account.

Alain Fraysse has a spreadsheet online at alain.fraysse.free.fr/sail/rode/rode.htm that shows a 35ft (10.7m) boat in a 60-knot wind could experience dynamic loadings of up to 6000lb.

Of course, most motorboats are unlikely to be out in conditions like those. We will use an anchor, more commonly, for stopping for lunch in a bay or, potentially, to prevent drifting onto a lee shore

in an emergency caused by sudden engine failure.

From Alain Fraysse's figures, a 35ft boat would experience loads of around 380lb in 15-knot winds (a strong blow if you're stopping for lunch) and around 1500lb in 30-knot winds (tough conditions to experience engine failure).

Our tests were based around a maximum load of 5000lb, which is well in excess of the stresses a motorboater might expect.

Remember, though, that your anchor is a piece of safety equipment, and must be capable of dealing with worst-case scenarios, not just ordinary circumstances.



The Spade anchor awaits hoisting aboard *Shana Rae*



The anchor chain was securely fastened to a steel frame

used three locations off Santa Cruz, California, with different seabed conditions.

Each anchor tested is available in a range of weights, but we used

products recommended for a 35ft cruiser.

Do check before you buy, though, as displacement can have an effect, too. The

anchors were tested at least three times at 5:1 scope (ie the chain/rope combination was five times longer than the depth of the water) at one location and again at two further locations. A bottom sample was taken at each location with a core-

sampler. We used a known depth (20ft), dropping each anchor in fresh holding ground alongside the last position, which was confirmed by GPS. Depth was measured by

echosounder and leadline.

anchors were attached to the 20ft of 5/16in chain cable and 108ft of 12-strand 1in nylon rope. Why didn't we use all chain? It's

true that it will add weight and give a better pulling angle, but an all-chain cable doesn't absorb shock loads. Experts say that, in extreme conditions, the best compromise is a rope-chain combination, which has elasticity to compensate for

“Revs were increased until the anchor dragged or broke out”



Our powerful test boat was *Shana Rae*, a 48ft research vessel with a 375hp Caterpillar engine driving a 40in prop, which simulated gale-force pulling power

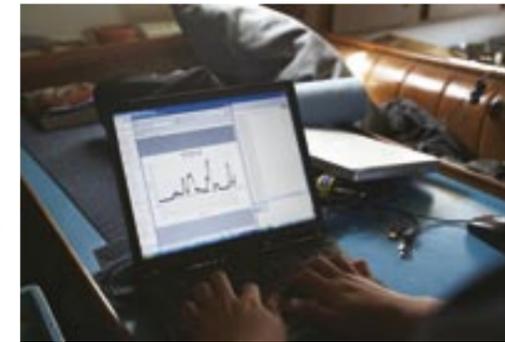


Data crunching

So how did we measure the results of each trial? The digital load cell attached to the anchor cable automatically sent two or three readouts to the laptop PC every second. Thanks to computer-savvy Phil Cowley, West Marine's product tester, the data was put onto an Excel spreadsheet and was accurate to two pounds. This

eliminated the chance of human error and showed exact load recordings for every pull we conducted. A second digital readout on deck (pictured right) provided live tension feedback.

A hydraulic windlass and a large open deck made a perfect testing platform



The anchor cable sent readouts to the laptop every second



shock loads, which our tests involved. The cable was connected at the inboard end to a digital dynamometer linked to a PC and the test boat's engine idled until the anchor was set. Revs were steadily increased until the anchor dragged, broke out or reached the maximum failsafe load we had set at 5000lb – when the test was terminated.

anchors that failed to set at 5:1 scope were tested at 7:1 scopes. And the top performers were further tested at a deliberately short scope of 3:1 – both to replicate what might happen in a crowded anchorage and to see which anchor finally broke out and under what load.

Veering tests were also conducted. We motored over anchors at 90° and

180° angles to see if they broke out and how quickly they re-set.

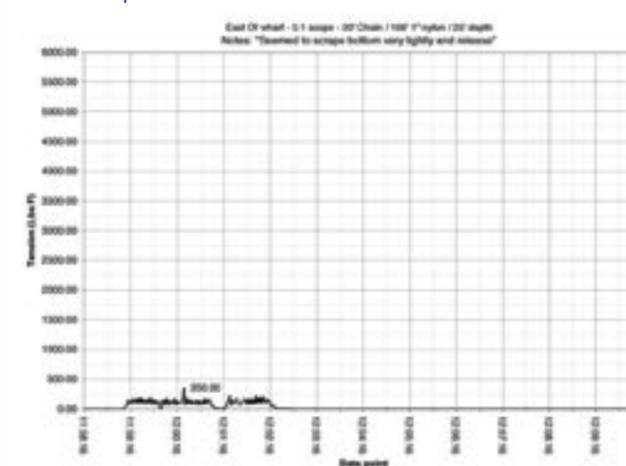
The main tests took place off Santa Cruz Harbour, California. Samples revealed the top five inches of ground were fine-grained, dark sand on top of harder almost clay-like sand. The second location had similar holding but less densely packed sand. And the third location,

just down the coast, was similar but with a harder, clay-like sand underneath. Sand, mud or clay provide the best holding conditions for safe, reliable anchoring.

