X-RES

X-res

R.E.S. Modell

An almost understandable translation to bad English by The Machine, (Kevin Caldwell button pusher). Any errors were purposely introduced by the robot overloads in pursuit of world domination, and the original authors of the German manual are not responsible.

Further translation refinement by Ken Mouton, as an X-RES was being built. Original construction sequence was not followed. The wing was built first and fuselage construction deviated as an electric powered version was built. At least that was the plan, but I could not get all the electronics in the fuselage and it would take a lot of weight in the tail to balance it. Motorized version idea went out the window. Mine built out at 406 gm.

Wingspan: 1999 mm
Length: 1220 mm
Profile: AG-Profile modified
Wing Area: 38.0 dm2
Takeoff weight: from 430 g
Wing loading: from about 11.3 g / dm2
Controls: rudder, elevator, spoiler
EWD: about 1.0 °
CG: about 73 - 76mm

X-RES

The X-RES is a R(udder) E(levator) S(poiler) - high-performance model in predominantly wood construction with 2m wingspan.

We have optimized the Allegro by Mark Drela using our ideas. It retained good flying characteristics with practical wood construction.

The following points were emphasized in the design:
• Min sink
• Good high starting heights
• Easy handling, especially circling in thermals
• Consistent braking and steering effectiveness during landing.

The modified Mark Drela airfoil was optimized specifically for rib construction.
The airfoils, coupled with the aspect ratio of 11.6 and almost elliptical lift distribution, makes an excellent soarer.
It has managed to design a model that allows long flight times, with the
but also a large area can be scanned for thermals. At the same time the
X-RES, a model with the less experienced pilots quickly learn.
I wish a lot of joy with the model

Alois Janowetz

2 building instructions
General construction
We tried to keep the structure of the aircraft as easy as possible, without compromising on the performance.
However, it is very important to proceed with the necessary care to a straight and to obtain high-performance model.

In some modular boards for planking are u.Ä .. Please with here
Carefully cut so that it is sufficient for everything.
best separate out the milled parts only when required.

In inner corners of the radius of the mill stops. These radii have at individual be reworked parts.
designations
Inner Wing: Heart rectangular wing piece, which is centrally placed on the hull.
Center wing: trapeze between outer wing and inner wing
Outer wings: Wing utmost trapeze.

Bonds, unless otherwise described, most with thin
Superglue be executed.

Epoxy (UHU Endfest 300) for trunk / Tragflächenverschraubung, joiner, Aluminum tube CFRP link at the Wing.

It is explicitly stated in these instructions on it, if epoxy or glue used should be.

If you are faced with unsolvable problems, you can also like me under my reached by email.

Additional Resources / Tools

To build the following tools are required:

- Craft knife
- Aluminium ruler
- Set Square
- Small handsaw
- sanding blocks (80, 120, 180)
- Key Files
- pins
- needle-nose pliers
- cannula for superglue 0.9 mm are available in the pharmacy
- Superglue
- 5 – Minute epoxy
- White glue
- straight (!) Building board
- sealing iron

What else is needed?

- Servos e.g. 2 x Dymond D60 1.6 to 2 kg and 2 x 0.5 kg D45 8mm
- Battery: four cells Eneloop AAA 800mAh
- Receiver: 4 channel as small as possible and reliable
- covering film: about 2.5 m Oralight of monochrome clothing

2.2 Fuselage construction

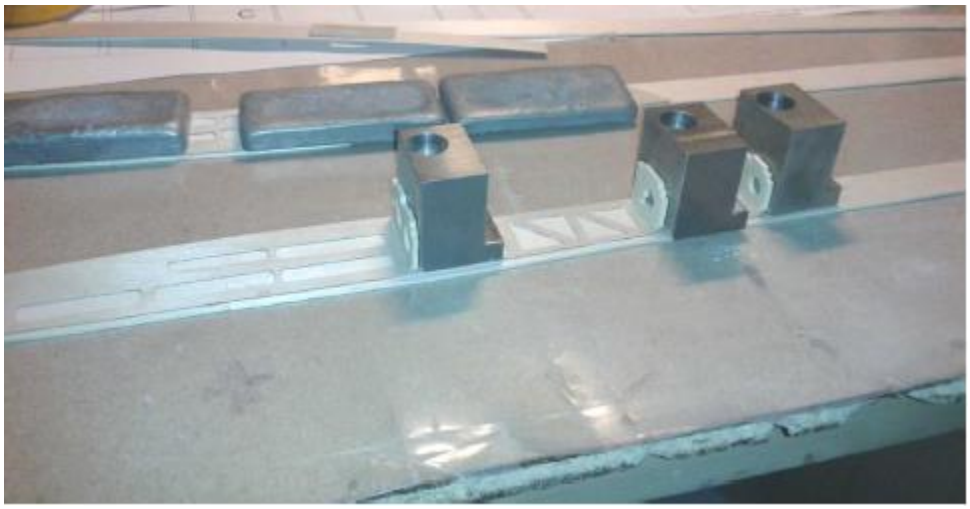
2.2.1 Material for the fuselage

1 3 mm plywood bulkheads for fuselage
1 0.8 mm plywood reinforcements for sides and bottom of fuselage
1 2 mm balsa fuselage, bottom and sides
1 2 mm balsa side and bottom + small parts to the hull, cover
2 Bowden tubes (pushrod tubes)
1 0.6 mm steel wire pushrod rudder
1 0.8 mm steel wire pushrod elevator
1 10 mm balsa fuselage nose pieces
1 4 mm plywood surface mounting
2 5 mm plywood adjustable tow hook

2.2.2Fuselage construction

First, the milled parts are separated and the webs that hold the parts are trimmed and sanded flush. Glue the two piece balsa sides of the fuselage and bottom together.
Now the 0.8 mm thick plywood reinforcements are glued to the 2mm balsa sides and bottom using white glue. The top edges of the balsa and ply reinforcement are flush at the front of the fuse. The fuselage bulkheads are used to align the reinforcing - not glued at this step.

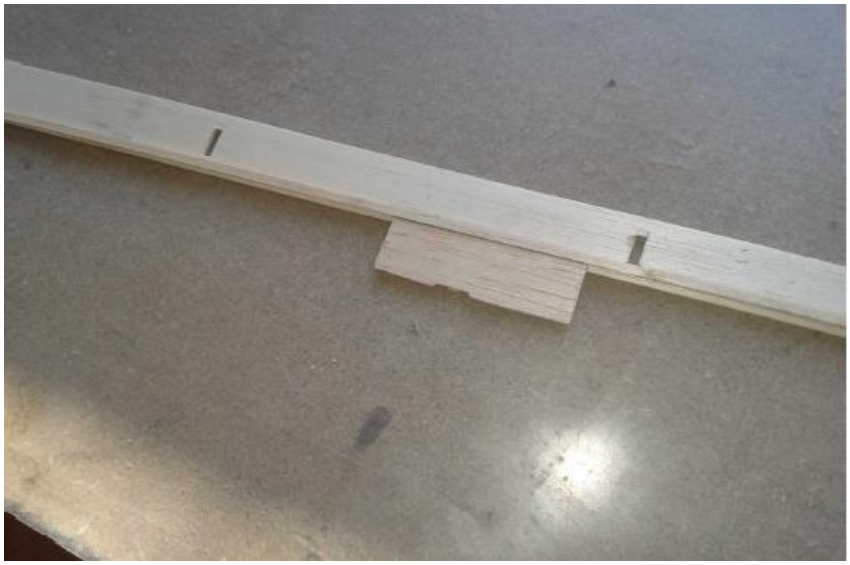
NOTE:
Make a left and right side fuselage.



