



# Micro F-4D Skyray Assembly and Setup Manual



Specifications	
Wingspan	12"
Overall Length	16.78"
Wing Area	73.75 in <sup>2</sup>
Flying Weight	1.25oz / 34g
Intended Use	Indoor/Calm Winds

Recommended Power System	
RX/ESC/Servo	Spektrum AR6400 (or similar)
Motor	Parkzone P-51 Motor & Gearbox (PKZ3624) or Hobbyzone Champ Motor & Gearbox (HBZ4930)
Battery	160mAh 1S 3.7V 25C LiPo (or similar)



## **Thank you from Sawn Craft.**

Thank you for purchasing the Sawn Craft Micro F-4D Skyray aircraft. Like the full-scale F-4D Skyray, in your hands is a remarkably versatile airplane designed to deliver a pleasure cruiser with an incredible look. The lightweight and rigid XPS and carbon construction makes it possible for you to experience a wide performance envelope. This means that no matter how you like to fly, you'll enjoy both stability and maneuverability without any sacrifice in precision or control feel.

Your Sawn Craft Micro F-4D Skyray aircraft represents the benchmark of ultra-micro performance and aerobatic versatility. All you have to do next is read and apply the information presented in this instruction manual.

I sincerely hope that you enjoy your model as much as we do! If you have any troubles with these instructions or in the setup of your model feel free to contact us and we will provide you with the service you expect from a hobbyist-owned and operated business.

Jonathan Sawn

Owner, Sawn Craft

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# 1 Introduction

The contents of this manual assume the operator will have the following prerequisites:

- Understanding of all appropriate safety procedures and requirements
- The ability to follow written procedures and possess basic hobby building skills

## 1.1 Style Conventions

Below are the important style conventions that will be used throughout the guide.

**Note:** Key points or hints for success will be formatted in this manner.

**Warning:** Any area that poses either a physical hazard or the danger will be formatted in this manner.

Arrows inform where to click or to perform the specified operation.



Circled items inform of items of interest for the specified operation. Circled items will typically be accompanied by text further identifying the region of interest.



## 1.2 Required Tools & Supplies

The list below contains all of the required tools and supplies that are required for the assembly and tuning of this model.

- Clean, flat work surface
- #11 hobby knife
- Straight-edge ruler
- Foam-safe adhesive
- 3M Blendederm tape or Clear packing tape
- 200-grit Sandpaper
- Soldering iron & solder
- Heat gun
- Wire cutters
- Needle nose pliers

Sawn Craft recommends the use of Beacon Foam-Tac adhesive and 3M Blenderm Hinge Tape for the construction of this model due to its strength, light weight, and easy use. Both Blenderm and Foam-Tac can be purchased by visiting the [Building Supplies](#) tab on [Sawn-Craft.com](#)

## 1.3 Required Parts for Completion

This model was designed with the intention of putting to use the electronics that are used in today's popular 1S LiPo-powered Ultra-Micro aircraft. Once you have worn out the airframe on your Hobbyzone® Champ or Parkzone® UM P-51 Mustang, simply remove the electronics and use them to power this model. The list below contains the tested and recommended parts for your model:

- **1S LiPo “Brick”** - ParkZone Receiver/ESC DSM2/X - *Part #PKZ3352*
- **Ultra-Micro Gearbox** – HobbyZone Gearbox (No Motor): Champ - *Part #HBZ4929*
- **Ultra-Micro Motor** – HobbyZone Motor: Sukhoi/Champ – *Part#PKZ3516*
- **Ultra-Micro Motor (HP)** – ParkZone Motor: Ultra Micro P-51 - *Part #PKZ3616*
- **Propeller** – E-Flite Prop and Spinner 130 x 70 (2) - *Part #EFL9051*
- **1S LiPo Battery** – Turnigy Nano-Tech 160mAh 25c 1S LiPo - [Available from Sawn Craft](#)

Please note that other power systems and components may be compatible and may work without issue, but the listed components have been used successfully by Sawn Craft.

