THE ULTIMATE PROPELLER TEST

Which is the best prop for your boat? In the most comprehensive test ever published, Emrhys Barrell and the YM team compare 15 propellers for speed, thrust, drag, stopping distance, prop walk and price

What's the difference between a bucket and a fixed, three-bladed propeller? Not much, if you want to slow your boat down by at least half a knot when you are sailing. That's the conclusion of our test on fixed, folding and feathering props – the most detailed ever conducted in the UK, and as far as we are aware, in the world. A fixed three-bladed prop, free to spin, exerts as much drag as hanging a bucket over the stern of our test boat. And if you lock the shaft, as many gearbox manufacturers require, then you might as well chuck another bucket over the stern and lose a whole knot of boatspeed. Put another way, prop drag will add about four hours to a typical cross-Channel passage.

So what is the solution if you don't want to sacrifice precious speed? The answer is, fit one of the many folding or feathering propellers on the market. But which one, and what are the drawbacks?

We tested all the props we could get our hands on, measuring top speed under power, thrust (bollard pull) ahead and astern, stopping distance, and – for the first time in a sailing magazine – we measured the side-force (prop walk) generated when you put the engine into reverse. It is this vital, unwanted component that sends you swinging off to one side when you try to stop suddenly, or back-up in a marina. We then towed three typical props behind a test boat to measure their drag, and how it contributes to the overall drag of a yacht under sail.

Prop drag has been an issue for sailing vessels since the propeller was invented. Early trials were carried out on English warships, using jointed shafts that could be lifted into a trunk in the hull when sailing. In the 1890s, Danish pilot boats used similar lifting shafts.

For many years, long keels reduced the drag of two-bladed props on yachts, but the advent of the fin keel and exposed shafts brought the problem back again, with the added factor of more powerful engines making three-bladed props a necessity. The need to manoeuvre precisely in tightly packed marinas and overcrowded harbours has convinced even the owners of many long-keeled yachts to fit three-bladed props.

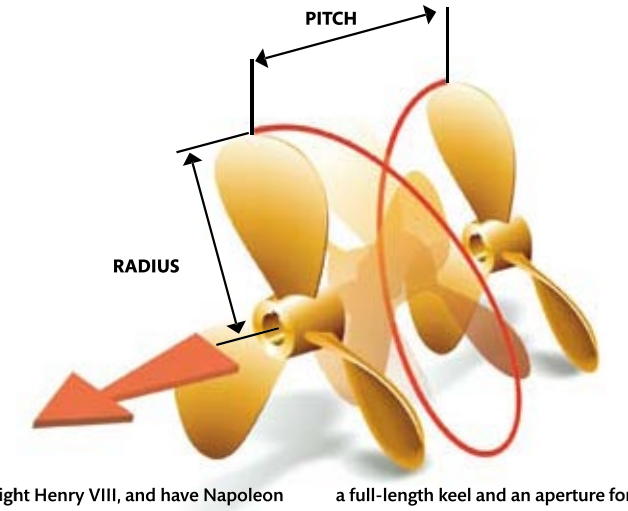
Most cruising skippers simply ignored the unwanted drag and loss of speed, but in racing circles it became increasingly significant. This led to the development in the 1960s and '70s of propellers whose blades folded backwards when sailing, reducing the drag markedly. The blades flew out under centrifugal force when the engine was put into ahead or astern. The earliest folding props had blades that moved independently, but this could lead to the lower blade dropping down when sailing, so the roots of the blades were linked with geared teeth, ensuring that they opened and closed together.

At the same time, an alternative approach was developed: the feathering propeller. Here, the blades are set at right-angles to the boss, as in a fixed prop,

PROP FACTS

The four main figures used to describe propellers are diameter, pitch, number of blades and rotation. **Diameter** is double the radius (distance from centre of the boss to tips of blades. As a rule of thumb, the more powerful your engine, the bigger the diameter you will need. **Pitch** is the measure of how far the propeller will advance in one revolution and thus how fast it will push your boat through the water for a given engine rpm (revolutions per minute). To understand pitch, imagine screwing a screw into a block of wood. The angle of the spiral thread governs how far it goes in for each turn. Similarly, the blades of a prop are set at an angle to the boss. The greater the angle, the greater the pitch. However, this is only the theoretical pitch. In practice, as water is not solid, the prop will slip to a degree and not advance so far. The amount of slip is around 30% for the props and speeds we are looking at.

