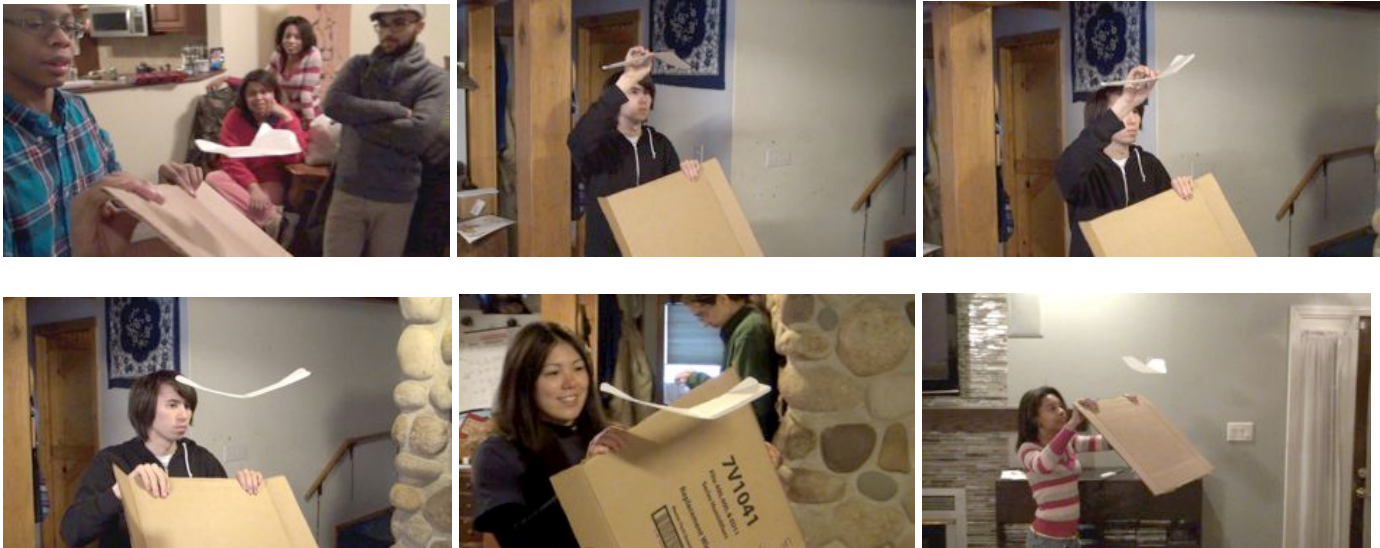


Make a Giant Mama Bug Air Surfing Glider

Much more information about Walkalong Gliders/Air-Surfing and links at <http://www.sciencetoymaker.org/airsurf/index.htm>

You can use the same foam that you make Mosquito gliders out of to make giant Mama Bug gliders, by taping two sheets together. The big glider droops when you hold it in the middle, but when set flying with even lift across the wing, it flies beautifully.



Video Instructions to Make the Mosquito Glider

<https://www.youtube.com/watch?v=PNsXFnobEW4>

PDF Pattern for the Mama Bug Glider.

<http://www.sciencetoymaker.org/airsurf/images/GLIDERS/MamaBugPatternTW.pdf>

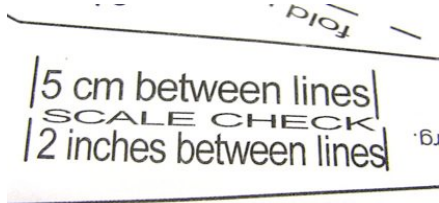
See Print Out Pattern below, on this page to keep the size from being distorted.

Larger gliders are more efficient than smaller ones and you can see it in the Mama Bug's breathtaking glide. You can see this in nature, too. Flying insects have to keep flapping their wings or else they drop like stones. Small birds can glide a little, but not as well as the large birds that soar in updrafts of air with still wings. That is not coincidence; there's a reason. Higher efficiency of bigger flyers has to do with the viscosity of air, denoted by "Reynolds Numbers" if you want to do some research.

