

RippinFoamies.com Build Guide for the Football Indoor 3D biplane

Hello and thank you for purchasing the plans and stencils for the Football. I am dedicated to creating a quality experience for you. If there is anything about the build guide, stencils, or instructions that are not to your liking, please drop me a line at John@RippinFoamies.com. Once again, thank you and I hope that you like your Football as much as I like mine!

Best regards,

John E. Cramer
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1. Selecting the right equipment.

My indoor designs are intended to all 3D maneuvers inside of a gym the size of a basketball court. This is the size of venue that most people will have access to. To ensure that your model will perform in this size venue it is imperative that the weight be approximately the same as the prototype. Any weight variation will come from the equipment that you select so choose wisely. You can't go wrong with the equipment and weights suggested here:

Recommended Gear:

Motor: AXI 2204/54 (25.9 grams)
RX: Berg Microstamp 4L (6 grams)
ESC: Castle Phoenix 10 Lite (6 grams)
Battery: 2-cell 730mah Thunder Power Lithium Polymer batteries (35 grams)
Prop: GWS 9x4.7 SloFly
Servos: 3 required, (4-6 grams each)
Antenna: Ecubed R/C micro

If you need to substitute different equipment, just make sure that the weight comes out approximately the same, or less.

Materials needed:

3mm Depron foam (2 sheets), 1.5mm carbon fiber rod, 0.014-0.030" carbon fiber strip, free-flight wheels, 0.030 and 0.040 music wire, micro control horns, foam adhesive such as hot-glue, foam-safe CA, or UHU Por contact cement, and paint such as foam-safe Acryls, water-based craft paint, or Krylon Fusion.

Material and Equipment Sources: See www.rippinfoamies.com for suggested sources.

2. Scaling

The plans can certainly be scaled up or down. I wouldn't scale the plans down unless you really have some light gear. However, if you have some heavier gear and want to achieve the same wing loading you can scale up the plans. If the weight of your equipment is say, 20 percent heavier than what I have specified, then scale the plans up 10% to achieve the same wing loading. This works as a general rule of thumb, i.e.

Excess weight in percent \div 2 = Scale factor for plans

3. Rendering the plans

The plans are full size scans of the original prints that have been distributed in a PDF file format. The best way that I have found to get the plans printed is to put the files on a CD and take them to your nearest FedEx/Kinko's store. You could even email them the PDF files ahead of time if you know their email address. They have large printers that can print the plans full-size for you.

4. Transferring the plans to posterboard.

Posterboard makes an excellent template for foamies. The full size plans will fit on a typical 22" x 28" piece of posterboard. I get my posterboard from my local Staples office supply store. The stuff I get is the consistency of a poker card and is insanely cheap at about \$2.50 for five sheets. To render your plans on the posterboard, simply lay the plans face-down on the posterboard and weigh it down with shot bags or pins.



Figure 1: Put plans face down over posterboard.

The next step is to use white towel (an old athletic sock works fine) to wipe on some Acetone. Make sure that you have adequate ventilation because the Acetone is smelly. You just want enough wiped on to render the plans “clear” from behind. See Figure 2 for the effect that you are looking for.

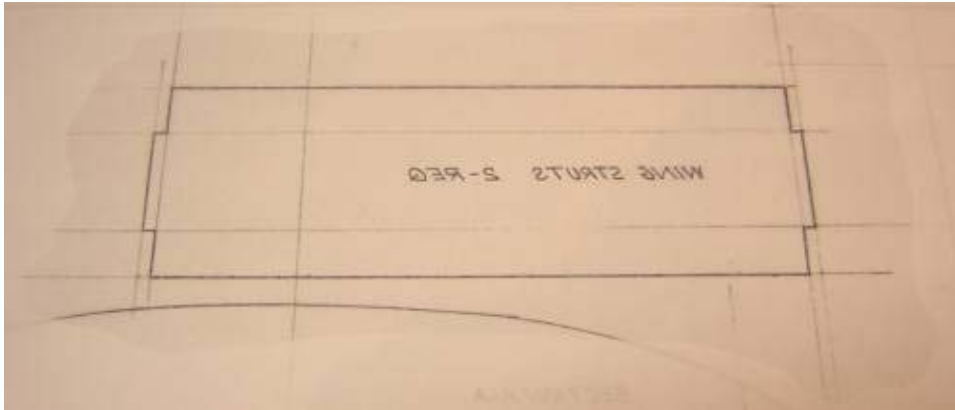


Figure 2: Acetone turns plans clear.

Wipe down all areas where there is drawing data to be transferred to the posterboard. When complete and dry, slowly peel off the drawing and you have a set of plans on posterboard (See Figure 3). They are mirror-image, but this presents no problems. Save the original plans for reference while you build.

