The birth of a new

New boats are launched at almost every show – but what's involved in creating a design from scratch? David Harding has been following the development of the Cornish Crabber 26 to find out

PART 1 – from the drawing board to the plug

If you go to the London Boat Show this year, there's one area you'll definitely want to visit. Right in the north-west corner is the Guinness bar, with the PBO stand conveniently located about four paces (or six imperial staggers) diagonally opposite.

These are undoubtedly two of the show's big attractions but, for those partial to modern gaffers, there's another one too. Step across the alley from PBO and you'll find Cornish Crabbers, builders of the ubiquitous Shrimper and her sisters.

Whether or not your fancy is tickled by wooden spars, gaff rigs, bowsprits and simulated lapstrake hulls, there's no denying that the Crabber family has a wide and dedicated following.

It starts with the Crabber 17. Then there's the Shrimper 19 and the newest of the range, the Crabber 22. All three have long, shallow keels and a centreplate. Next up is the Crabber 24, the current version of which replaced the original – and Crabbers' first boat – back in 1994. She differs from her smaller sisters in having a deeper fixed keel and no centreplate, so trailing and drying out need a little more thought.

Going up again brings you to the flagship, the Pilot Cutter 30 – a solid little yacht that, at around £110,000, costs £45,000 more than the 24.

This left owners of Shrimpers or 22s nowhere to go within the Crabber range if they wanted to move up to something the size of the 24 or a bit bigger; something that offered more space and pace combined with the convenience of shallow draught and a price tag less than that of the 30. It was a gap that Cornish Crabbers' new owner, Philip Langsdale, decided needed filling – so he and his team set to work on the next model.

By the time a new boat is finally launched at a show or unveiled to the public, as the 26 will be next summer, thousands of man-hours will have gone into it in a series of processes that few boat-buyers ever have occasion to witness, so I took the chance to follow the creation of the new Crabber from the very start.

Decide on the design

Having established what size and type of boat they want to build, the boatbuilder needs to choose a designer. This was easy for Crabbers because sales manager Peter Thomas is the son of David Thomas, whose designs need little introduction. From the Foxer dinghy to the Sigma and Hunter ranges (which include the stunningly successful Sigma 33 and Sonata, for example), Thomas senior has drawn more successful production yachts for British builders than any other designer.

As he has also produced world-girdling racers such as the Global Challenge 67-footers, you might think that drawing a 26ft (8m) traditional-style gaffer would be

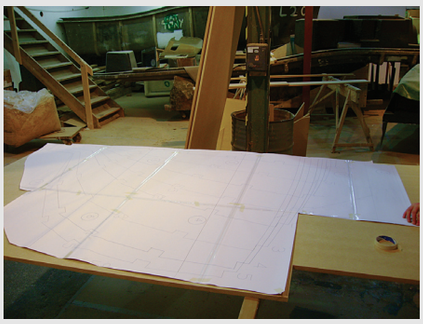
David Thomas (seated), Peter Thomas and Philip Langsdale study the design drawings

MAKING THE PLUG – FRAME BY FRAME

In days of yore, plugs were built using a process known as lofting: the shape of each section from the designer's drawings was laid out on the floor of the yard. CAD programs now allow David Thomas to print them out at full size on A1 sheets of paper. The sections are substantially larger than A1, however, so several sheets have to be stuck accurately together with tape. To save space and paper, several sections can be printed on the same set of sheets.

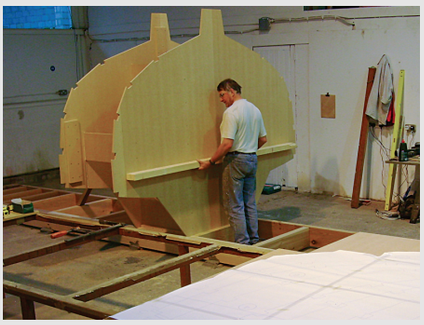
Next comes the transfer to MDF board. The paper drawings are laid on sheets of 18mm MDF and a spike (like a bradawl) is used to punch a series of small holes through them to transfer the shape of each section to the MDF.

