

GUPPY

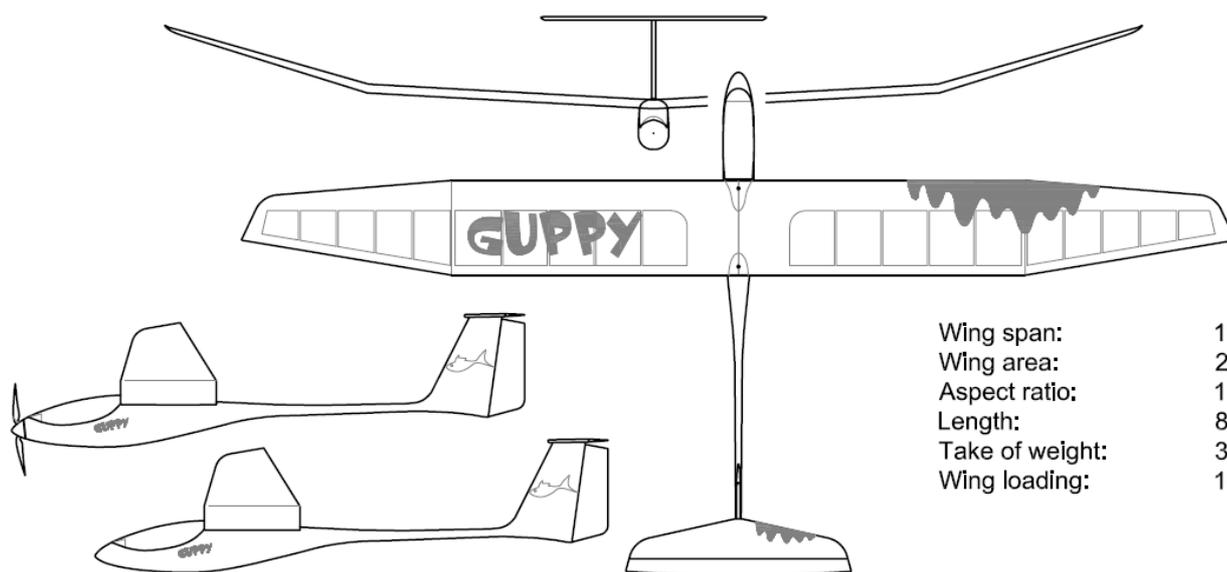


Sailplane

Assembly manual

Please, read carefully this assembly manual before you actual start with assembling the sailplane in order to get familiar with building process.

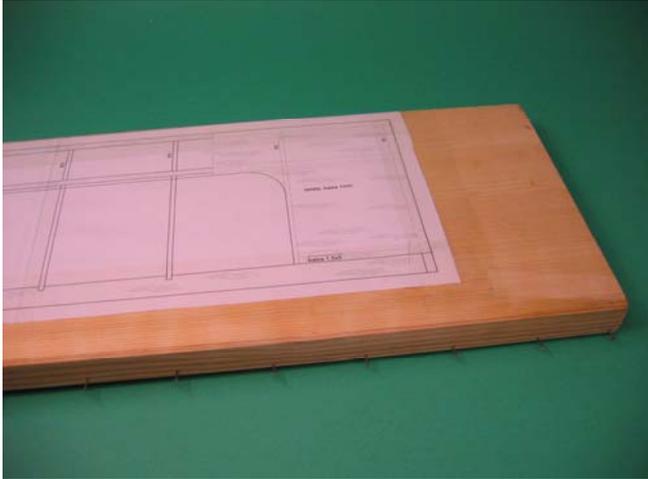
Some parts on the pictures may deviate from the actual KIT contents, because they were taken before current KIT manufacturing. But generally the assembly is the same.



Wing span:	1500 mm
Wing area:	20,4 dm ²
Aspect ratio:	11
Length:	805 mm
Take of weight:	320 (480) g
Wing loading:	16 (24) g/dm ²

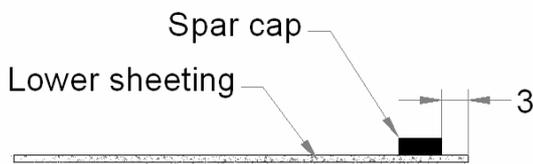
WING ASSEMBLY

Put the wing plan form plan on the straight assembly board and fix it firmly. Protect the plan with clear plastic foil, or clear self adhesive tape.

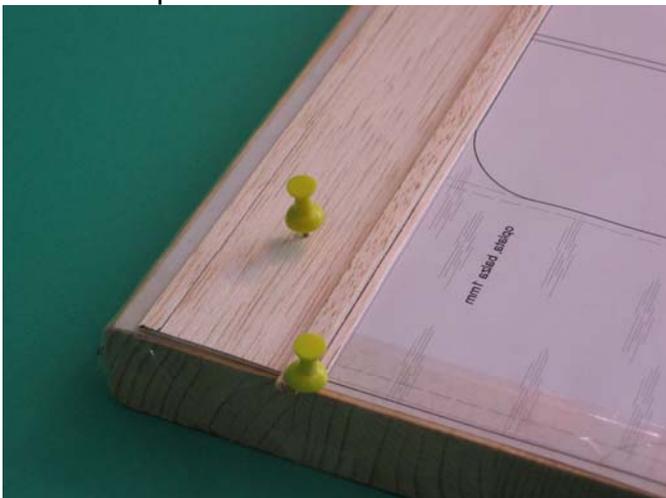


Cut 1 mm thick balsa sheet, which will represent bottom torsion box sheeting. The aprox. Dimensions should be 450 x 50 mm for rectangle part and 310 x 50 mm for tapered part of the wing.

