SECTION 36 - MAINMAST

36.1 Timber

36.1.1 Timber for spars needs to be lightweight, strong, straight grained and free of knots and other defects.

36.1.2 North American Silver Spruce (Picea Stichensis) is the ideal timber but it is expensive and sometimes difficult to obtain. Its average weight is 430 g/m3. European spruce is not suitable.

36.1.3 Douglas Fir (sometimes called British Columbian Pine) is a good substitute. It chief disadvantage is its weight - about 530 g/m3. It is available in good long, clean lengths.

36.1.4 Russian Redwood if available in long clean lengths is also a good timber for spars and has a slight weight advantage over Douglas Fir at about 510 g/m3.

36.1.5 The timber needs to be dry - preferably kiln dried down to 12%.

36.1.6 If timber of sufficient length is not available for the various mast component then it can be scarphed up into boards of suitable lengths. Use a scarph length 10 times the board thickness and WEST bond the scarph, wetting out very thoroughly as usual.

36.1.7 It is usual to arrange the scarphs to come in different places on the finished spar.

36.2 Equipment

36.2.1 To glue the spars up on, you will need several stools spread over about 5000mm set up so that their tops are dead straight (and preferably level, though this is not vital). Check for straightness with a taut line or an accurate straightedge if you have one long enough.

36.2.4 Fix a length of timber along the tops of all the stools to bridge them and tie them together to form a firm base. The length of timber should be, say, ex 150 x 50 planed up square and straight. This will form a good base for cramping to.

36.2.5 You will need lots of cramps and cramping pieces. The mainmast will need pairs of cramps on cramping bars, spaced at no more than 400 between each pair - which would be about 30 cramps, plus the same number again to cramp across the spar, plus some spare in case some intermediate cramps are needed.

36.2.6 A good alternative to cramps (at least for cramping top-to-bottom) can be pairs of cramping bars pulled together with a bolt at each end. A suitable size of timber would be about 50 x 40, of sufficient length so that the bolts run clear of the spar being glued up. About 200mm long with bolts about 150mm apart would be about right for the mainmast.

36.2.7 The spars are WEST/#403 bonded together and you should use slow hardener to give yourself sufficient working time.

36.3 General principles

36.3.1 The mast is basically a hollow box with chocks in the internal corners so that the wall thickness is maintained when it is rounded up.

36.3.2 Externally the finished mast is a straight taper from Ø00 at 450 above the heel to Ø65 at the hounds and then a sharper straight taper from the hounds to Ø50 at the head. The first 450mm from the heel are left square to fit in the tabernacle. Above the head there is a parallel section at Ø45 for 100mm length (for the upper mast band) and then another parallel section at Ø30 to take the truck.

36.3.3 The wall thickness also varies in proportion to the outside diameter to produce internal diameter tapers. Thus there is a straight taper from Ø48 at 450 above the heel to Ø39 at the hounds and then a sharper straight taper from the hounds to Ø30 at the head.

36.3.4 There are solid sections at the top and bottom of the mast.

36.3.5 The mainmast is made square, then planed to an octagon and then rounded up to a circular section.

36.3.6 In the instructions that follow for the mainmast and all the other spars we shall give finished sizes to get the various items of timber out to. In most cases these will be the actual finished sizes of the spar. When planing the timber to size you should keep just full of the given sizes to allow for losses in rounding up and sanding. By “full” we mean no more than 1mm, perhaps a little less.

36.4 Side planks & chocks

36.4.1 Get out the two side planks planed up to 22 thick by 22 wide by say 5100 long. Scarph the timber up if necessary, arranging for one scarph to come towards the top end and one towards the bottom. Note that we need a minimum of 22 thick to ensure that the 90 square can be maintained up to 450 from the heel - if the planks are only 21 thick (their final thickness at the heel) they will not make 90 at 450 up because of the taper. Similarly, they need to be 92 wide to make 90 at 450 up

36.4.2 Mark a centreline down the side planks, both inside and outside.

36.4.3 Now mark the line of the inside taper on the inside faces of the side planks. These lines will be spaced 48mm apart (measured 24 each side of the centreline) at the heel, 48mm apart (24 each side of the centreline) at 450 above the heel, 39mm apart (measured 19·5 each side of the centreline) at the hounds and 30mm apart (15 each side of the centreline) at the head.

36.4.4 Join these points up with straight lines from the 450 above the heel to the hounds and straight lines from hounds to head.

36.4.5 Mark the bottom 450 parallel (at 24 each side of the centreline. From the head to the top continue the hounds-head taper.

36.4.6 Now get out the triangular chocks to fit in the internal corners of the spar. These should be left triangular for the moment, the inside faces can be hollowed out once they are bonded to the spar side planks.

36.4.7 The chocks will have 24mm arms at 450 tapering to 20mm (neglect the 0.5mm) at the hounds and then tapering again to 15mm at the head. Allow them to run on at 24mm to the heel and 15mm to the top.

36.4.8 In practice the chocks can be made in several pieces with short scarphs (say 6:1) joining them together. To plane a chock to a taper, first get it out parallel. Mark the line of the taper on the two arms, measuring from the 90º corner towards the hypotenuse face. Rest the chock in some vee-blocks on the bench with the 90º corner downwards and the hypotenuse face upwards. Then plane off the hypotenuse face down to the taper lines, starting at the end which is to be the smaller and working back to the larger. The taper doesn't have to be dead perfect, but the two 90º faces want to be good and straight.

36.4.9 Now try the chock sections on the side planks. When the chocks are laid on the planks with their inside corners touching, the inside width lines should in theory just be visible. If the chocks have to be drawn apart a mm or so in order to get to the lines, then this is fine. Otherwise, adjust the chocks as necessary.

36.4.10 At the top and bottom the spar is solid. We shall make these solids to run into the spar for about 100mm greater depth the the solid depth shown on the drawing, to allow the inner ends of the solids to be hollowed out a little to provide a reasonably gradual transition from solid to hollow. The chocks will also house up into the solids for 200mm length.

36.4.11 So at the top, the chocks will end 100 below the head and at the bottom they will end 350 above the heel

36.4.12 Before finally fitting the chocks together and bonding them to the sides, we have to induce the upper taper into the sides. Because the walls are parallel thickness at the moment we can work from the internal diameters. If the heel to hounds internal diameter taper were continued to the head, then head internal diameter would be 36mm. In fact it is 30mm which is 6mm less (or 3mm less on each side).

36.4.13 So, on the set-up plank on the stools that we are going to glue the mast up on, mark the heel, hounds and head positions. At the head tack a 3mm thick strip across the plank. Half way between the hounds and the head tack a 1.5mm thick strip across the

plank. Now cramp one of the side planks down to the set-up plank so that it takes up the correct shape with the slightly sharper upper taper.

36.4.14 Now the chock sections can be finally scarphed together and WEST/#403 bonded to the spar side plank, making sure that they remain accurately the correct distance apart. With softwood you do need to wet the bonding faces out really thoroughly.

36.4.15 Allow the WEST to cure well before removing from the set-up plank. Then repeat the process for the other side plank.

36.4.16 Hollow out the inner faces of the chocks so that they approximate to the core radii of the spar. Where the chocks will house into the solids (the top and bottom 200mm) they can be left triangular, without any hollow.

36.5 Solids

36.5.1 The top solid will start off at least 430 long and will start in the mast at 300 below the head.

36.5.2 The solid will taper from bottom to top. So measure the inside diameters at 300 below the head and at the top of the mast and make the solid to these dimensions (but square in section of course).

36.5.3 Chop out the housings for the chocks in the bottom 200 of the solid and try the solid down on both side plank assemblies - the housings can be a fairly free fit over the chocks because any gaps will be filled with WEST/#403.

36.5.4 Bore a series of holes in the inner end of the solid angled in to the centre and about 100mm deep, and chisel and gouge these out to provide a reasonably gradual transition from solid to hollow

36.5.5 Make the bottom solid in a similar way.

36.5.6 The solids are bonded in when the whole mast is bonded together.

36.6 Fwd & aft end planks

36.6.1 Get the end planks out (scarphed if necessary) at 22 thick by 48 wide. Mark the centreline down these. As with the side planks, we need a minimum of 22 thick to ensure that the 90 square can be maintained up to 450 from the heel - if the planks are only 21 thick (their final thickness at the heel) they will not make 90 at 450 because of the taper.

36.6.2 Mark out the widths of the end planks: from 48 wide (24 each side of the centreline) at 450 above the heel. to 39 wide (19·5 each side of the centreline) at the hounds in a straight taper; then another straight taper to 30 wide (15 each side of the

centreline) at the head. Let the top end just run on at the same taper. The bottom end will be 48 parallel.

36.6.3 Cut and plane the end planks to the tapered widths.

36.7 Assembling the spar

36.7.1 Lay one of the spar sides on the stool set-up (with the strips still in place for the upper taper). Fit the top and bottom solids. Stand the end planks in place and then lay the other side on top

36.7.2 Lightly cramp the whole spar up making sure that the ends slide fully in to touch the chocks bonded on the sides. Check the joints for a good tight fit. You can check the overall widths of the spar, remembering that at the moment the wall thickness is a constant 22mm. So at the heel the mast should be 92 square (48 + 22 + 22), at the hounds the spar should be 83 square (39 + 22 + 22) and at the head it should be 72 square (30 + 22 + 22). Make any adjustments necessary.

36.7.3 Now disassemble the spar and WEST coat the inside of all the components 3 coats - but only coat the outside faces of the triangular chocks and the other bonding surfaces one coat to avoid a build-up of WEST.

36.7.4 We can run cables inside the spar, or we can run a plastic conduit top to bottom to allow cables to be drawn in later on. In either case the cables or the conduit must be firmly clipped to prevent them working loose in the future (when it will then tap very irritatingly).

36.7.5 We have to be a bit careful about the exit points of cable. Through the side of the spar makes cleaning off very difficult and the cables tend to get chopped off during the process. Probably the best way is to use plastic conduit curving it round at the bottom in a channel in the solid to exit above the pivot bolt hole on the fwd face. At the top the cable can out through the top - so bore a hole through the solid.