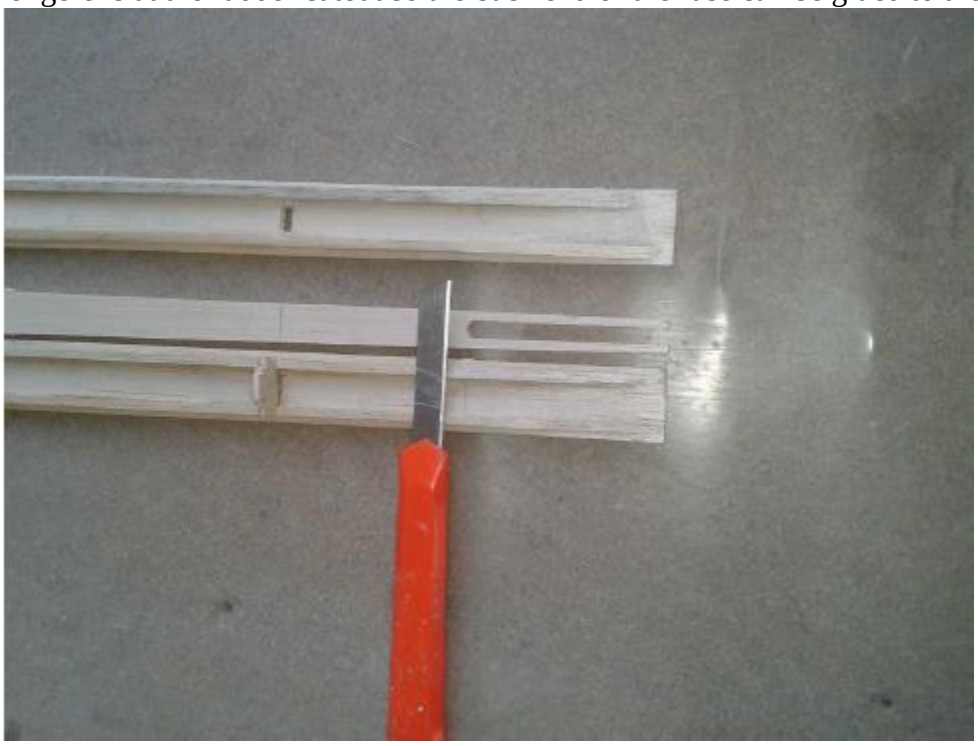
Glue the fuse bulkheads with superglue. Make sure that these are perpendicular to the fuse sides.
Now two 4x4mm balsa longerons are glued in place on each fuselage side. Up to the wing saddle (bulkhead 5) on top and to the nose on the bottom.
The two long bottom pieces must be scarfed together.
On forward fuselage, the lower piece is flush with the bottom of the 0.8 mm plywood reinforcement. From the end of the plywood reinforcement, both the top and bottom 4x4 pieces are 2mm in from the top and bottom edges of the sides. The top and bottom sheeting fits inside in this space later.

Affixed bulkheads and 4x4mm balsa longerons.

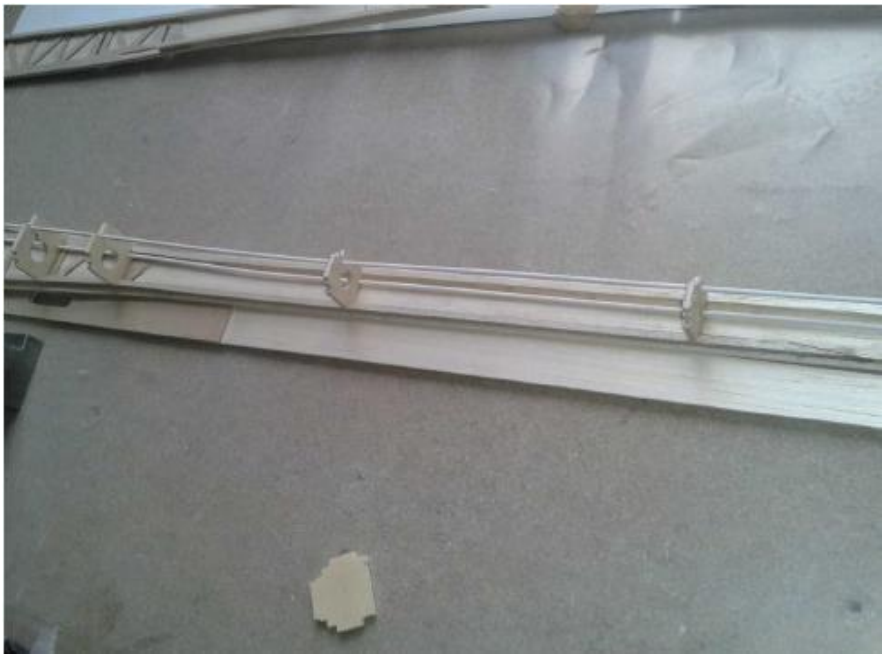
Use a spacer with 2 mm offset to locate the longerons.



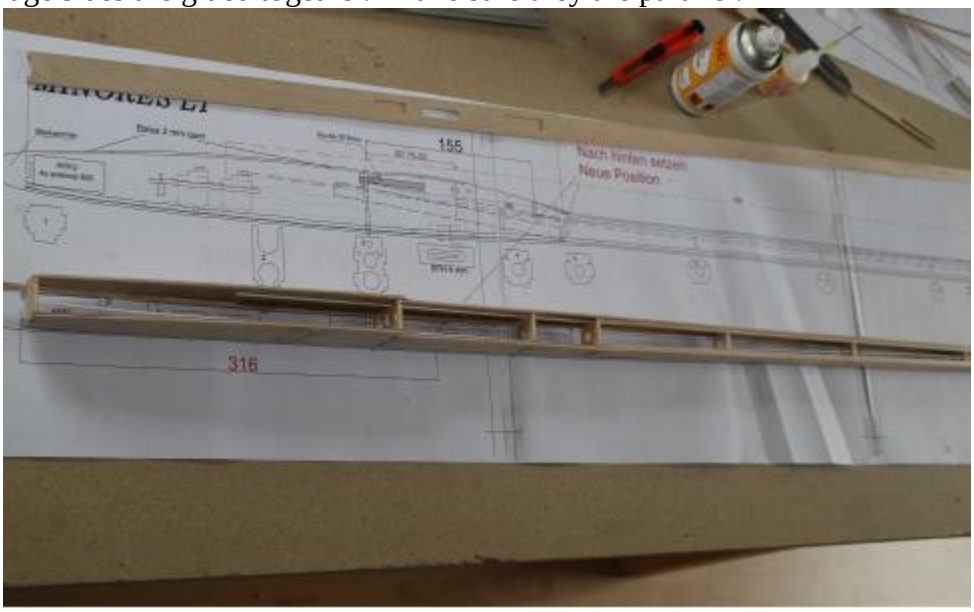
The taper the longerons at the rudder cutout so the back end of the fuse can be glued to the rudder.



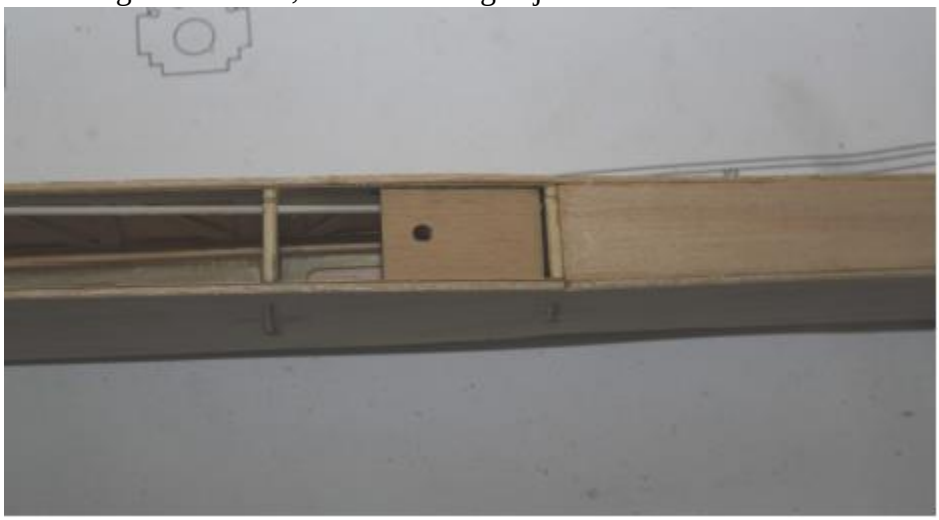
Now the pushrod housings are sanded with rough sandpaper and run through the bulkheads, but not glued.



Next, the fuselage sides are glued together. Make sure they are parallel.



Before the frame is bonded at the end of the plywood reinforcement, insert the wing retainer.
Insert the 4 mm sheet of plywood with the 5 mm threaded hole toward the front of the fuselage.
Do not glue yet. That is glued later on, when the wing adjustment is made with the locking pin



Now the pushrod housings can be glued to the fuse bulkheads.
Ensure the housings are as straight as possible. It is recommended that the steel pushrods be inserted to help straighten them. A slot still has to be cut into the side wall for the rudder pushrod housing.

Now the fuselage top is glued. The elevator pushrod goes through the elongated hole in the fuse top.

Fuselage top with pushrod housing shown.

Glued fuselage bottom.

Finally, the adjustable tow hook and the balsa nose are glued with white glue.
To accommodate trim weight, the nose can be slightly hollowed.

