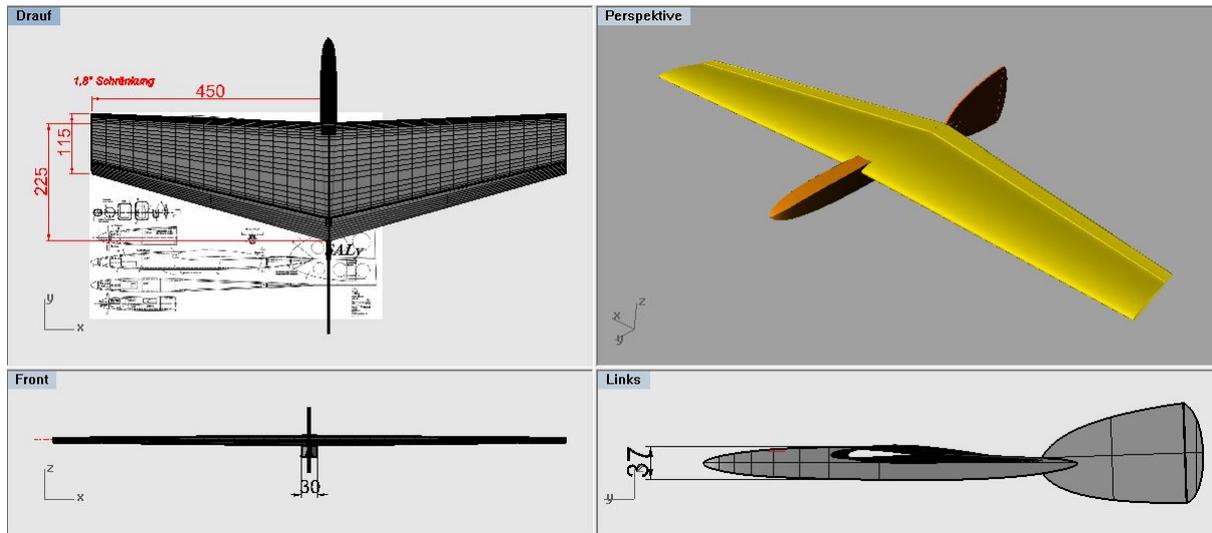


Slingshot RG20/900 DLG EPP Wing Build Instructions (Lightweight)

