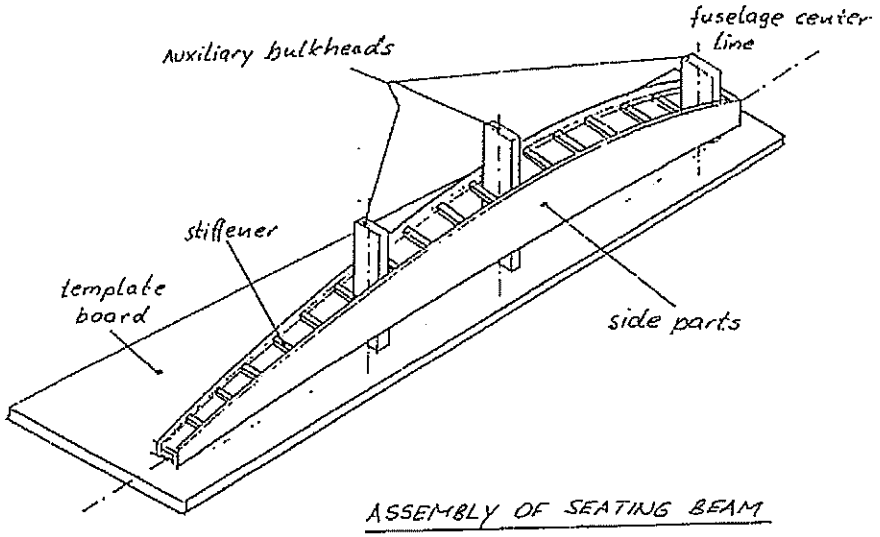
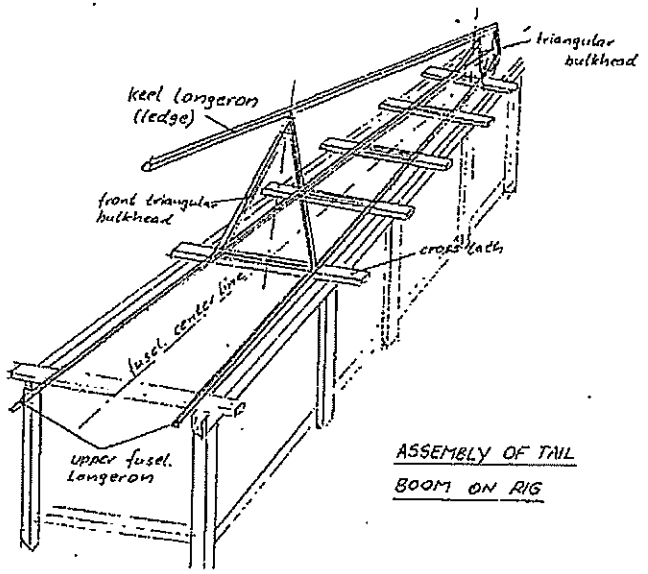


