# 4S-Bipe Build Notes

February 4, 2006, by Gene Bond ( genebond@yahoo.com )

Thanks for your interest in my contribution to the 3D electric plane craze. This Biplane is number 10 or so in a series of prototypes over several years, searching for an honest design. By honest, I mean that all axes are independent. Rudder doesn't cause roll, ailerons don't cause yaw, and of course elevator doesn't cause either.

I actually had this design done, calling it the 'Sym-Bipe', since it was so symmetrical, but along came one of the other contributors on www.rcgroups.com (ThatOvalGuy) with a sketch of a sleek bodied, close to symmetrical bipe that tripped my interest. The Sym-Bipe looked more like a fish, and I was struggling to make it look more like a plane. I grabbed some of his outline ideas, and sleeked the Sym-Bipe into this design. 4S stands for 'Sorta-Sym & Sorta-Soma'. Here's the build thread: http://www.rcgroups.com/forums/showthread.php?t=452577

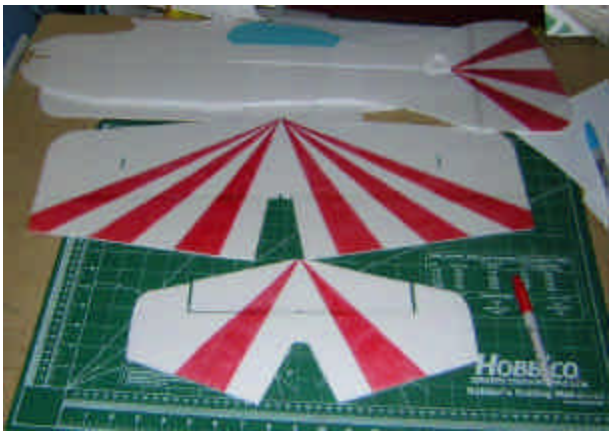
The 4S-Bipe is originally designed to run on a CDR sized motor (1oz). I prefer a 20 turn, 26 gauge motor with a 8040HD prop and a 3s340 pack. We have reworked it to carry more weight with 6mm depron for setups that use a 1.5-2oz motor and larger pack.

Assembly can be done with normal hobby tools and your choice of a few adhesives, as well as hinge material, control rods, wing bracing, etc. In other words, for the experienced modeler, feel free to 'bash' the kit. My personal preferences are shown in the following pictures. I prefer hot-glue for most assemblies, with some other adhesives for special purposes. Alternative adhesives are: epoxy, foam-safe CA, and several 'contact cements', such as UHU Creativ (or POR), Foamhesive, GWS glue, etc.

**Get started**

The first thing to do is attach the control surfaces to the mating part. This can be done in a great variety of ways, from simple scotch tape to pin hinges as well as tyvec and plastic strips. Use your favorite, but keep it light! Bevel the mating surfaces appropriately for the hinge type you use. I used ½" Blenderm tape on this build, top side only (for weight concerns)

I like to get out the Sharpies, and spend a few minutes on some simple graphics primarily for orientation purposes. I'm not good at this, and my models don't last long enough to invest much time. Some guys are genuine artists, and do a beautiful job with simple materials, but typically they don't crash like I do, either.

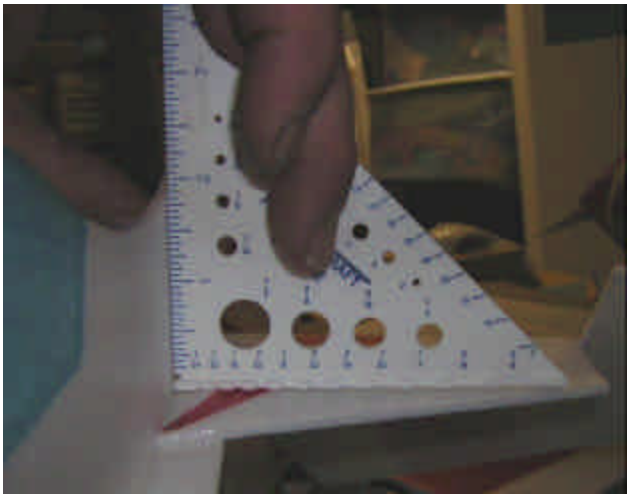


The H-stab/elevator snaps into place with the locating notches.