## Optional Parts for Completion

To make your build easier and ensure the nicest looking finished product, the following products are offered on [Sawn Craft.com](#). See the [Building Supplies](#) tab for these products.

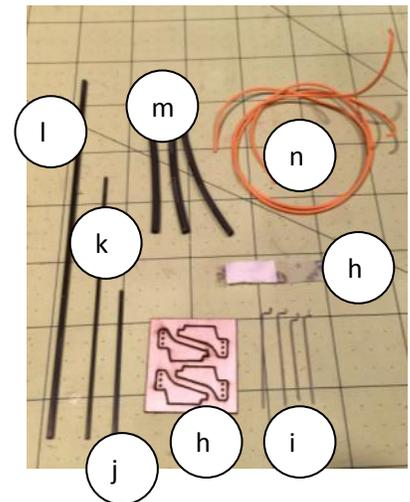
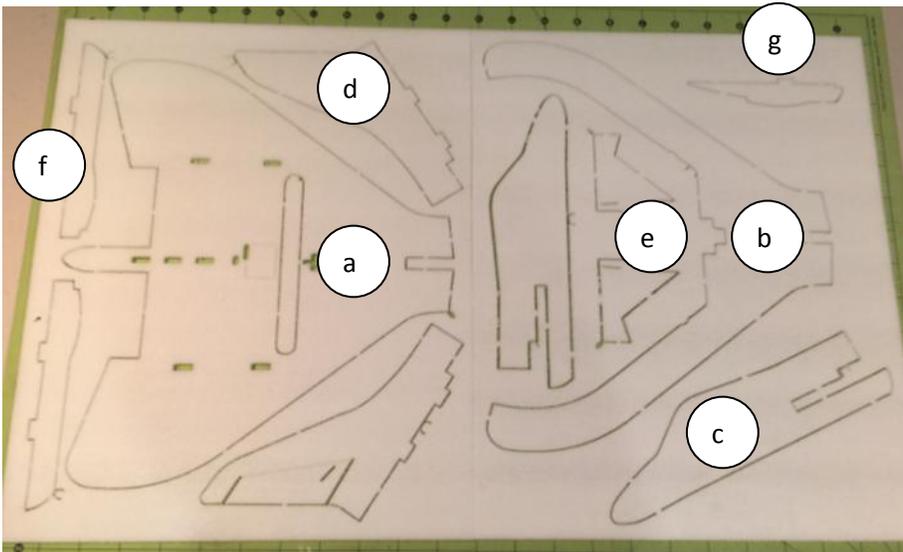
- [Sawn Craft Custom Decal Sheets](#)
- [Colored Packing Tape](#)

The order of assembly presented in this instruction has been tested and it is recommended that you do not differ from them to provide the most accurate and easiest assembly possible. Also, the construction techniques of many of our aircraft are extremely similar. Though we will try to include as many photos of your specific kit in this instruction, other kit assembly photos may be used if the instruction and “look” of the assembly is the same.

## 1.4 Included Parts Description

Please inspect your kit and ensure that all listed parts are present and undamaged. If you find missing parts or signs of damage please contact [Support@Sawn-Craft.com](mailto:Support@Sawn-Craft.com) for assistance.

- a) Main Wing
- b) Kfm Step
- c) Fuselage Half (2 each)
- d) Vertical Stabilizer (2 each)
- e) elevon (2 each)
- f) Skid (2 each)
- g) Ventral Fin
- h) Micro Control Horn (4 each)
- i) 1" x 0.024" Control Wire with Z-Bend (4 each)
- j) 2" 0.051" Carbon Rod
- k) 4" 0.051" Carbon Rod
- l) 6" 0.083" Carbon Rod
- m) 2" 3mm Heat Shrink Tube (3 each)
- n) 12" Micro Wire
- o) Micro Velcro
- p) 3.5" 0.024" Music Wire (not shown)



## 2 Assembly Instructions

### 2.1 Parts Sheet Removal

- **Parts Required:**
    - Kit Parts Sheets
    - Hardware Pack
- 1) Lay both kit parts sheets out as well as the hardware pack to inspect for damage and confirm that all pieces are in the kit. If you find that there is an issue, please send an email to [Support@Sawn-Craft.com](mailto:Support@Sawn-Craft.com) and we'll get right back to you.
  - 2) Using a sharp hobby knife, carefully cut the foam parts out of the sheets. The small tabs holding the parts into the sheet can sometimes be tricky to find so if you have trouble removing a part from the sheet keep looking for that last tab. Once out of the sheet, you may choose to clean up the remaining tab on the foam pieces with some sandpaper.