Diameter and pitch are still measured in inches throughout the world – a quirk of history that would delight Henry VIII, and have Napoleon turning in his grave. But pitch can also be measured in degrees, especially relevant with feathering props whose blade angle can be varied.



The number of blades will vary between two, three or four, or even five in some high-speed craft. In practice, more blades will take greater power for a given diameter. For many years sailing boats used two-bladed props as they gave least drag in a boat with a full-length keel and an aperture for the prop, provided it could be locked in the vertical position. Today, most fixed props have three blades. Folding or feathering props have either two for cheapness, or three for higher power.

The hand of the propeller is the direction of rotation in ahead, when you are looking from astern. A right-hand prop is one that turns clockwise in ahead.

Blade area ratio (BAR), sometimes called disc area ratio (DAR), is the area of the blades as a percentage of the area of a circle the same diameter as the prop. A prop with a greater BAR will take more power, but have more drag. Figures for sailing boat props are around 60%.

The notion that a prop advances just because its blades are angled forward is a convenient way to imagine what is happening, but not strictly correct. The blades of a standard prop are in fact aerofoil in section, and move the boat forwards because as they spin round they develop lift, caused by a reduction in pressure on the back of the blade ('back' being confusingly the blade's forward face). The faster they go, the greater the reduction in pressure. Once a certain point is reached, the reduction in pressure causes the water next to the blade to vapourise and form bubbles. This is called cavitation, and limits the amount of power that a given area of blade can cope with. As the bubbles collapse, they erode the metal of the prop, resulting in surface pitting on the back of the blade.

but on swivelling hubs. When motoring, the blades swing to the ahead or astern angled position, but under sail they 'feather', turning parallel to the boss. One great advantage of feathering props is that they're suitable for the many fin-and-skeg and long-keel yachts that have a small prop aperture in the rudder, where a folding prop won't fit. In the earliest feathering props, the blades remain in the same orientation to the boss in ahead or astern, as with a fixed-blade prop. In astern the aerofoil is working backwards, giving less thrust than in ahead. Some new feathering props have blades that swing right round, so the same leading edge is presented to the water in ahead or astern. Under sail, the drag of folding and feathering props is tiny compared to a standard fixed-blade unit. Feathering props create about 5-10% of a fixed prop's drag, sometimes less, while folding props have almost zero drag. This gives a significant gain in sailing speed, between half a knot and one knot, with the greatest percentage saving at low speeds.

Inevitably, there are drawbacks. The first is expense: a folding or feathering prop costs between two and six times more than a fixed equivalent. The second issue is complication – the gearing and folding mechanisms are prone to wear and corrosion in the salty and sandy environment, leading to reduced performance, and even loss of blades in extreme circumstances.

The third problem is performance under power. The early folding and feathering props produced less thrust than an equivalent fixed prop, particularly in astern, with dire consequences if the blades fail to deploy when you need to make an emergency stop.

Now, the manufacturers claim to have addressed all the issues except cost. They claim the latest generation of their products give as good a performance or better under power, and major gains in speed under sail.

We put their claims to the test on two chilly days in February. To our folding and feathering props we added a fixed three-blade prop as a benchmark, and the Axiom prop, a radical new development in fixed propellers, just to see how it compared.

'Drag from a fixed-blade prop will add about four hours to an 80-mile passage'

THE TEST

We used a Bénéteau Océanis 323, kindly lent to us by Sailtime in Lymington. She has a typical fin keel form, but atypically she has a built-in skeg carrying the shaft, rather than the P-bracket or saildrive of most other modern yachts. The skeg protects the shaft and prop from underwater damage, but a downside is increased vibration as the blades of the prop pass through the disturbed waterflow behind the skeg. This is resolved in normal use by fitting a three-bladed prop as standard rather than two, but otherwise did not alter the propulsive element of our test for either two- or three-bladed units.

The engine was a Yanmar YM20, giving 21hp at a maximum 3,600rpm. The gearbox ratio is 2.6:1 in ahead, but somewhat confusingly a higher ratio of 3:1 in reverse. This is a very common engine/gearbox combination, so not an unreasonable test. Yanmar says it gives better thrust in astern, but in practice it meant the folding props were forced to use a compromise pitch. Some of the feathering props were able to set a different astern pitch.

