



# *Gentle Lady-250*

## *Super Simple Series*

**LESS THAN 250 GRAMS! NO FAA REGISTRATION REQUIRED!**

### **BETA KIT**

#### **WARRANTY**

Willy Nillies guarantees this kit to be free from any defects in both material and workmanship at the time of purchase. This warranty does not cover ANY components or parts damaged by use or modification. In no case shall Willy Nillies' liability exceed the original cost of the purchased kit. Willy Nillies reserves the right to modify or change this warranty without notice.

#### **LIABILITY RELEASE**

In that Willy Nillies has no control over the final assembly or material used for final assembly, no liability shall be assumed or accepted for any damage resulting from the use by the user of the final user assembled product. By the act of using the user assembled product, the user accepts all resulting liability. If the buyer is not prepared to accept the liability associated with the use of this product, the buyer is advised to return the kit immediately in new and unused condition.

#### **PRODUCT SUPPORT**

This product has been designed to function properly and perform as advertised with the SUGGESTED power system, speed control, and servos, as described in advertisements and in this manual. For the proper electronics to complete this model, replacement parts, and product assembly questions, please contact us online at [www.WillyNillies.com](http://www.WillyNillies.com)

Our aircraft are built from self-jigging interlocking laser cut. balsa and plywood parts. It's like a 3D jigsaw puzzle with instructions. Full size plans are NOT INCLUDED or needed to assemble our kits. If the instructions are read beforehand and followed during the build, our kits can be built up and ready to fly in only 2 to 4 evenings. We think you'll like the super simple construction and flying qualities of our kits and look forward to any feedback you might have.

Sincerely,  
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**PLEASE VISIT OUR WEBSITE and Builders Group FOR CURRENT BUILD  
INSTRUCTIONS, VIDEOS AND UPDATES**

## Introducing the Gentle Lady 250 classic sailplane - or electric powered!

The Gentle Lady has always a great choice for a first airplane. Classic and graceful in looks and extremely gentle flight characteristics make this the perfect Sunday relaxed flyer or trainer! Enjoy it off a mini high start or use a 1306 brushless motor!

We have recreated this wonderful little sailplane at a slightly smaller size to come in well under the 250 gram weight rule for the proposed FAA RID rules. This means NO FAA rules or regulations for the Gentle Lady 250! Fly it at your local park or school yard (with permission of course) or your own large yard!

We have also updated the design to have interlocking parts. Building the fuselage and wings are a snap and takes less than 1 or 2 hours for experienced builders to frame up and have ready for covering! Beginners should allow a couple of hours and a visit or two to our builders group to get any questions they have answered quickly.

### **Gentle Lady - 250 specs:**

Wingspan: 48.5"

Wing Chord root 5"

Wing Chord tip 3.75"

Wing Area: 229 sq in

Fuselage length from front of fuselage to tip of rudder: 21.25"

Flying Weight Brushless or Glow: 4.5 to 6 ounces.

Wing loading 2.82 to 3.76 oz/sq.ft.

Wing Cube loading : 2.2 to 3

### **Features:**

Build as 2 channels or 3 with Brushless motor.

Easy access battery hatch

Built in servo tray in fuselage

Clark Y flat bottom airfoil

Laser cut self-jigging construction - The entire airframe can be built and ready to cover in less than 2 hours!

Full length shear web re-enforced main spar.

### **Includes:**

All wood pieces to build the entire airframe

.032 K&S music wire pushrods

6 each number 32 rubber bands for attaching wing

### **Recommended equipment:**

2 each Emax 9251ii, 2.5g or equivalent micro servos - ( Emax 9051 - 5 gram servos can be uses with minor resizing of servo tray). Rudder and Elevator.

Non powered flight: Minimum 3 amp UBEC and 350 mAh Lipo battery, or equivalent Rx Battery.

For powered flight: 1306 - 3100kv Brushless Motor

For Brushless - 350 mAh 2s Lipo battery, minimum 12 amp ESC, Gemfan 5030 propeller or equivalent

\*\*\*\* 3 covering packs are required to cover entire airframe\*\*\*\*

### **General Practice for assembly:**

Join all your pieces using thin CA (Cyanoacrylate) glue, unless we tell you otherwise. In general, only a small amount of CA is necessary to glue parts together. Use of a capillary tube is HIGHLY recommended.

Choosing to build with an Aliphatic such as Titebond, Sig Bond, or Deluxe Materials ect. will require the use of a flat and true building board, Pins, and Clamps. The construction sequences remain the same.