## 2.2 Fuselage Lamination

- **Parts Required:**

- Fuselage Half (2 each)
- 6" 0.083" Carbon Rod

- 1) Lay both fuselage halves flat on the table with the recessed slot facing up. Apply a bead of glue around the entire perimeter of one of the fuselage halves.
- 2) Press the unglued fuse half onto the glued fuse half, recessed slots facing each other, and gently slide the parts around to spread the glue evenly.
- 3) Separate the two fuse halves and insert the carbon rod into one of the recessed slots.
- 4) Rejoin the two fuse halves, glue side toward each other, ensuring that the carbon rod already in the slot aligns with the recessed slot on the other fuse half. Set the assembled fuse lamination aside to allow the glue to cure. If desired you can place a flat weight (book, etc.) on top of the lamination while curing to ensure a flat assembly.
- 5) Once cured, sand leading edges to your liking.

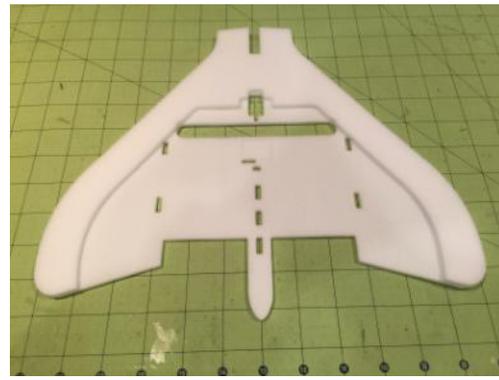


## 2.3 Wing Reinforcement Lamination

- **Parts Required:**

- Main Wing
- KFm Step

- 1) Lay the main wing on the table with the milled brick location markings slot facing up. Apply a bead of glue around the entire perimeter of the KFm Step.
- 2) Press the glued side of the KFm onto the Main Wing, aligning the leading edges of both parts, and gently slide the parts around to spread the glue evenly.
- 3) Set the assembled fuse lamination aside to allow the glue to cure. If desired you can place a flat weight (book, etc.) on top of the lamination while curing to ensure a flat assembly.
- 4) Once cured, sand leading edges to your liking.



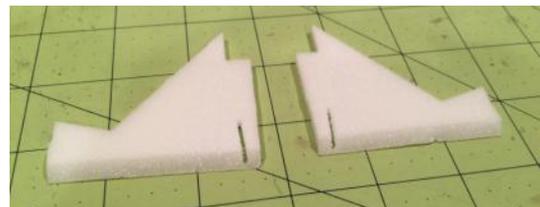
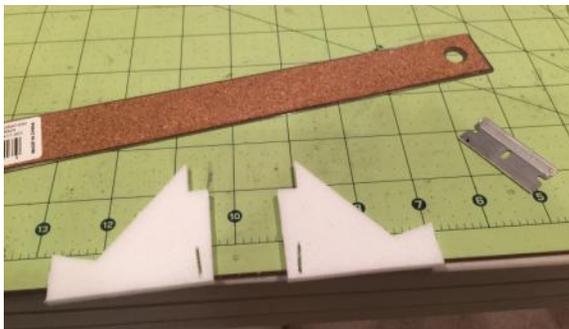
## 2.3 Elevator/Elevon & Rudder Hinging

- **Parts Required:**
  - Elevon (2 each)
  - Vertical Stabilizer w/Rudder
  - 3.5" .024" Music Wire
  - Micro Control Horn (2 each)
  - Main Wing
- or
  - Elevon (2 each)
  - Micro Control horn (2 each)
  - Main Wing

