



## Switchblade-S Rocket Glider

J&H Aerospace ↗

***Warning: This model rocket glider is not a toy. It is capable of traveling great distances at hundreds of miles per hour. Do not launch in the vicinity of full scale aircraft and be aware of your surroundings when flying!***

### Building Instructions

Congratulations on your purchase of the Switchblade-S rocket glider! The build manual can be found on our website at <https://jhaerospace.com/product/switchblade-s-rocket-glider-kit/> You are about to build a high performance rocket glider capable of more than 1 minute flights in calm air. Please carefully read all of these instructions prior to beginning construction of your model. This aircraft uses several construction techniques which may be unfamiliar to you and requires care in assembly to ensure that all parts are correctly aligned.

#### 1. Parts list

Before beginning construction, please verify that your kit contains all of the necessary parts listed below. Please be aware that some of the laser cut parts may have separated from their carrier sheet, so you should ensure that all of those parts are present and undamaged.

1. Parts Sheet #1, wings/tail, 1/16" balsa
2. Parts Sheet #2, Fuselage core, 1/8" balsa
3. Parts Sheet #3, Plywood parts, 1/64" ply
4. Guides and retainers (3/32" OD aluminum tubing) – qty 3
5. Hinge saddle (piano wire)
6. Binding and retention line (100lb Kevlar thread)
7. Hinge bearings (Easybuilt 1/8" nose bearings) – qty 2
8. Wing opening bands (.025 Tan Super Sport rubber) – 12"
9. Wing hold-down loops (piano wire) – qty 2
10. Wing deployment hooks (piano wire) – qty 2
11. Nose cone hold-down loop (piano wire) – qty 1
12. Balsa nose cone (turned balsa, size BNC-5V) – qty 1
13. Motor tube (Estes BT-5, 3" long) – qty 1
14. Balancing weight (modeling clay) – qty 2
15. Launch lug (paper tube) – qty 1
16. Carbon tailboom

## **2. Materials required**

You will need the following tools to complete your Switchblade-S:

1. Hobby knife
2. Cyanoacrylate glue (Duco Cement may also be used, but it will take longer to dry and will require jiggling the parts into place while glueing); epoxy is optional for hinge attachment and bearing installation
3. 12" ruler or straightedge
4. Needle nose pliers
5. Scissors
6. Pencil or pen
7. 300 grit sandpaper
8. Razor plane (optional but highly recommended)

## **3. Assembling the fuselage**

Separate the fuselage core and the plywood sides.



Use plywood to assemble the fuselage pod section.



Glue the fat end of the carbon tailboom into the slot in the fuselage pod.

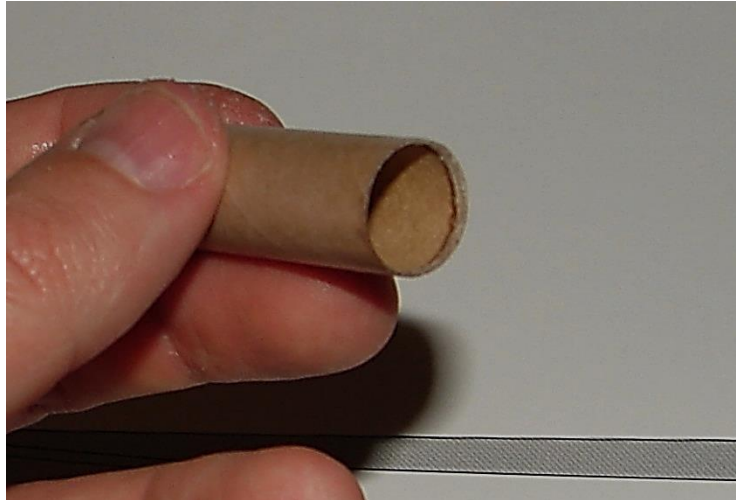


Install the saddle. Once the glue has hardened, bind the joint with the supplied Spider Wire line and fill the binding with CA. If you are uncomfortable with CA, use 5-15 minute epoxy to mount the saddle; binding may be added before the glue has set up; you will need to jig the saddle to ensure that alignment is retained. Before either type of glue has hardened, it is important to ensure that the saddle is correctly aligned.