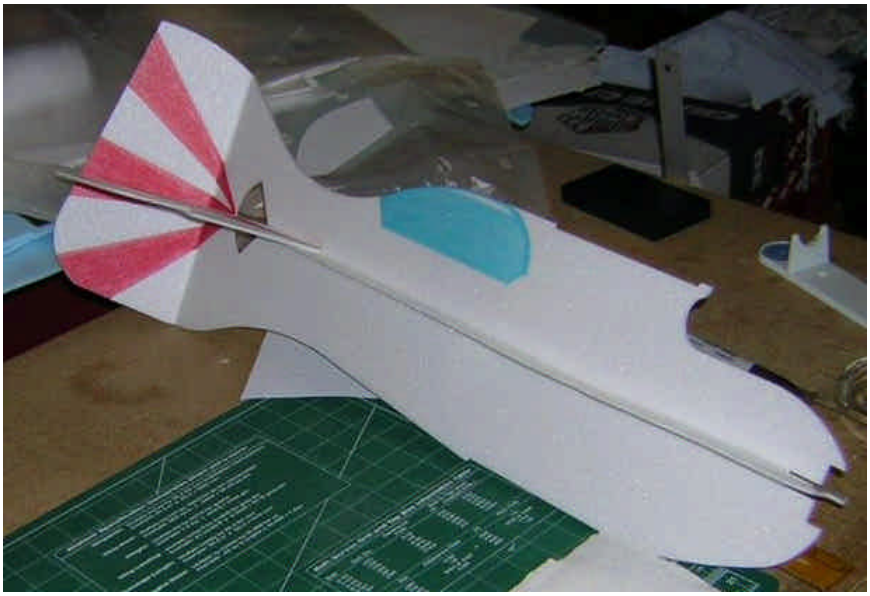
Then the H-fuse/crutch piece slides in.

And snaps in the tabs & notches.

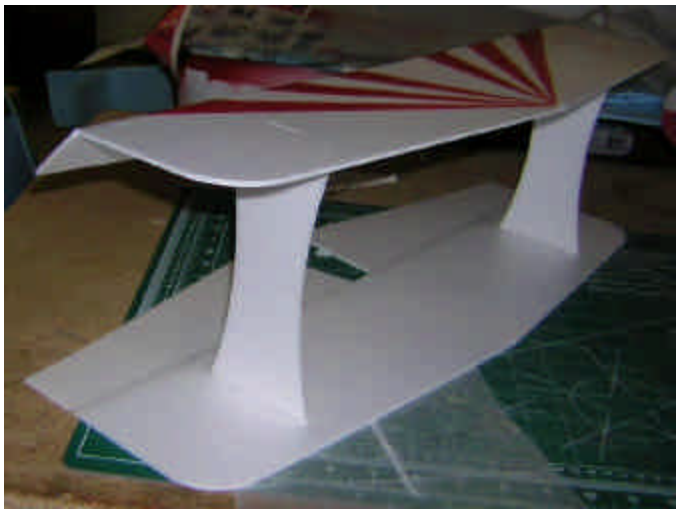
Make sure the stab and crutch are square as you glue them in place.



And, Viola! A completed fuselage assembly.

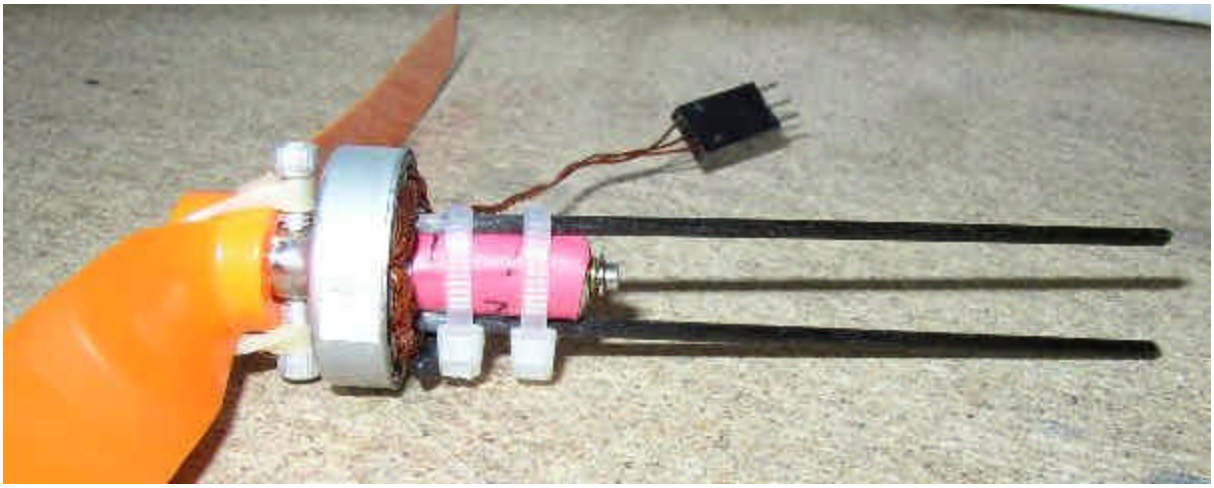


Now, assemble the wings & struts. Square them up as you glue, and build the complete box.