We measured thrust, or 'bollard pull', in ahead and astern, throughout the rev range, using a load cell borrowed from Diverse Yachts, with a remote read-out. We then measured the side-thrust at full power in astern. This enabled us to predict the prop walk created when you go into astern. To put this figure into context, the thrust produced by the worst prop in our test is the same as a 3hp outboard mounted on the transom, driving at right-angles at full throttle. No wonder so many yachts veer off to one side!

On the water, we measured speed through the rev range to maximum. We then carried out a crash stop from 6 knots. We recorded the time it took to bring the boat to rest at full throttle from the moment we engaged reverse gear.

To put these times into context, the distance the boat would travel before stopping would be 12m (39ft) with the best prop tested, but 17.4m (57ft) with the worst.

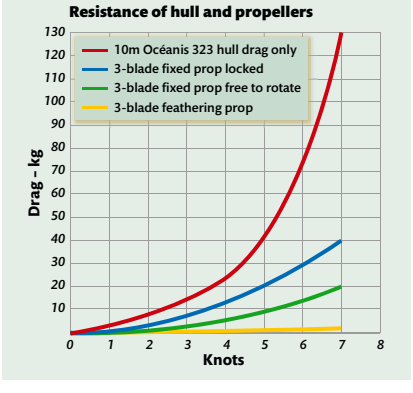
To measure the drag of all 15 propellers precisely enough to compare them with one another, making allowances for different yacht hull forms, we would have had to build a sophisticated testing rig, hire a team of scientists and spend several days in a research laboratory with a very large towing tank. Our objective was just to demonstrate the difference in drag caused by different types of propeller.

We fitted a fixed prop, then a folding one, then a feathering one, to an outboard motor leg mounted on the transom of a lightweight 14ft skiff. We then towed the skiff at speeds up to 7 knots, and measured the difference in drag. We don't claim this gave us the last degree of accuracy, but it was sufficient to compare with published drag figures. We then compared this drag to the hull-only drag of the Océanis 323 – a typical 10m cruising yacht.

Measuring prop walk. INSET: The Océanis 323 has a typical modern hull form

ABOVE: The load cell shackle was crucial for accurate measurement; Emrhys records a 'bollard pull'

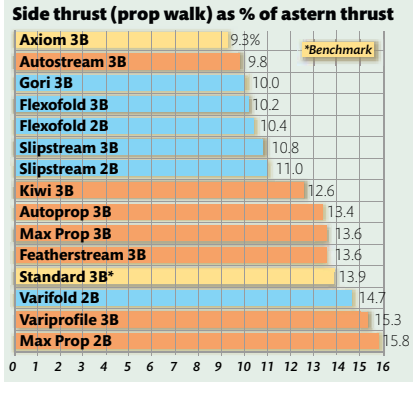
DRAG CURVES



At 5 knots, a fixed three-blade prop with its shaft locked creates almost half as much drag as the entire hull. The drag can be halved by allowing the prop to spin, but the gearbox may suffer. By contrast, the drag of a feathering prop is negligible, and the drag of a folding prop is too small to plot on a graph of this scale.

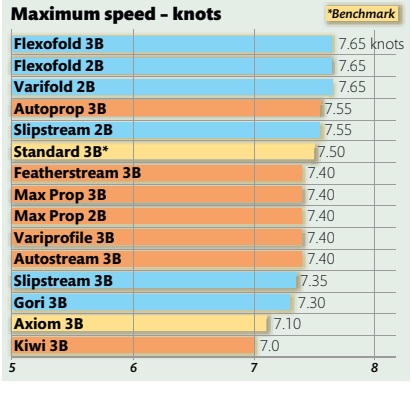
The hull resistance curve for the Océanis 323 was calculated for *YM* by the Wolfson Unit, at the University of Southampton, using data from the Delft University Systematic Series. The propeller drag curves are based on data from SSPA Maritime Consulting, using Volvo S-drives. This data was verified by *YM*'s on-the-water drag test.

PROP WALK



All but three of the propellers on test produced less prop walk than the standard fixed prop. The fixed Axiom and feathering Autostream were the best performers, but nearly all the folding props fared better than the rest of the feathering propellers.

MAXIMUM SPEED



There was more than half a knot of difference between the best-performing props and the worst. Four folding propellers and one feathering prop managed to prove the claim of better performance than a standard fixed prop, but nine of them fell slightly short.

Interestingly, some of the best performers were two-bladed props, which are widely assumed to perform worse than three-blade versions.

