DIAMOND

Ten Rater design by SAILSetc

background

In late 2005 we experimented with a Marblehead hull made for us from pre-preg carbon baked at 70 degrees C using an existing mould. The result was very encouraging and we have continued to explore this method of making hulls. In fact, except for our IOMs, all our boats are made this way now.

The pre-preg hulls have several advantages. They are stronger, stiffer, heat resistant and longer lasting hulls, with the possibility of supplying hull mouldings and hull kits almost 'from stock' and more time available for us to carry out other work. One side effect (possibly good, possibly not so good) is that the natural carbon and clear resin produces a black hull thus requiring the hull to be painted/sprayed if you want any other colour.

Ideally parts made of pre-preg carbon are cured at 100 decrees C or more. To do that we had to make new mould. Because we had to make a new mould we also took the opportunity to make the hull in a different way that would enable the primary hull moulding to be made with all the deck structure, as well as a number of other useful features, all in one. By the end of 2006 we had also modified the moulds to enable the fin box and mast tube to be moulded as part of the primary hull moulding.

New moulds for the A Class SWORD were also made in early 2006 and all new SWORDS will be made this way.

Rather than make a new mould for the 1999 design Ten Rater PRIZM, we took the opportunity to go through the design exercise afresh to see what gain in performance could be made in light of the experience gained from use of PRIZM as well as the lighter expected build weight.

The new Ten Rater, called DIAMOND, sailed first in spring 2007.

design development

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DIAMOND is a development of PRIZM but the hull form has been tuned to improve the straight line performance across the wind speed range while, at the same time, retaining the excellent manoeuvrability that PRIZM has. In fact we believe it is this ability to steer and be steered that gives PRIZM an edge in light airs over smaller boats with larger sail area that, in principle, should have better straight line speed in those conditions. The ability to change course to take advantage of a freeing shift, or to tack on a header, without losing too much speed seems to translate into better speed. Keeping the underwater hull form very close to PRIZM means we can retain those characteristics.

Overall beam is substantially lower than for PRIZM at around 190 mm. This ensures the hull immerses to maximum waterline length as soon as it is heeled slightly and moving in its own wave pattern. It also keeps the hull moulding weight down and gains back some of the heeled stability by virtue of a lower centre of gravity.

construction

The hull with integral centre deck and foredeck, fin box, and mast tube is moulded in two layers of pre-preg carbon with additional reinforcement where needed. The bare hulls weigh around 450 grams. Many useful detail design features are incorporated into the primary hull moulding: witness marks for station positions, recess for keel bolt, recess for headsail sheet fairleads, recess for headsail boom swivels.

performance

The prototype won the Brittany Cup and GBR national championship in 2007 each sailed in a range of wind conditions.

specification

See the Boat Specification sheet for full details.

end

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performance

An unknown quantity at present but we are confident it will be an improvement on PRIZM (the moulds for PRIZM have been sold). The following is what we wrote about PRIZM.

> *The first boat out of the mould placed 2nd at the UK national championship (in the 10 - 20 knot winds we expected in Singapore). This was its first time on the water and it showed excellent speed compared with the PUZZLE which won, only losing out due to unfamiliarity and minor errors.*
>
> *Some weeks later this boat and the second PRIZM out of the mould took the top two places at a breezy event at Poole where the top four rigs were used during the day's racing. Again the boats showed excellent speed and manoeuvrability.*
>
> *In Singapore the anticipated stronger breeze did not materialise but the boats had sufficiently good speed in the 2 - 6 knot winds to place 1st and 2nd. A well sailed PARADOX did place 3rd having gained in the really light airs by catching the other boats out of time indicating that our earlier decision was a sound one. The third PRIZM completed in time for the event was at one stage in third position but, having sailed consistently without winning many heats, he fell foul of the scoring/tie break system and dropped to fifth overall.*
>
> *The time invested in the design process was worth it and since 1999 the design has dominated the UK national championship results and traveller series results.*

statistics

Length over all	1680 mm	Length on waterline	1230 mm
Sail Area	1.02 m^2	Disp	5.8 kgs
Ballast (approx)	4.2 kgs	Draught	590 mm
Maximum Beam	190 mm		

construction

For the first time we have commissioned a CNC machined hull prototype from which to take the mould. This will enable a mould to be made in pre-preg carbon at a much higher temperature than has been possible from our older timber plugs. This should give a better surface finish as well as guarantee symmetry.

The mould will be in three parts: port and starboard sides of the hull and the deck. This permits many features to be incorporated into the deck that are not possible with moulds split on the centreline. For example a recess in front of the mast allows the headsail sheet fairleads to be fitted flush with the deck instead of above the surrounding deck. A recess in the foredeck permits the attachments for the headsail boom swivel to be below deck level and keeps the headsail boom as low as possible to the deck.

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The fin box and mast tube will also be incorporated into the primary hull moulding guaranteeing repeatability and symmetry of these important elements.

