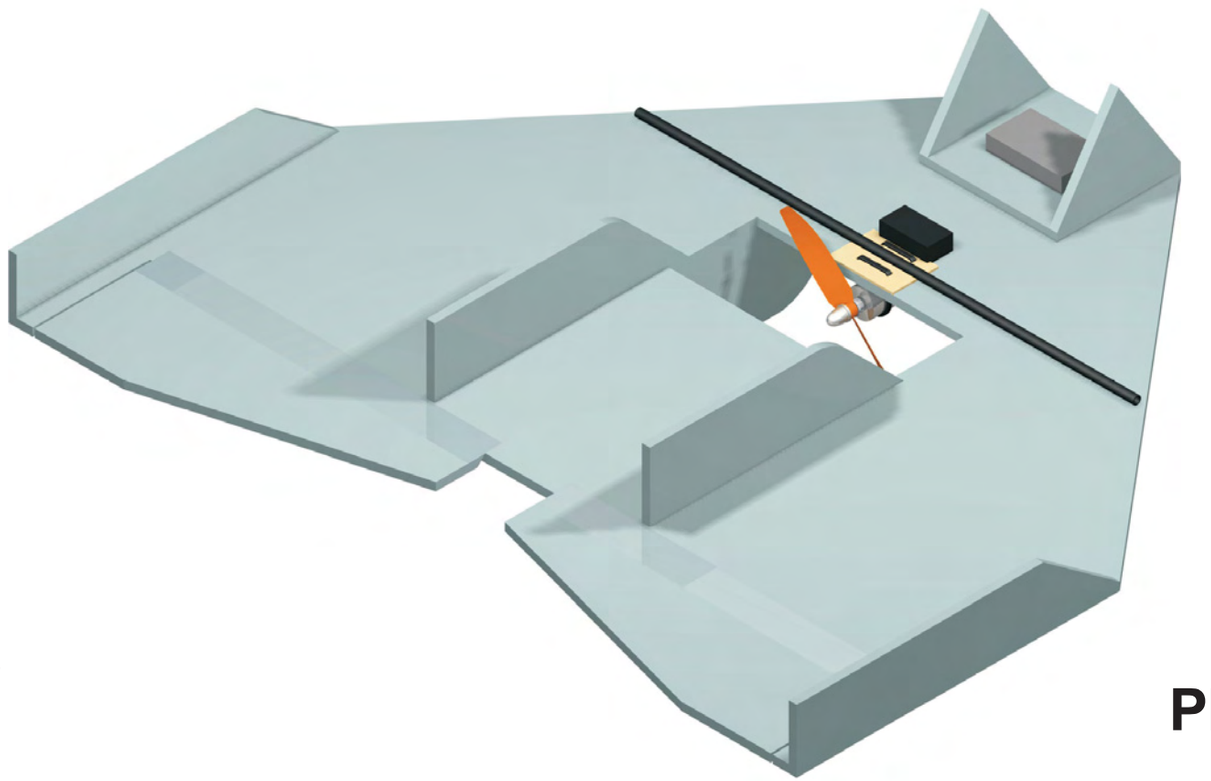
Combat Foamie

An electric powered model made from sheet foam for full contact combat matches



Designed by

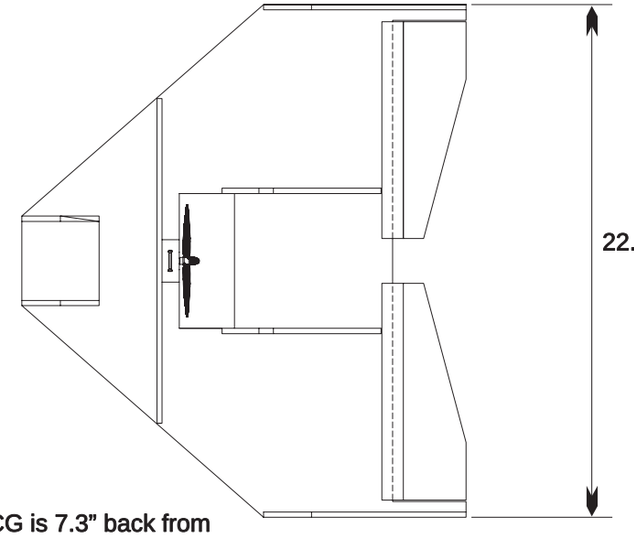
Jerry W. Hagood

Plan by Paul Bradley

July 2010

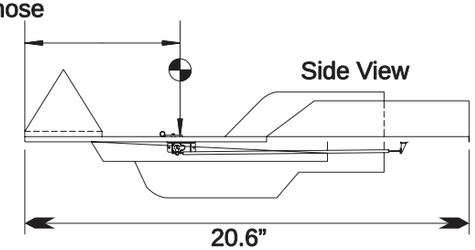
Combat Foamie

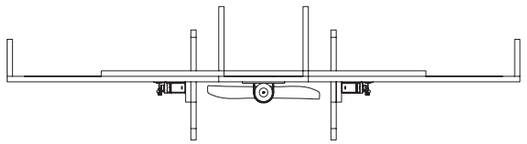
Top View



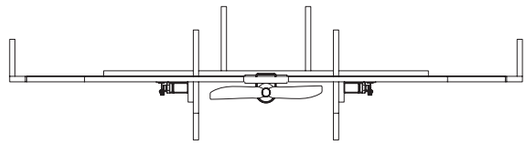
CG is 7.3” back from nose

Side View



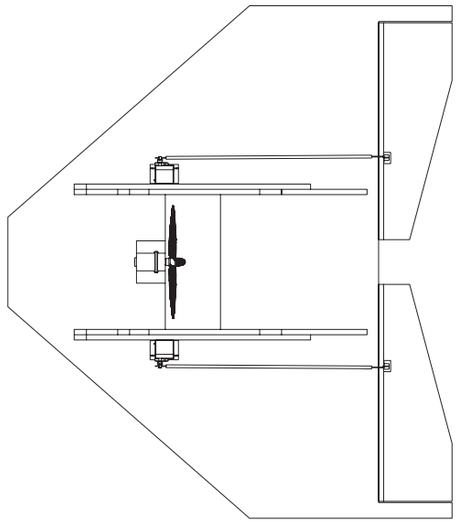


Front View



Rear View

Bottom View



Design by
Jerry W. Hagood

Combat Foamie Assembly Guide

The model presented in this package is fairly simple sheet foam model intended for full contact combat matches. The design was developed by Jerry Hagood. The original model was built from fan fold foam that is about 1/4" thick. As presented in this drawing package, either fan fold foam or 6mm sheet foam can be used.

The prototype model used an ARC 110 brushless motor from http://www.Lightflight.com turning a GWS 5x3 electric prop and a two cell lipo battery pack in the 1300 mah capacity range. You can use any inrunner motor that will produce at least 110 watts of power.

The materials needed to build a model from this plan are listed below:

