INTERNATIONAL MOTH
BUNYIP IX — 1985/86

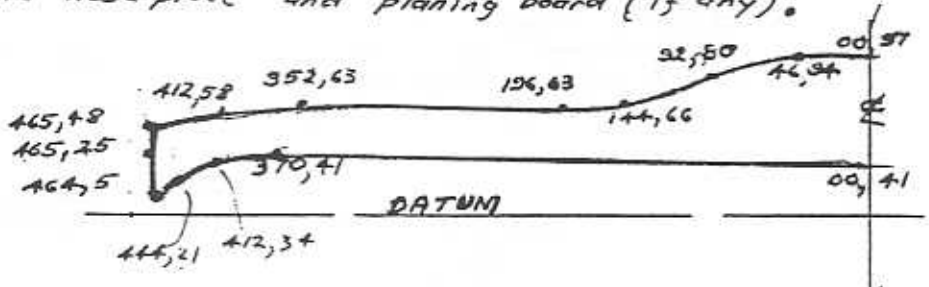
R.C. HILTON
4 Hawkins St
MT PLEASANT
W.A. 6153
(09) — 364 4942

Note — All dimensions are in millimetres.

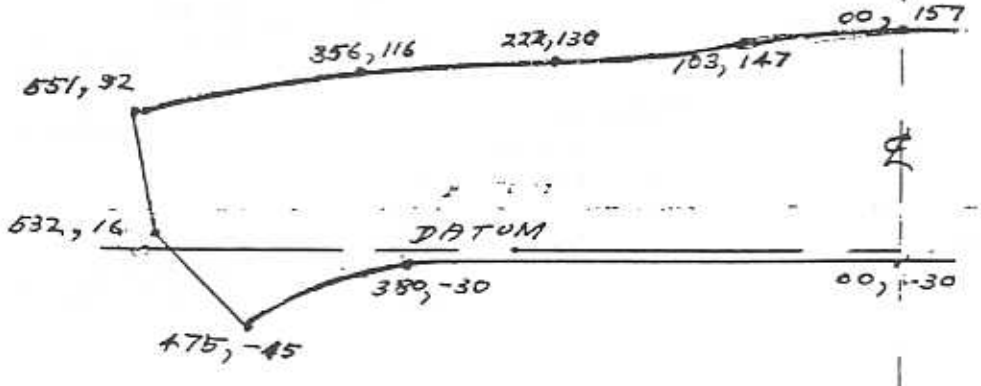
1. The layout of each station is related to a common horizontal datum line (or plane) and a vertical line (or plane) along the centre. Each point on the profile of a station is given in coordinates such as 605, 6 which means 605mm out from the centre and 6mm above the datum line. 605, -6 would mean 605 out from the centre and 6mm below the datum line.

Station 00 is the front of the hull before the nose piece is glued on. Station 3315 is the aft face of the transom. The finished overall allowable length is 3355, so 40mm has been left for the nose piece and planing board (if any).

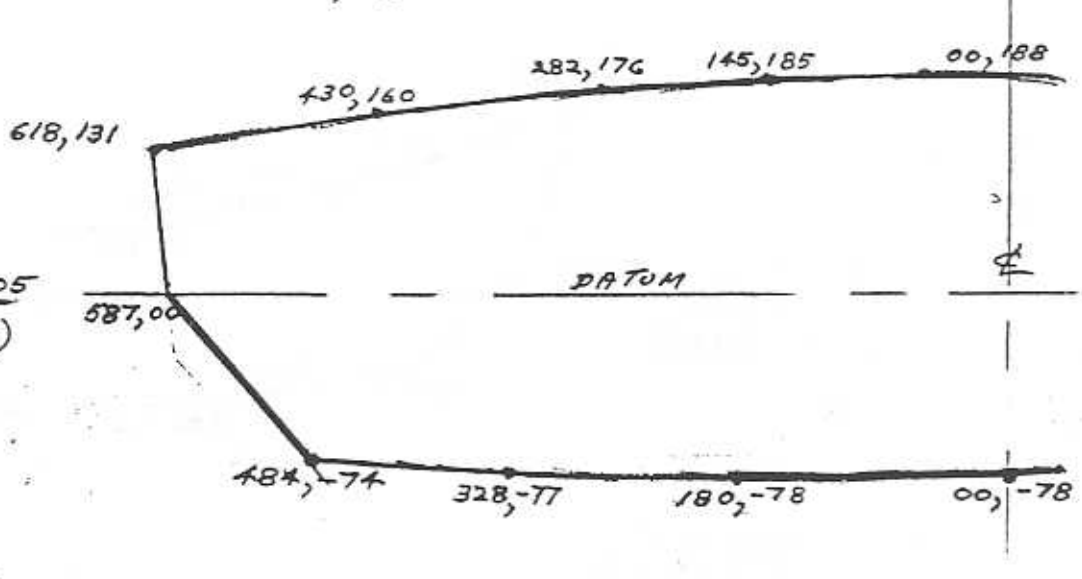
STATION 00

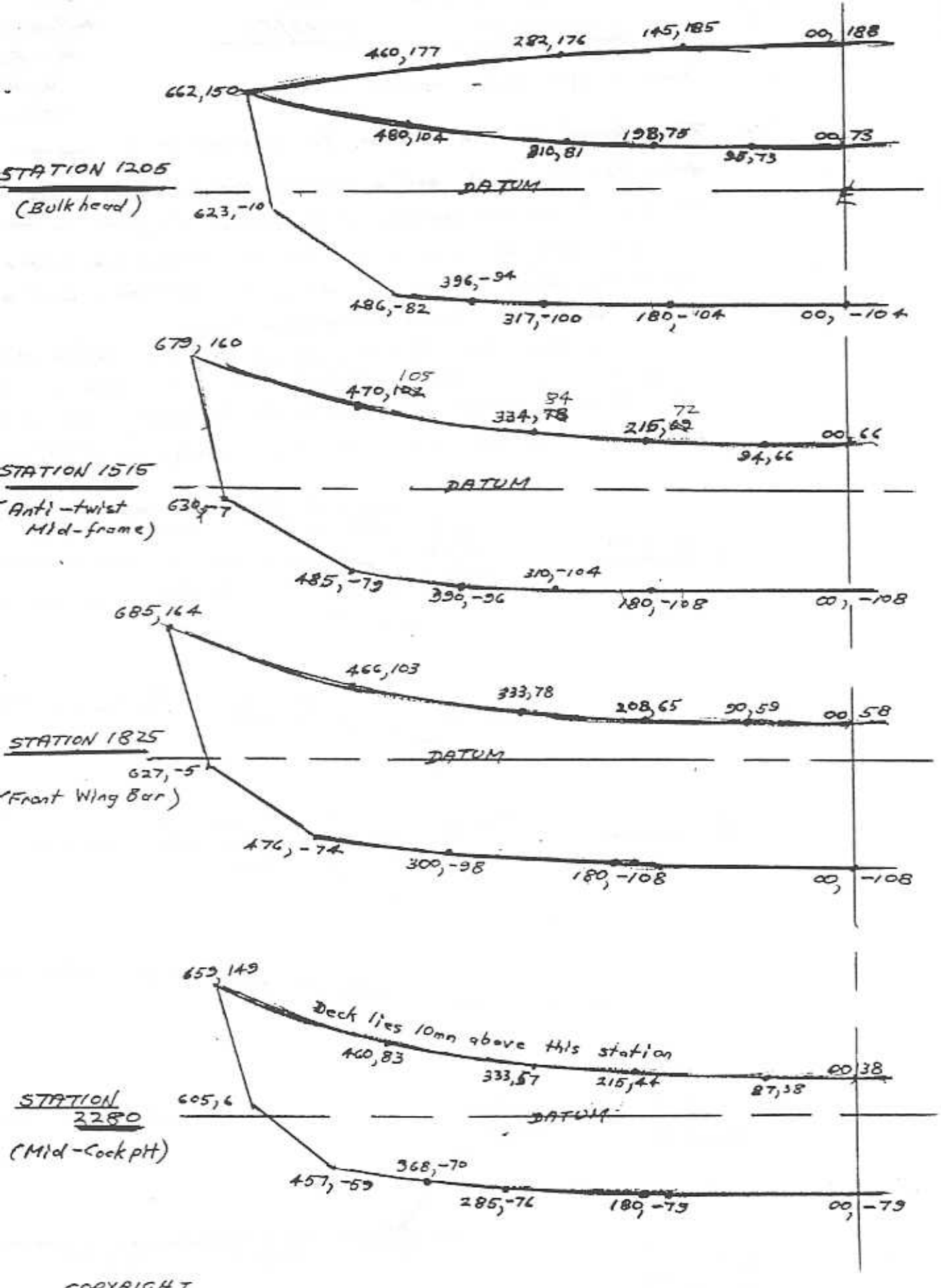


STATION 400

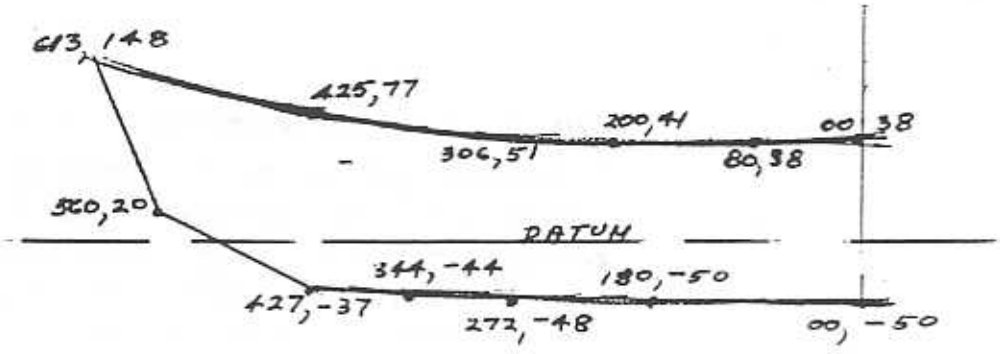


STATION 805
(Mast Frame)

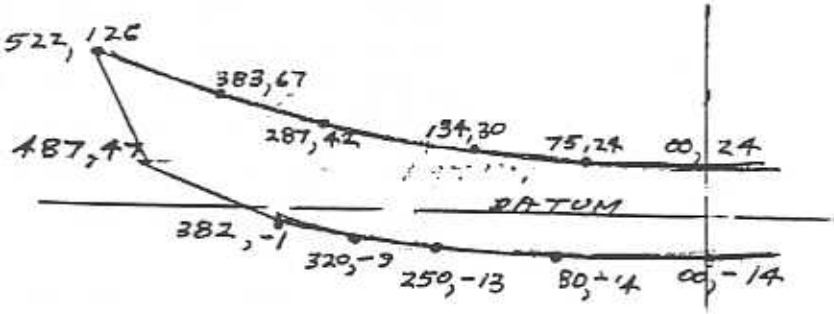


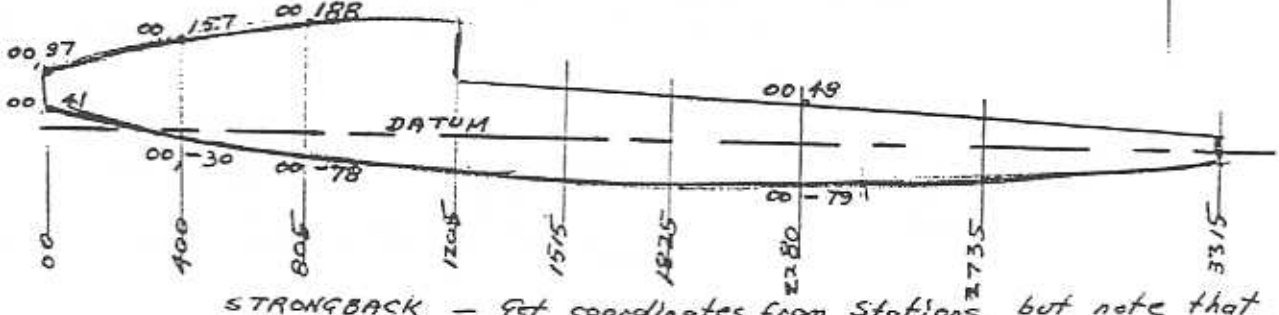


STATION 2735
(Rear Wing Bar)



STATION 3315
(Transom)





STRONGBACK – Get coordinates from Stations, but note that the top at 2280 is 00, 48. (The Station is 00, 38).