Finally, on land we set up a beach-drag using a powerful RIB so the team could see for themselves how each anchor rolled and buried itself.

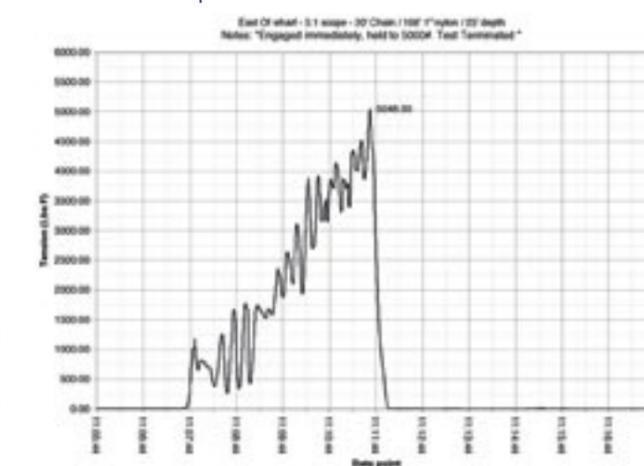
What the results looked like

Non-Set Graph



A graph was produced for every single anchor test conducted. This one shows the results for an anchor that failed to set after dragging on the bottom of the seabed for three minutes

Max Resistance Graph



This graph is an example of an anchor that performed well. It reached our maximum pull of 5000lb as we gradually increased load over four minutes before terminating the test

Fortress FX37

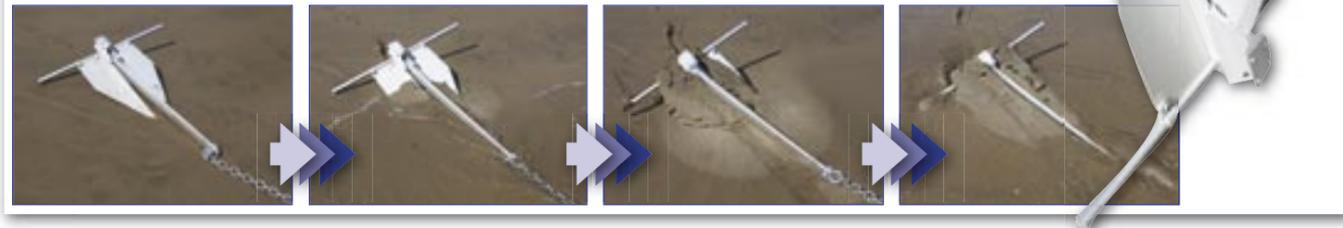
Weight: 22lb (10kg)

The Danforth-style Fortress anchor is made of corrosion-resistant aluminium and is as strong as steel but only half the weight. It can be flat-packed for shipping and has proved the perfect kedge anchor and storm anchor for many users.

The sharp flukes have adjustable angle settings for soft mud and sand. The Fortress's ability to dig in instantly and hold was astonishing – especially when it weighs only 22lb, one of the lightest anchors tested. At 5:1 scope, it dug in immediately each time, its cable quivering like a bowstring as the test boat's 375hp engine produced whirlpools of turbulence. We terminated the test at the maximum 5000lb pull. The anchor hadn't budged.

We subjected it to a further test at 3:1 scope, and it gave an amazing 4500lb-plus resistance, though the shank bent slightly during our veering test. This is a lightweight anchor, which should prove dependable in an emergency.

Price: £485 **Contact:** Proboat (in UK) **Tel:** 01621 785455 www.proboat.co.uk www.fortressanchors.com



CQR 35

Weight: 38lb (17.2kg)

The faithful CQR plough anchor, originally patented by Simpson-Lawrence in 1933, is now marketed by Lewmar, with the same drop-forged construction as S&L's. We were surprised, therefore, that during the first three tests at 5:1 scope, it failed to set. No matter how slowly we went, or how much we tried to manually coax the anchor to set, it seemed to skip along the seabed. Even at 7:1 scope it failed to penetrate.

It set and held briefly at 2000lb at our second location, but released instantly and didn't re-set. On the beach pull, it also failed to penetrate as well as most, and dug a long trench. The CQR has a sharp point, but we concluded that there might not have been enough weight over the tip to penetrate the hard sand. The combination of a heavy shank and hinge means it can also slide along on its side without engaging.

Price: £326.04 **Contact:** Lewmar **Tel:** 02392 471841 www.lewmar.com



Delta

Weight: 36lb (16.3kg)

The Delta is a one-piece plough-type anchor made from manganese steel with an angled shank and ballasted tip. Designed to be self-launching, it has a lifetime guarantee. It set quickly and gave good resistance, averaging around 3000lb before breaking out. But in the first three pulls at 5:1 scope in our first test location it failed to reach maximum 5000lb load – ploughing a trench through the seabed (more than 700ft in one pull, recorded on GPS!)

