

Birdy DS building instructions

Loosely translated by Kees Blokland. (this means, you can't blame Fa. Decker for my errors and omissions. Therefore, if in doubt do ask!)

First part: Have fun building, says Andreas Decker.

For the full series of images that go with the build, visit:

<http://www.rc-network.de/forum/showthread.php?t=161530>

This appears to be more or less the official thread for the build, for there are no images in the official manual.

The translation below is interspersed with my own experience and observations. I suggest you read the lot before gluing the first bits. Try to understand what is suggested, rather than blindly following the sequence.

A very important point: DO look at your radio-gear, and make sure all the bits will fit. You don't have a lot of room to play with! (Saying that, I used a Spektrum 6100 RX, and 2 DS47's and a 2 cell lipo, and still had space to spare in the fuse.)

Preparation:

Take all parts out of the box. Remove all parts from the sheets, use a sharp knife where needed, and very carefully sand back the small remaining protrusions from the parts. *(Personally I would not remove parts till I need them, especially the wing-webbing parts are all very similar in size and unless you mark them when they are still in the mother-sheet, it will be a time consuming affair to find the right one!)*



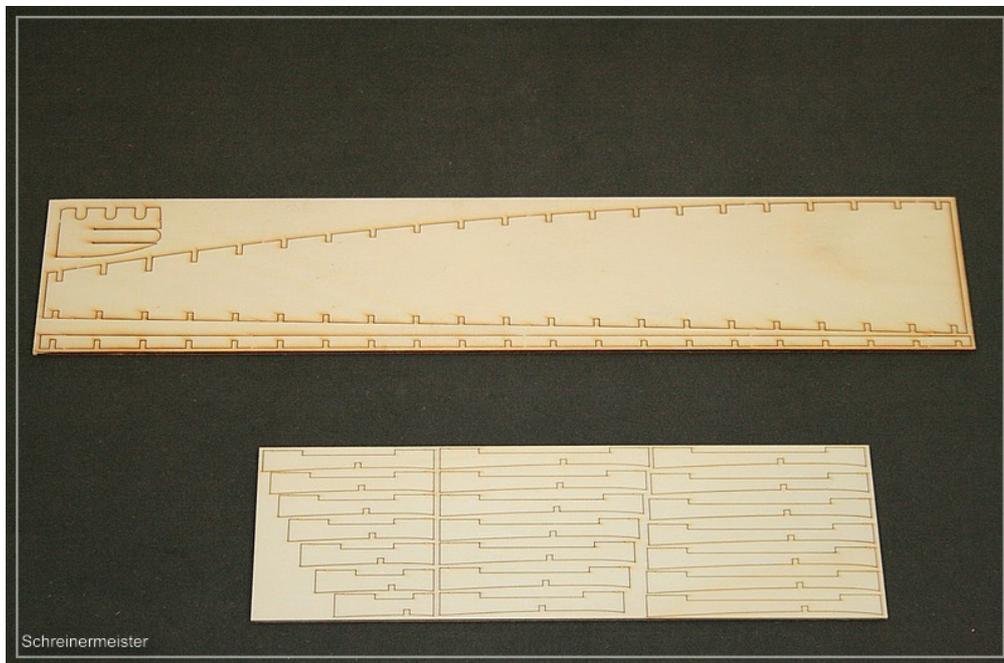
Cover the plan with plastic, to stop the glue adhering wood to the plan.

All parts in the kit, with the exception of the wing-joiner, trailing edge and elevator/rudder parts are glued with ZAP.

Wood-glue is in general not suitable, because it will warp the very small parts in the wings, due to the amount of water in the glue. Every builder will understand that the ultimate strength of the model will depend on properly glueing all parts! And since this is a DS, you will know what that means.

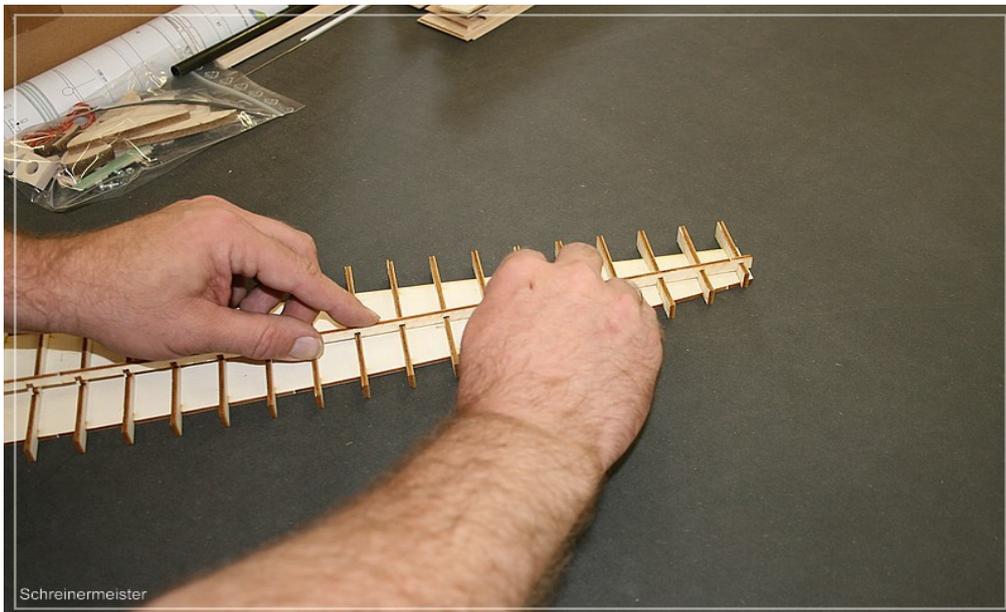
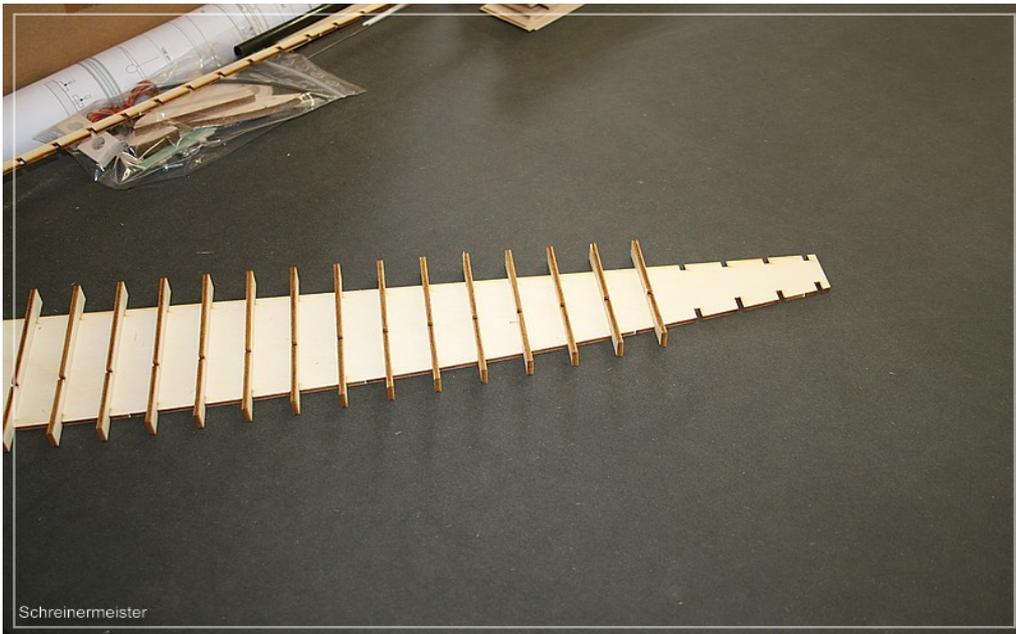
Wings:

There is a new procedure for building the wings. You will find a few 3 mm ply sheets/parts that must be used to create a jig for the wing. The wing has an almost symmetric profile, therefore it cannot be built on a flat surface.