Once the paper is removed it's a case of 'joining the dots' using a pencil and ruler. Then comes the cutting out. No complex technology is involved here, as Richard Dickson explains: 'you eye-ball it – it's a job for a steady



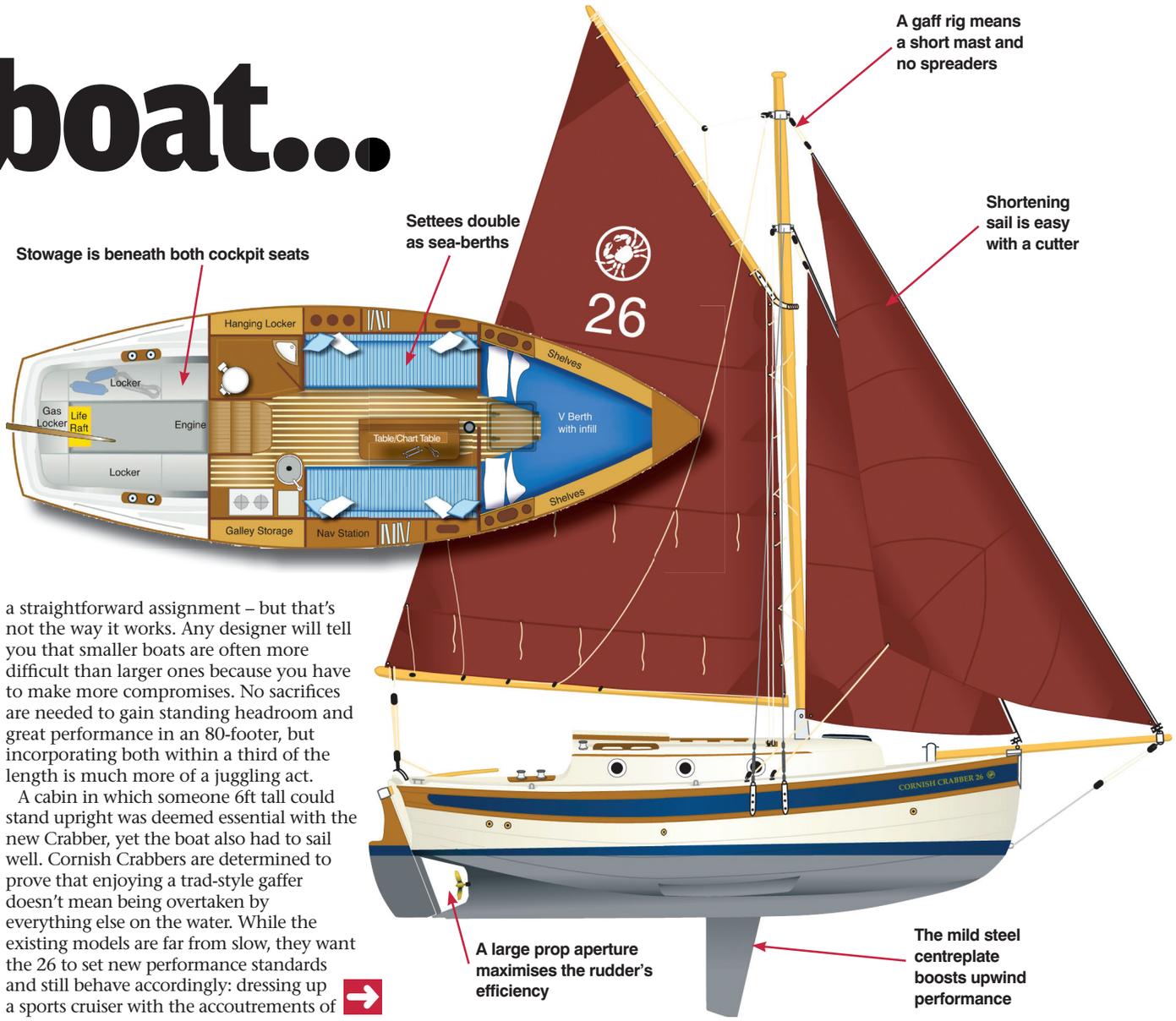
1 Assembling the sections: the full-size drawings are printed out on A1 sheets of paper, which are then stuck together…

2 … and laid on sheets of MDF. A spike transfers the shape to the board in a series of holes, which are then joined by pencil and ruler.