1. Fan fold foam or 6mm sheet foam
2. 1/32" plywood
3. Spray adhesive
4. Hot melt glue
5. Motor - A brushless intrunner motor is suggested that can produce at least 110 watts of power set up for direct drive
6. Prop -GWS 5x3
7. Two wire tie wraps large enough to hold the motor to the mount
8. Prop adapter for the motor
9. At least a three channel radio system capable of elevon mixing. A micro receiver is recommended.
10. Micro servos - two
11. Electronic Speed Control (ESC) with a Battery Eliminator Circuit (BEC) capable of at lest 10 amps
12. Micro control horns - two
13. Two cell lipo battery pack in the 900 - 1300 mah capacity range
14. Hook and loop (Velcro) fastener material for the battery pack

If 6mm foam is to be used a good source for foam sheets is RC Foam. You will find them at http://www.rcfoam.com.

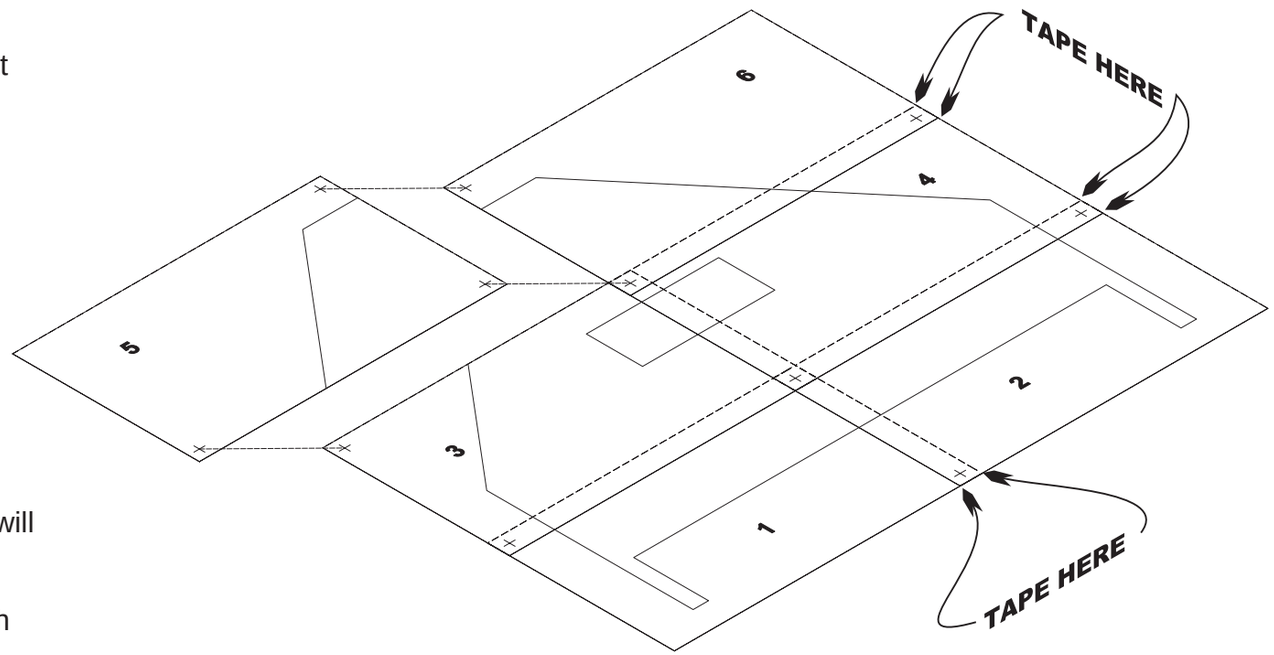
A model built from this plan package has a span of just under 23 inches with an overall length of 20.6 inches. The total flying surface area is 345 square inches. The total flying weight will depend on the materials used, the selected motor, and battery pack. The total flying weight should not exceed 8.5 ounces.