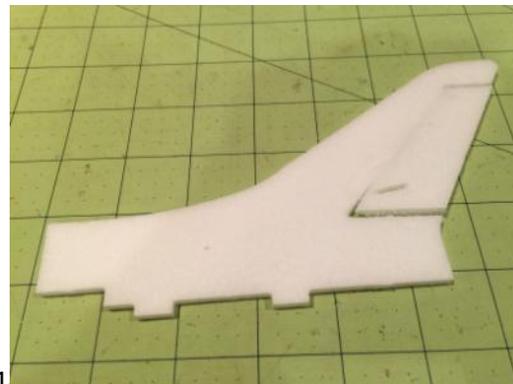
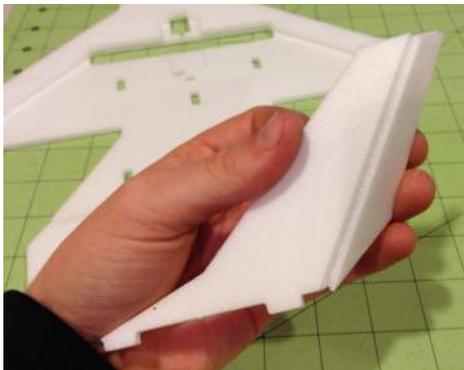
### Elevator/Rudder Setup

**Warning:** This process involves using extremely sharp cutting blades. Care must be taken to avoid injury.

- 1) Lay the elevons on the table with the leading edge facing yourself and the control horn slot to the left. Use a straight edge ruler and a hobby knife or a sanding block to cut an approximate 45° bevel into the leading edge of the control surface. Set elevons aside.



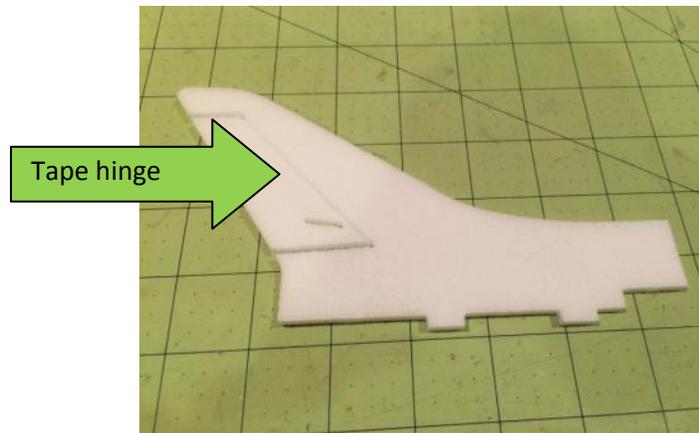
- 2) Lay the vertical stabilizer on the table with the bottom facing you. Carefully crack the rudder along the rudder line or use a straight edge ruler and a hobby knife to cut down the rudder cut line in order to separate the rudder from the stabilizer.



- 3) Lay the rudder on the table with the leading edge facing you. Use a straight edge ruler and a hobby knife to cut an approximate 45° bevel into the leading edge of the control surface, ensuring that the bevel is on the correct side (the side that had the milled slot).

**If you choose to use a glue hinge for your surfaces ensure you bevel the mating surface as well.**

- 4) Place the vertical stabilizer and rudder back together with trailing and leading edges touching, oriented the proper direction for the bevel to face to the left when installed. Cut approx. ¼" x 1" pieces of hinge tape. Use two of these small pieces of tape to attach the smooth sides of the rudder and vertical stab together. Flip the assembly over and install two additional pieces of tape on the bevel side of the hinge to complete the tape hinge. Dry fit a micro control horn into the slot, ensuring that the hinge bevel is facing down. Set assembly aside.



