

Dear Model Making Friend,

Congratulations on your purchase of the **Tango**. This model been developed with state-of-the-art computer aided design, and manufactured using CNC milled and laser cut parts to create a kit that builds into a strong and accurate structure. Even a less experienced modeler can successfully assemble this great model in a reasonably short time.

The assembly mainly uses thin cyano but some parts ie the Wing plug, motor mount etc should be glued with epoxy resin.

The **Tango** is an extremely good-natured glider with very good flying performance and, with its large spoiler, can be landed very slowly and precisely.

Contents of the kit

The kit includes all parts for the structure of the aircraft.

Other items required are:

- RC system with at least 6 channels (some users recommend a higher channel count so that the two flaps can be set up individually).
- Complete electric drive: motor, ESC, folding air screw with 40mm spinner.
- Covering (e.g. Oracover)
- Cyano, Epoxy resin, White glue

Recommended drive train:

The motor should not exceed 30 mm diameter, it must have a front mount and should weigh between 1200 and 1700g.

Some possible examples are:

- Hacker A20 EVO with 3S LiPo
- Staufenbiel X-Max X28L outrunner.
- Staufenbiel DYMOND MASTER HQ 2838 or 2832.
- Poly Tec 400 F5J Motor 2-3S LiPo

Controllers and air screw according to Manufacturer's recommendations.

Recommendation Servos:

4 off KST DS135MG wing, 4 off servo mount frame.

2 off KST DS145MG elevator and rudder.

Recommended control throws (measured at the end of the control surface)

Elevator: +/- 12 mm / Landing mode - 1-3 mm, must be added

Rudder: +/- 30 mm

Aileron: + 15 / - 10 mm

Aileron offsets: Landing +8mm/Speed +2mm/Thermal position -1mm

Flaps/airbrakes: Landing -90° /Speed Position + 2 mm /Thermal position -1.5 mm

Technical data

Wingspan: 3150 mm

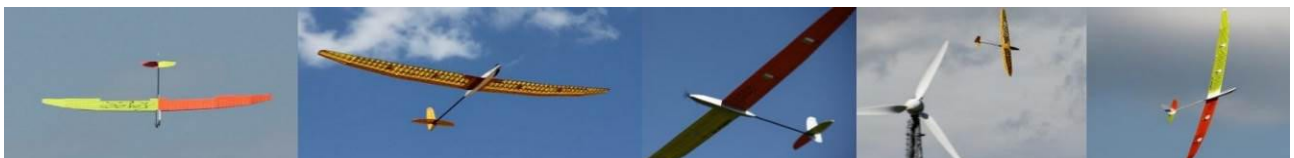
Length: 1265mm

Weight: 1550g

Wing loading 24.5 g/dm²

Aerofoil: HQ 30/11-10

Have fun building!



Tips and tricks

A few tips for building the model. Please read carefully.

During construction, it is recommended to look back at these tips from time to time.

Due to the plug-in system, it is difficult to make mistakes in assembly. We also recommend that the joints be made initially with only 1-2 drops of thin liquid cyano. Then check everything is correctly aligned and only after that should the component be securely glued. Since the thin cyano soaks through the joint it can penetrate to the work surface and glue everything down. It is helpful to work on a surface that resists glue penetration and can be detached from the components. A layer of greaseproof paper or florist's film is helpful here. You could also use cling film, this does stick to cyano but can be carefully stripped off afterward.

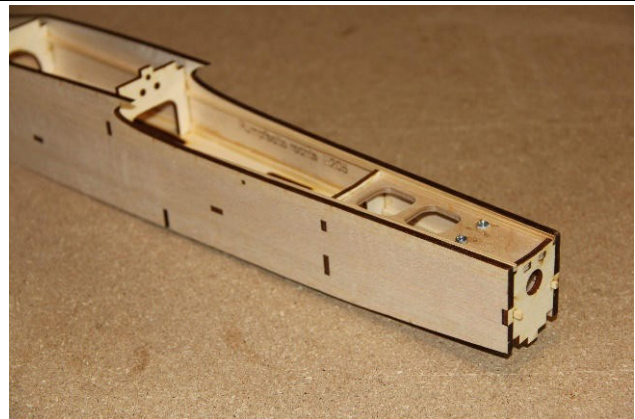


Apply clear tape to the outside of the joints then glue from the inside. The tape may then be quickly removed leaving a secure joint.

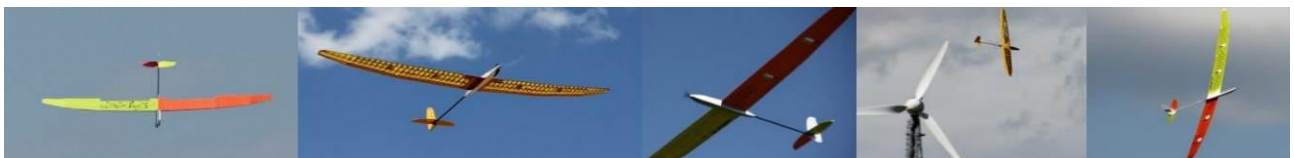
The interlocking structural design produces an extremely stable cell, which provides the fuselage with excellent rigidity. As a result, the fuselage can be built up without distortion.


The wing fixing is by dowels passing into the fuselage former and nylon bolts.


Note: The fuselage longerons are only inserted when the side walls are assembled, being inserted from the rear. Therefore, when gluing the fuselage sides be careful not to allow glue to block the longeron notches.





In order to strengthen the wing root, a 0.4mm plywood reinforcement is used. To clear the wing mounting plate in the fuselage the wing surface must be sanded back in the area of the mounting screws otherwise a snug fitting of the wing to fuselage will not result.

