BUILDING A ONE-OFF BOAT

John Campbell introduces a new building method

FOR BOATS up to about 20 metres in length, the standard material for construction has become GRP. At the last Southampton Boat Show, there were three boats built of ferro-cement, a couple of steel, one actually made of tree wood, but perhaps 95 per cent were GRP.

Like it or not, it seems that GRP is here to stay. The advantages for building production boats in this material are overwhelming. There are even a few advantages to owning one, but the big crunch comes when one chooses the design. There is a bewildering selection of hulls available from many companies, but often it is impossible to find just the right shape or size of hull for a particular purpose.

The majority of production boats are moulded in a female mould which is extremely expensive to make, as it in turn must be made from a plug. In the past, the plug for the mould has usually been made from wood. Sometimes the plug has been made as a sailing prototype wooden boat; but very often it is just a plug, which is broken up after use.

For the person who wants a 'one off' GRP boat, the cost of building a plug then making the mould would be prohibitive if only one boat is made. This method only becomes economical if the cost of the plug and mould is spread over many boats.

Over the years, there have been many attempts at finding a way to build a GRP boat without a mould. One of the more successful methods has been the foam sandwich form of construction. In this method, sheets of rigid closed-cell foam are laid over a series of wooden frames, which establish the shape of the hull. This foam then, in effect, becomes the male mould for the hull. The outside of the foam is covered with layers of glass mat and resin, and finally with a gel coat. Once this has had time to cure, the frames are removed, and the inside of the hull is covered in a similar way.

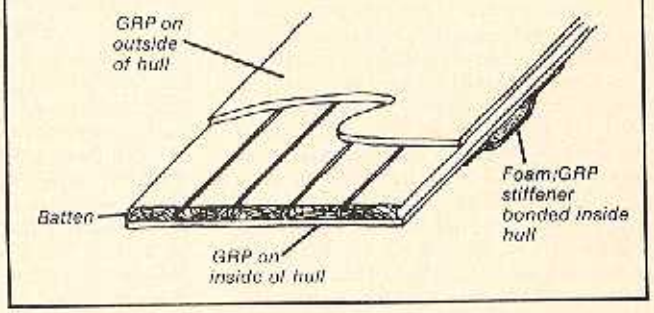
There have been problems associated with foam boats. Some have delaminated, others have soaked up water in prodigious quantities. Others have been entirely successful. Boats such as Chay Blyth's *Great Britain II* have covered many miles without apparent trouble.

A new system has been developed by the Tyler Boat Co Ltd, under their trade name of Duradense. They developed the system primarily as a way to reduce the cost of the plug for their moulds. Using this system, they can effectively build a plug which is sailable, as a prototype, and can then be sold to offset the cost, once a mould has been taken. However, it has proved so successful it seems bound to become an accepted way of producing one-off hulls, at a reasonable price.

The secret to the system is a specially made GRP batten, which is made by a process called 'pultrusion'. Resin is injected into a die under pressure, together with the continuous glass filaments. The mixture is heated as it is forced through the die, and the fully cured batten is pulled out the other side. Continuous lengths up to 25 metres can be made.

The battens are 3mm thick and two widths, 25mm and 50mm, are used. The edges of the battens are contoured, convex and concave, so that they fit together (Figure 1).

FIGURE 1



When actually making the hull, wooden frames are made up at suitable intervals to follow the shape of the hull. The battens are prepared for use by roughening their surface to ensure good bonding. The battens are then laid over the frames, and nailed in position using silicon bronze nails. In flat areas of the hull, the wider battens are used; in areas with tight curves, the narrower battens give a fairer surface.

Once the hull is completely 'planked', the battens are treated with a special resin primer. The outside of the hull is then covered with layers of chopped strand mat and woven rovings, either laminated in single layers or in combined mats such as 'Fabmat' or 'Linrove'. When the hull has the required laminations on the outside, it is sanded. Then the hull is screeded fair, using a thickened resin mixture before receiving its final gel coat.

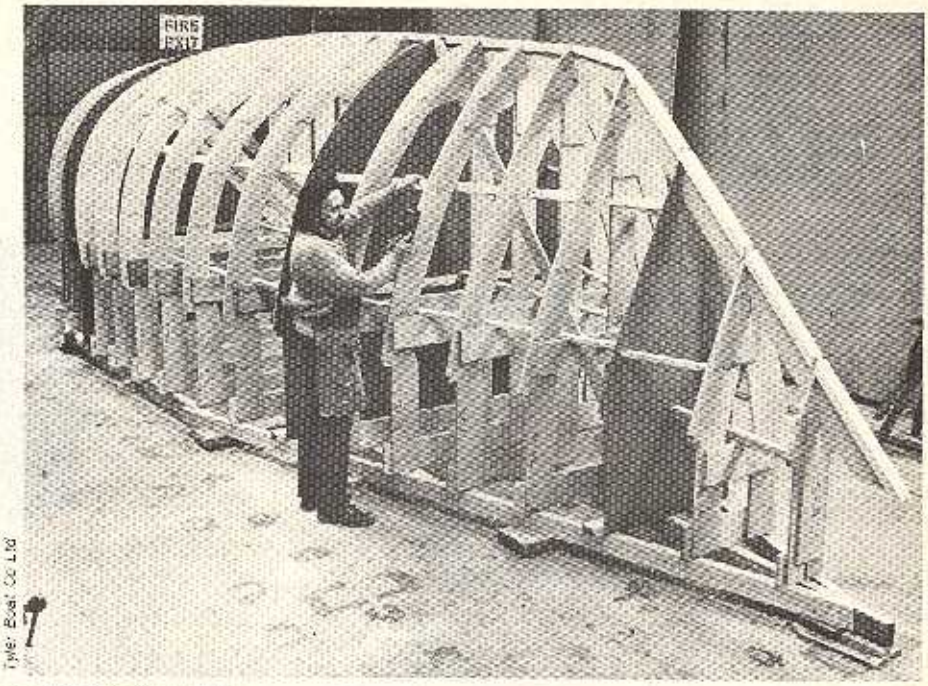
When the outside is finished, the hull is turned over and the building frames are removed. The nails are clipped off flush, and the inside of the hull is primed and laminated in the same fashion as the outside. The completed hull can now be fitted with transverse stiffeners and bulkheads as with a conventionally built GRP hull. Alternatively, some of the building frames can become bulkheads in the finished boat, so they can be left *in situ*. Other frames could be cut back to within a few inches of the hull, then covered when the inside of the hull is glassed. These frames will then form the core effectively for GRP frames.

