



Designed by:
Dave Garwood

Zero 24 Assembly and Setup Manual



Specifications		Recommended Power System	
Wingspan	24"	ESC	10A Brushless
Overall Length	22.6"	Motor	40 to 50 watt out runner (14g)
Wing Area	132.62 in ²	Servo	4x 3.6g Sub-Micro
Flying Weight	3.6oz / 104g	RX	6-Channel (4-ch minimum)
Intended Use	Indoor/Outdoor	Battery	180 to 300mAh 2S 7.4V 25C LiPo (or similar)



Thank you from Sawn Craft.

Thank you for purchasing the Sawn Craft Zero 24 aircraft kit, the second model in our Front Yard Fighters Series! Like the full-scale A6M Zero, in your hands is a remarkably versatile airplane designed to deliver a pleasure cruiser with an incredible look in the air. The lightweight and resilient EPP 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 Zero 24 aircraft kit represents the benchmark of indoor flight 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 (building board)
- #11 hobby knife or other razor knife with spare blades
- 2x Metal straight-edge ruler
- T-Pins (1" – 1.5" are ideal)
- Scissors
- Marker
- Drill w/ 1/16" & 5/64" bit
- Beacon Foam-Tac foam-safe adhesive
- CA adhesive
- Masking tape
- Wax paper
- Soldering iron & solder
- Heat gun
- Wire cutters
- Needle nose pliers

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

1.3 Required Parts for Completion

The list below contains the tested and recommended parts for your model:

- **Sawn Craft Mini Completion Kit**
 - Turnigy C1822 2100kv motor
 - 10A Brushless ESC
 - 4x 3.6g Servos
 - 6-Channel Receiver
 - 6"x3" Electric Prop
 - 2mm Bullet Connectors
 - JST Female Pigtail
 - Shrink tube, etc.
- 180mAh to 300mAh 2S 25C LiPo Battery
- Velcro

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

2 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.

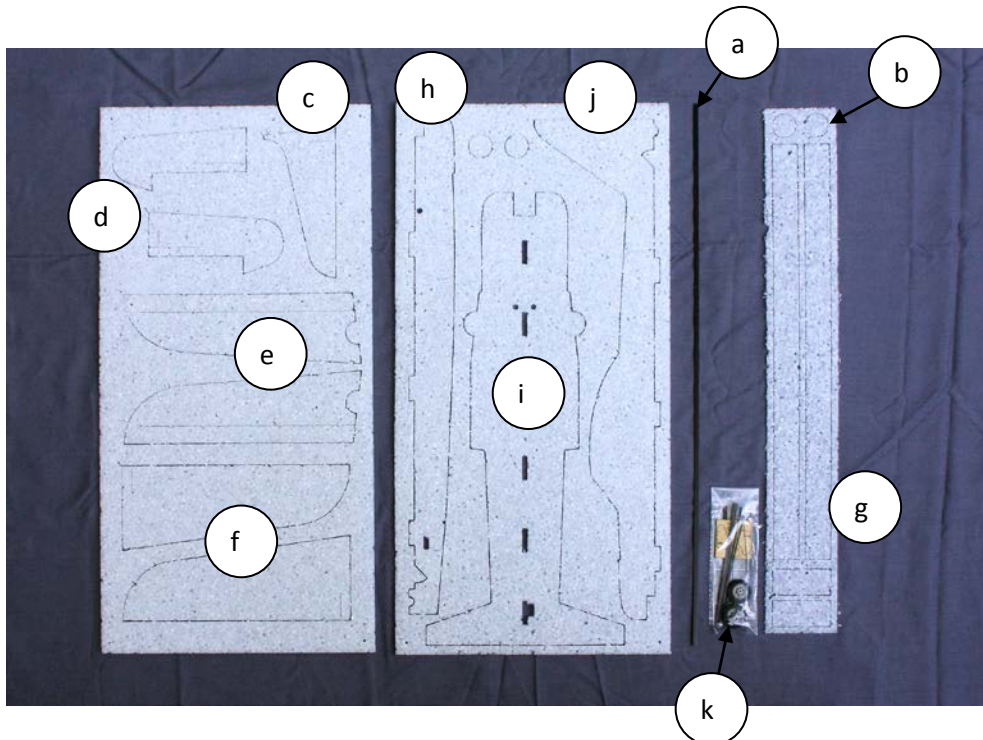
- [Colored Packing Tape](#)

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 for assistance.