A recess for a pot (containing the receiver and batteries) at deck level is also incorporated into the primary hull moulding and all boats will be completed this way. Since 2006 we have developed a universal moulding (item 311p) for installing the winch and rudder servo. Any winch can be installed using this moulding but we think the RMG 280 most suitable for the purpose.

DIAMOND will also feature the attachments for the new snap in/out rigging screws (item 31s). These are a quick and simple-to-attach rigging screw that create no snag points whether on or off the boat, and which can be adjusted in situ. If using our rigs we imagine they would be used only for the No 1 rig. The lower rigs will be stiff enough without the use of shrouds.

See the Specification for fuller details.

rigging

DIAMOND is intended to be used with conventional (shroudless or with shrouds) rigs rather than with swing rigs. See page 10 of catalogue for kits.

Choose a No 1 rig mainsail luff of 2000 mm if you sail in generally breezy conditions. Performance at all higher wind speeds will be superb. For those who sail regularly in winds above 10 knots it would be worthwhile using a heavier ballast.

Choose a No 1 rig mainsail luff of 2100, or even 2200 mm, if you sail in predominantly lighter winds. A ballast reduction from 4.2 kgs to 3.85 kgs (bigger sails required) would further enhance performance. The taller rig means shorter boom lengths and reduced performance relative to the standard rig at higher wind speeds.

If you have knowledge of the probability of any given wind speeds in the 2 - 20 knot range we can provide an analysis of comparative performance with a view to further optimising the choice of rig and ballast. This may take more or less time depending on the degree of finesse required - to be charged for as appropriate.

The attachment of the No 1 headsail boom is made to an eye tied to a piece of cord which is attached to the bottom of the hull in the bow. The cord is placed in a tube to keep the hull watertight. We need to have knowledge of the rig height you will use in order to place the tube correctly at the completion stage.

The attachment for the headsail boom of lower rigs is by way of the headsail boom swivel, item 120d.

If you want to order rigs please see our Rig Specification and Rig Order Form.

foils & ballast

In early 2003 we tested a new fin section and found it to be a marked improvement on previous designs. We revised the fin again in 2004 when another small improvement seemed possible. All new boats are fitted with the newest fin.

The carbon rudder is a deeper, narrower, version using the same aerofoil section.

The ballast is the longer and thinner design we have used since 1998.

specification and prices

During 2006 we were in the process of learning about the methods and costs of building boats this way. Initial indications were that price of hulls made using pre-preg would remain about the same and for 2006 we are kept the price the same as for hulls made using the previous method. Having settled down to a system that gives us excellent and consistent results we have found, perhaps inevitably, that this is no ‘magic’ way of making top quality boats less expensively. Thanks to the aircraft and defence industries, as well as industry as a whole, waking up to the benefits of carbon fibre the cost of this material has escalated a lot recently. While we have good stocks of our own materials we can keep price rises for parts made in house to levels close to inflation. However, we cannot do that for carbon products that we buy in. Thus the price of the pre-peg hulls (as well as carbon tubes) have risen considerably.

The very large increase in the prices of a Marblehead and Ten Rater hull moulding are due partly to the increased price of the process but also reflect the very much larger amount of value that is built into the hull moulding itself. The hull shell is a very complete moulding and, apart from details that help with the fitting out, now even has the fin box and mast tube moulded in from the outset. Because of the extra completeness of the primary hull moulding the cost of getting to the completed boat stage has been reduced. There is also a benefit in consistency. However the cost of a hull kit, part completed boat or a finished boat remains much higher than previously.

We think the new construction will produce boats that are not so susceptible to crash damage. If it does occur, damage will be repairable without the need to spend a lot of time restoring the polished gel coat finish that our earlier boats had. In fact perfectly sound and cosmetically acceptable repairs should be well within the scope of most owners.

Our boats have always had a reputation for excellent performance and value over a long term and we are confident the extra longevity achieved by the pre-preg building process for these thoroughly well proven designs will make the increased costs fully justified.

Please see the our Ten Rater Boat Specification and Boat Order Form.

ordering and payment

You can specifyy the boat you want by completing the Boat Order Form.

For e-mail customers this is an active spread sheet that allows you to learn about the options and see the cost, and other, implications of the choices you make.

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For customers unable to use the Boat Order Form please tell us what you want and we will complete a copy for you. This will be posted to you to sign and return to us.

Confirm your order by sending us a signed copy of the Boat Order Form. This provides us with confirmation of what you have ordered. The specification of your boat can be altered at any time up to production time by submitting a revised and signed Boat Order Form.

Our normal practice is to take a 25% payment on submission of your Boat Order Form. This reserves your spot in the queue. If you are unsure of the final specification details it is worth getting in the queue and deciding the details later.

Another 25% will be taken the week we start to mould the hull, 25% the next week and 25% the next week.

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