

# Sky Fieri - Detailed Assembly Guide

*This detailed guide aims to be a near-complete walkthrough of how to assemble your high power rocket kit, from box of parts to flight-ready rocket.*

## PARTS LIST:

### Airframe Parts

- 3.0" (75mm) Plastic Nose Cone
- 3.0" (75mm) Slotted Body Tube
- 3.0" (75mm) Upper Airframe Body Tube
- 6" Tube Coupler for 3.0" (75mm) Tube
- 29mm x 12" Motor Mount Tube

### Wooden Parts

- Set of 3 CR-3.00-29mm Centering Rings
- Bulkhead for 3.0" Airframe
- Set of 4 Laser-Cut Fins

### Other Parts

- Set of 2 Rail Guides
- 15'  $\frac{3}{8}$ " Nylon Shock Cord
- 9" x 9" Flame Resistant Blanket
- 36" Ripstop Nylon Parachute
- Z-Clip Retention Hardware
- Eye Bolt and Quick Link

## ADDITIONAL MATERIALS:

You will need to source these materials separately. Hardware stores are a fantastic resource for these items.

- Various Grit (~100-400) Sandpaper
- Utility Knife
- Ruler
- Masking Tape
- Safety Glasses
- Pencil
- 15 Minute Epoxy
- Disposable Gloves
- Popsicle Sticks
- Disposable Cups
- Drill Bit or Pin Vise
- Hammer
- Paint (Optional)

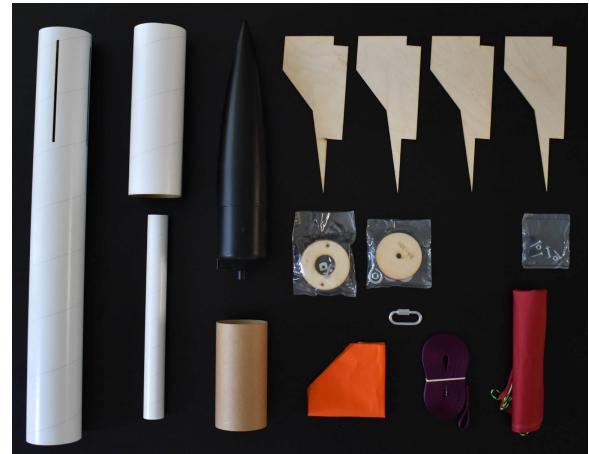
## NOTES:

When working with knives, sandpaper, paint, etc., be aware of and wear the appropriate PPE. When using epoxy adhesive, follow the manufacturer's instructions for appropriate preparation and application.

## ASSEMBLY INSTRUCTIONS:

### 1. Prepare Materials

Unpack all materials included in the kit and ensure that you have all of the parts listed in the **Parts List** above.

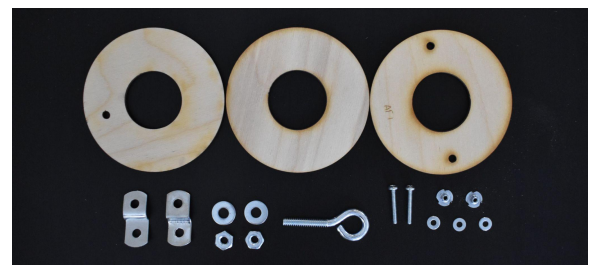


This is also a good time to take stock of the additional materials required and ensure you're ready to start the build.

### 2. Prepare Centering Rings

Materials:

- Centering Rings
- 100-150 Grit Sandpaper
- Epoxy (Optional)
- Z Clip Hardware
- Eye Bolt Hardware



Begin by lightly sanding the inner and outer diameters of all centering rings. Then test fit the centering rings on the motor mount tube; the fit should feel snug, but you should *not* have to force the ring on the tube.

If necessary, sand the inside of the rings until you achieve an appropriate fit. Next, do a similar test fit with the centering rings in the body tube. Again, you may have to sand this outer diameter until a desired fit is achieved. Finally, if desired, you may use a high-grit sandpaper to remove any imperfections on the top and bottom surfaces of the centering rings.

On the forward centering ring (the one with a single small hole in it) secure the eye bolt using two washers and two nuts as shown in the picture below. You should also check that the eye bolt doesn't protrude past the outer diameter of the centering ring as this will interfere with the body tube.



