

## Slingshot RG20/900 DLG EPP Wing Build Instructions

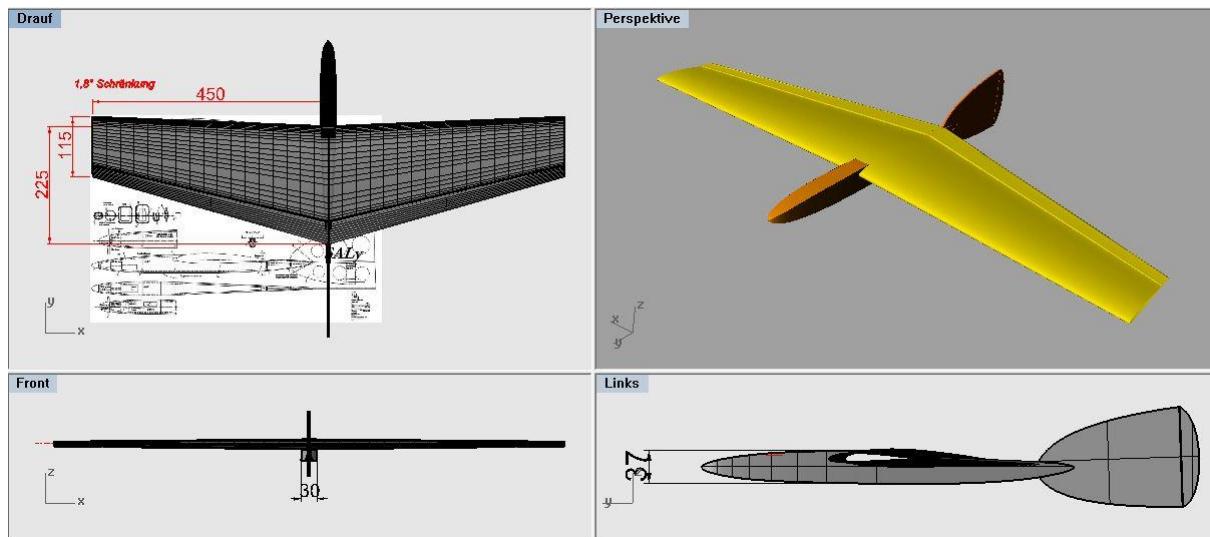
Kit supplied by **Causemann Flugmodellbau**

### 1. Introduction

These build instructions are for a rugged bolt on wing design for ease of transport / storage and covered in laminating film. Servos top mounted and a 1S LiPo embedded in the fuselage. This is an experienced builder's model, so feel free to use and adapt these instructions to meet your needs and experience.

The traditional EPP wing build is to reinforce with a carbon spar for rigidity, spray with contact adhesive, cover in fibre tape for strength and then cover with coloured packing tape for colour and protect the fibre tape from Ultra Violet sunlight. This gives a very rugged, but heavy structure that can take knocks and keep on flying.

