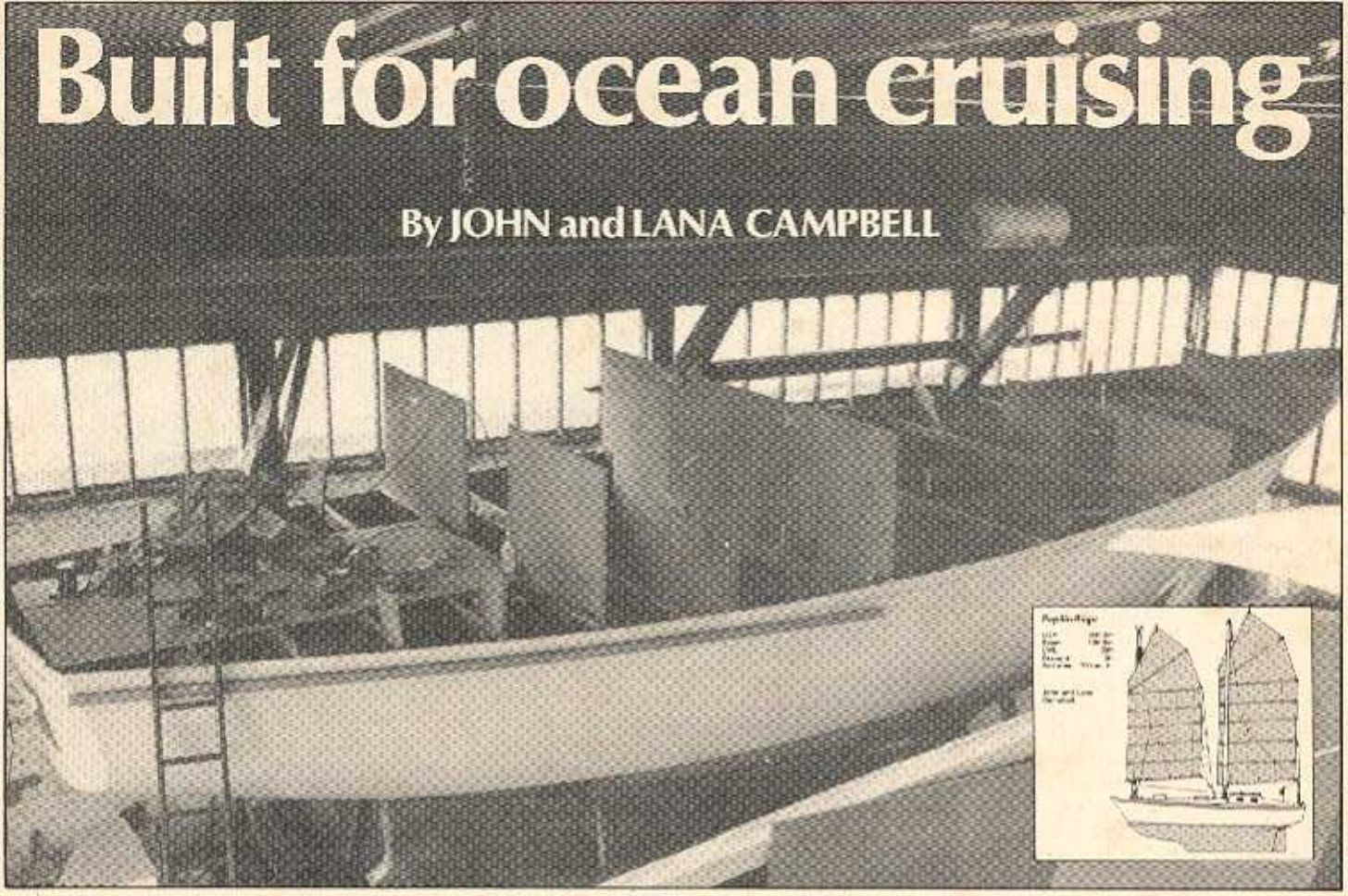
Built for ocean cruising

By JOHN and LANA CAMPBELL



Part two, fitting out the hull...