There are advantages and disadvantages to the larger Mama Bug gliders. It takes more skill to make, launch and adjust the bigger, droopy glider; and it's more delicate. I do ask that you **make the Mosquito first before you make the Mama Bug**. However, once in the air it's easy to teach people to fly with it because of its efficiency and slow flight. You cannot turn big gliders as sharply as small ones though.

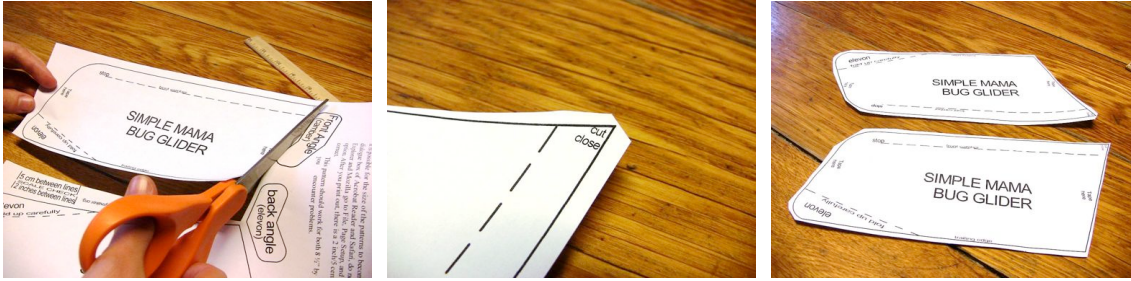
Print Out Pattern

<http://www.sciencetoymaker.org/airsurf/images/GLIDERS/MamaBugPatternTW.pdf> It is possible for the size of the patterns to become distorted—usually smaller. In the print dialogue box of Acrobat PDF Reader and Safari, do not allow "fit to page" or set it to "100%". For Explorer and Mozilla go to File, Page Setup, and uncheck the "shrink to fit" or similar option. After you print out, there is a 2 inch and/or 5 centimeter scale check to make sure it's correct.

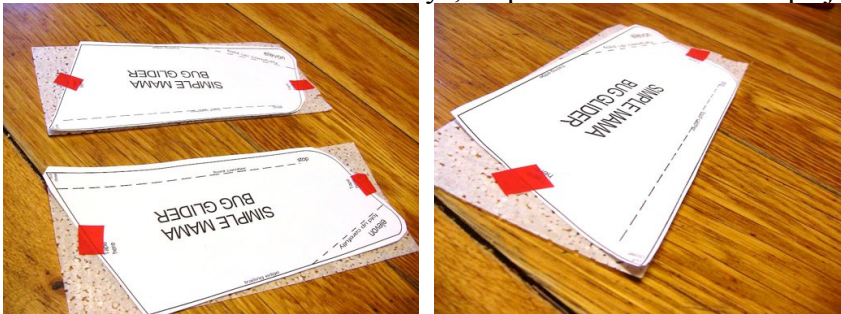


Rough-Cut Pattern, Fit and Tape on Foam, Fine-Cut

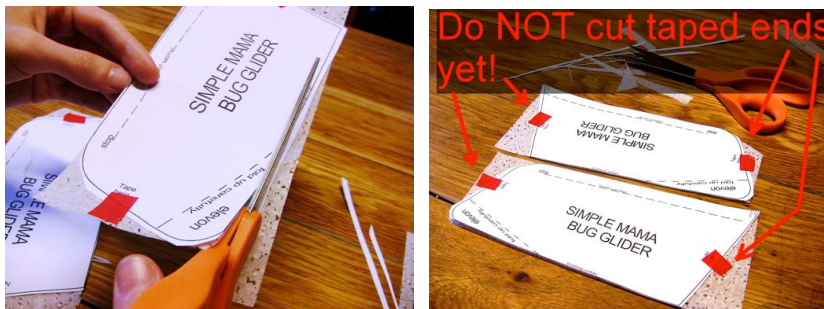
Rough-cut out the patterns. In one corner it says, “cut close”. Make the cut just hit the corner so there is easier to fit it on the foam.