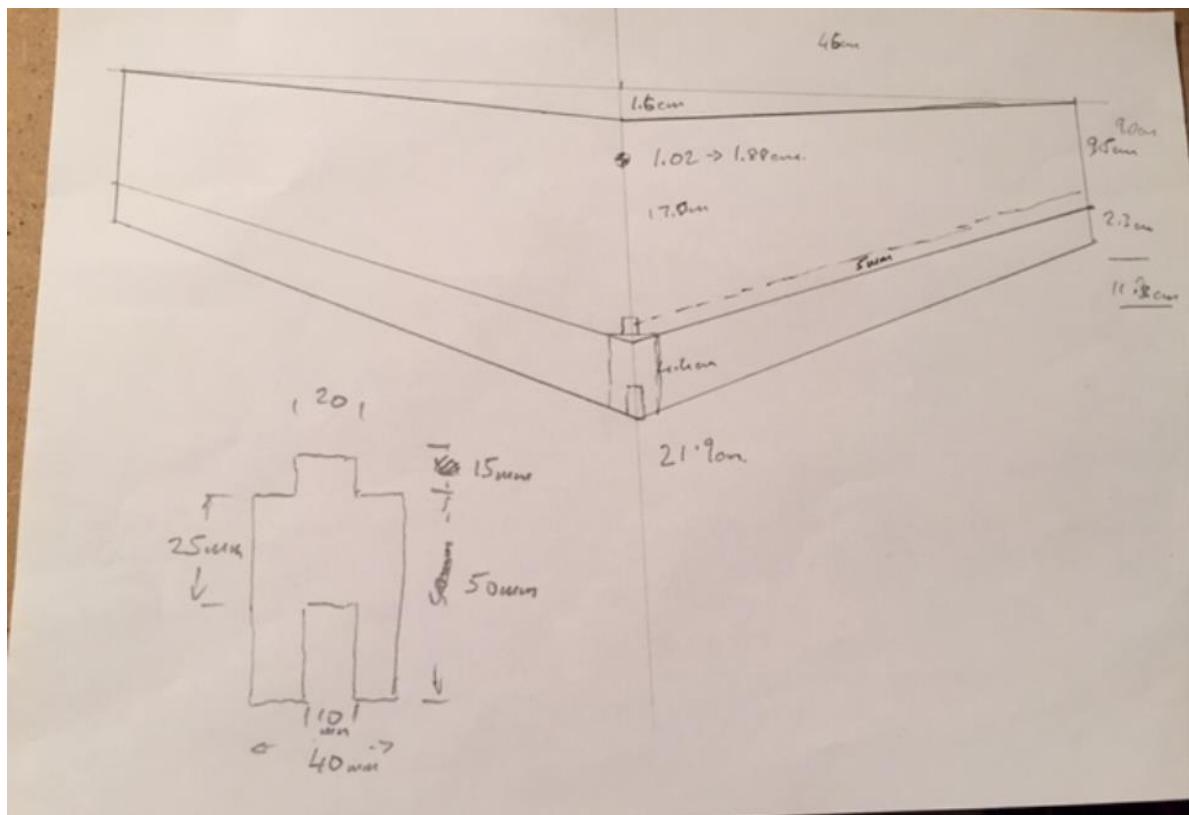
For this build I wanted something small, light and easy to transport / store using laminating film.



### 2. General Design Layout

The EPP Wing kit includes a sheet of 2mm balsa for the 2 ailerons (43mm at root and 23mm at tip), plus a fixed centre section that will be used to fix the trailing edge to the fuselage. This centre section can be used as the bolt down point for a 5mm nylon bolt.

I cut 5mm off the trailing edge of the wing to get a clean edge and match the 2mm thick ailerons. I would say this was too much and 2mm would have been better.



*(Note: Needs to show the position of the carbon wing spar 40mm @ root and 30mm at tip as a curve. The C of G turns out to be 20 – 25mm from leading edge.)*

### 3. Gorilla Glue Tips

Use Gorilla Glue to join the EPP with anything. This glue foams up when it comes into contact with water. First make some puncher holes in the EPP so the glue can grip the EPP. Wet with water using a small paint brush. Apply Gorilla Glue to both surfaces and spread with a small stick. Try and force the glue into the puncher holes. Push the 2 surfaces together, remove as much excess as you can. Hold together with masking tape until hardened. As the glue foams it will try and expand and push the surfaces apart.

### 4. Wing

The EPP wing cores may need a little heat from a hair dryer to remove any warps. It would be better if the kit came with the female cores they were cut out from so the wing can be supported both in transit and when being built.

You may need to trim a little off the trailing edge to get a clean sharp edge that's a little thicker than the 2mm ailerons. I removed 5mm which turned out to be too much. 2mm would have been better.

Start by rounding off the wing tips using sandpaper. A 30mm diameter is a good guide. Make sure they are the same. It's a good idea to apply Gorilla glue to the tip to harden up the EPP. It needs to be sanded back when hardened to end up with a smooth hard surface.



Make up a small peg (eg bamboo chopstick 3 mm diameter) about 40mm long so that 10mm can stick out the front of the wing and plug into a hole in the EPP fuselage. It makes sure the wing is centre. Cut a half channel in each EPP wing root to take the peg.



