



Mana-Tee Assembly and Setup Manual



Specifications	
Wingspan	28"
Overall Length	19.75"
Wing Area	338.4 in ²
Flying Weight	348g / 12.27oz.
Intended Use	Outdoor/Combat

Recommended Power System (Click here to purchase)			
Motor	Emax 28-12 1534kv Brushless Outrunner		
ESC	30A Brushless	Servos	2x 9g servos
Prop	7"x4" Electric		
Receiver	At least 4-channel		
Battery	1000mAh to 1300mAh 3S 25C+ LiPo		



Thank you from Sawn Craft.

Thank you for purchasing the Sawn Craft Mana-Tee aircraft. This model has been the result of numerous design revisions that now deliver a fantastic-flying plane that is more shark than manatee in the air! 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 Mana-Tee aircraft represents the benchmark of electric combat 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.



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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.

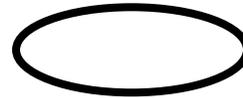
Note: Key points or hints for success will be formatted in this manner.

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

Arrows inform where to 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
- Soldering iron & solder
- Heat gun
- Wire cutters
- Beacon Foam-Tac
- Thin or Medium CA glue
- 3M Blended Hinging Tape
- 200-grit Sandpaper on sanding block
- Pencil

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 Components/Parts for Completion

The list below contains all of the required and recommended parts for the successful operation of this model.

- **Mana-Tee Completion Kit**
 - **Sawn Craft Mana-Tee Completion Kit – Standard**
 - Emax 2812 1534kv motor
 - 30A Brushless ESC
 - 2x 9g Servos
 - 6-Channel DSM2 Receiver
 - 7"x4" Electric Prop

Or

 - **Sawn Craft Mana-Tee Completion Kit – High Power**
 - Turnigy 2826 2200kv motor
 - 30A Brushless ESC
 - 2x 9g Servos
 - 6-Channel DSM2 Receiver
 - 6"x4" Electric Prop
- 1000mAh to 1300mAh 3S 25C LiPo Battery

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

Optional Parts for Completion

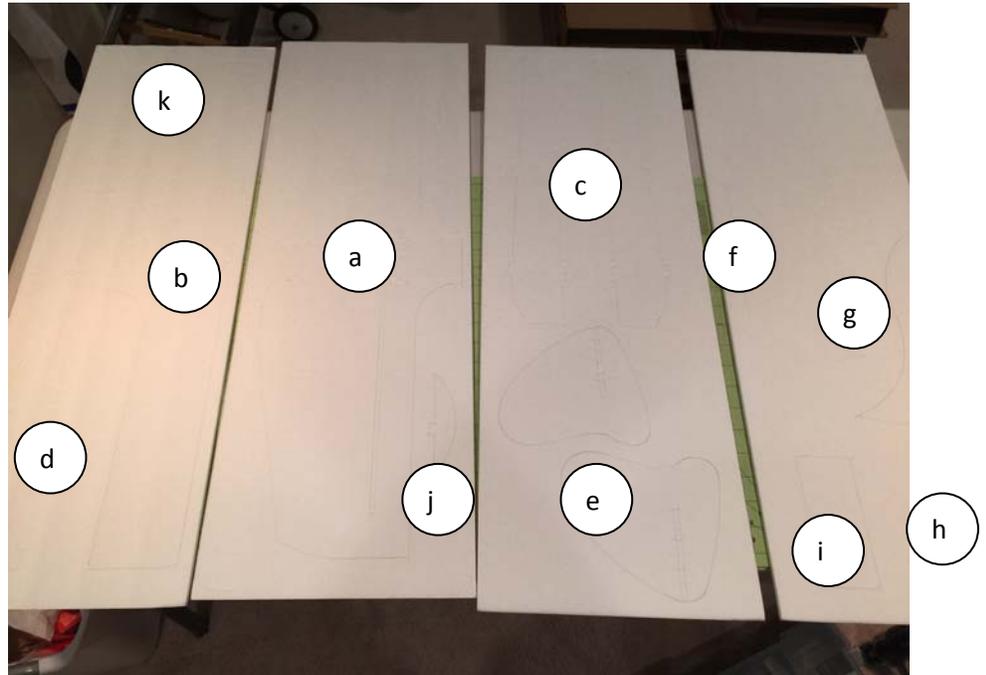
To make your build easier and ensure the nicest looking finished product, the following products are offered on [Sawn Craft.com](#). See the [Building Supplies](#) tab for these products.