Now take balsa cap strips 5x2 mm, 455mm long and glue it 3 mm away from rear edge of the balsa sheeting. You can help yourself with the ribs, as they can serve as a guide.



Now place lower sheeting with already glued spar cap on the exact place on the plan. Fix it with some pins to the board.



Prepare trailing edge balsa strip. It should be sanded down to triangular cross section, as shown on plans (section N-N). You can use

sharp knife, or razor plane to made rough carving, and later finish with sanding block.

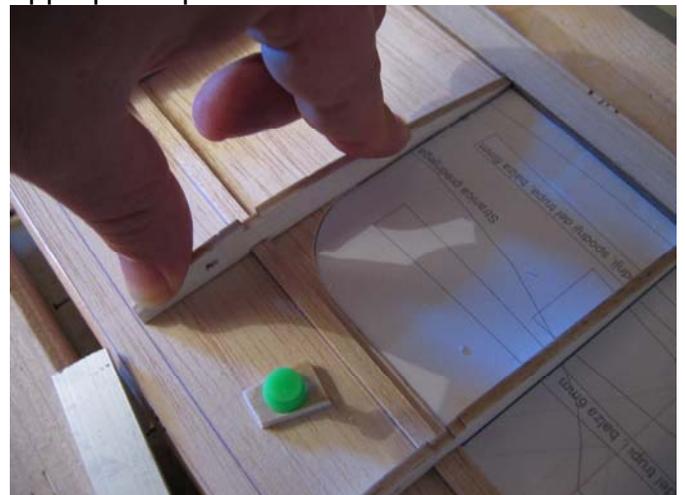


Now put on the place prepared trailing edge. Pin it to the board.

Prepare sheeting of the wing at the root of the wing. The curved edge, you can cut using some bottle of appropriate diameter.

Trim and glue that root sheeting on the front sheeting and also to the trailing edge.

Now take CNC cut ribs and place them to appropriate places.

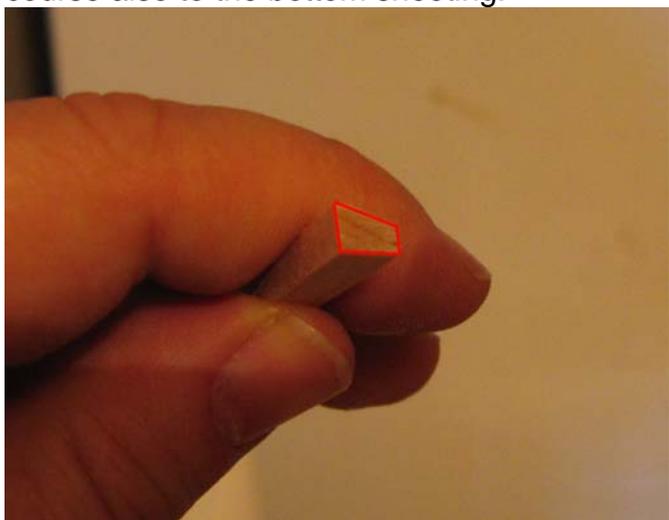


You can use white carpenter glue (water based) or CA glue, to glue ribs on their places, according to the plan.

When placing the root ribs, install also shear webs, 2 mm balsa with vertical grains. Then install upper spar cap into the notches on the upper side of the wing ribs.



It is time to prepare leading edge balsa. Put it on the front of the ribs and mark the height of the leading edge balsa. Use razor plane and sanding block, to reshape cross section of balsa and when satisfied with the shape, glue it on the front of the ribs, and of course also to the bottom sheeting.



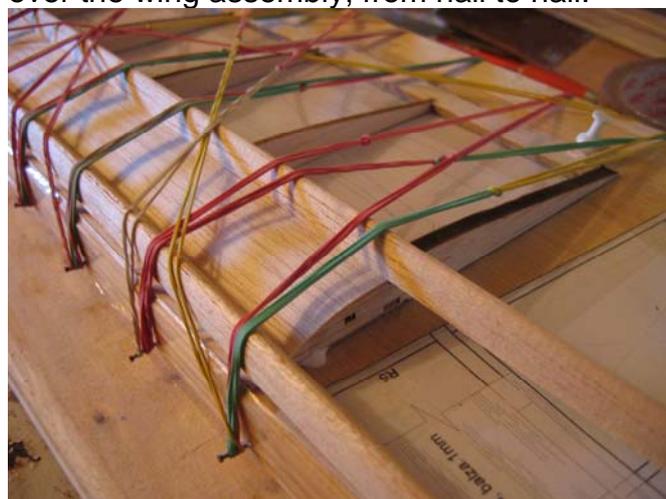
Now prepare upper wing sheeting (balsa 1mm) and glue it on the upper side of wing skeleton.

Don't forget to remove any pins that could stay hidden inside of the torsion box, when you cover it with upper sheeting!!



In order to attain pressure in the gluing areas, you can use simple but efficient method. Put some short nails on the both sides of the assembly board as shown on photo above. Well, you should do nailing before starting of assembly of the wing.

Now put on the sheeting some scrap balsa strips, one at location of leading edge, and another at location of spar cap. It is not a bad idea to put also one at the middle between them. Now take a bunch of kitchen rubber bands, knot them in pairs and stretch them over the wing assembly, from nail to nail.



Left that until glue dry.