3 A timber base-frame is built, strong and level, and glued to the floor. Then the transverse sections are added one by one.

boat...



a straightforward assignment – but that's not the way it works. Any designer will tell you that smaller boats are often more difficult than larger ones because you have to make more compromises. No sacrifices are needed to gain standing headroom and great performance in an 80-footer, but incorporating both within a third of the length is much more of a juggling act.

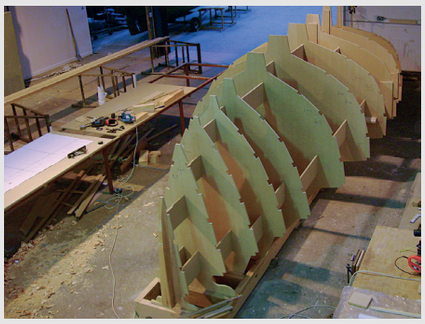
A cabin in which someone 6ft tall could stand upright was deemed essential with the new Crabber, yet the boat also had to sail well. Cornish Crabbers are determined to prove that enjoying a trad-style gaffer doesn't mean being overtaken by everything else on the water. While the existing models are far from slow, they want the 26 to set new performance standards and still behave accordingly: dressing up a sports cruiser with the accoutrements of

hand and a good jigsaw.'

Once you have cut out all the sections (13 in this case) you're ready to start building the plug. This is where you need a solid, level base frame. Crabbers made it in timber and glued it to the floor. Steel could be used but wouldn't expand and contract with the plug and, as Richard quipped, you can't use it for firewood afterwards.

Each section is sized to allow for the thickness of the planking on the outside and incorporates slots to accommodate the fore-and-aft battens – six each side where the planks overlap or butt against each other, plus one along the gunwale. They're formed by two 15x60mm strips of cedar; the inside one fitted first and the outer one screwed into it. A single 30x60mm batten would be too stiff.

With the sections and battens in position, it's time to start planking up. Ordinary plywood is used for this: two layers of 6mm (¼in) for the bottom plank because of the



4 A boat-like shape begins to emerge. Longitudinal stiffening is added between the sections to make the structure rigid.

5 The stem is built from solid timber and the fore-and-aft battening is added, formed by two 15x30mm lengths of cedar.

6 Sections and battening complete, and now the patterns for each 'plank' are made over the battens – here for the second plank down.

tradition was never an option.

Making it doubly hard to achieve headroom and sailing ability is the need to give the 26 a simply-engineered centreplate that's easy to lift. That means a reasonably light galvanised steel plate, as with the other boats in the range, and keeping most of the ballast inside the full-length shallow keel. Internal ballast means a higher centre of gravity than if you have more weight lower down, and that in turn calls for more form stability, so the boat has to have a broader waterline and a shallower canoe body. The problems are that a shallower canoe body restricts headroom. Internal ballast occupies valuable space in the bilge, restricting it even further. Lead would be the best solution because it takes up less room and also keeps the centre of gravity as low as possible. The problem is its price, so iron castings shaped to fit inside the keel are the most realistic option. Iron punchings mixed with resin are another alternative: lower cost again, and easier to install, but bulkier.

These are among the countless elements that David Thomas had to juggle in the design of the 26, though he could include the Yanmar 3YM20 diesel engine in the ballast calculations as it's mounted low down in the hull.