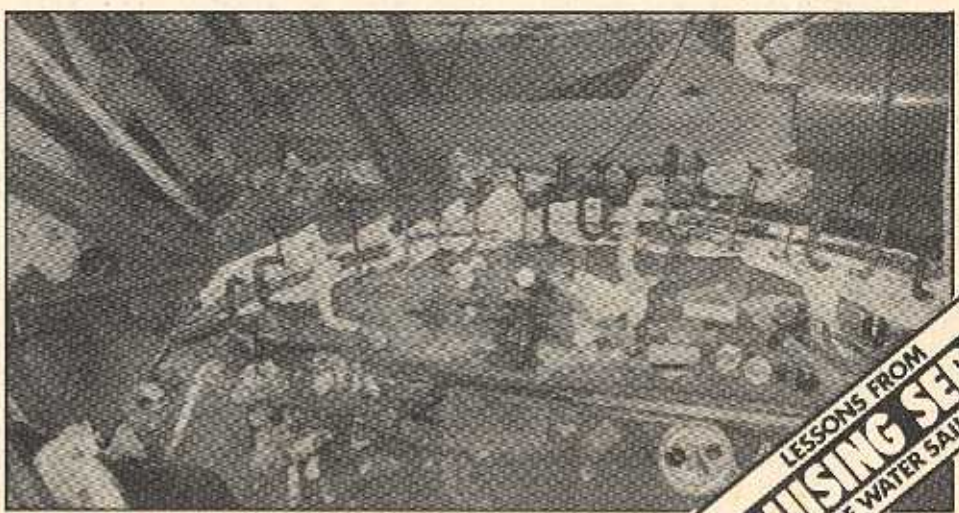
AT THE END of stage 1, we had arrived at a design for the boat. Flush decked with a small doghouse on a 35 feet resinglass hull, and with a Chinese lugsail schooner rig. Now, we had to face the ugly reality of building it, drawing on limited funds and skills, and yet ending up with a boat strong enough to survive the rigours of ocean passages.

We decided that the deck itself would be plywood, sheathed with polyester and glass, on wooden deckbeams. The first major decision to be made was how to fasten this lot to a resinglass hull in such a way that it would stay fastened and not leak. John Tyler, of Tyler Mouldings Ltd., strongly suggested that we avoid a conventional wooden beamshelf and instead use grp as an effective shelf.

It is very difficult to fasten a wooden beamshelf to a resinglass hull in a manner which is strong, spreads the stress, and will not leak. The scantlings Tylers suggested for us were half-inch thick ply, sheathed with 3oz chopped strand mat, and the deck bonded to the hull with six layers of 1½oz mat inside and out (Figure 1). So in effect the top edge of our hull is stiffened with an angle of resinglass 14 layers of 1½oz mat thick. This gives a laminate thickness of a little over ⅝in thick in addition to the thickness of the hull. Certainly as strong as a wooden beamshelf.

To make the outside of the join as neat as possible, we asked Tylers to incorporate a rebate into the top edge of the hull when they moulded it. The outer layers of mat would lie in this rebate, resulting in a flush outer surface to the joint (Figure 2). They achieved the rebate by fastening a strip of plywood into the mould along the line of our chosen sheer, and laminating the hull over this. It did not add significantly to the cost of the hull, but made the whole joint much neater.

At this point in the deliberations, another bonus came to light. With a resinglass beamshelf, the beams themselves could not be dovetailed into the shelf. I would be the first to admit my woodworking skills are limited. While I can cut a reasonable lap dovetail joint, it is a major project not to be lightly undertaken. Provided we could come up with an alternative way to fasten the



One more clamp should just about do it . . . Each of the deck beams was made up from five half-inch laminations to prevent straightening.

beams to the hull, the saving of some forty dovetail joints seemed very attractive.

The method we evolved was to glue and screw plywood hanging knees to either end of each deck-beam, and bond these to the hull. These hanging knees served to increase the area of bonding, and helped to spread the loads and stresses down into the hull. The hanging knees were mounted on a horizontal plywood shelf which in turn was bonded to the hull. This perhaps was not entirely necessary, but no doubt added strength, and made it much easier to position the hanging knees. The final hull-to-deck joint is shown in Figure 3.