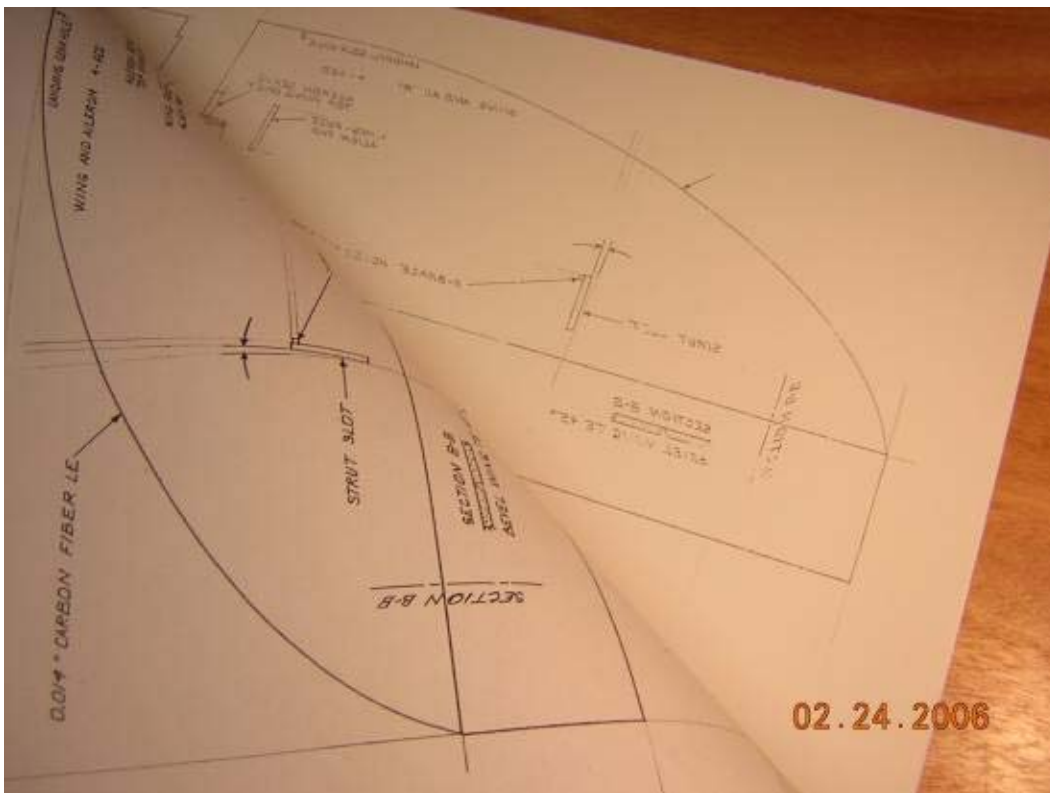


Figure 3: Peeling away plans reveals transfer to posterboard!

5. Cut out all parts with scissors or a sharp #11 hobby knife.
6. OK, if you didn't put a new #11 blade in your hobby knife in step 4, do it now before you start cutting precious Depron.
7. Cut out all parts from 3mm Depron using your posterboard templates as a guide.
NOTE: that the fuselage has two sides. The right side has the canopy and fin attached and the left side does not. Also note that the top wing has the aileron servo cut-out and the bottom wing does not. Assemble top and bottom wing halves. See figure 4.

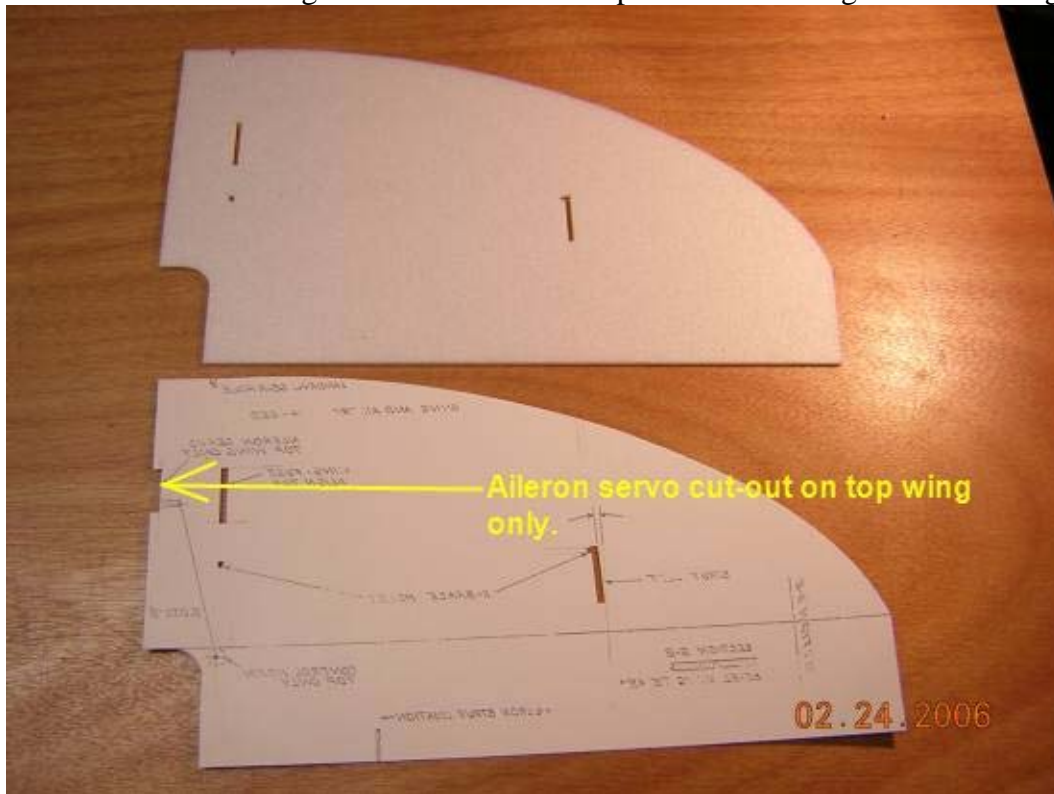


Figure 4: Cutting wings using template. Aileron servo on top wings only.

