Epsilon35’s Guide to Elastic Launched Glider

This is my guide to making Elastic Launched Gliders, complete with tips I’ve learned along the way. I hope this helps as much as it helped me!

To start off, it’s always good to have a base sketch of the type of plane you want. This can be a quick sketch, but you can also take the time to make an 3-view drawing. However, if you decide to buy a kit, you can use that instead and skip the majority of this. Personally, I’ve never used one nor seen anyone else use them, and find kits should just be for practices and learning experiences rather than for competitions. But hey, no one is stopping you.

Start off by taking a standard piece of paper. This can be lined, graph, or just regular printer paper.

Fold the paper in half vertically. Fold it in half again, this time along the x axis.

Unfold this paper, and you now have the paper creased into four quarters.

You can now make a standard four-view drawing, with one isometric view, one side view, one front view, and one top view. This will help you plan out your plane.

This is somewhat of what it should look like ⇒
(Please excuse the poor execution). Use a ruler and a scale once you have an actual design figured out. Of course, if you wish to use a computer aided drafting program to sketch out the plane, feel free. Due to budget and time, I always find myself using paper and pencil. But you do you.

Once you have a plan, take another piece of paper and lay it out. We now will make a template for the wing-shape.

Since most wingspans are more than 11 inches long (and having a center axis makes it easier later) I recommend taking two sheets and taping them together. Here I used clear tape sparingly, but you can also use masking tape so you can draw on it. If you use Scotch tape like I did, simply flip the taped papers over and use the opposite side to sketch on.

This part is very crucial—using a ruler! Make a to-scale top view sketch of your wings for the plane. Without a good wing shape, your plane won’t fly well. Research many different gliders and planes to pick your wing shape. Remember, this event is all about trial and error- then trimming to make it work. To ensure clarity, I typically sketch out my drawing and then trace it with pen. This also helps refine the shape and make sure you don’t get confused from the many eraser and pencil marks (at least if you’re like me and have a TON of them left on your paper).

This is my finalized sketch of the wing-shape for my glider. The extra lines are where I will score
my wings and bend them at a certain angle.

Fold the paper down the center of the wingspan (for me this is at the point where the two edges of the papers are taped together) Then, using scissors or an Xacto blade, cut out the shape. This not only evens out both sides of the wing, but also gives an idea of where it will be placed on the fuselage to make it centered.

Here is mine cut out from its template using a straight edge and lots of time to prevent jaggedness.

Next, it’s time to turn this plan into reality. I’m using some junk 1/32 balsa wood sold for cheap at Hobby Lobby (Many times you’ll find broken pieces and its price will be marked down. If you find one that is in poor shape but is regular priced, you can always talk to an associate. Please note: do not purposely break balsa to get it for a cheaper price- It ruins the fun for everyone because sales like this would no longer be possible. This guide also helps if your balsa accidentally breaks.

Start off by taking my template and taping it to the table to prevent it from moving. Then, take a piece of wax paper and affixing it to the table over the template using tape.
Next is glueing. I prefer using a cyanoacrylate like Loctite. You can find a four pack of 2 liquid and 2 gel for $10 at Sam’s Club. This beats spending $4 per bottle at Walmart. For most of this project, you want to use a medium viscosity glue. Therefore, for most of it I will use Loctite gel.

I already cut the balsa wood to size, but as you can see because it is broken there is a space that is missing. To fix this, you can glue another strip to it.

Many times the students I’ve helped out have used glue straight from the bottle (I was also guilty of this when I first started Science Olympiad). Instead, use a piece of foil or wax paper and drip glue onto it. Then, use a toothpick to blob some glue into areas where you need it. A little bit of glue goes a long way, and this way you save money and keep the plane light.

Tadaa! Good as new- sorta. To gain as much strength as you can (and because you have time), you don’t want to use accelerator to cure the glue. Instead, simply wait for it to cure for an hour (30 minutes on packaging, but it’s nice to extend the time if you don’t feel like accidentally gluing your fingers together). One quick remedy if this occurs: use acetone! You
can find this at dollar stores marketed as nail polish remover. 100% is quick but also is rough on skin.

Also, I should note that while I had an idea to glue it back together, I also received some guidance from my old coach as to how exactly to glue it back. (Thanks Mr. Slaven!) Though I’m hesitant to admit I had to talk to my former coach even as a college freshman, it definitely helped and I recommend others to do the same! You never know what you can learn from your coach!