ASSEMBLY OF SEATING BEAM

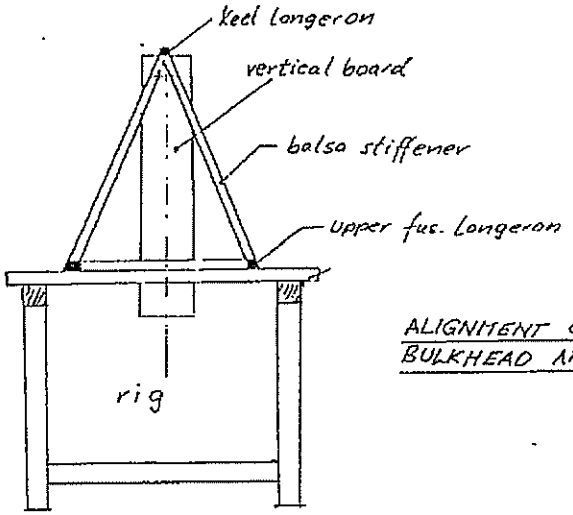
ASSEMBLY OF FUSELAGE

First start building a rig on which the fuselage is constructed keel up. The rig is build the same way as the rig for the wing with wooden boards and metal profiles and fastened to the ground with dowel and screws. The rig should be appr. 65 cm wide and 5 m long. At each place where a bulkhead is located on the tail boom, screw a cross lath. These laths have to be adjusted with a water balance. Using a string mark the fuselage center line. Measuring from center line mark width of fuselage. Now put on upper fuselage longerons (stringers). Before putting them on, cut the stringers to trapezoidal shape, using a disc saw with a tiltable table. Between the last two bulkheads the stringers are cut (slitted) lengthwise. This cut is filled with a matching plywood strip. Now the stringer is glued together in the right curve (laminated) When glueing the plywood strip, cover it with glue and squeeze into the cut. Measure the plywood strip a bit wider than necessary. It will be planed down later.

Now the upper fuselage surface is assembled with stiffeners and diagonals. After the upper surface has been glued together with plywood gussets, a vertical board is clamped to the cross lath of the front and rear triangular bulkhead. To this board the keel ledge is tacked down with clamps. Now the bars of the front and rear triangular bulkhead are fitted in and glued together. Now all other triangular bulkheads are glued in and after that all diagonals. The height of the bulkheads is taken from the drawing. When constructing the triangular bulkhead watch that the keel longeron (ledge) is straight. To fit in the diagonals is difficult, because their front ends have to be slanted in two ways. It is advisable to use a disc saw with adjustable angle of elevation guided in a grove mounted on a tiltable table when doing this work. When glueing the plywood gussets watch for proper size because these glueing areas are going to be highly stressed. The balsa bars should not be dented during clamping. On the rear bulkheads glue in the bars and filler blocks for later attachment of vertical fin, horizontal tail attachment and