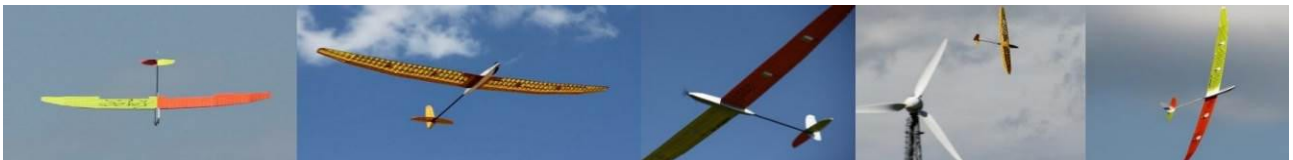


<p>Attention: The fuselage sides are different lengths. This is to allow for the side thrust. You must assemble the fuselage with the shorter side on the right.</p>	
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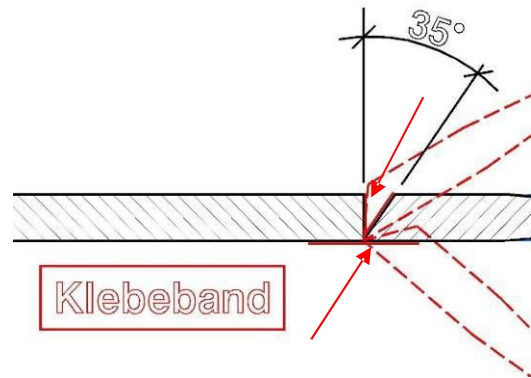
<p>The center of gravity is 80mm from the wing leading edge. The holes in the fuselage side serve as a balancing aid.</p> <p>With the center of gravity balance included in the kit it can be easily checked and adjusted. The model should sit in a slightly nose down attitude when supported by the balance rod passed through the balance and the holes in the fuselage.</p> <p>The last picture shows the dihedral support for the outer wing panel.</p>	
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<p>To allow the thin liquid cyano bottle to dispense precise quantities of glue insert a hypodermic needle into the nozzle and secure with tape. Needles should be available at your local pharmacy. Should the needle become clogged you can carefully burn out the blockage using a cigarette lighter.</p> <p>Caution: Please refer to the manufacturer's safety instructions.</p>	
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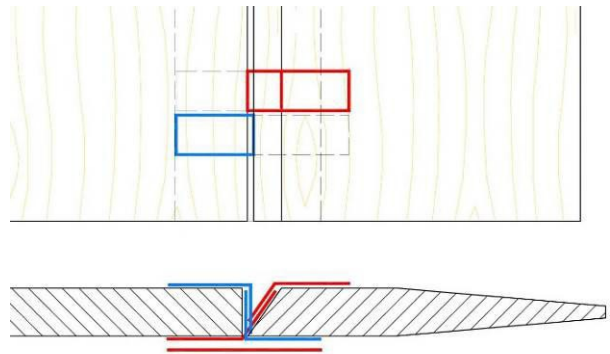
<p>We recommend ORACOVER for the covering of the flying surfaces. For details of the best methods for applying this covering please refer to the Oracover website. (http://www.oracover.de/) Here you can check out the range of colours.</p>	
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Control hinges may be made using adhesive tape (normal scotch Tape) by applying Inside and outside you get a good hinge. It is also possible to use the covering film to create the hinge. Check the internet for the techniques for doing this.

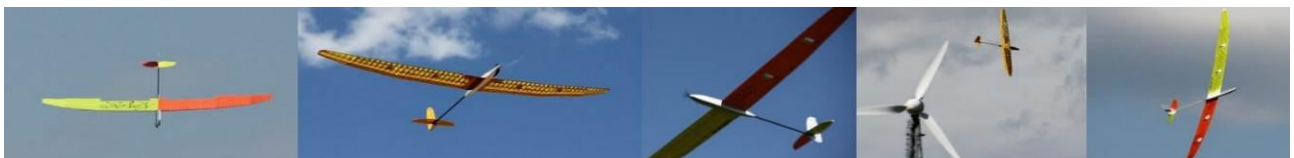


Another alternative is to cross the tape. Use 2 narrow strips of tape with 3mm overlapped and the adhesive areas stuck together. Then use pairs of the tape strips crossed over and under as shown. Use several pairs on each control surface evenly spaced over the span. This is a little more elaborate but gives a longer life.



Warranty and Liability

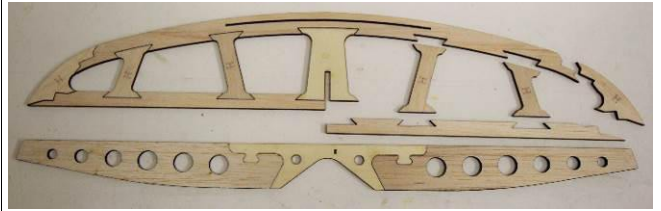
Should a part have been damaged during delivery we will of course replace it. All parts can also be reordered. Describe the required part briefly or take a photo to make an order. Unfortunately we cannot give a guarantee on the aircraft since manufacturers and sellers have no influence on the proper construction and operation of the models, any liability is excluded.



Standard tail

It takes only about 15 -20 minutes to assemble the tail surfaces.

Dry assemble the wooden parts on your building board and then glue with cyano. As cyano can penetrate through the whole joint you need to ensure that the component does not stick to your building board – see note above.



The rudder has a Reinforcement of 0.4 mm plywood glued to its lower area.

Note: Position the plywood over the rudder and fix with a small drop of cyano in the center cutout. Then lift the plywood at the edges Insert glue and press it back into position. Before fitting the edges of the plywood may be beveled on the outside surface to produce a feather edge as this will blend in better with the surface of the rudder when covered.

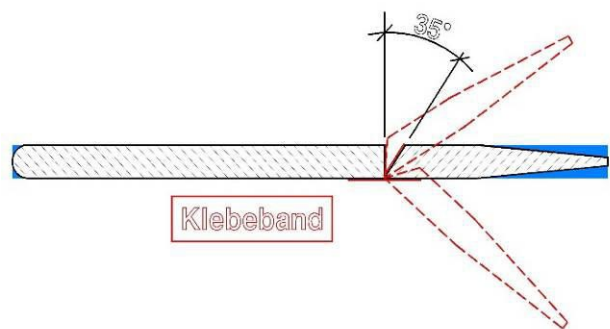
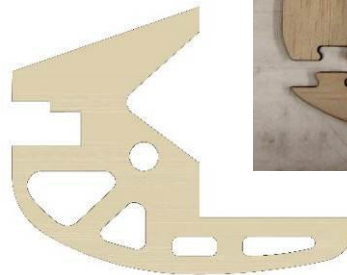
For better aerodynamics, the leading edge of the fin is rounded. The trailing edges of the rudder and elevator are tapered evenly on both sides leaving about 1mm thickness at the TE which is then rounded off.

The elevator and rudder hinge lines are sanded to 35 ° to allow clearance for the surfaces to move.

The surfaces of the parts are finished with a fine Abrasive paper (220 grit or finer) with the help of a sanding block to give a smooth surface.

The drawing shows the section required with the leading edge rounded and the trailing edge tapered. The blue areas need to be sanded away.

The drawing also shows the 35 ° angle at the hinge line. The hinge tape should be applied after covering and assembly to the fuselage boom.