General Assembly Notes

1. **Printing and assembling the wing template.**

The wing template had to be printed on individual sheets of paper to make sure all printers could be used to generate the complete template. The largest paper size that all printers can handle are sheets 8 1/2"by 14" (Legal size in the U.S.). The pages of this package have been set up to print on that size paper.

Sheet alignment marks have been included. Place one sheet on top of another using the alignment marks. Tape the sheets together on each side. Cut the templates from the assembled sheets. An illustration is provided below:



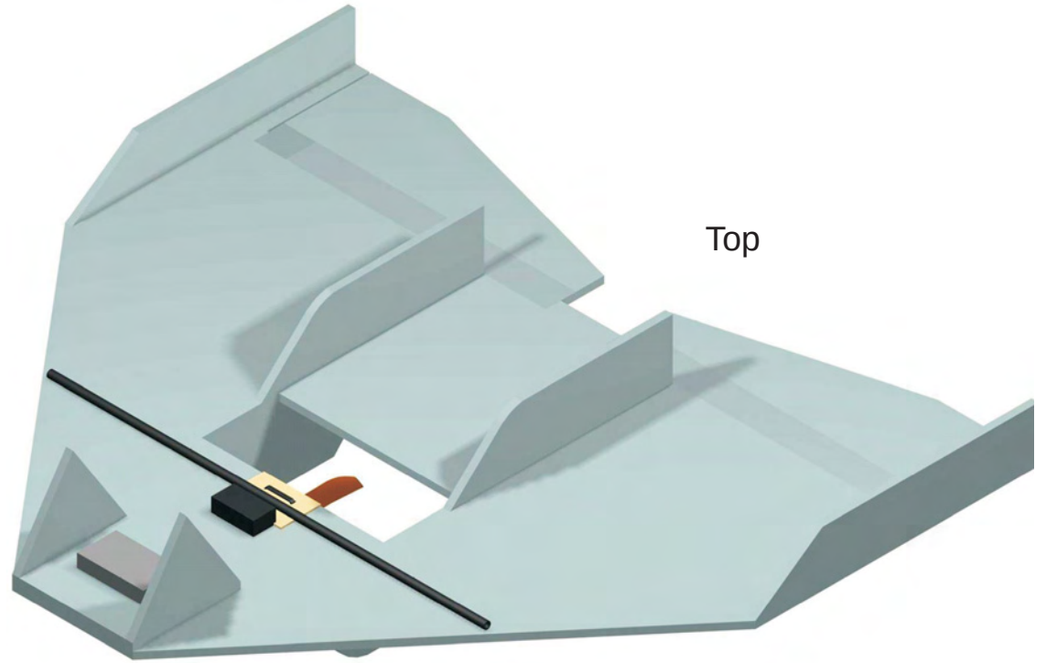
2. **Attaching the templates to the construction materials**.

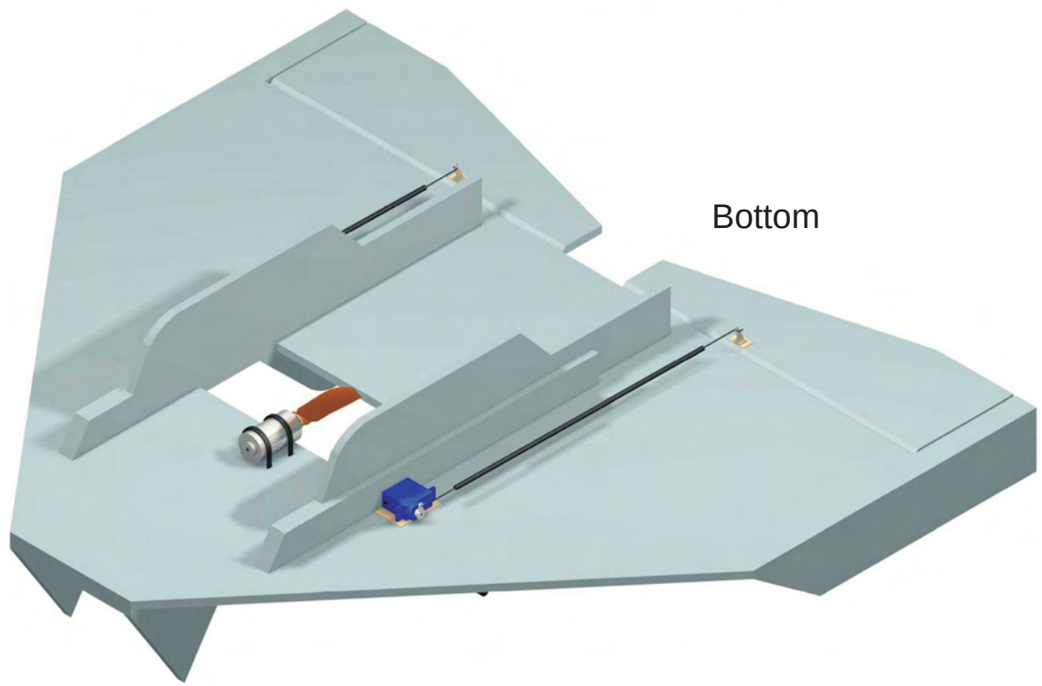
A very good way to attach the paper templates to the construction material so they can be easily removed (and reused in some cases) is to use a spray adhesive. Please note that spray contact cements should not be used as they form permanent bonds. There are several low cost spray adhesives available. Two that work well are Duro All Purpose Spray Adhesive and 3M General Purpose 45 Spray Adhesive. These products are available at home improvement centers, office supply stores, and general department stores.