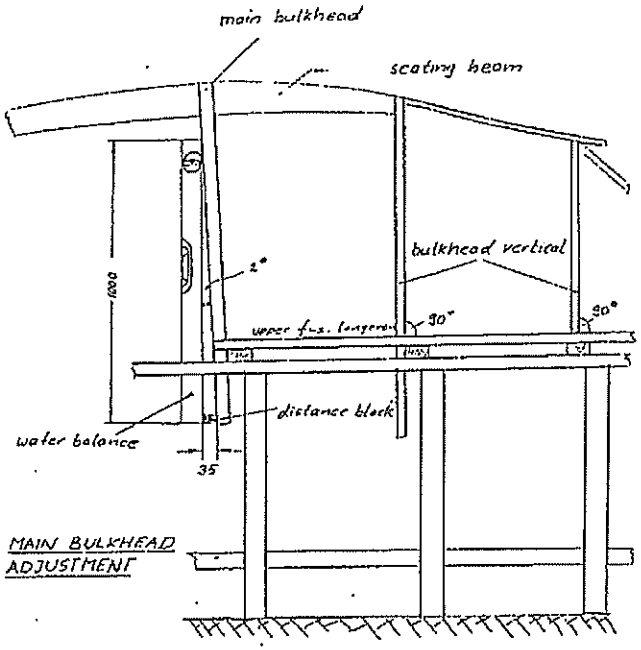
ASSEMBLY OF TAIL BOOM ON RIG



ALIGNMENT OF TRIANGULAR BULKHEAD AND KEEL LONGERON

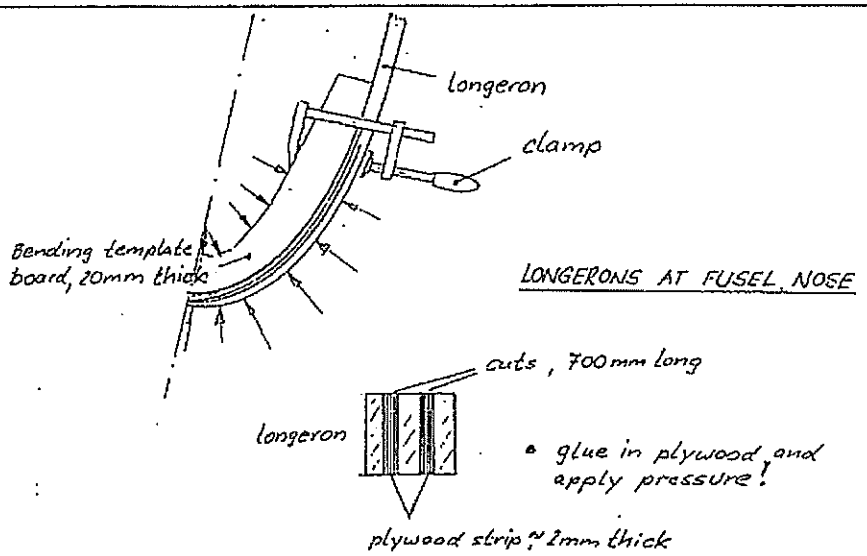
tail bump. Now the main bulkheads and the seating beam can be put in for testing. The distance between bulkhead 1 and 2 has to be common to the distance of the wing attachment. The rear main bulkhead is vertical to the fuselage upper longerons. The front main bulkhead has an angle of inclination of 2°. This angle has to be exact because the wing reference chord is rectangular to the main bulkhead and therefore determines the angle of incidence of the wing. The angle is reached with the help of a straight edge of 1 m length, a water balance and a spacer block of 35 mm (see drawing). On the longitudinal level both main bulkheads must naturally stand vertical.

After the seating beam has been put in, project down from the seating beam. The plummet has to hit exactly the fuselage center line. If this is not so it can be corrected by tilting the rear main bulkhead slightly sideways. If all measurements are correct the bulkheads and the seating beam can be glued in. The seating beam is addionally glued to the bulkheads using small corner blocks to enlargen the glueing area. Start preparing the longerons for the front fuselage.



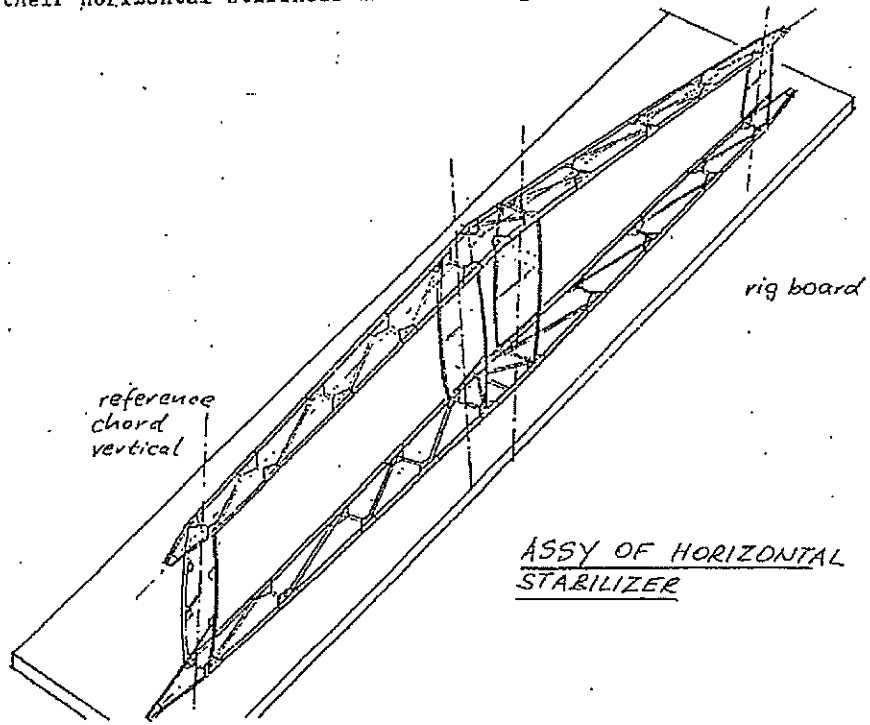
On the tip of the fuselage both upper longerons and the lower longerons can be laminated using the same bending template. In this section make two cuts of 70 cm length (slits) into longeron using a disc saw. These cuts are filled with matching plywood strips which are coated with glue. Now the longerons can easily be bended. and glued using the template. When pressing, place a wooden strip under clamps. Now start fitting of lower longerons. They lead in a slant to the plywood corner at the joint of bulkhead 3. Here they are fitted well to the slant and then glued. At the front both longerons are glued together using a filler block made of balsa. When the longerons are adjusted clamp spacer ledges between main bulkhead and tip of fuselage to ensure the exact width of fuselage. The bow on the nose is glued together with the rip of the seating beam.