- | | | | |
|-----|---|------|---------------------------------|
| a) | 22.75" Carbon Strip | | |
| b) | 3mm EPP Motor Spacers | | |
| c) | Rudder | | |
| d) | Elevator | | |
| e) | Wing (2 each) | | |
| f) | Aileron (2 each) | | |
| g) | 3mm EPP Gussets (2 each long, 2 each short) | | |
| h) | Lower Vertical Fuselage | | |
| i) | Horizontal Fuselage | | |
| j) | Upper Vertical Fuselage | | |
| k) | Small Parts Bag: | | |
| k.1 | 25mm Wheel (2 each) | k.6 | Plywood Motor Mount |
| k.2 | 5" Carbon Strip | k.7 | Plywood Control Horns (4 each) |
| k.3 | 5" Carbon Rod (2 each) | k.8 | Wire Control Rods (4 each) |
| k.4 | 5.5" Carbon Rod | k.9 | Micro Linkage Stoppers (4 each) |
| k.5 | 3" Carbon Rod | k.10 | 24" Landing Gear Binding Thread |



2 Assembly Instructions

2.1 Parts Sheet Removal

- **Parts Required:**
 - Kit Parts Sheets

- 1) 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.



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- 2) Find and mark with masking tape the bottom of the horizontal fuselage, bottom of the wing halves, bottom of the ailerons, and bottom of the elevator. The bottom of these components will have a slot milled for carbon strips. Find and mark with masking tape the LEFT side of the rudder and the LEFT side of upper component of the vertical fuselage. These labels will help to assure the beveled hinge cuts are on the correct side of the foam.



2.2 Control Surface Hinging

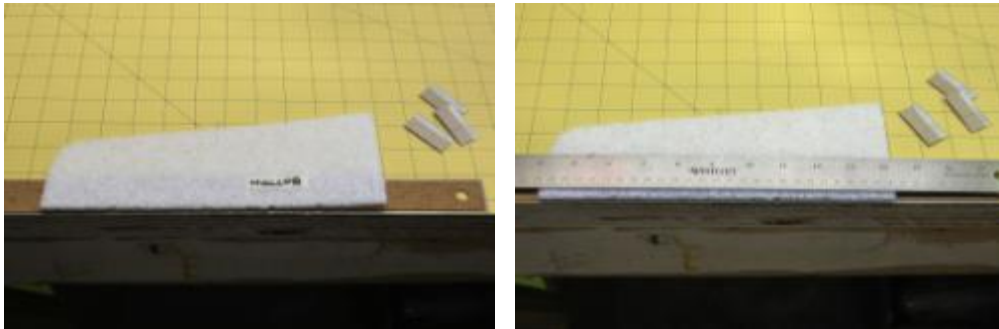
- **Parts Required:**

- Horizontal Fuselage
- Upper Vertical Fuselage
- Wing (2x)
- Aileron (2x)
- Rudder
- Elevator