You may optionally mix a small amount of epoxy and apply it to the top and bottom nuts to prevent them from backing out.

On the aft centering ring (the one with two small holes in it), decide which side will be the top side and press the T-nut inserts into that side. A light hammer tap may be required to fully seat the nuts into the rings. This is shown in the following picture. You may want to mark this side of the centering ring as "top" (towards top of rocket) for reference in later installation.



The screws and Z-clips will screw into the underside of this centering ring in later steps and for motor retention.

### 3. Prepare Fins

Materials:

- Fins
- 100-150 Grit Sandpaper
- 250-400 Grit Sandpaper

Start by using a low grit sandpaper to rough up the root of the fin (the part that will be epoxied to the motor mount tube). The goal is not to remove too much material, but to make the surface better for epoxy to bond to.

The rest of the fin work is left to the builder's liking, but the author recommends the following. On the large flat surfaces of the fins, use a high grit sandpaper to smooth out the surface. Here the goal is not to remove material, just to smooth out the surface. On the leading and trailing edges, you can round off the hard edges of the wood by using a medium grit sandpaper and then smoothing the surface out with a high grit sandpaper.

Whatever you decide to do to one fin, repeat with all remaining fins. All of your fins should be as close to identical as possible. When working with delicate parts (like the leading edge of this fin style), be careful to not damage the fins.

#### 4. Assemble Motor Mount Tube

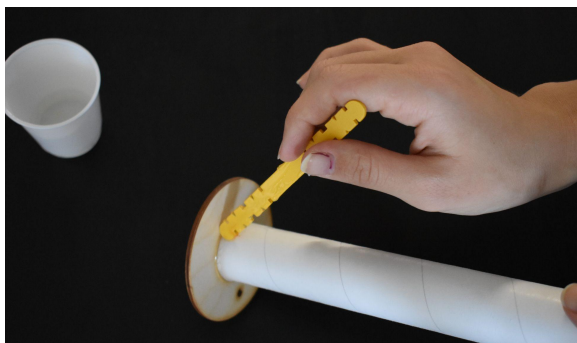
Materials:

- Centering Rings
- Fins
- Motor Mount Tube
- Shock Cord
- Epoxy
- 150-200 Grit Sandpaper

Start by lightly sanding the motor mount tube in places where centering rings will interface with the tube. The goal here is not to remove material, but to prepare the surface for an epoxy bond.



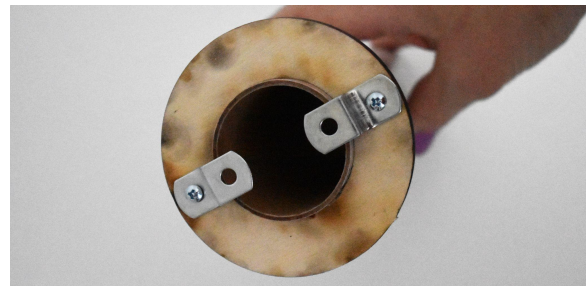
Prepare a small amount of epoxy. Position the forward centering ring (with the eye bolt facing towards the top of the rocket) roughly  $\frac{1}{8}$ " from the top end of the motor mount tube. Use the round edge of your popsicle stick to create a bead of epoxy ("fillet") at the interfacing edges between the centering ring and motor mount tube (on both the top and bottom side).



Once the epoxy bonds on the forward ring have cured, you may move on to the middle and bottom centering rings.

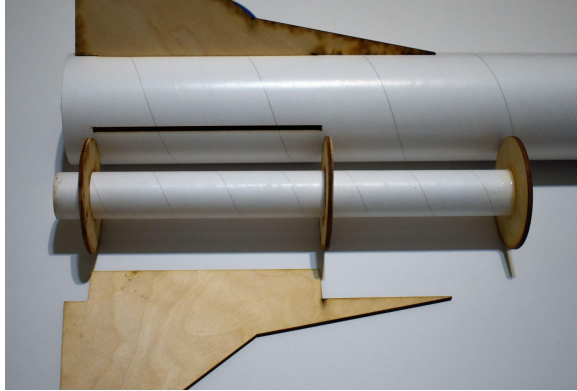
Start by sliding the middle centering ring to roughly the middle of the motor mount tube. Next, slide the aft centering ring on in the correct orientation and temporarily install the Z-clips by screwing the screws into the T-nuts, through the Z-clips.