Drag test rig: the props were mounted on a lightweight skiff

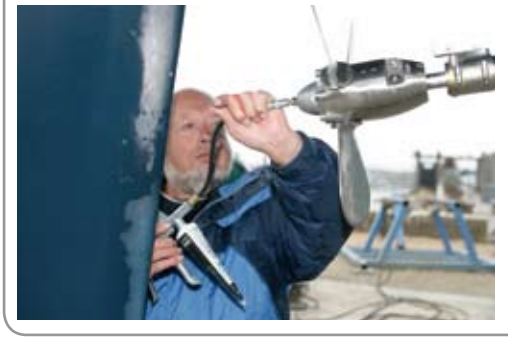
PROP TIPS

FITTING

Some of the props on test are very simple to install, others are very complicated. However, while they all have instructions for DIY fitting, unless you're very confident in your own skills, a piece of equipment as vital as a propeller ought to be professionally installed, both for safety and peace of mind. For our test, we had every prop fitted by the manufacturer's representative, so there was no question about the installation, and they also observed all our tests and measurements.

MATERIALS

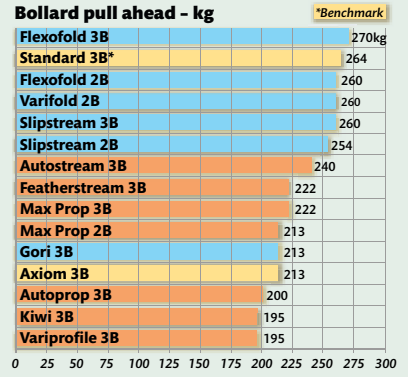
Propellers have been bronze almost since they were invented. Strong, resistant to salt-water corrosion and easy to cast with a low melting point. Stainless steel has been making an appearance recently. Even stronger, it allows thinner blades, which are more efficient. It is even more corrosion resistant, and also harder, so less vulnerable to impact damage. However, its higher melting point means it's more difficult and expensive to cast and machine. The Kiwi prop has plastic blades, even more resistant to corrosion and easier to cast.



MAINTENANCE

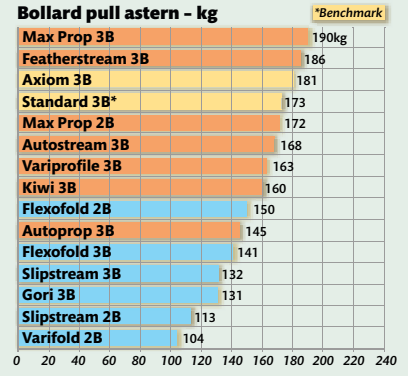
Whatever prop you have, it should be checked every time the boat is lifted, for wear, corrosion and movement. Folding and feathering props do require more maintenance than fixed ones. Some bosses are packed with grease, which should be repacked annually. Some have nylon shims or bearings, which should be checked regularly, especially in silted waters. Most props have an anode, which should be checked and replaced if necessary.

BOLLARD PULL: AHEAD



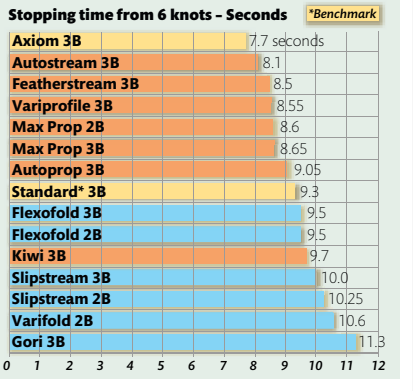
Our bollard pull test shows that the fastest propellers are generally also the most powerful in ahead, and most of the slower ones are among the least powerful. However, only one unit – the three-bladed Flexofold – generated a greater bollard pull than the standard fixed prop. There was a considerable difference in performance – the most powerful props tested produce almost a third more thrust than some of their rivals.

BOLLARD PULL: ASTERN



Three propellers produced a more powerful bollard pull than the standard fixed prop in astern: two folding units and the newly designed Axiom. Nearly all the feathering props performed better in astern than the folding ones – some by a very wide margin. There's a huge difference between the best and worst-performing props – the three-blade Max Prop has almost twice the bollard pull of the two-blade Varifold.

STOPPING TIME



The new-concept Axiom prop excelled in this test, but nearly all the feathering props were better at bringing the boat to a standstill than the standard prop. The difference between the best and worst stoppers was about 3½ seconds or 18ft in distance (39ft being the shortest stop and 57ft the longest) which is over half a boatlength in our 32-footer. It may not sound like much, but in a crunch, it could make all the difference.