Installation of the tail surfaces onto the carbon tube:

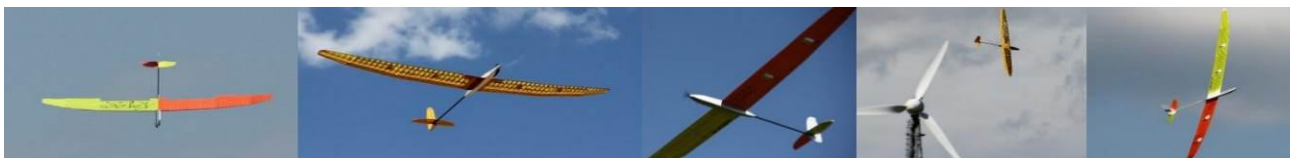
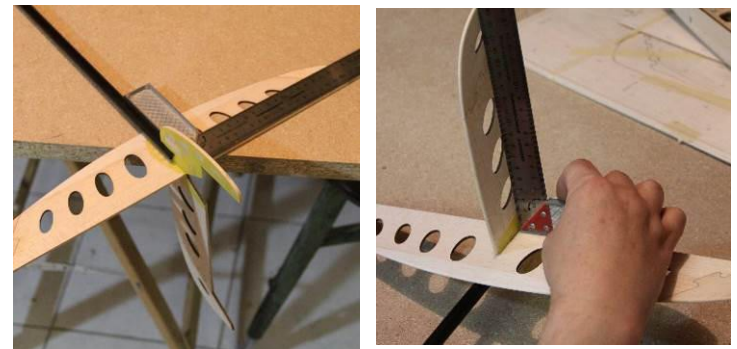
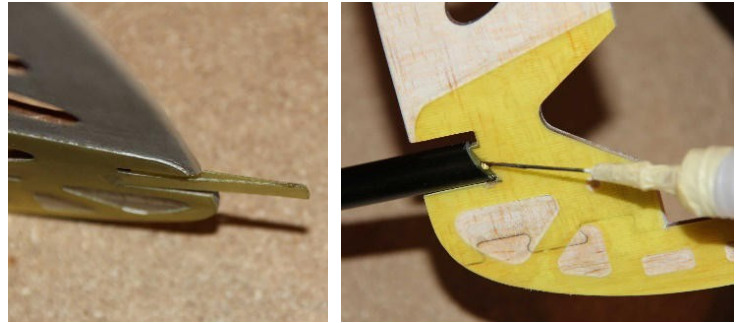
First, glue the two plywood strips on fin with a drop of cyano.

Note: The pictures show Extensions to the plywood reinforcing piece that extend into the carbon tube. The kit is supplied with the reinforcing pieces cut without these sections, so it may be necessary to add these pieces separately.

When assembling the tail surfaces.
Pack up the fin by 4mm whilst gluing to the fuselage boom.
(Use the fuselage hatch cover)

Now you are introducing the tail plane. it Should not be too tight in the slot. If it is, then ease the fin slot a little. The tail plane must be glued in at right angles to the fin and the fuselage boom.

Important: Before joining the fin and tail plane to the carbon tube, carefully remove the film from the joining areas with a soldering iron or knife.



Fuselage structure

Glue the formers 2 and 3 and the servo mount at 90 ° with small drops of cyano.

Don't put on the base!

The kit provides a plywood angle gauge, with the angles needed for construction.

Note: The fuselage side is labelled on the inside.



Tack glue the laser cut battery support and former 1 to the assembly but do not glue the battery tray to the fuselage side.

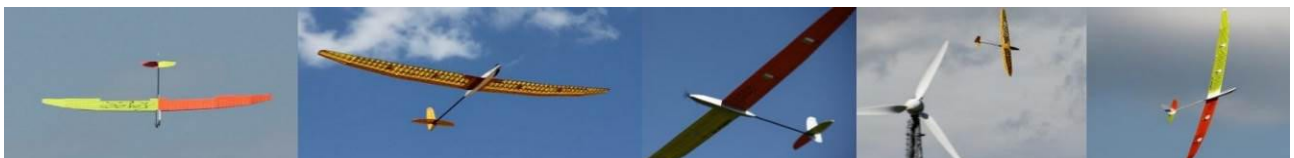



Press the spine nuts into the underside wing support plate and fix onto the fuselage side. Ensure the nuts face downwards, see picture.

For added security the nuts should be glued in place with Epoxy Resin.

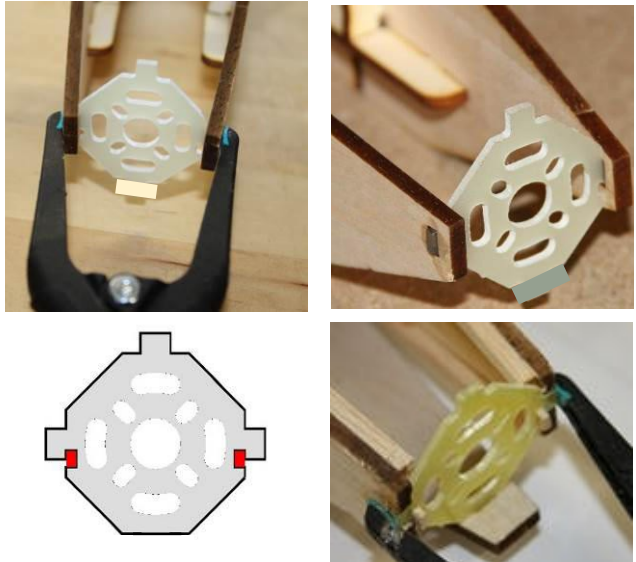


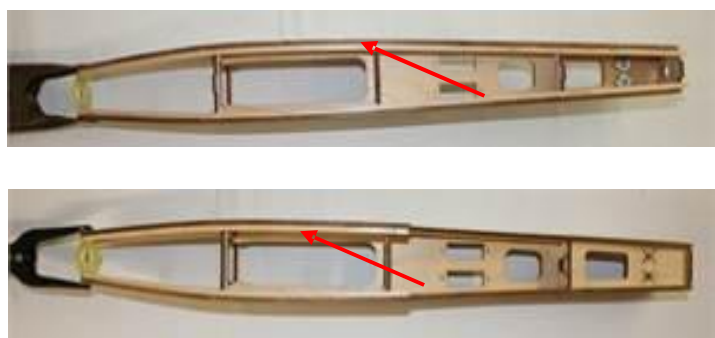
Add the second fuselage side.