The wing pattern enclosed by the solid black lines will fit on the sheet of foam, but just barely, if you place it perfectly. Put that “cut close” corner exactly on the corner of the foam. The “leading edge” of the pattern should be very close to the edge of the foam. Once you are sure that the inside of the pattern is all on, tape the pattern to the foam on the two ends where it says, “tape here”. I used red tape just so it shows up on camera.



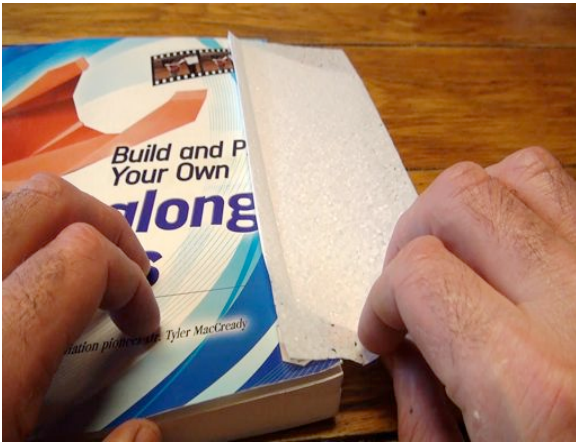
Fine-cut exactly on the solid black lines of the long sides, leading edge and trailing edge. DO NOT CUT OFF THE ENDS WITH THE TAPE YET.



Fold Front Camber and Back Flaps (Elevons)

The Mama Bug is folded the same way as the Mosquito, with help of a paperback book. Slip most of a pattern under the book cover so that the dashed front camber line just barely peeks out (the “leading edge” side). Fold **down**, pushing firmly against the edge of the book. The paper protects the foam. When you pull it out and flip it over, you can see (in the right light) a clear, straight fold.





After folding the other side of the front camber the same way, put the pattern under the book cover with just the elevon (back flap) dashed lines barely peaking out (the paper pattern is on top and foam underneath again). This time, use a ruler or something similar and fold the elevons up and all the way over, 180 degrees again to establish the fold. You will set the final angles in a later step.

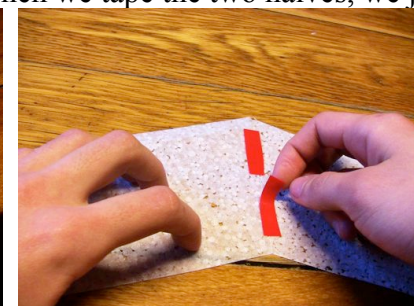
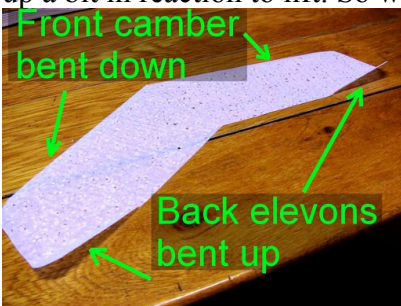


Separate Pattern from Foam, Tape Wings Together

Now that the folds are made, cut on the solid lines at the ends with the tape. This will separate the paper pattern (which you can reuse) from the foam. Pull them apart carefully so as not to rip the foam.