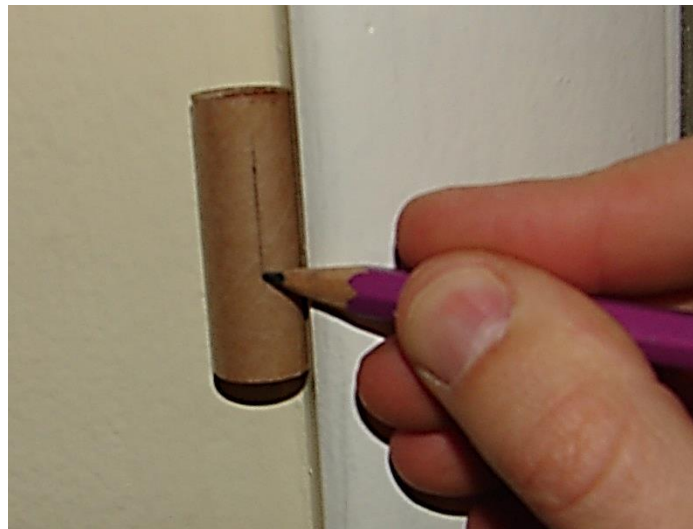




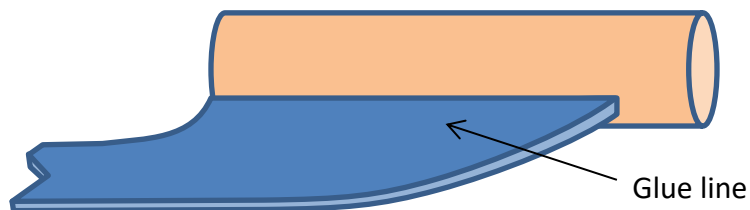
It is now time to install the motor tube. Due to the stresses imposed on the nose cone area of the motor tube, it is highly recommended that you harden that area with epoxy.



Your motor tube must be marked for proper alignment to the fuselage using a door frame or the corner of a drawer.



Next fasten the motor tube to the fuselage. It is recommended that you hold the parts together to ensure your understanding of how they fit prior to gluing in place. If you are using CA glue to cement this joint, spread it on the top of the fuselage and join the two parts together. If you have used sufficient glue (avoid using so much that the glue runs or drips), no further action will be necessary once the two parts are joined. If using Duco cement, you will need to add glue fillets after the glue joint has dried. Remember, this part experiences the highest stresses of any part of your model because of the ejection shock.



Install the launch lug atop the motor tube using CA glue. It should be aligned as closely as possible with the direction of travel.



#### **4. Assembling the wings**

Use a razor plane to shape the wings to an airfoil. Be very careful not to make two left or right wings. Use sandpaper to shape the wings to a smooth finish.





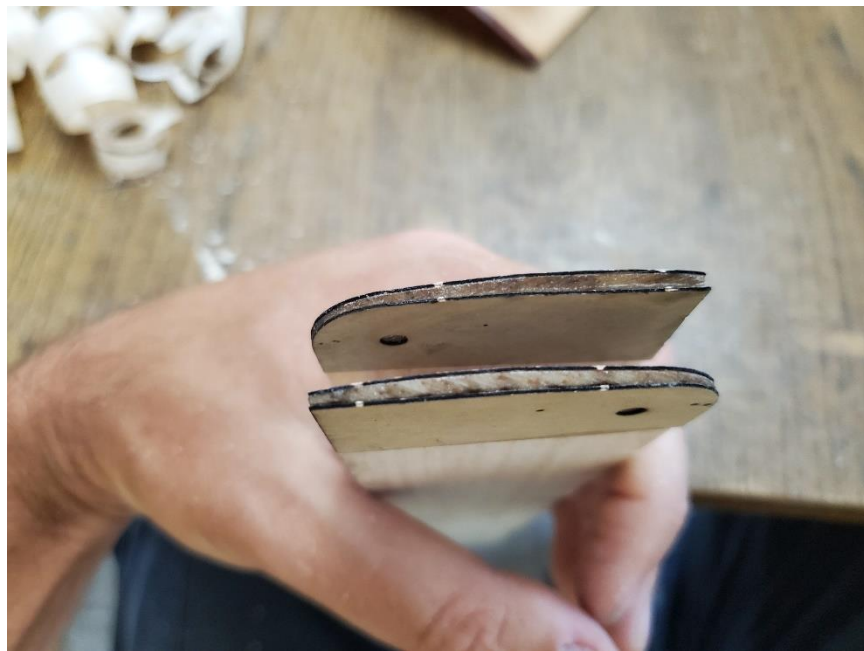




The assembly of your wings is perhaps the most critical segment of building your model. Read the instructions for this step thoroughly to ensure that you fully understand this step. You only get one chance to assemble the wings correctly!

You will attach the wing reinforcement pads first. Each pad must be aligned correctly so that the bearings will not be skewed, making your model unflyable.