To form a temporary bond, spray a light coat of the adhesive on the paper template. Let it dry for a half minute or so. The template can then be stuck to the construction material. After the part is cut the template can be easily removed without damage to the template or the cut part.

Some parts need several copies made. The printed paper template can simply be reapplied to the construction material without needing additional spray adhesive. If a given template gets damaged before all the parts have been cut, just print out the page or pages that contain the template and make up a new one.

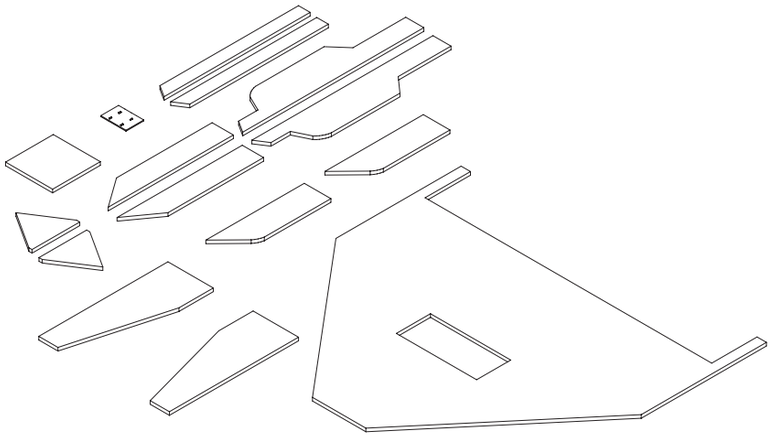
The detailed assembly steps are detailed in the pages that follow.





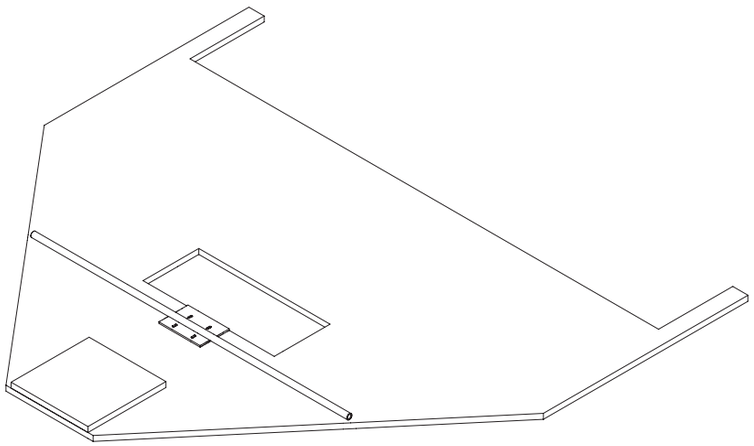
Assembly Steps

1.



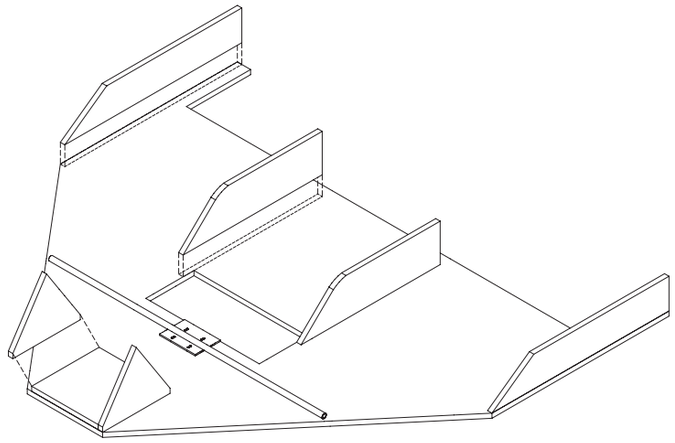
Assemble the wing template. Attach all templates to the construction materials and cut out the individual parts.

2.



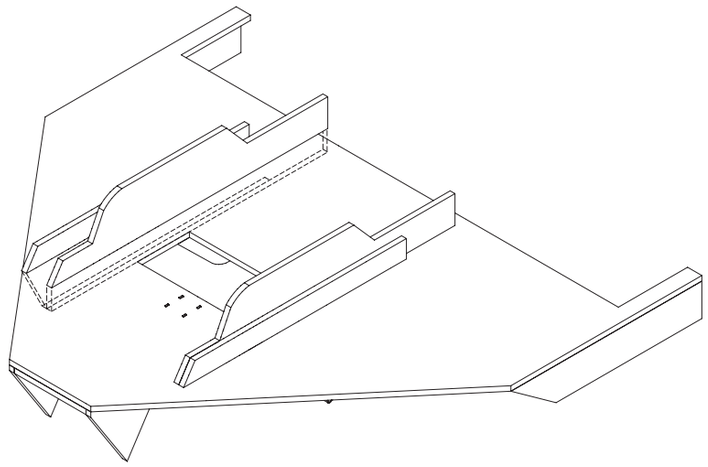
Using hot melt glue, glue the battery pack doubler to the nose. Center it on the nose span. Glue the top 1/32” motor mount plate to top of the wing. It is aligned and centered with the forward edge of the prop clearance cutout. With a drill bit or other suitable tool, open the tie wrap holes in the foam using the motor mount plate as a guide. Glue a 6mm carbon tube spar to the top of the wing surface centered 6.5” back from the nose. The spar will be on top of the motor mount plate.