At the second location at 5:1 scope, it set quickly and held at 5000lb in slightly more loosely packed sand. It didn't perform as well at the shortened 3:1 scope, where it averaged around 1200lb resistance. In the beach pull tests, it set quickly and firmly. The Delta was one of the better, more consistent performers.

Price: £151.25 **Contact:** Lewmar **Tel:** 02392 471841 www.lewmar.com



Oceane

Weight: 38lb (17.2kg)

The Oceane was developed as a cheaper, lighter option to the Spade. Its shank is positioned to provide weight over the tip but its shape is awkward to stow on a bow-roller – a 'shark fin' on the shank stops the point damaging the bow. The Oceane was a good example of why it's worthwhile testing at different locations.

The Oceane failed to set at the first and third locations – even at 7:1 scope it only managed a brief dig-in at 800lb. However, at the second location the anchor set and held at a maximum 5000lb pulling power on multiple pulls. Since our tests, the Oceane has been superseded by the 'Sword', which looks a promising combination of the Spade's proven design and Oceane's budget price.

Price: £170 (price for Sword) **Contact:** Blue Water Supplies Ltd. **Tel:** 01534 739594 www.bluewatersupplies.com



Claw

Weight: 33lb (16.3kg)

The Claw is Lewmar's version of the Bruce anchor, which has been around since 1972. Used by cruisers the world over, it was used to secure oilrigs to the ocean floor. The Claw is made from a single piece of high-grade steel and stows well on the bow-roller.

We were surprised it was one of the worst performers in our tests. The maximum resistance at 5:1 scope was 886lb – for a brief moment before breaking out. The tension graphs showed that the anchor never penetrated properly, setting and releasing rapidly or simply scraping the bottom. Is this because the Claw doesn't share the original geometry of the Bruce design? Were the Claw's flukes simply not sharp enough to penetrate the harder clay-like sand?

We recorded similar results at 7:1 scope. The beach trials showed the Claw ploughing a longer trench down the beach than most. Our conclusions were that the flukes of the Claw weren't sharp or weighted enough to penetrate.

Price: £60.10 **Contact:** Lewmar **Tel:** 02392 471841 www.lewmar.com



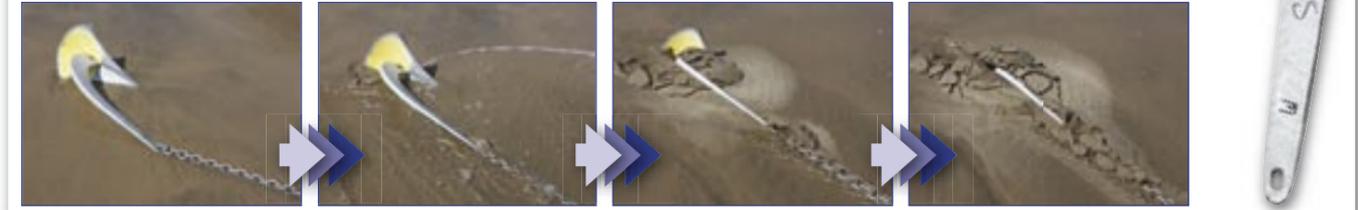
Spade 80

Weight: 34.4lb (15.6kg)

The Spade, launched in 1999, was a revolution in anchor design, with French inventor Alain Poiraud pioneering the use of concave blade and surface area to give holding power, rather than weight. It uses a wedge-shaped 'ballast chamber', to ensure weight is over the tip, so it digs in instead of ploughing a trench. For ease of stowage the Spade's shank disconnects, but make sure you use the correct locking nut, as one boater lost his boat because of the wrong connector.

The Spade has proven itself in most tests and ours was no exception. At 5:1 scope it repeatedly held at the maximum 5000lb. On veering tests it held up to 5400lb. The beach pull tests showed how the weighted tip dug in instantly, with no drag-time. On shortened 3:1 scope, and at the third location, results were mediocre. Nevertheless, this was one of the top three performers on test.

Price: £386.58 **Contact:** Blue Water Supplies Ltd. **Tel:** 01534 739594 www.bluewatersupplies.com



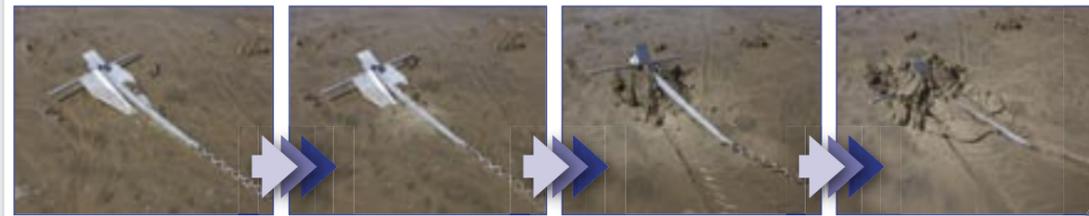
West Marine Performance 20

Weight: 26.3lb (11.9kg)

The Performance 20 is West Marine's version of the Danforth-type anchor. It failed to impress our test panel and caused lots of discussion, as we were consistently unable to get it to set at various scopes and locations. Its maximum holding of just over 1500lb at 5:1 scope was recorded at the third location, New Brighton, where the seabed was less dense with brown sand on decomposing clay. Even at 7:1 it failed to set at the first location.