Wing retention system

(I built the wing first because of this step). If the wing locating dowel is not installed, drill a 5mm hole in the leading edge and install the locating dowel at the center of the wing.
insert the wing into the fuse saddle, thread the nylon wing retention bolt into the plywood retainer plate, and put the 3mm plywood wing locating piece on the dowel and in the fuse. Measure the wingtip to back edge of fuselage and make sure the distance from each wingtip to the fuse end is the same. Make adjustments to the hole in the plywood piece if necessary.

When wing is lined up, glue the ply wing locating piece in the fuselage. Remove the wing and reinforce glue the wing retaining piece in the fuselage.

The wing retaining piece in the fuselage.

Fuselage sanding

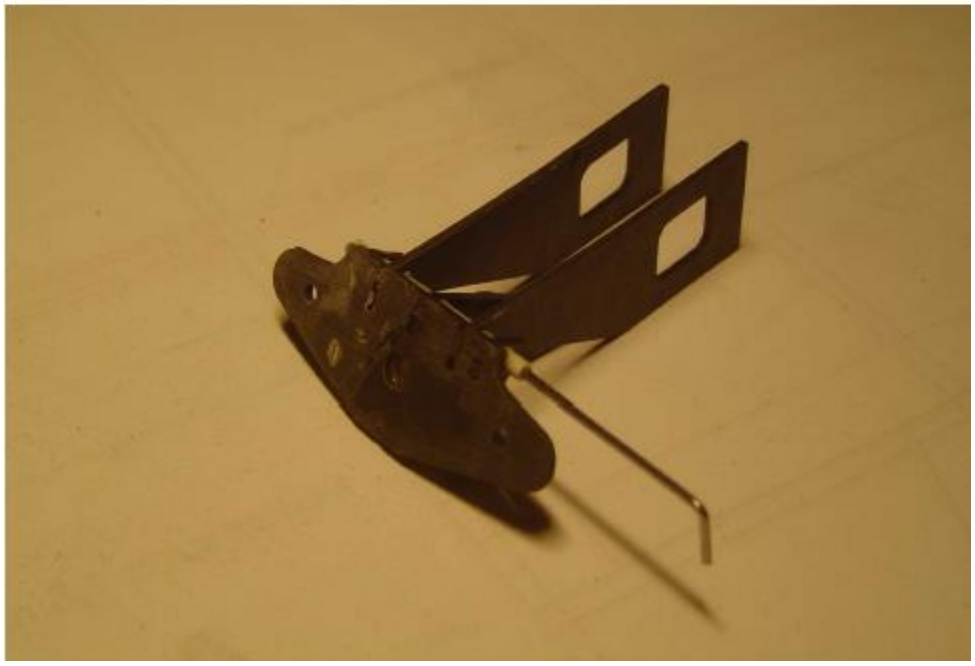
The fuselage edges can be slightly rounded. The nose is first sanded to match the fuselage walls and rounded thereafter. Rearward, the balsa of the sides can be sanded down. Sand the rear end of the fuselage to match rudder thickness.

Elevator Installation

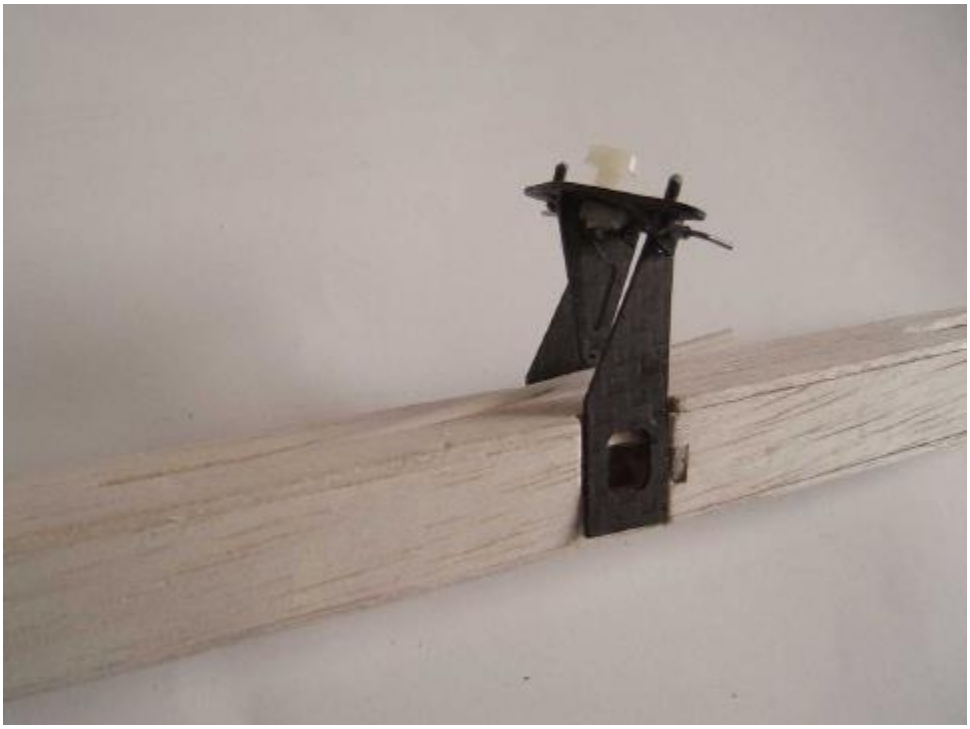
Install on the fuselage only after the wing center section is fit to the fuselage.

The elevator pivot assembly

First glue the two guide parts for the straight tube onto the elevator plate with superglue.
Then sand the nylon nut on all sides to roughen the surfaces. Grease nut and bolt threads so glue will not stick to them and thread the bolt into the nut, through the horizontal elevator plate.
Glue the control horn part onto the elevator plate and bolt using epoxy glue.
Sand the tube and stick through the holes, gluing with epoxy.
Insert the 2 mm CF round pegs into the 2 mm holes in the elevator plate and glue with about 4mm extending from the top side.



The elevator pivot is located in front of the last bulkhead. Notch the fuse sides for the elevator mounting side plates. Install the horizontal elevator plate onto the side plates using a piece of wire.



Glue the elevator mounting plates to the fuse sides, making sure the horizontal elevator plate is parallel and level with the wing. Cut the pushrod housing to length.

2.4 construction stage - wing

The material for the planking of the wing should be cut in each phase of construction.
Some small bars, however, are not shown here. Therefore, do not throw away the cut off pieces.

2.4.2 building phase – center wing section

2.4.2.1 Material center wing

1 board 5 mm Balsa root ribs A-1
1 board 1.5mm plywood A-reinforcing ribs A-2
1 Board 3 mm plywood ribs and ribs for the wing joints
1 Board 2.5mm balsa ribs
1 Board 3.0mm balsa leading edge sanding templates
2 boards 1.5mm balsa planking inside wing
1 board 2 mm balsa trailing edge inner wing
1 board 3mm balsa for spoilers
1 strip 3x3 mm balsa auxiliary web airbrakes
1 strip 4x10 mm balsa leading edge
2 6x2 mm pine spar caps for center wing
2 carbon fiber rods 6 mm Ø, wing joiners
2 ALU tubes 58x7 mm joiner tubes
1 angle template 5 ° (plywood) alignment of the ribs A-9, B-1 for dihedral

2.4.2.2 Construction of the center wing

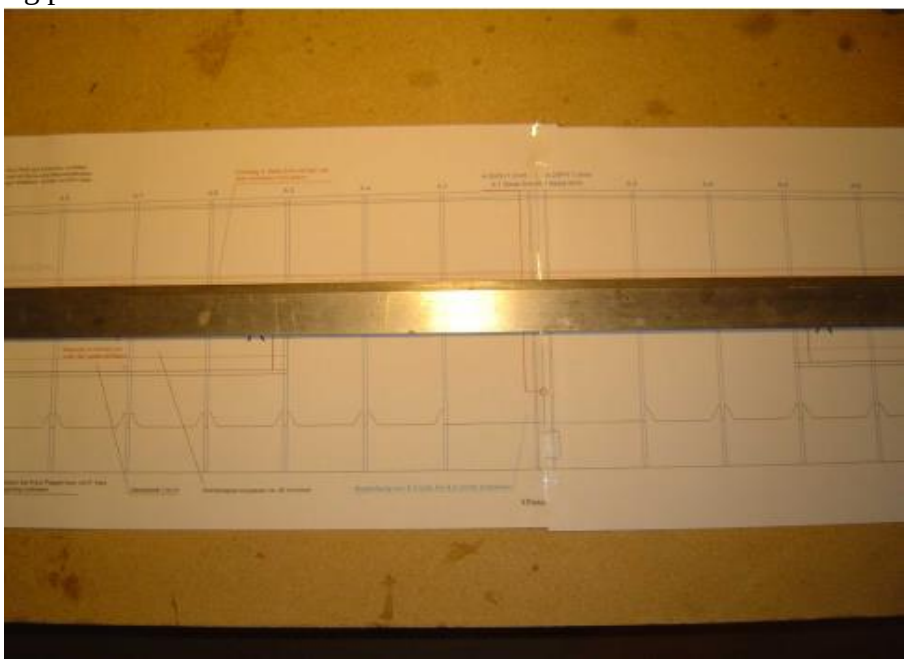
The printed plan must be just glued together from the individual pages.
The plans need to be taped together using the alignment marks on each page.
Use a long ruler to check alignment of plans. Spar lines should be straight. See below.