Position the aft centering ring roughly  $\frac{1}{8}$ " from the aft end of the motor mount tube. At this point, you should use the Z-clips and Z-clip screws to check that the lower centering ring is appropriately located such that the Z-clips clear the bottom of the tube and room for a motor thrust ring.



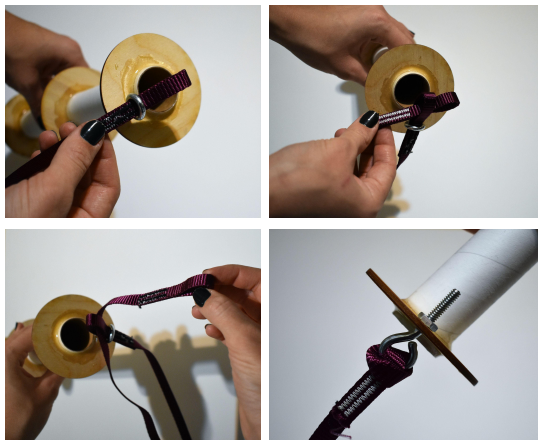
Remove the Z-clips for now to avoid accidental epoxying in place. Ensure the aft centering ring hasn't moved. Prepare a small amount of epoxy and then, using a popsicle stick, apply a fillet to the *lower side* of the aft centering ring. Make absolutely certain that no epoxy drips into the T-nuts.

Once the epoxy on the aft centering ring has fully cured, use the fin root to properly space the middle centering ring from the aft centering ring. The centering rings should be a close fit on the top and bottom of the fin root, as shown in the following picture.



Remove the fin used for spacing and then prepare a small amount of epoxy. Using a popsicle stick, apply a fillet to the *upper side* of the middle centering ring. Let this fully cure before moving on to the next step.

Attach the shock cord to the eye bolt on the forward centering ring. Using the stitched loop at one end of the shock cord, create a lark's foot knot by passing the loop through the eye, passing the cord through the loop on the other side of the eye, and cinching down the knot.



## 5. Assemble Body Tube

Materials:

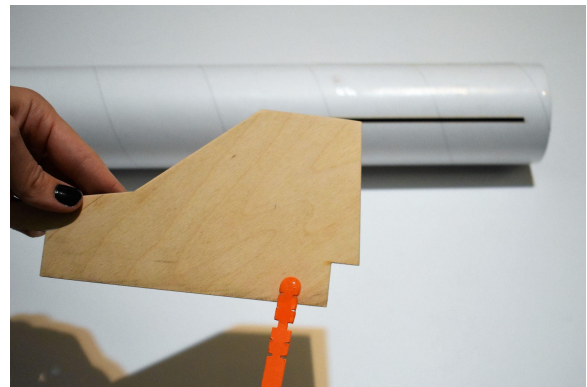
- Assembled Motor Mount Tube
- Lower Airframe Body Tube
- Fins
- Epoxy
- Masking Tape

Test fit fins into fin slots to ensure clearance and carefully sand to clearance if needed.

Prepare a small amount of epoxy and apply it to the outer diameter of each of the centering rings. Pass the shock cord through the body tube, from the aft end to the forward end; ensure that you don't get epoxy on the shock cord as you install the motor mount tube. Insert the motor mount tube, forward end up and motor retainer aft, into the aft end of the body tube.

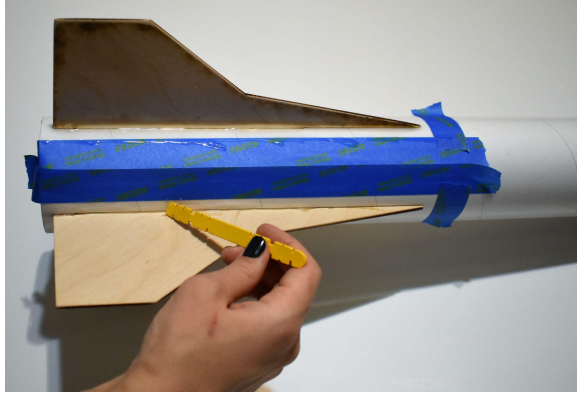
Quickly but carefully, before the epoxy cures, push a fin root partially through the slot and make sure the centering rings are positioned either side of the slots. Remove the fin root and wipe off any epoxy residue that may have accumulated.