AUTOPROP

£1,480 TO POA H5-394mm tested: £1,620

Brunton's Autoprop marked a completely different approach to feathering props when it was brought out in 1987. The three blades rotate independently, going from fully feathered while sailing, or in neutral, to fully twisted under power. The difference is that when you go into gear, the amount they rotate depends on engine speed and loading. Thus the ahead or astern pitch varies according to engine rpm, which, Brunton claims, improves performance and fuel economy, with reduced rpm and so improved comfort onboard for a given cruising speed. We can confirm the latter: our tests show the Autoprop achieved 6 knots at 2,100rpm, compared to 2,500rpm for our standard prop and most of the others on test. However, other tests have shown the trade-off is more drag than other feathering props, though still 80% less than a fixed prop. Bollard pulls were on the low side, but it still achieved near the maximum top speed, with mid-range stopping distance.

Sizes 13in-35in **Max power** 300hp
Website www.bruntons-propellers.com
Tel 01255 420005

AUTOSTREAM THREE-BLADE

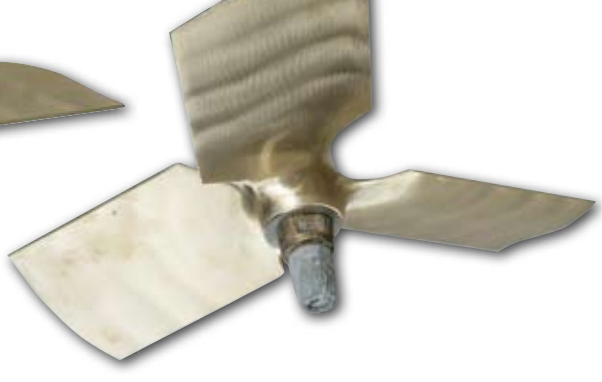
£2,050 TO £2,460 17x11in tested: £2,095

From Australia comes the Autostream, a three-bladed feathering unit that has been in production for 26 years. Construction is all-stainless steel with a zinc anode at the aft end of the boss, and the blades swivel 180° to give the same leading edge in astern as ahead. Separate ahead and astern pitch can be adjusted by the owner without dismantling the prop. It has been designed to stay feathered at speeds up to 25 knots, helped by extra blade area aft, making it suitable for fast multihulls. On test, it gave the fastest stopping time of all the folding or feathering units, plus significantly lower side-thrust than the rest, while still maintaining good ahead speed.

Sizes 15in-22in **Max power** 80hp
Website www.steeldevelopments.co.uk
Tel 020 8874 7059

AXIOM THREE-BLADE

£590 TO £1,230 16x11in tested: £690



The Axiom is the joker in our pack. It is not a folding propeller, and is unlikely to cause less drag than a standard prop, but it does have a revolutionary blade profile and section, if you will pardon the pun, and has never been tested on a yacht before, so we just had to put it into our trials. As the photographs show, the blade profile is rectangular, while the blade section is almost S-shaped, and symmetrical in ahead and astern, with no twist. Its designers claim it gives greater thrust and stopping power, together with lower wash. So how did it stand up against the standard fixed prop and the others? The charts show the story, with its stopping time nearly a second better than any other model, and its side thrust again the lowest by far. This was at the expense of lower top speed, which suggests some more tweaking is needed, but it is still one to watch.

Sizes 12in-24in **Max power** 120hp
Website www.axiompropellers.com
Tel 01832 734609

FEATHERSTREAM THREE-BLADE £1,130 TO £1,680 16x11in tested: £1,150

Made in England for the past 18 months, this is a three-blade feathering unit with a bronze boss and stainless steel blades. The pitch of the blades can be adjusted externally, and can be different for ahead and astern. The blades swivel 180° to present the same leading edge in ahead and astern. As a result, it performed well in astern: second best for bollard pull and third for stopping distance.

The first few times we gently put it into astern it didn't deploy reverse but this didn't happen again. Darglow put it down to the fact that the unit was newly and tightly packed with grease, which took a couple of operations to free up, something to watch for if you repack any prop and then relaunch.

Sizes 12in-20in **Max power** 75hp
Website www.darglow.co.uk **Tel** 01929 556512

FLEXOFOLD THREE-BLADE £1,485 TO £4,075 16x11in tested: £1,690

Made in Denmark for the past 12 years, the Flexofold is an all-bronze folding unit, with blades fixed by stainless steel pins, and the anode, which covers the gearing, cleverly enclosed by the folded blades. On test, it gave the equal highest forward thrust of all props, and highest top speed. It also had one of the lowest side-thrusts. Going astern, its performance was the best of all the folding propellers.