The big sheet of plywood is the bottom part, onto which the plywood support ribs are mounted.

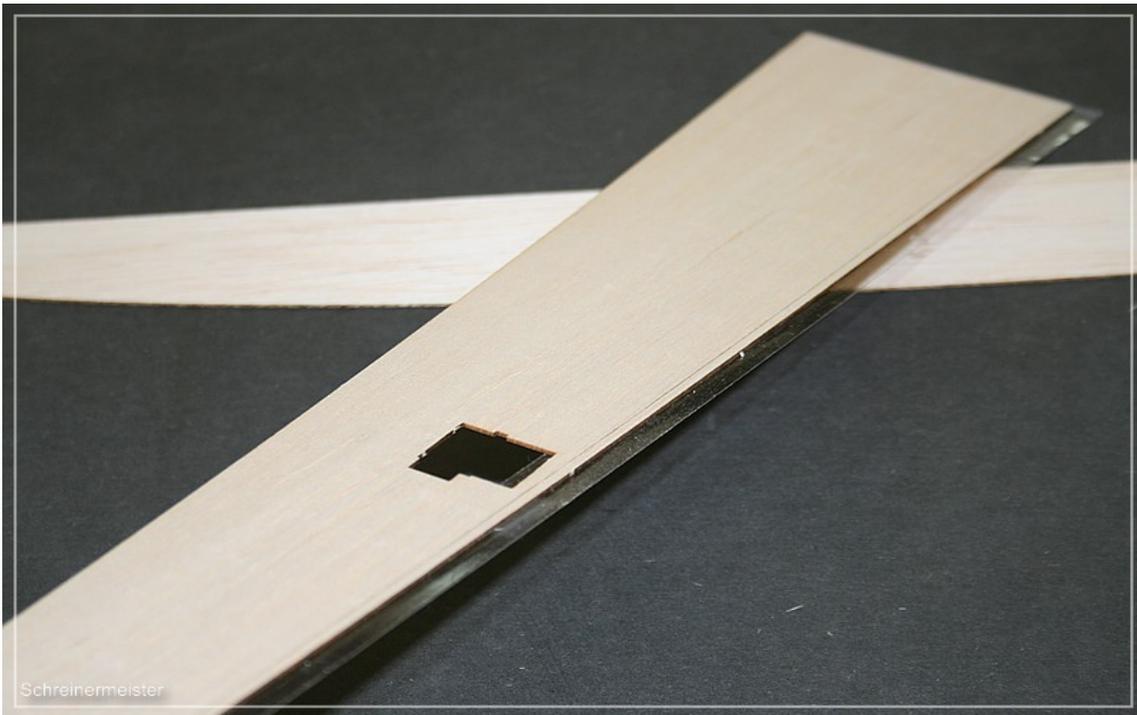
Don't glue those ribs, you need to take the jig apart and rebuild it for the other wing. (yes, you will be able to work out that you have to put some things the other way about)



When all the ribs are in place, you insert the false spar. The manual suggests you nail the complete assembly to your dining table. I would suggest only doing this when you have permission from the responsible adult in your household. (She Who Must be Obeyed)

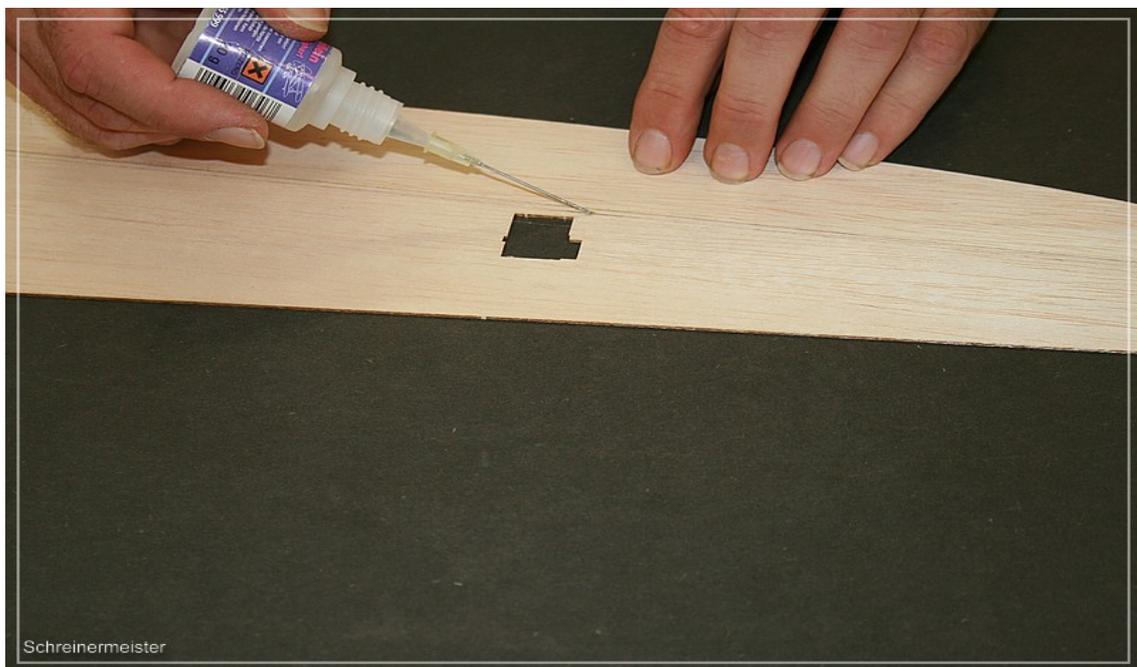
Find the lower balsa wing skins and remove the servo-cut outs.

Do take some minutes to work out which wing you are actually building. The left one or the right one?



Assemble the balsa skins dry with a bit of sellotape. (make sure the laser line on the sheet is on the opposite side of the sellotape!) If you see the laser-line underneath the sellotape, you can stop now and try again.

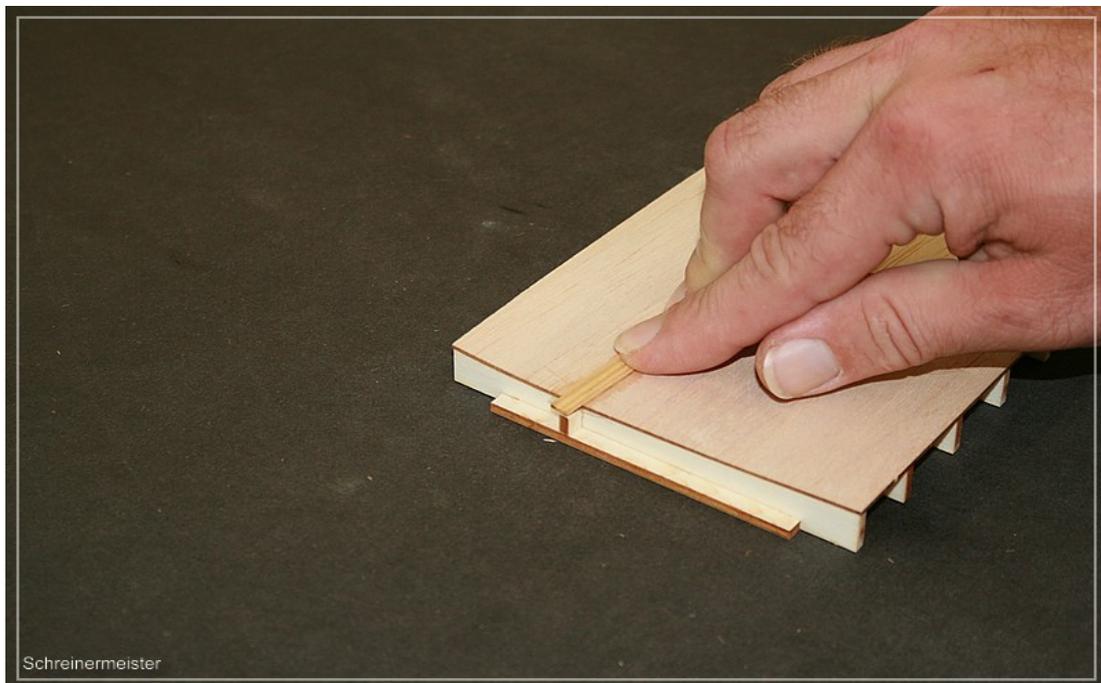
Turn over the sheets and on a flat surface, carefully glue the wood together by running a thin line of super-glue along the seam. (keep the wood flat on the building board, the glue will wick into the seam!)