2. There are three 15 x 12 stringers each side of the centre. Their centres measured from the centreline of the hull are:-

00	–	120, 233, 341	1825	–	126, 239, 352
400	–	124, 239, 350	2280	–	120, 230, 336
805	–	128, 243, 357	2735	–	112, 215, 315
1205	–	128, 244, 360	3315	–	99, 193, 280
1515	–	128, 244, 357			

3. FRAMES

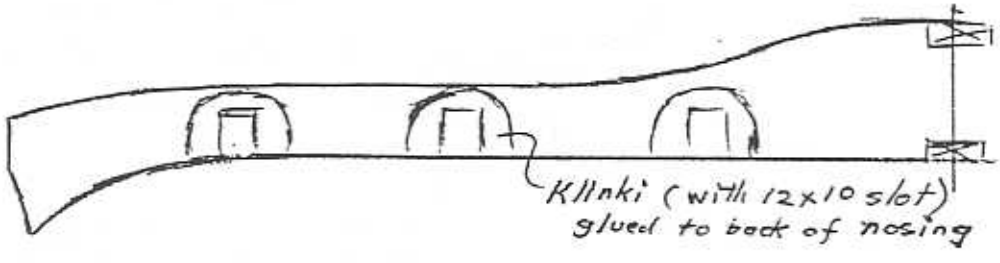
The frames and strongback can all be cut from one 8' x 4' sheet of 3mm Klinki ply. If this is not available, 1·5 or 1·2 marine ply can be used, but less material should be cut away in each frame. In order to get the most out of the ply, make templates first – rough paper templates would do – and lay them out on the sheet of ply to the best advantage. The strongback

will be in two pieces – from the nose to 8 feet, with a further piece to be spliced on. Other small pieces will be needed for the centrecase, the nose-strengthener and the Mast Step support. These can all be obtained from the one 8ft x 4ft sheet.

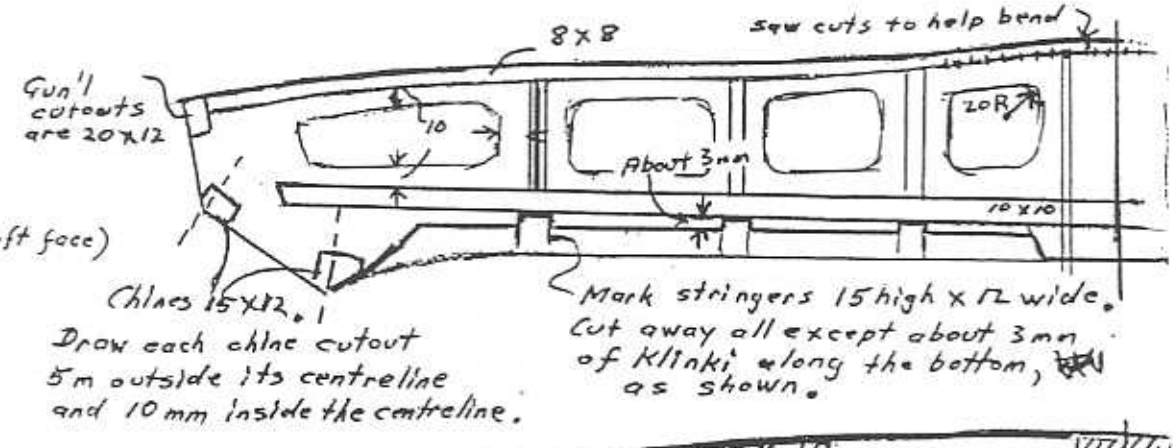
When satisfied that the best layout has been obtained, draw each station accurately. Station 00 is not marked out on the ply, but on a 12 mm thick piece of cedar which has 115 mm ply glued on each face; mark out as shown in para. 1, but cut station 00 about 3mm bigger all around, as the wood will have to be tapered out to follow the profile of the hull, after fitting on the jig.

Before cutting out the various stations, mark the positions of the struts, ~~and~~ stringers and cut outs. I use Western Red Cedar for all stringers, struts, etc. Make all struts, etc, 10x10 unless shown otherwise.

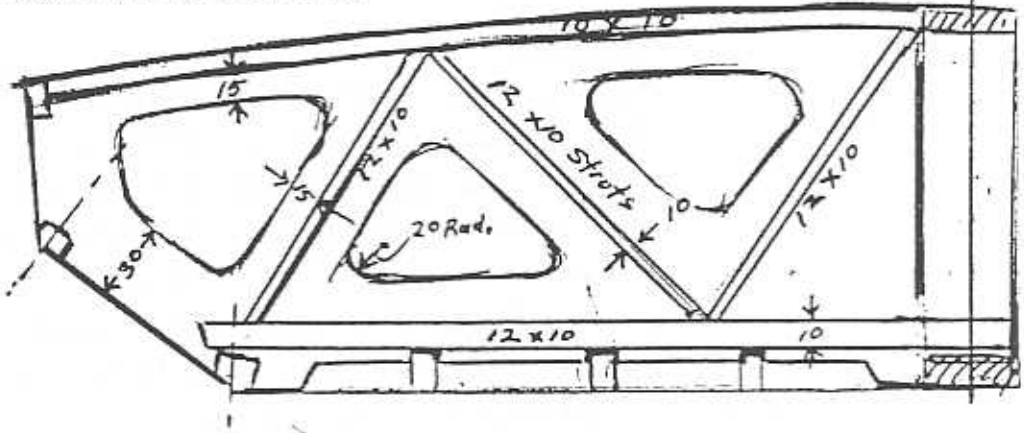
00



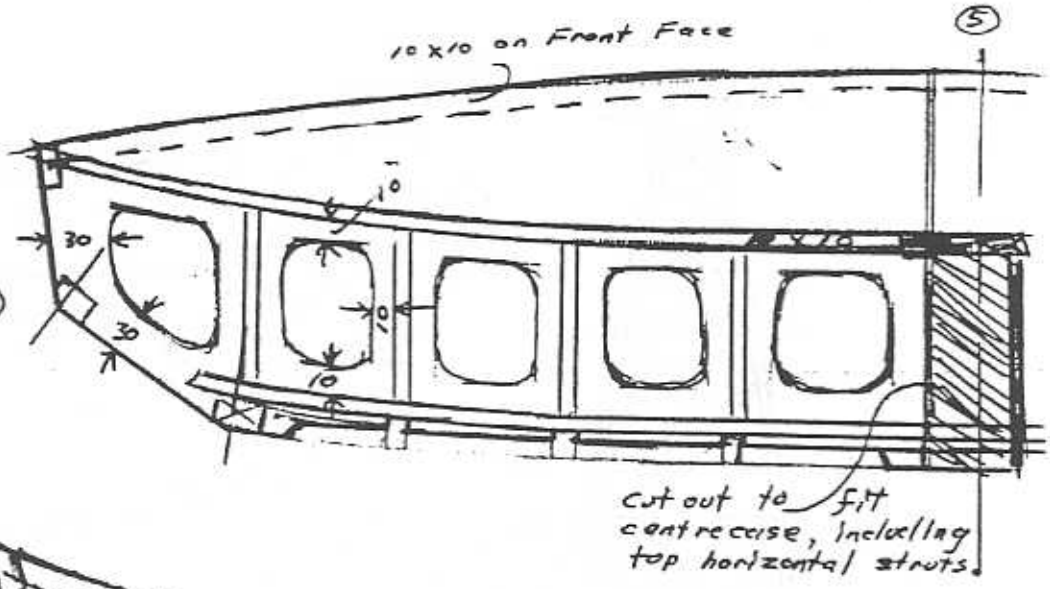
400
(struts are on aft face)



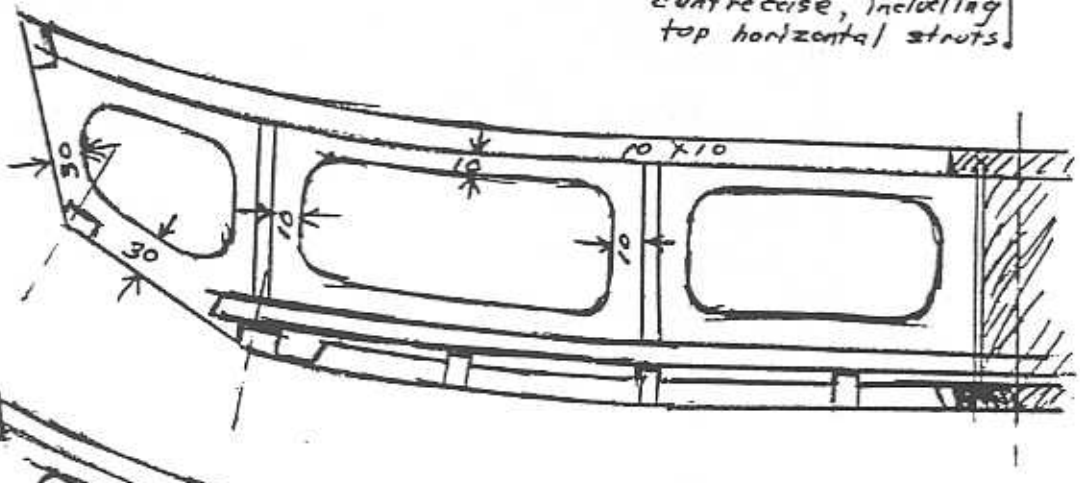
805
(struts are on aft face)



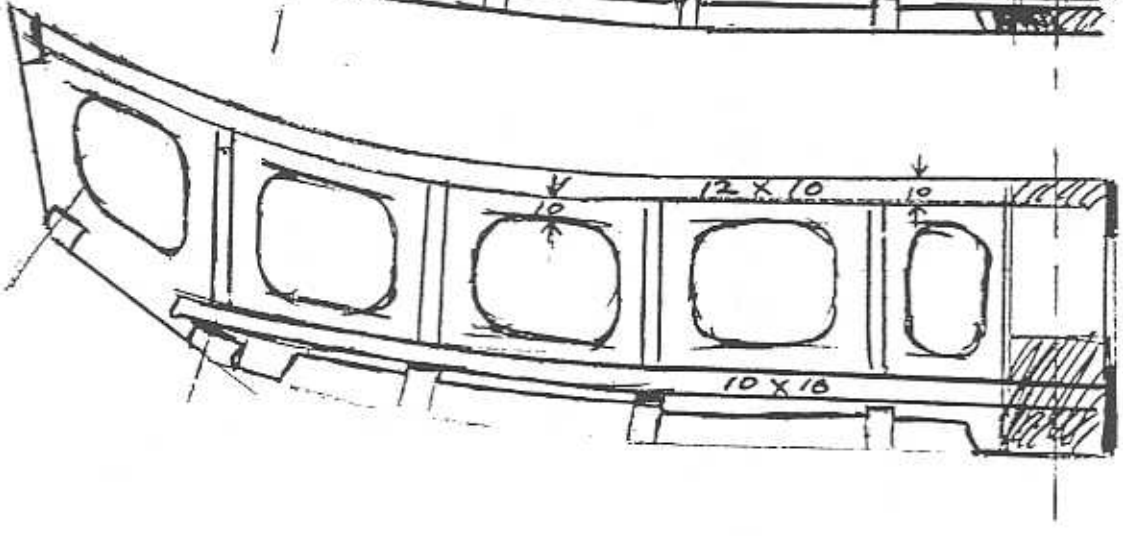
1205
(struts on aft face)