At a cruising speed of 6 knots, the engine was turning at 2,300rpm, compared to the 2,500rpm of our standard fixed prop and most of the other props on test.

Sizes 14in-24in **Max power** 350hp
Website www.darglow.co.uk **Tel** 01929 556512

FLEXOFOLD TWO-BLADE £705 TO £1,605 16x13in tested: £885

A two-blade version of the Flexofold, its performance was only slightly down on the three-blade, and in fact better for astern thrust. With better test results across the board than some three-blade units, it exploded the commonly held myth that twin-blade props are inefficient. It did suffer some vibration due to the skeg. A racing two-blade version is also available.

Sizes 12in-20in
Max power 250hp
Website www.darglow.co.uk
Tel 01929 556512

GORI THREE-BLADE

£1,840 TO £6,900 15in tested: £1,840

Another of the earliest folding designs, the Gori propellers have been made in Denmark since 1975, in two and three-blade versions, but the company only recommended the three-blade for this boat. Gori also makes a racing two-blade version. The blades have a three-way gearing system for opening and closing. Boss and blades are bronze, with stainless steel pins. A speciality is its overdrive feature, which sets the blades in a coarser pitch if you first get the boat moving in astern, then engage ahead, which allows you to cruise or motor-sail at lower rpm. Performance ahead and astern were near the bottom of our list, with the longest stopping distance, but the prop walk was third best *(see note on p101)*.

Sizes 15in-30in **Max power** 300hp
Website www.sillette.com
Tel 020 8337 7543

KIWI PROP THREE-BLADE

£985 for all sizes 16x11in tested: £985

Designed in New Zealand nine years ago, this is only available as a three-blade unit. The boss is stainless steel and the blades, which rotate independently of each other, are glass-reinforced Zytel plastic. Each blade has two different aerofoil sections, as you move out from the boss. It has no internal gears, so each blade feathers independently according to the waterflow over it. The blades do not swing completely round in reverse, so the trailing edge becomes the leading edge. It was one of the simplest to fit – just slide it on and tighten the nut. Mid-range for astern thrust and stopping distance, but the lowest top speed. It also went easily into astern.

Sizes 15.5in-18.5in **Max power** 56hp
Website www.vectamarine.com
Tel 01672 564456

MAX PROP THREE-BLADE

£1,795 TO £16,045 16x11in tested: £2,065

Designed by Massimiliano Bianchi in 1976, the Max Prop was one of the first of the new generation of props. Boss and blades are bronze, and the pitch can be set as you assemble it, or by the factory if you want a different astern pitch. The blades swivel 180° to present the same leading edge in ahead and astern. It gave the best astern thrust, and was in the middle of the pack for stopping distance. It never missed a beat going into astern.

Sizes 12in-40in **Max power** 350hp
Website www.darglow.co.uk **Tel** 01929 556512

MAX PROP TWO-BLADE

£1,120 TO £2,750 16x12in tested: £1,275

A two-blade version of the Max Prop, also named after its designer, Massimiliano Bianchi. As expected, it gave some vibration on our test boat, but this would not occur on a yacht with a P-bracket or saildrive. On test, it gave mid-range performance for speed, astern thrust and stopping distance, but generated more prop-walk than any other propeller on test.

Sizes 12in-30in
Max power 250hp
Website www.darglow.co.uk
Tel 01929 556512

SLIPSTREAM THREE-BLADE

£1,360 TO £1,845 15.5x11in tested: £1,530

From the same Australian company as the Autostream comes the Slipstream folding propeller. Again, the boss and blades are stainless steel, which gives greater strength, allows thinner section blades, and removes the need for an anode. The bearings are bronze bushes, while the blade gears are bevelled, with two rows each, claimed to better chew up any barnacles that might choose to grow on them. Polyethylene side thrust washers further improve the opening action. On test, it performed in the middle of the group of folding propellers, though with comfortable low cruising revs of 2,250rpm at 6 knots. which makes for a quieter passage while sailing or motor-sailing.