Once the epoxy from the previous step is cured, prepare another small batch of epoxy. Apply this epoxy to the root and edges of the root tab of one fin and insert it into a fin slot. Either hold in place, position the fin vertically, or use a fin jig until the fin is tacked in place.



Repeat with the remaining fins until all fins are epoxied at the root and to the centering rings.

Once all connections are fully cured, apply masking tape between the fins as shown in the following picture.



Starting with the rocket in a similar position to the one pictured, prepare a small batch of epoxy. With this epoxy, lay two fillets on the edge between the fin and the body tube, using the popsicle stick end as a tool to give your fillets a radius. After the epoxy has partially, *but not fully* cured, remove the tape.

Once the epoxy has fully cured, repeat this process with each of the four sides.

## 6. Assemble Upper Airframe

Materials:

- Upper Airframe Body Tube
- Tube Coupler
- Bulkhead
- Eye Bolt and Hardware
- 100-150 Grit Sandpaper
- Epoxy

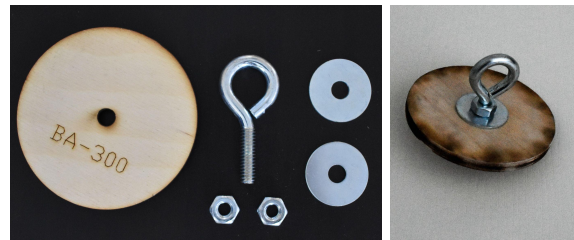
Test fit the coupler into the upper airframe body tube. This fit should be snug but not requiring excessive force. If necessary, use a medium grit sandpaper until you achieve an appropriate fit.

Mark roughly at the halfway point of the coupler. Prepare a small amount of epoxy and apply it to the inside of the upper airframe body tube, between the end and 3-4 inches up. Insert the coupler into the upper airframe body tube, twisting as you insert and stopping at the mark that you made. Quickly wipe away any excess epoxy that emerges from the joint.



Similar to the top centering ring, assemble the eyebolt onto the bulkhead with a washer and nut on either side as shown below.

Once the epoxy on the coupler has fully cured, check the fit of the bulkhead into the coupler. It should be snug but not forced. If required, use some rough grit sandpaper to adjust the fit until appropriate.

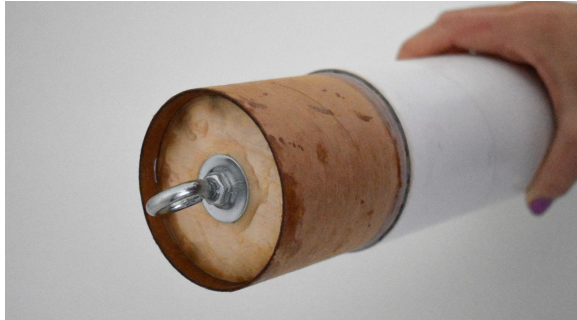


You may optionally mix a small amount of epoxy and apply it to the top and bottom nuts to prevent them from backing out.

Using rough grit sandpaper, use a light pass to prepare the outer diameter of the bulkhead and the inside of the bottom of the coupler. Prepare another small batch of epoxy and apply it to the outer diameter of the bulkhead. Insert the bulkhead roughly  $\frac{1}{8}$ " into the coupler, with the eye bolt facing the aft end of the assembly. Allow this to fully cure.

Using a drill bit or pin vise, drill a small hole into the rough middle of the upper airframe body tube. This hole will allow for pressure to vent during the rocket's ascent.

The final assembly should look similar to the picture below.