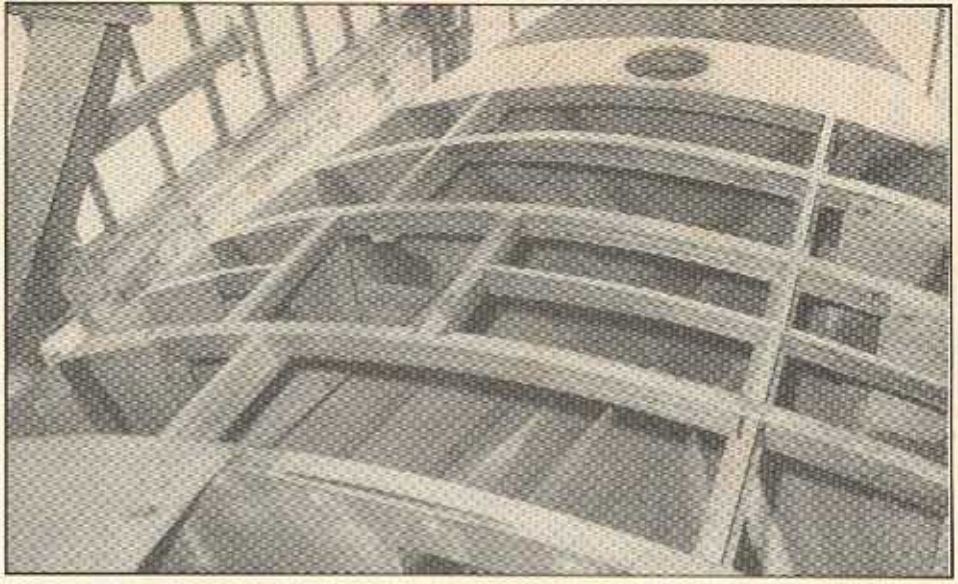
It perhaps looks complicated at first sight, but it was in fact extremely easy to build, particularly the flush decked area. For all this part of the deck, the only joints required were for the carlins for the hatches. A conventional coach-roof could be built in this way, as indeed our doghouse was. This requires the carlins to be jointed into the beams at either end, and the inner ends of the half beams are jointed into the carlins. The hull-to-deck join remains the same, and the wooden coachroof is built conventionally on to the carlins.

I will run through the order in which our deck was built, and for a rough guide, give the scantlings we used. It should be remembered, though, that we were trying to overbuild the boat for ultimate strength, and no doubt, for coastal use the scantlings could be reduced somewhat.

The cockpit for *Papilio* is in reality a flat area of deck surrounded by coamings. This flat area was the first part of the deck to be built. For the good reason that it gave us a good, flat space to set up a small workbench. That saved many hundreds of trips up and down the ladder.

The beams for the cockpit are all straight, 2 inch by 2½ inch iroko. The first beam was glued and screwed to the aft face of the bulkhead forming the back of the doghouse. Its top face was level with the top edge of the hull. The next beam to go in was the aft one. It was suspended at the same height as the other beam, close to the transom. We wanted the cockpit sole flat and level as it is our tropical double berth.

Plywood hanging knees were glued and screwed to either end of the beam and bonded to the hull, using six layers of mat either side of the knee. Two battens laid across the two beams enabled all the other beams to be suspended in place. They were, in turn, bonded to the hull using hanging knees. A sheet of ¾ inch plywood glued and screwed to the beams formed the sole of the cockpit, and I was able to set up my workbench.



Hanging knees bonded to the hull, with six layers of mat either side, carlins dovetailed into the beams, and half beams dovetailed into the carlins.

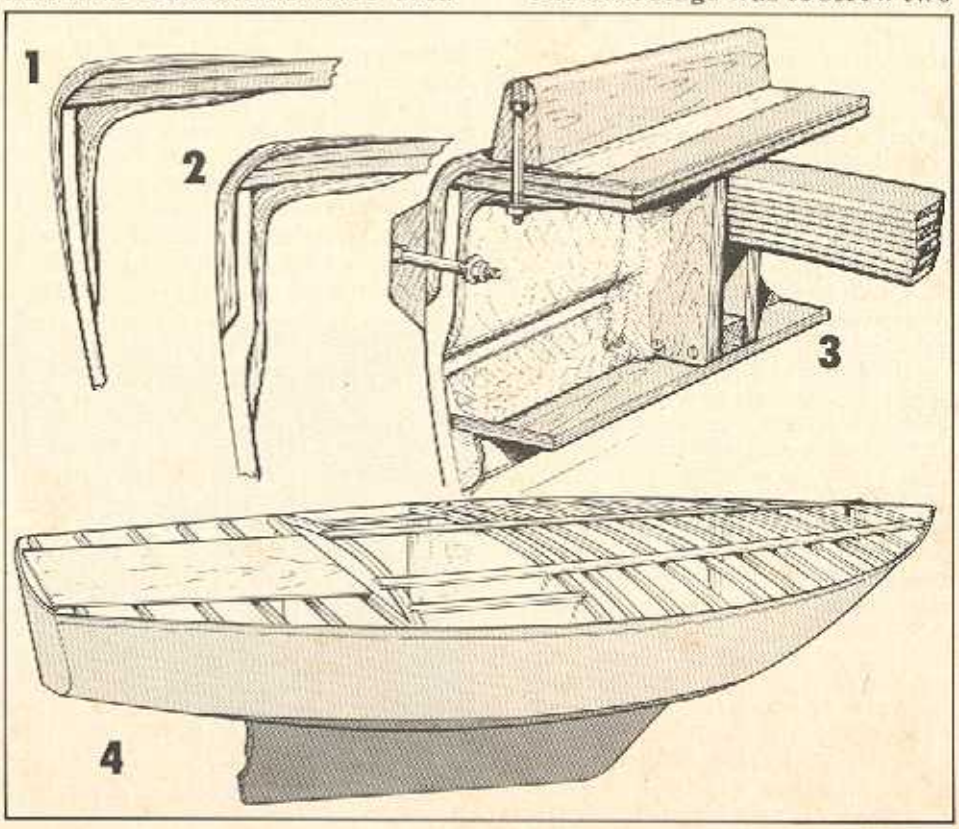
The remaining deck beams are all laminated from iroko, and they are 2 inch wide and 2½ inch deep. Sixteen inch centres were chosen for the beams so that, using eight-foot by four-foot sheets of plywood, the joins would lie on the beams.