<p>Carefully clamp the fuselage sides to the internal structure and securely glue. For a firm joint Leave to dry for longer than usual (2-3 min). (Instead of clamps a large rubber band may do.)</p>	
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<p>Glue the 3-piece fuselage bottom together on a flat board.</p>	
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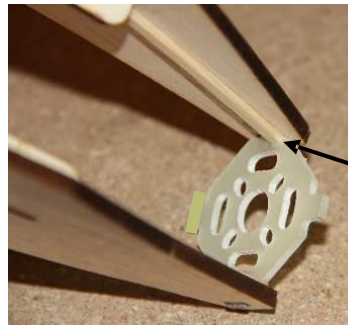
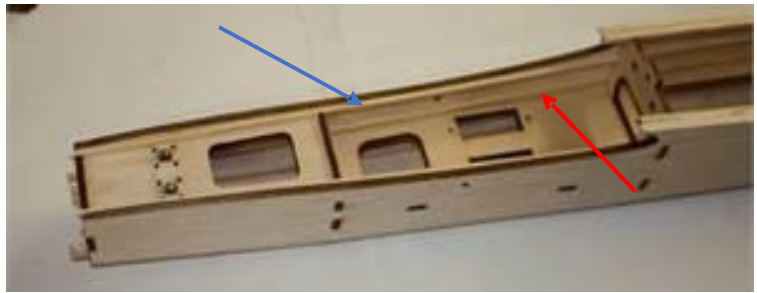
<p>The motor mount is fitted in the locating holes in the sides. Assemble and clamp together. Should one side be stiffer than the other resulting in an unequal curvature, then brush the straighter side with warm water on its outside in order to achieve an equal degree of bend. Glue with Cyano and leave for 2-3 min to dry. You may use the fuselage floor to correctly align the engine mount but do not fix it at this stage. Note that the motor mount is not at right angles to the fuselage but is angled to the right in order to give the correct right-thrust to the motor.</p> <p>NOTE: The additional notches in the motor mount (shown in red on the picture) must be positioned on the lower part off the fuselage mounting tabs. These will later take the 3x2 mm fuselage longerons.</p>	
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<p>The 4x4 mm balsa strips are now inserted into the notches in the bottom edges of the fuselage, and when properly inserted the joints are soaked with thin cyano. They may then be sanded flush with the fuselage sides.</p> <p>Similarly, fit stringers to the fuselage top.</p>	
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When inserting the 2x5 mm pine strips, it is easy to break the formers due to the square ends of the strips. It is therefore a good idea to slightly taper the ends with sandpaper before inserting them. They should then be inserted from former 4 through the whole length of the fuselage until they pass through the motor mount and then be glued in position. Due to the curve of the sides it may be useful to use a few clamps to hold them in place while gluing.

Note: The edges must not protrude above the sides in the area of the wing seats.



Zuspitzen

Now while the interior of the fuselage is still accessible reinforce all the joints with thin cyano.

Add the fuselage bottom, using Cyano.

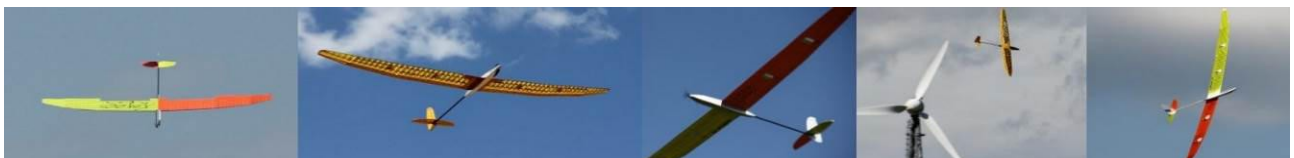
Reinforce the joints between the motor mount and the sides and bottom with 5min epoxy. Do not get Epoxy on the rear face of the motor mount where the motor will fit as this needs to be perfectly smooth to allow the motor to align properly.

Fit the fuselage top. (use epoxy for the motor mount joint).

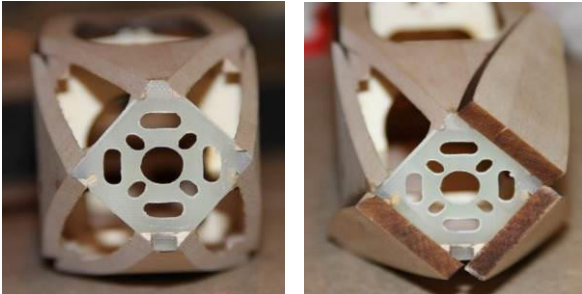
Taper the end of the fuselage top to a thickness of about 1 mm and blend in with the fuselage sides. Also trim the balsa stringers to match the sides.



Add the reinforcing former 2a being careful to accurately align the 4 mm holes.

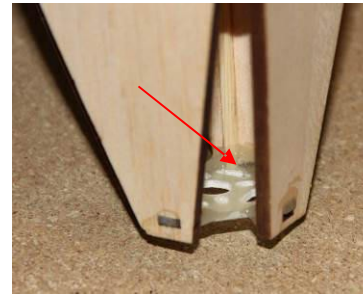
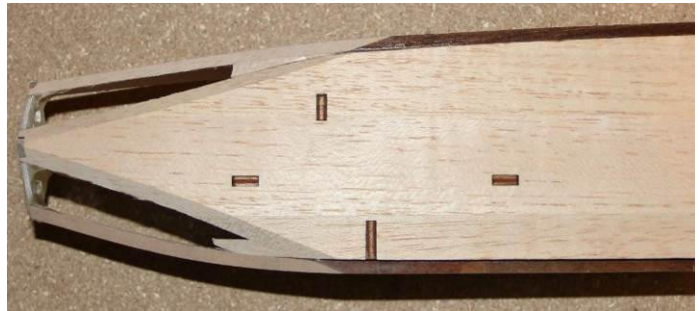
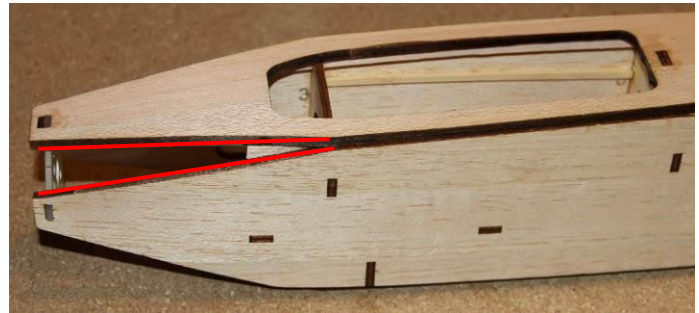


Now break out the sanding block and sand down the triangular sections at the nose end to meet the edges of the motor mount. Do not remove any material from the mount itself.



The 6mm balsa pieces can now be glued in place. Before adding the last piece reinforce all the motor mount joints with epoxy. Be careful not to get epoxy on the inside surface of the mount where the motor will fit.

