

SO13 - for Science Olympiad

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1) Design-

This is a good glider for beginners. It doesn't require sanding, is strong enough to withstand some hard landings and can still be somewhat competitive.

2) Material Selection- Wood

Light weight is important, so choose the best balsa you can find for the wing and tail. The fuselage should be from stiffer harder wood, don't make it too flimsy or it can break in a crash.

I used 2 sheets; First a 1/32" x 3" x 36" sheet weighing 8 grams for the wing and tail. Second a 1/16" x 3" x 36" sheet weighing 30g for the fuse and wing pylon. 8g sheets of 1/32" can be hard to find. Make sure you take a scale to your hobby shop and WEIGH EACH SHEET. Don't buy the sheets which are too heavy. If needed, heavier can be used at the expense of performance but do not exceed 14g for the 1/32 sheet or you may exceed the 10g maximum weight for the glider

3) Construction

Cutout parts

Start by cutting out the plan parts. I then trace all of the parts made from 1/32" on my balsa sheet with a marker and then cut them all out at once. It lets me keep them closer together on the sheet and save balsa.

Building the parts

Wing- I build the wing first because this is the core of any glider. First draw the dihedral breaks on the bottom, then mark out the wing outline and cut to shape. Lightly cut the bottom of the wing under the outside dihedral breaks. DO NOT cut all of the way through. Break the dihedral at the cuts and glue the outside flaps at the correct angles.

Stab / Fin - cut to shape from your 1/32 sheet and glue the fin on the top of the stab. No angle is needed. The glider will turn because of the difference in wing dihedral.

Fuselage – Cut a straight piece of your 1/16 sheet so it is 5mm wide. Make sure it is straight and the top is level. If you make a mistake and the fuse is wavy, try again. Alignment is critical so check carefully that the top edge is in fact straight, and that the wing platform is in fact level with the bottom. You need the wing and tail both at zero, no compromise here.

Final Assembly

I use superglue for everything because it dries quickly. It also makes things permanent so be sure everything is correct before gluing. Glue the wing to the pylon first. Then glue the pylon to the fuse. Here I only use a small drop at the front and rear of the pylon. It makes it possible to get a razor between the fuse and pylon in case I want to move the wing later. I then glue the stab to the fuse being sure to keep the 10mm amount at the tail end of the fuse to allow for pullback. Attach the launch hook and nose piece (for the Chap Stick rule). Balance at the CG point by adding sticky tack / poster putty. I don't use clay because it tends to dry out and fall off. Don't worry too much if it is a little heavier than the plans, it happens (but make sure it is less than 10g).

4) Flying / Trimming for performance and repeatability

First do several hand glides, it should glide in the correct direction without diving or stalling. I make a couple of level 25% power catapult launches to determine the glider direction and make sure the model doesn't want to nose dive or go into a loop. If it does, these must be corrected to a level flight first. If this is OK then you can start to use the catapult and add some elevation. Do NOT aim straight up like you are shooting an arrow at the moon. This model needs to glide, and to do that it needs to *transition* from fast catapult to slow glide, getting the transition to work correctly is the hard part. Start with about 45° bank and 30° elevation and about half power. The model should arc up and then go into the correct glide. The elevator is your most powerful control here, and then rudder. You may need to adjust the launch angle. Increase power to 80%, and if OK then 100%. As you approach maximum warp speed things happen much faster, and a trim that works at 50 % power may not cope with higher speeds, the trim becomes more critical and needs to be refined in smaller steps. If it is now too loopy you will need down elevator, perhaps a touch of rudder, and you **need to be accurate and consistent on the launch angle**. On my sample model, I cut flaps into the tail and attached them with clear tape. This let me change the elevator more easily. I then glue these in place and remove the tape when I have it where I want it. Good trim is the result of effort and testing, so you need to make the time to do this. Note - *the plan may have changed size during scanning and copying, so check the reference line on the wing is actually 50mm long.*