First the 6x2 mm pine spars are cut to length, slightly oversized.

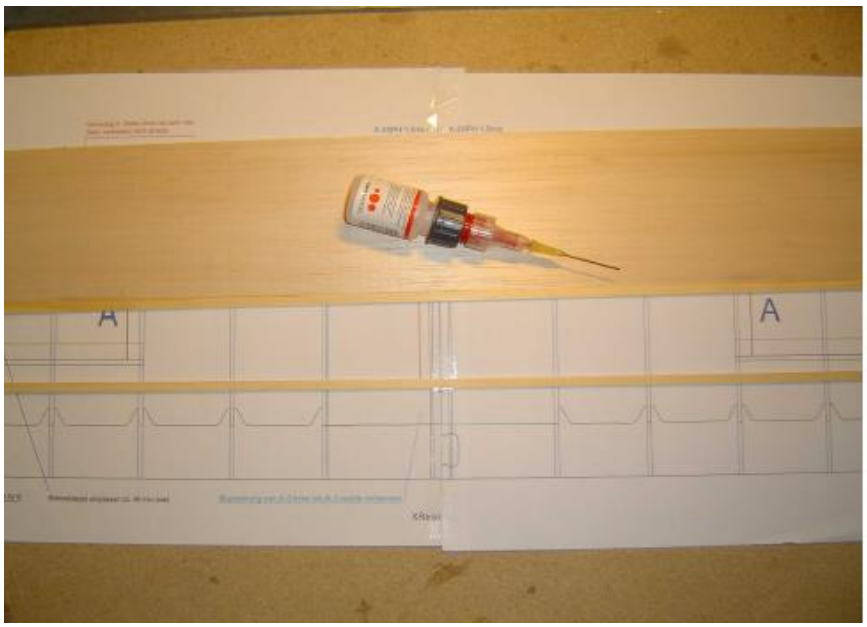
Now a 1.5mm balsa sheet (bottom sheeting) is glued to the edge of the pine spar.

Care must be taken to ensure that the parts are mutually aligned. The balsa can now
be cut off at the front, but it should extend about 5 mm in front of the ribs.
The balsa that is cut off should be saved for possible use in the future.

Aligning the wing plan.



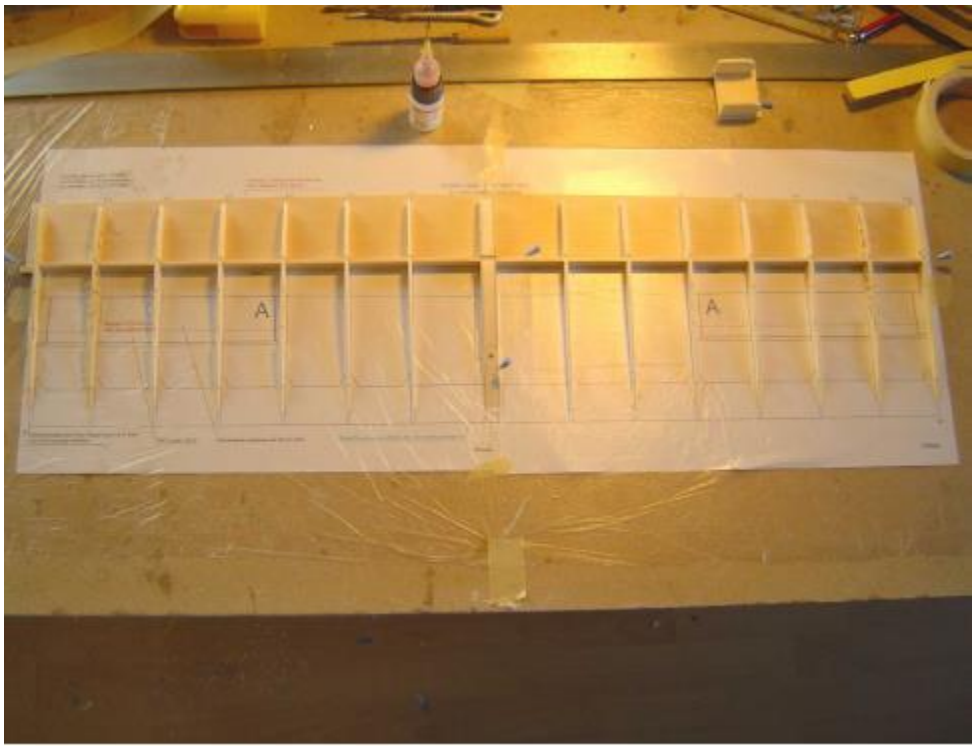
Cutting and gluing the 6x2 spar to the bottom sheeting.



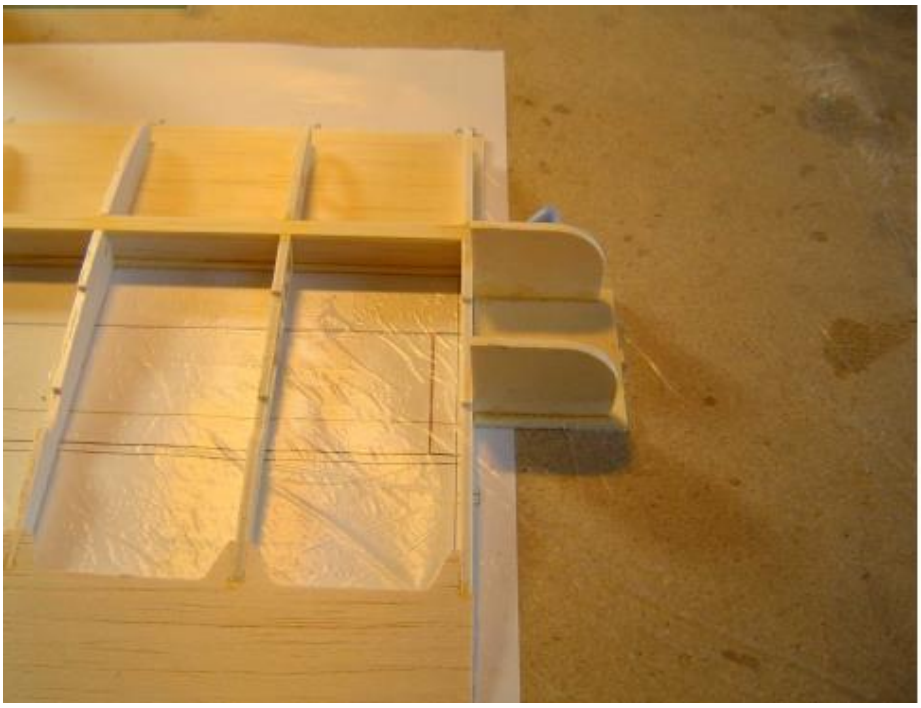
The ribs are cut and sanded to fit on the pine spar. The 3mm balsa spar webbing is also prepared.
The two ribs adjacent to the root rib have a section for the webbing.
The outer ribs A8 and A9 are made of 3mm plywood.
An important criterion for distinguishing the ribs: All ribs of the inner wing are shorter as you move to the wingtip.

The two root ribs A1 from 5 mm Balsa and 1.5 mm plywood ribs A2 should be glued to each other. Use epoxy. Glue in the 1.5mm plywood reinforcement at the wing mounting bolt position.

Ribs sorted on the plan and glued to spar. Do not glue ribs to bottom sheeting yet. Ribs A9 are glued at a 5 degree angle, using the 5 deg jig. See below. Make sure ribs are perpendicular. Use lots of glue around the spar and spar webbing.



Aligning end rib A9 with 5 ° angle jig.