The other Danforth-type anchor on test (the Fortress) proved beyond doubt the effectiveness of the design. Were the flukes on West Marine's version simply not sharp enough? Was the angle at which they are set wrong? Either way, this proves the geometry of anchor design is an exact science.

Price: £107 + £85.50 (shipping + tax) = £192.50 **Contact:** West Marine **Tel:** 0800 895473 www.westmarine.com



Sarca Anchor No5

Weight: 33lb (11.9kg)

Designed for optimum holding in a wide variety of seabeds, the SARCA (Sand And Rock Combination Anchor) is the result of six years R&D by Australian Rex Francis. This 'new generation' anchor was the first to use a slot in the shank, allowing the shackle to slide forward so you can trip and recover it if fouled in rock or coral. The convex blade shape helps create a vacuum and the slots break the suction for recovery. On every 5:1 pull at all locations it set quickly, recording a max peak of 2962lb.

Its average holding power was 1800lb. Even when we drove the test boat over the anchor to simulate veering, the Sarca held at 1000lb-plus and on the 3:1 scope test. The ideal anchor will hold in every seabed and the Sarca certainly comes close. It may not have as much holding power as other roll-bars, but it was a consistent performer.

Price: Sarca 5: 14.8kg £234.95 (galvanised) **Contact:** www.anchorright.co.uk

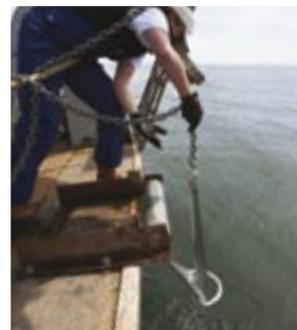


Roll-bar type anchors

These anchors, pioneered by the German Bugel, are designed to self-right on the seabed with a 'roll-bar'. Like the Spade anchor, it's the spoon-like concave blade area on each of the anchors (excluding the convex Sarca), and not the weight, that provides the ultimate holding power. They penetrate the seabed with ultra sharp fluke tips.



The slots in the Sarca Anchorright are designed to break the vacuum when recovering the anchor from the seabed



Our tester drops the Bugel 20ft to the seabed



The Manson Supreme was unfazed by the veering tests, but on the downside it's awkward to stow

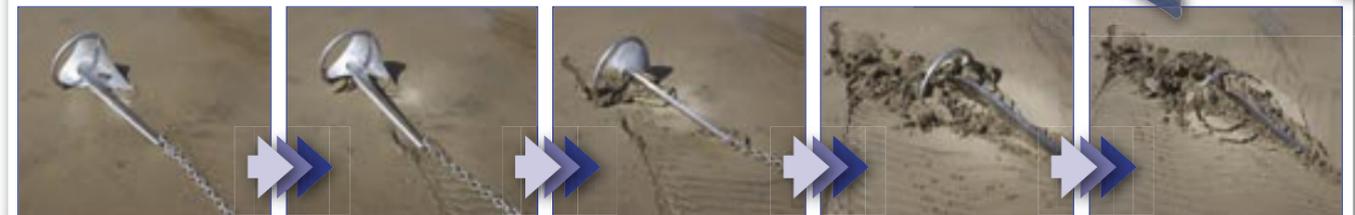
Manson Supreme

Weight: 35.9lb (16.3kg)

Manson is a New Zealand company specialising in high-tensile stainless steel anchors. Its Supreme anchor, launched last year, is similar to the Rocna design. It also copies Sarca's shank slot: the shackle slides forward to trip the anchor. Its penetrating tip is claimed to set in the anchor's own length.

At our first test location it set immediately and held to the maximum 5000lb pull. Even on 3:1 scope it held to an astonishing 4612lb. It was unfazed by the veering tests, refusing to budge at 5000lb from all angles. At other locations it wasn't quite as steadfast, but still set and provided around 2500lb of resistance. Its downside, like the other roll bar anchors, is that it's awkward to stow, except on the bow-roller.

Price: 16kg/35lb £218 (galvanised) **Contact:** Superyacht Docs **Tel:** 02392 476566 www.superyachtdoc.com www.manson-marine.co.nz



Rocna

Weight: 32lb (14.5kg)

The Rocna incorporates clever ideas from different designs into an extremely effective anchor. A long, angular Delta-esque shank meets a large concave surface blade area associated with the Spade, with a chisel-blade tip and 'skids' on the back of the blades ensuring rapid penetration. Like the Delta, it has no moving parts and is self-launching. Designed by sailing veteran and New Zealand boat-builder Peter Smith, Rocnas are made from alloy steels with hot dip galvanised zinc finish. Weight is in the tip, not the heel.

