

# Eva 3D Wing



## Eva 3D Specifications

**Wingspan:** 32in.

**Wing Area:** 288in sq

**Weight (without battery):** ~12-13oz.

## Revision History

Date	Revision Notes/Comments
7/29/05	Document initial creation.

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## Parts List

Number in Kit	Description of Part
<b>Metal</b>	
1	.032" x 18" " thin music wire for the tail wheel and aileron pushrods
<b>Bagged Parts</b>	
2	4-40 T Nuts
2	4-40 x 3/8" Allen Head Bolts
2	#4 Washers
2	6" heat shrink tubing
1	1" x 1/8" dowel

## General Building Tips

- Balsa is a lightweight and fragile wood, so you do need to be careful with it; however, you will also need to use a little bit of force to make everything fit properly, so don't be too timid.
- Join all of your pieces using thin CA (Cyanoacrylate) glue, unless we tell you otherwise. In general, only a small amount of CA is necessary to glue parts together.
- Don't remove any pieces from the balsa sheets until they're ready to be used. That way, parts won't get mixed up or disappear.
- After you remove pieces from the balsa sheets, carefully remove any of the extra material from where the piece was attached.
- Don't over force your pieces together. If they aren't going together properly, make sure you have the right pieces and that they are oriented correctly.
- If you want to remove the charred edges caused by the laser cutting process, dampen a cloth with bleach and gently rub the affected areas. Removing the char will not increase the strength but will make it look better.

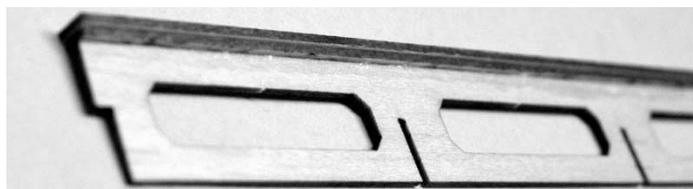
## Assembly Instructions

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 **NOTE** You will be making a right and a left wing. It is all too easy to make two of the same side wings.

### Assembling the Wing

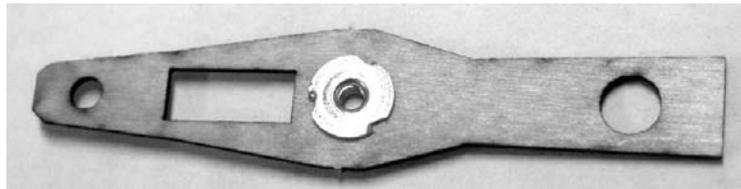
1. Note that there is a slight dihedral to this wing. There is a top spar and bottom spar and the ribs have a top and bottom. Failure to pay attention to this detail can easily ruin the wing. You will make a left and right wing, one at a time. The inside of the spars are the sides with the lettering.
2. Glue the two 1/16" leading edge strips to the leading edge support. The smaller leading edge strip goes on first. This forms a step that the 1/32" balsa sheet will fit in to.



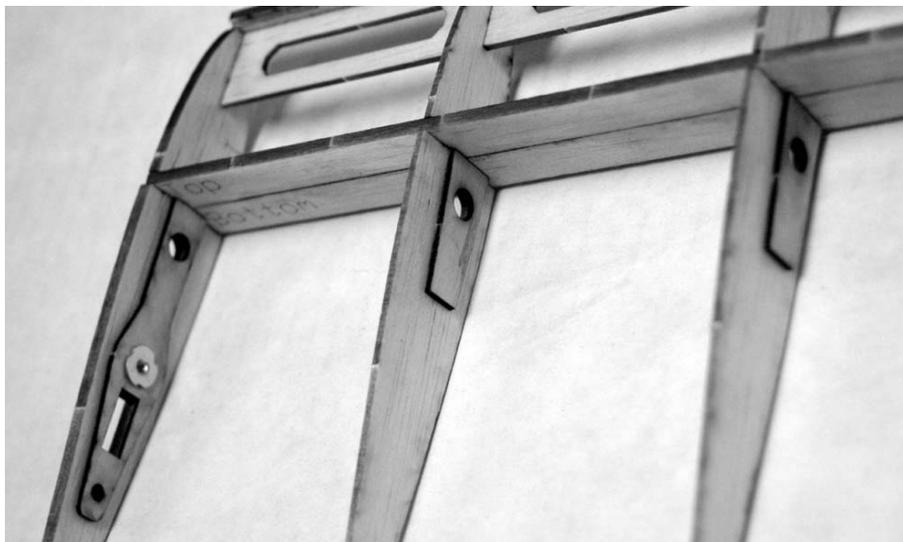
3. Set a bottom spar on the table and position all the ribs but the end two in the spar, ensuring that the tops of the ribs are up. Ribs 1, 2, and 3 are numbered with #1 being the inside rib. Press the top spar into place. Press the trailing edge into place. Press the leading edge into place. Note that the inner sides of the leading and trailing edge are angles to mate with the angled fuselage and are marked with an "I". Glue these parts then glue the end ribs into place.