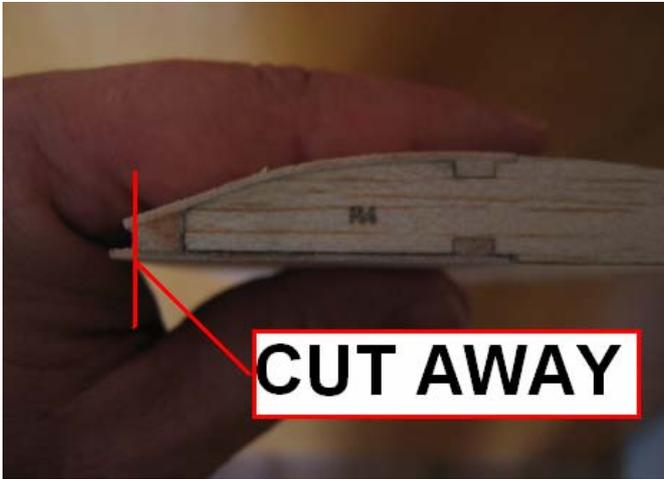
When glue is dry, remove some rubber bands at the root area. In front of the trailing edge balsa glue some scrap balsa strip, to support upper root wing balsa sheeting.

Now cut and tailor to proper size that root sheeting from 1 mm balsa and glue it on the top of the wing. Make a perfect joint to the front upper sheeting. CA glue is the best for the sheeting to sheeting joint.

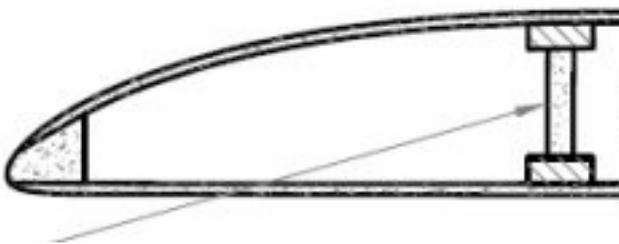
When glue is dry, remove all rubber bands and carefully loose free the wing section from the assembly board.

Cut and sand away any overlapping sheeting. Now you should cut away also the sheeting, that overlap nose balsa.

You can do it with sharp razor blade or razor plane.

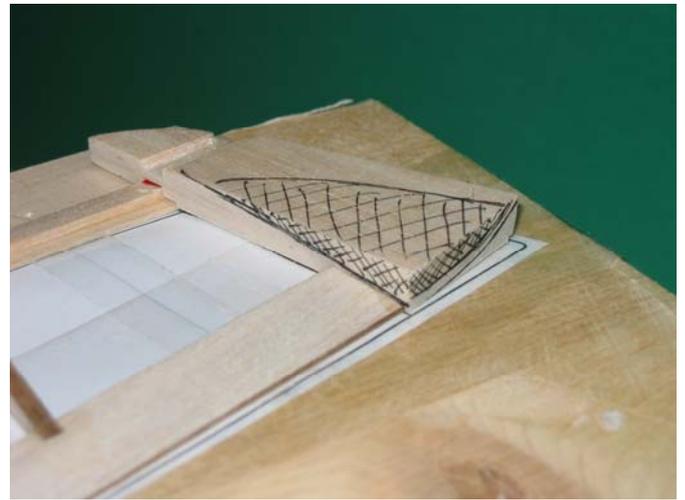
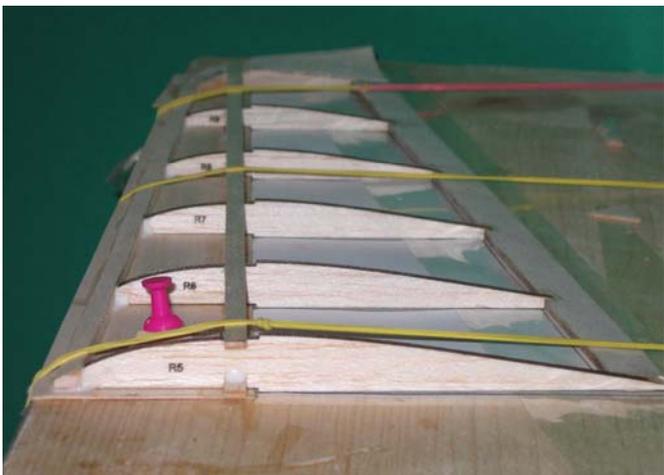


Now sand the leading edge cross section as shown on the plans (section N-N)



The opposite wing section is build by same procedure, only difference is that it is mirrored.

Outer wing assembly is very same, only it his tapered and at the end it is a wing tip, that must be carved from a balsa.



Wing tip. Shaded area must be sanded away.



You can sand the wing tip shape with sandpaper wrapped around oval object (CA glue bottle in case shown on picture above)

When gluing on the upper torsion boy sheeting, you should raise a TE at wing tip for about 3 to 5 mm in order to achieve wing twist that is needed for stable flight in the tight turns. You can also refine this wing twist when ironing on the heat shrink covering, but don't relay on that phase to correct possible mistakes done at wing structure assembly.



When all for wing sections are finished and sanded, prepare them for joining. The joining side of end ribs must be sanded at angle, that proper wing dihedral will be achieved.

Glue sections with 5 min epoxy. Be sure, not to produce any twist in the joint. Wipe away any excess glue. Use some CD covers or video tape cassettes in order to support wing parts until glue dries.

Next step is to reinforce all 3 wing joints with strips of glass fabric. Prepare 1 cm wide glass fabric and glue it over joint. Use epoxy or CA glue. Sand a little if necessary.

