

Mike Lucas on Keel Choice

Mike Lucas discusses the various options built into Sadlers over the years. These notes are intended to clarify choice of keel by discussing the advantages and disadvantages of various configurations:

1. Introduction. Over the years since 1974, when the first 25 was developed by David and Martin Sadler, many different keel configurations have been built into Sadlers to suit the changing market requirements and sailing area conditions.

The choice has been wide, with conventional deep fin keel and skeg hung rudder being available on the 25, with the option of a shallow fin keel for reduced draft. Demand for even shallower draft resulted in Sadler Yachts producing a 25 with twin keels (or bilge keels to use the traditional terminology). Interest on the East Coast for centre plate boats resulted in a centre plate version of the Sadler 25 being developed with the lifting keel housed inside the ballast keel, thus obviating any need for keel housing within the boat cabin.

A sufficient number of Sadler 25s were built with all variations of keel to give Sadler Yachts confidence to offer the same range of choice for the emerging Sadler 32 in 1979. Later in this article, I have covered performance considerations of the various keel options, some of the facts being drawn from a comprehensive keel comparison test carried out by Yachting Monthly in the early eighties on a number of Sadler 32s.

With the advent of the 26 and 29 in 1981, the twin keel was by then a popular choice. In fact, most 26s were built with twin keels and a high proportion of the 29s. In due course, the Sadler 34 emerged in 1984 and this was also offered with all four choices. In practice, most of the 34s were built with either deep fin or shallow fin keels, but a number were completed with the twin keel option and a few with centre plate.

The Starlight range of boats emerged in 1989 with wing keels with the advantage that the concept had been well tried and largely accepted by that stage. Following the success of wing keels in America Cup racing, much development work was done by many of the notable naval architects. Stephen Jones designed a sophisticated all lead keel for the Starlight and this was felt to be a major contributory factor to the exceptional sea keeping capability, directional stability and windward performance. In fact, a number of Sadler 34s had earlier been fitted with wing keels designed by Warwick Collins, this being a tandem keel of unusual design. However, it failed to catch on, but was successfully applied to the few boats that were built with it.

2. Draft considerations. The most efficient keel is without a doubt the deep fin, this giving best windward performance with least frictional resistance. The case for considering other options is essentially to reduce draft and this is achieved progressively, with the various options available.

Twin keels have the advantage of enabling the yacht to stay upright when dried out and also enabling storage ashore to be safer and more convenient.

A centre plate gives substantially reduced draft with the plate in the high position and a pretty good windward performance with it fully down. However, the mechanics of lifting the centre plate dissuade most people from opting for this system, although you will find those who have used it are very enthusiastic about the arrangement, particularly on the East Coast.

To clarify draft considerations, the following table provides some interesting statistics :

DRAFT	25	26	29	32	34	35	39
Deep fin	4' 8"	4' 8"	5' 0"	5' 6"	5' 8"	5' 11"	6' 9"
Shallow fin	3' 10"	3' 10"	4' 0"	4' 6"	4' 8"	N/A	N/A
Bilge/wing	3' 6"	3' 6"	3' 8"	4' 0"	4' 0"	4' 9"	5' 3"
Lifting	2' 3"/4' 6"	N/A	N/A	3' 6"/6' 6"	3' 8"/6' 8"	N/A	N/A

3. Deep fin keel. This keel has always been available on all Sadler boats and providing one could accommodate the draft, this is without doubt the best option, if one takes sailing performance as the most important consideration.

From about 1990, there was a variation of the deep fin keel available for the Sadler 34. The keel was designed by Stephen Jones and effectively put the centre of gravity some 4" lower and draft was increased to 5' 10". This was achieved by making the keel narrower near the top and wider at the bottom. In fact, Andrew Bray had the first of these keels fitted and he expressed enthusiasm for the improved stiffness and windward performance of his Sadler 34 "Dash".

Although lead wing keels have been fitted to most Starlights, a few have had deep fin keels, either because draft was not a problem (one boat went to Scotland), or it was necessary to optimise rating and light weather performance for racing purposes. The few Starlights built with fin keels did achieve the objectives required, although the remarkable directional stability down wind, with a wing keel, was adversely affected once a fin keel was fitted.

4. Shallow fin keel. This arrangement is a logical solution for those wanting a fin keel, but requiring reduced draft. It can be seen from the table that saving in draft is between 12" and 16" dependent upon the type of boat.

Although, there is perceptible loss of windward performance, nevertheless there are a certain advantages to be gained. A shallow fin keel has the length of keel increased by about one third and this does give improved directional stability down wind and steadier steering, which is of interest to the cruising yacht. Also, when drying alongside a wall, (or sitting in a cradle ashore), the longer keel does give improved fore and aft stability. This is indeed a significant factor when lying alongside and reduces the dangers of tilting forwards or backwards once the water has left the boat.