The Rocna was a powerful, impressive performer in our tests, recording instant sets at multiple 5000lb maximum (or near max) pulls at 5:1 scope. On the second 5:1 pull, it released suddenly at max tension when revs were reduced, only to reset instantly at 4300lb of resistance, which was astonishing for an instant set. It was less impressive at 3:1 scope and under veering tests, but remained a consistent top performer. **Price:** £310 **Contact:** Rocna www.rocna.com



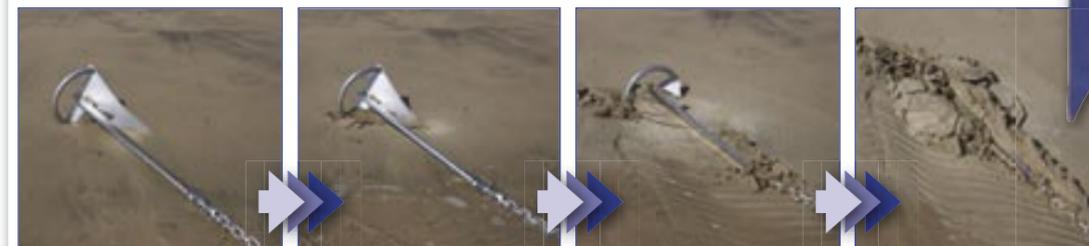
Bugel

Weight: 32lb (14.5kg)

The German-designed stainless steel Bugel, made by steel-manufacturer Wasi, was the first of the 'new age' anchors to use a roll-bar. The flat, triangular blade is smaller than most, with a sharp tip. The shank is set at an acute angle to drive the tip down under force. It comes with the patented Wasi Powerball – a swivelling stainless steel anchor connector. Its price, however, is considerably higher than its roll-bar competitors.

At the first location the Bugel performed well at 5:1 and 3:1 scopes, averaging over 2000lb resistance during four pulls and recording a 4000lb spike. At the other two test locations, performance declined. The smaller surface area of the blade may explain why its holding power never matched some other roll-bar models on test.

Price: £586 **Contact:** Blue Water Supplies Ltd. **Tel:** 01534 739594 www.bluewatersupplies.com



The shape of things to come?

None of these anchors are available in the UK yet, but we have included them to give readers a unique example of how anchor design is evolving

Hydrobubble Yachtsman EzyStow

Weight: 16lb (7.3kg)

This Heath Robinson-looking design, with its curious 'float bubble' on top, looks like an April Fool joke. It soon wiped the smile off our face when it withstood multiple pulls on 5:1 scope at 5000lb – our maximum. And it weighs a mere 16lb, the second lightest on our test!

It set quickly and worked beautifully every time. The bubble is designed to help it settle at the ideal penetrating angle and the upside-down V-blade penetrated and dug in without the aid of a sharp point.

Price: \$302+ shipping and import duty **Contact:** Anchor Concepts. www.hydrobubble.com



Bulwagga

Weight: 28.6lb (13kg)

Another weird creation, the triple fluke configuration looks like a sculpture for the Turner Prize. It looks painfully awkward to stow and can't be taken apart. Yet, whichever way it falls, two flukes dig in. It certainly set quickly, holding at 5:1 scope with a peak resistance of around 2500lb averaging over 2000lb. But at 3:1 scope, performance fell off dramatically.

Price: \$350 + shipping and import duty **Contact:** www.noteco.com/bulwagga



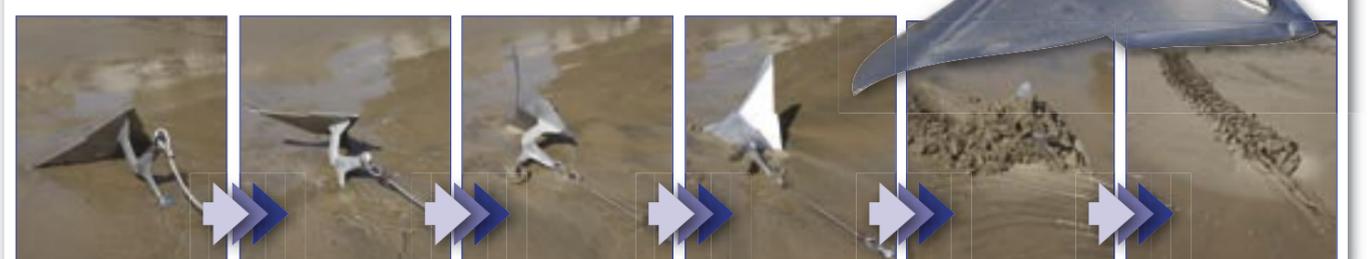
XYZ

Weight: 12lb 8oz (12.8kg)

The test team thought this was the most futuristic-looking anchor – the shank and fluke were unlike anything we'd seen before. The shank has a knob to help it flip over if it lands upside down. In our beach test it dug a long trench. No matter how hard we tried, we could not get the XYZ to set in any of our tests. Its peak holding power was just 300lb. It was also the lightweight of the group, weighing in at only 12lb 8 oz.