Sizes 14in-20in **Max power** 80hp
Website www.steeldevelopments.co.uk
Tel 020 8874 7059

SLIPSTREAM TWO-BLADE

£895 TO £1,195 16x11½in tested: £990

Slipstream's two-blade propeller is similar in design to the three-blade version. On test, it achieved almost the same thrust in ahead, though with slightly worse astern figures. But it proved faster than the three-blade Slipstream and made 6 knots at a low cruising rpm of 2,350.

Sizes 14in-20in **Max power** 80hp
Website www.steeldevelopments.co.uk
Tel 020 8874 7059

VARIFOLD TWO-BLADE £585 TO £760 15x11in tested: £630

Made in the UK, this folding unit is mid-way between a racing and cruising prop, with the blades closing tightly for low drag, but still having enough shape to give good motoring performance. As a result of its close fit, you have to give the engine a burst of throttle to get the blades to open initially. It has a bronze boss and blades, and stainless steel pins. The Varifold achieved equal highest top speed, but was near the bottom of the field for astern performance.

Sizes 12in-17in
Max power 50hp
Website www.bruntons-propellers.com
Tel 01255 420005

VARIPROFILE THREE-BLADE £1,604 TO £2,740 16x11in tested: £1,770

This is a three-blade feathering prop, made in Germany. The blades swivel 180° to give the same leading edge in astern, and the pitch can be set differently for ahead and astern. Usually, this is set in advance for the customer, but can be altered on site. Blades and boss are bronze, with stainless pins, and an anode aft of the nut. Ahead thrust was low, but stopping distance was good.

Sizes 13in-22in
Max power 120hp
Website www.bruntons-propellers.com
Tel 01255 420005

MORE PROPELLERS

PROPELLERS FROM THESE THREE COMPANIES ARRIVED TOO LATE FOR OUR TEST

Volvo

Volvo has a range of all-bronze two, three and four-bladed folding props, for shaft drives and saildrives. The blades have an unusual hooked design, claimed to give better performance under power.
Sizes 14in-22in **Max power** 120hp **Prices** £615-£2,470; 16x11in two-blade £650, three-blade £1,215
Website www.volvopenta.co.uk **Tel** 01923 228544

Radice

Radice of Italy makes a huge range of fixed and folding props, for every type of boat. Its two-blade folding props are all-bronze, and simple to fit.
Sizes 13-20in **Prices** £505-£680; 16x12in £540
Website www.sillette.com **Tel** 020 8330 9014

J-Prop

The J-Prop is a feathering unit made in Italy. All-bronze, in two, three and four-blade models, they feature helical gears for smooth vibration-free operation.
Sizes 13-38in **Max power** 240hp
Prices £1,624-£12,860, 16x11in three-blade £1,900
Website www.calibramarine.com **Tel** 02380 403944

CONCLUSION

If you want to add up to a knot to your boatspeed, then fitting a folding or feathering propeller is a must, not just for racing boats. And as our test demonstrates, you can usually still retain the handling and performance under power that you had with a standard fixed-blade prop. In fact, often you'll get better performance.

Five of the tested props gave more speed than the standard prop, with four of them being folding models, and both Flexofolds coming out top. And even though it was only 0.15 knots better, when you look at the hull resistance curve this is a considerable improvement. On the other hand, with astern performance, in general it was the feathering props that came out best, with better bollard pull than the standard, and better stopping times, and the Autostream coming out top. The folding props were generally not as good as the standard, though in the main only by no more than 10%.