- **Colored Packing Tape**

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) Main Wing Front
- b) KF Step
- c) Fuselage Half (2 each)
- d) Fuselage Bottom
- e) Vertical Stabilizer (2 each)
- f) Elevator
- g) Aileron (2 each)
- h) Battery Spacer
- i) Battery Tray
- j) Winglet (2 each)
- k) Main Wing Rear



Component Bag:

- l) Mana-Tee 1/8" Plywood Firewall
- m) Mana-Tee 1/32" Plywood Battery Box Side (2 each)
- n) Standard Control Horn (4 each)
- o) 2" 0.063" Control Wire with Z-Bend (3 each)
- p) 2" 0.063" Control Wire (3 Each)
- q) EZ-Connector for 0.063" control wire (3 each)
- r) 11" 0.083" Carbon Rod
- s) 6" 0.083" Carbon Rod (2 each)
- t) 24" Carbon Tube
- u) 2" 3mm Heat Shrink Tube (2 each)
- v) 4-40 Threaded Blind Nuts (4 each)
- w) 4-40 Bolt (4 each)

A quick note about the manufacturing method and material

We have designed this model to utilize XPS foam that has a lightweight paper laminated on both sides of it. The use of this material versus other available options gives us multiple benefits, including a more rigid product as well as one that is more durable for the intended combat-flying use.

To provide the highest-quality edge finish we utilize a CNC drag-knife that cuts the foam using a precision blade. The blade is oriented at an angle so you will note that on one side of your foam the cuts have small hash marks that extend beyond the cuts; this is simply a function of the cutter and does not affect the durability of the material. As these marks are not necessarily the nicest-looking, we have oriented the parts such that they will be hidden when the model is completed.

In order to maintain the integrity of this material, care must be taken to either not get the foam wet (including painting with water-based paints), or if that is not possible, coat the entire model in oil-based polyurethane prior to flying to protect the foam. We have flown countless flights with our test models built of this material and with a little bit of care there have been no issues. We do recommend either taping the leading edges of the model or using a thin coat of Foam-Tac on the edge of the foam to protect the exposed paper from delamination.

If you have any questions about the material or our manufacturing method please don't hesitate to contact us and we'd be glad to chat!

2 Assembly Instructions

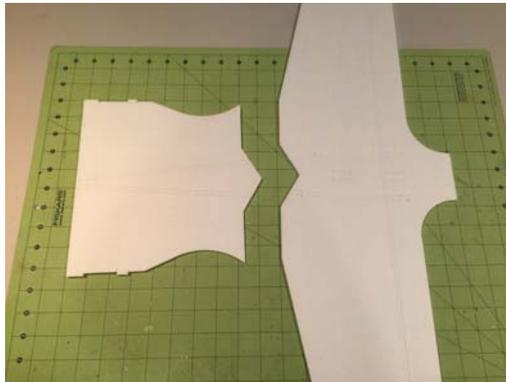
The order of assembly presented in this instruction has been tested and it is recommended that you do not differ from them to provide the most accurate and easiest assembly possible.