Our deck is heavily cambered to give sufficient headroom without resorting to a coachroof. The beams are all of a constant camber so one jig could be used to make all the beams, and the shape was an arc of a circle.

The arc for the inside face of the beams was marked out on a heavy plank, and a batten 2 inch by 1 inch on edge was securely fastened to this line using wooden blocks. Five half-inch laminations were used for the beams. Glue was applied to each face and all five laminations were clamped in place together round the outside of the batten. Newspaper was used to prevent the beam sticking to the jig. If fewer than five laminations are used, there is a tendancy for the beams to straighten when released from the jig.

Each beam was left in the jig for about forty-eight hours, and when released, they sprang back only about one inch. The first four beams were glued and screwed to the four main bulkheads, which were in turn cut down to match the profile of the beams.

The next stage was to screw two



temporary battens to these frames running almost the whole length of the boat. We used 4 inch by 2 inch battens and they were fastened along the boat two feet either side of the centre line (Figure 4).

From these two battens, all the deck beams for the flush-decked area were suspended in position.

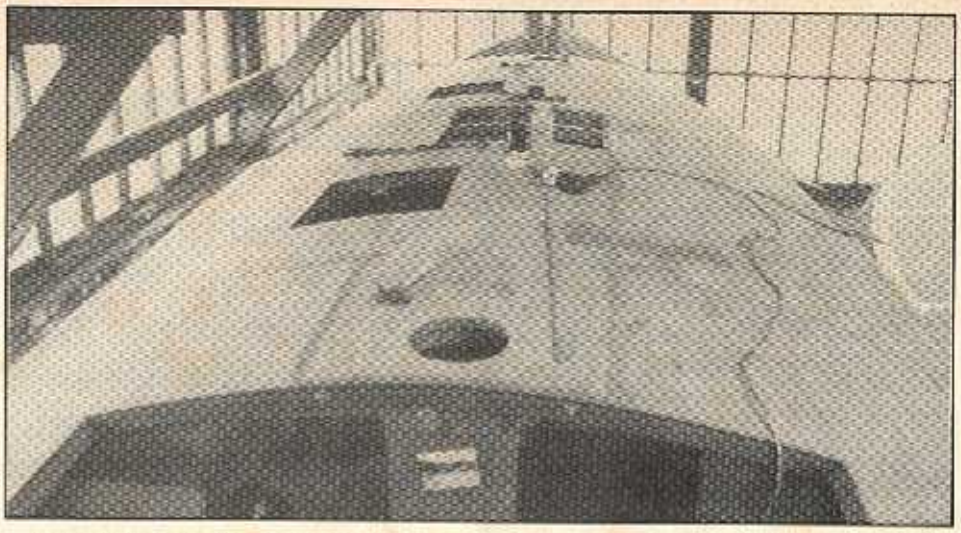
At this point, the fore and after ends of the carlins for the doghouse were jointed into the beams (which were already fastened to the hulkheads). But they were not glued in until the joints for the half beams had been cut.

While the beams were being made, there was plenty of time to bond in the horizontal plywood shelf. Our hull has five longitudinal foam stringers bonded along each side. The shelf was fitted in sections, between adjacent bulkheads, and bonded to the hull just above the top stringer, using five layers of mat.

Plywood hanging knees were then cut to shape, and one was glued and screwed to each end of each beam. The lower edge of each knee was glued and screwed to a wooden block the same width as the beam, and this in turn was glued and screwed to the plywood shelf.