36.7.6 Fit the conduit in place and brush a coat of WEST over the conduit & clips to seal any pin holes round the clip fastenings. You can leave a draw string through the conduit.

36.7.7 Finally glue the spar up using WEST/#403, drawing all the cramps and cramping bars in gradually so that all the components get fully home.

36.7.6 Allow a week for the spar to cure fully, though you can move it off the stools after a day or so.

36.8 Finishing the spar

36.8.1 Plane the edges of the side planks off flush with the end planks, so that the spar is square for its whole length. Make sure that the heel is square to the sides and ends.

36.8.2 Remark if necessary the principal positions: 450 above the heel; the hounds; the head and the top at 130 above this. Cut off the top to length. Remark the centreline on all four sides.

36.8.3 Plane the bottom 450mm to be 90 square and parallel (it doesn't matter if it's marginally different from this as long as we get a free fit in the tabernacle. The change from square to round won't be sudden as the drawing shows but will be faired in (a spokeshave is the tool for this) as the spar is rounded up.

36.8.4 Now mark out the taper of the spar from 80 at 450 to 65 at the hounds, and then to 50 at the head (allow the head taper to run through to the top), measuring the half-widths each side out from the centrelines.

36.8.5 Plane the spar down to the square tapered sizes. Remark the centrelines on all four faces

36.8.6 To get to a round, we next plane the spar up to an octagon. The sides of an octagon which is 80 across flats are 33mm . For 65 across the flats we need 27mm sides and for 50 we need 21mm sides.

36.8.7 So at 450 above the heel measure 16.5 each side of the centreline on all four faces; at the hounds measure 13.5 each side of the centreline and at the head measure 10.5 each side of the centreline. Join these lines up as usual. Then plane off the corners of the spar down to the lines until it is nicely octagonal.

36.8.8 Now plane off the corners of the octagon but retaining the centrelines on all four sides.

36.8.9 Then sand the spar up round. If you cut a length of 60 or 80 grit abrasive paper (off a 100mm wide roll) about 600 long and fix a ply handle each end, this makes a good preliminary sander. Pull the sander back and forth slightly diagonally across the spar, gradually working along and around the spar. You can feel bumps with you hand best of all. Once the spar is reasonably round move to sanding by hand along the length of the spar gradually using finer paper until you have a really good finish. You can use an electric sander but beware of sanding flats on the spar and the little circular sander marks made by bits of dust trapped in the paper. From time to time try the 4-eye band at the hounds on to the mast - to ensure that you don't make the mast too small in this area so the band is loose and wants to drop further down the spar

36.8.10 Once the spar is all rounded up and smooth mark the hounds position lightly and try the 4-eye band on the mast again to make sure that it will tap down to the hounds position and be a good tight fit. Don't tap it right down for the moment - it should just pull tight about 30mm or so above the hounds position.

36.8.11 Make the chocks to be housed and bonded into the mast at the hounds. These are to prevent the 4-eye band pulling down the mast under the shroud and stay load. Check the chocks into the mast neatly and WEST bond them in place. Sand round the mast immediately above the chocks with a narrow strip of abrasive paper until the 4-eye band will tap gently down on to the chocks. Remove the band.

36.8.12 Round up the top of the mast above the head so that the 2-eye head band (or you can fit a 4-eye band if you intend to use runner backstays) will just tap down on to the shoulder formed at the head of the mast. Then round up the final section of mast to take the truck.

36.8.13 Make the truck (on a wood turning lathe if you have one or have access to one) with a hole in the centre to fit closely over the final top section of the spar. Make a slot out near the edge of the truck to take a tiny sheave for the burgee halyard (this is usually set to stbd). The truck is not bonded to the mast as otherwise the bands could never be removed etc. Usually the truck is just a tight drive fit over the mast, but you can screw a small plate across the top with one screw into the mast and one into the truck to retain it in the correct orientation.

36.8.14 Cut the heel of the mast to suit the tapered wedge in the tabernacle.

36.8.15 Bore off for the copper tube for the pivot bolt and WEST bond the tube in place. Fit the cleats - these should be checked into the mast 3mm to take the sheering load off the screws and make sure that the cleats stay tight under load. Remove the cleats while the mast is being WEST coated.

36.8.16 WEST the mast one coat and sand smooth. WEST two further coats and sand smooth ready for varnishing. You can incorporate a section of fine woven glass cloth at the gaff jaw position if you wish to prevent any wear on the spar. Make this about 300 long, 150 above & below the centreline of the jaws.

36.8.17 Fit the 4-eye band at the hounds and the 2-eye (or 4-eye) at the head.

36.8.18 Draw the cable through the conduit. Seal the exits using Sikaflex 221 or similar (not silicones).

36.8.19 Varnish the mast 3 or 4 coats using a good quality UV resistant varnish, sanding between coats as usual. Fit the truck.

SECTION 37 - MAIN BOOM

37.1 General principles

37.1.1 The main boom is basically rectangular, with the corners radiused off.

37.1.2 The boom is a hollow box section with constant wall thickness.

37.1.3 The top face is straight but both the depth and width vary, with a maximum section, tapering in both width and depth to the ends. Note that the maximum section of the boom is not in the middle but aft of middle at 1430 from the fwd end.

37.1.4 The boom has solid sections at both fwd and aft ends.

37.2 Making the boom

37.2.1 The boom can be glued up on the stool set-up used for the mainmast, but with the taper strips removed. You will need to cover the set-up plank with polythene to prevent the boom becoming bonded to it.

37.2.2 Get out the two side panels. These start off at 12 thick by 85 wide. The top edges remain straight. The bottom edges are curved. Mark out the widths - 55 at the fwd end; 85 at the deepest point; and 65 at the aft end. Remember that the deepest point is 1430 from the fwd end. Join the three points with a batten and mark in the curve of the bottom edge. Cut and plane the bottom edges to shape.

37.2.3 Get out the top and bottom panels. These start off at 17 thick by 36 wide.

37.2.4 Mark a centreline down the top and bottom panels. Then set out the widths - 16 at the fwd end (8 each side of the centreline); 36 at the widest point (18 each side of the centreline); and 21 at the aft end (10.5 each side of the centreline). Remember that the widest point is 1430 from the fwd end. Join the points with a batten as usual; cut and plane the curved shapes of the top and bottom panels. Be sure to plane the edges square to the faces and flat across so that you get a good glue line.

37.2.5 Make the fwd and aft end solids - it's not necessary to fair these in to the hollow although you can on the depth if you wish by making the solids about 75 longer than shown and cutting a v-shaped notch in the inner ends. You can obtain the taper of the solids by measurement from the the side, top and bottom panels. Remember that the top is straight so all the depth taper is on the bottom edge.

37.2.6 To help keep the boom components stable while gluing up you can make, say, three ply bulkheads to fit the inside dimensions. Place one of these at the deepest point and the others half way between the deepest point and the inner ends of the solids. The sizes can be established by marking their positions on the panels and taking measurements (deducting the top and bottom panel thicknesses from the height). The bulkheads can be 12mm ply or similar.

37.2.7 To assemble the boom, lay the top panel on the set-up plank on the stools. Fit the end solids and the three intermediate bulkheads - these can have a little cleat (say 10 x 10) each side on the top panel to locate them and hold them in place. Then the solids and bulkheads can be WEST bonded to the top panel.

37.2.8 WEST coat the inside of the top panel and the bulkheads (all three coats) - don't WEST the bonding surfaces more than one coat. WEST coat the inside face of the bottom panel 3 coats. WEST coat the inside faces of the side panels 3 coats

37.2.9 Try the bottom panel and the side panels in place to make sure that the solids and bulkheads are the correct depth and width. Make any adjustments necessary.

37.2.10 Bond the bottom panel to the solids and bulkheads, making sure it remains accurately square over the bottom panel (you can cramp some side pieces up each side at the ends and perhaps the mid-bulkhead).

37.2.11 Bond the side panels to the top and bottom panel, the solids and the bulkheads.

37.2.12 Once the WEST has fully cured (leave it about a week before working on the boom), clean the boom up, radius the corners, square off the ends, sand smooth and WEST 3 coats. Sand smooth and varnish as usual. In practice the fittings are best fitted before the final WEST coat and varnishing.

SECTION 38 - MAIN GAFF

38.1 General principles

38.1.1 The main gaff is round in section and hollow.

38.1.2 The maximum section is Ø55 at its mid-point. The top and bottom ends are both Ø43.

38.1.3 The gaff is made from two planks of timber, each hollowed out and then bonded together along the centreline. The join can be vertical or horizontal but it is usual to make it vertical - i.e. so that you see the join on the top and the bottom. Select your two planks carefully so that if possible they can be bonded together so that the annular rings in the timber (viewed for the ends) oppose each other. This helps to prevent the spar twisting or warping:-

38.1.4 The traditional and simplest way to get opposing annular rings is to have a single baulk of timber for the spar, saw it down the middle and turn the two halves outwards, so that the two outer faces are now the two inner bonding faces - thus naturally producing opposing annular rings.

38.1.5 To make the hollowing out job easier, the inside of the gaff is a constant Ø25.

38.1.6 There are three solids in the gaff - each end and in way of the lower chock for the peak strop (the upper chock comes within the top end solid).

38.2 Making the gaff.

38.2.1 Get out the two side planks minimum 2770 long clear of end grain splits and planed up to 55 x 25.

38.2.2 Mark a centreline down each of the planks.

38.2.3 Mark the bottom end, leaving about 30 extra length for rounding over. Measure and mark 250 up the spar for the start of the lower section hollow.

38.2.4 Measure & mark the top end 2700 from the bottom. This should leave about 40 on the top end for rounding over. Measure and mark the start of the upper section hollow, 180 in from the top end.

38.2.5 Mark the position of the lower peak strop chock at 1585 down from the top. mark the solid 75 each side of this - thus delineating the extent of the hollows.

38.2.6 Rout or gouge out the hollow sections to give a semi-circular hollow 25 wide x 12.5 deep. Run the hollows smoothly into the solid sections - not an abrupt square halt.

38.2.7 Repeat with the other side plank. Try the two planks cramped together (on the stool set up as before) to make sure the join is good and close.