Price: \$297 plus shipping and import duty **Contact:** XYZ Marine Products, USA.

Tel: 001 212 4863912 **www:** xyzanchor.com



Conclusion

One of the problems with anchor tests is that they don't represent the real world. We tried to go beyond the typical test programme, by extending our trials to include veering pulls, plus using three different scopes, and three locations.

So after three days, with a team of 12 people conducting more than 100 test pulls on 14 anchors, what did the data crunching tell us? The

ability for an anchor to set quickly is just as important as its ultimate holding power.

The biggest surprises were that proven designs – the QCR, the Claw (Lewmar's copy of the Bruce), plus West Marine's copy of the Danforth – didn't live up to expectations.

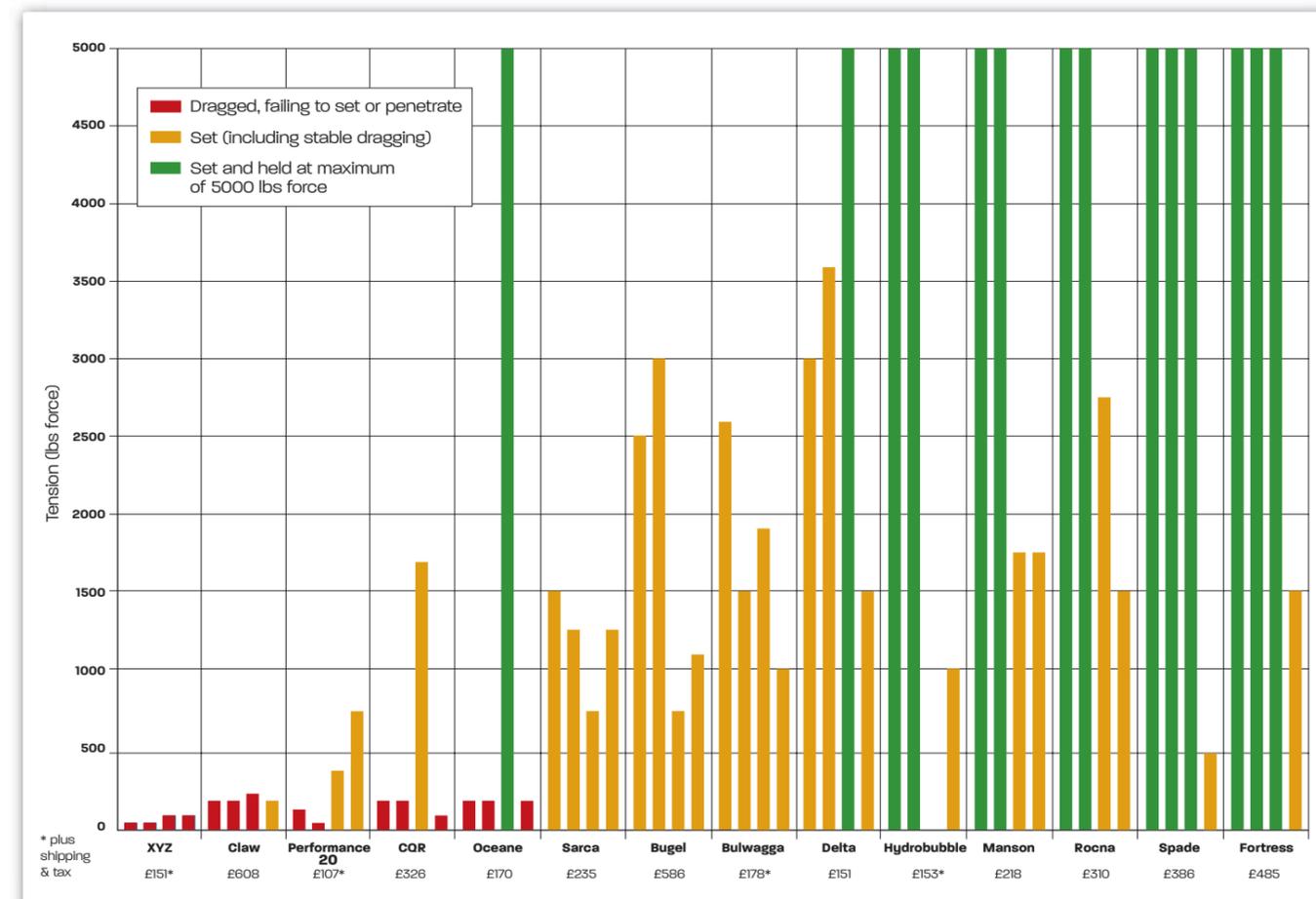
Was our test boat *Shana Rae* too powerful a testing platform? Using a smaller, less powerful boat in separate mini-tests, the team were able to get all the anchors to set.