Now, for the motor mount. I'll show my favorite for a CDR with a bearing tube. Glue 2 pieces, about 4" long, of fiberglass or carbon fiber rod (.080 is the size I typically use) to opposite diagonal sides (top left and bottom right) for the spacing of the tube diameter.

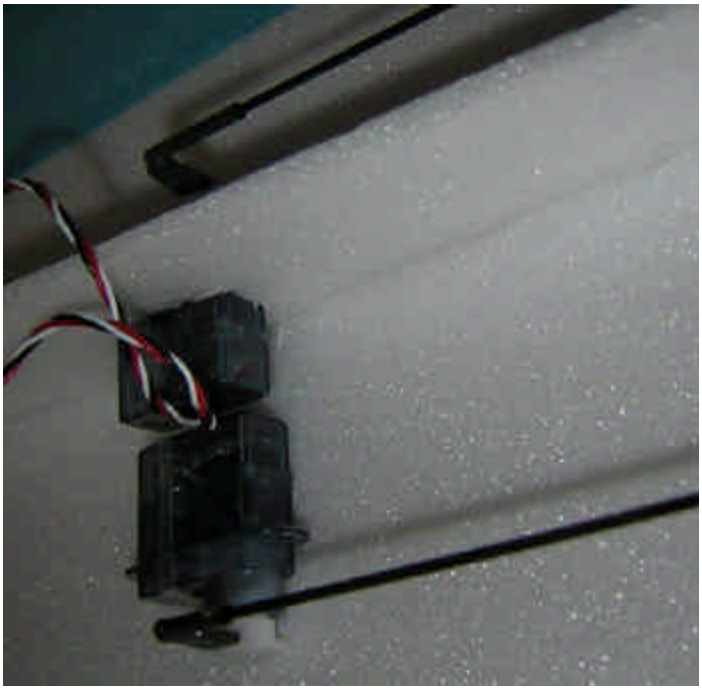
The motor can now be mounted. I like to wrap a strip of 2-sided tape around the bearing tube, and use 3 tie-wraps to secure the motor. This kind of shows it outside the plane.



Now slide the wing assembly onto the fuse and snap it in place. Pop one side off and glue it back, then the other.

The doubler pieces butt up against the wing, on top of the bottom wing. This is area that takes a lot of abuse if you don't use landing gear, or land in tall grass. Also, make the cutout for the aileron servo pretty well forward, to minimize the angle error on the control rods. The tail servos need to be mounted so the model balances as well as possible without the pack, allowing different pack sizes. This may mean pretty far forward, but I would not go past the TE of the ailerons.

I opted to put both tail servos on one side, so the battery on the other side would come close to balancing.



You can see the way did my control rod rigging here and in a few more pictures. I used .050" carbon fiber rod, and 1/16" shrink tubing (1/8" shrink tubing for the servo arm, since it's bigger in diameter). I heat the tubing to shrink it with a soldering pencil. Make sure the servos are centered, as this method