38.2.8 WEST the inside of the spar 3 coats - but only one coat on the bonding faces.

38.2.9 WEST bond the spar together in the usual way and allow to cure fully.

38.2.10 Mark centrelines down all four faces.

38.2.11 Mark the top and bottom ends as before. Mark the maximum section position 1465 from the bottom end.

38.2.12 Set out the widths, measuring each side of the centrelines as usual; join the points with a batten to give a lengthways curved shape. Plane the spar (still keeping it square) to the lengthways shape.

38.2.13 Now mark it out to an octagon (55mm octagon has 23mm sides; 45mm octagon has 19mm sides). Then plane and sand the spar up round.

38.2.14 Round the top end over (so that it is a hemisphere of radius 22.5mm)

38.2.15 To arrive at the shape/angle to cut the bottom end it is best to draw the gaff/mast geometry out full size - or at least just the bottom end of it. The gaff makes an angle of 25º with the mast (measured centreline of gaff to centreline of mast).

38.2.16 Cut the bottom end of the gaff off to length at the angle (which will be 25º to the centreline). But don't round the end off yet until the gaff jaws are being fitted.

38.2.17 Make the two peak strop chocks and fit them to the underside of the gaff in their correct positions. The chocks are screwed to the gaff (not bonded) so that they can be removed to fit the peak strop. Their purpose is to hold the eye ends of the strop in place. The chocks should be just checked into the gaff a maximum of 3mm - this will take most of the sheering load off the screws and ensure that the chocks don't work loose.

38.2.18 Bore the hole at the top end for the sail head lacing.

38.3 Gaff jaws.

38.3.1 The gaff jaws shown are timber; proprietary metal jaws are available which may be suitable

38.3.2 In the absence of grown oak bends, the best way to make the jaws is by lamination. Any suitable timber can be used that will WEST laminate successfully. English Oak is not satisfactory but American White or Red Oak would be fine - as would timbers like African Mahogany, White Ash and similar. As the jaws are laminated the timber doesn't need to be quite so tough and stringy as is traditionally chosen.

38.3.3 The jaws are basically 32 thick with a centreline radius of 100mm. So they have an inner radius of 84mm (100 - 16). The horizontal radius in the jaws is 43mm, giving a internal jaw width of 86mm. Thus we have an external width of 86 + 32 + 32 = 150mm. So we shall laminate up a curved plate of timber, say 155 wide by 32 (full) thick, with an inner radius of 84mm.

38.3.4 Make a simple male jig 155 wide with an 84mm radius knuckle running into straight arms and turning through 25º. One of the straight arms should be about 300 long; the other only need be about 100 or 150 long.

38.3.5 You will need 11 off 3mm laminates, 155mm wide and about 450 long. Drape these over your jig and make your cramping arrangements - which will need to be a bit ingenious - you may find cramping bars are also useful. In any case you will need cramping bars under pairs of cramps as you can't cramp straight on to the laminates. You may find that a length of 9mm ply bent round on top of the laminates works well and pulls them down nicely.

38.3.6 Another alternative (not so tedious as it may sound) is to make a female jig as well to clamp on top of the laminates. This would need an inner radius of 100 + 16 = 116. If you make the arms of both jig sections a little longer than the lamination, then you can draw them together with bolts. You will still need some cramps across the middle section but perhaps only two pairs.

38.3.7 If you have vacuum bagging availability this is actually the easiest method for this type of lamination.

38.3.8 Once you have you cramping arrangements made, laminate up the jaws, wetting the laminates out in the usual way and then bonding with WEST/#403.

38.3.9 Once the lamination has cured, remove it from the jig and clean it up. mark a centreline along the length of the lamination and establish the end points and the line of the mast centreline.

38.3.9 It is probably easier to cut the inner shape of the jaws out and shape up the inside radius while the lamination is still in a single piece. So mark out the inner shape with reference to the centreline and the mast centreline, cut it out and clean it up - its best not to round up the jaws yet.

38.3.10 Returning to the gaff now, flatten off the gaff sides to receive the jaws - the flat width will need to be 32mm (which is the finished thickness of the jaws) and this should leave a 32mm wide central section of the gaff - see the end view on the gaff drawing. Gaff jaws usually finish on a diamond point so that the flattened off area can ease out to the full diameter.

38.3.11 Now cut the gaff jaw lamination in two down the centreline and then re-cut to fit the flattened off area of the gaff, being careful to maintain a parallel 84 internal width between the jaws.

38.3.12 Cut the outer profile of each of the jaws out to shape, maintaining a minimum width of 32mm between the inner and outer edges as the jaws sweep round and down on to the gaff. Leave the profile of the jaws square for the moment.

38.3.13 Now the jaws can be WEST bonded to the gaff. We shall also be driving some structural fastenings as there can be a considerable twisting load on the jaws. Traditionally the jaws were copper clench fastened (copper nails and riveted over roves - or copper rod riveted over washer for larger sizes). You can do this if you wish, but screw fastening is probably simpler. As the fastenings are performing a long term function, use stainless steel or silicon bronze screws, rather than brass. There is no need to dowel over the screw heads, just a very shallow countersink so that the heads pull in nicely flush. However we shall leave the fastenings for the moment until we have cleaned the jaws up fully. So bond the jaws to the gaff, wetting out very thoroughly.

38.3.14 Once the WEST has fully cured, the jaws can be finally shaped up and the end of the gaff rounded off.

38.3.15 Round the arms of the jaws up to circular section and continue the same radius round the inner radius of the jaws. The inside of the jaws will be leathered eventually.

38.3.16 The shape of the jaws as they sweep in to the gaff can be rather more hollowed out than shown on the drawing as, once away from the inner radius, they are picking up strength from being bonded to the gaff. So hollow the outer edge a little so that the jaws run smoothly into the gaff. Then round the outer edge off to the same radius as the arms.

38.3.17 Bore off for say 3 screws (10g) each side and drive these home with some WEST down the holes to give added grip.

38.3.18 Sand the jaws up smooth and clean. Bore the two holes for the throat strop and the two holes for the parrel bead line (parrel beads are small wooden balls threaded on a line which passes loosely from one jaw to the other around the fore side of the mast, to prevent the jaws coming aft off the mast)

38.3.19 Now the whole gaff and jaws cane be WESTed three coats, sanded smooth and varnished.

38.3.20 After WESTing but before varnishing, leather the jaws. You need a fairly soft flexible rawhide for this job - not too thick (about 2mm or so). Stretch the leather round in the jaws, turning it back neatly on to the top and bottom faces. Secure with copper tacks. You may need to dampen the leather so that it will stretch and mould to shape. Right in the middle, in way of the gaff itself, let the leather run up and over the gaff end on to the top and bottom of the gaff.

38.3.21 Finally varnish the gaff.

SECTION 39 - MIZZEN SPARS

39.1 Mast

39.1.1 The mast can be solid or hollow.

39.1.2 If you make it solid, still make it from two planks bonded together (with the join fore-&-aft). As with the main gaff, the purpose is to prevent the spar from twisting or warping (by having opposing annular rings in the two halves of the mast) and the easiest way to achieve this is by sawing a single baulk into halves and reversing the two planks obtained thereby.

39.1.3 If you make the mast hollow, make it up like the gaff from the two planks, hollowed out before assembly.

39.1.4 Wall thickness is usually 20% of section size, which would give us a wall thickness of 10mm at the heel (and a hollow of Ø30) and a wall thickness of 7mm at the head (and a hollow of Ø21). In practice 9mm is a bit thin for the wall and a constant wall thickness of 10mm would be better.

39.1.5 A constant wall thickness produces a variable hollow (Ø30 at the heel to Ø15 at the head). You may think that this is a bit of a fiddle for the small amount of weight loss - so just go for a constant 15mm hollow and make the two planks up just as you did for the main gaff.

39.1.6 Whether solid or hollow, the spar is assembled, bonded, rounded up and finished just as the gaff. The sides of a 50mm octagon are 21mm and of a 35mm octagon, 14mm.

39.1.7 Once the spar is all shaped up and sanded, cut the tenon on the heel. The tenon runs fore-&-aft.

39.1.8 At the head of the mast make the box (the slot through the mast) for the sheave. Note that the sheave lays athwartships, not fore-&-aft. Have the sheave to hand first so that the box is the right size. The box mustn't be much wider than the sheave or else the halyard can jump out and get jammed between the sheave and the side of the slot. The sides, top and bottom of the sheave box are traditionally lined with copper sheet dressed over the edges and copper tacked in place. For a modern mast it is better to line the box with WEST and woven glass cloth, wrapped just over the edges and trimmed neatly off.

39.1.9 Bore the hole for the sheave pin - make this a slightly tight drive. WEST down the pin hole. The pin is retained in the mast with a strip of copper tacked to the mast over each end.

39.1.10 Cut the housings for the cleats to check in the mast just 2mm

39.1.11 Complete the WEST/glass cloth in the sheave box and the WESTing down the pivot pin hole. WEST the mast one coat and sand smooth. WEST two further coats and sand smooth ready for varnishing.

39.1.12 Fit the sheave in its box and drive the pivot pin through. Fit the retaining strips over the ends of the pin. Brush a coat of WEST over the copper to seal it.

39.1.13 Varnish the mast.

39.2 Mast step.

39.2.1 This is a simple block of timber bonded to the cockpit sole and side. The mizzen is on the port side of the boat.

39.2.2 Make the step as shown on the drawing with a fore-&-aft mortise to suit the mast heel tenon - make the mortise a mm or so deeper than the tenon, so that it is the heel of the mast that rests on the step, not the bottom face of the tenon.

39.2.3 Check that the fore-&-aft taper given on the drawing will make the top face of the step level fore-&-aft.

39.2.4 Run a chamfer round the three open sides of the step and then WEST coat it thoroughly; bond the step in place.

39.2.5 The mast will require circular cut out (20mm deep) through the port cockpit seat overhang, to allow it to enter the step. The centre of the cut-out is at Position –4410 so the mast steps vertically with no rake.