4. Press a T nut into the plywood reinforcement plate.



5. Glue the three ply reinforcements into place.



6. Glue the 1/32" D Box sheet to the leading edge. It fits into the step made by the two leading edge strips. The 1/32" sheet will be flush with the outside of the outer rib and extend past the inner rib. It will be trimmed later.



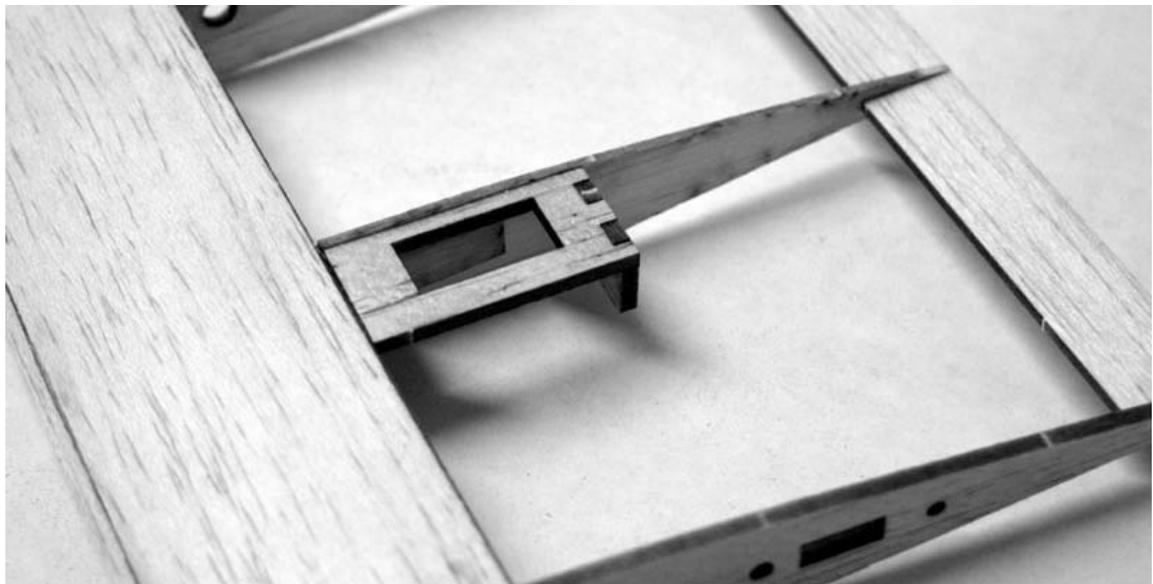
7. Prop the trailing edge up against something flat and level – I use a 3/4" block of wood. When you glue the rear edge of the D Box down, it is imperative that the wing be flat.
8. Start with the center of the wing, glue the rear of the 1/32" balsa to the spar. The wing is flat, right?



9. Glue the second 1/32" balsa to the other side of the wing. Pay special attention to this side. The wing will not be able to twist once the second side is glued. If you glue this sheet while the wing is twisted, you will not be able to remove it later.
10. Trim the 1/32" sheet flush with the outside of the inner rib then sand the leading edge round.



11. Glue the servo tray to the inside of the second rib. The servo tray is on the bottom of the rib and flush with the edge of the rib and spar. Flow some thin CA on the tray to harden the wood so that it will take a servo screw without stripping.



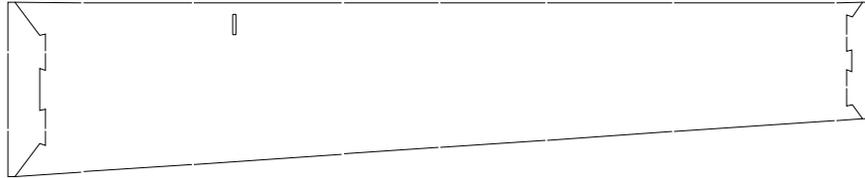
12. Cut a 3/8" long piece of 1/8" dowel and glue it into the rearmost hole in the inner rib.



13. The first wing is done being assembled. Lay it on the table and build a second wing that is a mirror image of the first. This is to make sure you build a left and right wing.

## Step 4: Assembling the Ailerons

1. Glue the three parts that make up the ailerons. Sand a bevel into the leading edge, taking care to make a left and right aileron. Glue the control horn into place.



## Step 8: Sanding and Covering

The next step is to sand the pieces that need to be sanded and cover everything.

 **NOTE** We aren't going to go into how to cover the pieces themselves, you're going to have to refer to your covering's instructions for this information. Additionally, we aren't going to cover our kit for instructional purposes, since the covering hides too much.

### What to Sand

This is a fairly small chore for the Eva; apparently the air prefers sharp edges to rounded ones, so we aren't going to round any of the pieces. Mind you, by sharp edges we don't mean pokey bits, you ARE going to have to sand those, we just mean non-rounded bits.