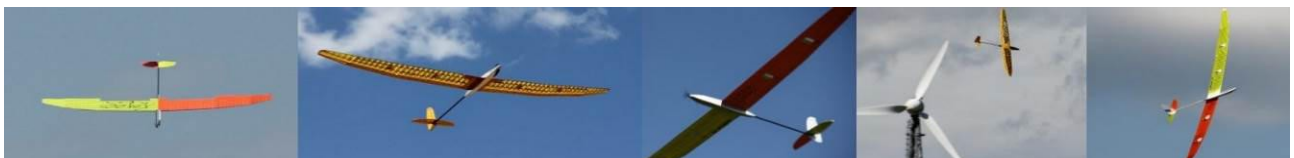
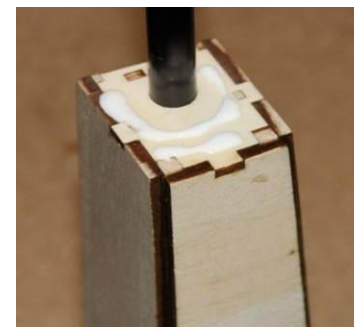
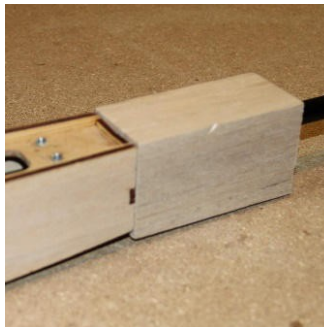
Once the glue is firmly set then sand down the overhanging pieces of the sides and blocks flush with the front of the motor mount and epoxy the nose ring in position and sand the outside of the nose to a pleasing contour.



Sand the rear end flush with former 4.

To attach the rear block. First thread the carbon tube through the block. Next apply white glue to the rear former. Fit the block in position using the carbon tube through the hole in the rear former to achieve a perfect fit. Before the white glue sets, tack the block in position with a few drops of cyano applied to the outside edge and then remove the carbon tube and clean its outside of any white glue residues. The fuselage should now be put aside to allow the white glue to firmly set.

ATTENTION: Do not glue the tube in yet as this must be done later!



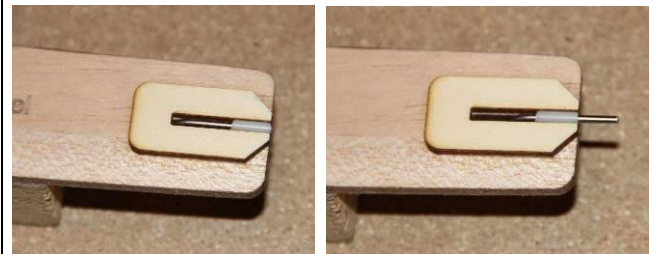
Add the doublers to the fuselage hatch, the positions are engraved on the hatch inside.

The plastic tube is supplied full length and should be cut after assembly. Slide the wire catch into the tube and epoxy the tube in position taking care that the bent portion of the wire protrudes through the slot in the hatch.

ATTENTION: Ensure that no glue comes into contact with the wire!

Once the glue is set cut off the tube flush with the end of the hatch, save the cut piece and fit into the fuselage in line with the hatch pin.

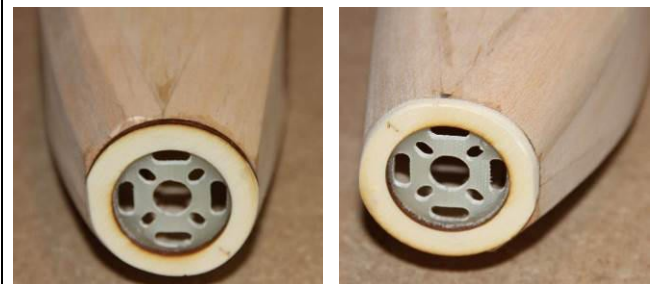
The cut off piece of the lid is glued inside the fuselage in line with the position of the metal pin once the hatch is in position.



The whole fuselage is now sandpapered to a nice, rounded shape.

It may help to temporarily mount the motor in order to blend in the fuselage curvature and make a nice shape. Be careful not to damage the spinner whilst working on the fuselage.

Shape the rear block to a smooth shape.

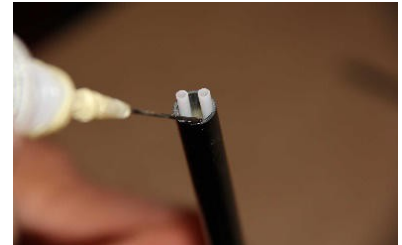
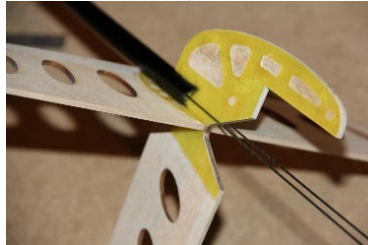
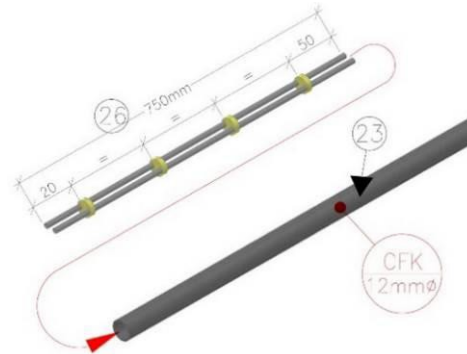


Mounting the tail boom

Glue the two control cable outers into the small circular spacers. They should be only lightly glued to avoid problems when installing the control system into the tail boom. Note the positions of the spacers shown on the photo.



The cables are fed into the tail boom from the front. In order to ensure that the controls exit on both sides of the fin the wires are fed in from the tail end and then inserted into the outer tubes as they are glued and fed into the tail boom from the front (Use epoxy). The outers should not appear outside the boom at the rear end and should show about 1cm sticking out from the front end.



Insert the tail boom into the fuselage so that it passes through former #3 by about 1-3mm.

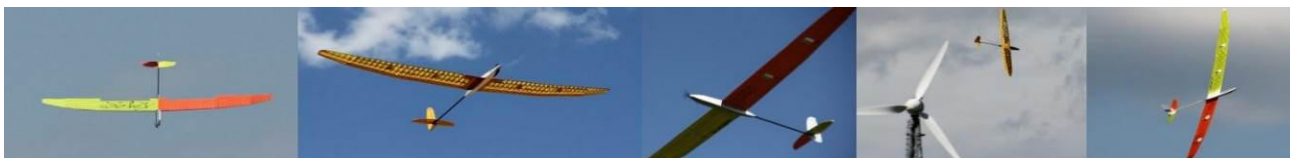
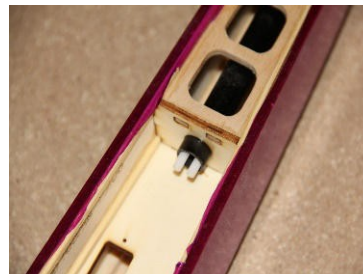


Place a straightedge across the wing seat and check by eye that the tail plane is exactly parallel to it.

Once everything is lined up, tack the boom in place with a little cyano at former #3. Once secure hold the fuselage nose down and drizzle cyano around former 3 to secure.

When the glue sets add glue from the other side, and also around the tail block.