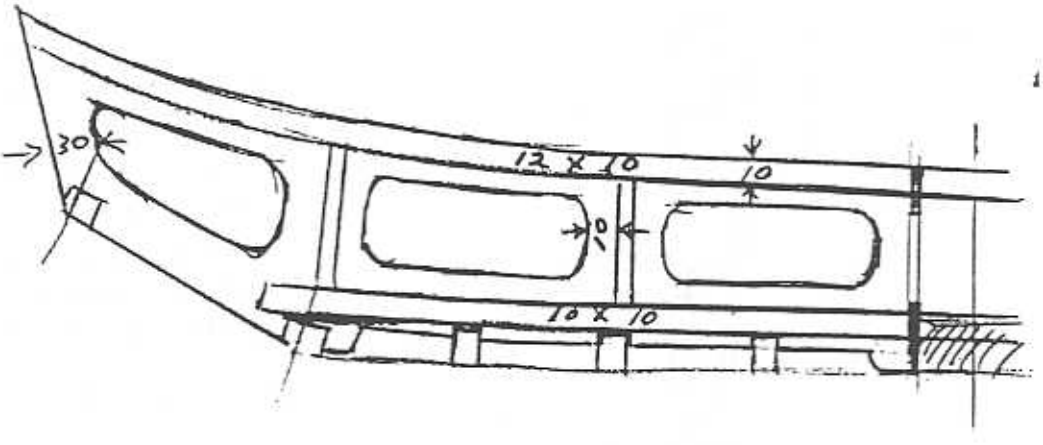
1515
(Aft Face)

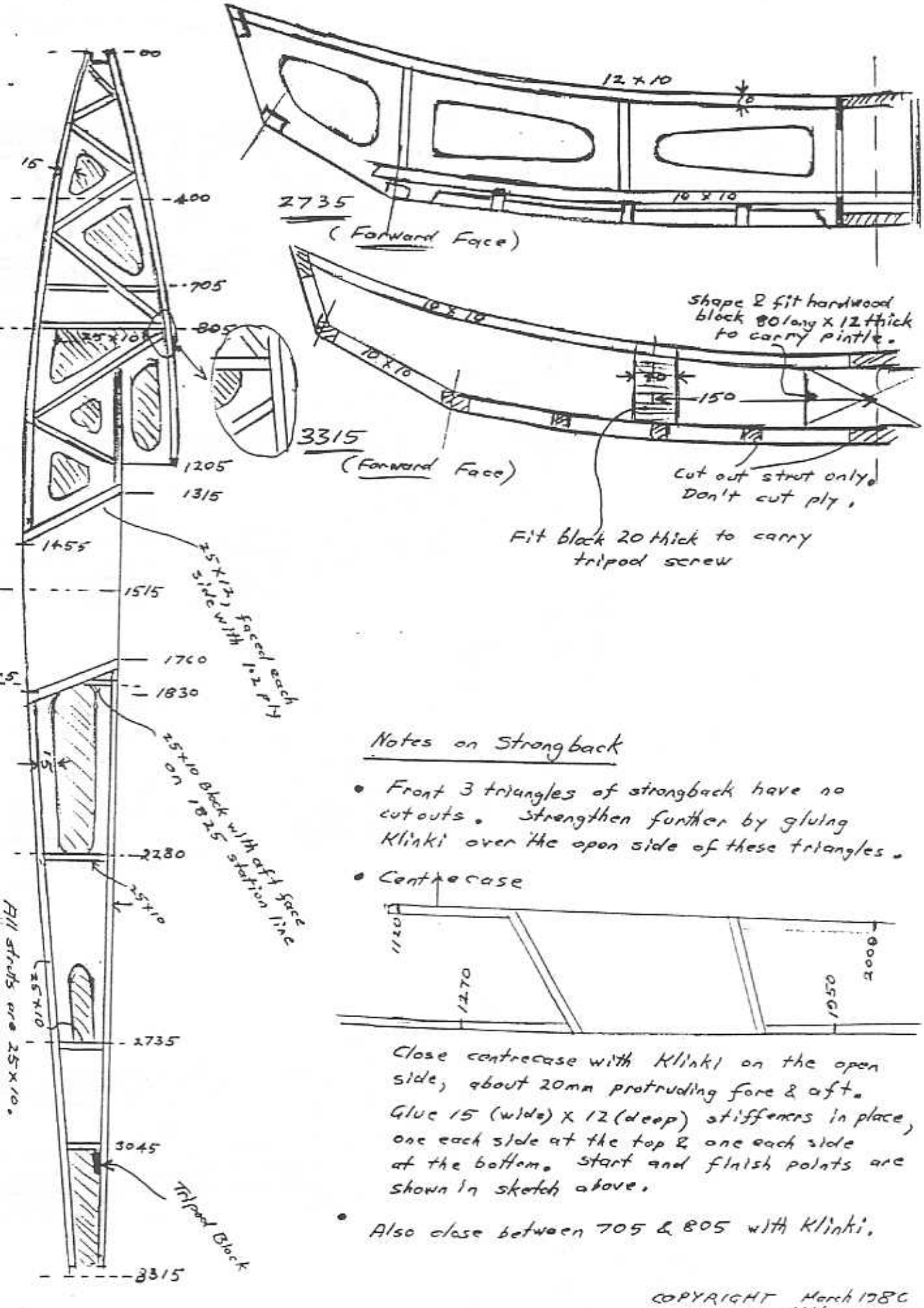


1825
(Aft Face)



2280
(Forward Face)





Notes on Strongback

- Front 3 triangles of strongback have no cutouts. Strengthen further by gluing Klinki over the open side of these triangles.
- Centrecase

Close centrecase with Klinki on the open side, about 20mm protruding fore & aft. Glue 15 (wide) x 12 (deep) stiffeners in place, one each side at the top & one each side at the bottom. Start and finish points are shown in sketch above.

- Also close between 705 & 805 with Klinki.

4. ASSEMBLY

All cutouts and chine & Gun'l slots should be completed first, and each station is then ready for fitting.

a) Noseplece 00. Cut slots to top & bottom of noseplece at the centre, and cutout and sand the front of the strongback so that the noseplece fits tightly in place.

b) 400 will be fitted when the frame is on the jig

c) 805 has to be fitted so that it slides through the cutout aft of the station, then pushes up into place. In fitting each station frame (except 2280) the objective is to have the top surface of the frame match the top surface of the strongback. If the bottoms don't qu. match, it will be remedied by packing the stringers.

d) The bulkhead frame 1205 has to fit over the two centre case stiffeners to arrive at its position, and any further cutting out should be done symmetrically. Whe in position, glue a small block each side of the strongback on the bottom, to help subsequent assembly.

e) 1515 will be fitted when the frame is on the jig.

f) 1835, 2280, 2735 and the transom are fitted in similar fashion.

g) Now glue all fitted frames together, and support on the jig, which should be ready and levelled up. A waxed thread is good for a centre stringline to ensure that the strongback is held straight. Hold the frames with clamps initially, and one by one level each frame, using the datum line drawn on each frame and measuring up each side from a straightedge laid across the jig frame. Repeat the adjustmen on each frame until satisfied that all frames are true and the centre of the strongback is straight. Then staple the frames to the jig.

Stations 400 and 1515 should now be added, in a manner to preserve the relative locations of the two halves.

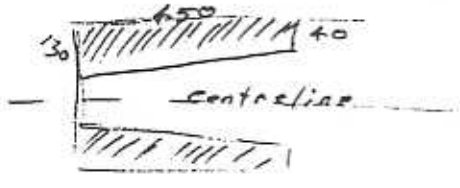
h) Finally look at each frame in turn, and add strips of ply or blocks or fibreglass as required to eliminate obvious weaknesses where the frames join the strongback. Each joint must be made strong and continuous, while keeping the added weight down to a minimum. Add another vertical piece of 25x10 aft of 805, to complete the mast post.

5. <u>STRINGERS</u> Dry-fit the stringers, chines and gunwales. I use small sand bags (plastic) with wires attached, to hang on to the stringers where necessary to hold them down, and light bell wire to hold the chines & gun'ls, and their front ends. The gun'ls will need to be hel twisted by using weighted levers wired in place, or similar.

The bottom chines must now be faired in by sighting both ways, and adjusting the slots or packing if and where necessary, to ensure that each chine is a fair curve both from above and from the side. Then the stringers are adjusted frame by frame, starting from the transc Lay a straightedge crossways at each frame, and pac up any stringer which is low according to the straightedge, or by sighting along it. Crossways, the stringer each side of the centre should be about lev with the strongback. Find 2 identical packing pieces which will just fit under the straightedge at each chine on a particular station, without lifting it off the strongback. It will then be easy to see what h to be done to the stringers at that station. When satisfied that all the stringers are fair, they can be glued in place, with the packers if any. The top chines are next faired up and glued, and finally the gunwales.

6. <u>BOTTOM PLY</u> With a sanding board and/or a file, clean up any glue spots or irregularities on the strongback and trim the nosepiece to match the stringers, etc. Lightly sand the stringers and bott chine to receive the ply. Lightly plane and/or sand the second face of the bottom chine to give a good fair edge with 2/3 on the top face and 1/3 on the second face 

. Prepare the top chines similarly, and then the gon's.

Splice 4 sheets of 1.5 marine ply transversely, and after measuring and making a necessary side and chine templates, mark out and cut the ply. The bottom need not be cut alon the centre throughout — only from the nose to the rear of the centre case. To achieve the curved turn at the front two corners, it will be necessary to sand away 1½ to 2 veneers from the back of the ply. 

Later, glass will be gl on to the sanded sect inside the hull, to repl the material sanded away

Place numerous weights on the ply to seat it the stringers, and repeatedly mark and plane or sand the centre edges until they butt neatly toge

Finally, glue and staple. Minimise buckling by initial wid spacing of staples, and progressi filling in.