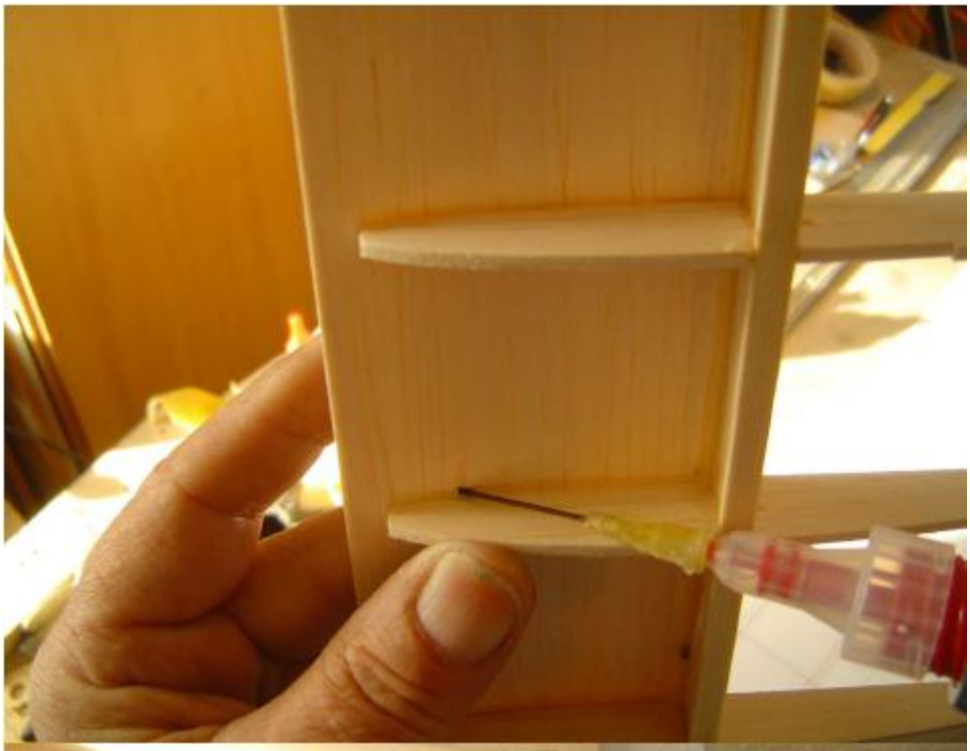


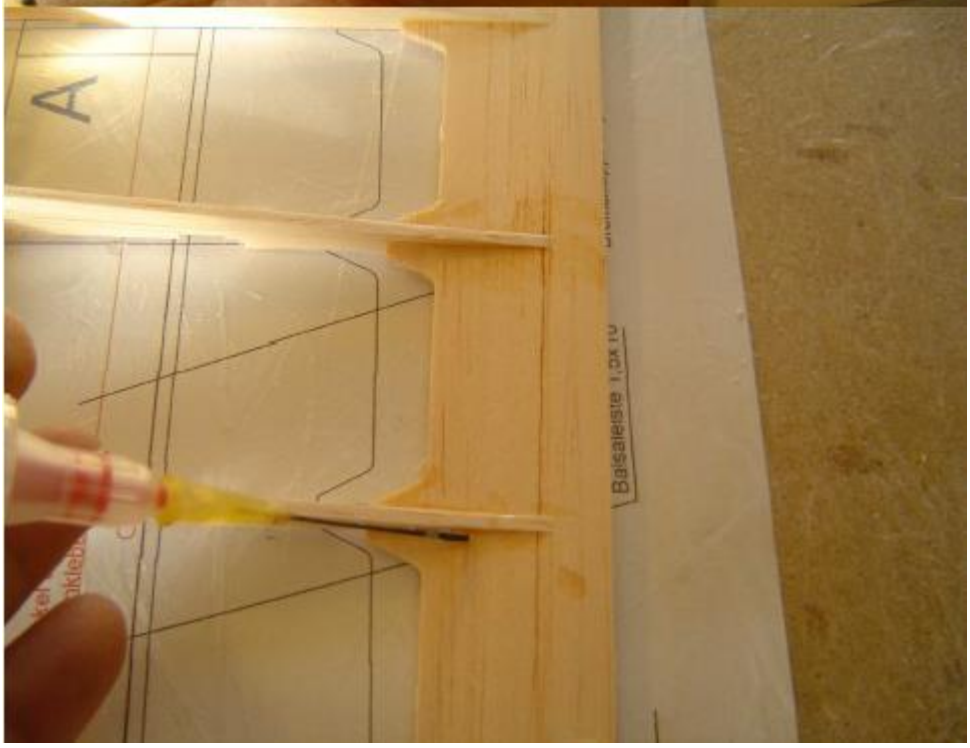
Roughen and thoroughly clean aluminum wing joiner tubes. Slide aluminum tube into ribs A-9 and A-8. Align at 90 ° to end rib. Gap between tube and spar webbing will be filled in with scrap 1.5mm plywood. Coat ply filler, Al tube, and spar webbing with epoxy and assemble. Picture shows top spar in place, but do this step before top spar is glued in so the ply filler can be inserted.

Glue in the top spar using plenty of glue. Carefully remove assembly from building board and turn over. Fit and glue on the trailing edge balsa, flush with the top of the ribs, gluing from the bottom side.

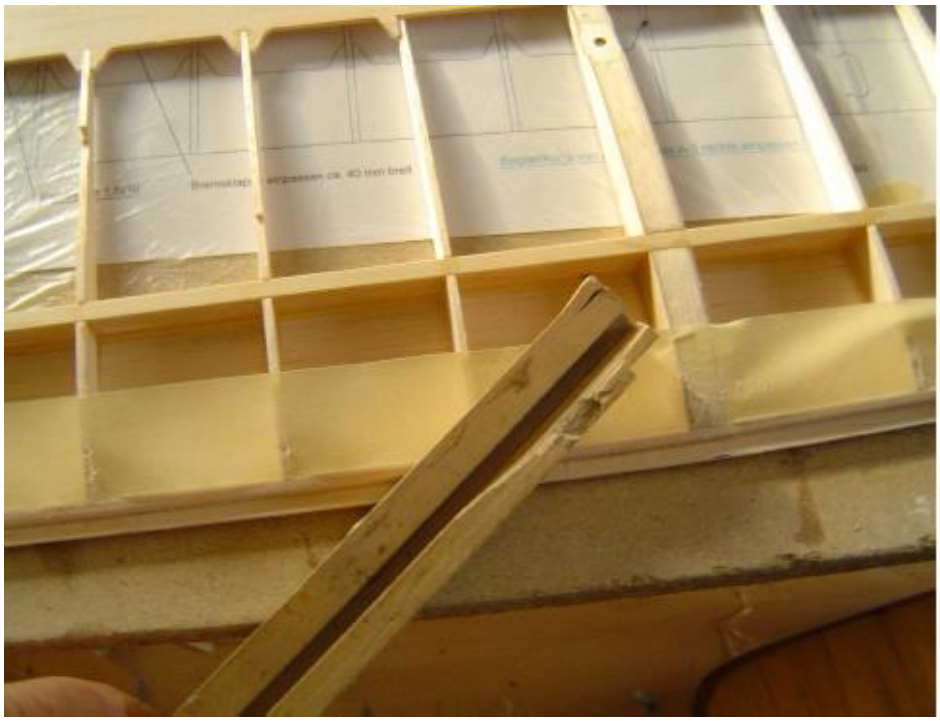
The wing can be turned right side up and the trailing edge can be sanded to a taper on the top side, starting from about 12 mm from the edge, so it is about 1mm thick at the trailing edge. Masking tape can be used to protect the area that is not sanded.

Thereafter, the middle part can be taken from the Plan and the bottom sheeting can be fully glued to the ribs.



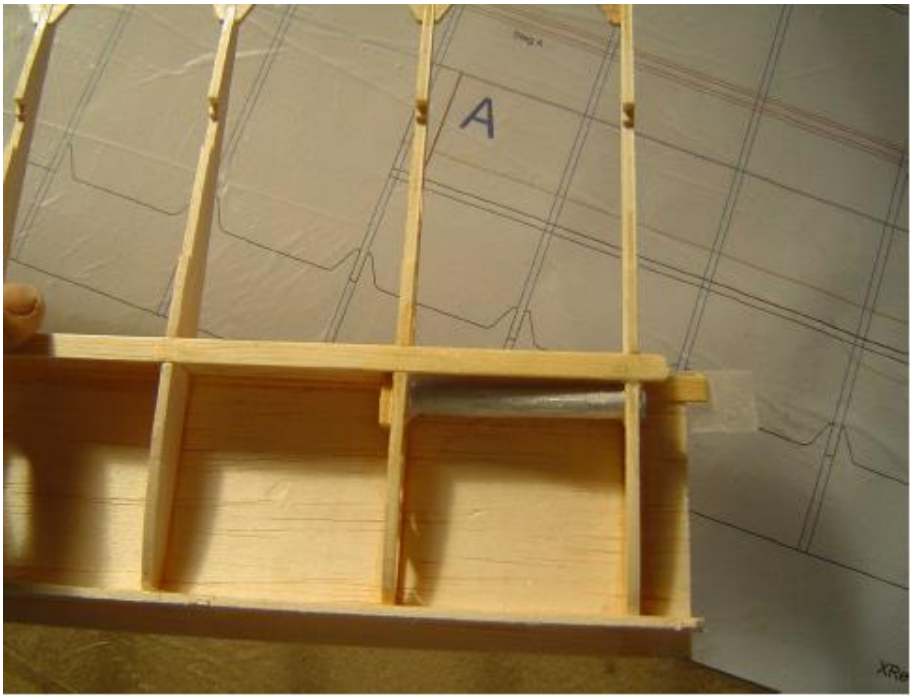


Now a strip of balsa 2 mm is cut from scrap balsa sheet and glued to the front of the ribs. Take a long ruler or a straight bar as a sanding block to make the front edge straight.