2.0 Main Wing Assembly

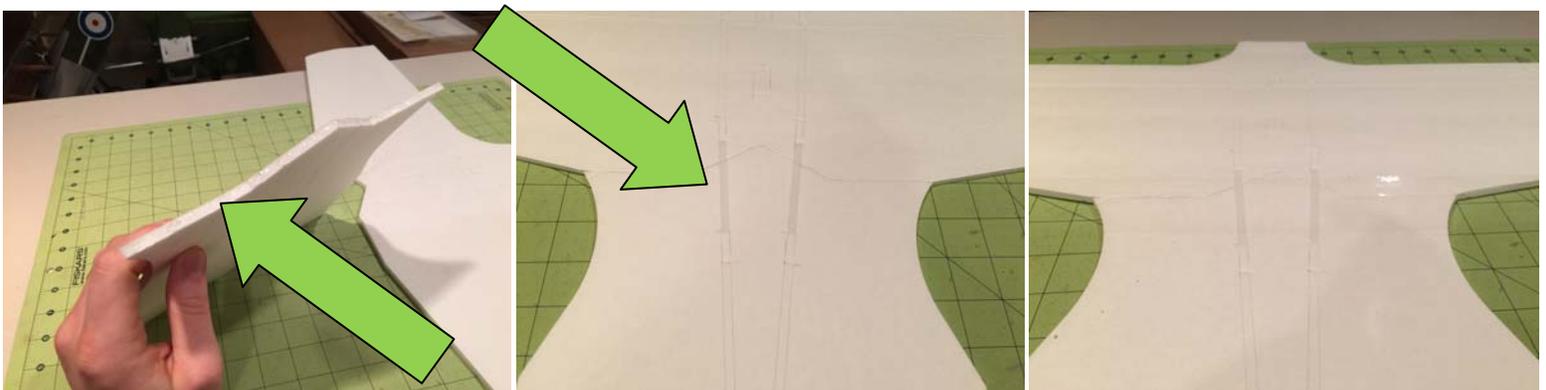
- **Parts Required:**
 - Main Wing Front
 - Main Wing Rear

Due to changes in our packaging, we were forced to modify the main wing and this step covers assembly of the two main wing pieces into what will be referred to as "Main Wing".

- 1) Carefully remove the Main Wing Front and Main Wing Rear from their respective sheets. Lay both pieces on a flat building surface with the paper score cuts facing up.



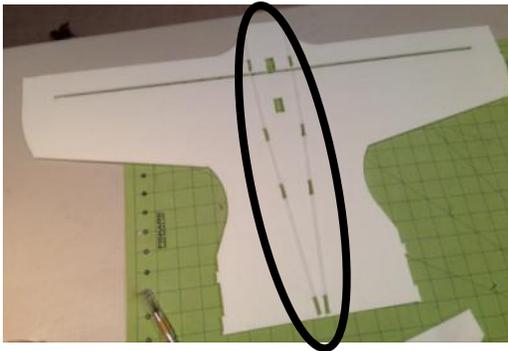
- 2) Apply glue to the mating edge of one of the pieces and assemble. When the glue has cured, peel the paper off of the scored areas nearest the glued seam. If desired, apply one strip of clear packing tape over the seam to make the joint seamless.



2.1 Parts Preparation

3) Parts Required:

- Main Wing
 - 2x Fuselage Half
 - 2x Vertical Stabilizer
 - Fuselage bottom
 - Mana-Tee 1/32" Plywood Battery Box Side (2 each)
 - Standard Control Horn (4 each)
- 1) Lay the main wing on a flat building surface with the knife hash marks facing up. Peel the thin paper strips off of the foam where it has been scored for the fuselage to mate with it. This side will now be referred to as the bottom. This will give the glue a place to make a foam-to-foam bond which is stronger than foam-to-paper.
 - 2) Lay the vertical stabilizers with the hash marks facing up and peel the thin paper strips off the foam for the wing to mate with it.
 - 3) Lay the fuselage halves with the hash marks facing up and peel the paper section off of the front part of the piece, where the battery box will mount.
 - 4) Lay the fuselage bottom with the hash marks facing up and peel the thin paper strips off the foam for the fuselage sides will mate with it.
 - 5) Use a hobby knife to carefully cut the control horns and battery box sides from their material skeleton. Take the 200-grit sandpaper and smooth the holding tabs and the edges of the parts.