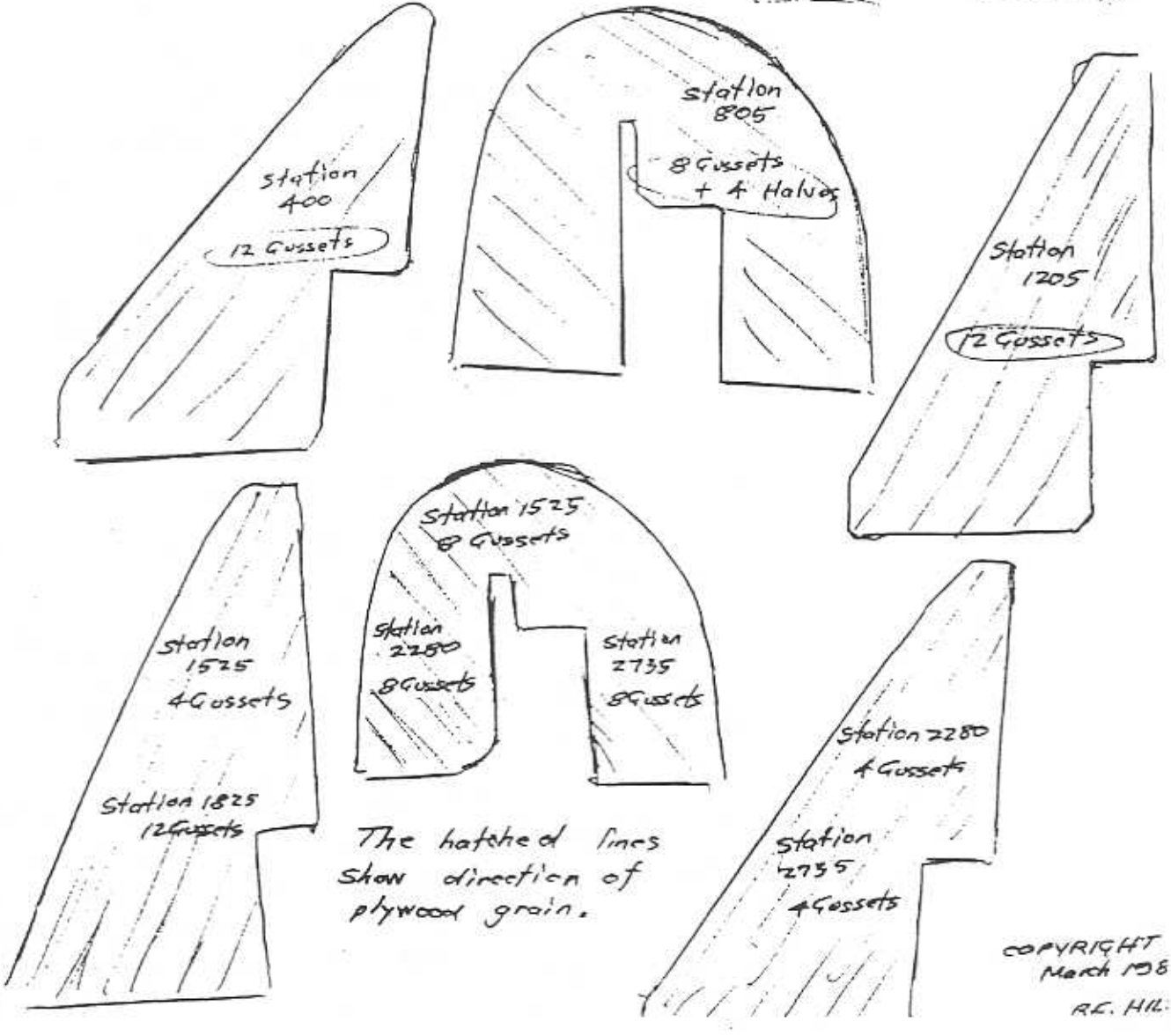
When set, clean up the edges and glue on th chine strakes, and finally repeat for the sides.

While on the jig, cut and finish the bottom of the centre case, glass the bottom two chines and the centre butt joint using 2 oz glass (cut from cloth with a sharp knife) and liquid epoxy, (u masking tape). Make the glass 25 mm wide. Finally coat with a varnish prime

7. TURN OVER OF THE HULL

(a) Remove the hull from the jig, and turn over. Cut 2oz fibreglass cloth and lay in place over the sections at the nose which were sanded down to 1 to 1½ veneers. Glue in place with liquid epoxy. Cut 14 lengths of 2oz 'gloss strips, each 1metre long by about 25mm wide. Lay in place along each side of each stringer and the strongback, to strengthen and bond both the stringers and the adjoining ply —  . Glue in place with liquid epoxy.

Join each intersection of stringer and frame with a 112mm ply gusset each side



The hatched lines show direction of plywood grain.

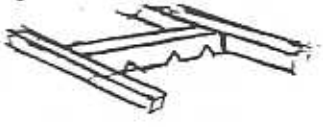
Triangular gusset joints are further strengthened with a strip of 4 oz bandage on the other face of the frame.

The half-round gussets are further strengthened with a small insert of stringer section, gluedin upright, to sit on top of the bottom frame bearer.

(b) Glue a breather tube block to the front of the bulkhead (about 30mm square × 15 thick), about 100 mm out from the centre and 60 down from the top. When set, drill a small pilot hole through the centre of the block and through the bulkhead

(c) Bond each stole, and chine stroke, to each frame with 2oz glass strips (25 wide) and epoxy.

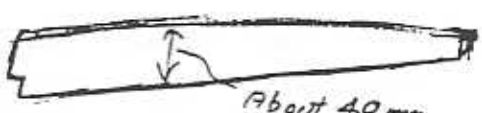
(d) Instal a 12×10 horizontal strut each side of the centrecase, bracing the centrecase stiffener against the adjacent stringer. Before gluing in place, cut 3 drainage slots to the underside of each strut.



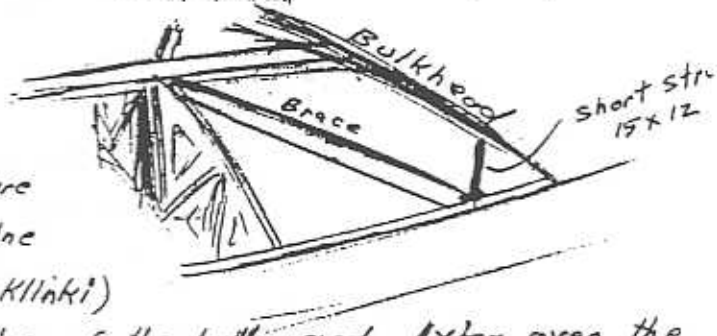
(e) Roughly plane the gun'ls, nearly to finished stage.

(f) Measure forward from the bulkhead along the gun'l each side and mark 110 mm. This will be the centre of the chainplat Carry the chainplate centreline down inside the hull and mark it in pencil, sloping down and backwards at 7 in 150, relative to the top of the gun'l. Also lightly mark the centrelines on the outside of the hull, to locate the screws later on. Cut a 1.2 mm plywood pad for eac side, about 120 mm wide and fitting between the top chine and the underside of the gun'l. Cut and fit a chainplate block for each side from Meranti or hardwood, about 15 thick by 40 wide by 70 long, tapering to 25 at the bottom and fitted to lie on the centreline and to sit snugly up under the gun'l. Glue pads and blocks, and clamp in place.

(g) Instal chainplate bracing. Use Jelutung (Geloton) or Cedar faced with ply; about 8 mm thick.



Suggest make a template first out of Klinki, say.



The top of the braces should be curved to accept the foredeck. Check for correct curvature by laying a flexible spline (Say 8x8 or a strip of Klinki) parallel to the centre line of the hull and lying over the top of the frames. It should just touch the top of the brace. Glue in place, and add a short (200mm) 12x1 strut as shown.

(h) Decide where the mainsheet pulley will go — probably about 1930, on the centreline. Glue strips of 1.5 ply under the top of the strongback to strengthen it where the screws will

(i) There will be 2 mast step screws about 855, one each side near the edge of the strongback. Add a small 10x block each side of the strongback, and glue in place.

(j) The two wing-bar stations 1825 and 2735 are each strengthened at their outer top corners with a ply gusset of Klinki or 2.5 ply. Edges are about 80 to 100 mm. Fit up tightly under the top bearer of the frame. Glue and clamp.

(k) Instal vertical stiffeners between the top chine and underside of the gunwale at about 2055, 2510 and 3025, each side. Use about 17x10 cedar. Fit tightly, glue, cla

(l) To ensure proper drainage of any water along the chines, cut drainage holes (5 to 10 mm) in each frame where it meets each chine at its top edge. A 3" nail sharpened to a flat chisel point makes a good tool, used with a light hammer. Also cut a transverse hole through each stringer and the bottom chine, where they meet the transom, to enable any drainage water to flow crossways.

(m) Instal transom pintle screws, 50 mm centres and about 18 mm up from bottom of ply. Angle upwards to give good seating in wood block. Insert 3/16" s/s metal threads from inside outwards, with large washers under heads, and precoated with varnish or silicon sealant.

(n) Finish trimming gun'ls. Trim and sand planing board (about 3 or 4 mm of ply protruding aft of the transom), and trim and sand flush the nose piece.

SEE NOTE, PAGE 14

(o) Cut 2 drainage holes in transom, about 50 x 15 each

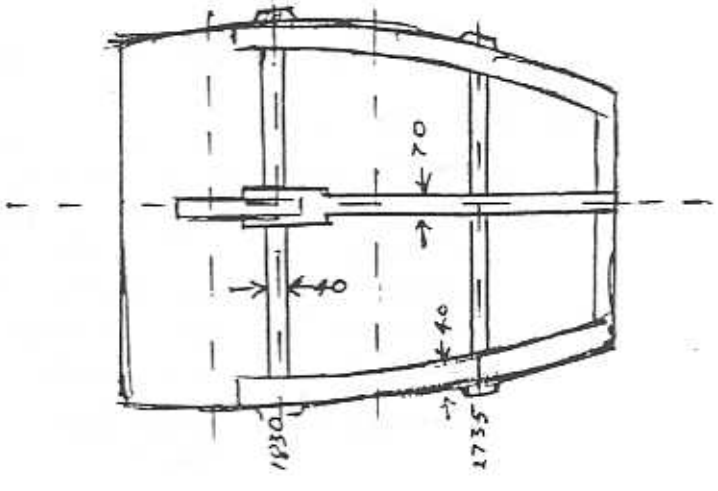
(p) Roughly fill any obvious staple holes - eg. along transverse splices.

(q) Waterproof inside by coat(s) of varnish. Stringers, struts, edges of Klinki and the aft bay of the hull should be given special attention.

8. <u>Top Ply</u>

The top is 1.2 mm throughout, with Kevlar (or, say, Gozgl glued under from about mid centre-case to the transo

Splice the ply, and fit to the deck with allowance for cleaning up but with the outline marked in pencil on the underside. Lay the cut out deck upside-down on the floor and draw in the outline of the to of frames, c/case, transom, etc. Cut up a numb of strips of 1.5 ply, cross grained, about 40 and 60 to 70 mm wide, and fit them (and mark and number them) along the positions of the frames, etc.



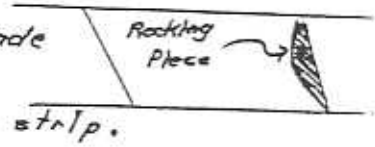
Remove the ply strips, apply the pre-cut Kevlar using liquid epoxy and a rubber squeegee, and quickly glue the ply strips in place (thick epoxy). Add weights (2 rows of house bricks) to all the ply strips.