8. The best time to decorate your airplane is when it is all flat in pieces. The Football comes with two stencil schemes. Select the one you want and cut it out of posterboard as indicated on the stencil plans.
9. There are many different paints to use on foam, but my favorite is Krylon Fusion spray paint. This paint, and similar products from Rustoleum ("Direct to Plastic") are designed to develop a molecular bond to plastic so that it won't chip off. It can be used on plastic lawn chairs for instance. These paints are solvent paints and WILL EAT Depron if you are not careful. To safely use these paints you need to spray them from at least 24" away so that the volatile components evaporate before it hits the Depron. If you do this the Depron is not harmed and it just about dries on contact making the whole paint operation a very quick affair. The idea is to mist on layers of paint. It does not take much. I used too much on my models – but they are my "show" models so I used more paint than I normally would. See Figure 5.

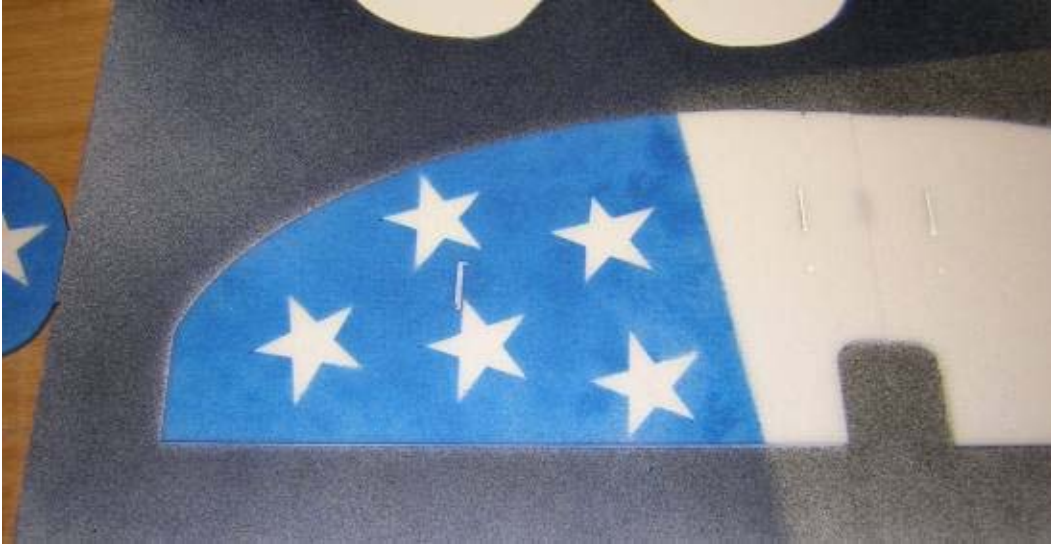


Figure 5: Painting through stencil with Krylon Fusion blue paint. You want to “tint” the Depron, not a heavy gloss finish. Shown here is really overkill – but done for my show models so they would photograph their best.

10. Now that you have all the parts painted. Assemble the fuse halves by stacking on top of each other so that they are PERFECTLY aligned. Then HOT GLUE the ends to form an open ended envelope. Hot glue is needed here for the flexibility. The second step is to run a bead of glue along the base of the fin and the bottom of the fuse to flatten the rear of the fuse envelope. See figure 6, 7, 7a, and 8.



Figure 6: Stack fuse halves keeping perfectly aligned.



Figure 7: Hot glue both ends of fuselage to form an envelope. I run a bead and then “smear” it flat to form a flexible bond.