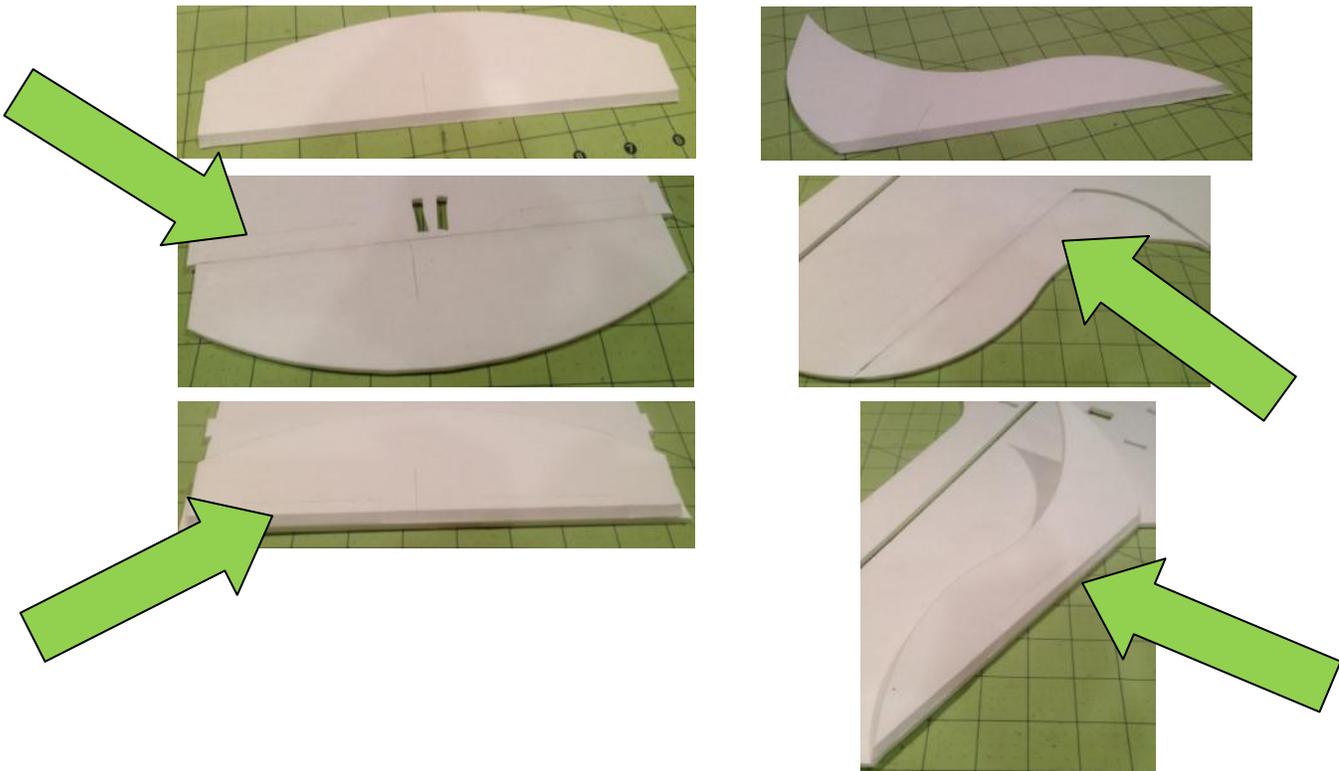
2.2 Control Surface Installation

4) Parts Required:

- Main Wing
- Elevator
- 2x Ailerons

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

- 1) Lay the elevator on the table with the leading edge facing you and the control horn slot to the left. Use a hobby knife to cut a $\sim 45^\circ$ bevel into the leading edge of the elevator.
- 2) Lay the aileron on the table with the leading edge facing you. Both ailerons are mirrors of each other so orientation (L or R) doesn't matter as long as you cut the bevel properly for the side. Use a hobby knife to cut a $\sim 45^\circ$ bevel into the leading edge of the aileron. Repeat for the other aileron.
- 3) Place the main wing on the table with top side up. Align the ailerons and elevator to their locations with their bevels facing down. Using Blendederm tape, apply 2x 2" strips to either end of the control surfaces. Flip the assembly over and apply 2x 2" strips of Blendederm again to either end of the control surfaces, being sure to get the tape down into the bevel.