3.



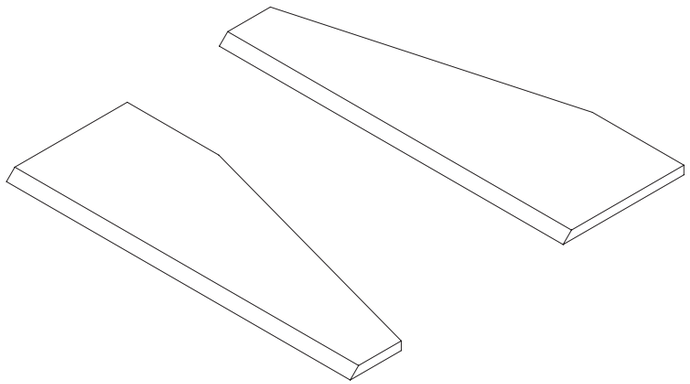
Using hot melt glue, glue the tip fins to the top of each wing tip. Glue the top fins in place aligning them with the prop cut out. They should be ½” forward of the elevon hinge line. Also glue the battery pack protection fins to the top of the wing and the side edges of the battery pack doubler.

4.



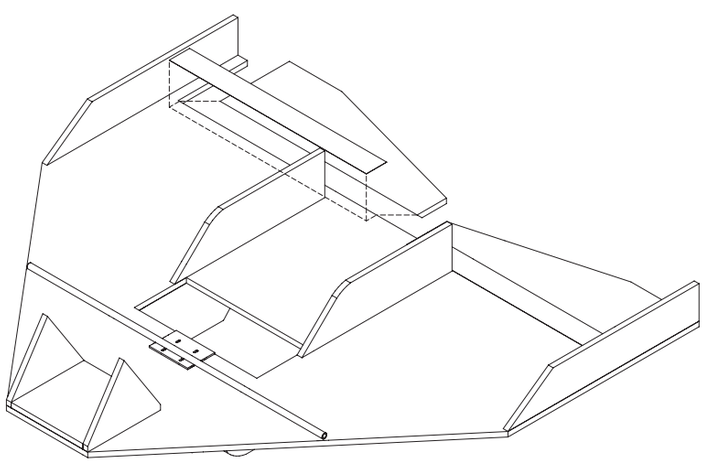
Again using hot melt glue, glue the two keel fins in place. They are aligned with the sides of the prop clearance cut out and are ½” forward of the elevon hinge line. Glue the keel doublers to the outside face of the keel fins and the wing surface.

5.



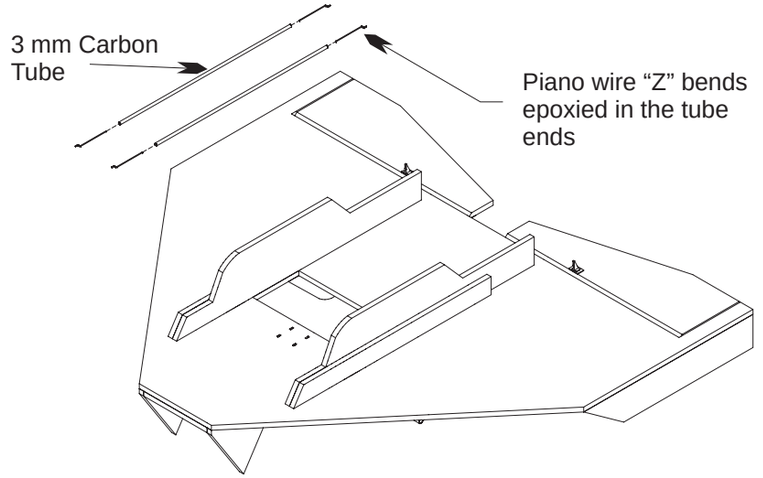
Sand or cut a bevel on the leading edge of each elevon. Make sure that you make a right and left elevon. The beveled edge will face down when they are installed.

6.



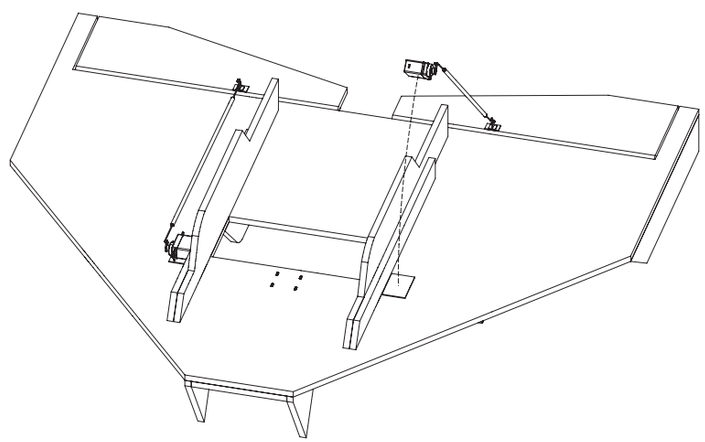
Use a suitable adhesive tape, like packing tape, to attach the elevons to the model. The elevons are installed with the beveled edge facing down. The tape is placed on the top surface. Make sure there is some clearance between elevons and the wing cut out near the tip fins. About 1/16” is good.