39.3 Mizzen boom.

39.3.1 The boom is solid, a parallel Ø30.

39.3.2 Make it from two boards (or a single baulk cut lengthways and reversed) with opposing grain as usual.

39.3.3 Assemble the spar, bond it together, round it up and finish it as for the other spars - a 30mm octagon has sides of 12.5mm.

39.3.4 Instead of a gooseneck, the boom is located on the mast with simple jaws, rather like the gaff jaws but straight not curved.

39.3.5 The gooseneck jaws can be made from solid (or you can make a flat lamination if you wish). They are shaped up and fitted to the boom in just the same way as the gaff jaws were to the gaff.

39.3.6 There is a chock on the top of the boom to retain the mizzen sheet. This is checked into the boom, just as the peak strop chocks were checked into the gaff. The chock is not bonded to the boom.

39.3.7 Bore the holes in the boom at the fwd and aft ends for the sail lacing; bore the holes in the jaws for the parrel bead line. Sand the boom and WEST coat it. Leather the jaws. Finally varnish the boom.

39.4 Mizzen yard.

39.4.1 This is called a yard not a gaff because it crosses the mast rather than sits on it with jaws or a saddle. The mizzen is thus a standing lug rig, not gaff.

39.4.2 The yard is made solid, from two boards bonded together in the same way as the boom.

39.4.3 Standing lug sails need care in setting if they are to set smooth without girts or wrinkles. Thus the position of the halyard on the yard will need to be set to suit your sail. So we cannot fix the position of the chock at this stage.

39.4.4 So make and finish the yard as usual, complete the WEST coating and varnish the spar - but don't cut the housing for the chock to check into until you have the sail set and established the best position. You don't actually need the chock - a rolling hitch or a topsail halyard bend should secure the halyard without it slipping - but the chock does make things easier and you get the right place every time.

SECTION 40 - BOWSPRIT & BUMPKIN

40.1 Bowsprit.

40.1.1 The bowsprit is made as a solid spar. They are often made from a single piece rather than splitting the baulk and reversing the pieces. This is probably because, for its length, a bowsprit is relatively larger section so tends to warp less. You can choose to do either.

40.1.2 Otherwise the bowsprit is made in exactly the same way as the other solid spar - though note that the first 500 from the heel is only rounded up on the top - the lower half is left square with just radiused corners.

40.1.3 Make the spar a little overlength at the heel so that, once the stemhead fitting in in place, the bowsprit can be offered up to the face of the samson post and the angle of the end and the heel tenon marked on. The bowsprit can then be cut to length and the tenon made.

40.1.4 When making the spar check that the Ø38 parallel section on the outer end is the correct size for your eyeband.

40.1.5 WEST coat the bowsprit as usual, sand smooth and varnish.

42 2 Bumpkin

40.2.1 The bumpkin is a marginally complicated little lamination because it secures the mizzen in place as well as taking the mizzen sheet.

40.2.2 The bumpkin is made from 3mm laminates, with a solid block in the corner fwd of the mizzen.

40.2.3 Make up a softwood jig, shaped to suit the outboard shape of the bumpkin.

40.2.4 Make the solid block and set it in the jig.

40.2.5 Laminate up the bumpkin on the jig and solid block in the usual way. You need to finish up with a 35mm lamination (11 or 12 laminations at 3mm), 35mm wide to round up to Ø.

40.2.6 Round up the outer part of the bumpkin to Ø35, working from square to octagon to round in the usual way.

40.2.7 The inner section is left square, with just a small radius on the corners.

40.2.8 The heel is tapered off from 35 to 30 to fit into the heel fitting; the outer face also houses out 3mm over the outer flange of the heel fitting. Its best to shape up the heel, once you have the heel fitting.

40.2.9 The outer end is made to suit the outer end fitting as shown.

40.2.10 The bumpkin sits level with its top face at dwl + 428 and passes through a hole in the transom. You will need to establish the centreline of the hole on the transom and establish its distance out from the centreline by reference to the bumpkin itself. The easiest way to do this is to make a thin ply pattern of the inside part of the bumpkin with a bumpkin (horizontal) centreline marked on the end of it. Hold this carefully on the cockpit seat side at bumpkin (vertical) centreline height (dwl + 428) and mark where it and the horizontal centreline hits the transom. this should be the centre of the hole through the transom.

40.2.11 The hole through the transom should in theory be slightly elliptical, bored at a slight horizontal angle. In practice a full Ø35 hole bored through (preferably at a slight horizontal angle) will suffice. You can clean this out a little with coarse sandpaper if the bumpkin is too tight a fit.

40.2.12 The bumpkin is entered through the hole in the transom from the inside, slid out until the heel is past the heel fitting and then slid back into the heel fitting. The mizzen is then stepped through the bumpkin locking it in place. Once the bumpkin is locked in place the mizzen too is held up in place. The bumpkin needs to be just a free fit through the hole in the transom - not too loose or else the mizzen will not be supported.

40.2.13 You can secure the whole arrangement rather better by having a slim, slightly tapered hardwood peg passing vertically through a slot in the bumpkin immediately fwd of the transom fwd face. The peg should be say, 6mm thick by 18mm nominal fore-&-aft width by about 80 or so long. Taper the width slightly so that the peg taps in tight against the transom.

40.2.14 Once the assembly of the bumpkin has been checked with the mizzen etc., WEST coat it as usual, sand smooth and varnish.

SECTION 41 - TABERNACLE

41.1 Making & fitting tabernacle.

41.1.1 The tabernacle is made with 15mm ply sides, back & webs on a solid mahogany base.

41.1.2 The base is hollowed out on the underside to suit the coachroof camber and the base is also tapered fore-&-aft so that the top surface ends up level and the tabernacle vertical.

41.1.3 Make the tabernacle base from African Mahogany or similar The base is two layers of timber together - the bottom layer with the grain running athwartships and the top layer with the grain fore-&-aft - to give a finished thickness of, say, 30mm minimum. You need some spare thickness for fitting the tabernacle down on to the coachroof

41.1.4 Get the tabernacle base out to shape. Mark the fore-&-aft centreline and the mast centreline on the top face.

41.1.5 Then plane the taper on the underside right across.

41.1.6 Hollow the base out - about 5mm of hollow should be about right but it will vary a little from one end to the other.

41.1.7 Set the base on the roof and get it accurately in position, using the centrelines to align it correctly.

41.1.8 Now check for the fit of the base to the roof. The usual way to do this is to brush the roof in way of the base with paint and then press the base down on the roof in its correct position. The paint will mark the high spots on the underside of the base, which can then be spokeshave off and the base tried again on the wet paint - continue like this until you get a good fit. As you fit the keep trying it for level both athwartships & fore-&-aft; you will be able to make minor adjustments by planing off the top face once the underneath is a good fit - but its better if you can keep near enough right as you fit the underside. The tabernacle will be WEST bonded to the coachroof, so some degree of imperfection in the fit can be accepted.

41.1.9 Once you have the base to an acceptable fit, clean all the paint off the roof and the base very thoroughly - so as not to get a contaminated bond.

41.1.10 Now draw the outlines of the grooves in the top of the base for the 15mm ply sides, back and webs. Cut the grooves 5mm deep.

41.1.11 Cut out the ply components and assemble them. The webs and the back are screw fastened (1.5" x 8g) and bonded to the sides. All the ply components are bonded in the grooves in the base and screw fastened (1.5" x 8g) up through from underneath. Assemble the tabernacle dry at first to check it for accuracy and squareness. Before bonding the components together, lay the sides together and bore the pivot and locating bolt holes. Then WEST bond the tabernacle together, wetting out well, especially the end grain ply.

41.1.12 Try the tabernacle on the coachroof and check that it stands level and upright. You can still make minor adjustments to the underside of the base if you have to.

41.1.13 Once you are happy with the fit etc., bore off for the M6 fastening bolts. There are four slightly staggered through the beam on Frame -1375 and two at each end through the mast runner. To avoid nasty chipping on the underside of the roof, just prick the holes through the roof and then drill them out from inside. The pair of bolts under the base wedge will need to be countersunk so that heads are flush with the base - or you can recess the underside of the base wedge out over them. The outer bolt each side is replaced with an M6 eyebolt (see Deck Fittings Plan). The stbd one of these is to take the single whip for the throat halyard purchase (see Running Rigging Plan).

41.1.14 WEST the tabernacle three coats; WEST down the bolt holes. The bond the tabernacle to the roof on an good thick bed of WEST/#403. Draw the bolts up on good large pattern washers on the inside and under the heads (except the two countersunk head bolts if you use these). Trim any excess bolt length off the inside and file the bolt ends smooth.

41.1.15 Make the base wedge, WEST coat it and bond it in place. make good any damaged WEST coatings in way of the bolts.

41.1.16 Sand the tabernacle up smooth and varnish it.

41.1.17 Make the pivot bolt and the locating bolt. The mast should be a free fit athwartships and you may need a thin Delrin disc washer each side between the tabernacle sides and the mast. The pivot bolt should have washers under head & nut; you can use two half thickness nuts so that you can lock the bolt just tight, rather than pulling it up hard; the intention is not to squeeze the tabernacle up to the mast - just to hold the mast in place until the rigging is set up. When the mast is stepped it is important that the weight is taken on the base, not on the pivot bolt. You may find that you need a shallow groove in the fwd face of the mast to allow the locating bolt to pass through.

SECTION 42 - RUDDER & TILLER

42.1 Rudder

42.1.1 The rudder has a balanced blade (i.e. it has some area fwd of the axis) which produces a very light helm.

42.1.2 The rudder blade is made with a 10mm ply core (actual 10mm - bond 4mm & 6mm ply together) with 18mm ply sides (they can be solid mahogany if preferred - but ply probably does the job better). The cheeks are 12mm ply or solid Mahogany.

42.1.3 The rudder has a lifting board made from 9mm ply.

42.1.5 Bond together 4mm & 6mm ply to make 10mm ply for the core.

42.1.6 Cut the core components to shape as shown on the drawing. .

42.1.7 Note that the top of the core is not actually square to the leading edge, but runs up 3mm from square to give a taper to the bottom of the tiller hole.