Kit supplied by Causemann Flugmodellbau

1. Introduction

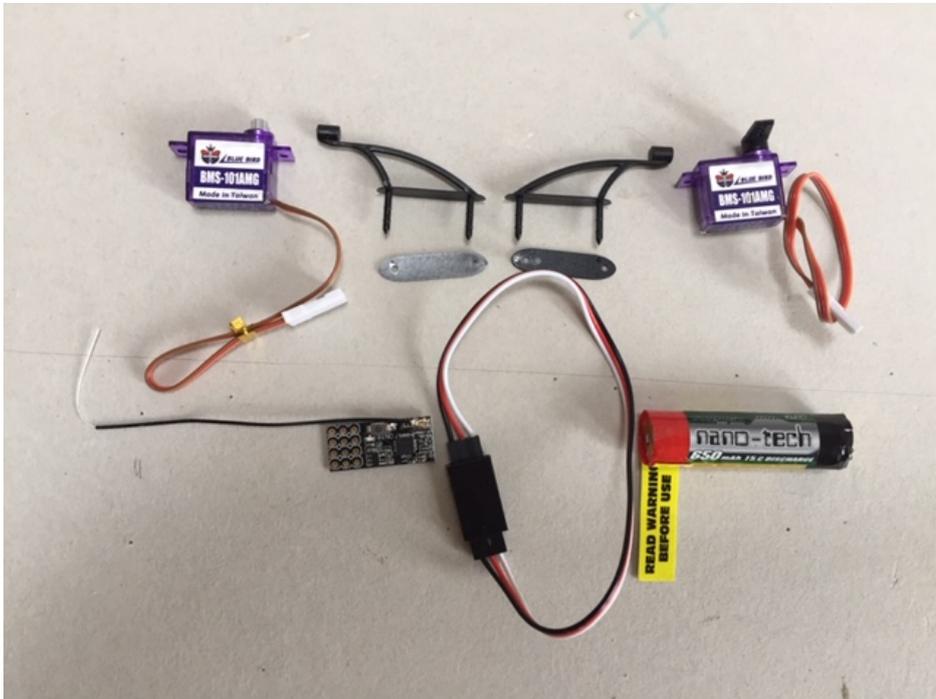
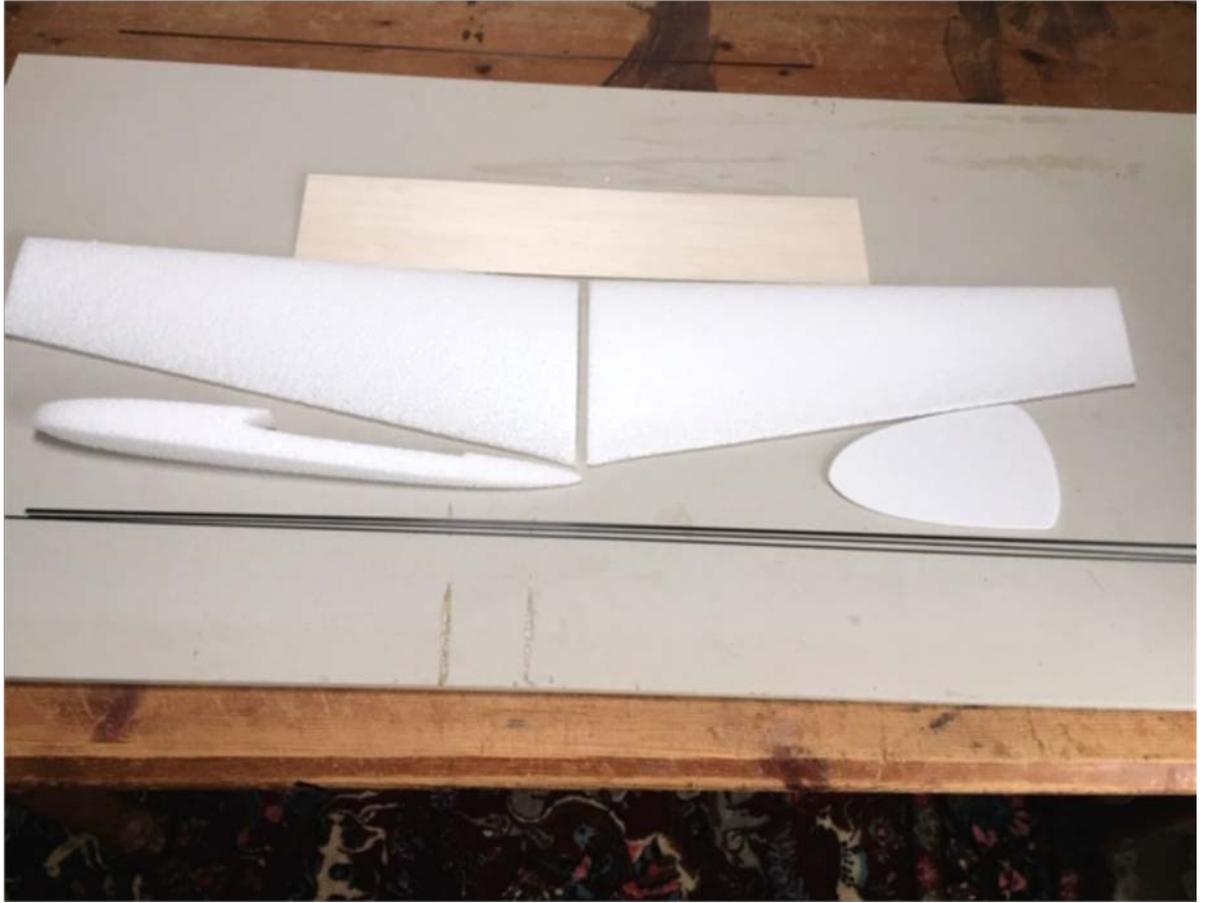
These build instructions are for a lightweight EPP wing covered in laminating film for slope flying when nothing else is able to fly. Servos top mounted and a 1S LiPo embedded in the fuselage. This is an experienced builder's model, so feel free to use and adapt these instructions to meet your needs and experience.