Place the bottom pine spar exactly along the laser line (check the location with the first half-rib) and secure it with a tiny drop of cyano.



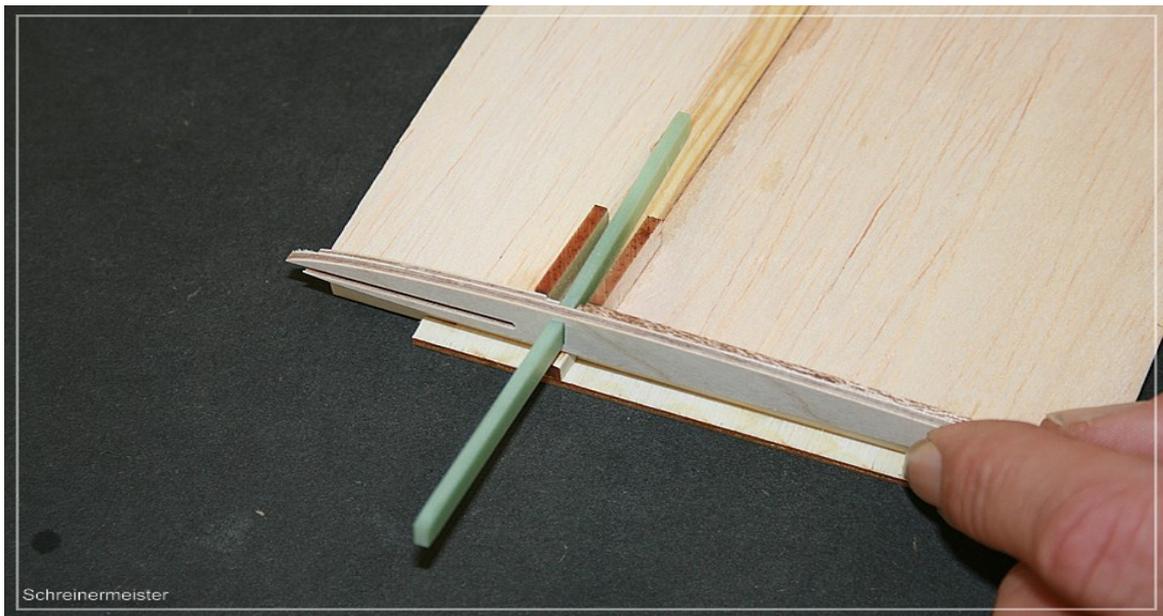
Then glue the spar to the skin by running cyano glue along the spar/balsa, while at the same time pushing it down on the skin. (A good trick is to use a screw top from a plastic-bottle as a finger protector. They are usually made of a material that does not stick to cyano, and you can push reasonably hard without having your fingers stuck to the wood.)



When the glue has dried you place the skin on the jig. You did not remove the sellotape yet did you? If you did, put it back (or better, put a fresh piece on the joint. To secure the skin in the jig, simply use a few small drops on the sellotape to stick it temporarily to the jig. Don't overdo it, you simply only want to stick it to the sellotape, not the wood!!

Next find the first rear webbing and rear rib and secure them on the skin. The rear web is slightly shorter than the front one, because the front rib is made of 0.5 mm ply. Make sure the rib is angled according to the slope of the webbing. And do note, the taper in the wing is also found in the webbing, so do not reverse them! (that's why marking them or leaving them in the sheet helps you.)

With the aid of the front webbing, place the front plywood rib in position. Check it with the 2 mm centre rib and glass-fibre joiner. (make sure you don't accidentally get those bits stuck!)



Next the fun part, add the remainder of the ribs and webbing. Keep an eye on their location, (the ribs must coincide with the plywood half-ribs in the jig) If you work carefully, and do webbing, then rib, webbing, rib, it should all fit as designed. However wood is wood, so don't be afraid to use a bit of sandpaper if things don't quite fit.



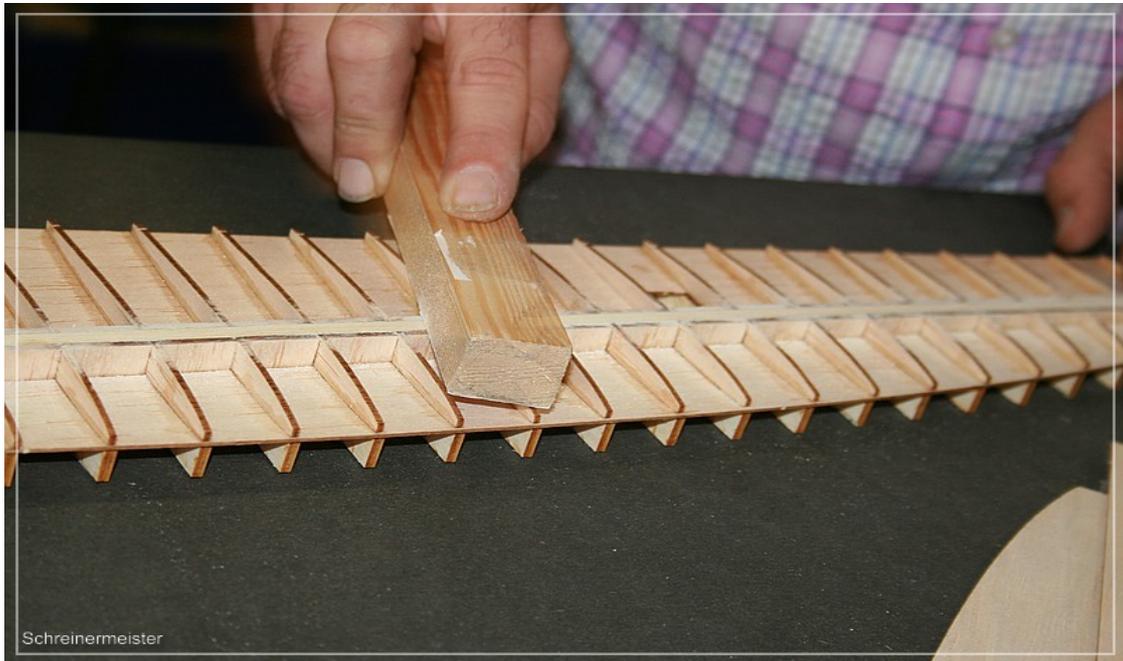
After a few minutes, you will have a beautiful wing like this. (That centre rib and joiner are still not glued in!)