Now you take two half elliptical shaped balsa parts and glue them together. This will be a rear streamlining of the upper wing side to the rear fuselage. Sand bottom of this part in wide open V shape to fit perfectly on the upper center wing joint. You will glue that part on the wing after shaping will be finished according to fuselage shape later.

FUSELAGE ASSEMBLY

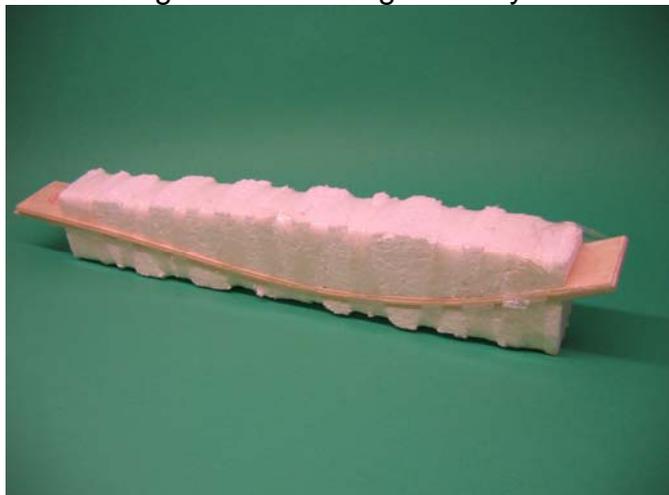
Front part or POD

We will assemble the front part of the fuselage first.

We will make a laminated part for the bottom of the fuselage. We will take 4 planks of 2 mm balsa and glue them together in curved shape, using simple »mold« made from Styrofoam.

Prepare a scrap Styrofoam piece and draw over it a curvature of the bottom shape of the fuselage. Using very sharp knife, cut foam block apart on this line.

Now cover the balsa planks with water based glue, and clamp them between Styrofoam »mold«. Wrap all with self adhesive tape or some string and wait until glue is dry.



Now you need to reshape that laminated part according to the fuselage plan if necessary.



Now, the assembly procedure different on your choice if building a pure sailplane or motorized sailplane.

Now we will show you the sailplane fuselage assembly.

Find all nose block parts and glue them together. Pay attention that those with a hole must be in the middle. This hole serves later as a lead ballast compartment. Look also, that a stack is not canted or twisted. Use square to check.



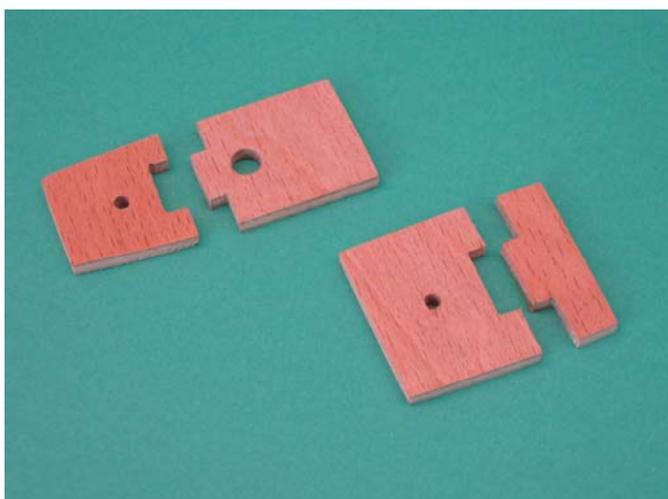
Now it is time to find a proper location and glue that nose block on to laminated lower part of the fuselage.



Now glue sides of the fuselage, and take in concern, not to twist anything. The wing saddle edge must be in line left and right side! At this moment you should glue only the front part of assembly, where the lines are straight...where the fuselage width is constant.



Now we prepare fuselage bulkheads that serve as wing attachment points.

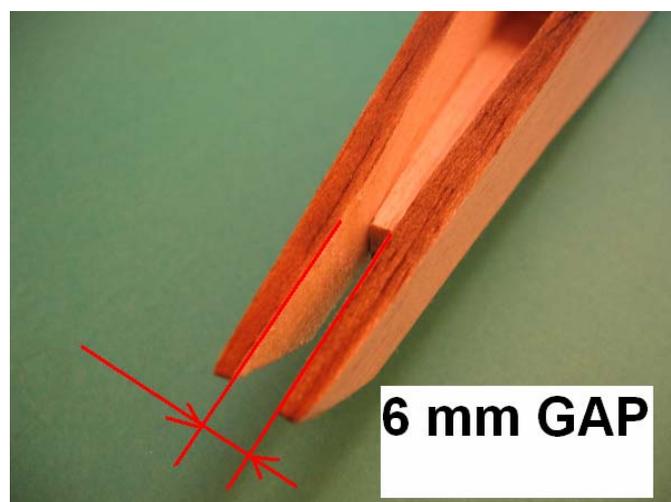


Cut the thread in to the tiny holes, reinforce thread with CA, or just press fit a metal nuts if they are a part of the KIT. Glue together parts at 90° angle and let glue to dry.