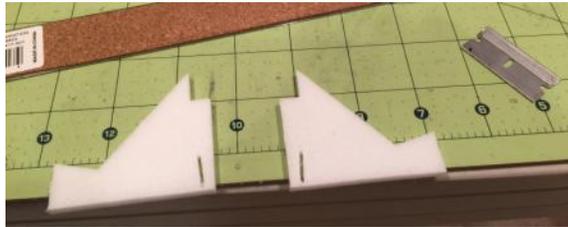
- 5) Bend the 0.024" music wire into a square-cornered U-shape with 0.75" on the short legs and 2" on the middle leg to create the elevator joiner. Be careful when bending the wire as if the two short legs aren't parallel the aircraft will try to roll one way or the other.
- 6) Place the elevons and main wing together with trailing and leading edges touching, oriented such that the hinge bevel faces down when the KFm Step is facing up. Align the elevator joiner with the milled groove in the rear of the main wing such that it is centered on the slot. Note where the legs of the joiner meet each elevon. Gently press the end of the joiner into the leading edge of the elevons until the leg is properly seated into the elevon.

**Using a gentle twisting motion will help to prevent the foam from "balling up" when inserting it into the foam.**

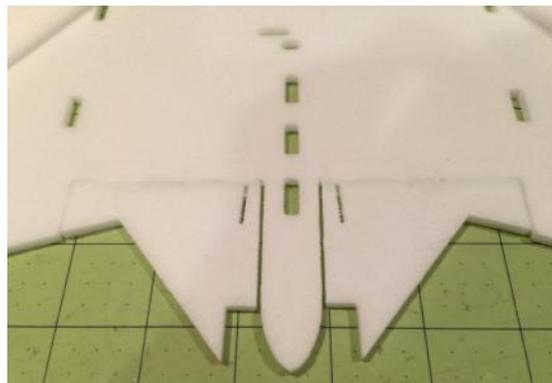
- 7) Use two small pieces of tape on each elevon to attach the smooth sides of the joined elevons and main wing together. Flip the assemblies over and install two additional pieces of tape on the bevel side of the hinge to complete the tape hinge.

### Elevon Setup

- 1) Lay the elevons on the table with the leading edge facing yourself and the wide part of the elevons on the outside. Use a straight edge ruler and a hobby knife or a sanding block to cut an approximate 45° bevel into the leading edge of the control surface, ensuring that you have both a left and right elevon. Dry fit a micro control horn into the slots, ensuring that the hinge bevel is facing down.



- 2) Place the elevon and main wing together with trailing and leading edges touching, oriented such that the hinge bevel faces down when the Kfm Step is facing up. Use two small pieces of tape to attach the smooth sides of the elevon and main wing together. Flip the assembly over and install two additional pieces of tape on the bevel side of the hinge to complete the tape hinge.

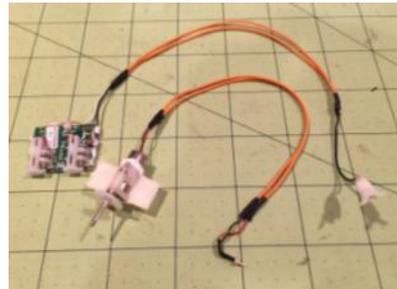


## 2.4 Electronics Installation

- **Parts Required:**

- Main Wing Assembly
- RX/ESC/Servo “Brick”
- Motor & Gearbox w/Prop
- 12” Micro Wire
- 3mm Heat Shrink Tube

- 1) Cut the motor and battery wires on your brick approximately in the center. Strip the insulation off the wire about 1/8” and tin the wires. Strip and tin one end of the micro wire as well. Cut pieces of shrink tube to cover the exposed wires. Slide the shrink tube onto the wires leading to the motor. Solder the micro wire to the motor wire ends, matching polarity. Once soldered, slide the shrink tube over the completed solder joint and use a heat gun to shrink the tubes.