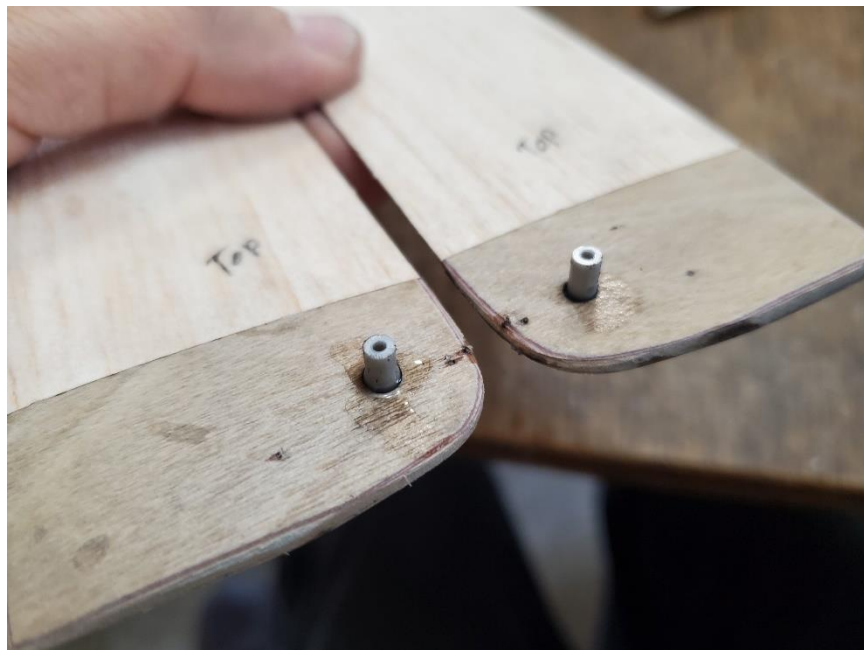




Sand the wing pads to shape and remove any burrs.



You will now carefully insert the plastic bearings from the bottom of the wings. Test fit to verify that they fit correctly and to understand their alignment before adding glue. After adding glue, you will need to carefully press the bearing in place so that it stays aligned with the hole. Refer to the photo to ensure that you insert the bearing in the correct direction. CA glue and epoxy are the only adhesives recommended for attaching the bearings.



Install the wire hooks and loops as shown. Pay close attention to the angle of attachment of the hooks so that the rubber band will correctly attach and open the wings.





### **5. Rigging the wing hold downs**

Install one of the lengths of 1/8" OD aluminum tubing on the bottom of the fuselage directly in front of the wing hinge saddle to serve as the wing hold-down guide tube. You will need CA or epoxy to cement this joint, and the tube should be bound in place with Spiderwire before soaking the binding with CA glue or epoxy.



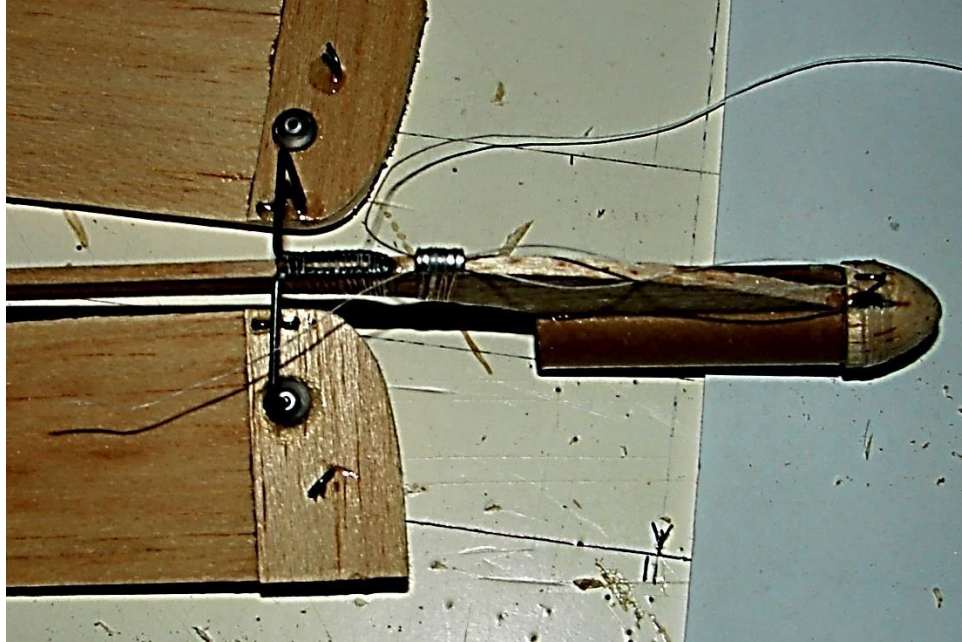
You should now check the fit of your nose cone to the motor tube. If it has a tight fit, carefully sand the nose cone shoulder until it slides in and out easily, but does not fall out on its own if the nose of the model is pointed straight down. Harden the back of the nose cone shoulder with epoxy to prevent erosion of that area by the hot ejection gases. ***Do not glue the nose cone into the motor tube! It must remain free to be ejected from the nose of the rocket at the end of the engine burn.***



Attach the nose cone hold-down loop as shown in Figure 18 and in the 3-view drawing in the templates section of this manual. Wrap the nose cone with Spiderwire to ensure retention of this loop and harden the binding with CA glue. This is an important, high stress joint, and it must not fail during launch!



You will now rig the wing hold down for your Switchblade-S. With the nose cone in place and oriented as shown, thread Spiderwire through the guide tube, into the nose cone hold-down loop, and back out of the guide tube. The path between the hold-down loop and the guide tube should be unobstructed.



Tie one end of the Spiderwire to one of the wing hold-down loops as shown. This knot should be as strong as possible. Ensure that this knot will not fail by hardening it with CA. Refer to the photo for correct placement of the knot on the inboard side of the hold-down loop. It must not be on the outboard side or there is a possibility that the knot could slide inboard, introducing slack into the hold down line.