At this moment it is a good idea to think ahead. Those holes in the ribs are for the servo wire. Some people put in the wire now, before the wings are closed. If you do that, and glue on the top sheet next, it is quite possible (likely) that the servo wire will be glued to the sheeting. It might be an idea to insert drinking straws to guide/protect the servo wire. Whatever you do, think about it now. To feed the wire through the holes later is a pain, so as a minimum, put in some kind of pull wire and secure it.

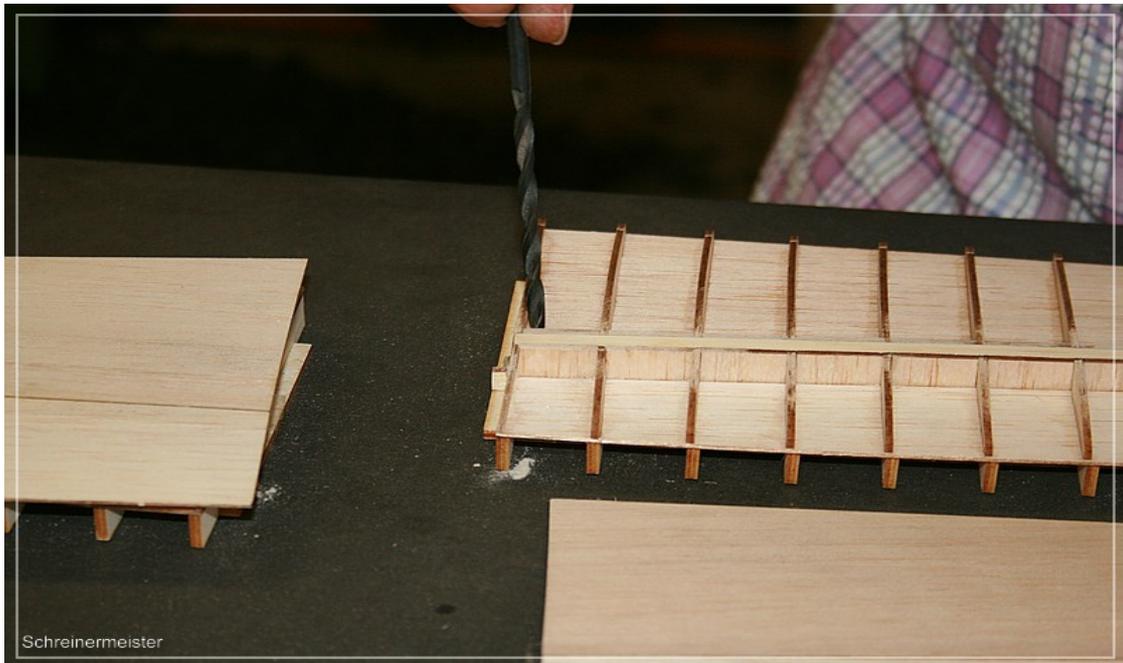
Anyway, it is time to place the top spar in the wing. You might need to slightly twist it to get it into place. Don't use too much force, this is all miniature building at its best. Be gentle, and it will fit. Secure it with cyano, making sure it is attached properly to ribs and webbing.

Note, on my previous Spinning Birdy, I glued in the front webbing last, I found that easier, and it gave me a little bit more playroom, and ability to make sure the spars were attached properly.

When things are dry and you are happy, use a sanding bar or similar to gently sand down any high spots on the ribs/spar/webbing. You want to be sure that the top skin lies flat on the spar, without any gaps.



It's a good idea to make an exit hole for your servo cable in the bottom sheeting now...



Next comes the top-sheeting.

It is glued on the top spar with thick cyano, since you will need some time to position the skin.

The top skin is prepared in the same way as the bottom one. Glue the two halves together, using the sellotape trick.

Find the thick cyano and run a good bead along the top of the spar. Next position the skin exactly with the seam centred on the spar. Practice if needed! You only can do this once! It is also advisable to have a length of wood handy that can be used to place on top of the sheeting, so that you can place some additional weights on it to let it dry. Do give it time to dry, or you will end up building a warped wing! (go for a walk, feed the dog, talk to the misses.)

All we are interested in at this stage is the glue-joint of the spar! When this has dried, use small drops (!) of cyano to bend down and secure the sheeting on the ribs. Make sure you keep the wing in the jig while doing this, you need a straight wing! Once you have secured all ribs this way, you can take the wing off the jig, and NOW you can secure the ribs properly, by letting a small amount of glue run along each rib.

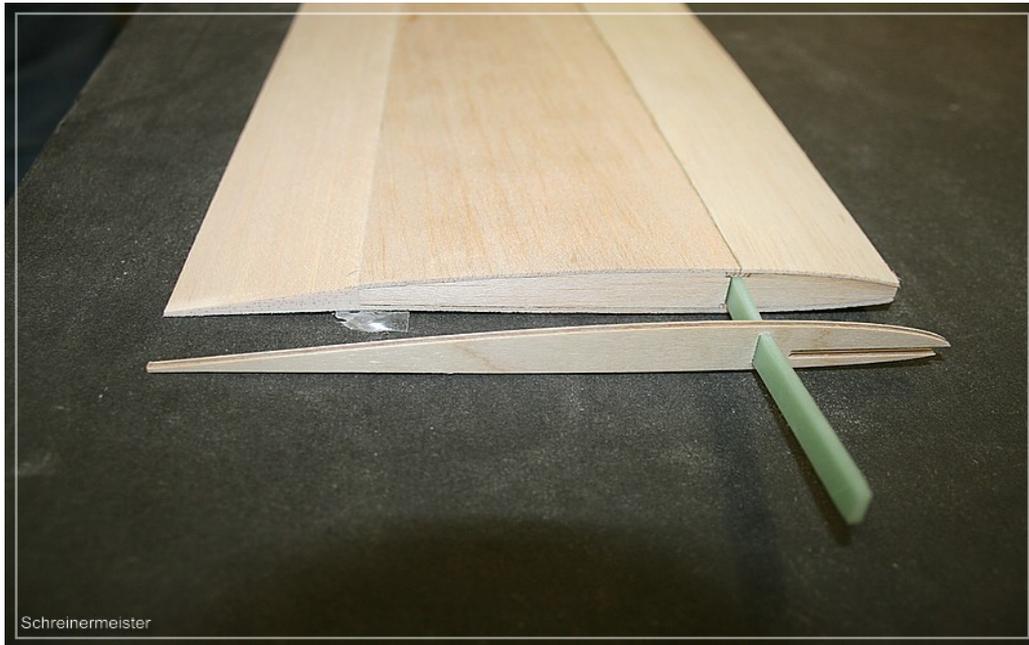


If you look carefully, you see that a visit to your local chemist might be in order to get a handful of needles. I will leave it up to you to explain to the man that you need to shoot some glue in difficult places ;-)