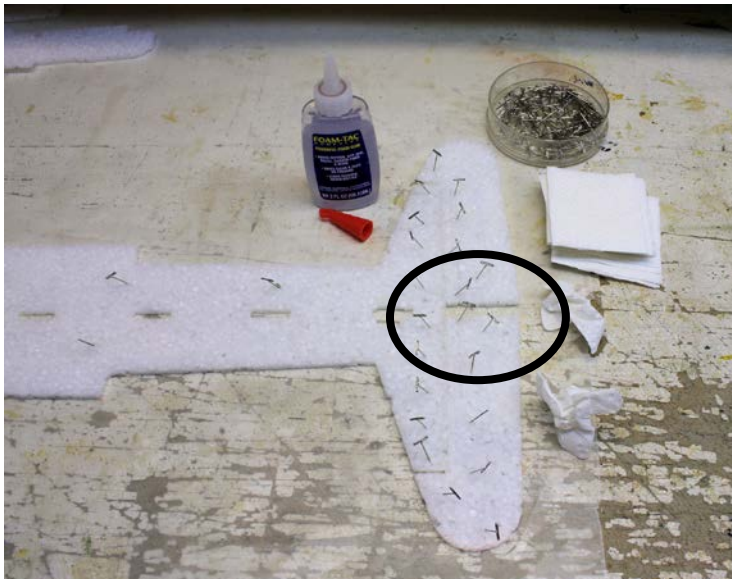
- 1) Bevel the hinged control surfaces, using steel rulers and fresh single-edge razor blades. Set a 12-inch or longer metal ruler backing at the edge of your workbench. Lay the foam part to be beveled on the ruler, aligning the edge of the ruled and the edge of the foam nearest to you. Lay a second steel ruler facing down far enough back to expose enough foam to allow a 45 degree slice to be removed. Cut the foam with the single-edge razor blade held against both rulers. Angling the blade makes a smoother cut.

EPP foam dulls blades surprisingly fast, so be prepared to change to a fresh blade when you detect snagging or excess drag as you make your cuts!

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- 2) Make glue hinges. Pin to the building board each of the hinged parts, with bevel cut down against the building board. Locate the parts with the mating surfaces gently touching. Run the smallest possible bead of foam glue along each seam. Run a finger along each seam to push the glue between the mating parts. Blot up excess glue with a paper towel. Let dry at sufficiently for the glue to fully cure. Leaving the parts overnight is ideal for the strongest and most true bond.



NOTE: In order to allow clearance for the rudder control horn an arc has been cut out of one half of the elevator. This is not shown in the photos in this manual, but it is intentional and the aircraft has been tuned to fly properly with the cut present.

BUILDING TIP: Keep small wipes handy to remove excess glue. Glue outside the joint adds weight, but does not add strength. To get a pile of these wipes, lay four paper towels together and cut in half repeatedly. Four paper towels cut to roughly 2x2 inch squares yields 64 very handy "micro wipes."



2.3 Lower Component Assembly

- **Parts Required:**
 - Wing Assembly (2 each)
 - Horizontal Fuselage Assembly
 - Lower Vertical Fuselage
 - Upper Vertical Fuselage Assembly
 - 5" Carbon Strip
 - 22.75" Carbon Strip
 - Plywood Control Horns (4 each)
 - 5" Carbon Rod (2 each)

1) Assemble and glue lower components. Test fit all part without glue to check fit before gluing.

Work over waxed paper to keep from gluing the model to the building surface.

- Pin the horizontal fuselage component to the building surface.
- Glue in the 5" carbon strip elevator spar.
- Glue the wing halves in place. Wipe off excess glue.
- Run a bead of glue along the spar slot and press the 22.75" carbon strip spar into place. Wipe off any glue that has squeezed out of the slot.
- Glue the Lower Vertical Fuselage in place. 1.25 inch T-pins work well to hold it in place perpendicular to and in firm contact with the Horizontal Fuselage. Wipe glue that squeezed out of the joint.
- Install four plywood control horns in slots provided in ailerons, rudder and elevator. Wipe off excess glue.
- Install two 5-inch carbon fiber rods for landing gear.
- Let this assembly set until the glue has fully cured. For the best bond, leave parts overnight.

Wipe off all glue outside of foam joints. This glue does not add any strength, but it does add weight which will negatively affect the flight characteristics of the model.