42.1.8 Fully WEST the edges of the core which will be inaccessible later on - i.e. those in the board and lift rope slots. WEST the remainder of the core components one coat

42.1.9 Cut out the two rudder blade sides and shape them up. Note that the top is 3mm up from square like the top of the core. Fully WEST the inside faces and sand smooth and matt. WEST the pivot holes.

42.1.9 Lay the core components on the inside face of each blade side in turn and mark the outline of the slot for the board. WEST/#423 graphite coat the area in the board slot.

42.1.10 WEST/#403 bond the core and the blade sides together, using screws if required to keep the parts together accurately and apply pressure. The screws can be left in. make sure that excess WEST does not get into the board and rope slots.

42.1.11 Get out the rudder cheeks - these are square across the top. Get out the block at the top which forms the top of the tiller hole.

42.1.12 Fully WEST all the components in way of the tiller hole which will be rather inaccessible once the final rudder is assembled.

42.1.13 Bond the cheeks to the blade, with the block bonded between at the top. Don't allow excess WEST into the tiller hole.

42.1.14 Clean up the rudder, lightly radius the corners and sand smooth. WEST on coat. Complete the WESTing after the rudder fittings have been fitted & checked into it, so that we get a WEST coating under them.

42.1.15 Once WESTed fully, sand smooth and varnish and antifoul. Mark the waterline on the rudder the same level as you did on the boat.

42.2 Tiller

42.2.1 The tiller is very simple being quite straight - so it does not require laminating - although you can make it up from laminates of different coloured timber (Mahogany and White Oak, say) if you wish. if you do this make the laminates about 10mm thick

42.2.2 The tiller starts out at 50 deep x 46 wide . The top edge stays straight, so all the depth taper is off the bottom. The side taper is off both sides equally.

42.2.3 Taper the aft 200 length from 50 x 46 at the leading edge of the rudder to 47 x 46 at the trailing edge so that it pushes easily into the tiller hole and draws nice and tight. The taper ensures that the tiller can be tight in the rudder and yet withdrawn easily.

42.2.4 Taper the fwd 1000mm from 50 x 46 at the rudder leading edge down to 35 x 35, then round up the final 150mm of this to Ø35.

42.2.5 Push the tiller firmly into the rudder and bore off for a Ø6 retaining pin. Make up a pin with a head on it and a small hole through it so that the pin can be tied to the rudder with a length of twine to stop it getting dropped overboard. Or use a Ø6 split pin also with a length of twine to keep it from getting lost.

42.2.6 You can WEST the tiller, which will stop it swelling up and getting jammed in the rudder. If you are going to do this, then bore off for the securing pin after the tiller is WESTed.

42.3 Rudder board.

42.3.1 The rudder is fitted with a drop-board to give it some additional area in deeper water. You will get control with the board up but, especially on the wind, you will get much better control with the board down. This is because as the boat heels the stern picks up somewhat and the rudder is lifted out of the water to some extent. Also the deeper water is denser and less aerated so providing more thrust against the rudder.

42.3.2 The board is made from 9mm ply.

42.3.3 Get the board out to shape as shown on the drawing.

42.3.4 Bore off for the pivot pin bearing and cast the bearing in the same way as you did for the centreboard.

42.3.5 To give it negative buoyancy, the board will require lead shot cast in a hole cut in the board. About 0.75kg should do the job and this can be obtained by cutting a Ø100 hole and filling it with lead shot packed densely with WEST/#406 Colloidal Silica. Position the hole near the tip, leaving about 50mm between the hole and the edges of the board.

42.3.6 Make up the little stainless steel strip to take the lift rope. Let the strip flush into the edge of the board and bond and screw fasten in place (5g or 6g screws). WEST the screws in as well to give added grip.

42.3.7 To bond stainless steel to timber with WEST there are four steps:

(i) Wash the metal with solvent to get it clean & grease free.
(ii) Sand the surface with 60 grit paper.
(iii) Coat the surface with WEST resin/hardener mix & sand the wet surface while the resin is still liquid (use wet-or-dry 60 grit paper).
(iv) Then bond the the metal to the timber in the usual way but using WEST/#406 Colloidal Silica.

42.3.8 Thread the lift rope through the strip and secure with a figure-of-eight knot. Fill the cut-out over the knot with WEST/#406 and sand smooth to 9mm thickness. This prevents the knot working out of its cut-out and jamming the board. When you need to replace the rope you can warm the WEST/#406 with a hot-air gun to soften it - the softening point of cured WEST is about 150ºC/300ºF.

42.3.8 Try the board in the rudder to make sure it all works OK - make any adjustments necessary.

42.3.9 WEST the board 3 coats and then apply a final coat of WEST/#423 Graphite.

42.3.10 Insert the board in the rudder, threading the lift rope up through the slot in the rudder blade. Drive the pivot pin home. Tack a strip of copper each side over the pin to retain it in place.

42.3.11 Run the lift rope to a small tubular jam cleat screwed on at the rudder head. Tie a figure-of-eight knot in the rope end to prevent it dropping back out of the jam cleat.

42.4 Rudder fittings.

42.4.1 The upper and lower rudder fittings are proprietary items. The heel fitting is made for the boat. The fittings with a pin on them are called a “pintle” and the fittings with a hole in them for the pintle pin to work in are called a “gudgeon”.

42.4.2 The heel fitting can be made from steel, hot dipped galvanized after fabrication, or from stainless steel. We are assuming that either you have the knowledge and equipment to make the fittings up yourself, or that you will send out to a local fabricator to get them made.

42.4.3 The fittings we have shown give a 50mm gap between the transom and the rudder, with the rudder axis 25mm astern of the transom. Other fittings may produce a different gap and axis - so the heel fittings will need to be modified accordingly.

42.4.4 The Delrin block in the heel fitting can be positioned once the rudder is hung. So the holes should be bored in the metal work and the Ø12·5 hole for the pintle bored in the Delrin, but the fastening holes should not be bored in the Delrin. Then the rudder can be hung, with the Delrin slid in place in the heel fitting, where it will naturally take up the correct position and angle. The fastening holes can then be bored through the Delrin.

This allows a final adjustment without which a 3-bearing rudder can be difficult to get dead right so that it rotates freely.

42.4.5 Assuming that you have all the fittings to hand, proceed as follows:

42.4.6 Draw a vertical down the transom.

42.4.7 Fit the upper gudgeon to the transom, accurately on the centreline and bolted through. Dry fit it for the moment - no bedding.

42.4.8 Similarly fit the lower pintle.

42.4.9 Fit the heel fitting to the boat, but just cramp it in place for the moment.

42.4.10 Offer the rudder up to the boat and set it in position, with a block between the bottom of the rudder and the heel fitting. mark accurately the positions for the upper pintle and the lower gudgeon on the rudder.

42.4.11 Take the rudder down and fit the upper pintle and the lower gudgeon to the marked positions, being careful to get them square to the axis. The fittings are narrower than the rudder is wide. We check the them into the rudder at the leading edge but spring them out to full width by the aft end of the fitting. The lower gudgeon has to be shortened to finish just forward of the the trailing edge of the rudder. The pin of the upper pintle will need to be threaded M12 so that a nut and washer can be pulled up just under the transom gudgeon - this is to prevent the rudder lifting and jamming up (should you get aground for example).

42.4.12 The fittings on the rudder can be clenched on with copper rod riveted over. Or they can be bolted on using stainless or bronze bolts. Clenching on with copper rod is tidier (no nuts or bolt heads). Complete the WEST coating to the rudder after checking the fittings in and boring off for the fastening holes, but before finally fixing the fittings in place. When you finally clench them on, use a smear of bedding under the fittings.

42.4.13 Remove the fittings from the transom and slide them on the fittings on the rudder. Offer the rudder up to the boat and refix the transom fittings, this time bedded on as well. Check that the rudder rotates smoothly.

42.4.14 Slip the Delrin block over the heel pintle and slide the pintle over the rudder and cramp in place. Rotate the rudder to check that the positions of the heel fitting on the boat and the heel pintle on the rudder are correct - if the rudder binds or either fitting tries to move as you rotate the rudder then something is wrong. Adjust the positions of the fittings until they are correct and mark those positions carefully.

42.4.15 Bore off for the heel fitting on the boat. WEST well down the holes and then clench or bolt the fitting in place (bed it as well).

42.4.16 Similarly bore off for the heel pintle holes through the rudder and WEST down these before bedding and clenching (or bolting) the fitting in place - make sure that the Delrin block is entered when you finally fix the fitting as you can't get in afterwards.

42.4.17 Finally bore through for the bolts through the Delrin block and bolt this in place.

42.4.18 Thread a nut and washer on the upper pintle just up clear of the underside of the gudgeon. Drill through for a 1·5mm split pin to retain the nut.

SECTION 43 - FITTINGS

43.1 General

43.1.1 This section covers the deck fittings, other fittings on the boat externally and the fittings on the spars.

43.1.2 Some of the fittings are proprietary, some are made specially for the boat.

43.1.3 With the specially made fittings, we are assuming that either you have the knowledge and equipment to make the fittings up yourself, or that you will send out to a local fabricator to get them made.

43.1.4 Most of the specially made fittings are shown made from mild steel hot dip galvanized after fabrication. They could equally well be made from stainless steel (use Grade 316 S16) and polished.

43.1.5 If you wish to use all bronze fittings, then fabrication is not so easy or easily available. Casting is an alternative and not necessarily prohibitively expensive if you make up the patterns for a local small foundry. Also sometimes, proprietary bronze fittings can be made to suit without too many changes to either boat or fitting.

43.1.6 Finding hot dip galvanized fastenings (screws, bolts, nuts & washers) is nowadays difficult. We find that bronze fastenings are better with galvanized fittings that stainless; both tend to remove the zinc galvanizing by electrolytic action - but stainless seems to do it much more actively.

43.1.7 Holes are shown on the specially made fittings are shown as the finished size - for galvanized fittings these will need drilling a clearance size so that they revert to the finished size after galvanizing.