### 7. Affix Nose Cone

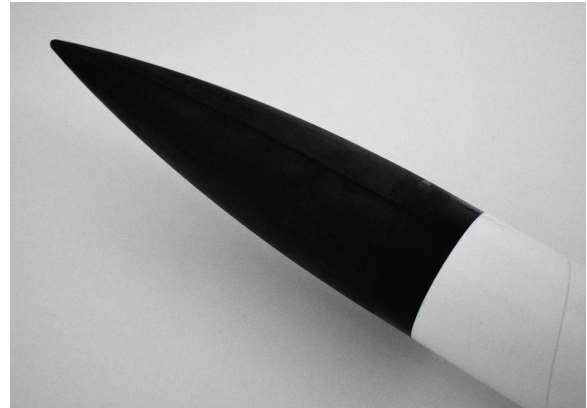
Materials:

- Nose Cone
- Epoxy
- 100-150 Grit Sandpaper
- 250-800 Grit Sandpaper

Begin by preparing the nose cone. The surface can be finished by using progressively finer sandpaper to smooth out manufacturing defects. Next, check the fit into the upper airframe. The nose cone shoulder should fit snugly into the upper airframe body tube, but without force. If needed, use rough to medium grit sandpaper to adjust the fit appropriately.

Next, you must decide how to affix the nose cone. If you are happy with the kit configuration, you can use epoxy. If you think you might want to modify the kit in the future, you can use either a friction fit or plastic rivets. This guide will assume an epoxy assembly.

Prepare a small batch of epoxy and apply it inside the body tube from the edge to roughly 3-4 inches in. Push the nose cone into the body tube, twisting as you seat it. Quickly wipe off any excess epoxy that accumulates on the seam. The final assembly should look similar to the following picture.



### 8. Assemble Recovery Hardware

Materials:

- Shock Cord
- Flame-Resistant Blanket
- Parachute
- Quick Link

Pass the shock cord through the hole in the flame resistant blanket and push the blanket down towards the lower airframe.



With the parachute starting laid out flat, align the shroud lines such that you have a loop at one end and the parachute at the other end. At roughly  $\frac{1}{3}$  of the length of the exposed shock cord, from the free end, attach the parachute to the shock cord with a lark's foot knot. This is done by passing the parachute canopy around the shock cord and then through the shroud line loop.

Unscrew the quick link and attach it first to the free end of the shock cord. Next, attach the quick link to the eye bolt in the upper airframe bulkhead. You should now have every part of the rocket attached together.

## 9. Affix Rail Guides, Finishing Up

Materials:

- Rail Guides
- Epoxy
- Ruler
- 100-150 Grit Sandpaper
- Drill Bit or Pin Vise

Using a ruler, determine the center point between two fins at both the top and bottom of the fins.



Again with a ruler, draw a straight line up your rocket's body tube between and extending beyond the two points. From the bottom of the rocket, mark points at 3 and 12 inches along this line. These points will be the locations of the rail guides.

Start by lightly sanding the body tube and guides with rough sandpaper where the epoxy joint will be. Prepare a small amount of epoxy and apply it to the underside of the rail buttons. Press each into place and ensure they don't move while curing. It is a good idea to look down the length of the rocket and make sure that the rail guides are lined up along the long axis of the rocket. You may also want to wipe free excess epoxy.

Once the rail guides are cured, you will need to create a vent hole in the body tube. Using the line used for the rail guides, mark a point above the top centering ring and slightly below where the bottom of the coupler sits when the rocket is assembled. At this point, make a small hole with a drill bit or pin vise.

You may also now reinstall the Z-clips until you need to insert a motor for flight.

Congratulations, you now have a completed rocket ready for flight!

## 10. Paint

Materials are ultimately up to you, however the author recommends:

- Spray Primer
- Spray Paint

With a completed vehicle, you can now paint it and add decals. Go crazy and customize the rocket to your liking.

Be sure that when painting, you do so in a well ventilated area with appropriate PPE. Additionally, you should use masking tape to prevent important parts like the coupler, inside of the body tube, and the inside of the motor mount tube from getting excessive paint on them.

## 11. Prepare for Flight

When ready to fly, you'll need to choose a motor, assemble it, and install it. Be sure to do so in accordance with manufacturer instructions.

Tips:

- Some motor recommendations are listed with this kit.
- You will need a motor casing and a motor.
- Make sure to adjust the motor delay as necessary for this rocket.
- Make sure your motor retention (Z-clips) is affixed appropriately pre-launch.