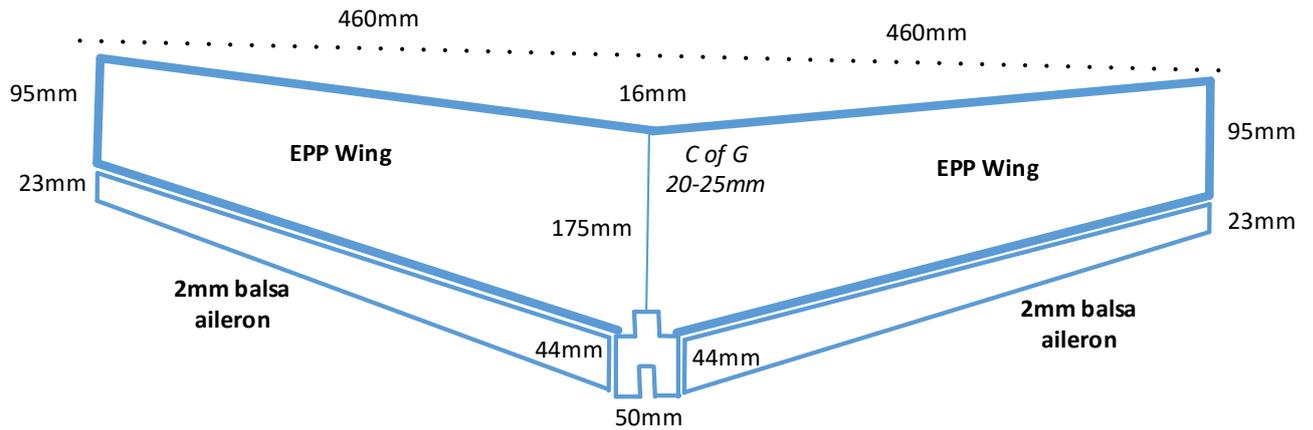


2. General Design Layout and Target Weight

The EPP Wing kit includes a sheet of 2mm balsa for the 2 ailerons (43mm at root and 23mm at tip), plus the fixed centre section that will be used to secure the wing trailing edge to the fuselage. A target weight to aim for based on the out of the box weights:-

| Out of the box weights | Grams |
|--------------------------|--------------|
| EPP Wing Core L | 30.3 |
| EPP Fuselage | 4.6 |
| Fin (3mm Depron) | 1.5 |
| Balsa (2mm sheet) | 8.2 |
| Carbon Spars (1.5mm dia) | 5.4 |
| Tail Carbon (3 x 0.5mm) | 2.2 |
| Radio, etc | |
| Battery (1S 650 mAh) | 13.0 |
| Receiver (FR-4CH) & plug | 6.0 |
| Servos BMS-101AMG (x2) | 9.4 |
| Horns (x2) | 0.9 |
| Covering (32 Micron) | 18.5 |
| Lead ballast, Glue, etc | 10.0 |
| TARGET TOTAL | 110.0 |





3. Gorilla Glue Tips

I 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

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 a little after covering the bottom with film so there was a straight edge for the ailerons, and then added the top film.

Start by rounding off the wing tips using sandpaper. A 30mm diameter is a good guide. Make sure both wings are the same.

Make up a small peg (eg carbon or bamboo 2 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 of the wing 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 wing top surface is flat.

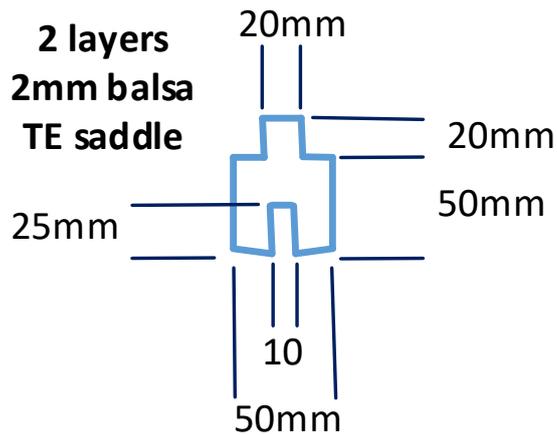
Once set (2-3 hours) remove the tape and clean up the excess glue with a sharp knife blade and then sandpaper smooth so there are no bumps. Don't worry about any valleys, just the peaks.