Cutting the sections and the planks calls for a good jigsaw, an experienced eye and a steady hand

Clear water

Finer lines than those of her older siblings are a feature of the new boat. She has a distinct hollow in the entry and a smooth run towards the stern. Subtleties include no overlap between the bottom two 'planks' to smooth the water-flow, whereas above the waterline they overlap to create the lapstrake effect that's fundamental to the appeal of the Crabber family.

Bilge strakes are another vital element, this time for practicality, because they protect the hull and limit its heel when the boat dries out. This time, however, instead of being straight they follow the hull's curvature to minimise drag.

Giving a shallow-draught boat a sufficiently deep rudder is always a challenge, and Crabbers were keen to avoid a drop-section à la Shrimper. Instead, David Thomas concentrated on leaving the water-flow forward of the blade as undisturbed as possible. He created a sizeable cut-out between the keel and the blade's leading edge and made the trailing edge of the keel as fine as possible. In a first for the range, the blade will also have some balance area forward of its axis.

Like the 22, of which she's really a grown-up version, the 26 will have a relatively high aspect-ratio centreplate (this time with a rounded leading edge) instead of the 'wedge of cheese' shape of the Shrimper and Pilot Cutter.

The cutter rig will be similar to that of the 22, with a high-peak gaff and no runners. It will give a sail area/displacement ratio of 18, which is on a par with many modern cruising yachts and should provide plenty of power.

A relatively high displacement/length ratio of 282 notwithstanding, there's no reason why this forthcoming addition to the Crabber range shouldn't give plenty of conventional 26s a run for their money. Everyone involved in the project believes that there's no reason why a gaffer shouldn't sail very well indeed; it's just that a lot of boats with gaff rigs happen to be bulky, inefficient and under-canvassed

MAKING THE PLUG – FRAME BY FRAME

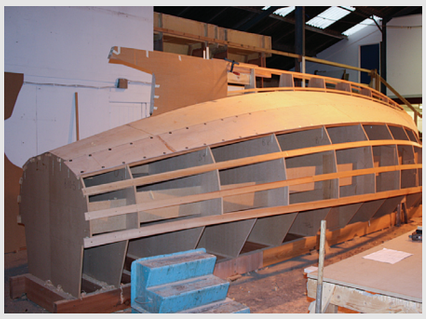
compound curves, then 12mm (½in) for the rest.

A pattern is made on the plug for each plank and, on the workbench alongside, two planks are cut from each – one for the port side, one for starboard. The plug is built to such precise tolerances that there should be no more than 1mm or so of difference between each side: if you reverse a plank from one side it will fit the other.

Because of the angle between each plank, the battens have to be precisely shaped with two distinct flats to align with the bottom edge of one plank and the top of the next one. Then, when the planks have been screwed into position, the overlaps between them that form the chines or knuckles have to be faired with filler because any unevenness will stand out. The overlap ranges from around half-an-inch deep amidships to nothing where the planks approach the stem.

At the stern, the plug is made

7 On the starboard side the first 'plank' is fitted and the pattern for the next one is in position. Planks are fitted alternately on each side.



8 Two planks down and the keel is taking shape as well. The extra length in the stern has yet to be cut off.

9 All the planks in position, screwed until the glue has set. Note the absence of overlap between the two nearest the keel.

View from the sharp end – and from here the plug could almost be an actual boat. Note the low-drag curved bilge runners

compared with today's performance cruisers. If a modern gaff rig is matched to an adroitly-designed hull and low-drag foils, you should benefit from good performance and great versatility: a short mast for simple raising and lowering, lots of sail combinations for easy reefing and good balance, plenty of downwind power without a spinnaker, easy sail stowing (the yard comes down on top of the boom) and the ability to de-power the main by scandalising – a trick to which the Bermudan rig has no direct answer.

Taking shape

The first stage of tooling up for production of a glassfibre yacht is to build what's known as a plug, which forms the shape of the hull. It's given a perfect finish because over the plug a female mould is made and then lifted off. The mould is used for laminating the hulls of the production boats and can last for several hundred mouldings before needing refurbishment or replacement (in which case a hull is used as another plug). A separate mould is created for the deck and cockpit.