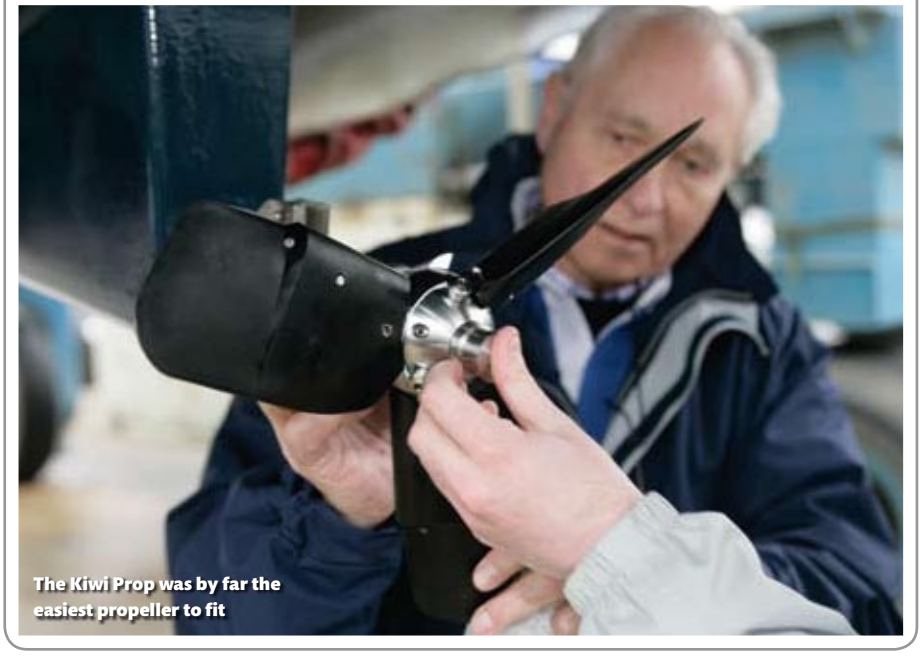
The prop walk figures were most revealing. Ten of our test units gave less prop walk, with generally the folders coming out best, but the top units being the Axiom and Autostream, with 30% less side-thrust than the standard fixed three-blade, a considerable advantage when you have to stop suddenly or back-up in a marina.

Our test shows that letting your fixed-blade prop spin, if the gearbox manufacturer will allow it, halves the drag. But fitting a folding prop will give at least 95% less drag than a locked, fixed propeller, while a feathering unit will give at least 92% less drag – still an enormous saving.

But these benefits do have a price, literally on your wallet. A 16in fixed three-blade propeller will cost around £300. The cheapest two-blade folding prop will cost at least double, with most of them between £600 and £900. For a three-bladed folding unit, expect to pay between £1,200 and £1,600. With the exception of the £985 Kiwi Prop, feathering props are even more expensive, starting at around £1,200 for a two-blade model, rising to £2,100 for the most expensive three-blade version.

Because of the wide variation in cost, performance and specifications of the units tested, we have not felt it appropriate to recommend a best buy. The tables and curves give you the information you need at a glance, allowing you to make your own decisions as to which is best for you and your boat.

Our test was only able to measure one set of circumstances, and one model of boat. If you have your own experience of props, good or bad, let us know.



The Kiwi Prop was by far the easiest propeller to fit

CRUISING OR RACING?

Some folding prop manufacturers now sell cruising and racing versions of their products. To minimise drag, racing units fold up tightly and create less drag, perhaps gaining an extra tenth of a knot of boatspeed. However, they don't perform as well when the yacht is motoring and can be more reluctant to open when the engine is engaged.

GORI

Gori recommended the15x12in three-blade propeller for our test. Subsequently, they have suggested a 16.5x11in would have given a better performance, as the engine was over-revving with the smaller prop. All manufacturers were given the same information regarding dimensions, specifications and test conditions. Gori says a prop test carried out by French *Voile* magazine, using the 16.5x11in propeller and a similar size engine, produced very different results.

THANKS

Testing 15 props in two days placed big demands on Lymington Yacht Haven's hoist team. Their professionalism, good humour and willingness to help meant the test went without a single hitch. Our thanks go to all at Lymington Yacht Haven for their considerable part in this test's success.

Lymington Yacht Haven
Kings Saltern Road
Lymington, Hampshire SO41 3QD
Tel: 01590 677071

Our thanks go to Sailtime, the sailing membership scheme, for agreeing to let us use its pristine Océanis 323, *Aragorn*, for this test. Not for the first time, Richard and Sue went out of their way to help us get what we needed and once again we're very grateful to them for their help.

Sailtime Lymington
19 Waterford Lane,
Lymington, Hampshire SO41 3PT
Tel: 01590 688 008 or 07809 444480

The load cell used to measure the bollard pulls and prop walk was supplied by Diverse Yacht Services. Diverse has been a major marine player since its foundation in 1982. Then as now, the company supplies and tunes electronics and load cells for the world's leading racing fleets.

Diverse Yacht Services
Uni 12, Port Hamble, Satchell Lane,
Southampton, Hampshire SO31 4QD
Tel: 023 8045 3399

To understand better what happens to feathering and folding props changing from ahead to astern, we needed to watch them do just that. We used a Scubar Pro unit – a waterproof video camera mounted on a pole that displays recordable video on a screen. See *New gear*, p88.

Scubar
Sailmakers Loft, Kings Copse Farm,
Tanhouse Lane, Botley, Hampshire SO30 2SZ
Tel: 023 8045 4484