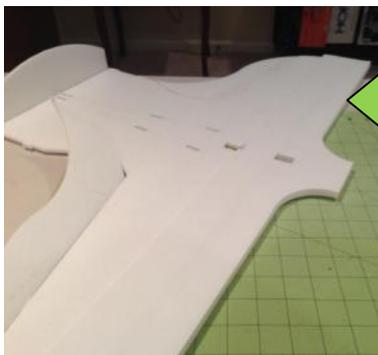
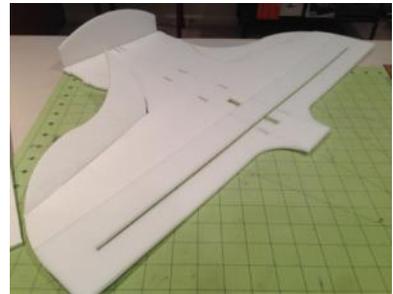
2.3 KF Step Installation

5) Parts Required:

- Main Wing
- KF Step

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

- 1) Lay the KF step on the table with the hash cut marks facing up. Peel the paper completely off this side of the part.
- 2) Lay the bare foam side of the KF step on the top of the main wing, aligning it with all of the edges. With a pencil, gently trace a line on the main wing where the trailing edge of the KF step is. Remove the KF step and use a straight-edge ruler and a hobby knife to lightly cut just the top layer of paper. Once cut, remove the paper that will be below the KF step.
- 3) Spread an even coat of Foam-Tac on the foam side of the KF step and glue it to the exposed foam of the main wing, ensuring to line up all edges.



Optional: You may bevel or round the leading edges of the wing to your liking.

2.4 Carbon Spar Installation

6) Parts Required:

- Main Wing Assembly
 - 24" Carbon Tube
- 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 slot where the carbon tube will be installed.
 - 2) Insert the carbon tube into the slot with a gentle twisting action in order to coat the entire rod with glue. Ensure the tube is sitting evenly in the slot and is flush with the bottom surface of the wing. Allow the glue on the entire assembly to cure before proceeding.



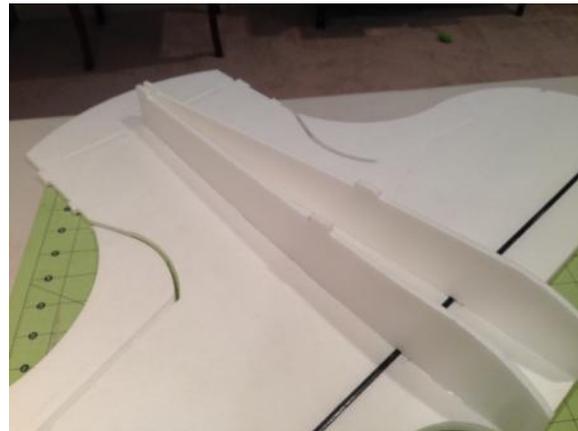
This is an ideal time to decorate the parts as they are still flat and will be easier to handle. We recommend using colored packing tape as it will add strength and durability as well as vivid color.

2.5 Fuselage Installation

7) Parts Required:

- Main Wing Assembly
- Fuselage Half (2 each)

- 1) Apply a bead of glue down the entire length of the flat edge of the fuselage half. Note which side of the fuselage half has the cut hash marks; this will face inside the completed fuselage.
- 2) Press the glued side of the fuselage half onto the main wing assembly, aligning all of the tabs with the slots in the main wing. Repeat this process for the other fuselage half.

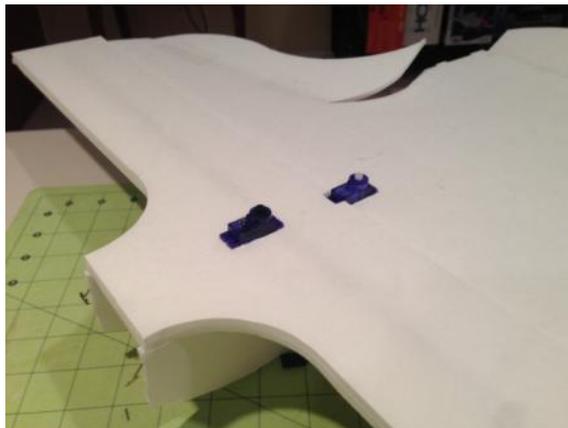


2.6 Servo Installation

8) Parts Required:

- Main Wing Assembly
- Servo (2 each)

- 1) Apply a bead of glue on the bottom of the servo mounting tabs. Install the servos into the slots cut in the main wing, with the servo output spline facing toward the back of the plane.