Next comes sanding- and LOTS of it! Basically, you want to create an airfoil by making a chamfered edge on the wingspan.

This is better described in the diagram I made:

The air flow causes the underside of the wingspan to have a high air pressure and the top of the wingspan to have a low air pressure. This creates lift.

To mimic this, we want to sand the edge as much as possible. To prevent splitting and breaking, I recommend using a 120 grit sandpaper or above. The higher the number, the smaller the grit. Although it takes longer, it’ll be worth it in the end when you have an intact glider.

Although hard to see, this is a side by side comparison of a 60 grit (left) compared to a 120 grit (right). My camera doesn’t do it justice, but up close it is pretty easy to tell which is which.

Now, back to sanding. It can get MESSY. If you’re like me and are allergic to wood dust- or just don’t want a mess on your kitchen table- it might be a good investment to purchase a desktop vacuum such as this one. I bought this one off Amazon.
when I was first purchasing stuff for college for around $12. Pricey, but effective. I’ve found myself using it nearly everyday for messes, and it cleans wood dust like a dream. It also is very quiet, which is a benefit if you’re working late at night and don’t want to wake your parents or roommates.

As you can see, to prevent breakage I am sanding along the grain with my hand spread out across the sandpaper. This makes it so your force is not in one collective spot and could cause snapping when moving back and forth. It is also good to note I was not sanding when taking this photo. You want to keep a grasp of the balsa and also want to have it at the edge so you’re not sanding down the table you’re working at.

Getting closer!

Another easy way to tell if the balsa is thin enough is to hold it to the light. Light should be easily able to pass through it, like a film. As you can see, I’m nowhere close.

Finally, I am done with the wings! Of course, in all of my excitement I forgot to take pictures of the wings and the next steps. Basically, I cut the wings along the pattern and scored the lines with pencil. Then, I carefully and slowly snapped the balsa to a ~45* angle. This I glued in place using the toothpick method to keep them in the exact angle.

Next is time for the fuselage. I cut a small piece of balsa for the tip to have a piece for the rubber band to anchor to. I glued this with the grains parallel.

I then sandwiched this between two other pieces of balsa, this time the grains running perpendicular
to one another. I then cut out notches into both exterior pieces to match the part in between.

Next is time for more planning! This part is for the tail and stabilizer of the plane I drew out one half of my design, then folded it along its edge and cut it out.

Here it is in its finished state.

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It was then at this point I glued the wings to the fuselage. I then took my template and lined it up on the plane to see how it looked.

Looking good if you ask me! Which you’re not, so - moving on.

I then traced the template onto a piece of balsa and cut it out using an Xacto blade. I always use a ruler when cutting to keep the lines straight.

Next comes the stabilizer. I make a template and trace it onto the balsa wood. Then, I line it up to make sure it’s what I want. This can be tilted in ways to cause your plane to turn on its own- something that can be valuable at times when you want to extend your flight time.
Here is the stabilizer glued in place!

And here it is glued onto the fuselage!

Here is the almost finished product- but there’s one important thing to make sure it flies!

You want to make sure the center of mass is about \( \frac{2}{3} \) down the wingspan. Simply do this by balancing it on your finger. If it balances, you’re good to go! If it balances at a different spot, you need to “trim” your plane. If the front end tilts down, you need to balance it by adding mass to the back. If the back tilts down, you need to add mass to the front. This can be easily done by attaching cheap
modelling clay. It never dries so it can be easily removed and added, and it is heavy enough that you only need a little to make the plane be balanced out.

And FINALLY, your glider is done!!!
the band like so (use a longer band than I am- my season hasn't started so I don't have access to the right elastics). Simply pull back the glider at the back end of the fuselage and let go. One question I get often is whether to use lubricant or not. Personally I've always found them more useful for winder events such as Helicopters and Wright Stuff. Keeping the bands in the freezer in between launches and before competitions is essential. When elastic is stretched their polymer chains will straighten and compress, causing an increase in thermal energy. The band's chains of molecules shorten and contract due to this (unlike other materials) which makes it prone to snapping. Storing them in the freezer causes the chains to cool down and expand-meaning it will stretch farther and not be as prone to snapping.

Now you're done!

I hope this guide aided a little in making elastic launched gliders!