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 curve. 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.

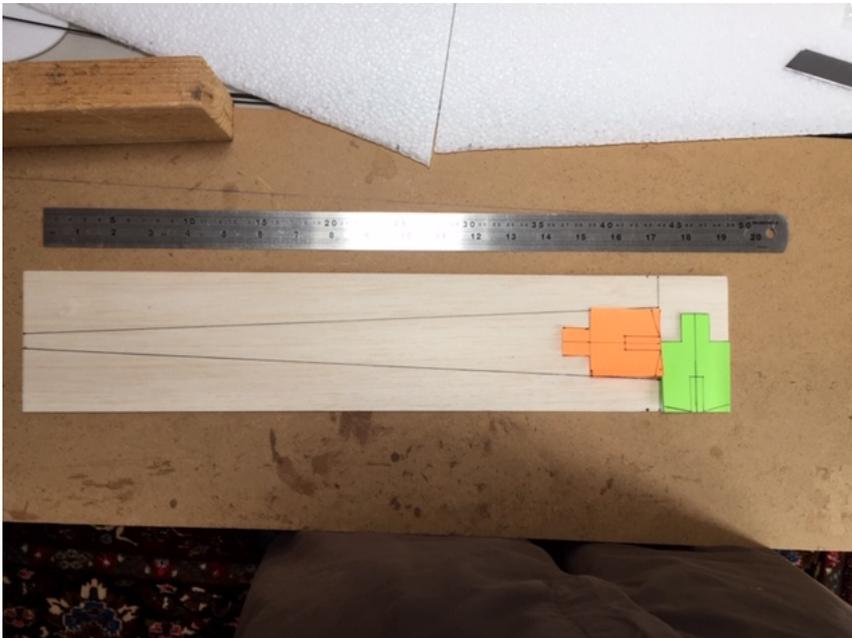
Cut off the excess length of carbon rod which you can use for servo push rods. Roughen up the surface off the carbon to take off the shine and help the glue stick.

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 as the glue dries. 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 very rigid wing.



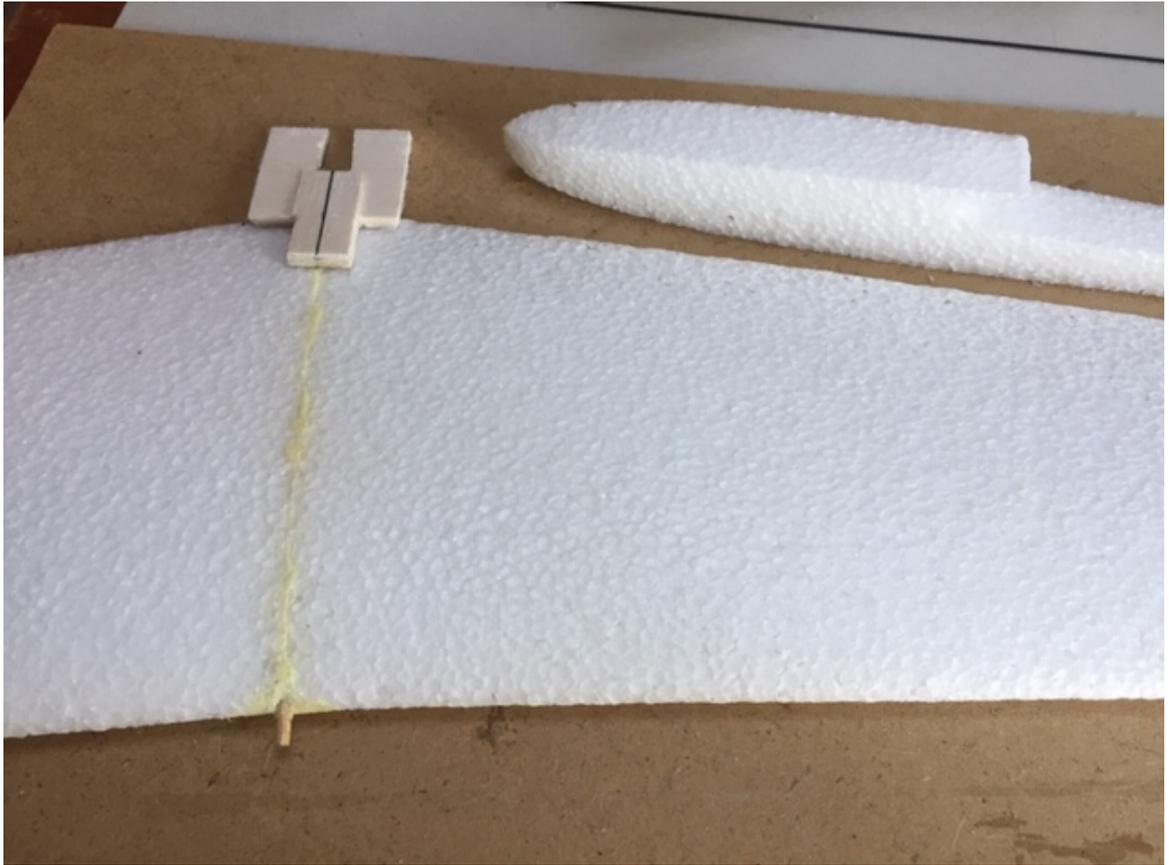
Wing Trailing Edge (TE) centre section fuselage saddle detail.