Join the 2 EPP wing halves together with the top of the wing on the table to end up with a small dihedral on the lower wing surface. Make some puncher holes in each side of the EPP wing root. Join the two wing halves together with tape on the upper surface and open up the join from the bottom. Wet both surfaces. Apply Gorilla Glue and spread out with a small stick forcing the glue into the puncher holes. Put the top surface on a flat surface so the excess glue squeezes out and clean up the excess. Add some tape to the join and weigh down so the top surface is flat.

Once set (2-3 hours) remove the tape and clean up the excess glue with a sharp knife blade and then sandpaper smooth so there are no bumps. Don't worry about any valleys, just the peaks. I added some extra Gorilla Glue to the tips and where the peg is to give the EPP a harder surface. It needs to foam up and then cut back and sand down.

The 1.5mm carbon wing spars need a slot cut in the EPP wings. 40mm from the leading edge at the root and 30mm at the tip looks about right and create a smooth bow. Tape the spar in position and mark each side with a fine marker pen. I used a Dremel cut off wheel to cut a slot no more than 2mm deep between the lines. Use a small stick to hold the wheel shaft off the wing surface to keep a check on the cut depth.

Cut off the excess length of carbon rod which you can use for servo push rods. Roughen up the surface off the carbon to take off the shine and help the glue stick.

Wet the spar slot with water, then add the Gorilla glue and spread with a small stick. Press in the carbon wing spars and clean up the excess. The glue will try and push the carbon rods out so they need to be weighed down. When cleaned up, cover the entire length with tape. Put the wing upside down, top surface down and weigh down the length of under side with 2 lengths. I used a couple of pieces of timber.

When dry remove the tape, cut off the excess glue that's foamed up with a knife blade and sand smooth. You should now have a rigid wing.

Make up trailing edge bolt down (5mm nylon bolt works OK) centre section. See picture below of the underside of the wing. This is glued to the EPP wing and will locate on the fuselage just in front of the fin. I used 2.5mm hard balsa, but laminating some light ply with the aileron balsa provided should work just as well. You will need to cut back the wing saddle on the EPP fuselage to suit. This gives positive a location between the wing and fuselage as well as stiffen up the rear considerably.

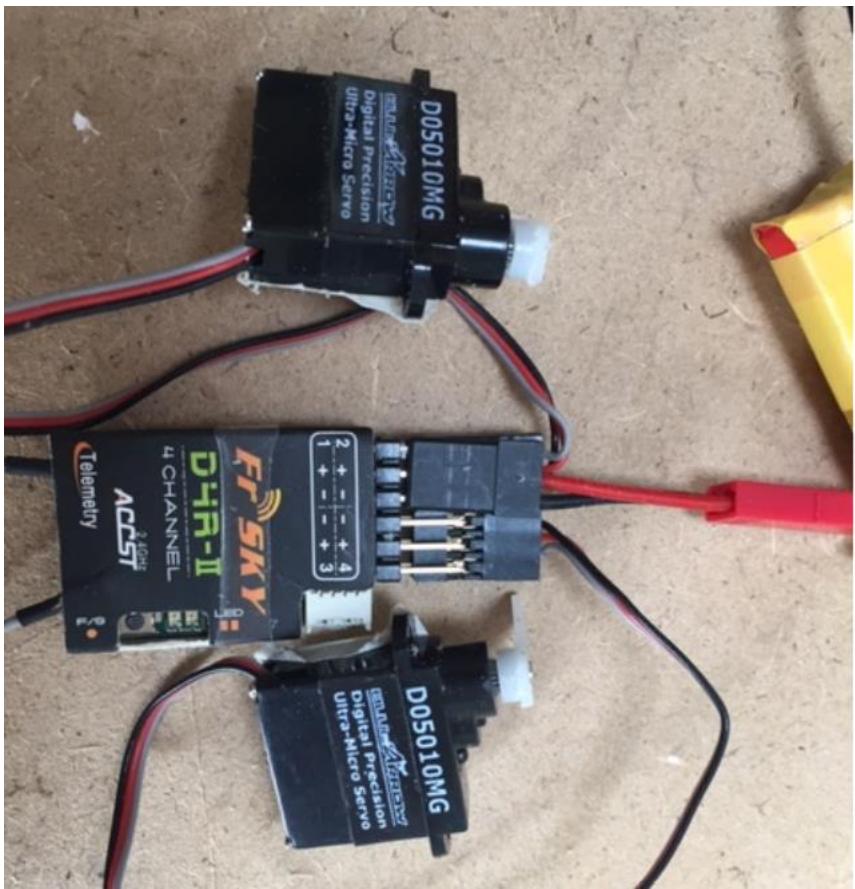


Using the EPP fuselage as a guide, use Gorilla Glue to attach the balsa bolt down centre section to the wing. Give it a good long time to harden. You may need to use 10mm wide fibre tape top and bottom to give it structural strength before covering. You'll be needing the same fibre tape for the fuselage later.