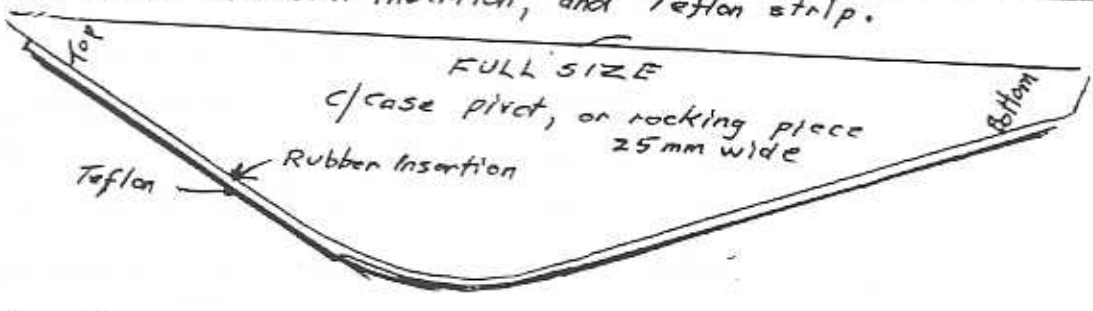
Glue and staple into position, after distributin weights to ensure good contact throughout.

Clean up, and round off the gun'l edges.

The cockpit is now very stiff, and leaks can dove where the ply meets the gun'ls and transom. Force glue along the transom joint. 2 oz 'glass bandage could be considered. Along the gun'ls, from transo to the front of the Kevlar, apply a Kevlar bandage st 25 to 30 mm wide, using liquid epoxy. In or to hold the ~~[illegible]~~ Kevlar tightly in place, use masking tape in about 100 mm lengths, laid transverse and overlapping slightly. When set, remove the tapes, clean up and add a further coat of epoxy.

Cut out the centre case, and force glue along the edges. Make and glue-in a rocking piece to rear of centre case, made of Meranti or similar, and faced with 3mm rubber or rubber insertion, and Teflon strip.



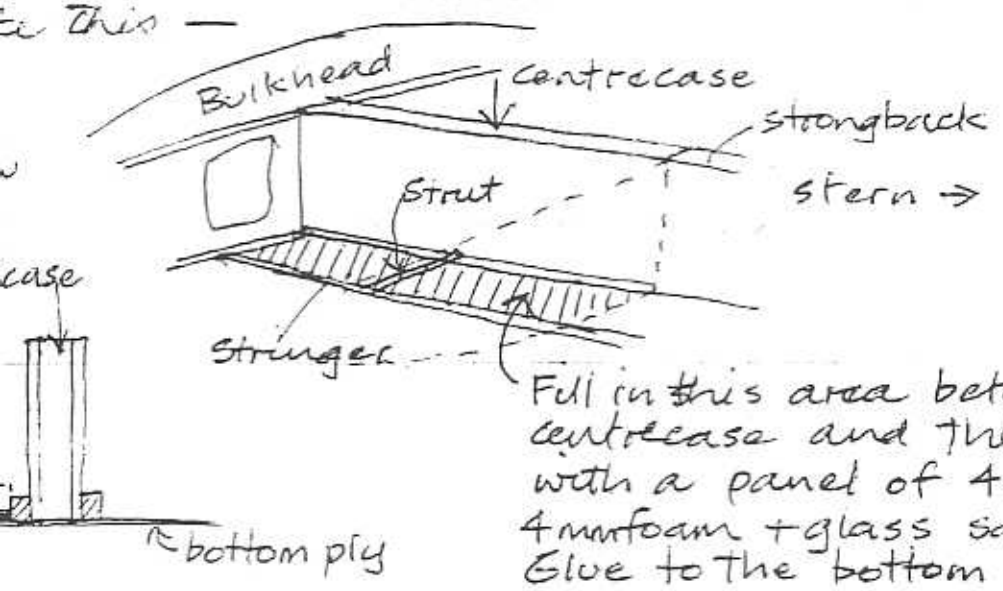


Finally, splice up and fit and glue on the foreda

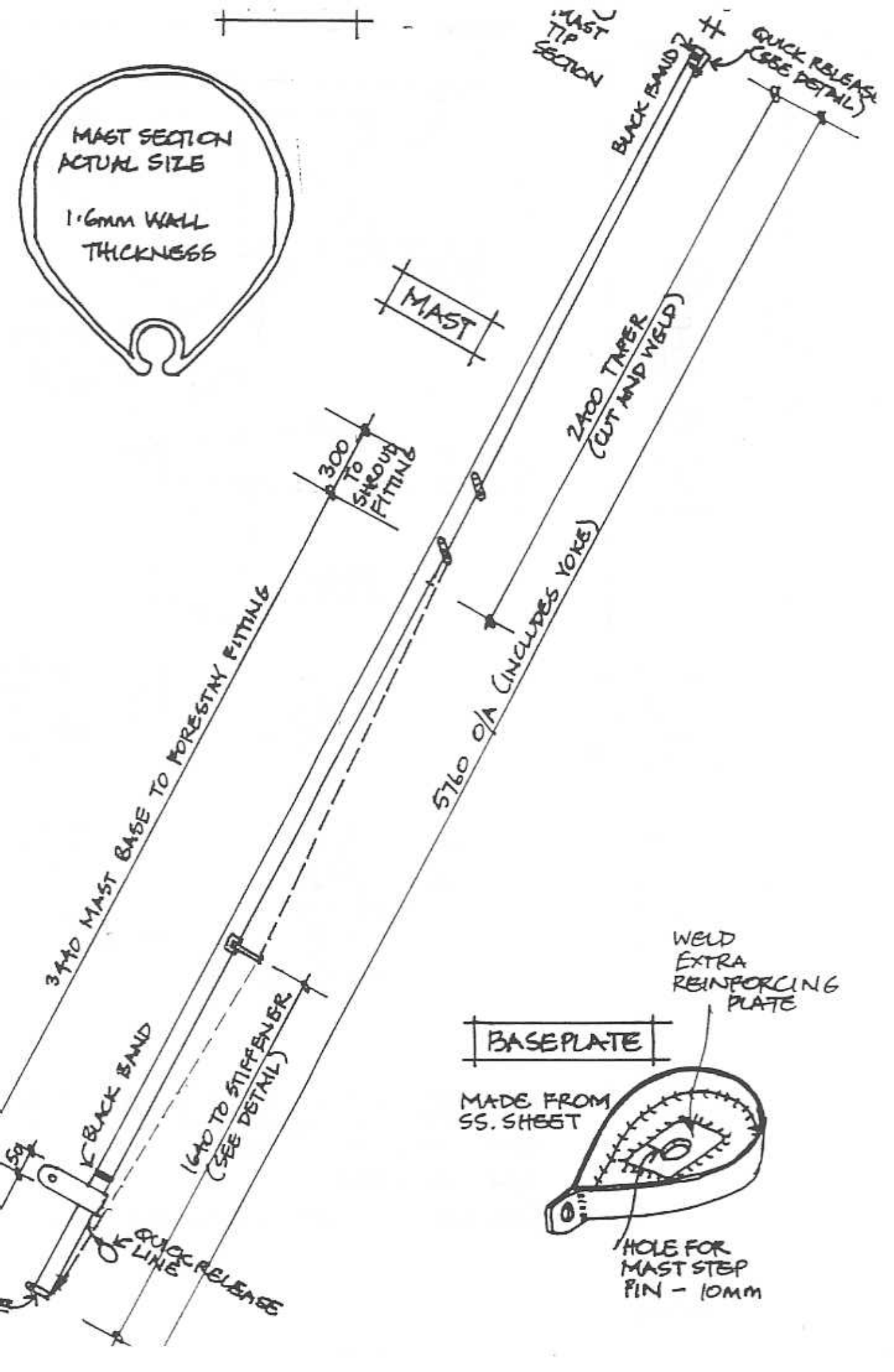
NOTE After 7(n), make up and glue in place the U-Bolt blocks, from Meranti, each initially 45 x 20 x 110. The U-Bolt holes go thro' the outer edge of the gun'ls. Due to the Kevlar, these holes sometimes leak. Put epoxy glue on a short length of 3/16" rod, insert in holes and work around to force glue into any air holes.

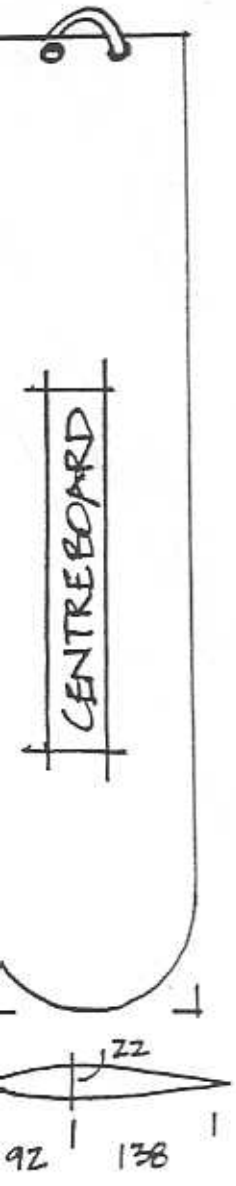
A useful piece of reinforcing should be
dded to the centrecase instead of (as
ell as) the strut shown in (d) on page 11.

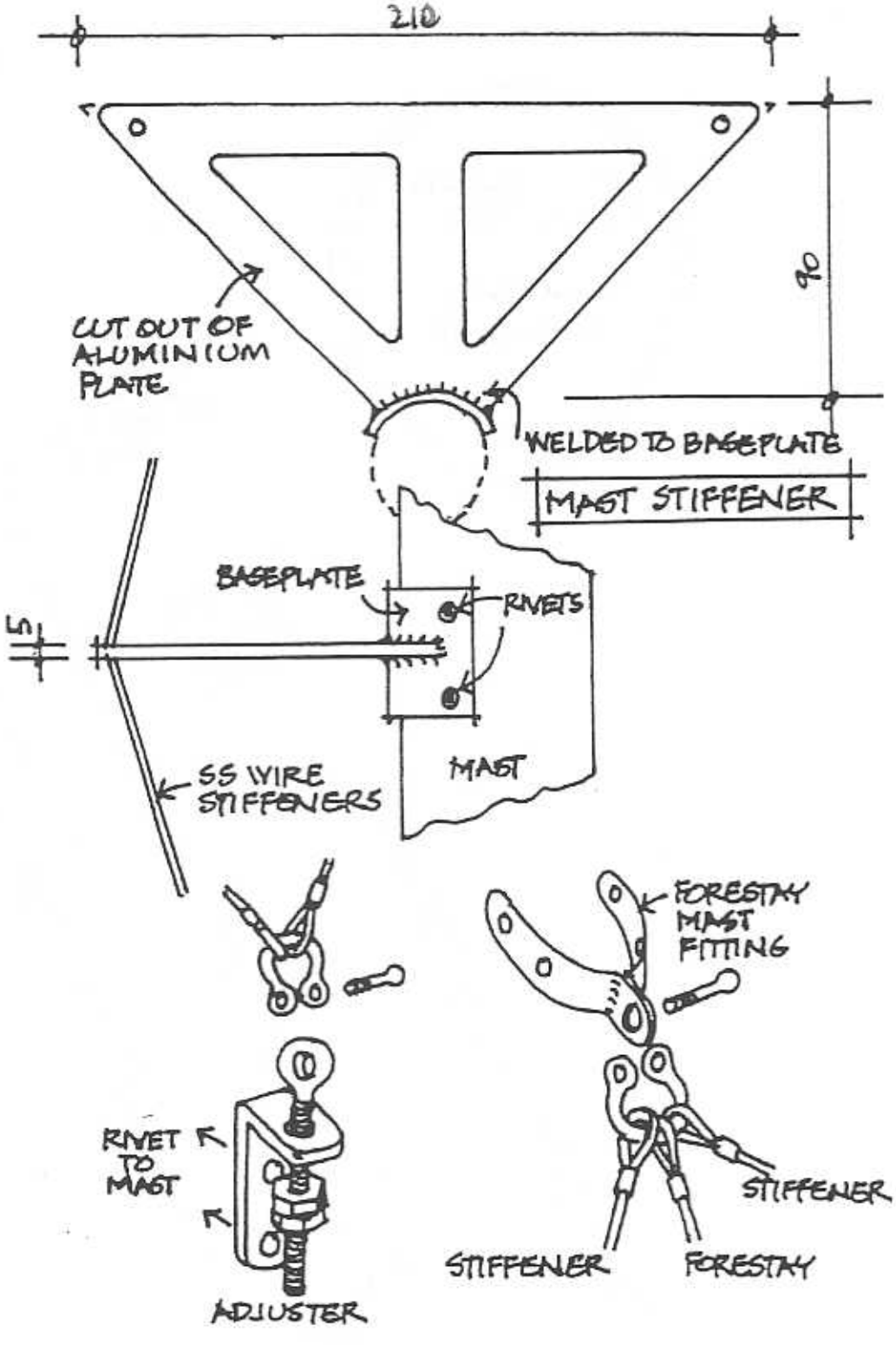
e this —



Fill in this area between the centrecase and the stringer with a panel of 4mm ply or 4mm foam + glass sandwich. Glue to the bottom ply.