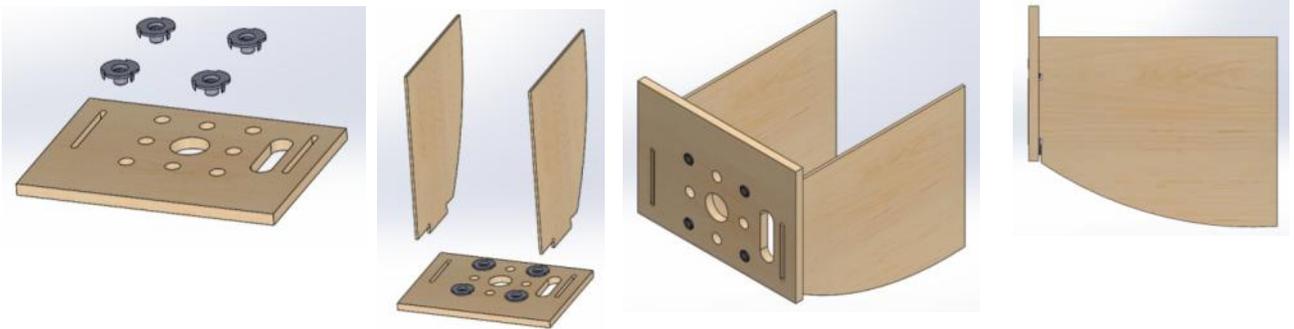


2.7 Battery Box Assembly/Installation

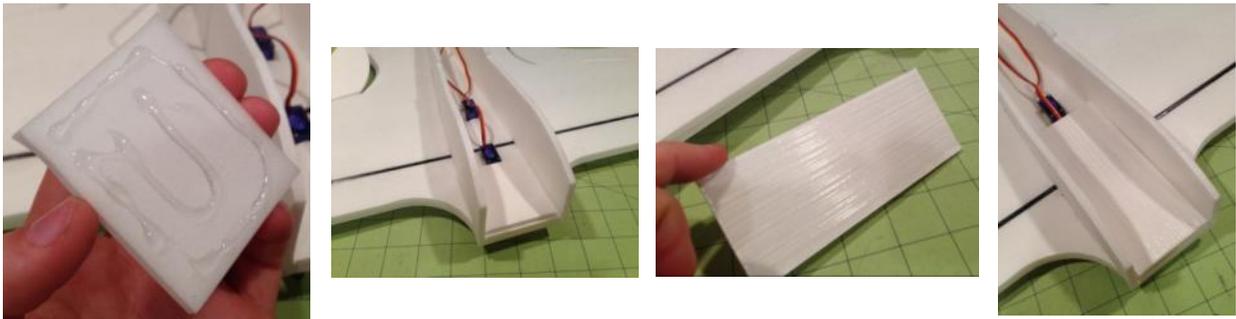
9) Parts Required:

- Main Wing Assembly
- Mana-Tee 1/8" Plywood Firewall
- Mana-Tee 1/32" Plywood Battery Box Side (2 each)
- Battery Spacer
- Battery Tray
- 4-40 Threaded Blind Nuts (4 each)