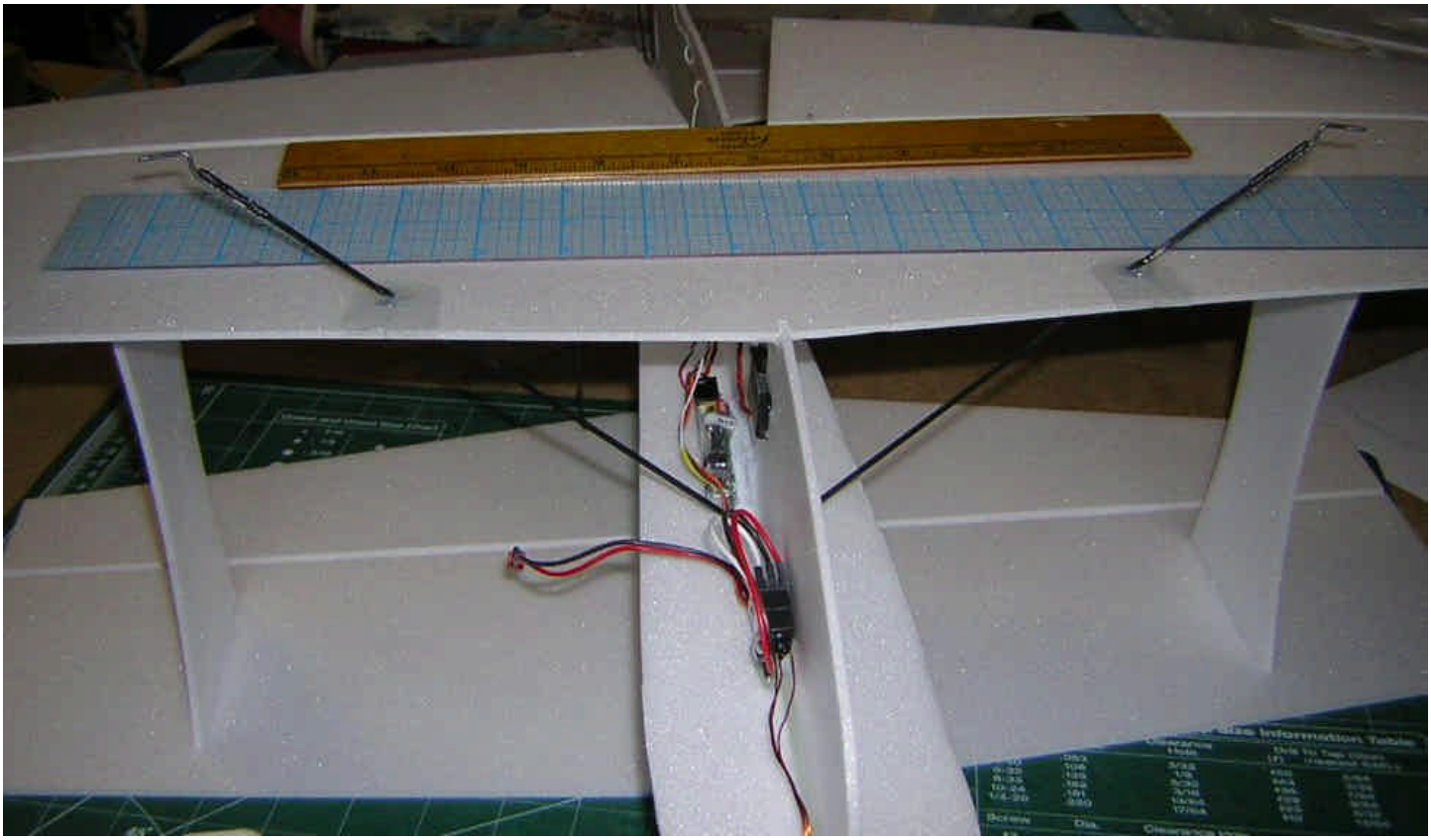
has no means of adjustment! Once positioned properly, I let a drop of CA wick under the tube, securing the rod.

To connect the top and bottom ailerons, use control rods connected to the TE of the ailerons. Again, they can be done the way I did them above, or with conventional Z-bends and L-bends or EZ-connectors.

Once all the control rods are complete, it's time to decide if the wings need reinforcement. Load up the other equipment with masking tape or something temporarily. Then see if the wings flex too much, or just enough.

I opted to use landing gear on this build, thinking it would supply adequate reinforcement for the wings as well. I use .080” fiberglass rod, but carbon fiber will work fine, just a little less springy and more brittle, which is important the way I land.

I sharpen a point on the end of a rod, and drill through the foam to position the rod. I then use hot glue to secure it, since this is somewhat flexible and easily spread out to increase the surface area which carries the load. You can see some little square scraps of packaging plastic I used as doublers to help with the loading.



I used .055” piano wire to bend up some axles for the wheels. I used 1.5” GWS wheels. I think I had to drill them out a hair. The axles are lightly sanded on the surfaces which will be glued, then CA’d in place and then wrapped with floss and saturated with CA.

You can also do diagonal bracing and or spars in the wings, but I felt I didn't need them. Here's an example of the diagonal bracing.

Viola! Make sure all the equipment is secure (I use Velcro), check the balance, and have fun!