Now place both of the wings in place on the wing hinge saddle in their folded position as shown. The hold-down line should run straight from the hold down hook on the wing to the guide tube. Do not loop this line over the hinge saddle or the wings will not close completely.

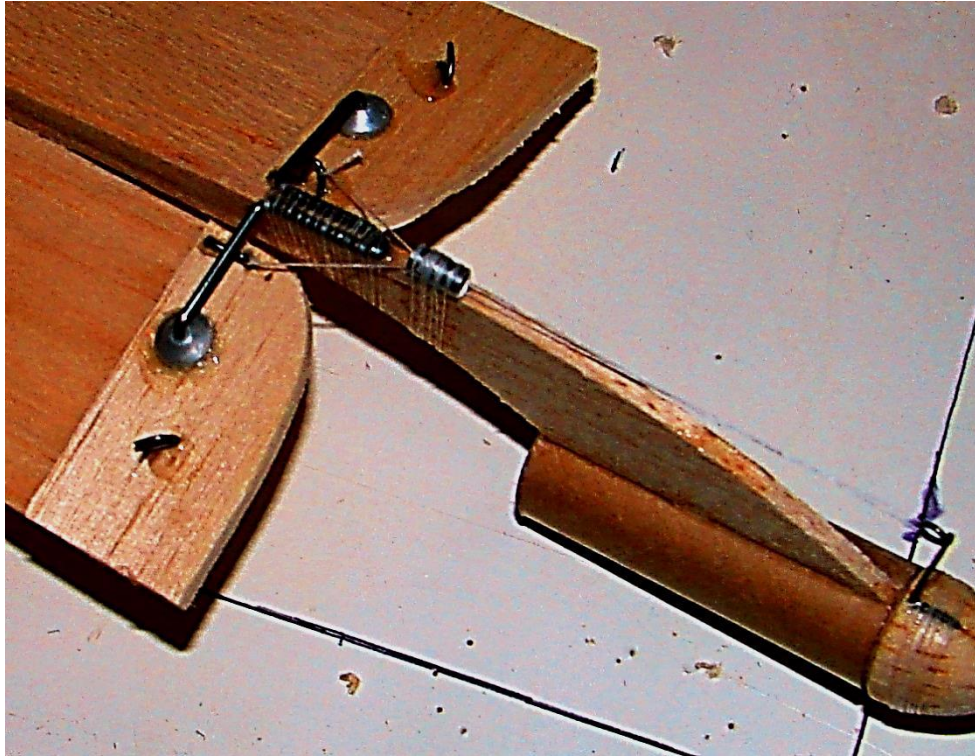




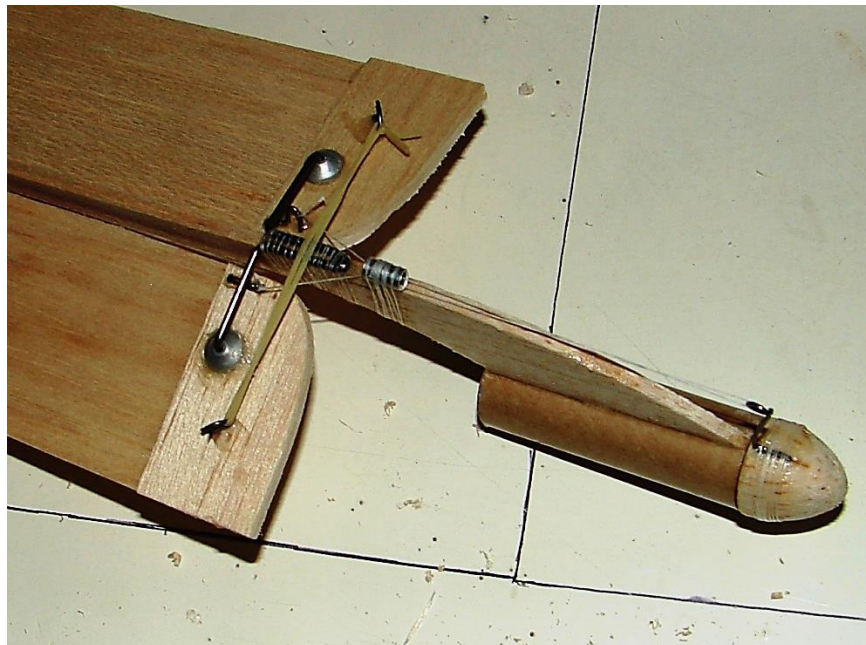
Loop the free end of the Spiderwire through the remaining wing hold down-loop shown and remove all slack from the line.



With the slack completely removed for the line and the wings in their folded position, tie off the remaining end of the Spiderwire into its hold-down loop and trim the line to length as shown. Harden this knot with CA glue just like the other one. Once again, be certain that the line does not run over the wing hinge saddle.