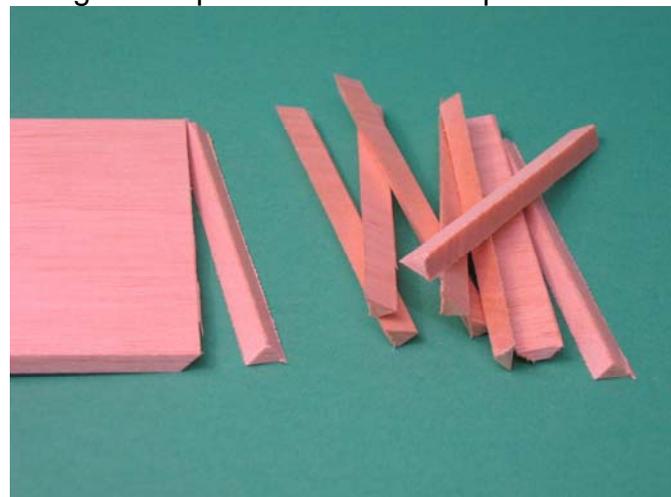
Now install those fuselage formers into fuselage assembly. Check their location on the plans. Sink upper surface of those formers a bit under sidewalls edge, because the wing has a dihedral at root. At this phase you will also glue rear of sidewalls with lower laminated wall. Use some clamps, self adhesive tape, or rubber bands to achieve pressure on the glued joints.



Now trim the rear slot between sidewalls to get the 6 mm gap in order to accept rear fuselage part later (the boom assembly).



Fuselage has now rectangular cross section. Later we will sand it to elliptical cross section, so now we must fill inside corners with balsa triangular strips. Take a 5 mm thick balsa and saw away some triangular strips as shown on the photo bellow.

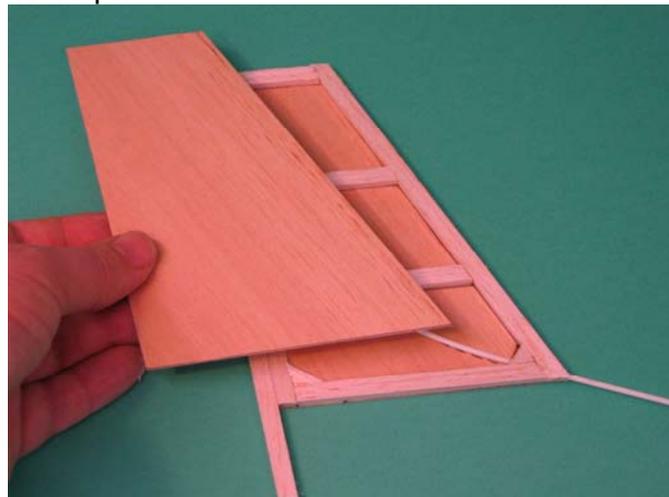


Cutting them that way, you will achieve flexibility of them and fibers go just in the direction where the strength is needed more.

Glue them on the lower corners of the fuselage right from the nose block to the rear fuselage former. Trim balsa, to fit without gaps.



protrude on the top of the fin about 5 mm, and glue it to place using CA glue. After that glue opposite fin covering; also balsa plank 1 mm thick.



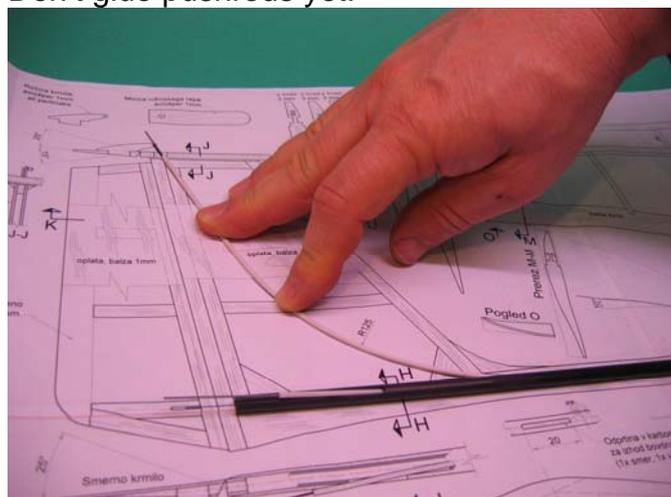
Rear part or BOOM

Preparing the carbon tube for internal reinforcing of the BOOM.

Cut the carbon tube to length of 450mm. Now lay it on the plan and wrap with self adhesive tape at area where pushrods for elevator and ruder exits. Use pencil and draw locations for the pushrods exits slots.

Drill a hole at each end of the slot and sand away with dremell tool cutting disk, to get a slot. You can also drill a series of holes and smooth the slot with fine file.

Insert the pushrods and check your work. Don't glue pushrods yet!



First we will assemble the vertical fin as it is a part of the rear part fuselage member. Fix the rear fuselage plan on the assembly board and protect it as you already do when building wing.

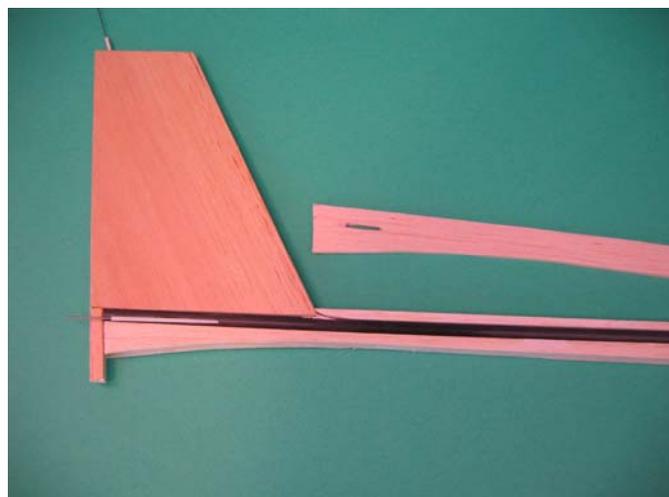
Prepare parts for the fin assembly, and glue them together over a 1 mm balsa fin covering. Carefully route the plastic pushrod tube into previous drilled holes in the fin »ribs«. Let it

Now test fit the fin and carbon tube.