Now the upper longerons are fitted between main bulkhead and nose of fuselage. Again use spacer ledges to ensure the exact width of fuselage. After that put all missing diagonals into front fuselage and between the main bulkheads. The balsa form stiffeners on the upper side of fuselage, and the super structure on the front fuselage are fitted when the glider frame is finally assembled.

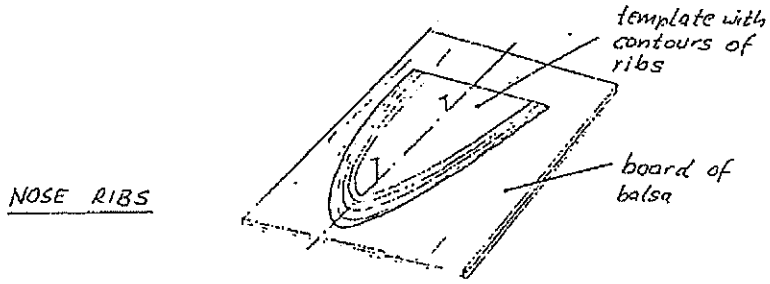


TAILS

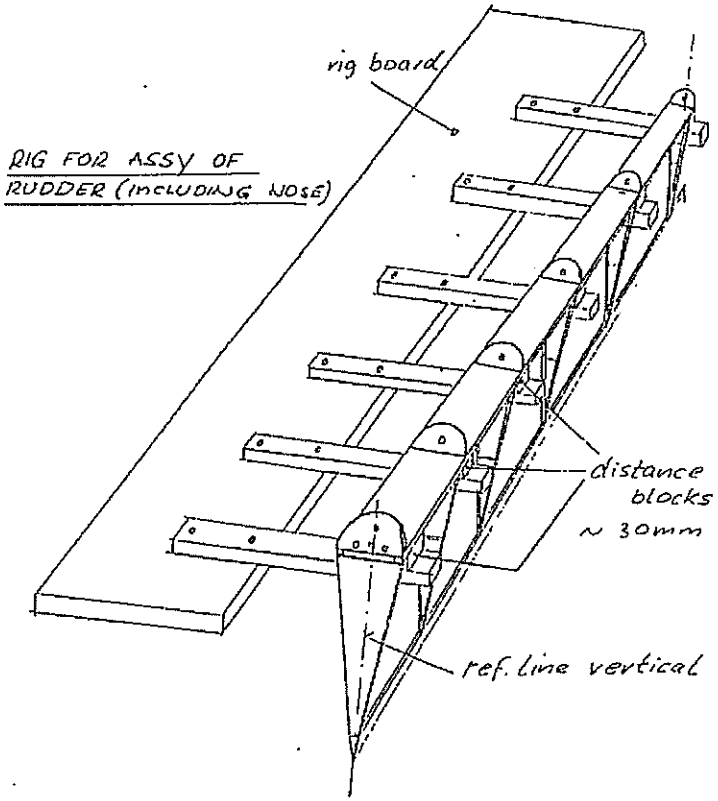
Spars and ribs are constructed on a template the same way as the wings. The fins of the horizontal tail and the vertical tail get their horizontal stiffness from the diagonal ribs. The fins are