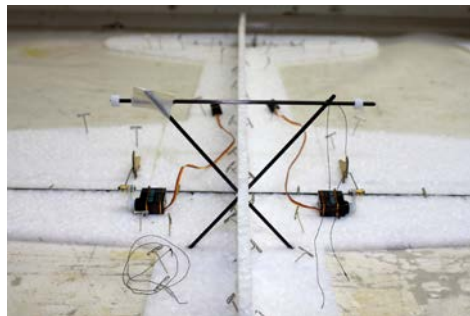
2.4 Landing Gear Assembly

- **Parts Required:**

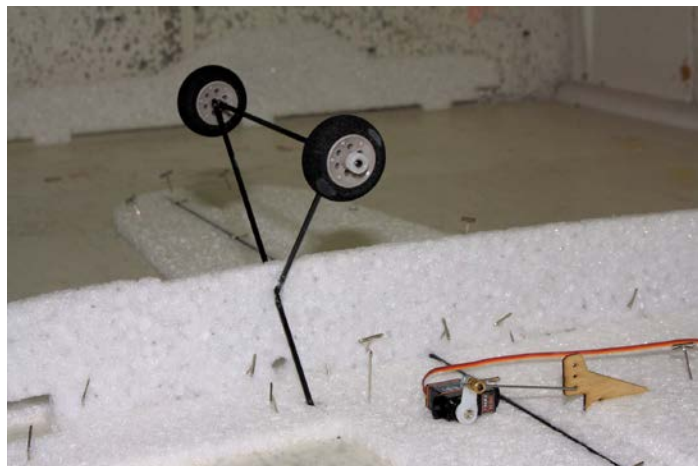
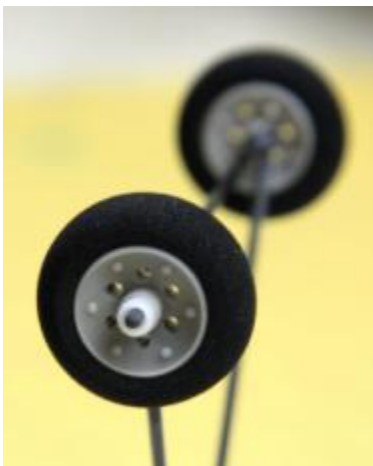
- Main Assembly
- 5.5" Carbon Rod
- 25mm Wheel (2 each)
- 24" Thread

- 1) Install the axle to complete the landing gear. Slide the wheels on the remaining carbon fiber rod and make sure they spin freely. If too snug fit, chamfer or slightly taper the axel rod ends with sandpaper to allow the wheels and hubs to go easily onto the axle.

Tape one end of the axle in place and bind the other side with the black thread provided in the kit. Remove the tape and bind the other side. Note that the axle should be arranged between the angled components to be as parallel to the spar as possible, to that the plane rolls as straight as possible when taxiing. Adjust the axle for even overhang on each side and for parallel to the wing so that the plane sits level. Secure the thread binding with a drop if CA glue on each side.



- 2) Slide the wheels on and hold them in place with a plastic hub made from the center portion of a servo arm from a micro servo. Remove the arms with side cutters, sand for smoothness, drill out to 5/64" if necessary and slide the hubs on to hold the wheels in place. Allow a little side-to-side play for easy rolling and secure the hubs with a drop on foam glue.



2.5 Upper Vertical Fuselage Installation

- **Parts Required:**

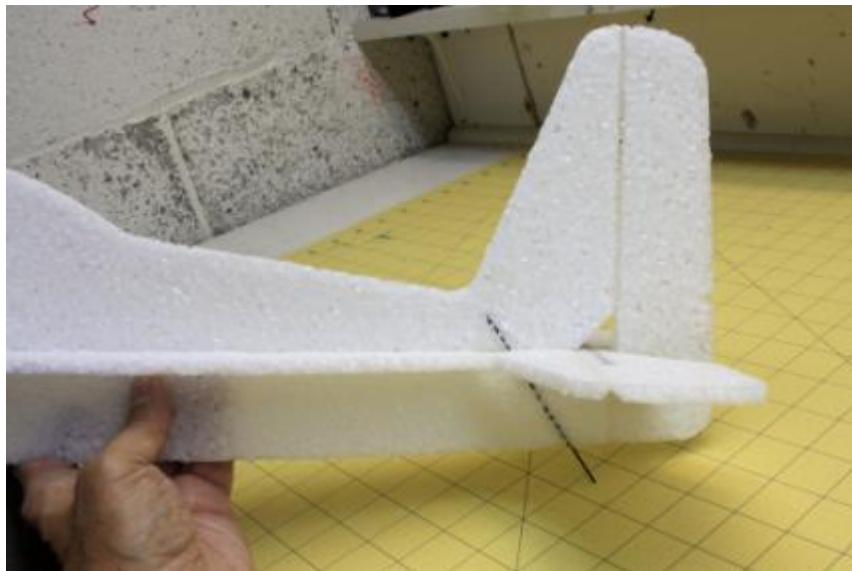
- Main Assembly
- Upper Vertical Fuselage Assembly

- 1) Glue the upper vertical fuselage component in place and hold in position with T-pins until the glue dries. Apply a bead of glue to the rudder hinge below the elevator. Wipe off excess glue to save weight.