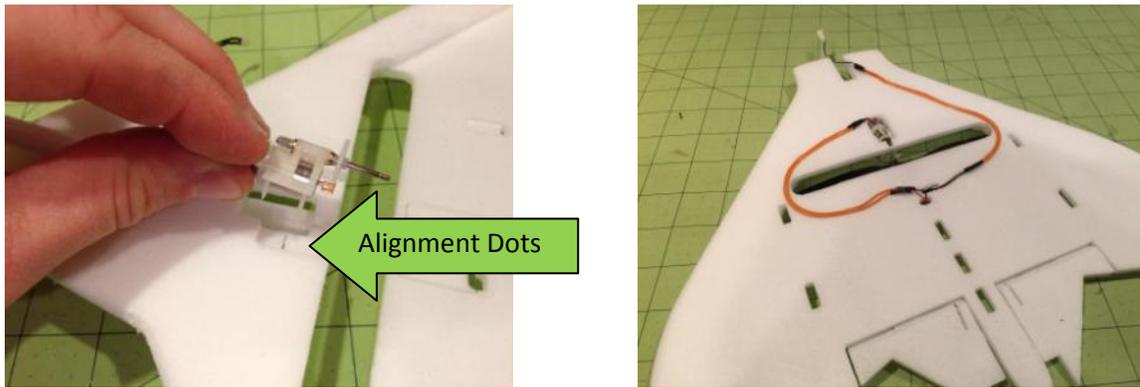


Warning: This process involves using soldering equipment that is extremely hot. Extreme caution must be taken

- 2) Glue the RX/ESC/Servo “Brick” on the top of the main wing at the location marked by a square, just behind the prop slot. Ensure that the servo gears are facing forward and the brick and all wires are completely clear of the prop.



- 3) If you already have a prop on your gearbox from another aircraft you will need to remove the prop and install it "backwards". By this, you will screw the prop onto the motor shaft with the molded-in numbers on the prop facing the motor. This is done because of the location of the motor/gearbox as compared to the other aircraft's stock location.
- 4) Glue the motor onto the top of the main wing by inserting the motor mounting pins into the pre-cut alignment dots in the wing with the prop located inside the open slot. Route the motor wires around the slot and to the brick and cut the micro wire to the proper length. Solder the motor plug onto the micro wire and cover with heat shrink tube. Use small pieces of tape or glue to secure the motor wires around the slot. Plug the completed, longer motor wire into the brick.

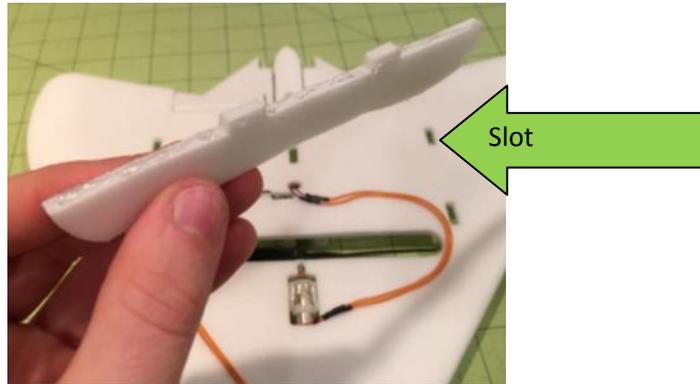


**We have found that some pilots prefer to have some down-thrust in their motor as opposed to it being mounted flush on the main wing when using more powerful motors. To do this, simply add a small piece of scrap foam below the rear of the motor/gearbox assembly (the non-prop side) and glue the assembly down as you would normally. Doing this can prevent some unwanted climbing under power, but otherwise doesn't noticeably change the flight characteristics.**

## 2.5 Skid Installation

- **Parts Required:**
  - Main Wing Assembly
  - Skid (2 each)
  - Ventral Fin

- 1) Lay the main wing assembly on the table with the Kfm step facing down. Apply a bead of glue down the entire length of the top of the skid.



- 2) Press the glued side of the skid onto the Main Wing, aligning the slots on the wing with the tabs on the skids, and gently press the parts together to spread the glue evenly. The rounded protrusion on the bottom of the skid will go toward the rear of the plane.