After drying, cover the ribs to protect them and sand the 2mm strip to shape for planking.

Midsection with pine spar and glued AL wing joiner tubes. Block end of tube with wood.

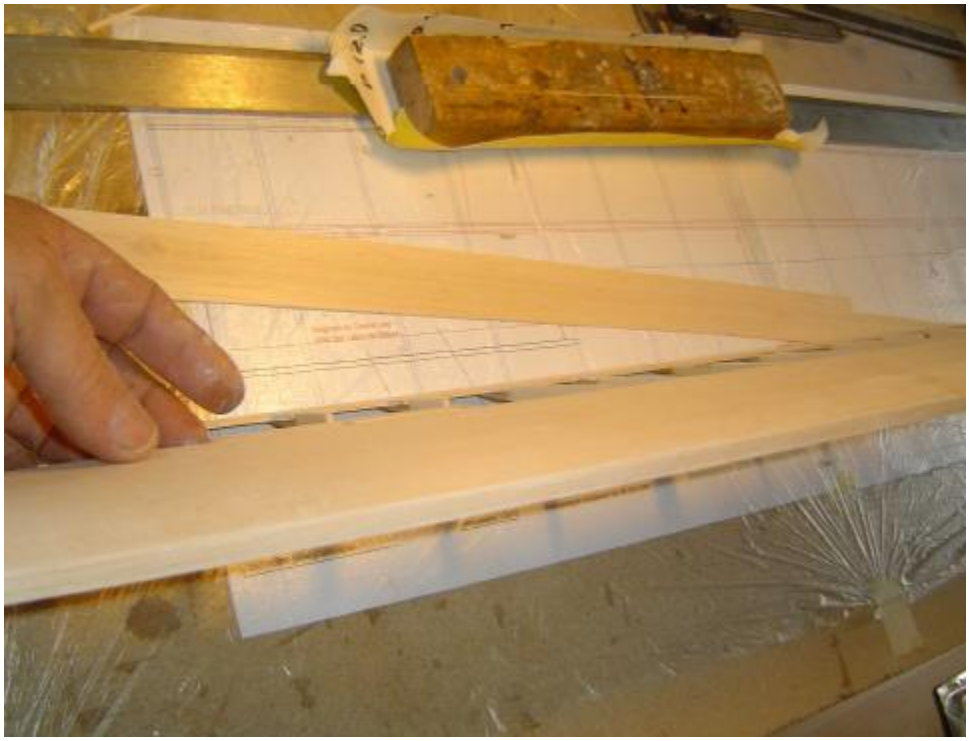


Now the upper planking can be glued to the ribs.

Then turn around and glue the ribs from behind to spar.

Now, through the gap between the strip on the nose and the upper planking, glue the upper planking to the ribs. Here it is advisable to use thin needles and take advantage of the fluidity of the superglue. Planking needs through the gap from the front are glued to the ribs.

The nose can now be sanded flat from the beginning to the 2 mm bar and a 4x10mm balsa strip leading edge is glued on. Now the middle 1.5mm planking is glued on. Sand the leading edge to shape using the ply jigs to get the correct shape. Each jig has the corresponding rib location on it.

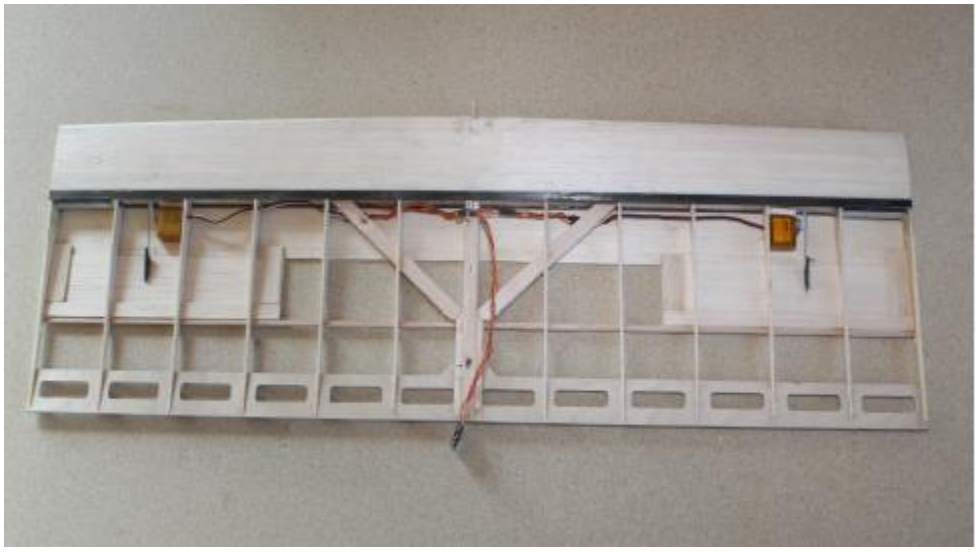


2.4.7 Fitting and articulation of the flap

Now the spoiler can be installed. Frame around the edges per the plan, with 3mm scrap, 3x3mm strip, and the 1.5x10 strip from scrap.
The spoilers are from the enclosed 3mm balsa. Cut and fit into the recess and sand from the top side for a flush fit. Leave 0.5mm gap all around the spoiler. As shown in the drawing, a magnet is located at the middle of the spoiler. Insert flap in the inner wing and at the appropriate place, glue the magnets under the 1.5 mm balsa strip. Observe the polarity. The spoiler servo is glued behind the spar web. The servo horn is glued to the flap.

The pictures below are from a different plane.

The steering wire to be bent toward the door only, so that the flap can be suspended stringing, it can then be saved. On servo a Z-bend. Possibly make the spar a little hole, so that the wire is not present.



2.4.4 Construction section middle wing

2.4.4.1 Material middle wing

1 Board 3 mm balsa ribs
1 Board 2.5mm balsa ribs
1 Board 1.5mm balsa planking center wing
2 board 2mm Balsa trailing edge
1 4 x10 mm balsa leading edge
2 4 x 2 mm spruce strip spar caps outer wing
2 ALU pipe 58x7 mm guide the joiner
1 angle template 5 ° (plywood) alignment of the ribs A-9, B-1 for dihedral
1 angle template 6 ° (plywood) alignment of the ribs to the outer wing B-8, C-1 for dihedral

2.4.4.2 Construction of the middle wing

The construction of the middle wing is analogous to those of the outer wing and inner wing.
The lower spar is flush with the bottom planking.
Now remove the ribs from the milled board, sand for assembly and the size sort.
There are six balsa center wing 2.5mm ribs and two 3mm plywood ribs.
The position of the ribs can be easily determined on the basis of their length and the plan.
Position the spar webbing and ribs over the bottom spar and planking. Glue with cyano glue.
Important: Place both outer ribs with the correct angle template.

Fit the aluminum wing joiner tubes and check alignment for each middle wing to the center wing. The exact angle is not critical, they just need to be the same for each side. When adjusted, glue in place with epoxy. Shim the gap between the tube and the spar webbing with scrap ply.
Fit and glue the upper spar cap, straighten, bonding webs and spar caps.
Remove from the building board and glue the trailing edge from the bottom.
Glue the bottom planking to the ribs forward of the spar.
Cut scrap 2mm balsa for the false leading edge and glue, then sand to the rib's shape.
Fit and glue upper planking 1.5mm balsa, just like in the inner wings, using thin CA glue.
Sand the front edge of the planking flat and glue on 4x10mm balsa leading edge.
Sand the leading edge to shape using the ply shape templates.