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- 2) Use some sandpaper and sharpen one end of the 3-inch carbon fiber rod tail skid. Carefully push the pointed end of the skid into the foam at about the angle shown in the photos. Secure with foam glue if desired. The preferred location for the tail skid is shown. The skid stiffens the tail section and saves shock from the rudder servo by keeping the rudder off of the ground.



2.6 Gusset Installation

- **Parts Required:**
 - Main Assembly
 - 3mm EPP Gussets (2 long, 2 short)

BUILDING TIP: The wires from the rudder and elevator servos will be concealed neatly under the fuselage side braces, but running the wires through the narrow passages can be a headache. Before gluing the side braces in place, loop strings on both sides between the servo cut-outs in the rear and the pass-through holes in the front. The string will be used to pull rudder and elevator servo wires through the braces passages forward to the receiver.



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- 1) Install the long 3mm EPP Gussets along the upper fuselage sides with foam glue, aligning the front of the gusset with the front of the fuselage. Aim for a 45 degree angle between vertical and horizontal fuselages. Trim excess gusset in line with the elevator hinge. Repeat the installation process with the small gussets on the underside of the assembly, aligned to the front of the fuselage.



The weighted bags and equal-height boxes in the above left photo help to keep the airframe square while the side gussets are being glued. This isn't necessary, but it has proven to help some builders.

2.7 Painting/Decorating

- **Parts Required:**
 - Main Assembly
 - Paint, markers, decals, etc.

One of the beauties of this aircraft is that you have the opportunity to finish it with the look that you desire. We recommend purchasing the painted version of our kits for the fastest and easiest way to a great looking model. If you chose to decorate your model yourself, 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. You would be surprised at how quickly the weight from paint adds up!

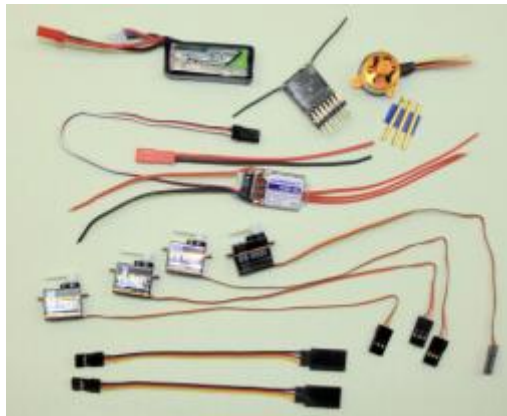
Our personal and demo models are painted using an airbrush then panel lines are added using a straight-edge ruler or various objects around the workshop and a Sharpie marker to trace around them.



2.8 Electronics Installation

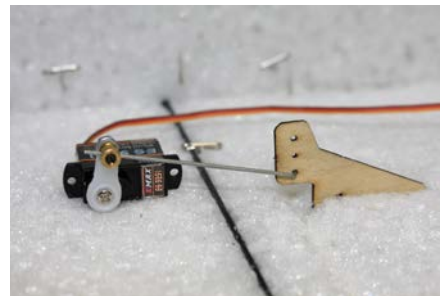
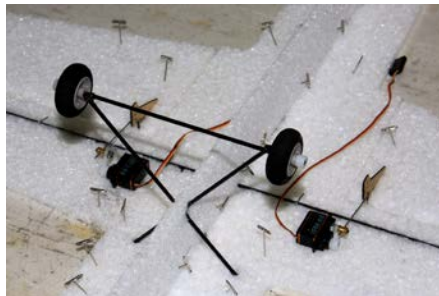
- **Parts Required:**
 - 50W Motor
 - 10A ESC
 - 4+ channel Receiver
 - 4x Sub-Micro Servos
 - 2x 8" servo extensions

The power and radio components you select to install in your Front Yard Fighters kit will likely be similar to the below photo. Don't forget that you can buy the Front Yard Fighter Completion kit that includes all of the necessary electronics to get your kit in the air without having to piece them together yourself.