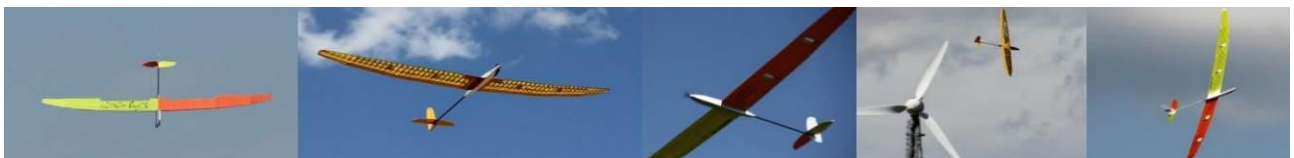
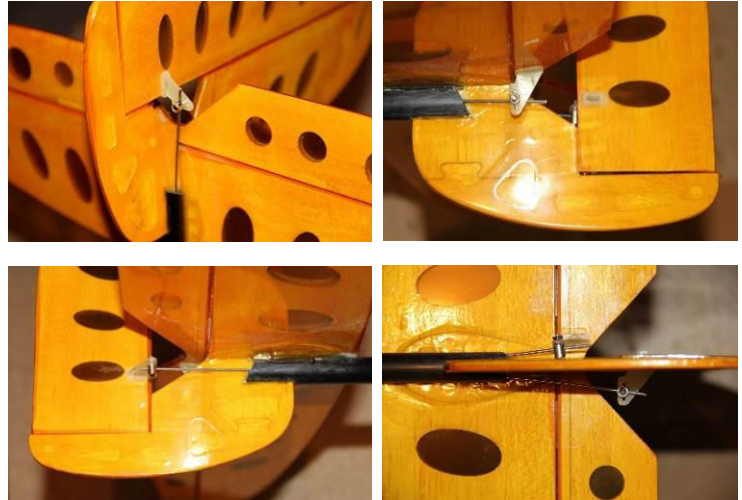
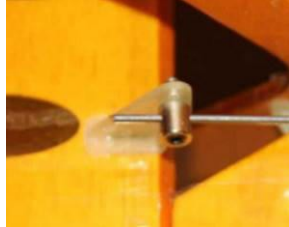
Note: The fuselage may now be covered with iron-on film in a colour of your choice



It is important that the elevator is hinged in place first as it would be impossible to fit it after the rudder is hinged.

Note: Refer to the earlier notes on hinging methods.

Note: that the photos show the control attached to the control horns using the screw connectors.



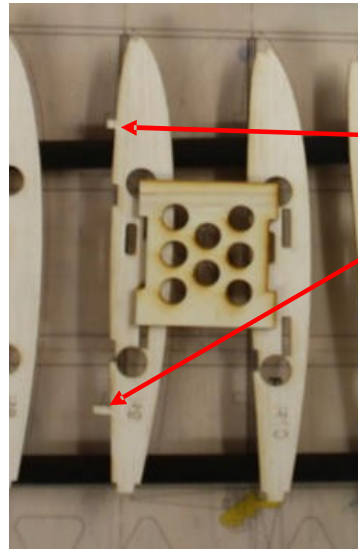
Wing

The photos show the construction of the right wing. The left wing is built up as a mirror image. The Plan is transparent and may be used for both panels by turning it over and using the other side.

IMPORTANT: The supporting blocks on the ribs are only provided on the end ribs, when the wing construction is completely finished they may be removed before covering.

The perforated servo mount must be inserted between the ribs before they are glued into position.

IMPORTANT: The dimensions of the plan can vary depending on humidity etc. As a result, small differences to the rib spacing may result. This is not critical to the wing construction. The only important thing is that the left and right wings are built exactly the same. Comb type rib placing jigs are provided in the kit and you may choose to build to the jigs or the plan whichever you prefer. We recommend using the jigs.



NOTE: The carbon tube spars are provided cut to length with only 1mm extra. Therefore, the spars should be positioned precisely over their positions on the plan needing only a very light tidying up after construction. Sand the surface of the spars in the areas to be glued.

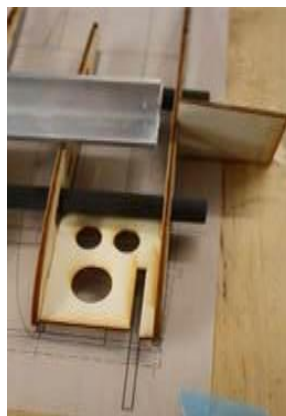


The ribs are threaded onto the spars in their correct positions according to their numbers supported from the building board on their jig tabs and positioned vertically (this may be done using the rib position jigs provided). The structure should be weighted down (eg. With a steel straightedge) to keep it true whilst gluing.



NOTE: The ribs are only permanently fixed to the spar tubes (using 2 hour epoxy resin diluted with methanol) after the trailing edge is fitted.

ATTENTION: The first and last rib may not be aligned using the (comb) jig they must be set using the provided angle templates to take account of the dihedral. (The plan indicates which angle to use on each end rib.)

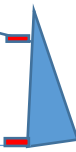


NOTE: Don't forget to include the Servo mount and the plate for the fuselage locating dowels whilst assembling the ribs

Add the two 4x2mm strips at the trailing edge for the support of the triangular flap support strip.



The triangular flap support strip is fitted against the 4 x 2mm strips flush with the bottom of the ribs and with the pointed side uppermost (See diagram).



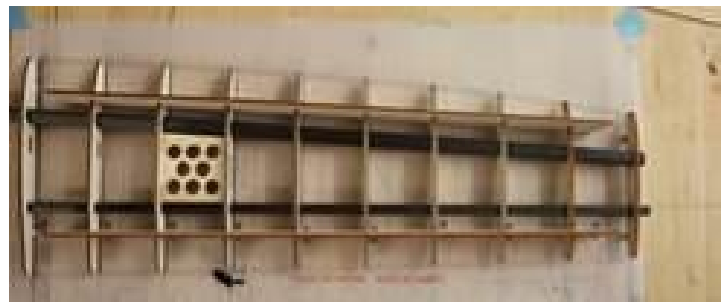
Glue in place the 3 mm carbon leading edge tube.

Turn the plan over and repeat the procedure for the other inner wing section.



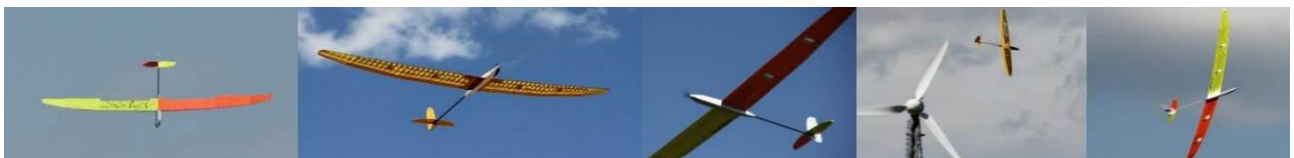
Mid Span Section

1. Fit all ribs on the 8 mm carbon spar
2. adjust the ribs over the plan using the (comb) jigs.
3. Carefully slide in the **12mm carbon spar**.
4. Add the servo mount.
5. Continue as per the inner wing panel.