MAST SECTION
ACTUAL SIZE
1·6mm WALL
THICKNESS
MAST
MAST TIP SECTION
BLACK BAND
QUICK RELEASE (SEE DETAIL)
2400 TAPER (CUT AND WELD)
5760 O/A (INCLUDES YOKE)
300 TO SHROUD FITTING
3440 MAST BASE TO FORESTAY FITTING
1640 TO STIFFENER (SEE DETAIL)
BLACK BAND
50
QUICK RELEASE LINE
BASEPLATE
WELD EXTRA REINFORCING PLATE
MADE FROM SS. SHEET
HOLE FOR MAST STEP PIN - 10mm

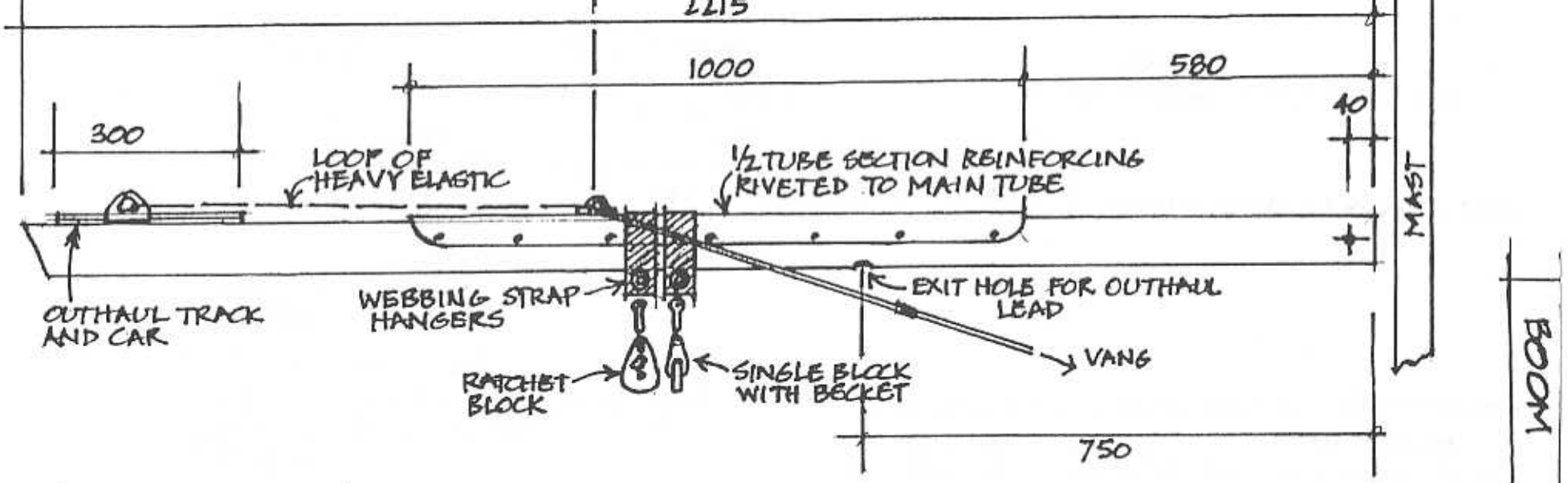




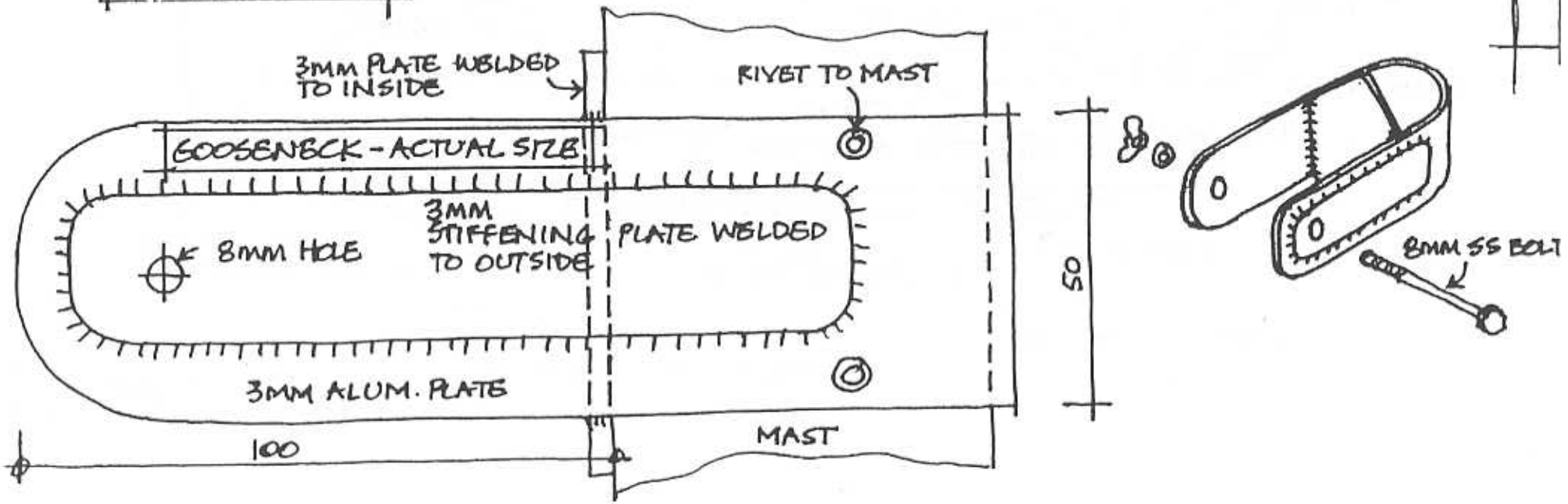
* CENTREBOARD AND RUDDER BLANKS MADE UP FROM STRIPS OF CEDAR WITH 2 x HARDWOOD STRIPS AT CHORD POSITION.

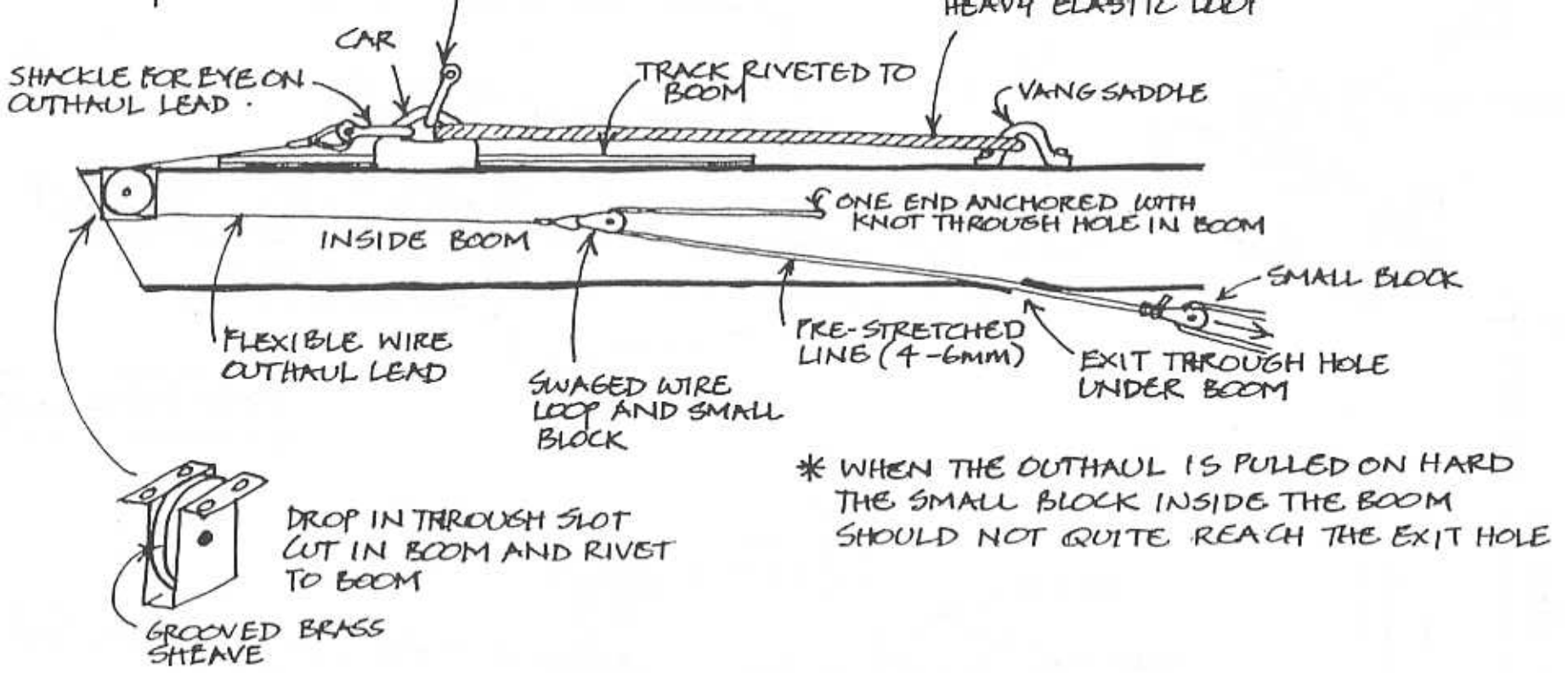
G.R.P. SHEATHING.