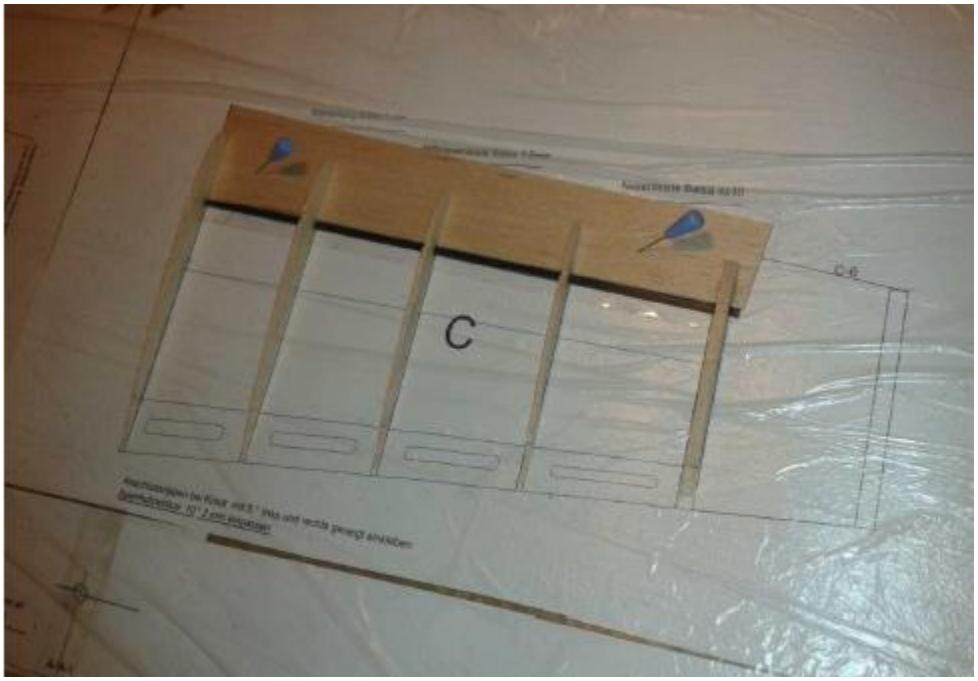
2.4.3 Outer wing construction

2.4.3.1 Material for outer wingspan

1 Board 3 mm balsa ribs
1 Board 2.5mm balsa ribs
1 Board 1 mm balsa planking outer wing
1 Board 1.5mm Balsa trailing edge for wing
1 bar 4x10 mm Balsa leading edge for wing
2 bars 4x2 mm pine spar caps outer wing
1 angle template 6 ° (plywood) for alignment of the ribs (dihedral)

2.4.3.2 Construction of the outer wing

Construction of the outer wings is the same as the other wing parts.
Glue the bottom pine spar the trailing edge of the bottom planking. Bottom planking extends out past the wingtip. These photos are not from the X-RES and differ in details.



Fit the spar webbing and ribs. Angle rib C1 for dihedral using the 6 degree ply template. Washout can be built into the wing tip, or it can be done with the covering. Glue ribs, spar webbing and bottom spar together. There is no spar webbing between the first two sets of ribs. A plywood angle part is put in here later.
Remove from building board and glue on trailing edge from the bottom side.
Glue on the top spar.
Glue the ribs in front of the spar to the bottom planking. Glue the wingtip on the outer rib and bottom planking. The wingtip is on the 4mm balsa sheet.

Make a false leading edge from 2mm scrap balsa. Shape top edge for upper planking. Cut top planking so it will extend over the wing tip. Glue on upper planking.

Sand front edge of outer wing flat and glue on 4x10 mm leading edge.
Sand leading edge to shape using the plywood templates. They are marked with the rib locations they correspond to.

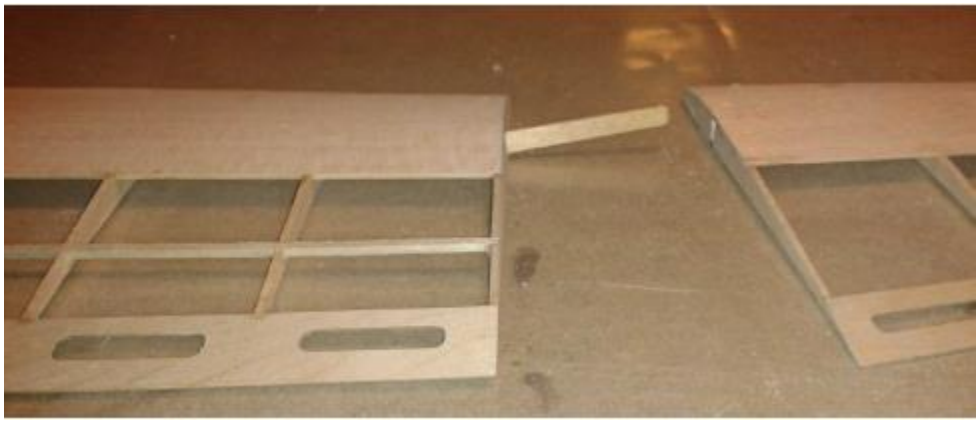
Wing tips

Sand the wingtip to shape following the rib shape of the outermost rib. Round the tip to shape per plans. Exact wingspan can be altered by changing the wingtips.
A 2 meter span conforms to competition rules.

2.4.6.1 Bonding middle and outer wings

Cut a vertical slot between the upper and lower spars in the end of the middle and outer wing tips. Test fit the plywood dihedral into the ends of the wings. Sand the plywood dihedral so the outer wingtip is 4.8 cm high, and is the same for both sides of the wing. The narrower end of the dihedral fits into the outer wing.

Glue the middle and outer wings together with epoxy. Glue the plywood dihedral between the spars using lots of epoxy and microballoons. The dihedral should rest on the lower spar. Make sure the two parts align properly with no height differences.



Joining inner wing and center wing

Sand the joint between the inner wing and the middle wing so there is a good fit between them. Glue in the CF anti rotation pegs.

2.5 Tail

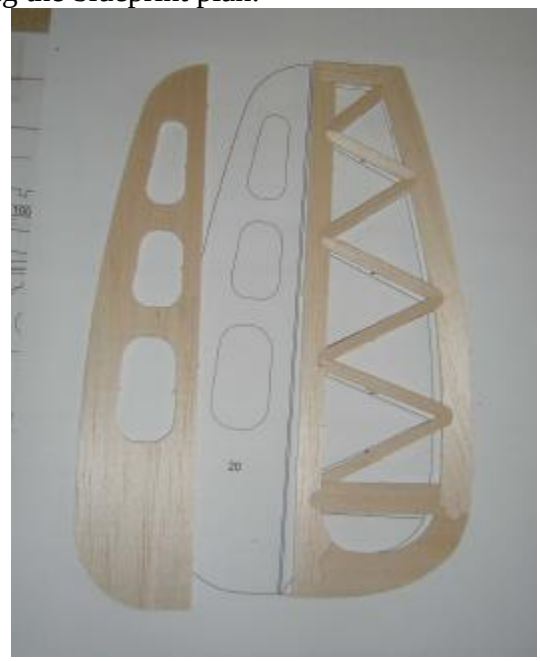
2.5.1 Tail material

1 Board 4 mm balsa tail parts

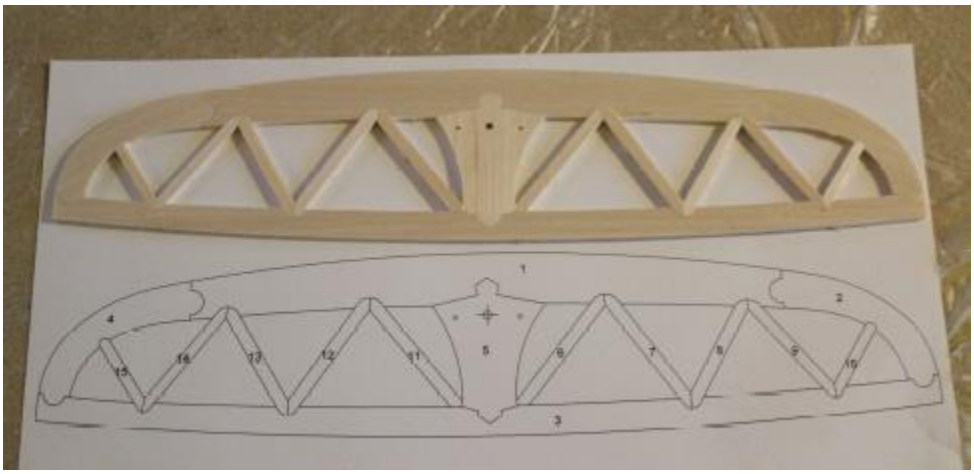
2.5.2 Tail Assembly

The tail can be assembled using the blueprint plan.