build vertically on a rig-board. The rig-board has to be level and tightly fastened. Again, start glueing the inner and outer ribs. Then the front spar is placed on the ribs and held down with clamps. The bend in the center of the front spar (horizontal fin) is put in over steam. Then all other ribs between front and rear spar are fitted and glued. The ribs have to be adjusted to the height of the spar while putting them in. Build nose ribs out of balsa wood as follows: transfer all ribs from loftlines drawing to 0,8 mm plywood. Now cut out the biggest rib with scissors. Finish with sandpaper. Now, with two nails, nail plywood to balsa. Cut out the rib along the contour using a sharp knife. Smooth balsa rib with sandpaper without removing the plywood template. Cut out the next rib.



NOSE RIBS



RIG FOR ASSY OF RUDDER (INCLUDING NOSE)

Between the balsa ribs place additional ribs made of styropor. The noses of 0,6 mm plywood are put on with clamps as done on the wing leading edge. At the caps the nose can be pressed with shim strips and clamps. Before the nose is put on the vertical fin, the plywood doublers, with which the fin is later glued to the fuselage have to be glued to the front spar. The rudders are also assembled on a rig-board in a vertical position. Contrary to the fins, the rudders receive their stiffness from the nose. Therefore a rig has to be build to enable the construction of the nose. (see drawing)

Before putting on the nose, the actuating horns on the elevator and the vertical rudder have to be screwed on. Planking the nose is done in the same manner as described on the fins. The cutouts in the nose planking, where the hinches are penetrating, are put in later.

GLUEING VERTICAL FIN TO FUSELAGE

When constructing the vertical fin and fuselage observe that the distance between bulkhead 6 and 7 matches the distance between rear and front spar of vertical fin. The plywood doublers to connect the fin spar with the fuselage bulkheads are glued to the spars before assembly of fin. The fuselage is adjusted vertically to the center line on bulkhead No. 1 and fixed in this position. The fin is placed vertically according to the center line of rear spar. Naturally the center of front and rear spar has to be lined to the center line of fuselage. To press the glueing joints use press board shims. The glueing has to be done with care because high loads will build up at high rudder deflection.

FABRICATION OF FITTINGS

The sheet metal from which the fittings are made has a strength of appr. 80 kg/mm^2. It is relatively hard and is very sensitive against nodging. Do not use a steel scriber to mark contours because it will cause fatigue fractures. To mark contours use a sharp hard pencil. Do not clamp into vice with checkered vice yaws since it will demage the sheet metal. Either use one with smooth vice yaws or else, put aluminum metal between yaw and steel sheet metal for protection. Parts that are mainly stressed in one direction should be cut from rolling direction. On identical fittings it is advisable to cut and prepare one, drill the holes for the screws, and then screw this to the other roughly cut pieces. Now the whole package is filed to size. The outer contours should be exact up to a tolerance of $\pm$ 0,2 mm. The bending radius on the sheet metal fitting should be 1,5 times sheet metal thickness. Fittings that have been bended toosharp can tear at the bending edge. Get some pieces flat steel of 10 mm thickness and 40 - 50 mm length. On these file the radius you wish to use. Radius templates are available with which the radius can be checked. Put the flat steel with the fitting into vice then hammer the sheet metal around the radius. Use a hammer made of soft material.
For the U-shaped parts, e.g. the fork at the control rod, use a bending device as explained in drawing. Hereby cut into the form piece with the filed radius a thread to tighten the fitting to the device.

The fittings for the safety harnesses are made on the same device. Therefore, put in a second thread.