The new generation of roll-bar type anchors were a revelation. You don't see many of these stowed on bow-rollers in the UK, but they were truly impressive performers – especially the New Zealand-made Rocna and Manson. They showed extreme holding power and versatility, giving the established Spade and Fortress a run for their money.

The anchors that performed best in our tests were the ones that self-orientated themselves on the

seabed with an optimum penetrating angle. By using a float even the weird Hydrobubble exceeded all our expectations.

So are new designs the way to go? It seems we are getting closer to an anchor that will cope with all types of seabeds, a universal all-rounder. So the days of the long-distance boater who carries two or three different anchors to cope with a variety of conditions may well soon be numbered.



In this graph, there are four results for each anchor: two at the first location, one at the second and one at the third. The bigger the bar, the better the hold

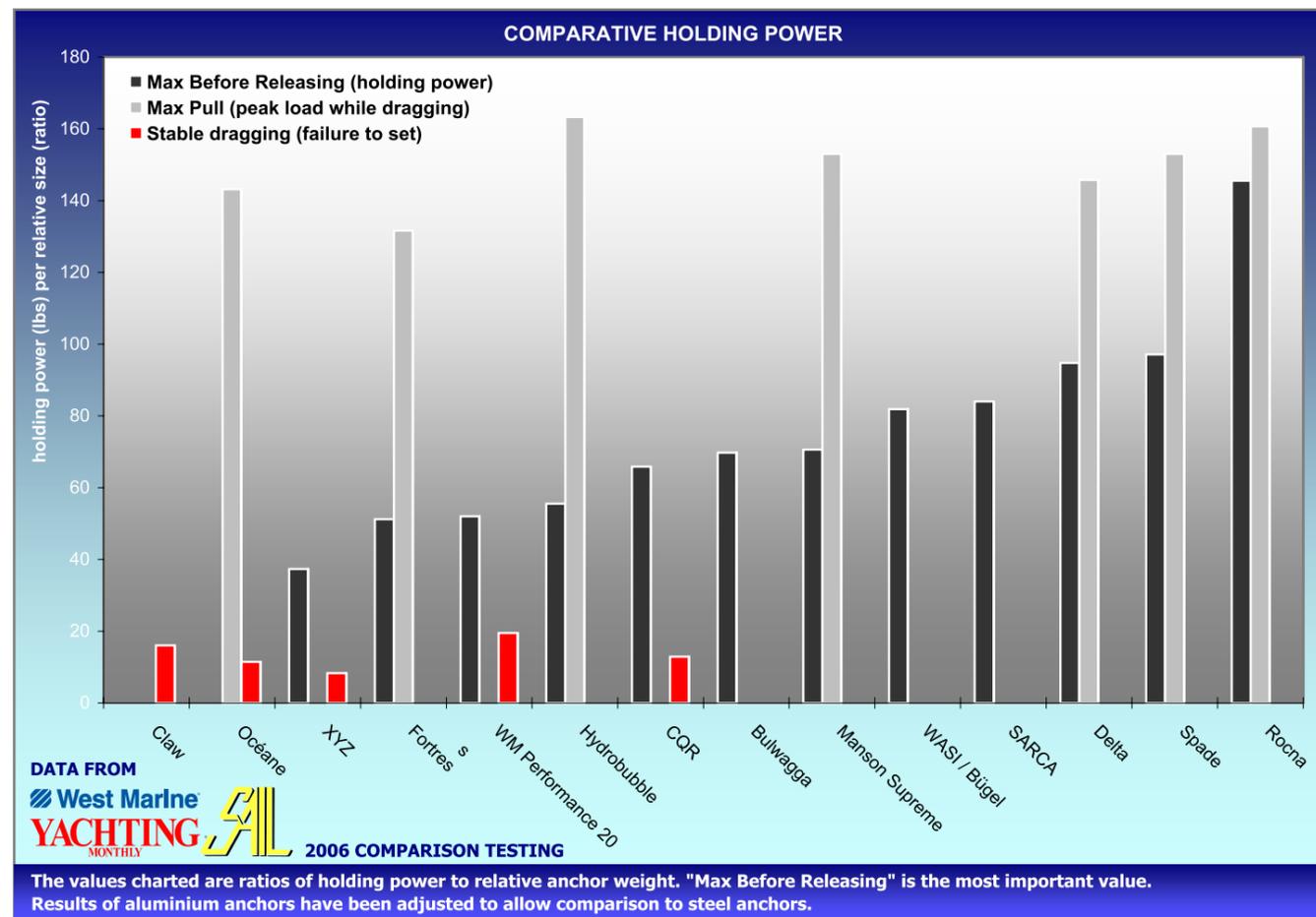
some notes from the designer of the Rocna anchor

concerning the West Marine / Motor Boats Monthly testing

When Chuck Hawley of West Marine first requested we send an anchor to take part in their upcoming comparison testing, I was cynical. I have never seen a proper comprehensive anchor test, and the recent travesty from *Practical Sailor* and *Powerboat Reports* had warned me to be wary.