Note: Angle the first and last rib with the angle jig as before.

Add the leading edge (3 mm tube) and glue.



The 4x2mm pine strips are a glued in place followed by the triangular aileron spar. contrary to the inner wing, this is fixed with the acute angle downward and the top edge flush with the ribs (see picture).

The aileron will be hinged to the top corner of this spar.

Turn the plan and repeat as before for the second mid-span panel.



Tip section.

Use the shorter 6mm carbon tube.

Again, angle the first rib using the dihedral jig.

Add the remaining ribs including the last with the (comb) jig. Also add the reinforcement between the last two ribs and glue.

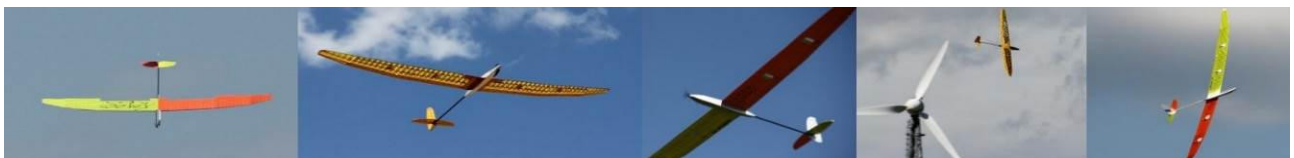
Add the leading edge (3 mm tube) and glue.

Sand the spars and leading edge flush with the end then add The tip block, this is made from the triangular block and is shaped to match the tip rib. Use sticky tape to protect the ribs whilst performing the shaping operations.

The wing joining tubes are threaded into the root ribs and fixed with a generous fillet of epoxy. Be sure to epoxy them to the spars as well as the ribs.

NOTE: At this point the German instructions mention the use of a brass tube. I can't find any other reference to this, but I believe it may be used if a plug-in tip is used instead of the permanently attached version shown.

Fit the triangular trailing edge piece and glue.



At this point don't forget to reinforce all the balsa- to-carbon joints with diluted epoxy if you haven't already done so.

Take the glass fiber spar connector for the 12 mm spar and fit the plywood part as per plan. The plywood serves as a centering for the connector.

Adjust the two connectors carefully to ensure that they fit perfectly into the spars or ribs.

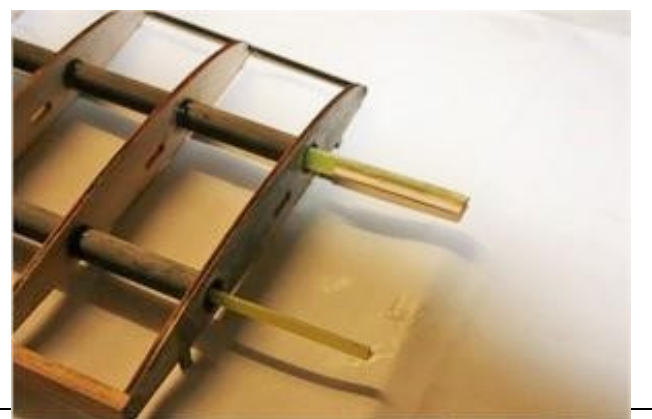
It should be enough to round the corners slightly. Check the fit of outer wing and that the ribs line up perfectly at the joint. First fit the spar connectors in the mid wing panel and leave to set. Then put the outer wing in place and glue. Use epoxy for all these joints.



The mid wing panel uses a similar technique to the outer section. The mid wing panel is already attached to the smaller outer wing.

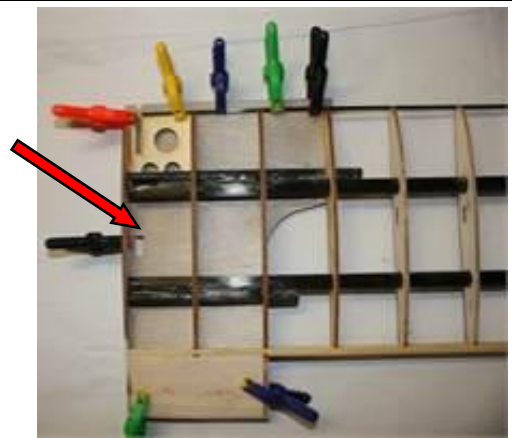
Glue together the fiberglass joiners and the plywood parts. The smaller part on the right sits at an angle to allow for the angle of the spar in the mid wing panel.

Insert and glue the connectors into the spars in the inner section. Let it dry before continuing otherwise, the connector will be pushed into the tube.





Fit the lower sheeting for the inner wing panel (with the cutout for the multiplex plug) as in the photo. At this point there is also a 3mm balsa Reinforcement to the thin plywood. Reinforce the joint with the leading edge with epoxy and chopped strand fibre filler.



Round one end of the 4 mm carbon wing locating pin (for easier insertion into the fuselage when assembling the model)

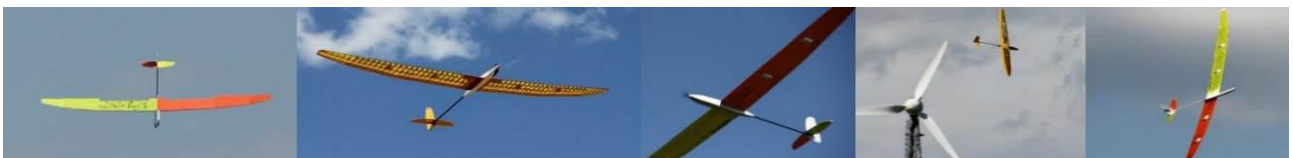
Glue in with epoxy, flush with the mounting plate.

Decide whether to install the servo wiring now or later.



Glue on the upper sheeting and sand the edges to smoothly blend in with the Leading edge. Sand the face of the wing root smooth and flush with the end rib.

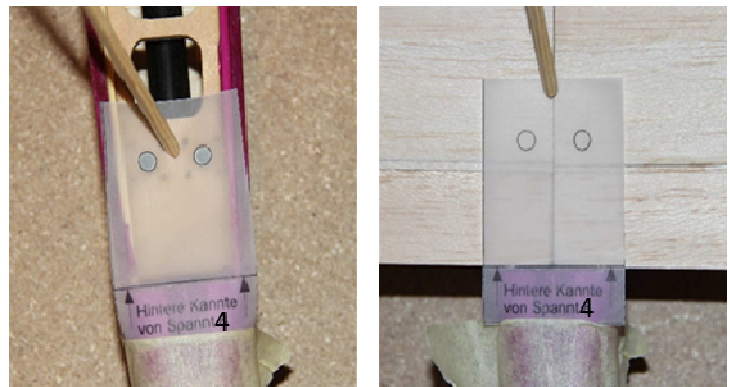
Trim off and sand smooth the small overlaps where the triangular trailing edge is glued to the 4 x 2 pine strips at the flap and aileron positions.