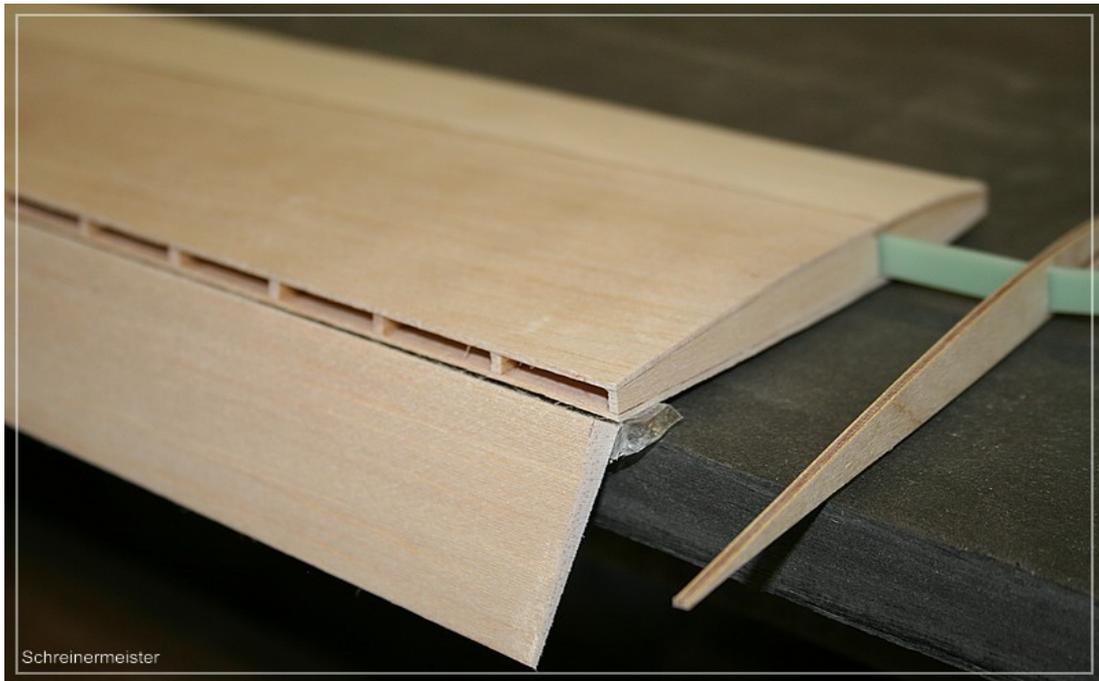
When the needle gets clogged up, find a lighter and simply heat the needle. The glue will burn away in a second with a nice puff of smoke. Maybe not a good idea to inhale, but it works a treat!

This is where you are likely to end up glueing the servo wire to the sheeting, unless you had a way to protect the cable.

Of course you are happy with the result, and next is the job of sanding the front & rear of the wing to accept the LE and TE. Just enough to create a nice straight edge. Next taper the TE, 40 mm at root, 30 mm at the wing tips, and make sure you have a good, nice, close fit of the TE and wing. Use the centre rib to check the alignment!



Finally, we use the sellotape trick again to position the TE stock. You also need to sand the angle of the stock to match the angle of the already installed centre ribs. No Gaps Please! Make sure your TE is as close to the final contour as you can get it. It might be easier to sand it down before glueing, I leave that decision to you. Finally, make sure once more that the TE is aligned perfectly with the bottom sheeting, fold it down and use either slow cyano or white glue to secure it permanently. When dry remove the sellotape. (Again, it is advisable to protect the wood either side of the glue joints with tape, it will be a lot easier to remove the glue spilling from the joint. It would be a good idea to clean any excess glue before it sets.)



The LE is easier to glue on. It is not a bad idea to put the wing back on the jig, check again that all is flat and level, and glue the LE using wood glue. Weigh the wing down in the jig and let it dry properly. This was your last chance to get rid of any minor twist in the wing. From now on you have what you built!!

Straighten up the wing-ends, glue the wing-tips onto the wing, and sand them to the contour as shown on the plan. Once they are correctly shaped, you should soak them with cyano, to harden them.

Time to sand the LE. A properly shaped LE makes all the difference in this model. Use the supplied templates to really get this right. And do remember, once you go too far, you've gone too far. Adding wood after you sanded it away is not easy. Be gentle, take your time.

Hopefully, you have a wing that you are proud of! Next, disassemble the jig and assemble it again, so that you can build the other wing. Making 2 left wings is only a good idea if you are building 2 planes. And yes, do repeat all the instructions above.

All that's left to do now is cut out the ailerons. Make sure you cut from the narrow side to the root, you want to make sure that the grain of the wood keeps your knife against the steel ruler or straight-edge you are using. Once the ailerons are cut free, sand them at an angle to allow proper down movement of the aileron. Check the plans for the amount of bevel. (Hey, you are building a model, not merely assembling an ARTF. This requires skills! Yes it takes time, how else are you going to get pleasure out of building?)

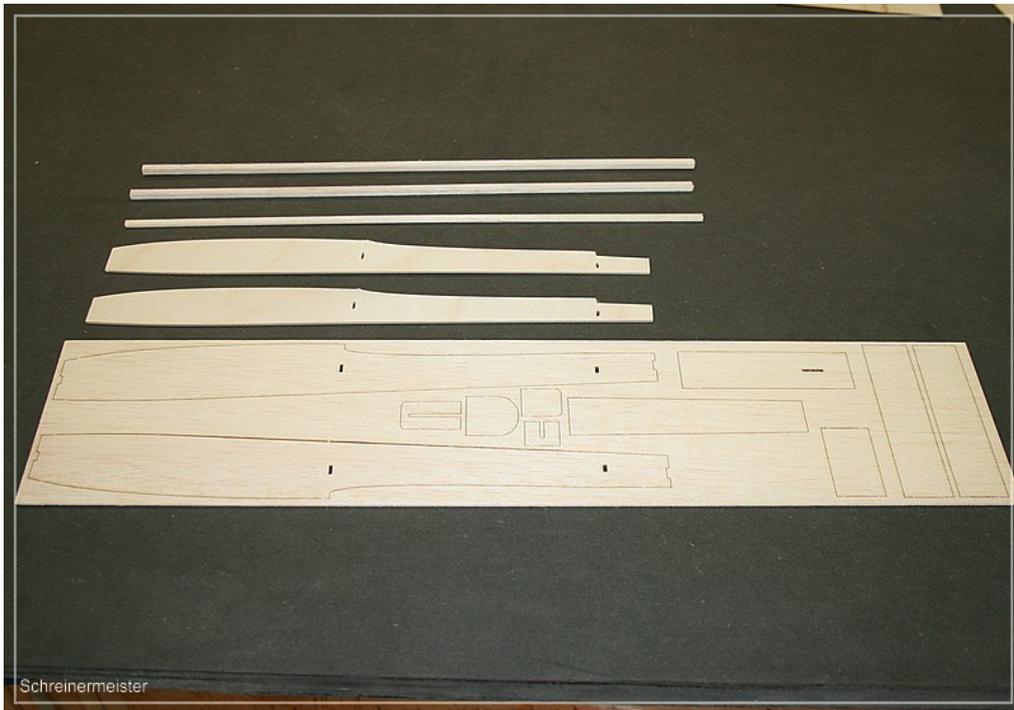
And finally, test fit the centre rib/joiner one more time, making sure you can push the halves together for a clean fit. For the next step it would be a good

idea to cover the surrounding wood with tape, to stop the epoxy messing up your balsa skins.)

Still happy, mix up some of your favourite 10 min epoxy (5 min if you are 100% sure you don't need to wiggle anything) and apply generously onto the joiner and centre rib, push some between the spars etc.. Don't skip on the glue! **At this stage I also insert that 2 mm carbon dowel into the centre rib.** If you don't insert it now, the space for it will be filled up with epoxy, and you will not be able to get it in later. The manual suggest to insert that dowel after covering the wing. If you can find a way to keep the hole clean, be my guest!