Do not over force your pieces together. If they are not fitting together properly, make sure you have the right pieces, and they are oriented correctly. If needed, you can lightly sand the part to fit. On balsa "tabs", you can "pinch" the wood with your fingers to get them to fit in slots. Over sanding may result in loose jiggling of the components creating mis-alignment. (The tabs might be tighter sometimes, due to tolerances in wood thickness)

### **Control Throws:**

1. Control throws are CRITICAL to the characteristics of our aircraft designs. The recommended throws have been determined through flight testing during development and It is imperative that you DO NOT EXCEED our recommended control throws on your first flight!!!!

**Elevator:** .5" up and down, measured at the trailing edge immediately aft of the control horn.

**Rudder:** .75" right and left, measured at the trailing edge immediately aft of the control horn.

**EXPO** - if you have a computer radio, we recommend setting rudder and elevator on 25% expo to help soften the sensitivity and effectiveness of the controls near center.

### **Center of Gravity:**

1. Beginner C of G is at 2.0 inches aft of the leading edge measured from the leading edge. Advanced fliers will prefer a C of G at about 2.25" of the leading edge. Adjust your battery and receiver forward or aft to achieve this placement for your first flights. Add weight if necessary.

### **First Flights:**

1. This model is an incredibly fun aircraft with a wide speed range for cruising from thermal to thermal. That said, don't be afraid of it! If you have followed our Center of Gravity instructions and have set control throws accordingly, you will be rewarded with a very fun relaxing all around aircraft.

### **Words of Caution:**

1. This is a SMALL plane. KEEP IT CLOSE.

2. IF YOUR GL IS POWERED, DO NOT LAUNCH AT FULL THROTTLE! The torque from the electric motor can roll the aircraft quickly!

3 Half throttle and a firm forward throw is all you need to get going.

4. It is highly recommended that you use highly contrasting colors in your finish. Visibility and keeping orientation are especially important.

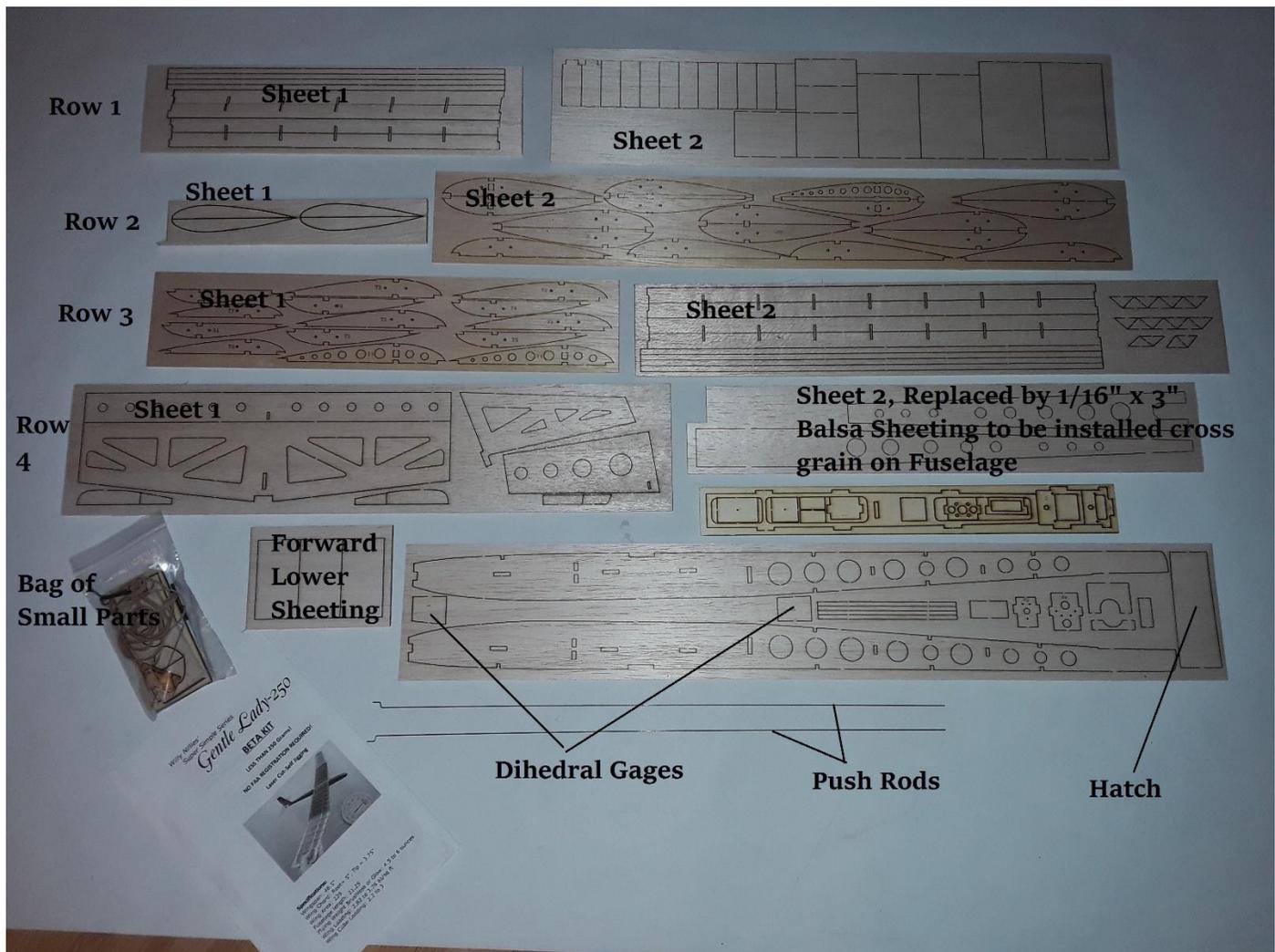
5. There is a High Start for the 250-gram sized planes available from WillyNillies.com and instructions for assembly in the Files section of the forum.