7.



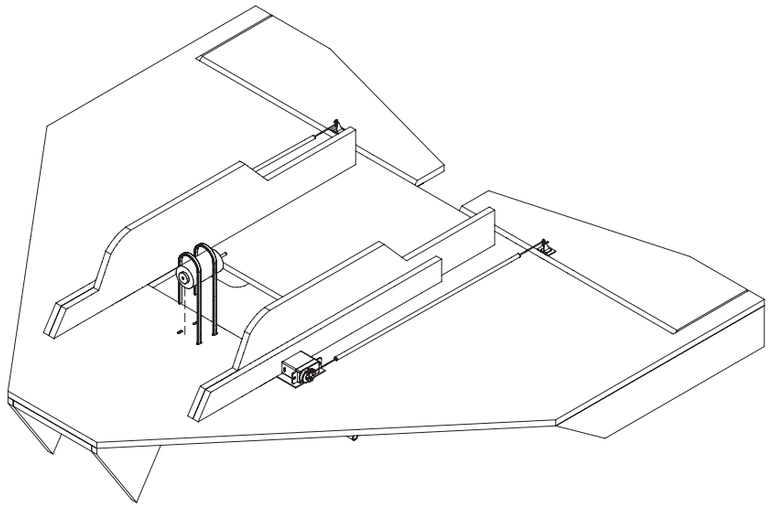
Install a control horn on each elevon. A small plate of 1/32” plywood under each horn will enhance their durability. Make up two push rod assemblies using 3 mm carbon tubes. Cut the tubes to a length of 8.25”. Make up 4 sets of “Z” bends from .032” piano wire. They should have an overall length of 1.5”. Use epoxy to fix the Z bends in the end of each carbon tube. The straight end of each Z bend should extend 3/8” into the epoxy.

8.



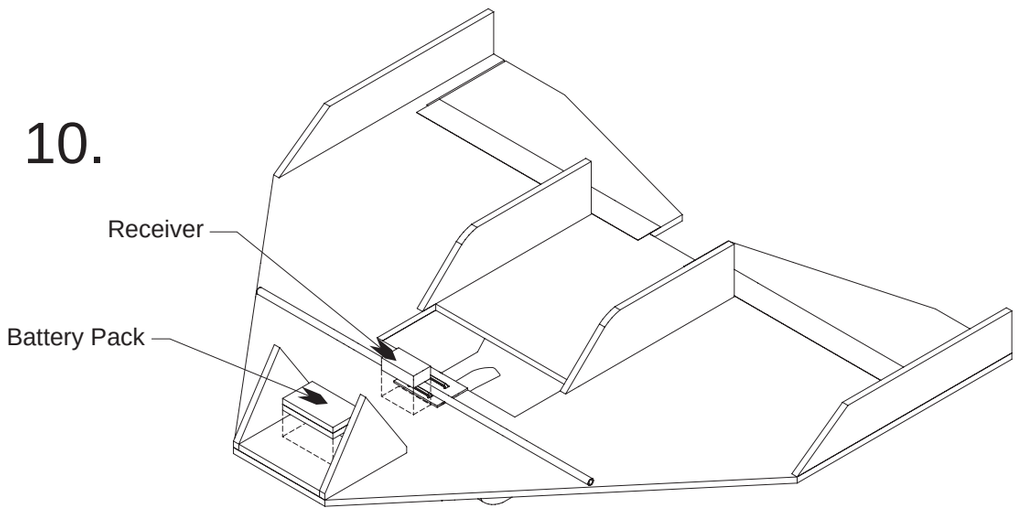
Temporarily hook up the receiver to each servo and make sure the servos are centered. Hook a pushrod to one of the elevon control horns using the Z bend. Slip a servo arm over the Z bend on the other end of the pushrod. Rotate the assembly so the servo can rest on the bottom of the wing surface and against a keel doubler. The output arm will be to the outside of the model. Using hot melt glue, glue the servo in place. A piece of 1/32” plywood under the servo will enhance the strength of the joint.

9.