 <b>HINT</b>
<ul style="list-style-type: none"><li>• While sanding, try to go over the entire edge in a sweeping motion, avoiding any part of the assembly that is to remain non-beveled. This will make sure that your bevel angle is even across the entire way.</li><li>• Make sure that you sand lengthwise with the grain and not across it, as this will cause less strain on the wood and less chance of breaking the pieces.</li><li>• Using a tack cloth, carefully remove the balsa dust once you are done sanding.</li></ul>

### Covering the Eva

Determine what material you'll use to cover, we recommend using Solite covering material since it is extremely lightweight and won't crush the balsa when shrinking. You may wish to paint the ailerons.

Follow your covering material instructions. Plan to use a few xacto blades. Covering dulls the blades quickly.

 <b>TIP</b>
Do not shrink the covering until both sides of each part are covered. This reduces your chances of twisting the surfaces.

## Attaching the Ailerons

Attach the ailerons to the wing with a strip of packing tape cut down to a 1" width. You want the aileron to just about touch the wing so that there is no slop in the hinge but not so tight that the aileron can not flex down.

 **NOTE**

Make sure that you pay attention to which is the left and right aileron when you are attaching them to the wings. I like to have the bevels facing down so that the aileron touches the wing at the top of the aileron.

## Step 13: Finish installing the Servos

### ▶ Attaching the control horns

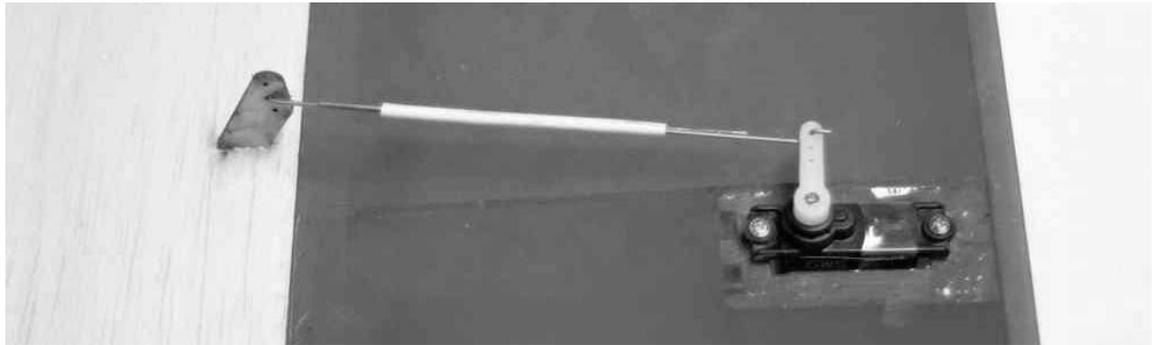
Insert the control horns into their appropriate pocket. After checking to make sure that they're aligned properly, glue them into place with plenty of thin CA.

### ▶ Installing the aileron servos

1. Flow some thin CA where the servos will be mounted. Make sure you allow the glue to dry completely.
2. Center the servos, and then screw them down.

### ▶ Installing the pushrods

1. For each wing, cut two pieces of .032" wire 2.5" long. Make a small Z bend in one end of each wire. One wire goes in the servo control horn, the other goes in the aileron control horn.
2. Lightly sand each wire to ensure a good glue joint later. Don't sand the Z bend.
3. Insure that the servo is centered and then attach the two wires to each other with heat shrink tubing.
4. Center the aileron and shrink the tubing.



5. Once everything is adjusted, flow some thin CA into the heat shrink tubing to bond everything securely.

### **Correct Control Horn Hole Selection**

Hole closer to the control surface = more throw

Hole further from the control surface = less throw

### **Correct Servo Horn Hole Selection**

Hole closer to the servo = less throw

Hole further from the servo = more throw

### ***Attaching the Wing***

1. Mark the middle of the carbon fiber spar. A sharpie works well for this. **DO NOT NICK THE SPAR.**
2. Slide the spar into the fuselage then slide the wings on to the spar, ensuring that the rear wing alignment tabs slide into the slots in the fuselage sides. Check that the spar is still centered in the fuselage.
3. Retain the wing with a hex head screw and washer from inside of the fuselage to the T nut you inserted in the root spar.

### ***Setting the Throws***

You need to adjust your radio trim so that the elevator, rudder, and ailerons are all level. The throws are listed as total travel, and are as follows:

	<b>Low Rates</b>	<b>High Rates</b>
<b>Ailerons</b>	1"	Whatever you can get out of them.
<b>Elevator</b>	2"	Whatever you can get out of them.
<b>Rudder</b>	3"	Whatever you can get out of them.

### ***Setting the Center of Gravity***

The Center of Gravity (CG) will affect how the airplane recovers from a nose up or nose down condition (pitch stability). With the CG too far forward, the plane will be quite stable, but require a lot of up elevator to fly level. This will result in an increased low end speed. On the other hand, too far back and the plane will be hard to control, requiring constant input to keep the plane flying straight and level. For the Eva 3D wing, start with the CG about 3" back from the leading edge at the fuselage. Use this as a starting point, you can slowly move it back as you get more comfortable with the plane.