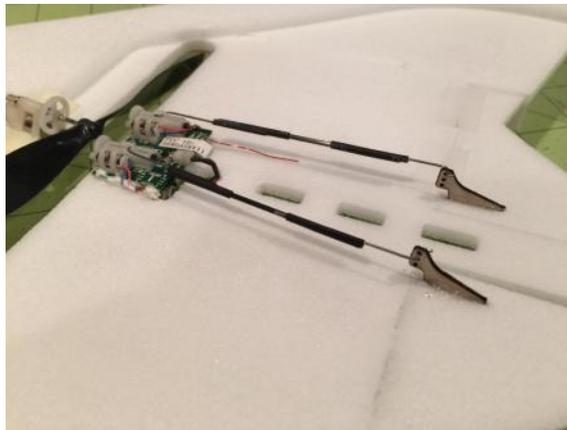
- 3) Glue the ventral fin in the center slots. The rounded protrusion on the bottom of the skid will go toward the rear of the plane. Allow glue to cure before proceeding.

## 2.6 Control Rod Installation

- **Parts Required:**

- Main Wing Assembly
- 0.051" Carbon Rods
- Micro Z-Bends
- 3mm Shrink Tube

- 1) If you chose to build a Micro Skyray with elevon control you will need to cut the 4" long 0.051" carbon rod down to 2" long.
- 2) Secure the push rod z-bends to the carbon rods by using glue and heat shrink tube. Adjust the control rod length and then shrink the heat shrink tube to "lock" the z-bend wire in place to ensure that the elevator and rudder are straight with the main wing and vertical stabilizer. Once the rod length is set, install the control rods to the brick and control horns then attach the unglued control horn to the z-bend and then glue the assembly in place.



## 2.7 Fuselage Installation

- **Parts Required:**
  - Main Wing Assembly
  - Fuselage Assembly
  - Micro Velcro

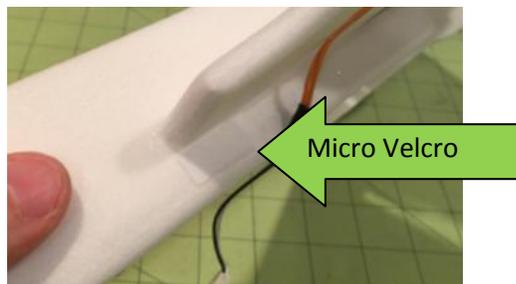
- 1) Apply a bead of glue down the entire length of the flat spot on the slot at the rear of the fuselage assembly. Also apply glue on the inside edges of the main wing assembly fuselage slot.



- 2) Press the glued side of the fuselage assembly onto the main wing assembly, sliding the fuse all the way back, and gently slide the parts back and forth to spread the glue evenly. Check that the front of the wing that is glued to the side of the fuse is straight and even on both sides of the fuse. Allow glue to cure before proceeding.



- 3) Apply a piece of tape just under the leading edge of the wing where it attaches to the fuse. Attach a piece of hook and loop material to the top of the tape for battery mounting and adjustment.

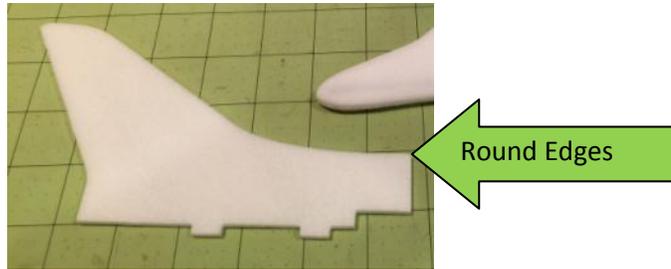


## 2.8 Vertical Stabilizer Installation

- **Parts Required:**

- Aircraft Assembly
- Vertical Stabilizer

- 1) You may choose to gently round the edges of the foam on the leading edge of the vertical stabilizer with sandpaper before proceeding.



- 2) Apply a bead of glue down the entire length of the bottom of the vertical stabilizer assembly. Press the glued vertical stab assembly onto the top of the main wing assembly onto the proper slots, ensuring that the stab sits evenly on the wing. This completes the build process!