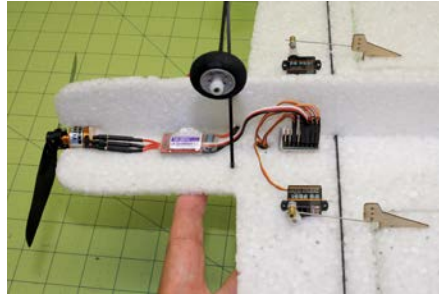


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- 1) Since we mount the rudder and elevator servos in the tail, 8-inch servo extensions will be needed to connect to the receiver, located near the wing spar. If you install a four-channel receiver, you'll need a Y-cable to drive the ailerons from one receiver channel. If you install a six-channel receiver, a Y-cable is not needed, as the aileron servos can plug directly in to AIL and AUX channels on the receiver, and are mixed in the transmitter.
- 2) Assemble the pair of aileron servos, with control arms, adjustment hardware, and control linkage hardware. Locate the servos so the control linkage is aligned and fix in place with a spot of foam glue.

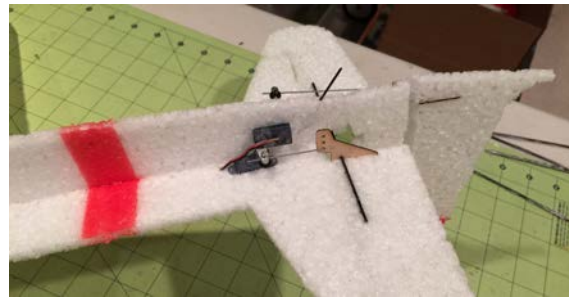


- 3) Locate the receiver near the wing spar and fix in place with a spot of foam glue. Make sure you locate it so the plugs are accessible.



- 4) If your rudder and elevator servos fit in the pre-cut slots, great. If they are larger, carefully trim away a little foam with a sharp hobby knife. We want a snug fit of the rear servos in their foam slots, to minimize the amount of glue needed to secure them in place.

Pull the servo cable with the extension cable through the triangular tunnel under the fuselage gusset and bring them out through the holes provided near the receiver location. Apply just a tiny bit of glue to the flat side of the servo that rests against the vertical component of the fuselage, to fix it in place.



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BUILDER'S TIP: Preparing to pull the rudder and elevator extensions through the triangular tunnel, make sure the servo cable and the servo extension cable are taped so they can withstand some tugging during this step. Make certain the cable is securely fixed to the string for the pull. If the cable becomes disconnected from the string, or if you neglected to install the strings back in step 11, you'll need a long reach grabber tool to get the servo cables up to the hole near the receiver.

- 5) Mount the motor to the plywood motor mount provided in the kit. We find the mounting screws shipped with the micro servos ideal for this. Locate the wire bundle at one of the corners of the motor mount. If the motor shaft protrudes from the rear of the motor case, make sure spinning parts not touch the plywood motor mount or foam spacers, as this would cause drag and reduce motor performance.



- 6) Select from the spacers provided in the kit the combination that locates the front of the motor case flush with the front of the fuselage. Make sure the propeller has plenty of clearance. Glue the spacers and motor mount in place with foam glue. We find it useful to mount the propeller to aid in getting the motor mounted square in the fuselage.

For best 3D performance we want a "Zero Zero" motor angle setup. We want the motor in line with the centerline of the fuselage - no down thrust, and no right thrust. This helps to insure that upright and inverted performance are as similar as possible, without needing trim change adjustments.