Rudder construction



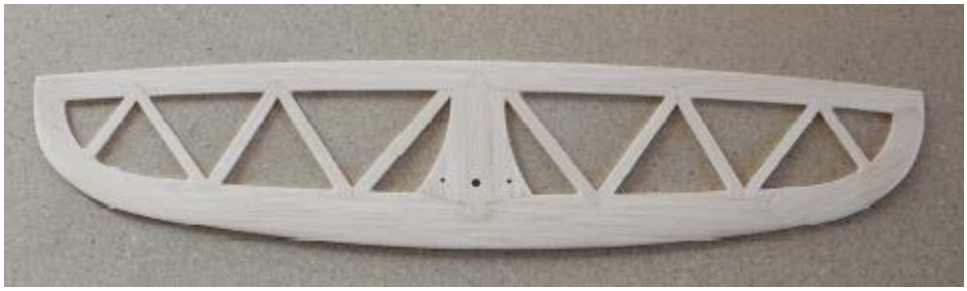
Elevator construction



Sanding of the tail

Sand the tail surface according to the plan detail.
Sand the control surface part of the rudder down to approx 1.2mm at the trailing edge. Sand the leading edge down to 3mm.
On leading edge of the rudder and trailing edge of the vertical stabilizer sand the edges round, making both sides symmetrical.

The elevator is sanded to the same airfoil shape as the rudder.
The 4mm hole can still be countersunk so that a M4 countersunk screw does not protrude. Reinforce with superglue.



Covering

Now the plane can be covered. This is not described completely here, however, some tips:
Temperature of the iron should only activate the adhesive. Tack covering to undersides first, then the topside. Overlap top covering onto bottom covering. Increase iron temperature to shrink covering.
The spoilers are covered separately, the attached with hinge tape.

Mounting and articulation tail

Installation of the vertical tail

Use hinge tape to fix the rudder to the vertical stabilizer. Now glue the vertical stabilizer into the slot in the fuselage. Remove covering so there is a wood to wood contact between the fuse and stabilizer. Line up the solid wood strut on the rudder with the pushrod tube. The rudder hinge line should be 90 ° to the top of the fuselage and to the wings. Installation of the wing in the fuselage will aid lining it up.

Articulation of rudder

Glue the rudder horn in the rudder. Bend the spring steel rudder wire (0.6mm) about 1cm long 90 ° angle and slide it into the pushrod tube. Put the bent end into the rudder control horn. Later, glue a short piece of pushrod tube on the end to secure the pushrod in the horn.

Mounting tailplane

Cut the M4 screw to length so that it can be screwed onto the elevator pivot.
Sand the 2.2mm CF rods and glue into the holes provided from below,
so that they project approx 1.5mm below.

Articulation tailplane and fin

turn a Z in the 1 mm spring steel wire with a pair of pliers. The hinge pin from
take the shuttle. The Z in the Hang the horn and the wire into the
introduce Bowdenzugröhrchen. Hinge pin reinsert and with a small Drop of superglue secure outside.

internals hull

In the trunk, the radio board must be glued. Who later a ballast tube
wants to install, should be careful that by no means the servo heads the loading and unloading of prevent pipe. The included board fits quite well for most 9mm servos as Dymond D60 or Graupner DES427. Who wider servos installed they should be slightly diagonal put.
The connection of the Bowden cables to the servo is performed by a short length of 0.8mm Spring steel wire in which a one-sided Z is bent mount it to the servo.
This piece of spring steel wire with the inner workings of a small terminal block with the Train connected.

adjustment

Now the X-RES should be ready for the first flight. But before even the setting:
Focus: for the first flight 73 mm behind the leading edge can later 2-4mm backwards hike.
Rudder: As much as possible, but symmetrical.
Elevator: at the end edge + 9mm -7mm
Elevator compensation for flap: +4 mm.
Zero position Elevator: From the front aiming across the face. Tailplane should now a little be seen from below.

First Flight

The first flight is best realized in a meadow. After a couple of litters should can find pleasant flight attitude and focus.
The focus can be finely adjusted with lead shot in the nose.

Mounting towhook

The adjustable towhook can then be set approximately 2 mm in front of the center of gravity.

More settings

Now the flier can be started the first time with the rubber.
The X-RES can now be set forth.
one determines the exact best focus with the flare out.
First, at low speeds. Later after 10 m windmilling at a 45 ° angle. In this maneuver should the Aviator easily change the trajectory upward.
Adjust the Höhenruderzumischung for airbrakes at a higher altitude.

ballast chamber

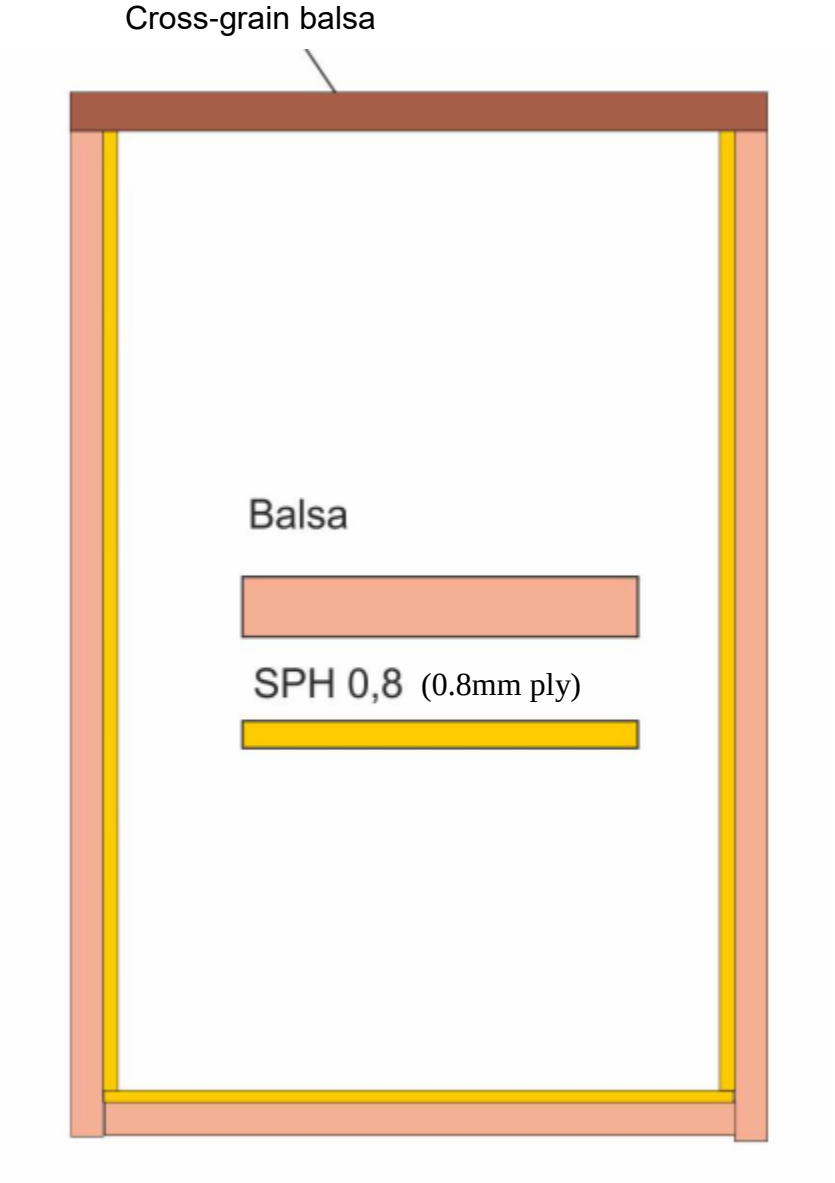
Anyone who wants to use the X-RES for pure leisure fly does not need ballast chamber.
but in competition it is quite reasonable, the model weight to adapt to the weather conditions to.
Ballast a 10mm round material is used. The best here are brass rods or poured with lead copper pipes.
The length of the ballast set should be about 20 cm.
In order not to always have to fly with full ballast, spacers are made
Balsa remnants needed. There will always be ballasted symmetrical to focus.
The individual pieces should all be the same length and ranged from 4 cm.
This tube is closed safely back and forth with a
Locking mechanism is provided.
The ballast tube is used, that the focus of the ballast pieces later exactly sitting in achieved during the flight center of gravity.

Your X-RES is flying right away - we promise!

You can focus the vernier adjustment yet, and the rudder deflections and Höhenruderzumischung

Set on high for spoiler at its own discretion.
Adjust the towhook about 2 mm in front of the center of gravity, then the glider rises perfectly on Rope and you do not need, or only minimally to give height.
I wish you much joy in flying, thermalling and successful participation
RES competitions!
Let Your X-RES always in sight!
All the best and have fun!
Alois

Forward fuselage cross-section



Covering