The normal weight and thickness of the hull built this way is comparable to that of a 40ft hull moulded conventionally. This means that a smaller boat will come out fractionally heavier than a standard boat, but it will be much stronger. Even for a 40ft boat, the hull will be stronger because higher than normal glass-to-resin ratios are possible. The battens are about 65 per cent continuous glasslibre.

Above 40ft, the scantlings of the hull can be increased to the desired weight by additional laminates. Batten lengths of up to 25 metres mean that 80ft boats can be built with continuous battens, although the largest boat built to date has been a 55ft workboat.

Tyler's will undertake to build one-off hulls by this method, and materials can be made available to other yards, or even to very enthusiastic amateurs to build under licence. Duradense opens up a whole new world for GRP. <>

Wooden framework ready for 'planking'. This is for the plug for a 30ft half ton racing boat



Tyler Boat Co Ltd

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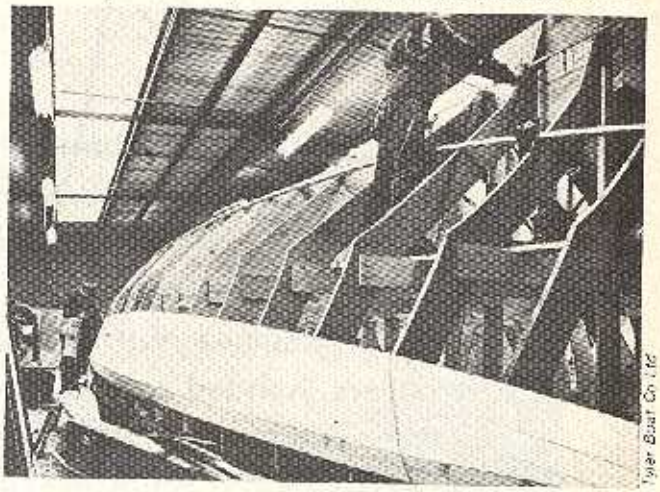
Framework of half ton prototype partially planked in Duradense battens. Note run of battens

Starting to plank up the framework for a 55ft workboat



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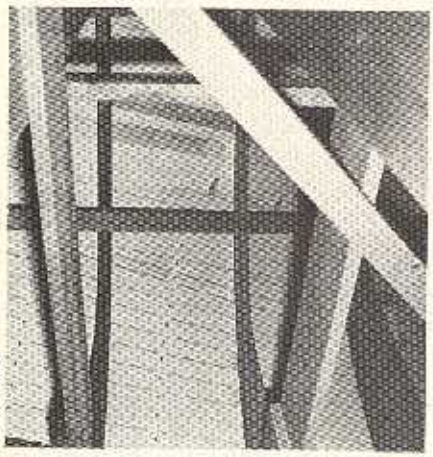

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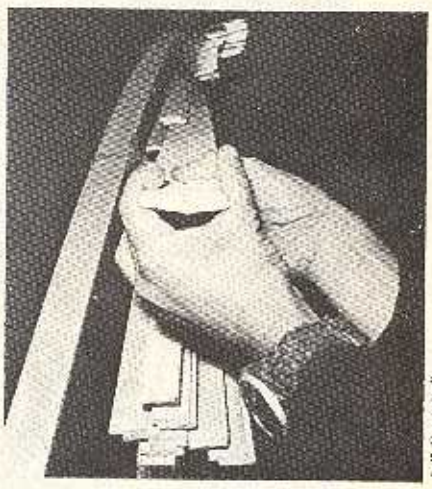
Looking up inside framework of half tonner. Note transverse ribs screwed to battens between frames to hold the battens together in a region where there is heavy curvature of the hull

Completed hull of 55ft workboat. Note fairness of hull as shown in reflections. This has been used as a plug for a production mould and will next be fitted out and sold as a boat



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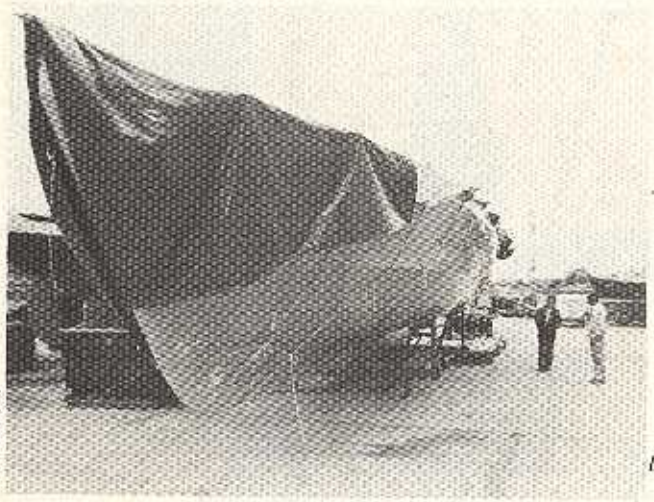
Duradense battens, showing interlocking edges



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