## 3 Setup and Tuning

### 3.1 Center of Gravity

The CG of this plane is located approximately 1/4" in front of the prop slot. Moving the CG fore and aft will dramatically change the handling of the plane so adjust to your liking. An aft CG will allow for slow, high-alpha flight while a more fore CG will provide a faster flight experience. Use the included hook and loop fastener to adjust the fore/aft location of the battery to adjust the CG without adding additional weight.

### 3.2 Radio Setup & Mixing

Depending on the transmitter and "brick" that you are using to control your model you may find that you need to do some special setup to make the controls work properly. This is especially true for elevon controls so below are a list of tested radios and the mixes used to make the controls function properly with the recommended brick.

<b><u>Elevon Mixing Reference</u></b>				
<b><u>Transmitter</u></b>	<b><u>Wing Mode</u></b>	<b><u>Mix 1</u></b>	<b><u>Mix 2</u></b>	<b><u>Notes</u></b>
Spektrum DX6i	Delta	N/A	N/A	You must reverse either the elevator or aileron for proper movement
Spektrum DX7s & DX8	Elevon	ELE>LEL = -125%	AIL>REL = -125%	Control throws may be reduced when using this mix, so the high and low rate control throws will need to be adjusted to suit your flying style.
Spektrum DX9 & DX18	Elevon-B	N/A	N/A	

*Note: The mixes given above reflect what was tested using our prototype setups and electronics. They should be used as a starting point and you may find that you end up with a different setting. If you are having trouble please contact us for assistance.*

### 3.3 Control Throws & Expo

By altering the amount of control throw the surfaces have you can fine-tune the handling and performance. Below are the recommended settings as tested that will provide a successful flying experience. Throws are measured at the point farthest from the hinge.

<u>Control Surface</u>	<u>Low Rate Throw</u>	<u>Low Rate Expo</u>	<u>High Rate Throw</u>	<u>High Rate Expo</u>
Elevator	1/4in (70%)	20%	3/4in (100%)	25%
Rudder	1/4in (70%)	20%	3/4in (100%)	30%
Elevon	1/4in (70%)	25%	3/4in (100%)	40%

### 3.4 Launching

Launching this aircraft is very simple and is easy to do. Simply hold the airplane by the wingtip in one hand with your radio in the other. Advance the throttle to full and gently swing the aircraft forward, releasing it with wings level and a slightly up attitude.



## 3.5 Flying Tips

This aircraft is designed to fly in the space as small as a single basketball court. Being such light weight, it is recommended that this aircraft be flown indoors or outdoors in calm wind conditions. Always ensure that you are comfortable with the aircraft and its flight characteristics prior to flying in a small venue. Never fly over people or animals.

This aircraft flies much “bigger” than it really is and the techniques of flying larger aircraft apply. Rudder turns will bank the aircraft so elevator will need to be added to maintain altitude. The delta-wing design is inherently stable and makes this model a pure joy to fly! This model can fly slowly in high alpha flight, but when you drop the nose it is remarkably quick and nimble. Landing the aircraft is simple; keep some throttle applied and as the plane nears the ground, pull back on the elevator to flare.

## 3.6 Decorating/Finishing

The beauty of this aircraft is that you have the opportunity to finish it with the look that you desire. We recommend using our [Custom Decal Sets](#) or colored packaging tape (available on the [Building Supplies](#) tab) for decorating as it is easy to use, lightweight, and provides a nice, glossy finish. Water-based paints have been used with success in the past as have permanent markers. Prior to using any paints or markers, test on a scrap piece of foam to ensure that it doesn't damage the foam.

**Remember that any weight you add to the airframe will affect its performance so keep heavy applications of paint and decals to a minimum.**

## 3.7 Repairs & Spare Parts

Due to this models extremely light weight, it is surprisingly durable! If a part of the model is damaged it can typically be repaired using small pieces of packaging tape or by gluing using [Beacon Foam Tac](#).

If a part is damaged beyond repair, simply send us an email at [Support@Sawn-Craft.com](mailto:Support@Sawn-Craft.com) as we have replacement parts for purchase.