(SEE MAGAZINE ARTICLE FOR SHAPING)

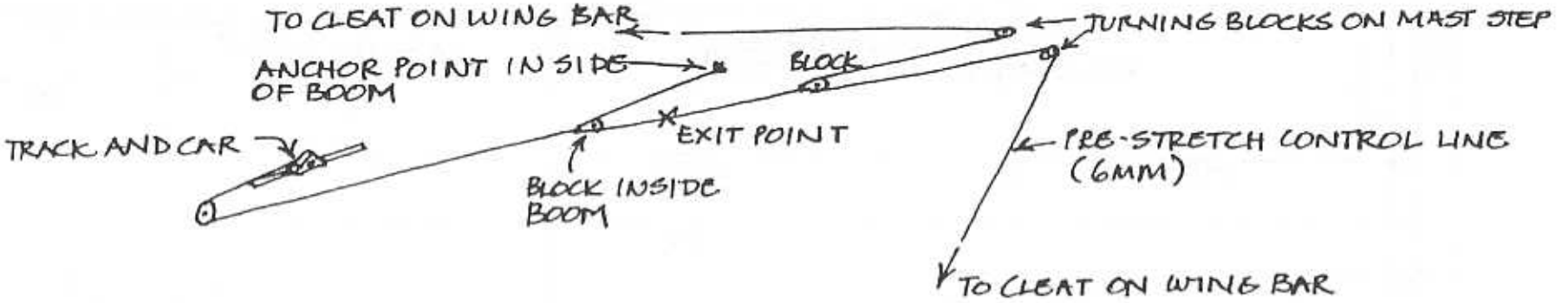

2215
1000
580
40
300
LOOP OF HEAVY ELASTIC
1/2 TUBE SECTION REINFORCING RIVETED TO MAIN TUBE
MAST
BOOM
OUTHAUL TRACK AND CAR
WEBBING STRAP HANGERS
EXIT HOLE FOR OUTHAUL LEAD
VANG
RATCHET BLOCK
SINGLE BLOCK WITH BECKET
750

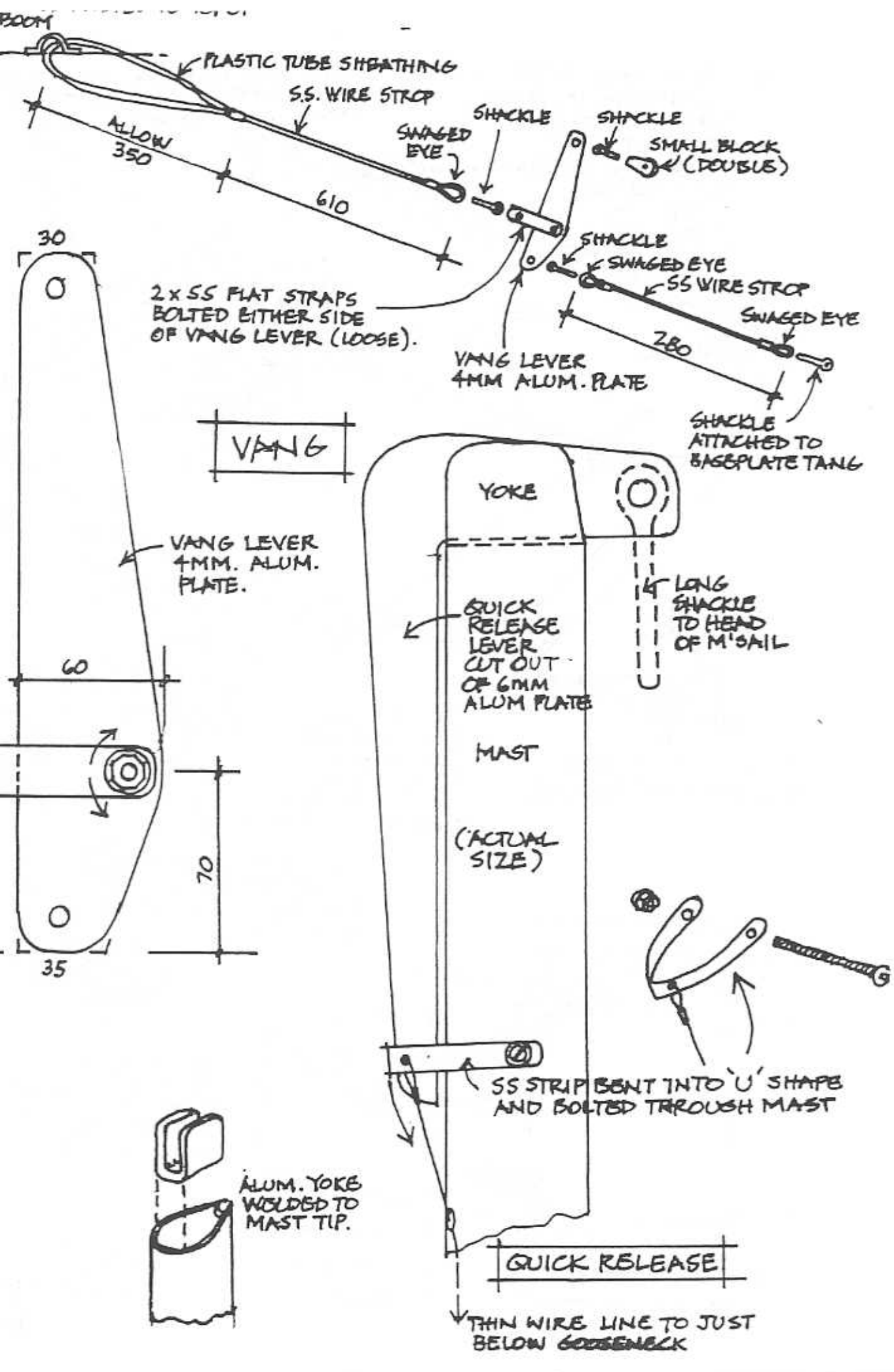
GOOSENECK


3MM PLATE WELDED TO INSIDE
RIVET TO MAST
GOOSENECK - ACTUAL SIZE
3MM STIFFENING TO OUTSIDE
PLATE WELDED
8MM HOLE
50
8MM SS BOLT
3MM ALUM. PLATE
MAST
100



* WHEN THE OUTHAUL IS PULLED ON HARD THE SMALL BLOCK INSIDE THE BOOM SHOULD NOT QUITE REACH THE EXIT HOLE




BOOM
PLASTIC TUBE SHEATHING
S.S. WIRE STROP
ALLOW 350
610
SWAGED EYE
SHACKLE
SHACKLE
SMALL BLOCK (DOUBLE)
SHACKLE
SWAGED EYE
SS WIRE STROP
SWAGED EYE
280
2 x SS FLAT STRAPS BOLTED EITHER SIDE OF VANG LEVER (LOOSE).
VANG LEVER 4MM ALUM. PLATE
SHACKLE ATTACHED TO BASEPLATE TANG
30
VANG
VANG LEVER 4MM. ALUM. PLATE.
60
70
35
YOKE
LONG SHACKLE TO HEAD OF M'SAIL
QUICK RELEASE LEVER CUT OUT OF 6MM ALUM PLATE
MAST
(ACTUAL SIZE)
SS STRIP BENT INTO 'U' SHAPE AND BOLTED THROUGH MAST
ALUM. YOKE WELDED TO MAST TIP.
QUICK RELEASE
THIN WIRE LINE TO JUST BELOW GOOSENECK

CROSS BAR IS 75MM ALUMINUM IRRIGATION TUBE FLATTENED SLIGHTLY.
WING BAR IS 50MM x 1·6MM ALUM. TUBING CURVED TO MATCH DECK

50MM HOLE IN CROSS BAR TO TAKE WING BAR

RIVET TAB TO CROSS BAR

WIDTH TO BE MAXIMUM ALLOWABLE (SEE MEASUREMENT FORM)

SPACING TO MATCH WING BAR FRAMES IN HULL

STERN

CROSSBAR

WING BAR

1½ SECTION 50MM TUBE SUPPORTS 300MM LONG

DECK

CLEAT PLATFORMS

BOW

OMM DIA NG BAR

THIN RUBBER BLOCK

OLTS MADE FROM EADED SS ROD (3/16")

RIVETS

CLEAT PLATFORM CUT AND SHAPED FROM SHEET ALUMINIUM, RIVETED TOP AND BOTTOM TO WING BAR

LOCATION OF * 3 x CLAM CLEATS FOR VANG, OUTHAUL AND CUNNINGHAM. RIVETED TO PLATFORM

RIVETS

4MM THICK HARD PLASTIC WASHER FOR MAST BASEPLATE TO BEAR ON.