Now we will assemble the balsa parts around that carbon tube.

First we will glue one side part, upper and lower part and we will use carbon tube as spacer between upper and lower part.



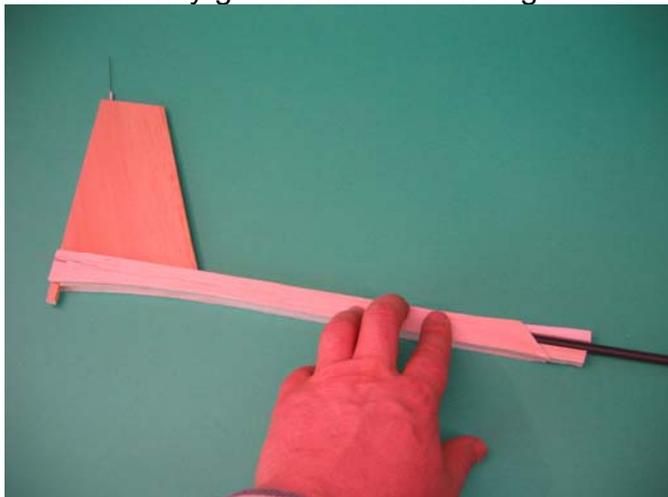
Now prepare the opposite side balsa and cut a slot for the pushrod exit on proper location.

Dry fit and if O.K., we are ready to glue BOOM together in one uniform part.

I suggest using a generous amount of glue in order to fill the cavity between round carbon tube and square cavity formed by surrounding balsa blocks.

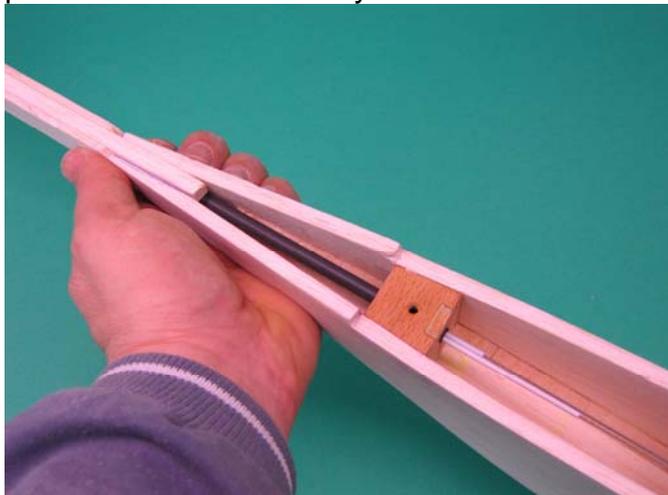
You can sand a little the carbon tube so glue could »bite« on it.

If you will use epoxy, the added weight is nasty, so I suggest you to use some of the urethane glue that expand and fill the cavity. Remember! In order to achieve sufficient torsion stiffness of the boom, the carbon tube must be firmly glued with surrounding balsa.



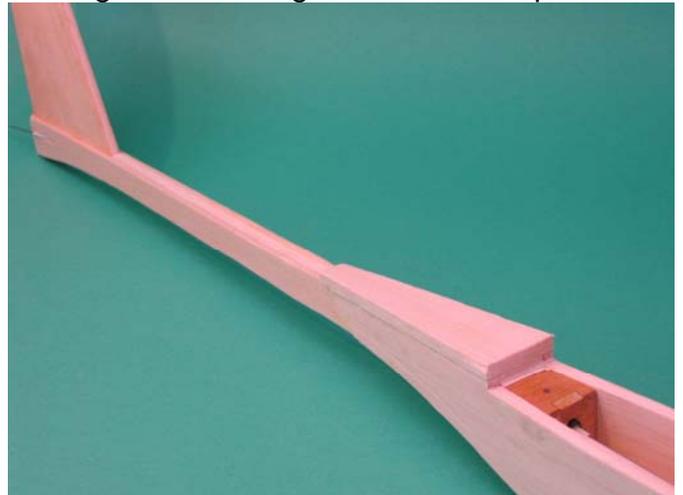
Now we will join BOOM and POD.

First we will test fit both parts and adopt their shape for best fit. If the overall length of complete fuselage vary for 5 mm each direction, no worry. More than finished length of the fuselage is important the straightness and direction of upper edge of the fin in relation to wing saddle to achieve proper angle of attack difference. Check that just by laying fuselage assembly sideward on the plan. Correct if necessary.



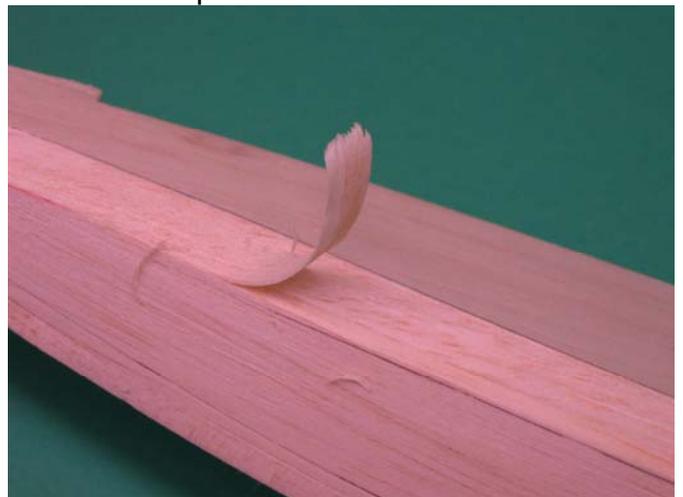
Using expandable urethane glue, join both parts together and assure that they fit as was at dry fit test.