43.1.8 Most of the fittings are bedded on as well as fastened. Use a good quality bedding (such as Sikaflex 221). Don't use silicones if you can avoid it. There is usually a best time to clean excess bedding off - when the bedding has set enough to trim and peel off easily. If you try to do it straightaway you usually end up with the bedding

smeared over everything. It is very worthwhile masking off close around fittings to keep the excess bedding off surrounding areas.

43.2 Stemhead fitting

43.2.1 This is shown on Plan No. 077/011/09

43.2.2 The fitting carries the bowsprit to port and the anchor roller to stbd. The forestay and the staysail tack attach to the centre lug.

43.2.3 The fitting fits down over the stem and bolts through the stem face. The upper bolt passes through the stem head and picks up the back plate of the fitting. The two side plates are screw fastened into the sides of the stem - use 8g countersunk screws. The screws are really just to pull the side plates onto the bedding rather than take any serious load - the through bolts are intended to take the forestay load.

43.2.4 Before making up the fitting (or getting it made), check the stem dimensions, angles etc. from your boat and mark any changes on the drawing. Also mark off for the side plate screws.

43.2.5 The fitting should take the bowsprit with its underside parallel to the foredeck centreline. Check that this is so on your boat - if anything keep the bowsprit outer end up rather than down - it looks better angled modestly up. Also check that the fitting matches your bowsprit shape/dimensions and mark any modifications on the drawing.

43.2.6 If your fabricator is local to you, it is best to try the fitting on the boat just tacked up, so that any minor fitting changes can be made easily.

43.2.7 Make sure that your fabricator knows the the forestay tang is load bearing and that it needs a full structural weld to the top plate of the fitting. This means proper preparation of the tang (usually to a 60º included angle), then root and sealing fillet welds each side and round the ends.

43.2.8 The anchor roller is designed so that a plough type anchor will self-stow and, suitably lashed, can stay in the fitting at sea.

43.2.9 Once you have the fitting to hand, try it over the stem and tap into place. mark off for the bolt holes. Mark the top bolt on both front and back faces of stem.

43.2.10 Remove the fitting and bore off for the bolts. With the top bolt, bore from both sides so as to get correct alignment of the hole with the fitting. WEST down the holes.

43.2.11 Bed the fitting with Sikaflex 221 or similar and bolt it in place. Use washers under the nuts on the inside of the stem. Bore off and screw the side plates (work WEST down the screw holes). Clean off excess bedding and wipe with solvent.

43.3 Main gooseneck.

43.3.1 The gooseneck shown is a modern style gooseneck with clew hooks for the reef cringles.

43.3.2 The fitting is quite straightforward to manufacture but make sure that you fabricator reads the drawing carefully so that he is clear about the function and purpose of each part and that the correct bits are threaded, tapped out etc. so that the fitting functions properly without parts coming loose in use. The fitting is designed so that the rotating parts can be pulled up tight enough to work smoothly but not so tight that they jam.

43.3.3 Once you have the fitting to hand, mark out the position of the mast plate on the aft face of the mast. .

43.3.4 Bore off for the fastenings into the mast (2" x 14g screws). WEST down the screw holes and fix and bed the fitting in place.

43.3.4 Fit the boom fitting to the boom, parallel to the top of the boom and about 8mm down from the top, and the cross plate between the straps hard up to the boom end. The boom will need recessing in way of the inner parts of the straps at the fwd end.

43.3.5 Bore off for the 5mm copper clenches (or M5 bolts). WEST down the holes. Catch up the WEST on the boom where the straps are checked in. Clench (or bolt) the straps to the boom, with a good smear of bedding

43.3.6 Fit the Delrin bushes to the gooseneck block. Fit the block to the boom fitting with the Delrin washers sandwiched each side. Screw in the M10 horizontal bolt and pull up just tight until the block has a nice easy movement in the fitting. Secure the bolt with the locknut.

43.3.7 Enter the boom into the gooseneck plate on the mast, fit the Delrin washers top and bottom and then drop in the vertical pin; tighten up the nut underneath until the assembly just pivots smoothly and then secure with the locknut.

43.4 Main boom end fitting.

43.4.1 Offer the fitting up to the boom. Chisel the boom down so that the fitting can tap on - it should house near enough flush with the faces of the boom.

43.4.2 Bore off for the screws (1.25" x 8g) and WEST down the holes. Catch up the WEST on the boom.

43.4.3 Fix the fitting in place on a good smear of bedding.

43.4.4 The eyes on the two side of the fitting are for vangs to lead forward to prevent gybing when running (especially by the lee) downwind.

43.5 Bowsprit fittings.

43.5.1 Tap the outer eye band (the crance iron) on to the bowsprit. Drill off for screws and WEST down the screw holes. Secure the fitting on a good smear of bedding.

43.5.2 The bobstay fitting through the stem is an eyebolt set about 75mm above the dwl. A 6mm eyebolt is of sufficient size but may not be long enough to go right through the stem - the usual length is 100mm and the distance through the stem is about 100mm.

43.5.3 You can weld (or have welded) extra length on to the eyebolt (fully prepare the ends). Or you can chop 15mm into the apron to take the nut & washer. WEST down the holes before final assembly and bed the eyebolt really well.

43.5.4 The bowsprit shroud plates are bolted to the hull at about 700 back from 000. Position them just under the deck so that you can get bolts through the shelf - make them low enough so that you can get the nuts and washers on the inside. WEST down the holes and fit the plates on a good smear of bedding.

43.6 Bumpkin fittings

43.6.1 Bolt the bumpkin heel fitting in place so that the top face of the bumpkin is at dwl +428. position the fitting fore-&-aft with the bumpkin and mizzen in place so that you get it exactly right.

43.6.2 The fitting has two bolts through the carling and two just through the cockpit sides. WEST down the holes as usual and fix the fitting on a good smear of bedding.

43.7 Mast and spar fittings.

43.7.1 The mainmast eye-band and cleats were dealt with in the mast manufacture.

43.7.2 Similarly, the mizzen cleats and sheave were dealt with during the mast manufacture.

43.7.3 There are no metal fittings on the other spars.

43.7.4 The mainmast shroud plates are fitted 365 abaft the mast centreline.

43.7.5 Ideally, we are aiming to get the top fastening for the shroud plates through the shelf, the next one through the clamp and the third one just through the planking. The shroud plates specified may not come drilled to allow this - and it is not so very important.

43.7.6 Position the shroud plates vertically so that the whole of the lanyard eye is just above the deck.

43.7.7 On the outside where the shroud plate crosses a plank land you need to make up a wedge spacer. Make this about 5mm all round bigger than the plate and radius the corners. Internally, fit a vertical doubler to the hull for any fastenings that do not go through the shelf or clamp. Again make this about 5mm bigger all round than the plate and radius the corners. The doubler may need to be joggled over the plank lands.

43.7.8 Bore the holes off for the fastenings and WEST down them well. Bed & bolt the shroudplates in place.

43.8 Mainsheet plates

43.8.1 These are fitted to the inner faces of the cockpit coaming stiffeners.

43.8.2 WEST down the fastening holes and usual and then bed and fix the plates in place.

43.9 Jib & staysail sheet leads.

43.9.1 The jam cleats can be fitted now, but the leads themselves should be positioned on sail trials to establish the best position for the cut of your sails.

43.9.2 You will need a neat pad under the coachroof top for the fwd fastenings through the jam cleats. The after fastenings should pass through the beam, though if this looks as if it is going to be awkward (because the fastenings come very close to the beam edge, or even partly through it) then move the fitting fwd enough so that all the fastenings clear the beam, through a larger pan underneath. Ply is best for the pads (use 9 or 12mm) because it doesn't split. But if you don't like the look of ply use about 12mm solid timber, shaped slightly if necessary to fit the roof accurately.

43.9.3 Make the pads large enough so that nuts and washers are well clear of the edges (say 10mm); clean the edges up nicely and radius them off. The pads can WEST up to the coachroof (scrape the varnish off locally) or just fit up dry, or on a smear of bedding.

43.9.4 WEST down the fastening holes and usual and then bed and fix the jam cleats in place.

43.9.5 There is rather more lifting load on the sheet leads as they are turning the sheets through a vertical angle, so they also need good pads beneath. It is probably best to WEST these pads to the underside of the roof, scraping away the varnish in way of them. Make the pads from 12mm ply or 15mm solid - about 75 x 75, with nicely radiused corners.

43.9.6 When establishing the correct position for the leads try to go out on a fairly calm day (say 8 knots of wind) and sail the boat just free of close hauled. Have the sheets through the jammers. The push the sheet down to the roof moving the position about both fore-&-aft and athwartships until the sail sets nicely, with neither the foot nor the leach too slack or too tight. Leads too far fwd will give a loose foot and a tight leach; too far aft will give a tight foot and loose foot; too far inboard will allow the leach to curl badly; too far outboard and you will not get close hauled enough. Lengthening or shortening the tack of the sail will also alter the sheet position. lengthening the tack will move the position aft; shortening will move it fwd. Make sure that the luff of the sails is set up properly tight. We usually do the staysail first and then the jib, keeping a sufficient slot between the sails so that the staysail doesn't suck the jib into it or the jib backing the staysail. The positions shown on the deck plan should be about right for the sails as shown on the sail plan - but individual sailmakers will all have their own ideas about cut and sail shape. if possible twist your sailmaker's arm to come on these trials with you so that he (or she) can select the best positions.

43.9.7 Once you have established the correct positions for the leads, fix them in the usual way, WEST down the fastening holes and bedding the fittings on.

43.10 Fairleads

43.10.1 We show fairleads fwd. These are screwed and bedded in place - screwing down into the shelf. WEST down the screw holes as usual.

43.10.2 You may wish to fit fairleads aft as well. These are usually the straight pattern (the ones fwd are handed or skene pattern). These can fit down on the deck aft of the toerail (you could end the toerail a little further fwd than shown). Or they can fit on the taffrail inboard of the coamings (best for towing a dinghy). Much depends on you usual berth arrangements.

43.10.3 We haven't shown mooring cleats. You can fit cleats as you wish. WEST down any fastening holes as usual.

SECTION 44 - RIGGING, SAILS ETC.