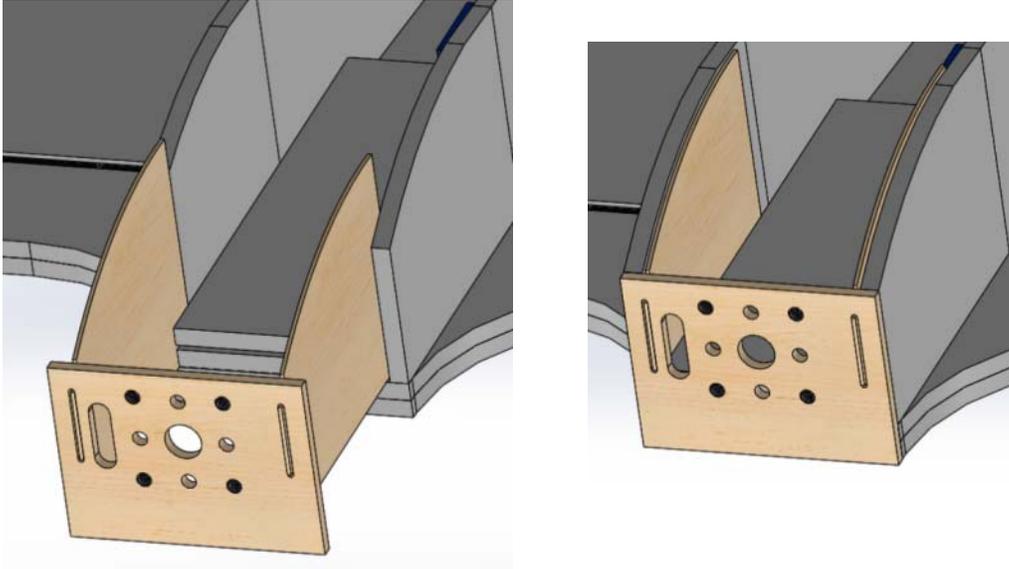
- 1) Place the 1/8" firewall on the table with the slot oriented to whichever side you prefer. Note that the holes are drilled such that they will be on the lower side of the mount when installed. Insert the blind nuts into the holes that correspond with your motor of choice.
- 2) Insert the 1/32" battery box pieces into the slots such that the curved edge is flush at the front with the bottom of the firewall. Use thin or medium CA to secure the battery box pieces to the firewall. The completed assembly is shown.



- 3) Peel the paper off of both sides of the battery tray and the battery spacer. Apply Foam-Tac to the battery spacer and install it in front of the aileron servo such that it is centered side-to-side and is touching the front of the servo.
- 4) Apply Foam-Tac to one side of the battery tray and glue it to the battery spacer and the bottom of the aileron servo. Again, ensure that the tray is centered side-to-side and is touching the elevator servo. If desired, you can apply packing tape to the battery tray on one side to give a solid base for mounting Velcro for the battery.



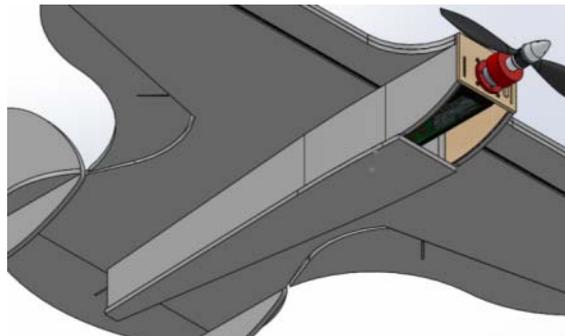
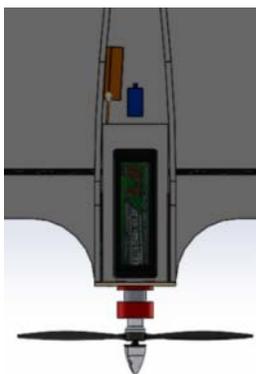
- 5) Apply Foam-Tac to either side of the battery box assembly and the front of the fuselage sides as well as the leading edge of the main wing assembly where the firewall will be attached. Slide the battery box assembly into the fuselage such that the 1/32" ply pieces fit between the battery tray and fuselage sides.



2.8 Electronics Installation/Fuselage Bottom Installation

10) Parts Required:

- Main Wing Assembly
 - Fuselage Bottom
 - 4-40 Bolt (4 each)
 - Motor, receiver, ESC
- 1) Attach your ESC and receiver on the inside of the fuselage. We recommend using Velcro for mounting to ease in adjustment and removal. Plug both servo plugs and the ESC plug into the receiver.
 - 2) Solder any necessary bullet connectors to your motor, if needed, and install the motor to the front of the firewall using the four 4-40 bolts. Route the motor wires through the slot in the firewall and connect them to your ESC.
 - 3) Apply glue to the exposed edges of the bottom of the fuselage sides and install the fuselage bottom, aligning all of the tabs into the slots.