Fuselage

Secure the sides to your building board with some pins. Using think cyano, and R1/R2 as guides



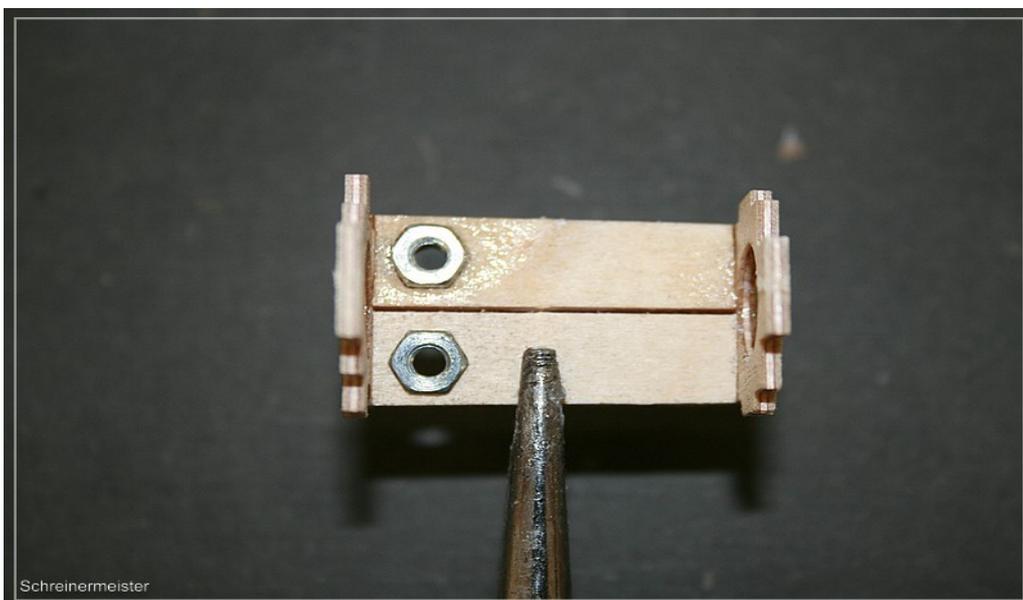
Make sure you build a left and right side! Trim the 4x4 and 2x4 sticks and glue them tight along the plywood doubler. Glue R1 and R2 at right angles to one side.



Note, the building sequence on the website where I get these pics from show a slightly different sequence, glue the former first, then the 4x4 longerons. I have a feeling you will get straighter sides if you follow the first method.

Once things have dried, add the other side to the first one. Do make sure you make a straight fuse box!

We now build the rear wing support structure, consisting of R3-6. Bend R5 slightly, to create a V-shape. (the bottom of the part is scored). Assemble R5 and R3/4. Then find the M3 nuts and insert them into R6. The narrow side of the plywood is on the outside. Check the pic below!

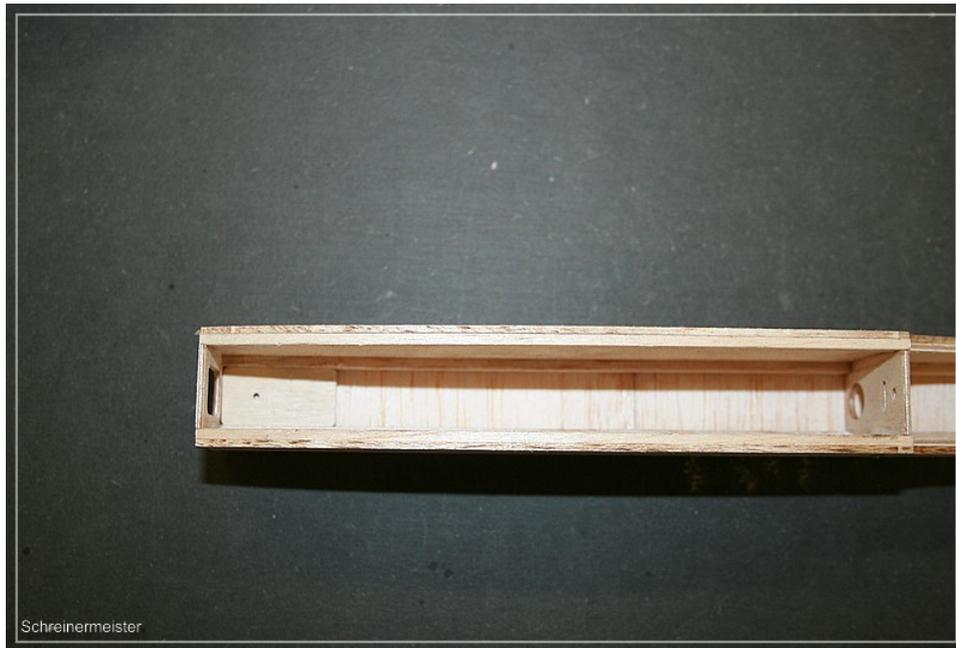


Finally, align R5 and R6 and glue them together. It might be a good idea to fill the M3 nuts with some grease, so that glue won't adhere to the threads. But keep the rest of the nut clean, you don't want it to fall out. I actually glue a bit of scrap wood underneath the nuts, so that they sit in a small pocket. Before glueing this whole assembly into the fuse, I also run an M3 tap through is, just to be sure the threads are clean.

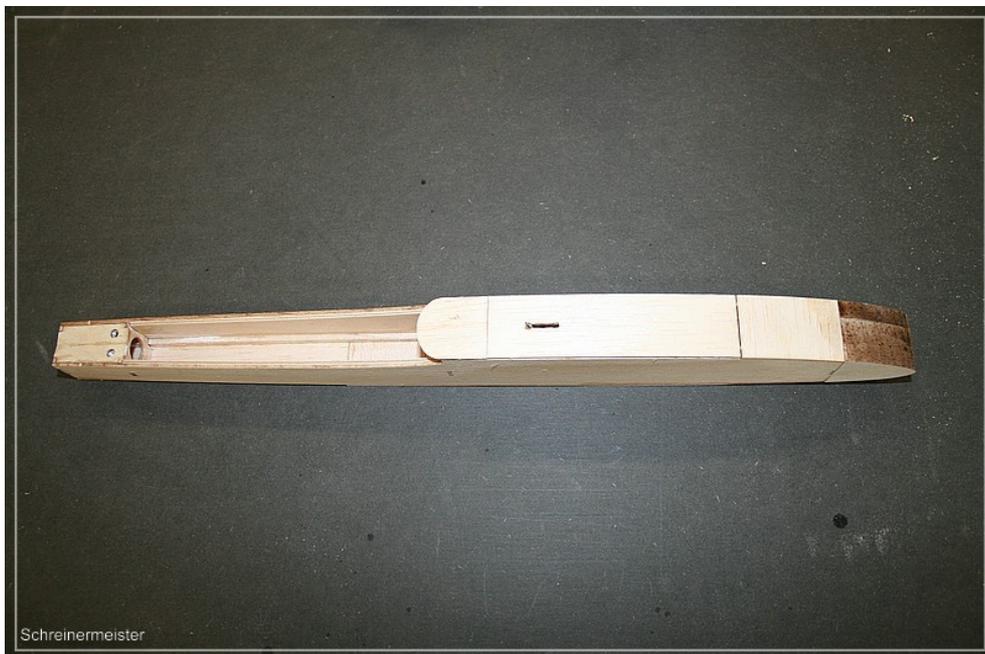


You will have made sure there is no twist in the fuse this far. Sand this assembly to make sure there is a nice clean surface for the bottom sheeting. Assemble B1-3 and glue it on the bottom. Insert the Flitschenhaken reinforcement according to plan. (There is simply no English word that has the same feel and power as 'Flitschenhaken'. The term for launching a DS with a bungee is 'Flitschen' I could say insert/glue the bungee hook. Does not sound the same does it??. **Flitschenhaken** it will be! (Fleet-sun-haken: say 'harden' then replace the 'rd' with a hard 'k').

You can see the position of the Flitschenhaken in the pic below.



Build the nose from the 3 balsa parts, sand the nose-sides flush, to allow for a clean fitting nose-block. Add B4 to the nose as well. Build cover B5 /7a/b and install the hatch-lock. 7B and 7C are additional supports for the tube that holds the wire. When everything fits as designed, sand the nose and sides according to the contours on the plan.