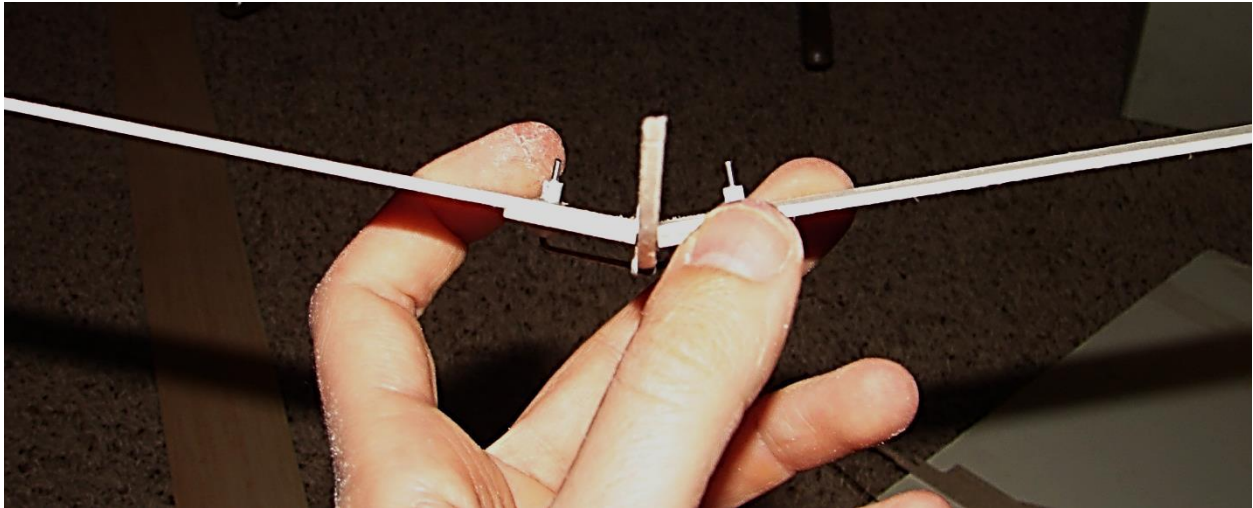


You may now install the wing deployment band between the two deployment hooks as shown. Only one band is required.



Slide the nose cone out of the front of the motor tube and release it to verify that the wings deploy fully and correctly. Note that the wings are still free to be removed from the hinge saddle. Take a moment to verify that when viewed from the front, your wings are aligned correctly. If they are not aligned together, you will need to twist one of the hinge saddle wires forward or backward to achieve correct alignment. Be careful to avoid bending the hinge axle

portion on which the bearing rides or the bearing will bind, preventing the wings from deploying at ejection. If you look closely in the photo, you will see that the wings are not perfectly aligned. This small amount of misalignment proved to be noncritical, requiring only a small piece of balsa strip to be glued to the right side of the rudder to prevent an excessively tight left turn in glide. Once you are satisfied with the wing alignment, crimp one of the pieces of aluminum tubing on the end of each hinge axle to prevent the wings from sliding off. You may add a small amount of CA to keep these retainers in place, but **be extremely careful to keep glue out of the bearings!** A better alternative is to add epoxy to fasten the retainers in place.



Wing alignment as seen from the front of the rocket; note that nose cone is not yet installed in this photo and that the top surface of the left wing is slightly visible, indicating slight misalignment which may be removed by carefully twisting the hinge outrigger or using right rudder trim

## 6. Attaching the tail surfaces

Sand the tail surfaces to a good, streamlined airfoil.







Glue the fin to the bottom of the stab.



Glue the wedge against the fin with the thick end toward the back.



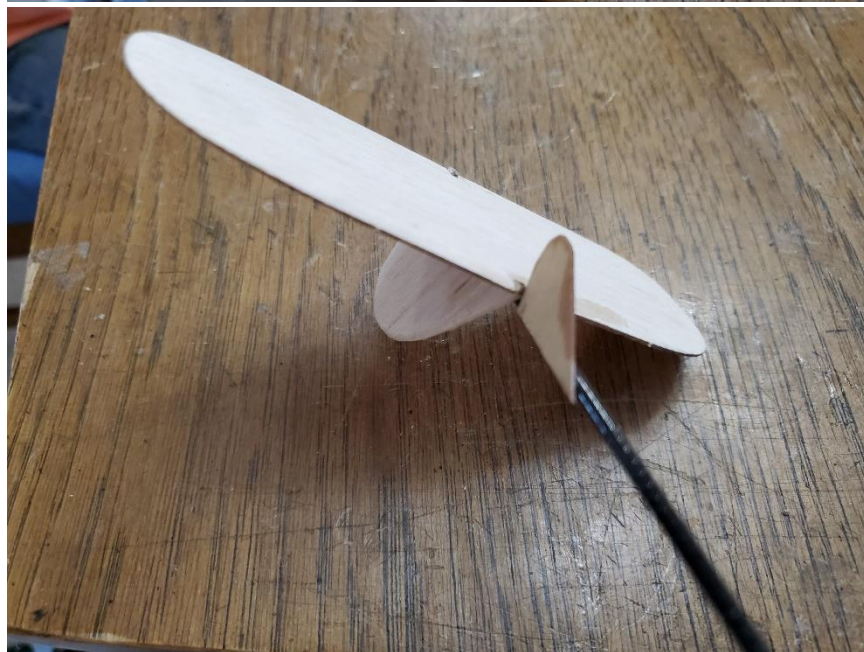


Flip the airplane over and block up the tailboom so that the tail assembly may be easily aligned with the washin wedge aligned to the tailboom.