When glue is dry, sand smooth the upper part of the fuselage joint and glue two trapezoid shaped balsa parts. The smaller goes inside fuselage and the larger one on the top of it.



Now you will reshape that »boxy« fuselage into nice curved shape.

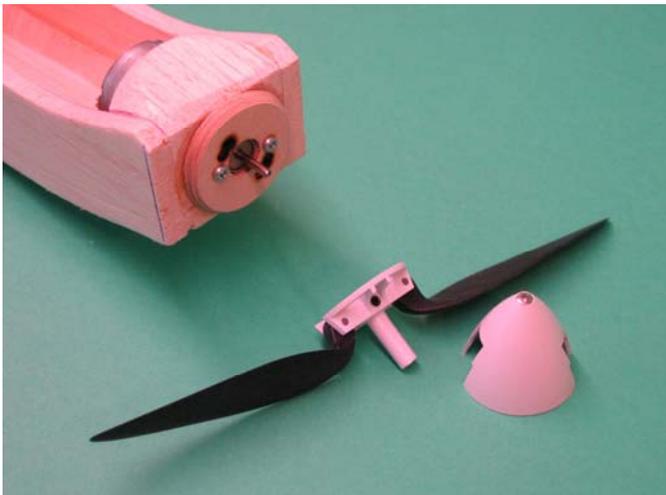
First step is to cut away the edges. You can use sharp modeling knife or razor plane. Pay attention on carving direction! From fattest point toward nose and from fattest part toward rear. In other case the balsa will split in grain direction. Be patient and careful.



When you remove enough of corner material, grab coarse sandpaper and sand further, but try to achieve oval cross section of the fuselage as shown on plans. You can use some cross section templates to check your progress. Actual shape is not so important for flying properties of the sailplane, but try to do your best to produce god looking glider! More you get closer to the end shape, more fine sandpaper you should use.



If you choose electric powered Guppy, then you should cut the nose block at location where diameter of nose is the same as your prop spinner (30mm). Look at the plans and allow for some »down trust«. Drill a hole in the nose block. Use oval rasp to file the hole to dimension slightly over 27mm, to accept SPEED 400 motor. Now bolt the first plywood former on the motor and test fit that on the nose block. Correct if necessary and when O.K., glue nose former to the fuselage nose block.



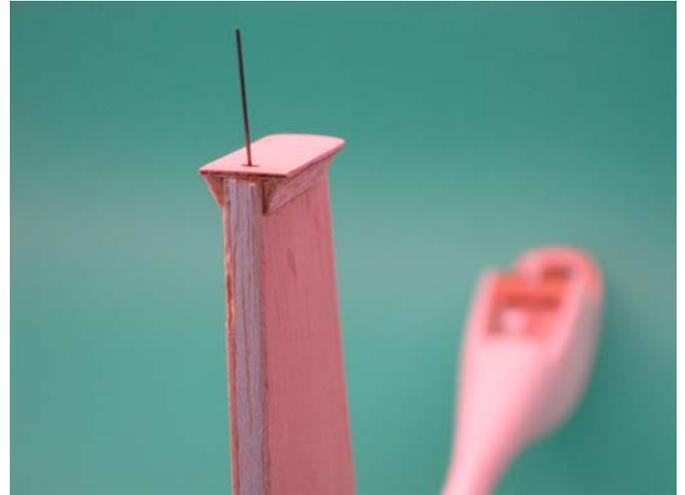
Sand fuselage as described for the sailplane version, but here just shape the nose part so, that you get smooth transition from fuselage to the prop spinner.

Now we must prepare vertical fin upper edge for the horizontal fin assembly.

Check the angle of attack difference again, putting the fuselage sideways on the plans, align the wing saddle edge with drawing and check the upper edge of the fin for location and direction (alignment). It is the direction that counts more than exact location! Couple

of millimeters back, forth up or down is not a disaster, as far the direction is proper. So correct the direction of upper edge of fin if necessary and sand it perpendicular, so the horizontal stabilizer will lay at 90° on that fin.

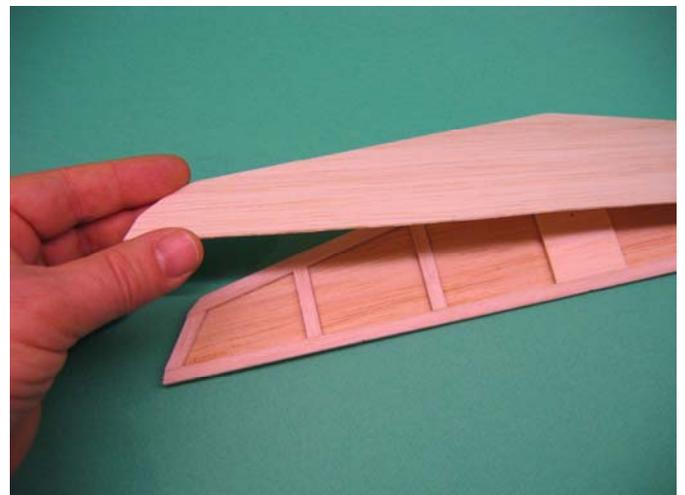
Now you glue the 1 mm plywood on top of the fin. Use some scrap balsa, cut it to triangular section and reinforce corner between fin and plywood part.