Next prepare the 4 blocks that sit at the end of the fuse. Carefully insert the carbon tube in the fuse assy, then slide those 4 balsa blocks over the tube in position and **ONLY TACK** them together at the corners with very little glue! Pull the carbon tube out, and put a bit more glue on them, so they are properly stuck together.

In the next step it would be handy to insert a bolt or metal tube of the right size in the hole for the carbon tube.



This allows you to sand the contours easily. Once you are happy with the results, soak the joints with cyano, to make sure it all sticks together properly. The carbon tube is NOT fitted yet!



After the dust clears, this is what you have..

Now take the wings and with the aid of the stress-plate, mark and drill the

holes for the M3 wing-bolts. Also sand the fuse sides slightly to follow the contour of the wing. (V-shape)

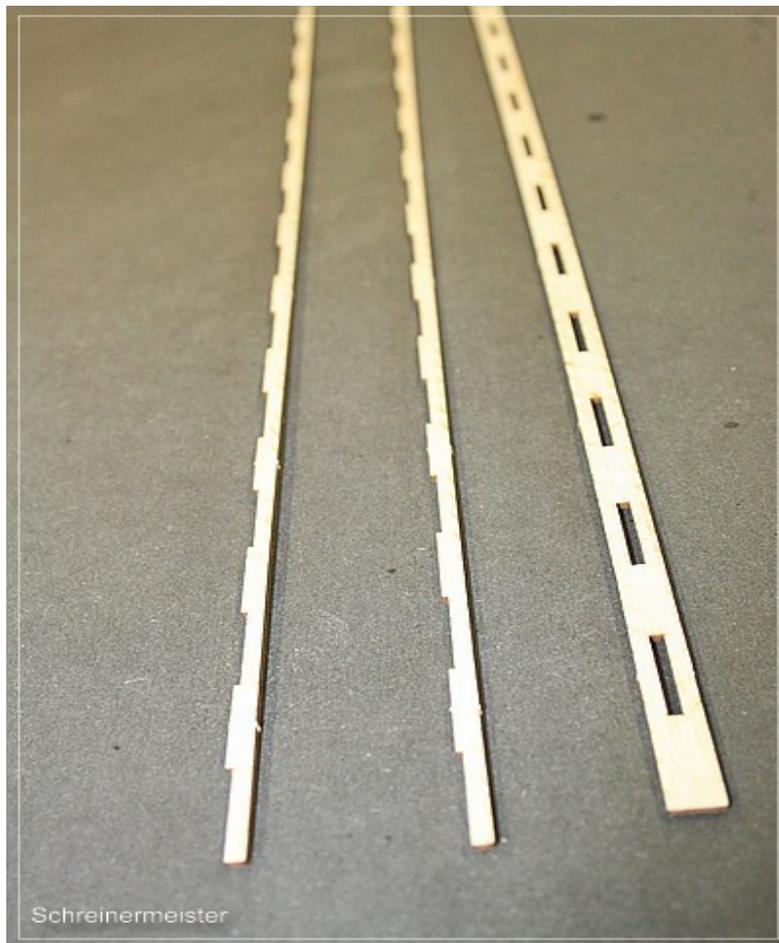
I like to cover the wing-bolts with some grease, and use epoxy to stick down the mounting plate. This will ensure that it is positioned correctly. I do this after I fit the tail section, however, you can do it now and twist the tail/boom if needed. Whatever makes you happy!

If you have a rough landing area, it is a good idea to cover the fuse bottom with glass cloth. (or use the famous strapping tape over the covering, this works miracles and is a lot easier/quicker to apply.

Carbon tail boom

This is where the magic starts. To make it extra strong, a balsa cross is inserted in the carbon tube.

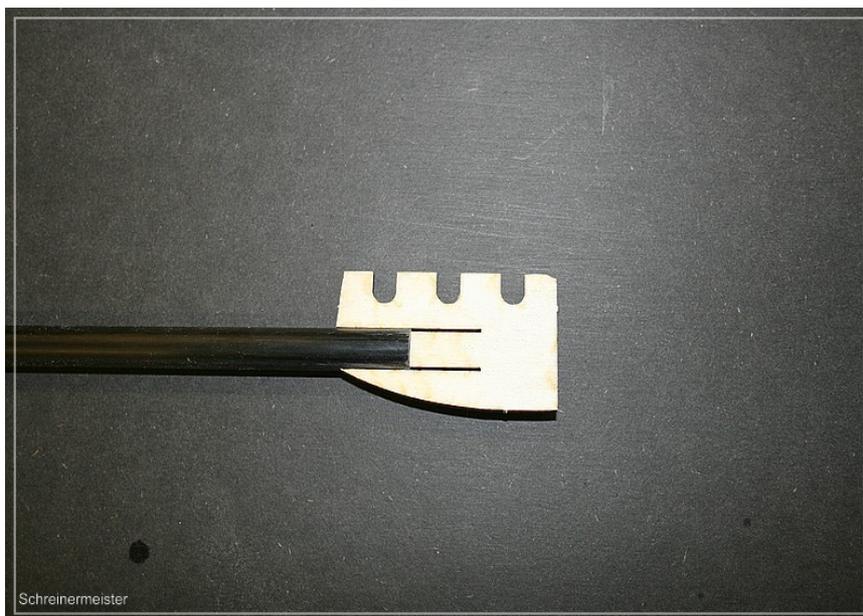
Assemble the parts dry on a flat surface. Don't break anything.



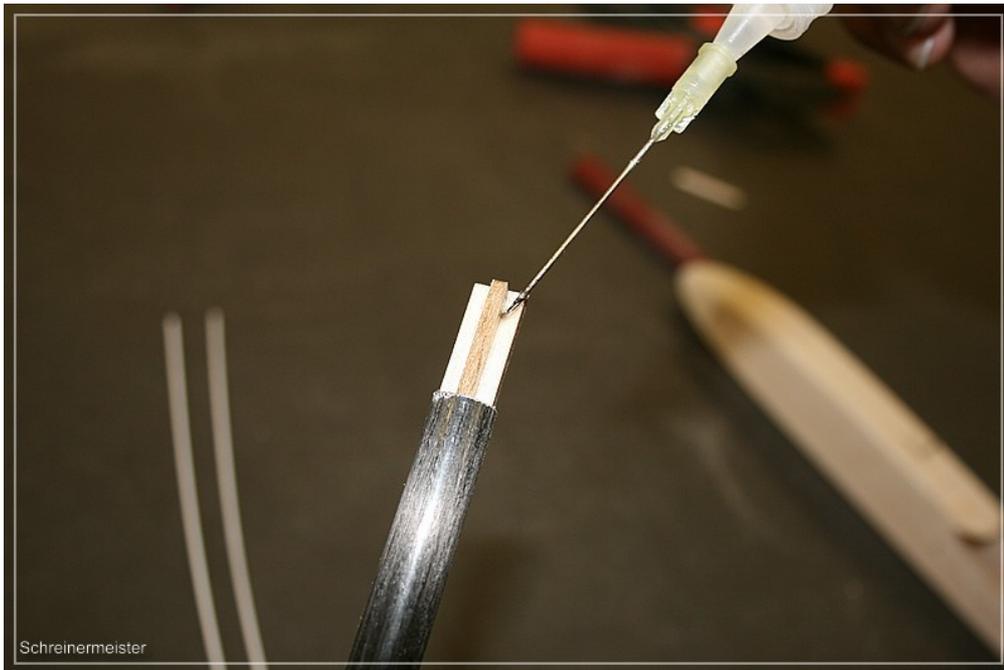
Insert the dry assembly into the tube, as far as the funny looking bot of plywood that is used to secure the fin.