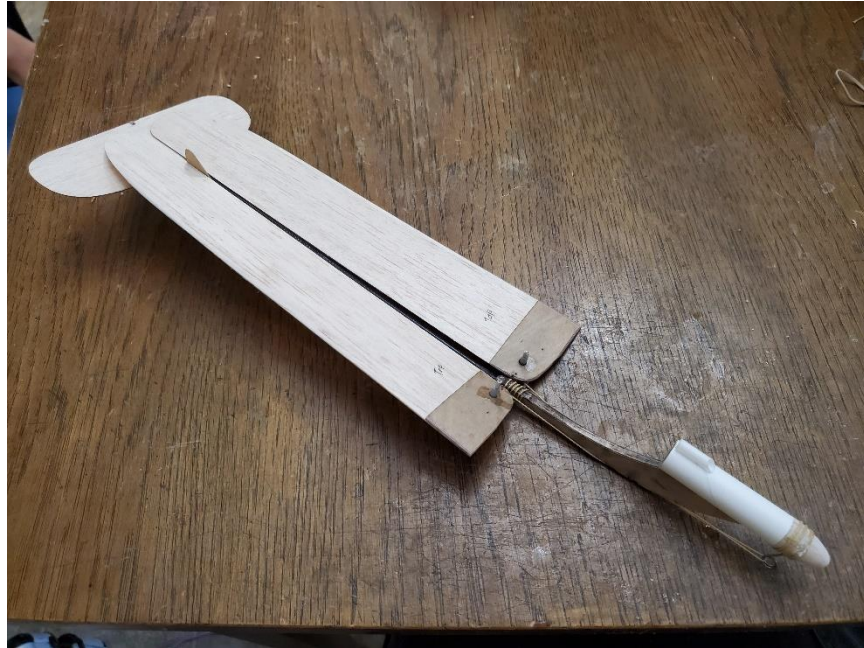
Glue the tail firmly in place.

To prevent the wings from rotating over center, it is necessary to install the plywood dorsal fin in front of the tail assembly as shown. It must be firmly glued into place.



Congratulations! You have finished the construction process of your new Switchblade FAI!





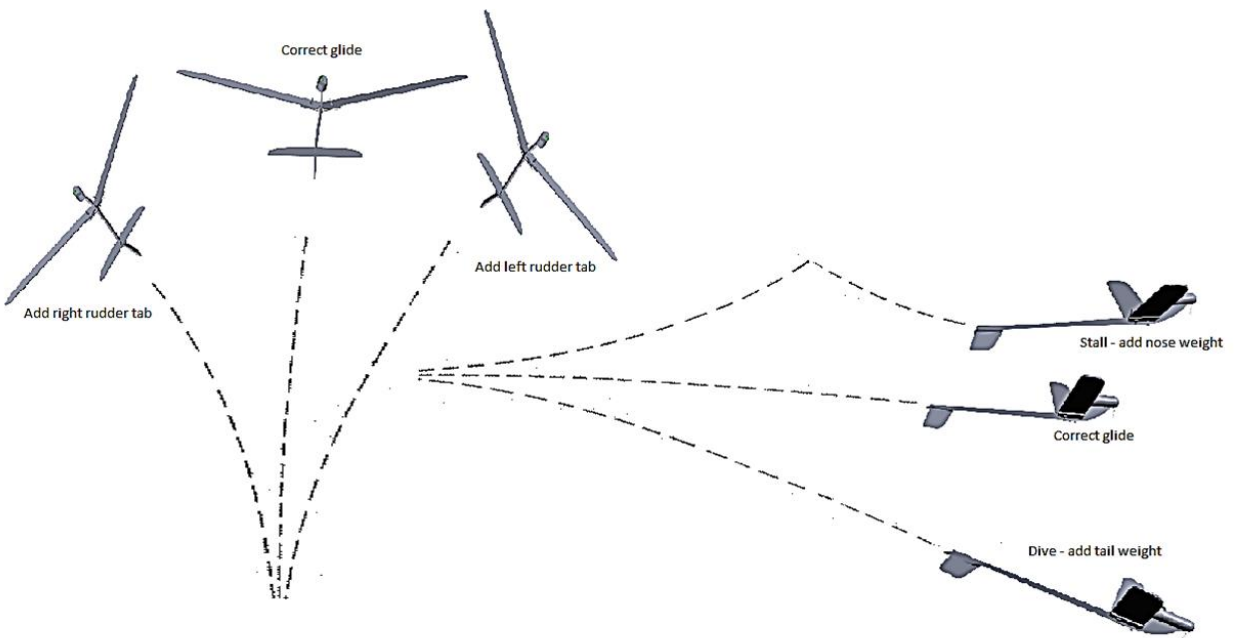
## 7. Finishing

We highly recommend the use of Minwax or similar oil-based polyurethane to maximize the moisture resistance and warp resistance of the aircraft. Use a very thin coat, wipe off any excess, and then sand lightly with 300+ grit sandpaper to a smooth finish before applying an extremely thin misting of paint.