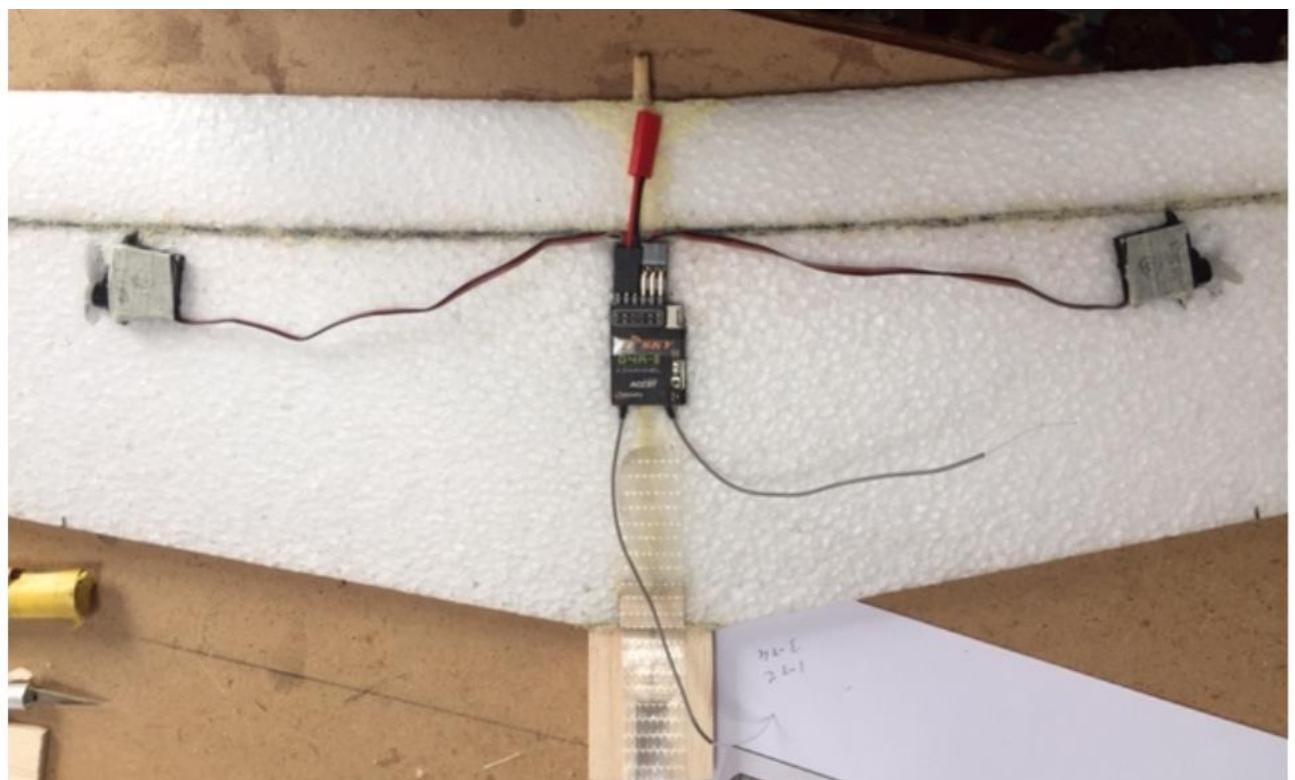


Mark up and drill the 5mm bolt down hole and check the blind nut arrangement. I decided to cut this into the EPP fuselage bottom which will weaken it, so it will need some fibre tape.

Decide the location for your receiver and servos. I wanted to plug the battery directly into the receiver to avoid the need for an extra plug / socket and on off switch (you'll need a special charging lead). Remember to program your radio and centre the servos so they 90 degrees to the servo body before installing.