HORIZONTAL TAIL ASSEMBLY

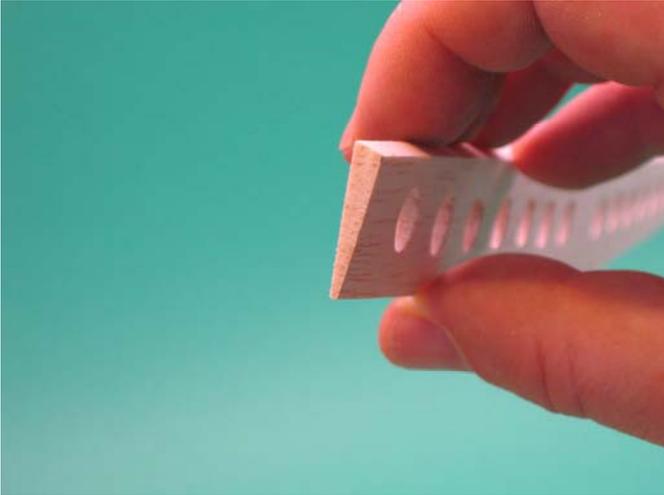
Horizontal tail consists from stabilizer and from elevator. Elevator is solid balsa and stabilizer is of similar construction as vertical fin.

Prepare 1 mm balsa plank for sheeting and all CNC cut parts for internal skeleton of the fin. Glue parts as shown on the plans.



Sand leading edges straight and round them to achieve better aerodynamic shape. Sand rear edge straight.

Now take solid balsa elevator and sand it to triangular cross section. Leave around 1 mm thickness at rear, not to weaken that edge much. Sand front edge at angle of about 30° in order to achieve free movement of elevator when finished.



Install elevator horn in the slot. Check the proper side to install the horn!

RUDDER ASSEMBLY

It is build from two 1 mm balsa sheeting's and internal balsa structure.

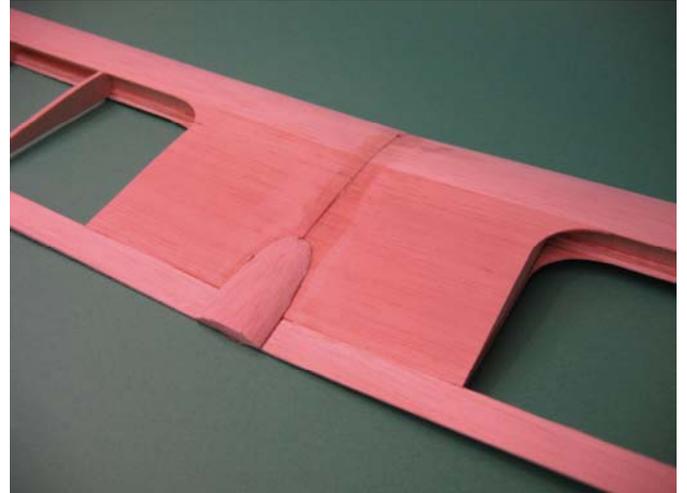
Glue internal parts of rudder onto one sheeting. When dry, sand structure to achieve uniform slope toward trailing edge of the fin. After that take another balsa sheering and cover to finish the rudder.

Made a slot and install rudder horn. Check the proper side to install the horn!



FINISHING THE MODEL

Now is time to sand the elliptical piece that goes on top of the wing, to get smooth transition from wing to the fuselage.



Measure the spacing between threads for wing holding bolts, mark and drill the holes in the wing. Reinforce holes with CA glue. Tests fit the wings on the fuselage and check the alignment. If necessary, correct the holes.



Now you can cover the model with your preferred covering film and at your desire for the overall outlook of the model. But you can also use Guppy »standard« design as shown on plans and this assembly manual.

Don't cover the joint between fin and vertical stabilisator. Cover them separately and leave balsa and plywood uncovered in order to achieve better gluing strength on final assembly.

FINAL ASSEMBLY



Make a hinge between elevator and horizontal stabilizer from clear self adhesive tape.

Use full length above and 3 short pieces below, at both end and at middle; opposite side inside V.

Glue horizontal tail on its place on the top of the fin. Be sure of proper alignment!

Join rudder to vertical fin in the same manner as elevator. One full length of clear tape and two at end, opposite side inside V.

Install your RC equipment. Servos could be put in hear shrink tube and glued to fuselage inside sidewalls, or glued to them using two sided self adhesive tape.

Measure and mark proper locations of Z bend on the pushrods and connect them to ruder horns and servo arms.

Wrap your re4ciever in foam and find place for it inside fuselage. Do the same with receiver battery and place it at very nose of the fuselage.

Cover the cockpit with clear canopy using your favorite method (clear tape, magnets...)

In case of electric glider, place the driving battery, ESC, and prevent that internal parts will move inside cockpit and change the C.G: of model.

FLYING

Rearrange internal RC parts in such places, that you will achieve exact C.G. location using as much low additional ballast in the nose of glider. CG location is located exactly on the lower wing spar cap. Look at the plans.

Set the rudder and elevator throws as shown on plans. If necessary, you can change those throws up to your desire and way of flying.



Many happy flights!

Designer: Mitja Seršen Erman