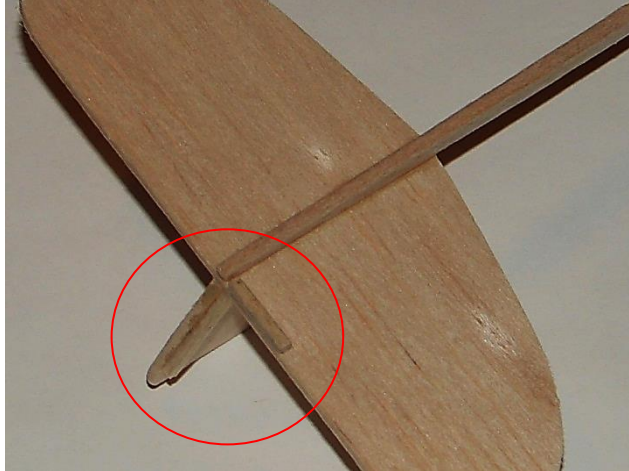
Your final finishing touch should be to write your name, address, and cellular phone number somewhere on the model in waterproof ink. Your Switchblade is a very high performance model and could fly into an updraft capable of carrying it out of sight. Having your contact information on the model enhances your chance of recovering it.

## 8. Flight trimming

Your model will likely need some trimming adjustments to get it to fly. Wait for a calm day to begin flight trimming, and make all of your test glides into the wind. **Your model must be test glided with the weight of a spent engine casing in the motor tube since this weight will be present in actual gliding flight.** If you do not have a spent 13mm engine casing, you may use one of the packets of balancing weight supplied with your kit. The weight has been dividing into two convenient packets, each the weight of a spent casing (approximately 4 grams). Test glide your Switchblade by holding it level and upright just behind the wing and shoving (do not throw it) the model forward toward a point on the ground about 20 feet in front of you. If the model dives, try launching it harder to ensure that you have not simply released it too slowly. If the model pitches upward into a stall and then dives back downward, try launching more slowly to ensure that you have not thrown the model too quickly. If the model continues to stall or dive, add noseweight or tail weight. **Nose weight must be added to the front of the motor tube, not the nose cone, since the nose cone hangs under the wings in glide configuration!**



If rather than diving or stalling, your model turns too tightly to the right or left, add a small strip of balsa to the side of the rudder trailing edge opposite the turning direction. If this change does not correct the excessive turn, try adding a balsa strip on the underside of the wing trailing edge  $\frac{3}{4}$  of the way to the wingtip that is on the inside of the turn. If these procedures still fail to correct the turn, you probably have a warped wing and will need to steam that wing flat over a pot of boiling water.



Trim tabs added to the tail. The tab on the stabilizer corrects for diving (up elevator), and the tab on the rudder was added to correct an excessively tight left turn (right rudder)

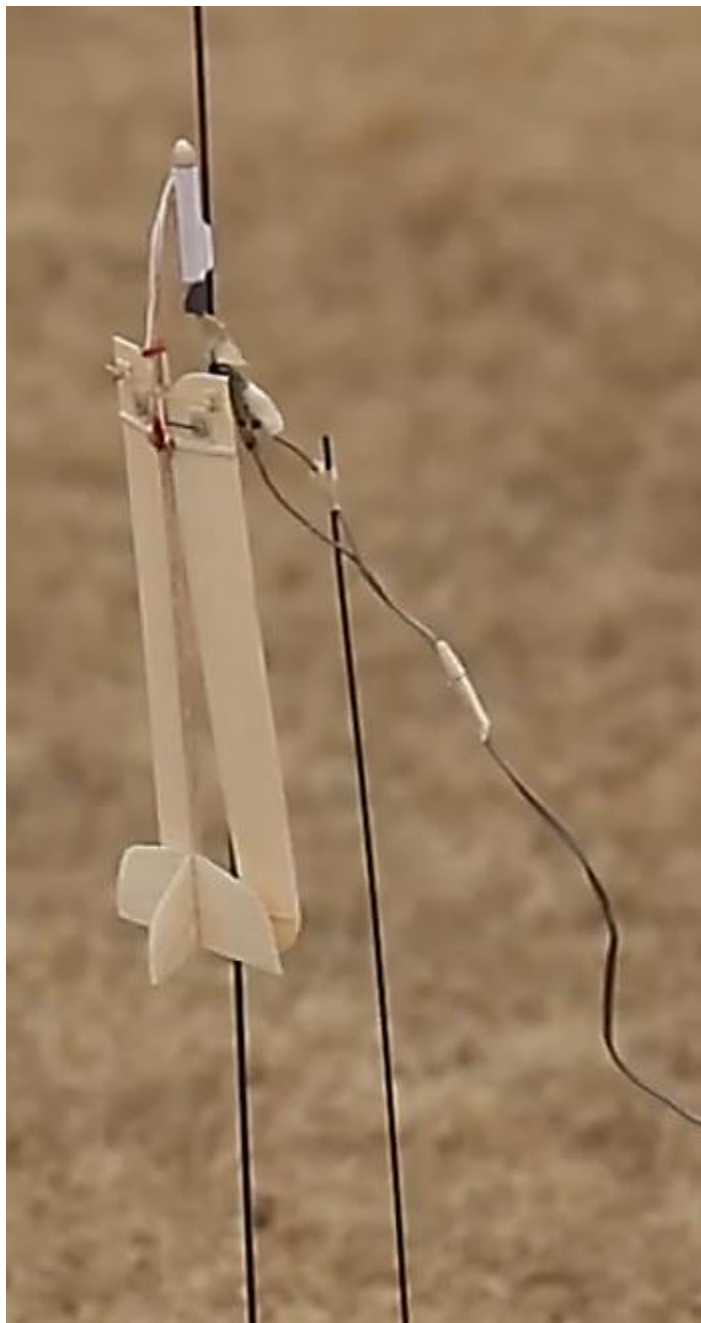
Expect to hand glide your model at least 20 times before having it trimmed completely. Just tossing it once and seeing something resembling of a glide is insufficient—you need to know that the model will reliably enter a smooth, steady glide. If you have access to a second-floor wind or a hill to launch from, use that to get a better view of what your model will do in flight. Some flight behaviors take 10-15 seconds to develop and cannot be detected from a shoulder-height glide.