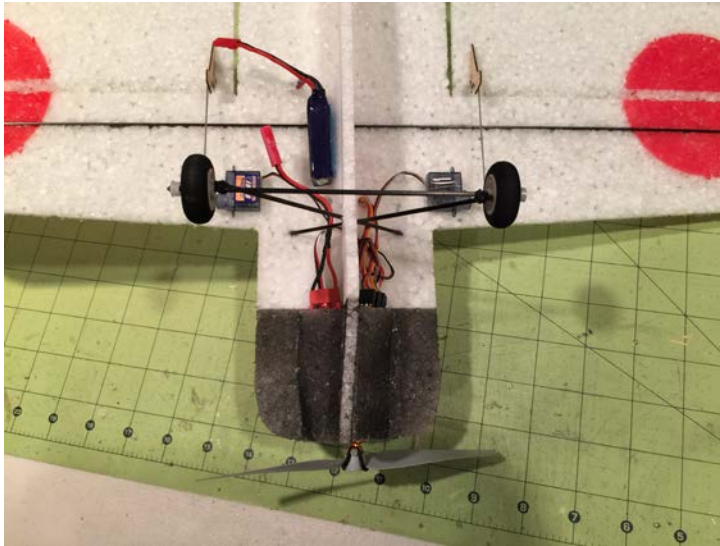


BUILDER'S TIP: to work on the underside of the plane after the upper vertical fuselage is installed, set the plane on a pair of same-size boxes.



- 7) Solder the provided connectors on the motor and the ESC, shortening the wires as desired to make a clean installation. Solder the battery connector to the ESC. Run the ESC radio connector to the receiver. Tuck the excess wire through the hole provided to make a neat wiring installation. Secure the ESC with a spot of glue.

- 8) Attach a strip of the opposite side of Velcro™ hook and loop tape to the underside of the horizontal fuselage component than you use on your batteries. Make it longer than the battery to allow fine adjustment to the plane's center of gravity. Attach the opposing hook and loop tape to battery packs to hold them in place when in use.



3 Setup and Tuning

3.1 Center of Gravity

Probably no other step is as important to having a sweet-flying airplane as locating the fore-and-aft balance point, CG, center of gravity in the correct spot. Too far forward makes for sluggish performance. Too far back makes for a twitchy and hard to control airplane.

The starting CG for Sawn-Craft Front Yard Fighters is at the carbon fiber blade wing spar. Anywhere between the spar and the aileron hinge will be acceptable. Ace-of-the-base pilots can move it further back for more agile responsiveness to control inputs and to facilitate hovering maneuvers.

3.2 Radio Setup & Mixing

Depending on the transmitter and receiver that you are using to control your model you may find that you need to do some special setup to make the control surfaces work properly.

Aircraft Setup Reference

<u>Transmitter</u>	<u>Wing Mode</u>	<u>Mix 1</u>	<u>Mix 2</u>	<u>Notes</u>
Spektrum DX6i	DualAile	N/A	N/A	Differential: ~12% if desired
Spektrum DX7s & DX8	Dual Aileron	N/A	N/A	Differential: ~12% if desired
Spektrum DX6, DX7, DX9 & DX18	Dual Aileron	N/A	N/A	Differential: ~12% if desired

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. After a few familiarization flights, modify to suit your personal taste.

<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	3/4in / 19mm (50%)	20%	1.25in / 32mm (100%)	30%
Rudder	1/2in / 13mm (50%)	20%	3/4in / 19mm (100%)	30%
Aileron	1in / 50mm (50%)	25%	1.5in / 38mm (100%)	40%

3.4 Launching/Take-Off

Launching this aircraft is very simple and is easy to do. Simply hold the airplane by the vertical fuselage in one hand with your radio in the other. Advance the throttle to full and gently push the aircraft forward, releasing it with wings level and a slightly up attitude. Since this model has landing gear, rise off ground take-offs are possible on smooth surfaces. Advance the throttle and allow the model to gain enough speed to fly before trying to use the elevator to pitch up as premature elevator application may push the tail skid down onto the ground, preventing take-off.

3.5 Flying Tips

This aircraft is designed to fly in the space as small as a single basketball court. Being so 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. Since this is a model with zero dihedral, you will need to apply rudder in order to make coordinated turns. This model can fly slowly in high alpha flight, but when you drop the nose it is remarkably quick and nimble. With its generous control surfaces, the model is capable of many 3D flight maneuvers. 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 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 as we have replacement parts for purchase.