2.9 Control Rod/Horn Installation

11) Parts Required:

- Main Wing Assembly
 - Standard Control Horn (4 each)
 - 2" 0.063" Control Wire with Z-Bend (3 each)
 - 2" 0.063" Control Wire (3 Each)
 - EZ-Connector for 0.063" control wire (3 each)
 - 11" 0.083" Carbon Rod
 - 6" 0.083" Carbon Rod (2 each)
 - 2" 3mm Heat Shrink Tube (2 each)
- 1) Apply Foam-Tac to the bottom of the control horns and insert them into the slots cut in the elevator and the ailerons, making sure that the holes line up directly above the control surface hinge line.
 - 2) Apply Foam-Tac to the end of a Z-bend wire and glue it to the end of a carbon rod. Once tacky, slide a ~1" piece of heat shrink tube over the wire and the end of the carbon rod and shrink it to hold the joint securely with about 1" of wire protruding from the carbon rod. Repeat this for the other two rods.
 - 3) The process is the same for securing the straight pieces of control wire on the end of each rod.
 - 4) Install the EZ-Connectors to your servo horns.
 - 5) Gently connect the Z-bend side of the longest rod assembly to the control horn on the elevator. Slide the straight end of wire into the EZ-Connector and center the control surface manually then tighten the grub screw to secure the rod to the servo.
 - 6) Repeat step 5 with the shorter rod assemblies and install them on the ailerons.



2.10 Vertical Stabilizer Installation

12) Parts Required:

- Main Wing Assembly
 - Vertical Stabilizer (2 each)
 - Winglet (2 each)
- 1) Apply Foam-Tac to the exposed foam that you peeled the paper from and glue the vertical stabilizers to the main wing assembly, aligning the tabs with the slots.
 - 2) Apply Foam-Tac to the straight edge of the winglet and install them to the outside of the vertical stabilizers, aligning the tab with the slot and ensuring that the leading edge of the winglet is flush with the vertical stab's leading edge.



3 Setup and Tuning

3.1 Center of Gravity

The CG of this plane is located approximately 1.5 to 1.75" from the leading edge of the main wing. 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 slower, high-alpha flight, but will be more unstable while a more fore CG will provide a faster, more "locked in" flight experience. Use the fore/aft location of the battery to adjust the CG without adding additional weight.

3.2 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	1/2in (70%)	30%	1in (100%)	45%
Aileron	1in (70%)	30%	2in (100%)	45%

The aileron control surfaces have built-in differential so they will move more in the up direction than in the down direction. This helps to eliminate adverse yaw. Measure the throw on the ailerons in the up direction.

3.3 Launching

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

This is a high-performance model aircraft! Extreme care must be taken to avoid the prop as it is spinning extremely fast and can cause serious bodily injury.

3.4 Flying Tips

This aircraft is designed to be the perfect “toss in the car” model for most fliers! The compact size allows it to fly in smaller parks, but the speed that it is capable of makes it a great choice for your local flying field as well. With smaller control throws and more expo, the Mana-Tee is a great choice for newer pilots that are getting their feet wet with aileron controls. Turn the throws up and you get a plane that is extremely aerobatic and will perform axial rolls at an alarming rate! Landing the aircraft is simple; keep some throttle applied and as the plane nears the ground, pull back on the elevator to flare.

We developed this model for club combat events and have found many pilots bringing them out on non-combat nights because they are just so much fun to fly! When we do fly combat we have used full-width (~2”) x 20’ crepe paper streamers attached with tape to the rear of the fuselage with no significant degradation in performance. In the “rare” case that a Mana-Tee is involved in a mid-air collision, the reinforced plywood battery box and strong, interlocking construction should provide your electronics and battery protection over other combat plane designs.

Remember: Always follow the AMA safety guidelines! Never fly over people or animals.

3.5 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 colored packaging tape (available on the [Building Supplies](#) section of our website) for decorating as it is easy to use, lightweight, and provides a nice, glossy finish. Water-based paints have been used if the foam had previously been treated with oil-based polyurethane. Prior to using any paints or markers, test on a scrap piece of foam to ensure that it doesn’t melt 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.

3.6 Repairs & Spare Parts

Due to this models design and 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 available for purchase.