## **9. Powered flight**

No doubt you are excited about seeing your model airborne. Resist the urge to rush through launch preparation, or your model could break up on launch or fail to deploy correctly and crash. Wait for a calm day on a large field (at least 50 acres) and prepare an Estes 1/2A3-2T for launch by adding pieces of masking tape to it as required to obtain a tight friction fit. The fit should be tight enough that the engine will not eject from the model, but not so tight that you risk damaging the model as you remove it. Fold the model's wings and install the nose cone. Now slide the engine in as far as it will go without pushing out the nose cone. Now install the engine ignitor and ignitor plug as shown in the engine instructions.

If a 1/2A3 series engine is not available, you may use an A3-2T or A3-4T, but bear in mind that the model will travel nearly twice as high, so you need a *very* calm day and a large field (100 acres minimum) to have any hope of recovering your model.

You will need two launch rods for your model. One can be installed in a launch pad as normal (this is the one you will use for your model), and the other can be driven into the ground so that it is parallel to the other rod and about 4 inches away from it on the side of the pad where you will be standing. With the safety key removed from your launch controller, slide your Switchblade-S on the launch rod with the top of the rocket facing toward the launch control area and hook up the ignitor clips to the ignitor. Now use masking tape to secure the clips to the launch rod just below where the model rests. Now grasp the ignitor wires about 5 inches down from the clips and tape that segment to the other rod. These steps are vitally important to ensure that the tail surfaces do not entangle in the ignitor wires as your model ascends the launch rod. Refer to the photo for the completed, armed launch configuration of a Switchblade glider.



Switchblade glider configured for launch; note that the ignitor wires are firmly fastened to the launch rod and support rod to keep them away from the rocket's tail surfaces

Extend the launch control wires so that you are a full 15 feet from the launch pad and install the safety key to verify continuity. After verifying wind speed and that no low-flying aircraft are overhead, give a countdown and press the launch button. If the rocket does not ignite within 5 seconds, follow the manufacturer's recommendations for addressing an engine misfire.

Your Switchblade should launch straight up with minimal rotation to an altitude of 200 feet before arcing over and deploying its wings. Observe its flight path carefully and refer back to the trimming instructions for any fine-tuning which might be required. The model should enter a gentle circle and remain aloft for nearly 1 minute. If all appears correct, you may re-prepare your model for launch on a full “A” engine and experience a full-length flight.

Enjoy flying your Switchblade. If you have any suggestions, questions, or comments, please contact J&H Aerospace at [joshuawfinn@gmail.com](mailto:joshuawfinn@gmail.com).

## **10. Launch Checklist**

1. Install nosecone on front of motor tube, locking wings into launch position (ensure that deployment band is strong enough to open wings at ejection)
2. Select an appropriate engine, wrap with enough masking tape for a firm fit, and install in motor tube
3. Install ignitor and plug per manufacturer’s recommendations
4. Place model on launch rod with pad assembly in an area free from dry grass or other flammable materials
5. **With safety key removed from controller**, connect ignitor clips to ignitor; ensure that clips and leads are restrained from contact with rocket’s tail surfaces
6. Clear launch area and alert any spectators of launch; verify that no low-flying aircraft are present
7. Arm launch controller; give audible countdown and press launch button until ignition (no more than 10 seconds).
8. Follow manufacturer’s recommendations in the event of a misfire