SS MAST STEP PLATE WITH 8MM PIN

3 x SMALL SHACKLES & BLOCKS

CLEATS

MAST STEP

ALUM. PLATE TO TAKE TURNING BLOCKS FOR CONTROL LINES

WOOD BLOCK GLUED TO FORDECK

3 2 1

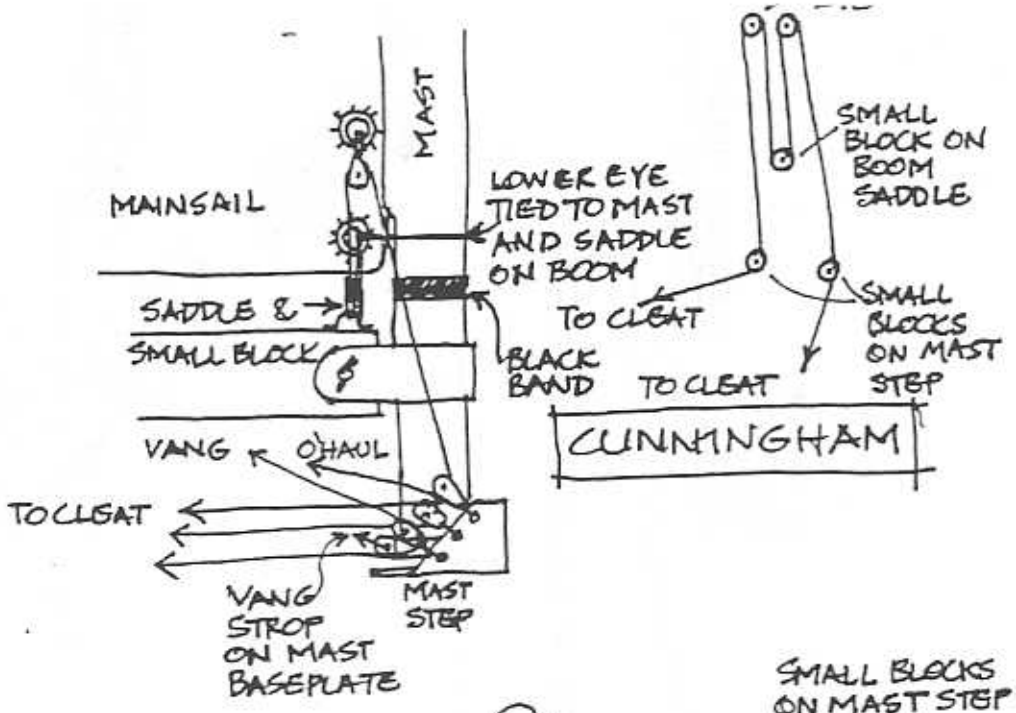
1 CUNNINGHAM

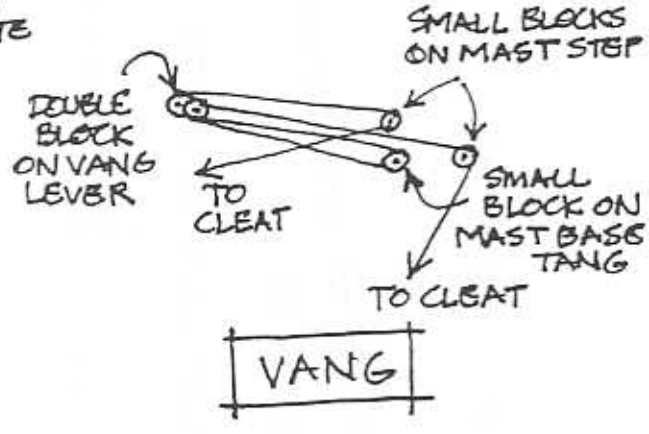
2 OUTHAUL

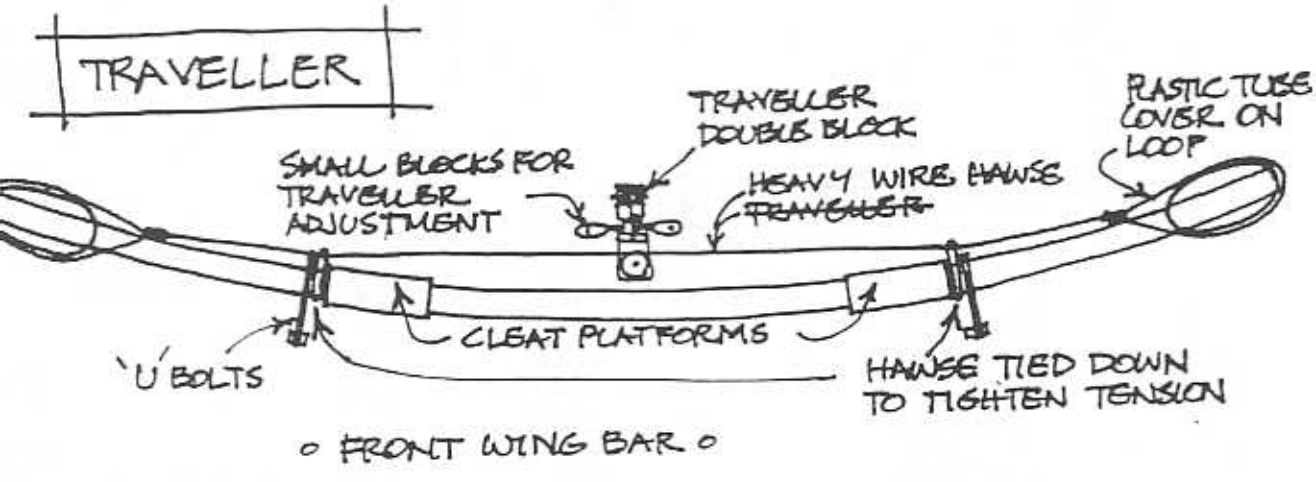
3 VANG

ALUM. PLATE ANGLED TO CLEAR MAST

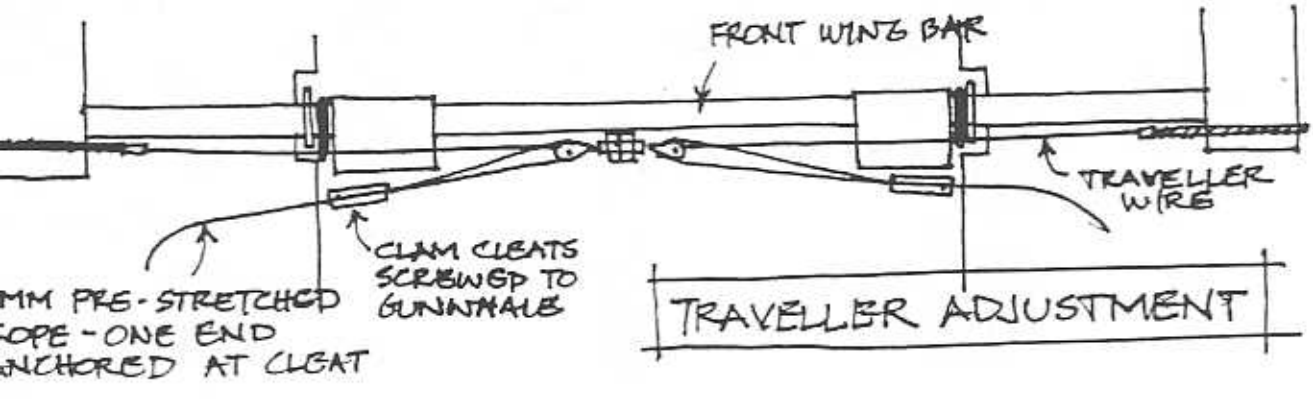
LOWER EYE OF MAINSAIL TIED TO SADDLE ON BOOM.

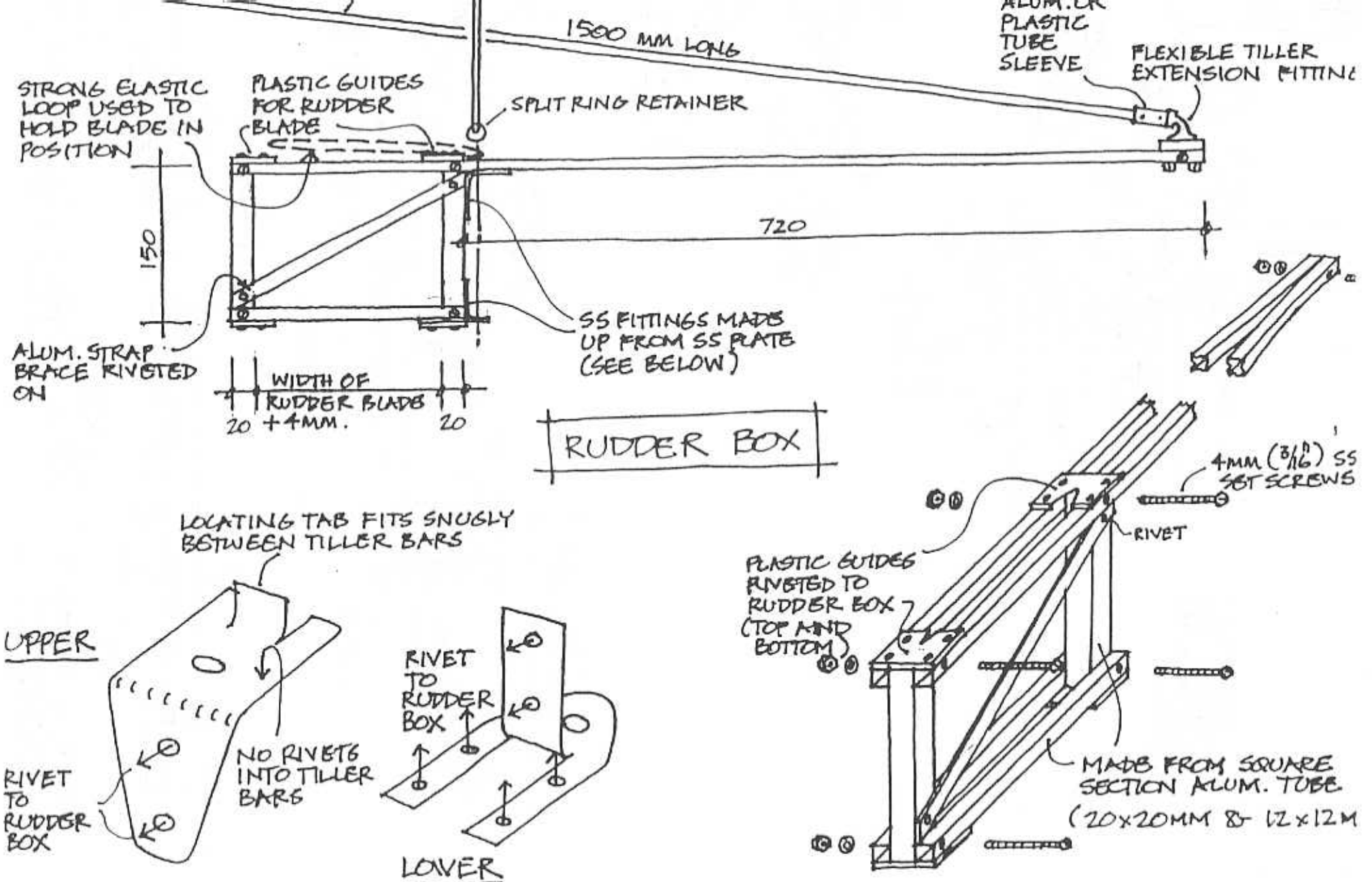




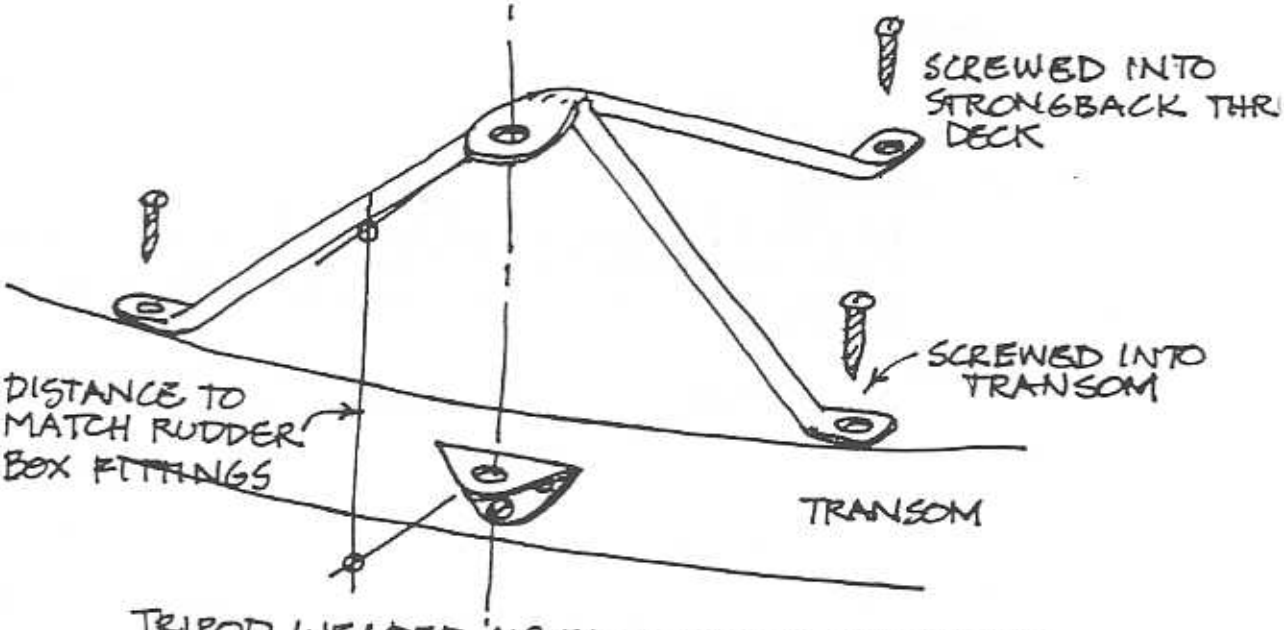


o FRONT WING BAR o




1500 MM LONG
ALUM. OR PLASTIC TUBE SLEEVE
FLEXIBLE TILLER EXTENSION FITTING
STRONG ELASTIC LOOP USED TO HOLD BLADE IN POSITION
PLASTIC GUIDES FOR RUDDER BLADE
SPLIT RING RETAINER
150
720
SS FITTINGS MADE UP FROM SS PLATE (SEE BELOW)
ALUM. STRAP BRACE RIVETED ON
WIDTH OF RUDDER BLADE +4MM.
20
20
RUDDER BOX
4MM (3/16") SS SET SCREWS
RIVET
PLASTIC GUIDES RIVETED TO RUDDER BOX (TOP AND BOTTOM)
MADE FROM SQUARE SECTION ALUM. TUBE (20x20MM & 12x12M
LOCATING TAB FITS SNUGLY BETWEEN TILLER BARS
UPPER
RIVET TO RUDDER BOX
NO RIVETS INTO TILLER BARS
RIVET TO RUDDER BOX
LOWER

TRIPOD



TRIPOD WELDED UP FROM 10MM SS TUBING

MAINSHEET