44.1 Standing rigging

44.1.1 Only the main has any standing rigging - the mizzen is free standing

44.1.2 The main has an aft shroud port and stbd and a forestay. Depending on the system chosen for setting the jib, there may also be a jib stay.

44.1.3 The bowsprit is rigged with bobstay and bowsprit shrouds.

44.1.4 The standing rigging is all 4mm diameter. Wire construction can be either 1 x 19 (19 strands of single wire) or 7 x 7 (seven strands each themselves consisting of seven strands). 1 x 19 is the usual wire for standing rigging nowadays as it stretches less than 7 x 7 wire. 7 x 7 can be hand spliced, mechanically spliced (Talurit or similar), swaged, or fitted with swageless terminals (Norseman or similar). 1 x 19 cannot be hand spliced but it can be mechanically spliced, swaged, or fitted with swageless terminals. The wire can be galvanized or stainless (stainless is more usual nowadays). Talurits for stainless wire are copper and for galvanized wire they are aluminium alloy

44.1.5 The standing rigging is set up (tensioned) on lanyards rather than rigging screws (though you can of course fit rigging screws if you wish). Lanyards have the advantage of simplicity, they have a traditional appearance and they are quick and easy to set up.

44.1.6 For a boat of this sort and to use lanyards, either hand splice or Talurit splice is best. Both ends will be eye ends with thimbles. On the mast, use heart thimbles for the top ends and lanyard thimbles if possible (these have a wider base) for the bottom ends. On the bowsprit we usually set up the bobstay lanyard under the bowsprit, rather than down on the stem (it is easier to reach); the bowsprit shroud lanyards are usually at the aft ends on the shroudplates.

44.1.7 The top ends of the rigging on the mast shackles into the 4-eye band at the hounds with 5mm D-shackles.

44.1.8 You can calculate your rigging lengths by trigonometry from measurements taken from the boat and off your spar. But on a small boat like this it is usually easier to stand the mast up in place and measure the lengths.

44.1.9 To measure the rigging lengths from the spar in place, you will need to set the boat up level athwartships and fore-&-aft. You will need two people to do the job. Tie three temporary lines to the top band on the mast, to be used for holding the mast upright while the standing rigging is being measured. Tie a length of stout twine or strong string firmly in the three eyes in the 4-eye band at the hounds (to represent the two aft shrouds and the forestay).

44.1.10 To step the mast, lay it the tabernacle and fit the pivot bolt through. Then one person,standing on the bridgedeck or at the aft end of the coachroof can lift the mast, pivoting it up until the angle is sufficient for a second person on the foredeck to pull it up with the temporary forestay. The first person then steadies the mast as it is pulled up and secures it with the locating bolt.

44.1.11 Now steady the mast with the temporary forestay (to the stemhead) and the temporary shrouds to the shroudplates, or perhaps to the aft ends of the handrails.

44.1.12 Now adjust the temporary shrouds and stay until the mast is vertical athwartships and fore-&-aft. Check for vertical with a spirit level, but because the mast is tapered you will need a wedge shaped length of timber (called a declivity board) to

place between the base of the spirit level and the mast to take out the taper. Use a good long spirit level (1000mm or so). The mast taper (lower part) is from Ø80 to Ø65 in 3240 which equals 4.6mm per 1000mm (say 4.5mm). So make you declivity board to this taper over 1000mm and set it on the spar with the spirit level set on top of it. Once you have the mast upright in both directions, pull the three strings representing the shrouds and forestay nice and taut to their respective fittings and mark the strings for dead length to the fittings. Then take off the temporary stay & shrouds, lower the mast and measure the lengths of the strings. The two shrouds should be the same length (assuming that the shroudplates are similarly placed), so if the string lengths come different add them together and divide by two to get an average length.

44.1.13 To get the shroud and stay lengths subtract 150mm for the lanyards and also subtract the lengths of the top shackles. This is then the length from base of thimble to base of thimble for the made up shroud or stay.

44.1.14 For Talurit splices you will need to give these lengths to you local rigger or boaster. If you are having hand spliced rigging then you are most probably doing the splicing yourself as it is a bit time consuming and has become expensive. Hand splices are usually parcelled (wrapped in linseed soaked strips of cloth) and then served with tarred marline.

44.1.15 The bowsprit shroud and bobstay lengths can easily be measured direct on the boat. Allow 150mm for the lanyards + the shackle lengths.

44.1.16 Lanyards can be Ø3 terylene line; allow enough for six turns plus frapping & tying off

44.2 Running rigging (main).

44.2.1 The running rigging for the mainmast is shown on the sail plan.

44.2.2 The blocks shown are Tufnol by Classic Marine, but any similar will be fine - or you can use the more traditional ash blocks if you wish (the mainsheet will require some modifications if so because ash blocks fitted with a jammer are not available).

44.2.3 The peak halyard strop is 3mm wire with a soft eye (an eye without a thimble) each end. The eyes should parcelled and served so that they do not cut into the gaff - a modern alternative is to thread nylon or plastic tubing over the wire before splicing the eye (but this can often lead to corrosion under the tubing). The eyes should be large enough after parcelling to slip easily over the gaff (say Ø80). The length of the gaff span should be such that it is just taut when secured by the chocks.

44.2.4 The peak halyard is a double purchase rove as shown with a single & becket block on the mast band and a single block on the gaff span shackle which slides along the gaff span wire. Note that only one of the blocks in a purchase is a swivel head block, the other is a fixed head - if both are swivel head the purchase tends to twist up on itself. The

halyard is Ø10 rope (Ø8 will be strong enough but may be a bit small to grip). The fall of the halyard (the "fall" is the final part of a purchase - the bit you pull on)

44.2.5 The throat halyard is a single whip with a runner on the fall to give a 2:1 purchase, the same as the peak. With a high-peaked gaff there is insufficient space for a block directly on the gaff at the throat, so we have to achieve the necessary purchase by other means. The end of the whip is secured to the throat of the gaff by the same lacing that laces the head of the sail to the underside of the gaff. The end of the whip has a soft eye (no thimble) for the lacing to lace through - otherwise a thimble would chafe on the mast. The block for the whip is secured to the aft eye on the 4-eye band at the hounds. The length of the whip needs to be arranged so that when the mainsail is lowered, the runner block is still just clear of the whip block on the mast band. You can tie the fall of the whip into the runner block until you get the exact length right on sail trials. The runner end secures to the eyebolt on the tabernacle and the fall to a cleat. The runner block will need to be fitted with anti-chafe or else it bangs against the mast and damages it. Once you have established the final whip length you could also fit protection to the mast in way of where the block sits in the reefed positions - this could be leather, copper or glass cloth (just scrape the varnish away and WEST a glass cloth patch in place - feather the edges off and revarnish).

44.2.6 Note that both the throat & peak halyards fall on the same side of the mast to make setting and lowering the main easy; traditionally they are on the stbd side. In the days of naval sailing ships sail control lines ran to specified places on all naval vessels; this meant that a crew member (even a new one) could find his way to the right piece of rope, and in the dark.

44.2.7 The staysail halyard is rove through a block at the hounds. You will probably need a short wire strop in the mast band so that the block hangs clear of the forestay. The halyard (Ø8) falls to port). The halyard can most conveniently tie (short bowline) into the sail head.

44.2.8 The jib can be set in a variety of ways:

(i) It can be hanked on to a jibstay, like the staysail is hanked on to the forestay. In this case a permanent jibstay, set up on a lanyard like the forestay, is required. The disadvantage of this is that you have to go out on the bowsprit to set the sail.

(ii) It can be set flying - which means that it is not hanked on any stay but is just set up taut by the halyard. To avoid going out on the bowsprit to fix the tack, have a block on the bowsprit end with the tack line rove through it back to the deck. You can then pull the tack out to the bowsprit end. You may need a cleat on the foredeck to secure this to. If you also have a retriever line tied into the tack of the sail you can pull the tack back inboard when you are lowering the sail. Sails set flying usually have a wire luff rope sewn in to help the luff stay tight.

(iii) It can be set on a traveller. This is a leathered ring fitting (incorporating eyes) which runs on the bowsprit and which is hauled out to the bowsprit end by a line through a block at the bowsprit end. The tack of the sail is fixed to the traveller ring. If the sail is set flying, then just the sail is tacked down to the ring; if the sail is hanked to a jibstay, then both sail and stay are fixed to the ring and hauled out together. the advantage of the traveller is that the tack of the sail can't get out of control when lowering. This system however is usually to be found on rather larger boats than this.

(iv) Wyckham Martin gear. This is an early version of modern roller furling gears. The Wyckham gear has a bottom drum and swivel and a top swivel. Unfurling the sail rolls a thin line on the drum: pulling the line off the drum rolls up the sail again. Using a wire luff sail with Wyckham gear top & bottom, the sail can be left out on the bowsprit and the halyard tensioned so no jibstay is needed.

(v) Furling gear. This is like the Wyckham gear except that there is an extrusion of some sort over the jibstay (a jibstay is usually required), into which the jib luff slides. When the sail is furled, the extrusion rotates as well and the jib will roll around it. The advantage with this system is that the sail will set partially furled - so you can reef the jib as required.

Of all the systems we reckon that the Wyckham gear is the best for this size of boat. It is simple and traditional looking; it works well and obviates the need to go out on the bowsprit; the furl line can be led aft to the cockpit so setting and rolling the sail away can be down from there. We don't really need to reef the jib (as we could with a furling gear) as it is not really big enough.

44.2.9 Whichever way you choose to set the jib, the halyard is rove in a similar way to the staysail halyard and also falls to port.

44.2.10 The jib & staysail sheets run aft through bulls-eye leads (positions to be established on trials) to jammers. They are single (i.e. no purchase).

44.2.11 The mainsheet is a four-part purchase arranged as shown. If you can obtain a single & becket block with jammer then this will be even better as the fiddle sheave is not used (a fiddle block is a double but arranged with one sheave over the other, not side by side as in a conventional double block).

44.2.12 Some people prefer a double-ended mainsheet system, which will end up providing a 6:1, with a triple on the boom and doubles (or fiddles) at the coamings - or an unbalanced 3:1 with a double on the boom, double one side at the coaming and single the other. The 6:1 is too much purchase - you get a lot of rope in the cockpit and the sail won't square away by itself in anything but a blow. As the sheet also acts as the horse we are not certain how the boom would position itself with an unbalanced 3:1 system.