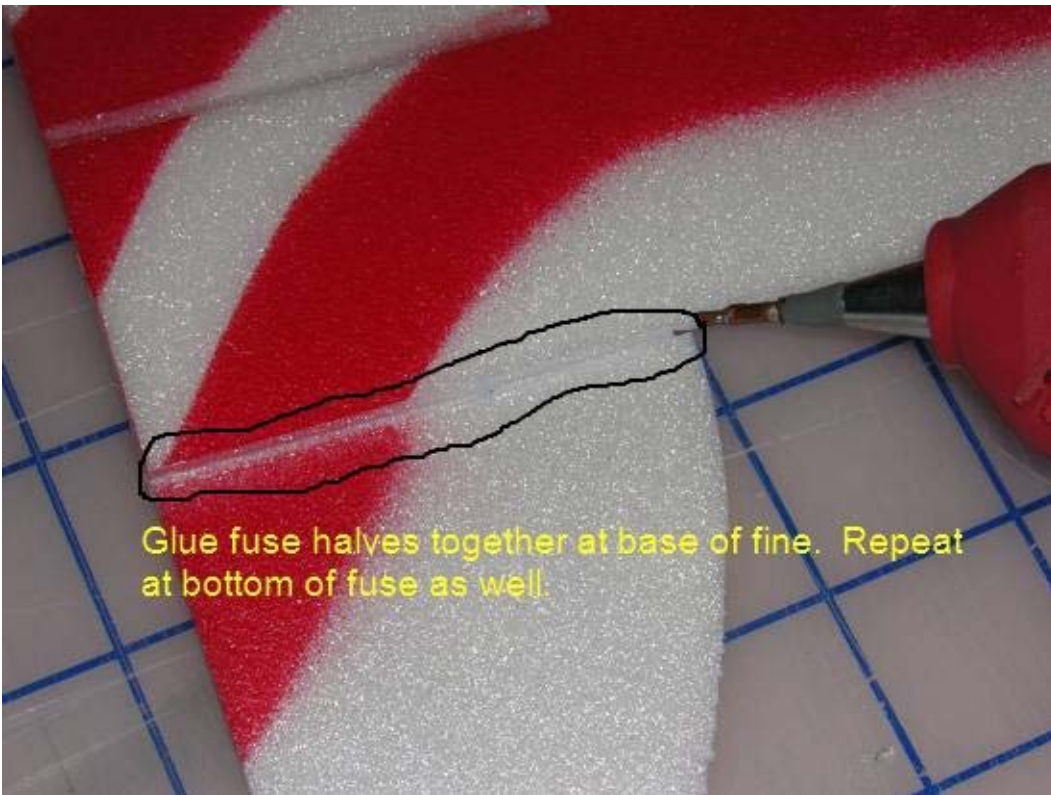
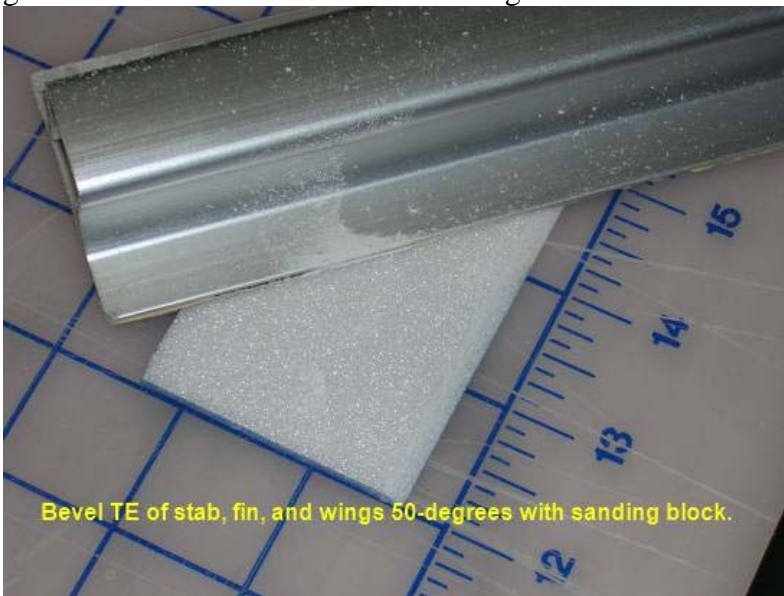


Figure 7a: Run bead of glue along base of fin and bottom of fuse to keep flat.



Figure 8: No, it is not Shamu the killer whale, it is the fuselage ready for top and bottom formers! Note how rear of fuse is flat until front of fin. Note that the final plans have only two slots for fuse formers – I eliminated the additional tabs shown on these photos.

11. Insert a fuse former. I like to start on top. Use tabs to align and then push forward until front of former nestles into front of fuse. Glue both top and bottom formers in place to complete the fuselage.
12. Cut ailerons from wing and elevators from stab. Bevel TE of stab, wings, and LE of rudder at least 50 degrees. I like to use a sanding block with 60 grit sandpaper. Go gentle and it won't "chunk" out. See figure 9.



Bevel TE of stab, fin, and wings 50-degrees with sanding block.

13. Assemble elevator halves by joining with a 1.5-2.0 mm carbon fiber rod. Hot glue works very well for this. I just put on a dab and then use the glue gun nozzle to smear it out into nice fillet. See figure 10.



Figure 10: Hot glue elevator halves to carbon fiber rod.

13. You can now hinge the elevators and ailerons. I use ordinary clear $\frac{3}{4}$ " tape. Leave about a 1 mm gap between pieces to ensure that there is no binding. After taping you can "set" the tape with a Monokote iron w/sock set at #1, warm. Setting the tape with a warm iron ensures that it will not lift over time. See figure 11 and 12.



Figure 11: Tape on ailerons and elevators with $\frac{3}{4}$ " clear tape.



Figure 12: Iron on tape with iron set at #1, warm.

14. For best longevity, I like to wrap the LE with carbon fiber strip. This is optional but will make your model last longer. Set the wings on some non-stick plastic wrap. Run a bead of foam-safe CA along the LE of the wing. Lay flat and weight with shot bags. Coat the carbon fiber strip with CA accelerator and then “wrap” around the wing as show in figure 13.