5. Lifting keel. Most small yachts with lifting keels have either a pivoted arrangement or a dagger plate (moving vertically through a trunking). Either way, the arrangement seriously encroaches into the accommodation in the main cabin. David Sadler developed an ingenious arrangement to house the steel centre plate wholly within the ballast keel. The ballast keel itself was bolted to the bottom of the Sadler 25 in exactly the same way as a conventional fin keel, with stainless steel machine screwed studs and nuts for security.

The 25 arrangement for lifting the keel, was via a tube that came up through the centre of the boat near the mast post and emerged on deck. Then a block and tackle arrangement provides the necessary purchase or the use of a winch, enabling the keel to be lifted and lowered with precision and ease from the cockpit. I have spoken to owners who have had this system and they have been delighted. It appears that should the tackle arrangement become unservicable for some reason, then the keel simply rests in the lowered position. The most obvious disadvantage is difficulty of antifouling, but owners tell me that providing they lift the boat high enough (in either sling or cradle), painting the lifting keel is no problem.

A centre plate arrangement was fitted to a number of Sadler 32s and here the lifting mechanism was via a deck winch or through a hydraulic ram.

Draft of a centre plate version is of course attractively low at 27" for a 25 and less than 42" for a 32, when lifted to it's highest position.

6. Twin keels. Over the years, there have been a whole range of production cruising yachts with what are commonly termed bilge keels. Performance has often left much to be desired and many bilge keel boats were equipped with draft that was too small and hence the keels were not deep enough. This meant that windward performance suffered substantially and many smaller boats with bilge keels heeled excessively through tenderness and "flew" the weather keel. This resulted in pounding and unpleasant noise down below.

David and Martin Sadler were aware of these problems and designed the Sadler range of yachts to have keels that were rather deeper than were customarily being used and a very reasonable

windward performance was achieved. Many Sadler owners preferred to call the configuration twin keel and I do believe that to distinguish between the old fashioned bilge keels and the modern twin keel, with improved performance, the term is helpful.

There is no doubt that windward performance is not as good as a fin keel, but entirely adequate for general cruising purposes. Certainly sea keeping capability is more than adequate and there are the undoubted advantages of shallower draft, with the ability to dry out on a mooring or for antifouling purposes. Certainly they can be wintered ashore sitting on the keels, with no need for a cradle.

The market readily perceived the advantages of twin keels, with the result that the vast majority of 26s were built with this arrangement. Probably two thirds of the Sadler 29s were built with twin keels and some 10% of the 34s. Very few of the 32s had twin keels.

7. Wing keels. As a result of the success of "Australia" in the America's Cup racing, the concept of wing keels became more widely accepted and progressively developed by yacht designers. Stephen Jones in developing the Starlight 39, opted for a wing keel and as discussed earlier, this was an essential ingredient for the overall performance of the yacht.

Sailing the Starlight 39 to windward, once 15 degrees angle of heel is achieved there is real lift imparted from the wing keel and the "wake angle" is noticeably reduced. Downwind the directional stability is impressive (compared with fin keel) and the wing keel does provide a degree of damping in a sea way.

Perhaps the main problem is the fact that significant fouling takes place on the under side of the keel and the only way to clear this, is to be lifted out of the water by travel hoist or crane and to clean the keel whilst it is held in the lift. It also has to be painted in this way of course. Alternatively, scrubbing can be done by a diver.

The yacht is remarkably stable when sitting on the keel on hard ground, although props/cradle need to be provided for complete safety. Care must be taken however regarding going aground, in that if the yacht were to dry out on a soft bottom and she were to fall over, the angle of heel would be extreme.

8. Performance comparisons. Comments have already been made regarding performance for the various keel configurations in relation to each type of boat. However, an interesting exercise was conducted by Yachting Monthly in 1981 to compare the four main keel options fitted to a Sadler 32 and I have drawn from this article a few conclusions which are relevant and I am sure you will find interesting.

SADLER 32		Deep fin	Shallow fin	Bilge keel	Lifting keel
Under power turning circle (x length)	in ahead	1.3	1.5	1.0	1.3 plate up 1.5 plate down
Under power turning circle (x length)	in astern	2.5	2.5	1.7	2.5
Under sail (wind 22 knots, close hauled)	weather helm, tiller angle	10°	12°	20°	14°
Under sail (wind 22 knots, close hauled)	angle of heel	20°	20-25°	25-30°	25°
Under sail (wind 22 knots, close hauled)	effective tacking angle	73°	75°	80°	75°

9. Summary. Not surprisingly, the 32 tests show that deep fin keel gives the best performance and "stiffness". However, the shallow fin pays only a small penalty in this respect, with the advantage of 12" less draft.

Choice of twin keel does sacrifice a fair amount of performance, but has the advantage of shallow draft and stability aground. However, manouverability under power is significantly better with twin

keel.

In practice, a shallow fin and twin keel yacht is likely to reef earlier than the deep fin keel yacht and would thence display less heel angle and weatherhelm than shown, at 22 knots of wind.

Only broad conclusions can be drawn from these tests, insofar as the other Sadlers are concerned, but the indications are interesting. It is likely that performance differences would be less evident with the 29 and 26, where twin keels are more popular.