Once the glue had set, the hanging knees were bonded to the hull, using six layers of mat either side of the knee. We then gilded the lily by adding a second hanging knee on the other face of the beam. This in turn was bonded to the hull. The second set of knees is perhaps not absolutely necessary, but I like symmetry, and the additional width spreads the load over a much wider area of the hull.

Once all the beams were in position, we added a pair of handrails, running between each pair of bulkheads, glued and screwed to the underside of the beams. We used iroko 3 inch by 1 inch, and they served not only as handrails but also helped to steady the beams while the plywood was nailed on and to spread the fore and aft loading imposed on the deck by the unstayed masts.



Time for a break, the deck is ready for bonding to the hull. Below, the author provides scale against the size of the task

Now the temporary battens were removed and the more technical bits started. Carlins for a forehatch and skylight over the saloon were dovetailed into the beams. Half beams were dovetailed into the carlins in way of the doghouse, their outer ends being bonded to the hull with hanging knees as before. I found that I could cut, fit and bond in half a dozen hanging knees in the same time that it took me to cut one halfway decent lap dovetail. Three-inch thick mast partners were glued and bolted to the beams where the masts would pass through the deck.

At long last all the beams were in position, and the tedious task of fairing them all in began. A long batten held on edge identified the high spots. It often seemed that for every shaving removed from one beam, two had to be removed from the next. It is easy to end up with very thin deckbeams!

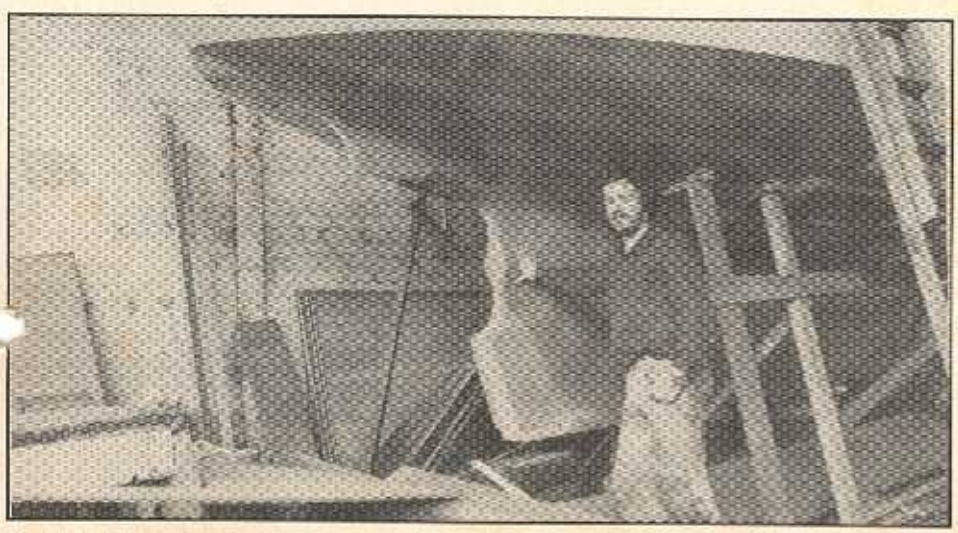
With patience, it all came right in the end. The tops of the beams were fair enough to start laying down the plywood. Because of the heavy camber, we elected to use two layers of ¼ inch ply instead of one layer of ½ inch. The first layer of ply was glued and gripfast nailed to the beams with the sheets of ply running fore and aft. Real progress was apparant at last. The second layer of ply was laid on top, with the sheets running athwartships. Glue was applied to both faces and care taken to remove all the air from between the two layers of ply. We added a third layer of ply down the centreline between the two masts to help spread the load imposed by the unstayed rig.

Once all the glue was well and truly set, the outer edge of the deck was trimmed flush with the hull, and the corner well rounded. The deck was then bonded to the hull with six layers of mat inside and out. Finally the deck was sheathed from gunwale to gunwale with two layers of 1½oz mat and a surface tissue.

The doghouse was built along conventional wooden boat lines, and the whole thing was also covered with two layers of 1½oz mat and a surface tissue.

All surfaces that were bonded were ground down and roughened. They were then washed in acetone and primed with thinned resin to ensure the best possible bond. However, so as not to rely entirely on the bond, we used two hundred 5/16 inch stainless bolts to bolt on a substantial rubbing strake and toerail. These bolts pass horizontally and vertically through our effective grp beamshelf, so even if the bond were to fail, the boat could not come apart.

After some heavy sailing and being nudged against a quay wall by an almost endless procession of Irish fishing boats, there is no sign of movement in any part of the boat's structure, and more important, not the slightest trace of a deck leak! ●



Next Month... the rig