I have the servo control rods 90 degrees with the trailing edge and suffer the extra air drag. With a removable bolt on wing, it easier to top mount the servos and receiver so all the wiring is on the same side. The wires and antenna can be pushed into a slit that's cut with a sharp knife. I wrapped the servos in tape and used a little Gorilla glue to harden up the EPP.





Cut the ailerons to size (43mm at root and 23mm at tip), round off the rear edge and add a small bevel for a top tape hinge. I added glass fibre reinforcement to each end and where the control horn is to stop the wood from splitting.



Now you should be ready to cover



I decided to use 75micron laminating film as I have a huge roll. 32 micron should be OK for a lighter build. I first added a wide black strip to the lower surface and some red to the upper ailerons so I can see which way it's up in flight. Some people suggest spraying the EPP with contact adhesive first to make sure the covering sticks (wait and see).

Push the servo horns out of the way below the surface and cover with laminating film and warm / hot iron. Bottom first with large overlap, followed by the top surface with little to no overlap. Keep the iron moving or you risk melting the EPP foam.

Cover the ailerons with film and top hinge using clear tape.

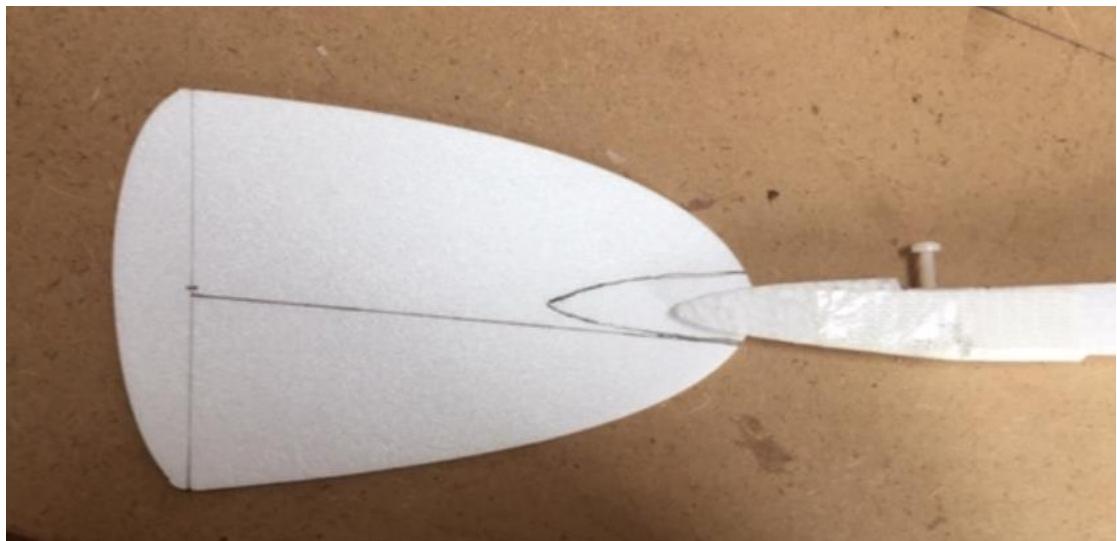
Add the control horns and make up the control rods. You should now have a fully working wing.



## 5. Tail

First mark out where the carbon stiffeners need to be cut so the carbon strip can be attached to the EPP fuselage, either below (as I did) , or above between the wing and fuselage. You may need to a cut a slot in the EPP fuselage to avoid the carbon being bent (if it does it will bend the EPP fuselage!).





Note: The carbon strip extends beyond the bolt.



Cut the Depron with a sharp blade and ruler. Insert the carbon strip and hold together on one side with tape. From the other side apply a little Gorilla glue and hold flat while it expands hardens.

I also added carbon tow and epoxy to the lower edge. Then cover with film before cut out for the fuselage.