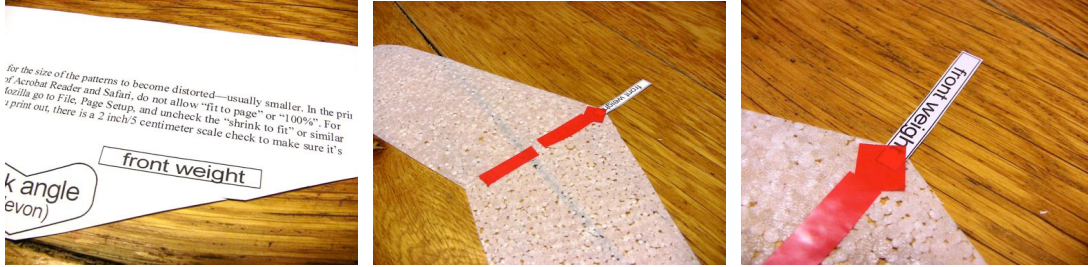
The wings fit together as per the picture. You will know it's right-side-up because the back flaps are bent up. I used red tape only so it would show up on camera. I use clear tape that's 1/2" (12 or 13 mm) wide. Cut two pieces about 1 1/2" or 4 cm and tape the two halves together. When you made the Mosquito glider, there was bend here in the middle to create a little dihedral, or upsweep of the wings. But here on the Mama Bug the long wings actually bend up a bit in reaction to lift. So when we tape the two halves, we just tape them flat.



Tape on the Front Weight

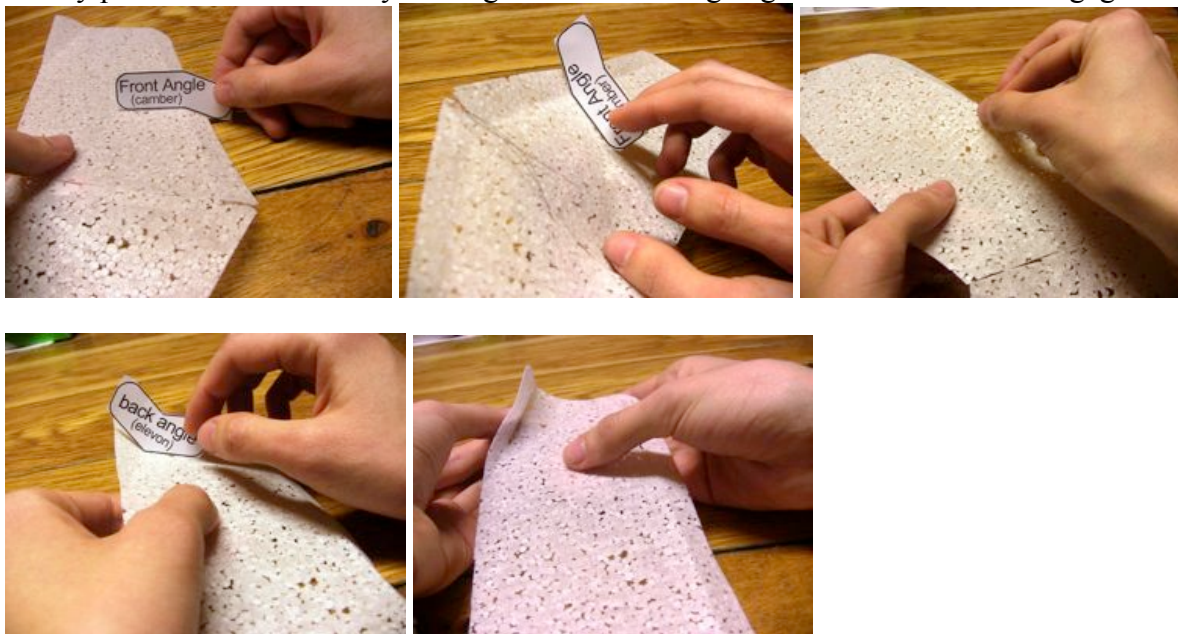
You can use lots of different things for the front weight: paper strip; a few wires from a lamp cord; a bit of aluminum foil folded into a wire. The trick is to get the right amount of weight. More about front weight here <http://www.sciencetoymaker.org/airsurf/frontWeight.htm>

Whatever you use for front weight, tape it on as close to the front as possible. I used red tape only so it would show up on camera.