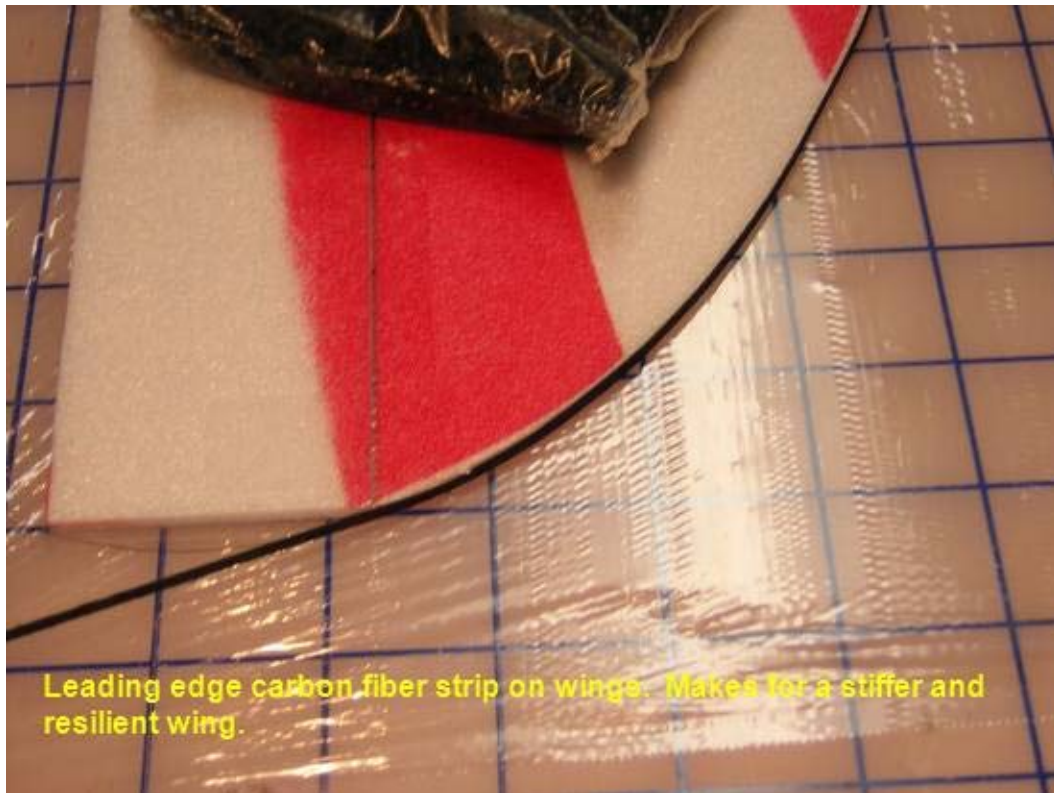


Figure 13: Wrap LE of wings with thin carbon fiber – 0.014-0.030 thick.

15. You can now glue in the stab and elevator. Once in, you can tape on the rudder. At this point, before adding wings, I like to glue in the elevator and rudder servos, install the rudder and elevator control horns, and install the pushrods. Better now than when you have a set of wings in the way. I cut a small hole just in back of the RX location shown on the plans and use that hole to bring out the servo and ESC leads. While you are at it, glue in the horizontal motor mount piece. See figure 14.



Figure 14: Glue in tail feathers ensuring they are perpendicular to fuse.

16. Make a motor mount from ABS plastic as shown on the plans. Adjust hole spacing to fit your motor. Bolt motor to mount from behind. I use a hot brass tube to melt away relief for the rear of the motor shaft. Attach ESC and tape motor to fuselage. I like to tuck the ESC into the fuse via a hole under the horizontal motor mount on the right side. Fish out ESC servo lead on opposite side of fuse as you did with servo leads. See figure 15, 15a.



Figure 15: Motor mount cut from ABS plastic.