44.2.13 The advantage with a double ended system is that you can use the fall on whichever side you are sitting (useful if you need to let the sheet go in a squall). The

disadvantage is that you have always got to be sure to make off both ends. We have found that the single ended system works well provided the jammer is angled so that the fall can be flicked out when the jammer block is to leeward and you are sitting to windward - again so that you can let the sail out quickly in a squall.

44.2.14 Topping lift. This is a single whip running through a small block hung either at the masthead or the hounds. If you used a 4-eye band at the masthead, then there is a spare eye for the block. A fixed length topping lift is not usually used on a gaff sail as it flaps against the sail (the single whip can be pulled up to the mast); also it is useful to be able to drop the peak of the main (leaving the throat halyard tight and supporting the boom on the topping lift). This is called "scandalizing" the main and it de-powers it very quickly without going to the trouble of lowering it. Ø8 should be fine for the topping lift.

44.3 Running rigging - mizzen.

44.3.1 The mizzen running rigging can be Ø6 .

44.3.2 The halyard is tied around the yard. Once the best position for this is established by trials then a chock can be fitted so that its position is permanently known and a bowline used to make the halyard fast to the yard, rather than a rolling hitch or topsail bend. It reeves through the athwartships sheave at the masthead and falls to the port cleat.

44.3.3 The tack line is simply rove through the tack cringle of the sail and round the spar and jaws and tied in a bowline underneath. It is made up on the aft cleat.

44.3.4 The mast downhaul is simply there to stop the mast lifting clean out of the boat. It is tied around the bumpkin, or to an eye on the cockpit sole or mast step, and made up on to the stbd cleat.

44.3.5 The mizzen sheet has a block hung on a rope strop round the boom (kept in position by a chock). The end of the sheet passes through the bumpkin outer end fitting with a stopper knot beneath. The fall passes through the block under the boom and fwd to the cockpit. It may be secured on a cleat on the underside of the boom. If you want a purchase on the mizzen sheet (so that a young child can control the mizzen for example) then arrange this with a single and becket on the boom and a single on the bumpkin. You could hang a lead block to the underside of the boom at the fwd end and thus lead the fall down to the mast.

44.4 Setting up the rigging.

44.4.1 When you set up lanyards tension each turn as you reeve it, pulling the previous turns tighter as you get more purchase. Rub soap (lanolin traditionally) on the lanyards so that they reeve round and all strands pull tight. To finish the lanyard off, frap the end about three turns around the body, then tuck the end through the middle and tie off

around the whole with a clove hitch; tuck the end into the middle neatly. At first, leave the lanyard ends long. After the first few hours sailing everything will have settled down and the rigging will need re-tensioning. Once you have done this the lanyards can be cut off if necessary to a length that finishes nicely with a short end left.

44.4.2 Set up the bowsprit. Tension the shrouds - you will need to tension one and make it off temporarily. Then tension the other. Continue like this until both are as taut as possible and as near as you can judge evenly tensioned. Make the lanyards off. Now tension the bobstay until the bowsprit is pulled down a little below its intended line. When the jibstay is set up, this will pull the bowsprit up again.

44.4.3 Now set up the mainmast. Make the aft shrouds up first, pulling the mast slightly aft and trying to keep the lanyards even so the mast stays upright athwartships (the shrouds should be the same length so the lanyards should end up the same length). Now tension the forestay until it is good and tight and the mast pulled fwd until it is upright fore-&-aft. The reason to tackle the job this way is that the forestay has more power because it makes a greater fore-&-aft angle with the mast - so we set the mast aft a little and then pull it fwd with the forestay, thus pulling the shrouds really tight.

44.4.4 You can tension the shrouds as tight as you can conveniently get them with six turns of 3mm lanyard. The standing rigging should be tight rather than loose as otherwise strains are put on the tabernacle for which it wasn't really designed.

44.4.5 All the rigging will need setting up again after the first few hours sailing as everything stretches out and spars and fittings bed in.

44.5 Bending the sails.

44.5.1 The mainsail is laced to the boom and marline hitched to the gaff.

44.5.2 Start with the boom. Lace or shackle the tack to the gooseneck athwartships pin. Heave out the foot tight, with about six turns of lanyard through the eye on the boom outer fitting. Then lace the sail to the boom.

44.5.3 Similarly, lace the throat of the sail to the gaff (in conjunction with the throat halyard) and pull out the head of the sail with a lacing at the peak, through the hole in the outer end of the gaff. Then lace the head of the sail to the gaff (using marline hitching rather than simple round-&-round lacing).

44.5.4 The mizzen is similarly bent onto its spars.

44.5.5 Both sails can be loose footed if you want too, though the rig is not designed this way and this does induce a greater bending load in the spars. We feel that you will get better and more satisfactory performance with them laced to the spars as described. You do need to talk to your sailmaker about this because a loose footed sail is usually cut differently from a laced sail.

44.6 Trials.

44.6.1 Do choose a quiet day for the first trials

44.6.2 Make sure all the seacocks are turned off and that you have all the necessary gear aboard - including safety gear, bilge pump, warps & fenders, boathook etc. Launch the boat - you'll find she slips into the water off her trailer very easily.

44.6.3 Straight away have a good check around to make sure that there aren't any leaks - there shouldn't be but sometimes there are even in the best built boats. Assuming everything is OK move her to the quayside, pontoon or berth.

44.6.4 Check the action of the centreboard and the rudder drop-board.

44.6.5 Fire up the outboard and check that it is running satisfactorily. Then have a short cruise under power. Tow a dinghy with you in case the outboard breaks down. Try manoeuvring the boat under power, both ahead and astern until you get the feel of how she handles. Then re-berth her to step the masts and set up the rigging.

44.6.6 Don't carry out the first sailing trials if it is blowing too hard - you want nice light airs (say 5 knots) to start with. And you need some open water, preferably a little away from other boats and especially commercial traffic.

44.6.7 Make sure all the sails are bent on and everything is free on deck and well stowed below.

44.6.8 Motor out into the fairway. Set the mainsail while holding the boat under power head to wind. As the main is hauled up, thread the luff lacing round the mast. Don't forget to tie the parrel bead line on the gaff around the mast before starting to hoist the main. Set the topping lift so the outer end of the boom is lifted above its working position; free off the sheet. Hoist the peak and throat together. Set the throat up good and tight. Then set the peak up reasonably tight. Let off the topping lift so that the sail takes the weight of the sail. Pull the luff lacing tight (but not over-tight) and make off the end. The square away until the boat is sailing fairly close to the wind (centreboard down; rudder board down). Put the outboard out of gear. Once the sail is full and drawing well the boat will pick up speed. Adjust the peak halyard tension so that the sail sets without wrinkles or girts. You will find that different peak tensions are required for different points of sailing (less when running free than when close hauled).

44.6.9 The boat may not tack very well under mainsail alone - or at least you will need to build up hull speed by freeing off a little before tacking. So, once you've got the main set nicely its best to pull the staysail up. Now you can try the boat on different points of sailing and establish the position for the staysail sheet leads.

44.6.10 Set the jib and establish its sheet lead position.

44.6.11 Set the mizzen - with a lug sail the halyard tension (and sometimes position on the yard) needs adjusting to produce the best set. Play about with these until you get a good wrinkle-free set.

44.6.12 Finally return to harbour to fit the sheet leads and make any other adjustments that you have found necessary.

44.6.13 Once this work is done you can start to take the boat out in more to get a really good feel of how she handles and performs under different conditions. Try reefing the main and sailing under reefed main before it is blowing so hard that you need to reef - so that you get the reefing process really sorted out. Try sailing under mizzen and staysail and mizzen and jib. Once you're confident of reefing and different sail combinations (including perhaps a bit of motor-sailing), you can have some heavy weather trials - but remember she is only 15' 6" - not a ocean cruiser! Don't forget to keep the rigging good and tight at all times.

SECTION 45 - GENERAL REMARKS.

45.1 Services & equipment.

45.1.1 We haven't included in this boat any plans, drawings, specifications or instructions for services - plumbing, gas, electrics etc. - or gear & equipment

45.1.2 There is a minimum of equipment that you should have - and in many countries that are now required by law. These may include, but may not be limited to, an efficient bilge pump (preferably as a fixed installation); a fixed and adjusted compass; navigation lights; warps, fenders, boathook; an anchor, with cable and warp; and of course life saving/preserving equipment for each of the crew members.

45.2 Some data.

45.2.1 The boat is relatively light for her length and has a relatively large sail area for her displacement and wetted surface. This gives her a lively performance especially in light airs. But you will need to reduce sail area quite early.

45.2.2 We have deliberately kept the design light to give easy towing, launching and recovery. And the sail area is deliberately relatively large to give excellent performance on inland waters, lakes & reservoirs, and the upper reaches of rivers & estuaries, where the majority of trailer/sailers are used.

45.2.3 By using a cutter-headed yawl rig we get an easy breakdown of the sail area into small components, so in heavier weather the rig can easily be reduced (often simply by lowering the main rather than reefing it).

45.2.4 If you are regularly going to sail the boat in more robust conditions then you can make the boat stiffer by adding up to 100kg of lead internally. This has the advantage that it can easily be removed for towing or sailing in sheltered waters. Four 25kg pigs will stow in the bilge alongside the centrecase. If you are going to fit lead, then ascertain the best position fore-&-aft (so that the boat trims nicely with your usual gear stowed). Then WEST in a ply base (or simply make a solid WEST/#407 platform) for the lead to sit on. Do not sit it directly on the skin. Make proper arrangements so that the lead is held secure at all times - including a capsize (you don't want pigs of lead falling through the cabin roof to add to your troubles).

45.3 ... and finally

We hope very much that you have enjoyed building your boat and that you will get many happy days sailing her. If you have any suggestions for improvement in the design generally, the drawings or the instructions we are always pleased to hear about these. Photographs of your boat in build and under sail are always appreciated. And we do like to hear from you from time to time so that we know how the boat is going.

END