Set Precise Angles for Front Camber and Back Flaps (Elevons)

Cut out the front and back angle gages. You can measure the angles from the top or from the bottom of the wing. Gently pinch and fiddle with your fingers until the wing angles are the same as the gages.



Test Glide and Adjust for Pitch and Turning

When you hold the glider from the back, in the middle, it does not look promising. It droops terribly and it won't glide if you let go in that condition. Two things help get the wings up into flying position. Having **two fingers (or finger and thumb)** under the glider, and **one finger on top** helps lift the wings a little. The other thing that gets the wings into a good upsweep (dihedral) position is lowering your hand so that the air pushes the wings up. When they sweep up a little, let go. You can also walk forward until the air from that lifts the wings to a slight dihedral.

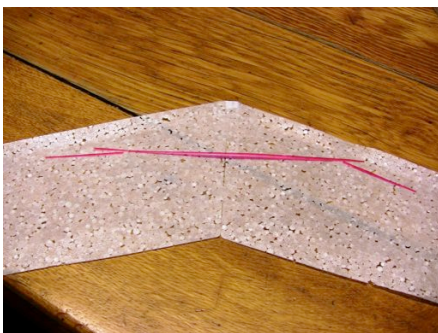
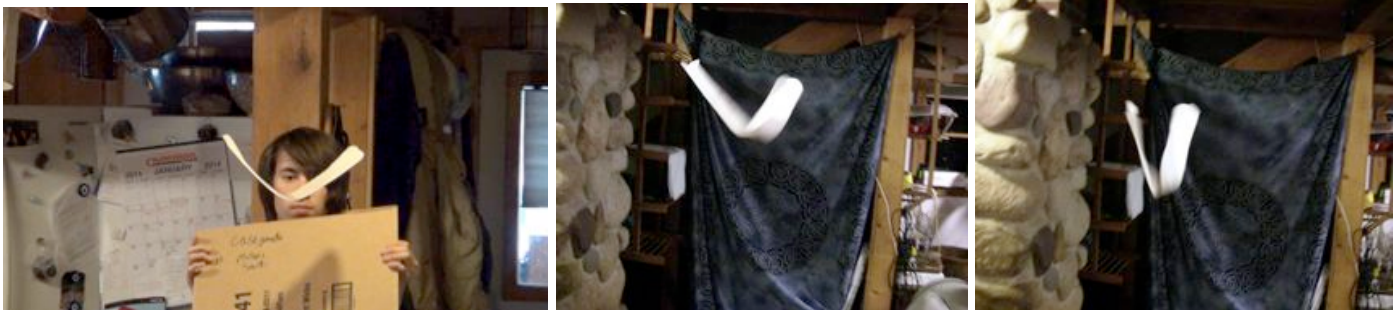


Even though you did not put dihedral into the wing when you taped it, the foam is thin. Once it is in flight the lift will bend the foam to have a little dihedral in the wing. You can also try a board launch.



If the glider gets banged up and weakened, it could fold up too much and fall. If that happens, I suggest taping in piece of foam on the bottom; in the middle.

Alternately, you can reinforce it with a thin strip of plastic drinking straw, about 3/32" or 2 mm. wide. Use a small piece of tape on each end. Even such a thin sliver of straw had enough weight that I did not have to use much front weight. I used to do it this way but taping the piece of foam is easier and seems to work just as well. Let me know what works best for you.



Correcting other problems is the same as the Mosquito glider. Bend the front weight back or cut off some weight if the glider dives. Add weight or bend the front weight forward if the glider stalls severely. If the glider always turns in one direction, bend the opposite elevon up more.



See the bottom of the Mosquito glider page for more detailed troubleshooting tips. And feel free to contact me if you are having problems. <http://www.sciencetoymaker.org/CONTACT.html>