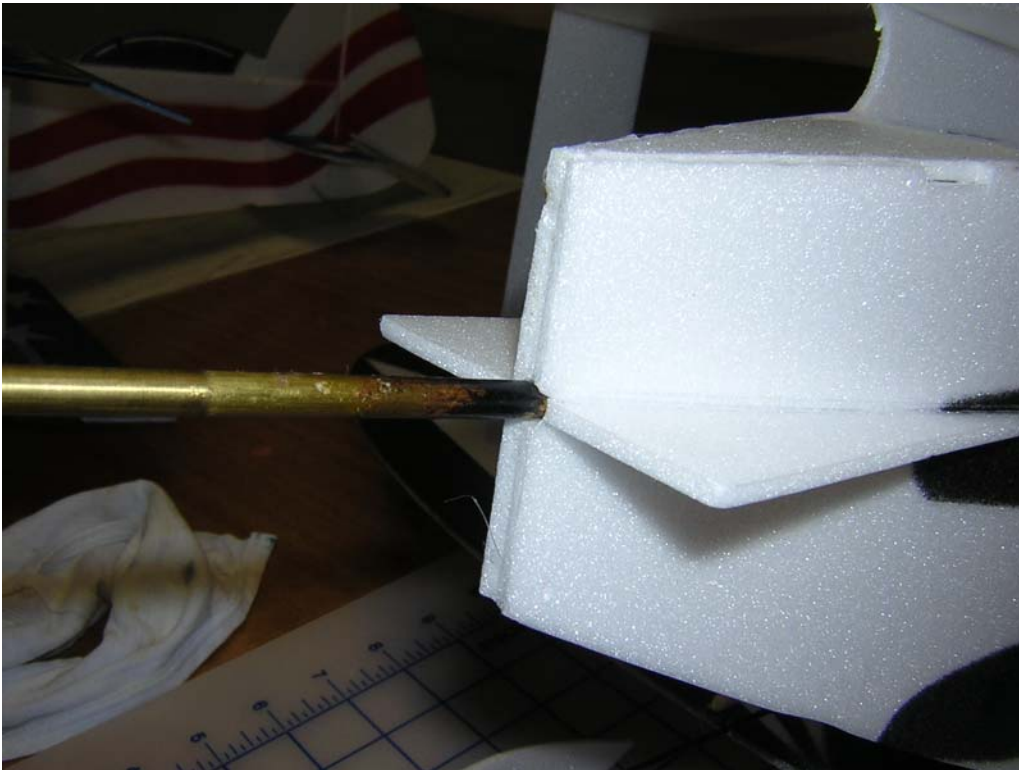


Figure 15a – Use hot rod to clear area in back of motor mount.

17. Mount wings to fuselage using guide slots on the top and bottom. Remember that the top wing has the aileron servo opening.

18. Add the wing struts to each side and then string the X-bracing. The best way to be a perfectly rigged wing is to put the fuse flat on a board and poke the 1.5 mm (or 1.0 mm) carbon fiber rod in from above. Glue in and then trim. See figure 16 for X-bracing.



Figure 16: X-bracing the wing. This is the Perfexion, but it is the same on the Football. Note how carbon rod was “poked-in” from above and then cut to length after glue sets. Repeat process for other braces. The braces are for rigidity and drag. Yes, drag is good on indoor models!

19. Now is a good time to mount the aileron linkages and aileron servo. I like to use Dubro micro hardware but this is all really up to you. I’ll add a couple of photos to show you what I do. See Figure 17, 17a.



Figure 17: Aileron servo glued in to top of wing. Dubro micro hardware is used at both ends. Pushrods for ailerons are just 0.040 music wire.



Figure 17a: I use cut-off zip tie ends for the aileron linkages. Drill hole through end and insert Dubro micro hardware. Connect the two ailerons with 1.0 mm carbon rod or wire.

Dot of hot-glue prevents injury.

20. I make pushrods and landing gear the same way. I start with 1.5 mm carbon fiber rod and wrap music wire to the end with thread. I then hit the thread with some thin CA and then some activator. See figure 18, 18a.

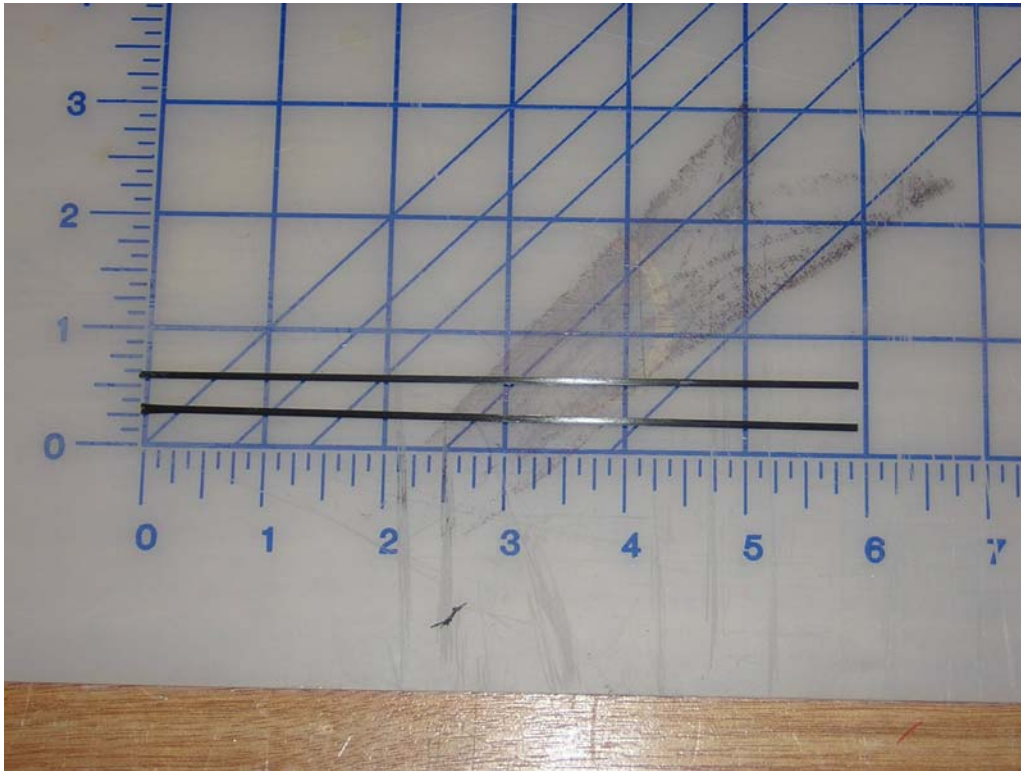


Figure 18: Landing gear is 2 x 6", 1.5mm Carbon fiber rod.