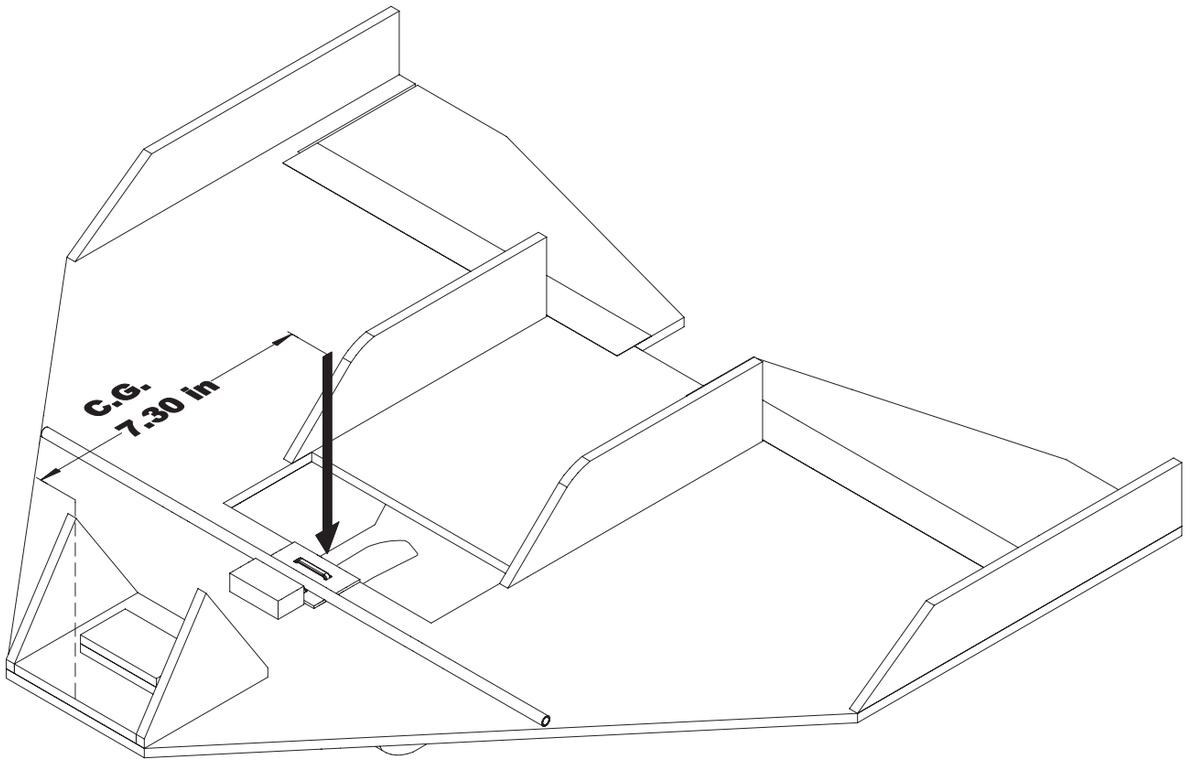
Install the motor. Use a bead of hot melt glue between the motor and the bottom wing surface. The wire tie wraps are pulled through the holes in the mount plate and around the motor.

10.



The receiver and battery pack are now installed. Both are mounted on the top side of the model. The receiver is place just forward of the carbon spar. The battery pack is mounted on the foam plate between the two protection fins. Use hook and loop fastner material to mount both items.

11.



Double check the CG location with the battery pack attached to the model. It should be 7.3” back from the nose of the model. Adjust the location of the battery pack if necessary.

This completes the assembly.

Set-up And Flying Notes From The Designer
Jerry Hagood

1. Use tape to cover all wires and hold them in place. I recommend soldering the ESC directly to the motor wires. Determine the direction of rotation before soldering.

2. To keep the weight down, use Lithium–Polymer (lipo) batteries. A two cell pack in the 900 to 1300 mah capacity range is recommended. The GWS brand 2 cell packs rated at 1300 mah are a good choice in terms of cost and availability.

3. Once the pieces are cut out and ready to assemble, run a bead of hot glue along the edge of the piece to the joined and hold it is place for a minute of so until the glue sets. Then run a fillet of glue along the junction to add strength. Do not over do it with the glue, it adds weight! Note that there are two places where the foam is double thickness; the battery pad and each keel brace. Just run a bead of hot glue and squeeze them together. The keel brace provides longitudinal stiffness and a hard landing will break the keel if it is not doubled. The battery is shifted in order to get the C.G. correct so leave yourself the room to do this.

4. The props may have to be reamed to fit the prop adapter depending upon which prop. adapter you use. I ream several of them at once and keep them in my flight box so that I can do a quick change at the field when one gets broken.

5. The required C.G. is noted on the plans (very close to the spar). Total weight should not exceed 8 ½ oz. It will still fly but you will have to have more power. Place all of the servos and other electronics as close to the C.G. as you can and keep them away from the leading edge (this gets hit and you don't want to damage the electronics if you don't have to.)

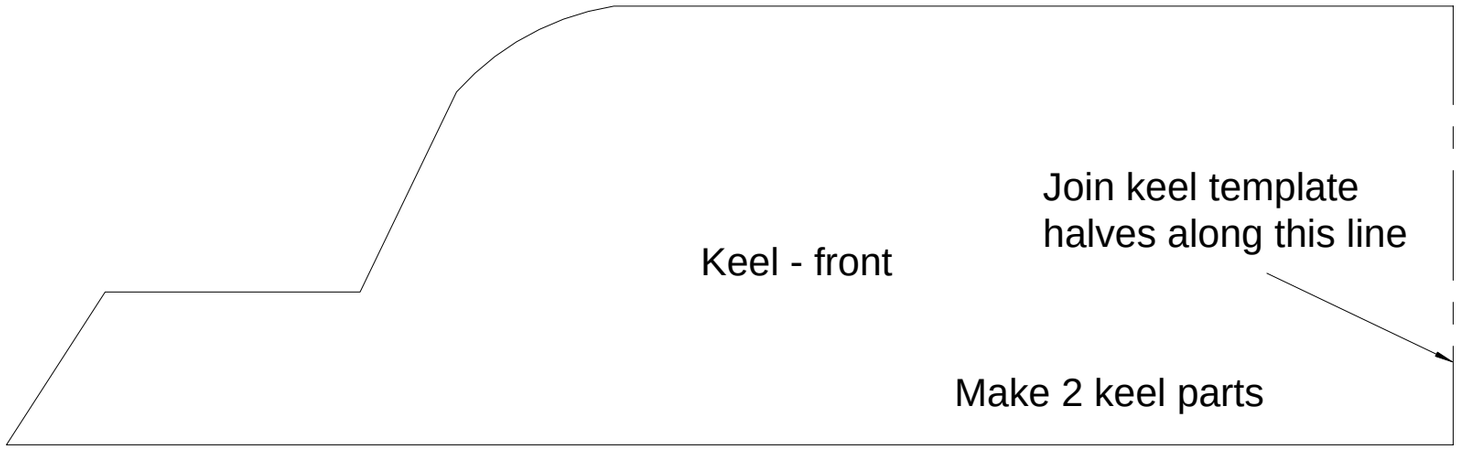
6. We cover the leading edge with Ultracoat to make it a little tougher. Monocoat will also work but is heavier and you need to keep the weight down as much as possible. This is just a 1 inch wide piece wrapped around the edge and ironed on.