The problem with all anchor testing is that the many factors which make a good anchor are never considered - holding power is often the only one. However, looking over this magazine write-up, I am happy to see that a decent amount of effort has been put into this attempt, if not the actual article. With three test locations and three different scopes, this testing can rightly claim to provide a good illustration of anchor performance. What's more, the range of anchors tested was complete, not just the usual handful of traditional types, so giving readers a good comparison.

Having said that, I must also say the write-up from *Motor Boats Monthly* is a bit disappointing. No real attempt is made to interpret the results in a comprehensive analytical manner. The graph on the last page leaves much to be desired. Accordingly, we provide you here with our own analysis of the results, a graph based on *SAIL* magazine's "average of peak strain at all locations" which better shows overall results:



As I write this I wonder why I am complaining. After all, the Rocna just came out no. 1 in a major international comparison test. But, part of what we do in promoting a new generation anchor design is education, so I feel obliged to point out these flaws when they exist. As good as this testing is, I feel that a properly comprehensive independent anchor comparison test, one to rule them all, is yet to be.

concerning copies and variations of original anchor types

West Marine's line-up of fourteen anchors included several anchors that are just copies and/or variations of other types. Such copies present a tempting option, since they are usually cheaper than the genuine article. However, when a copier makes his imitation, he has two options. One is copy the anchor identically but take short-cuts to save money. The other is "improve" it, but most such modifications are done by people that don't understand the original design as well as its inventor does, and the changes are often nothing more than useless gimmicks.

There are certain things I refuse to compromise on. For example:

- Since the Rocna has a fluke folded from flat plate, I needed to make sure the tip is very strong. We do this by brake-pressing the blade, which is a more expensive process than rolling. The crease then runs the full length of the fluke and provides excellent reinforcement.
- We don't laminate steel. Metal gains no strength from lamination; it's often just edge-welded so the space between the sheets is effectively hollow. This process also has other implications - for example the weld is usually ground off to make it look nice. The result is little weld holding the fluke together. I join others in advising boaters to avoid any anchor built from laminated metal.
- In designing the Rocna's fluke, I drew a proper concave shape by raising the heel of the fluke, so it is a two dimensional "spoon".
- I wanted a properly designed shank to fit on as many rollers as possible, and one which would work well with regard to self-launching and retrieval. A shank with a tall or deep profile is a bad idea, since anchors frequently come up sideways or upside-down. The shank must be of such a shape that it can rotate quickly while moving on the roller. Popular anchors have shanks of quite a low profile - for a reason.

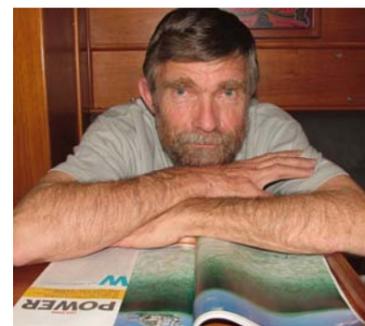
There are many more factors I could list, but the point is: do avoid copies. Stick with the original genuine design and you'll be better for it.

concerning gimmicks such as slotted/sliding shanks

Recently, some anchor manufacturers have attempted to implement the old idea of a slot for the shackle which runs the full length of the shank. This slot is supposed to allow the shackle to travel the length of the shank, so allowing the anchor to be pulled out 'backward', if fouled. As good as this sounds, unfortunately it does not work well in practice. A French magazine recently trashed the idea after testing an example.

- It tends not to work in real life scenarios. The shackle can jam along the slot, and even if the rode manages to reach the foremost point, the lifting dynamics for retrieving the anchor are not ideal. The point to which force is applied should be lower and farther forward.
- The presence of the slot weakens the shank. Many anchors with a full-length slotted shank fail, their shanks bending or twisting.
- In an attempt to compensate for this lack of strength, the shank is sometimes simply made deeper. This has several consequences, including adding weight to the anchor, where it is undesirable and adversely affects tip-weight, and creating a large bulky shank.
- If the shank is cut from plate, as most are, cutting the slot with the gas or plasma cutter severely affects the tensile strength of the metal.
- Lastly, when it does work, you probably won't want it to. When your boat drifts over the anchor in the middle of a calm night, and the wind picks up again in the opposite direction, consider what the anchor will promptly do...

My advice, to facilitate retrieval in the event of fouling, is to use a buoyed retrieval line. Most good anchors will offer an attachment point in the correct location, which will work much better and more reliably.



Another "feature" on some anchors is a float intended to rotate the anchor into the correct attitude for setting. I will make no harsh comment on this, save to point to possible issues concerning durability in the harsh conditions anchors are subjected to, and longevity if exposed to UV.

I wanted the Rocna to embody a philosophy of reliability, durability, and clarity of design. It is for this reason that it does not "feature" other sales ploys such as a hollow shank, a folding design or de-mountable shank, a break-away shank, et cetera. It is my hope that boaters will see the sense in this attitude, and consider the true value of the anchor they are entrusting with their boat's, and their own, safety and security.

Peter K. Smith

how to print this article on normal paper

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