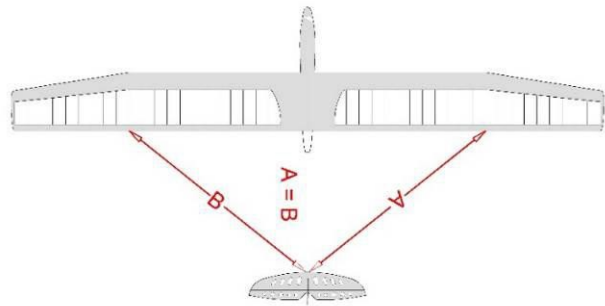
Final wing assembly:

The drill template is printed on transparent paper. Attach it to the fuselage with masking tape so that the hole positions match the spine nuts in the wing mount. The dashed line and reference to the fuselage side should help.

The important thing is that the holes match up, so it is a good idea to open up the holes on the template and temporarily screw the wing mounting bolts through it to ensure perfect alignment.



Remove the wing bolts and place the wing on the fuselage ensuring that it is accurately lined up by measuring from the tail to the wing tips and checking that both measurements are the same (See drawing). Once the wing is lined up, drill two 4mm holes through the wing in the positions shown by the template.

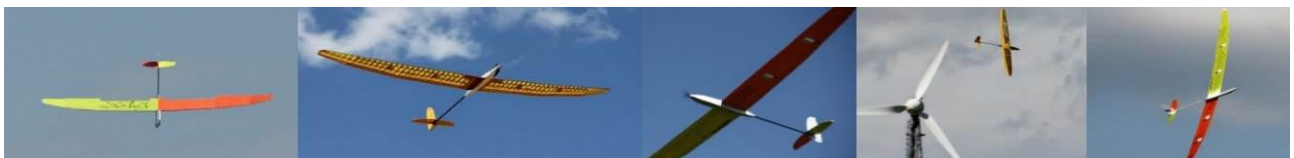


Now, check that the wing fits snugly onto the seat in the fuselage. It may be necessary to sand away some of the underside sheeting to clear the captive-nut plate. See picture. The wing may now be bolted onto the fuselage to double check that the alignment is perfect.

**Finishing**

Before covering the wings, insert the wing servos and the harness, the green 6 pin Multiplex plug fits flush with the lower planking. The ailerons and flaps are fitted after covering, then the fiberglass control horns with their reinforcing plates are fitted.

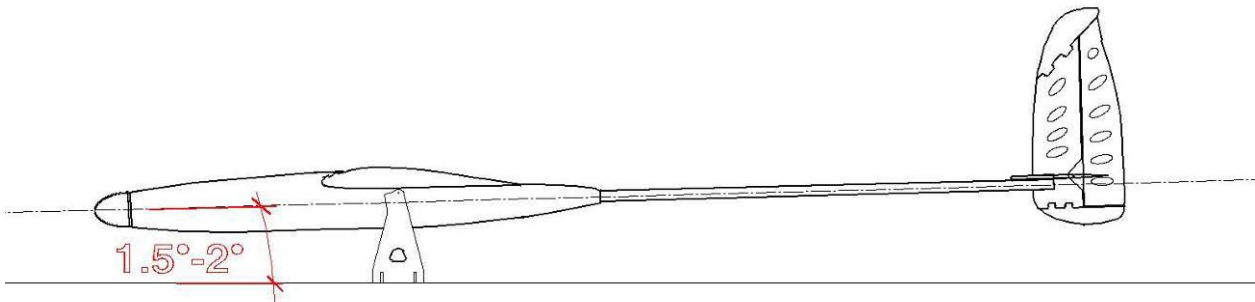
The model may be covered according to your individual tastes and creative ideas. Some examples may be seen on our homepage www.cad2cnc.ch



Centre of Gravity

Adjust the center of gravity by moving the battery or, if necessary, by adding ballast. The model should balance, as shown in the drawing, in a slightly nose down attitude.

The balance cradle and steel wire are included in the kit, with the holes precut in the fuselage sides.



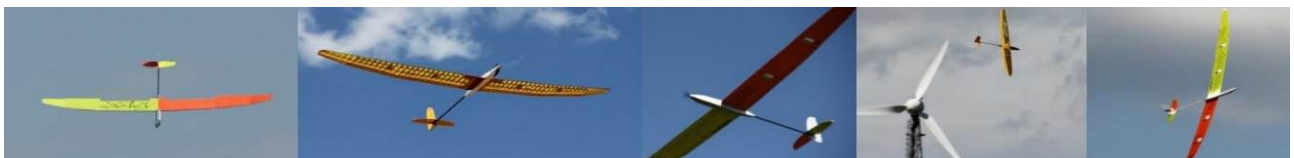
We are happy to show photos of your built-up **Tango** on our homepage.

If you would care to include short comment, that would be great.

Thank you very much!

We wish you a lot of fun when flying your Tango!

THE cad2cnc TEAM



A few personal notes from your translator:

On reading the reviews on Hyperflight's site I got the impression that the recommended power setups gave a fairly 'soft' climb and so I decided to go with a relatively inexpensive setup initially to assess the performance.

It would then not be the end of the world if I decided to upgrade later.

With this in mind I set it up with a Sunnysky 2216 (1400Kv) With an 11" x 4" prop giving me a power draw of around 300w. I found that with this setup the Tango gained height in a positive and safe manner – perfectly adequate for a sport model but a bit lacking for a competition machine. I assume that, since the international competition rules have been re-written to place more emphasis on conserving energy on the climb, rather than gaining maximum altitude in the minimum time, that these models are tending to be set up more in this way these days. This would not work too well for me since my club runs its thermal soaring comps to a set of rules that still favour fast climbing models.

After initial test flying, therefore, I re-motored my Tango, with Hendrych/Tenshok 450 on a 4.14:1 gearbox turning a 13x7" prop. This draws nearer to 400w but it did mean I had to buy some 75c 1300 x 3S LiPos since my old 40c packs couldn't maintain their voltage at the current required, meaning that the ESC would prematurely cut the motor. This now gives a much more positive climb. Still not quite the 'rocket' climb of some of the more expensive mouldies but, along with the superb glide of the Tango, I now feel that I have a competitive model.

The other slight issue I had was that, with the CG set as advised, I found the model very nervous on the elevator control. Even with a substantial amount of exponential set, I was still struggling to fly the aeroplane smoothly. With the new power-train the CG moved forward about 10mm from the recommended position and this made the handling much smoother and more to my taste.

I still have much fine tuning to do but, even at this early stage, I'm sure I have a potential winner.