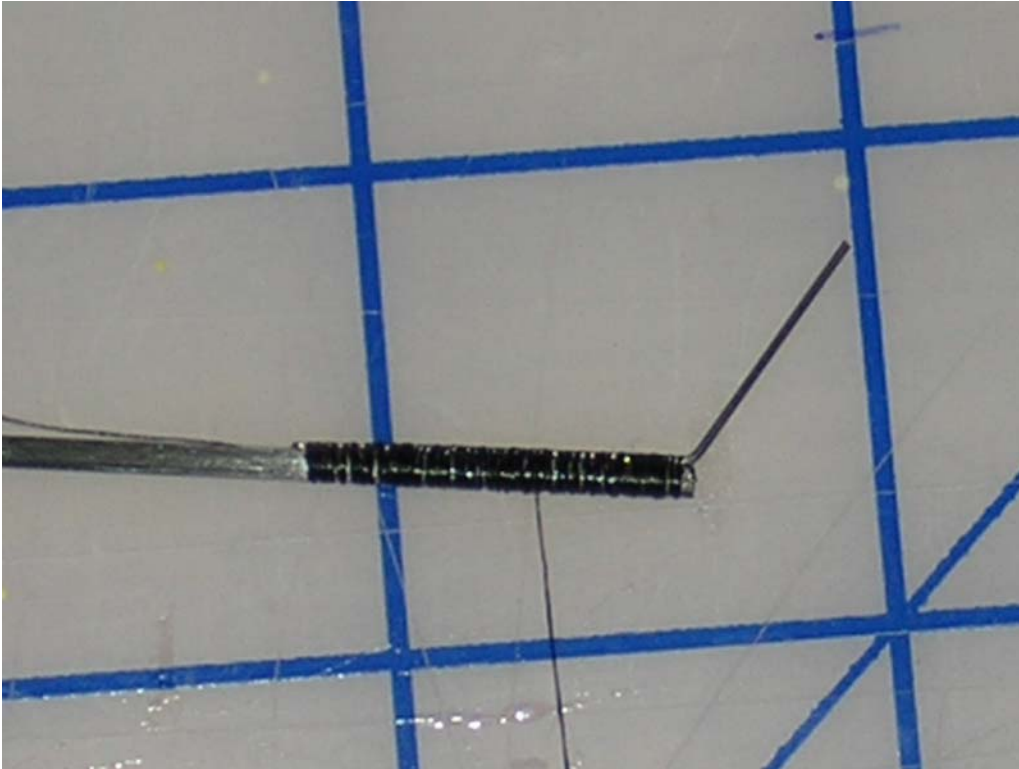


Figure 18a: Wrap wire to carbon rod with thread. Then glue with thin CA. Use same method for rudder and elevator pushrods.

21. Install landing gear as shown in figure 19.



Figure 19: Hot glue landing gear in place as shown. For real strength you can wrap the

intersection of the LE carbon strip and LG leg with some Kevlar thread.

22. Complete the installation of radio gear. If you have used components of similar weight she will balance fine. Move battery around until she balances where you like. I would temporarily mount battery on fuse and test fly. I like to see a tad of “up” trim in the elevator when trimmed for slow cruising flight. For me “zero” or “negative” elevator trim for level flight is too tail-heavy. Once you get the pitch trim where you want it cut a battery mounting pocket above the horizontal motor mount. For best performance it is **CRITICAL** that you mount the battery and RX along the thrust line as shown on the plans. Failure to do this will induce knife-edge coupling. I have attached several photos of my radio gear mounting. Eventually I will put the RX inside the fuse – just tuck it in the hole with the servo wires and fix in place with a dab of hot glue.