7. The Blue-Bird single conversion receiver intended for use with the park flyers works well and is very light weight. Spektrum 2.4 ghz equipment can be used but is more expensive to replace if it gets damaged. I have been flying these for 4 years and have yet to damage a receiver except to cut the antenna. The antenna is routed around the underside of the air frame and taped with Scotch tape. Scotch tape can also be used as hinge material for the control surfaces. It sticks best to the side of the foam which has the film on it so I place the film side up and hinge on that side.

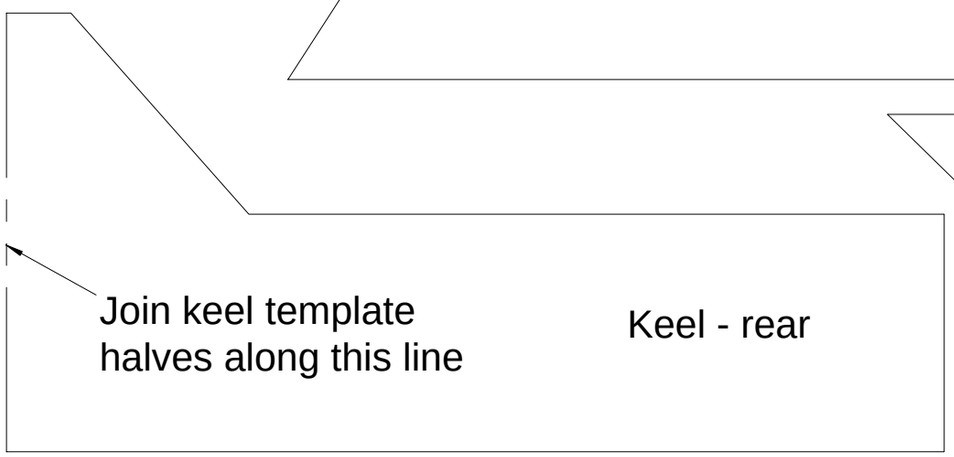
8. **Flying** - Keep in mind that this is a flat plate. There is no airfoil, therefore it flies on angle of attack only. Set the trim slightly positive and do not let the nose go below level unless you want to do a very sharp dive. Hold just enough speed to obtain the necessary lift. By turning into the wind, holding the nose high, and reducing power you can almost hover but not quite.

Launch as you would a “Slinger”, by holding it on one side and throwing it into the air with the throttle set at about ½ of maximum. Too much power on launch will cause it to go out of control before you can grab the stick and correct. I suggest setting control throws to around 30 degrees, but use dual rates during launch at about 70 percent. The flights should last about 10 to 12 minutes with the above setup.

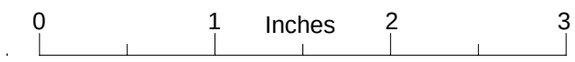
Jerry W. Hagood



Keel Doubler - Make 2



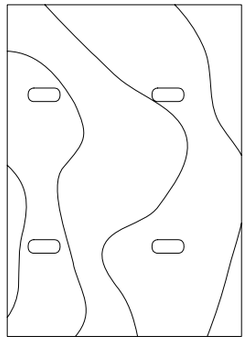
Top fin - Make 2



Tip fin/stiffner - Make 2

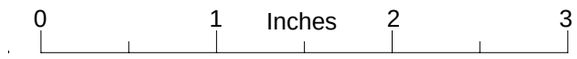
Battery area doubler

Motor Mount Plate - make from 1/32" plywood



Battery protection fin - Make 2

Elevon - Make 2



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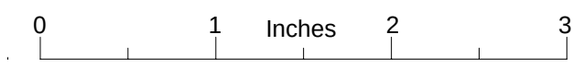

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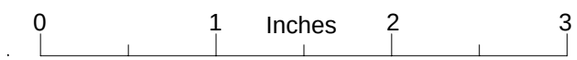

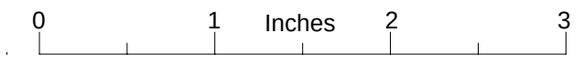

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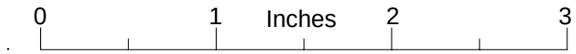

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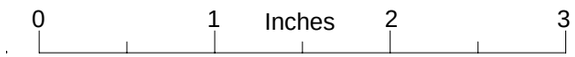

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