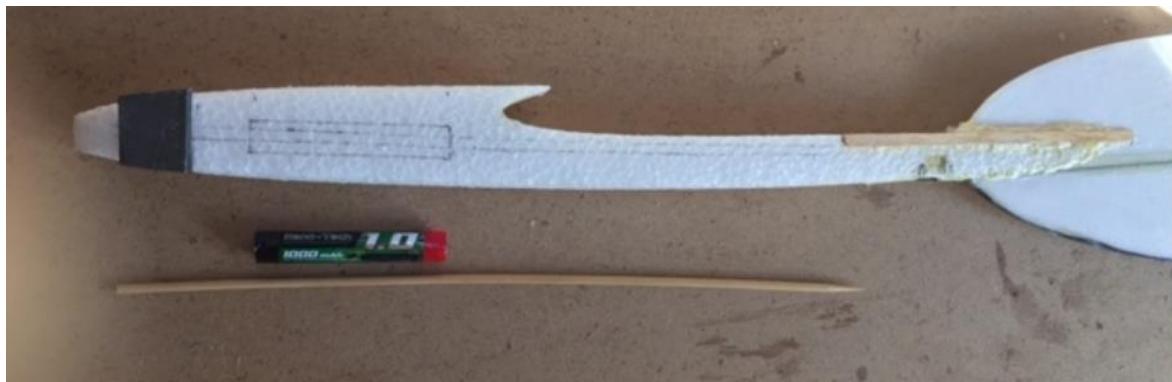


It's now ready to cut out the profile to join to the EPP fuselage with Gorilla glue. I added a pair of coffee stirrer sticks either side to stiffen up the rear end.



## 6. Fuselage

It's time for a trail balance to see where the Centre of Gravity is and how much ballast is needed in the nose. The use of 75 micron film I need a lot of weight in the nose, so the could use largest battery I have which is a 1S LiPo 1000mAh round battery 20g in weight 12mm diameter so it fits just right. I have left space for some lead ballast in front of the battery with some EPP foam surrounding that will be cut in from the top.

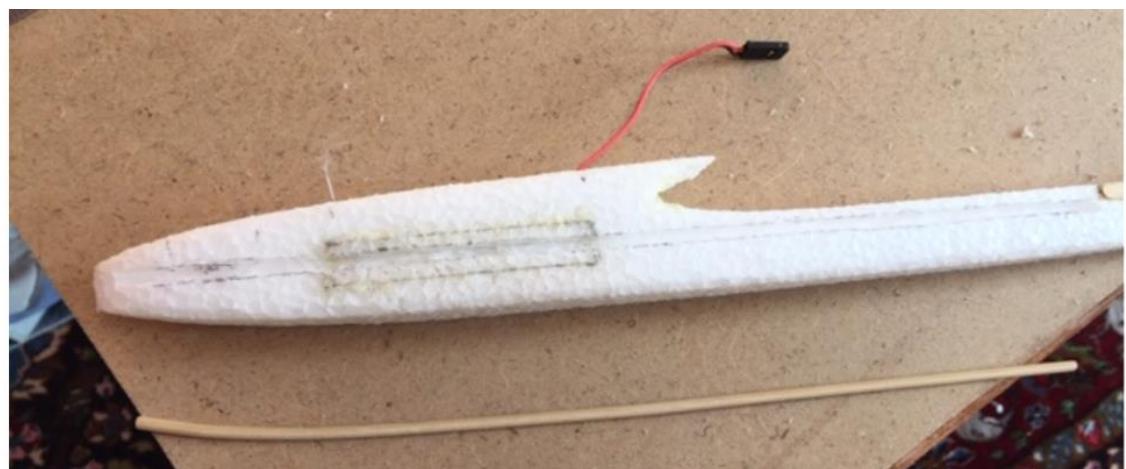


These are barbecue skewers from the supermarket that have been bent to match the fuselage side. Bamboo should flex with the EPP and not break as well as they can be easily bent with some hot steam. It would be better to have a single strip from nose to tip.

Cut a slug of EPP from one site to the other so the battery fits in the centre line. It's a good idea to mark each side, left and right, so you can put the sides back the same way.