Because the plug is like a perfectly-finished hull on the outside, it's sometimes built strongly enough to be finished as a wooden boat. Once the mould has been lifted off it, the redundant plug is used as a hull: it's fitted out, given a rudder, keel and interior, rigged and launched. Many of the plugs of the early Hunter models were turned into boats in the same way that the infamous *Barracuda of Tarrant* (a star of the BBC's *Howards' Way*) was the plug for the Sadler Barracuda 45.

Cornish Crabbers elected to keep everything in-house

Since so much work goes into building the plug, it might seem logical to make use of it rather than destroying it once the mould has been produced. The trouble is that to build a plug as a boat takes several times as long as to make it a temporary structure, so the tooling-up costs rocket. All you need with a plug is a perfect form and finish. In the case of relatively small-scale builders it's usually made from timber – a mix of solid sections, softwood battening and plywood as well as MDF – and finished externally with filler and wax. Inside it's full of the sections (like bulkheads spaced a few feet apart throughout the length) that form the 'skeleton' over which the external planks are laid.

Wasteful though it may seem, most plugs are therefore destroyed once the mould has been made.

Larger-scale builders will often contract out the plug-making to a specialist company that will computer-cut it from a solid lump of foam before applying the external finish. It might well be delivered complete with mould so the yard can go straight into laying up the first hulls.

If you don't want to do everything yourself for reasons of time or man-power, an alternative solution is to delegate the production of the frame sections to a laser-cutting contractor, but Cornish Crabbers chose the traditional approach and elected to keep everything in-house. They have skilled and experienced workers to do the job and believe there are benefits to retaining complete control over this crucial stage. Richard Dickson, who's in charge of the plug-building, explains: 'We're boatbuilders; we can see it evolve. If we spot something that's not right, we can change it. For example, the designer might make the aft end of the keel too narrow for the cutless bearing to fit in, or there might be a section of keel where there's not enough room for the laminators to work.

'Having practical boatbuilding experience among the workforce means we can think ahead and do something about these things before it's too late. Everyone who's going to be building this boat is walking past it every day, and certain elements are going to evolve during the construction.'

Peter Thomas also believes there are benefits, hard though they are to define, bestowed by the workers' sense of involvement and ownership from the outset. 'If we had bought in the plug from outside and started production, they'd build it but it wouldn't be the same.'

■ **See preliminary details of the Cornish Crabber 26 on the Cornish Crabber's stand, N11, at the London Boat Show**

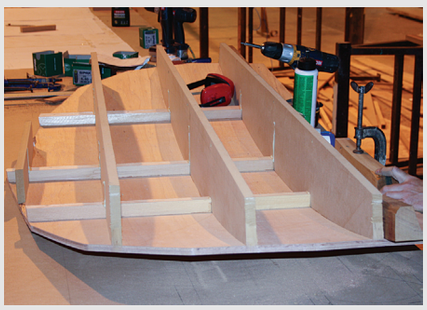
excessively long. This is for two reasons. First, the curve in the battens would be insufficient between the stern and the next section forward unless they're 'pinched in' beyond the stern; this forces the necessary shape into them. Second, the transom has to be inserted as the 'spare' length is cut away until it fits exactly. It doesn't work if you cut the plug to length and then try to fit the transom afterwards.

All the way through it's a job that demands accuracy, precise measurements, a good eye and plenty of experience.

After the planking, and the construction of other vital parts such as the keel, stem and bilge runners, comes hour after hour of filling and fairing to achieve a perfectly smooth surface ready for the application of the final high-gloss finish.

Next month

■ **Starting to make the mould**



10 Also built from plywood over MDF formers and battening, the curved transom is one of the last elements to be fitted.

11 The extra length of stern has been cut off, the transom is in place, the prop aperture cut out of the keel and the filling has begun.

12 Formed, filled and faired: the plug represents the shape of the hull of the new boat. Now it's ready for the final finish.