The 2mm balsa sheet is 100mm wide, so you need to plan how best to cut the ailerons and saddle layers.

Make up trailing edge to fuselage centre saddle by laminating 2-3 pieces of 2mm balsa with grain in opposite directions (like plywood), then profiled to the wing 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. 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.





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 find it better to top mount the servos and receiver so all the wiring is on the same side of the wing. I mounted the receiver so the power cable from the battery could be inserted with a standard servo plug (keep it simple). The servo wires and antenna can be pushed into a slit that's cut with a sharp knife. Nice a neat.

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.

Now you should be ready to cover with film. I am using 32micron laminating film. I added a wide black strip to the lower surface and some red to the upper wing tips so I can see which way it's up in flight.

Push the servo horns out of the way below the surface and cover with laminating film with a 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 laminating 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 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 so it can be glued to the fuselage bottom surface.



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.



It's now ready to cut out the profile to join to the EPP fuselage with Gorilla glue.

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. I am using the 75 micron film I have that is strong, so I have used that as most of the area is forward of the Centre of Gravity. The battery I have which is a 1S LiPo 650mAh round battery 13g in weight and 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.



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 cut 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.

Glue 2 lengths of the left over 3mm carbon strip either side of the fuselage for rigidity and hold down with fibre tape.



Finally cover top and bottom with fibre tape for added strength. Add some colour and apply the laminating film. I have extended the 75 micron film down to the tail.

Once covered glue the wing to the fuselage and it's ready.





Once it's been test flown and the balance is right then 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.

7. Balance. Throws and Flying

The C of G is expected to be somewhere between 20 and 25mm from the leading edge. The lead ballast can be taped on so it's easy to adjust at the flying field / slope.

Start with 20mm C of G 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.

As this is my lightweight build I pushed the C of G back to 30mm with 10g of lead ballast giving a final 120g flying weight. I may find it a more relaxing flight to move it back to 25mm.

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.

Low

Elevator +1mm / -1mm

Aileron +3mm / -2mm

High

Elevator +4mm /-4mm

Aileron +10mm / -10mm

Flying the Lightweight

In the lightest of wind it can be flown slower than the 190g model I first built. It just looks right in the air. Good speed range in a 5-10 mph wind. Tight turns little loss of height. Picks up speed and lift well. Easy large / small loops. Ten out of ten design.

Excellent DLG launch performance and a lot tougher than a pure foam ready to fly. On the slope you can throw it well out into wind away from the slope into some good lift.

The 32 micron film doesn't stick that well to EPP, has little rigidity so the wing flexes under it. It works OK on the Depron tail, so I'll use it again for that, but not EPP.