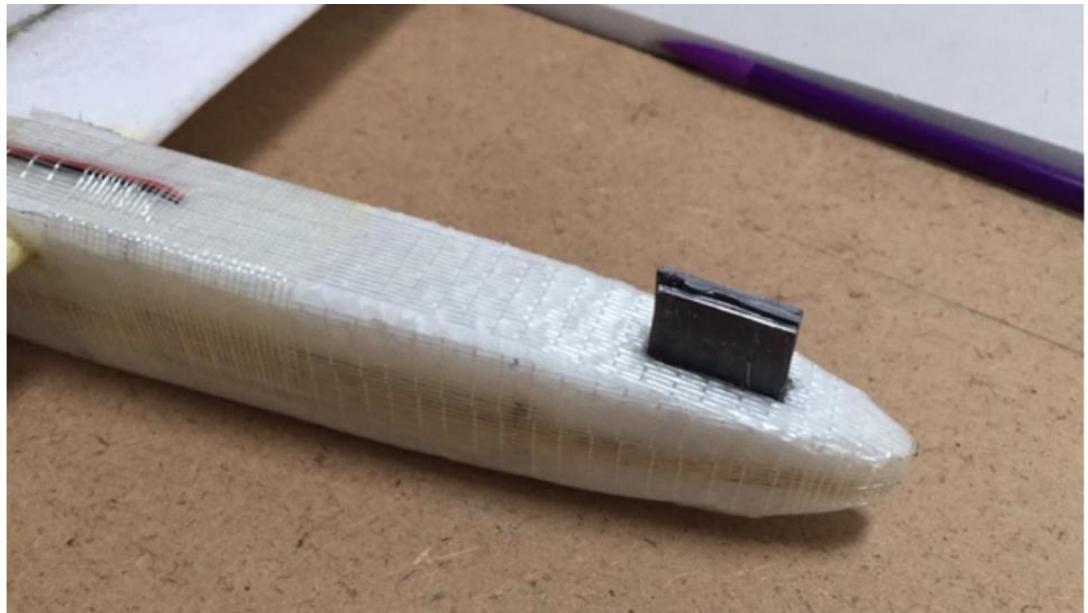


Cut the core of the EPP out so you are left with the 2 sides that can be glued back in. Wire up the battery and check it all works before using Gorilla glue to put the 2 sides back where they came from.



Cut a slot down the length of the fuselage both sides for the bamboo rods, pre bent, and glue in with Gorilla glue.

It's now ready to for a test fly to get the balance exactly right before gluing in the lead weight required. Cut a slot in the EPP close to the nose just large enough for lead ballast. Glue in with lots of Gorilla glue so there's hard protection on the inside.



Finally cover with fibre tape for added strength. Add some colour and finally apply the laminating film.





**7. Balance. Throws and Flying**



Before gluing the lead in the nose and laminating with film, I wanted a test flight so I can get an idea of the ideal balance and flight performance. The C of G is expected to be somewhere between 20 and 25mm from the leading edge. The lead ballast is taped on so it's easy to adjust at the flying field / slope.

Start 20mm and lots of up trim to get a glide and then work back. As the balance moves back the elevator pitch becomes more sensitive, so dial down the rate.

#### **Aileron Throws midway @ 35mm width**

When the balance is right it's very sensitive to pitch elevator control. 1-2 mm is enough. At high rates an attempted loop with 5mm up will stall out rather than tighten. I have seen someone program their throttle stick on their transmitter to add fine pitch control in flight (faster / slower) to save adjusting the trim control.

#### **Low**

Elevator +1mm / -1mm

Aileron +3mm / -2mm

#### **High**

Elevator +4mm /-4mm

Aileron +10mm / -10mm

#### **Flying**

It just looks right in the air. Good speed range in a 10-15 mph wind. Tight turns little loss of height. Picks up speed and lift well. Easy large / small loops. Axial roll still work in progress – it's just getting the right throws in each direction.

It kept up well with my 600g JW wing in a good breeze and I expect it will still be flying when the wind drops.



Excellent DLG launch performance. On the slope you can throw it well out into wind away from the slope turbulence.

## **8. Post build notes**

For a lighter build use 32 micron laminating film. There's 40g of 75 micron film in this build so there's a potential saving of 20g. The fibre tape applied to the whole fuselage could be saved as the laminating film has enough strength on it's own – 6g saved.

The bolt on wing introduced a weakness and needed to be taped on because the side stiffener bamboo didn't run nose to tail. For a light build glue the wing on and run whatever stiffener you decide on the full length.