That bit ...



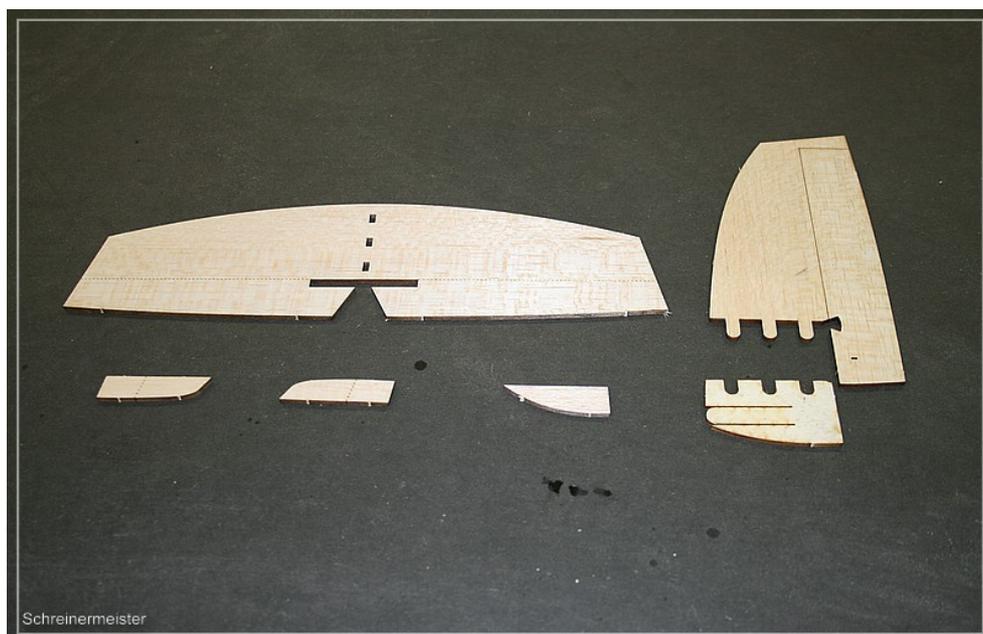
Now remove this part, leaving the cross in the tube. Next, make sure you have enough thin cyano. And be prepared for glue to run out of the carbon tube, so please, do not do this procedure on the living room carpet.



Somewhere outside would be a good place to do this! Gently pour glue in the tube, while at the same time rotating it. You want to be sure that this balsa cross is glued all along its length. The more the better! And do be careful not to get glue on the outside of the tube. It is recommended to close the end of the tube, so you get a chance to make the glue go where it is needed. After this messy job, leave the tube somewhere where the excess glue can drip out, and let it harden properly. If you live in a moist environment, I would think the amount of glue hardening will create quite a bit of heat.

Tail section.

Not much to say about this.



Insert the plywood connection between elevators, but make sure you only glue it to the elevators, and not to the front stabilizer. Assemble, and sand the rest to contour. Round the Leading edges, and taper the Trailing edge of elevator and rudder. Chamfering the elevators should be easy while they are still attached to the stabilizer. The dotted laser line should help. When you are happy, separate the elevators from the stabilizer. Chamfer the elevator LE according to plan.

The top of the fin is now pushed through the elevator and secured at right angles with cyano. The next bit is tricky. You must glue the rear plywood section into the carbon tube, but it also has to be accurately lined up with the rest of the fin. I would assemble the complete assembly, (plywood bottom fin and fin, and put the completed assembly into the carbon tube. This will make it a lot easier to align. Use good epoxy here. Since this is also the bit that you hold when you launch the DS, it is important to make this glue-joint strong!

Once the epoxy is dry you can insert the 2 control-rods, one each side of the rudder, they should fit in the space left by the cross fitted earlier. They should extend approx 5 mm from the tube at the rear.



If you want to make your life easy, I would cover the fuse-pod now, when it is still easy to handle. Carbon-Oracover is the favourite, but that's just for looks!

Only now are we going to glue the carbon-tube inside the fuse-pod. Slightly roughen the outer surface where the glue will go. Think ahead now, make sure that when you insert the tube, no messy epoxy can get into the pushrod-tubes! (You might want to leave those pushrod-tubes until you have completed this step. As always, there's a fast way and a safe way. You pick the one you like. Either way, make sure the pushrod wires end up where you need them. Once the boom is secure, remove the wing and add more glue around

R3/4. Again, remember the Flitschenhaken in front. If this section is not secure, the Flitschenhaken will depart on its own, while you hold the rear end! However, those living near a tall mountain will simply throw the DS off the side, and not worry about the Flitschenhaken.



The rudder horns are not fitted yet!

Final fitting:

Extend your aileron servo cables with the wire supplied (cut off the servo plugs and solder the extension wire.)

Cut off the mounting lugs from the servos, wrap 2 layers of sellotape around the servo, rough the surface up slightly and glue the in position with some epoxy, in the holes provided in the wing-skin. Before glueing, make sure the servo arms are positioned properly by turning on you radio etc. You also want to think about the 'zero' position of the arm. (if you have one of 'those' radio's it's 30% sub-trim from centre. See below) It appears to be slightly rearwards, to allow you enough 'down' aileron for the flaps.

Here's my trick for positioning the servos.

Bend a U-shaped bit of wire. (visit the guitar shop, and buy some nice thick steel strings. You never knew how handy those strings are till you used them!) One side goes through the servo arm-hole of your choice, the other extends to exactly the hinge line. If you use the same wire to position both aileron servos, they will be mounted exactly at the same distance from the hinge line.

Experience has shown this to be a good time to cover the wing, before fitting the aileron-horn. Use only enough heat to fix the covering, too much heat

*WILL distort your wing, and you will be flying a pretzel. The hinges are nothing more than decent quality sellotape. (Trial and error is the word here.)
Fit the ailerons before making the push-rods.*

Next, bend a slightly longer U, that extends to the servo-arm hole. Since the servos are properly positioned, using this longer U-piece to position/glue in the aileron arm will again make sure they are the same on both wings. You will argue that you can 'fix' problems with your radio. Sure, but it's a lot easier to build things properly. Trying to get the flap position (full down) correct with improperly positioned arms is a real PITA.

Radio-gear:

4 pcs D47 or similar.

Battery: 1S lipo. (2S if it fits, D47's work fine on 2S)

1S might not be enough for a 2,4 GHz radio.

Aileron servo's. Set up 30% rearwards with subtrim. Make the pushrods from 0.8 mm piano wire.

Use similar wire for the elevator/rudder. Use the inside hole on the servo's. It's all quite tight in there, be careful.

Movements: Elevator: +/- 3 mm, Rudder: +/- 12 mm, Aileron: 12/ 8 mm.
Expo/Differential/Flaps to be adjusted to you liking.

C of G: 72 mm from the Leading edge. As always, this value is a safe value to start with, adjust to you liking. Make sure you have trimmed the model properly before trying anything with a bungee. Mountain people have it easy: just toss it over the edge and fly..

The bungee start is something not to be taken lightly. Things go fast and you have no time to correct if the plane decides to head for terra firma. Look at the video's showing how a good launch is done. If in doubt, start gently, until you get the hang of it.

<http://www.youtube.com/watch?v=iFMbMQsOyTE&feature=fvw>

<http://www.youtube.com/watch?v=SsVkBD1apmc&feature=related>

<http://www.youtube.com/watch?v=r1d5ce0TgQ4>

<http://www.youtube.com/watch?v=LQwITT8pyRQ&feature=related>

<http://www.youtube.com/watch?v=itKrUsPJNn0>

but not like this:

http://www.youtube.com/watch?v=QkQ_tS21jDs&feature=related