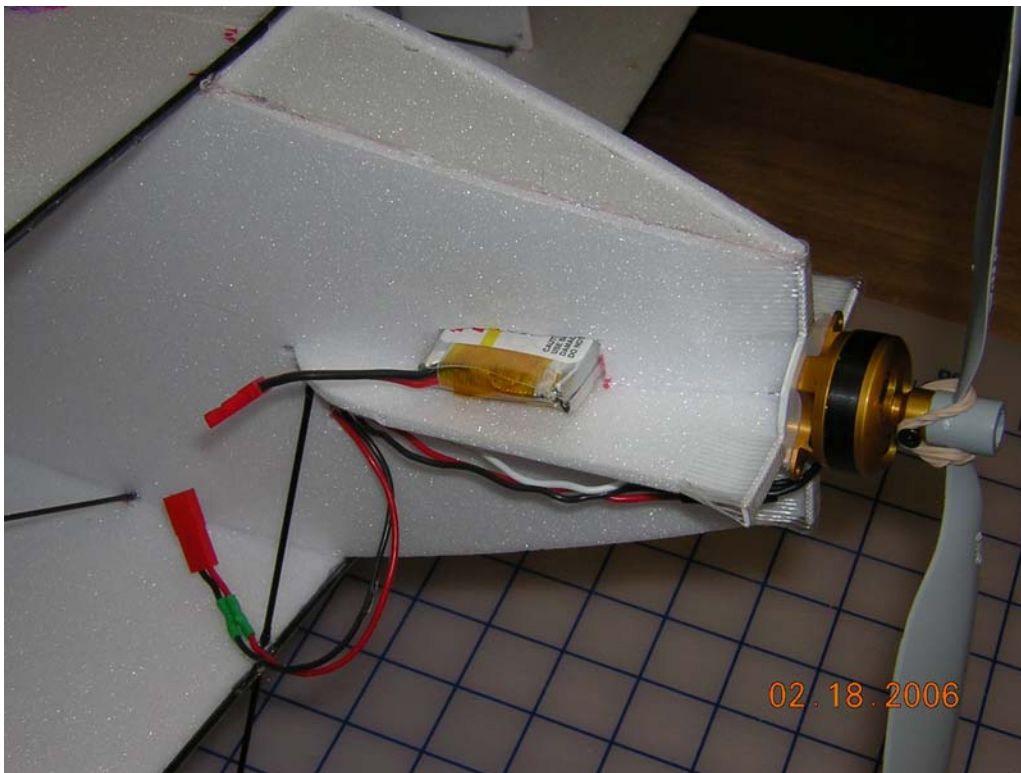


Figure 20: Perfexion photo – but same concept. Battery tucked into pocket above horizontal motor mount. Hint: line pocket sides with hot glue for strength. ESC is tucked into fuselage via hole in side of fuselage under horizontal motor mount foam piece. Motor mount taped to fuselage with reinforced strapping tape.

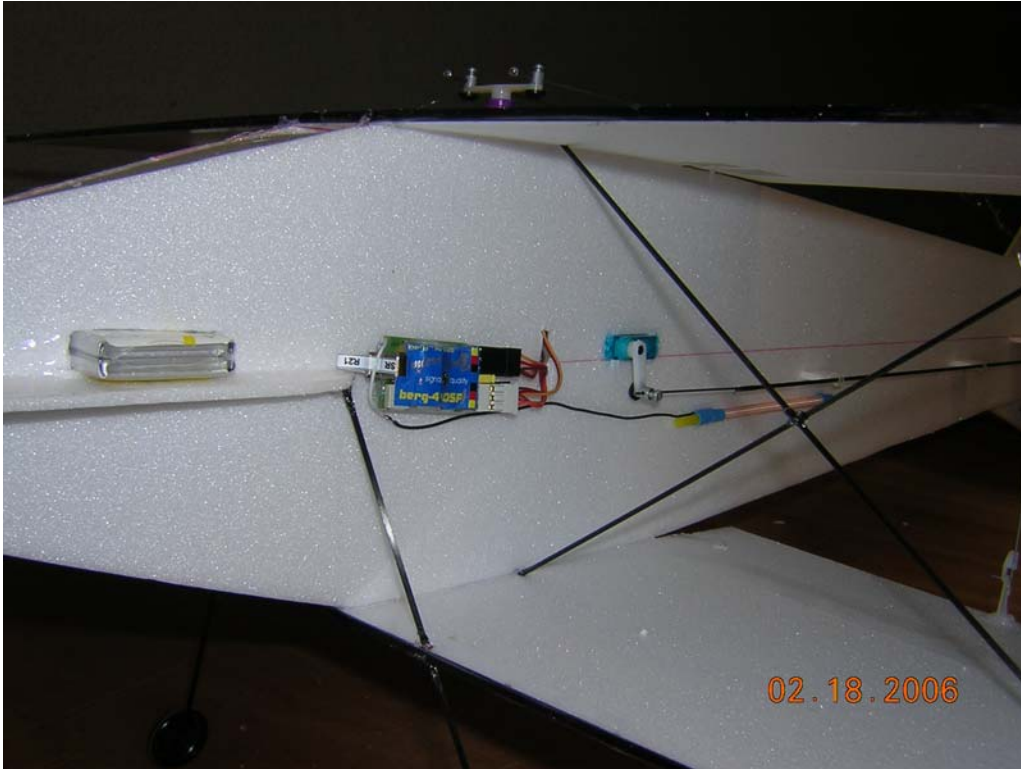


Figure 21: RX is taped to fuse side along thrust line. Again, Perfexion model shown here, sorry, that is the photo that I have. Eventually I'll tuck the RX inside. Note how everything is along thrust line!



Figure 22: Be sure to stabilize your pushrod runs with some standoffs as shown above and below. I use a piece of Dubro antenna tube cut to form a ring. Works good!



Finished!

That is about it. Charge 'er up and take her into the wild blue! Once you get some time on her and establish the best CG, then you can start mixing out any couplings. I had some slight (< 10%) roll coupling going from right to left on knife edge. I also had some pitch "up" coupling going from left to right in knife edge. All were easy to mix out with my computer radio.

I hope that you enjoy your Football as much as I have enjoyed mine!

JC