## Gentle Lady-250 Assembly Guide, Rev: A, 01/28/2023

This guide is a list of steps accompanied with photos on how to assemble the Willy Nillies Gentle Lady-250 and follows the information provided by Willy Nillies with input from the Facebook Builders Forum. All our kits share nearly the same construction techniques with only very minor differences. As with any Beta Kit there may be recommended modifications and updates available. **Always** check the documentation that comes in your kit.

All Willy Nillies planes have been Flight tested and built from random production selections to ensure you are getting a great product. With that in mind, you may feel free to be creative and make your own modifications, however, realize that any changes made by the Builder become the responsibility of the Builder and any change to the flight characteristics are the responsibility of the Builder to correct.

### Contents of the Original release of the Gentle Lady-250 Beta Kit:



**Top Row; Sheet 1,** Tip Panel Spars, Leading and Trailing Edges. **Sheet 2,** Wing center section sheeting, Shear Webs.

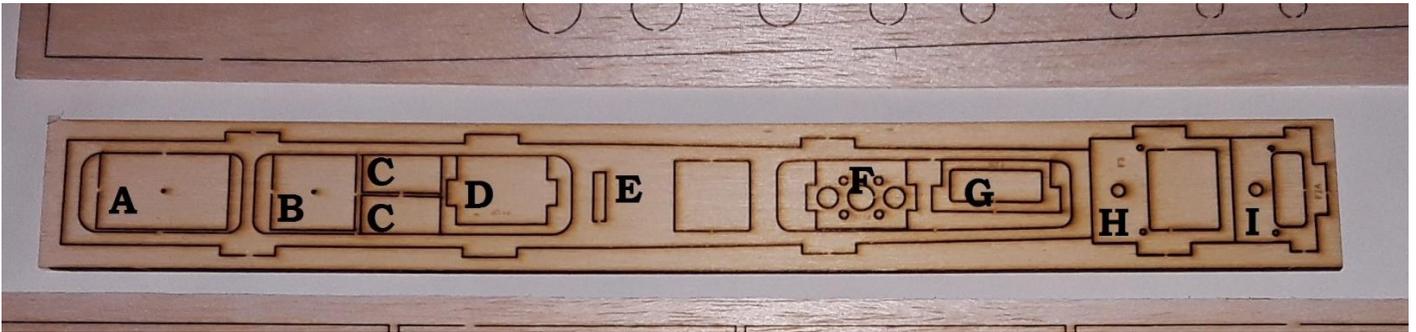
**Second row; Sheet 1,** Wing Tips. **Sheet 2,** Main Panel Wing Ribs.

**Third Row; Sheet 1,** Tip Panel Wing Ribs. **Sheet 2,** Main Panel Spars, Leading, Trailing Edges and Triangle Gussets.

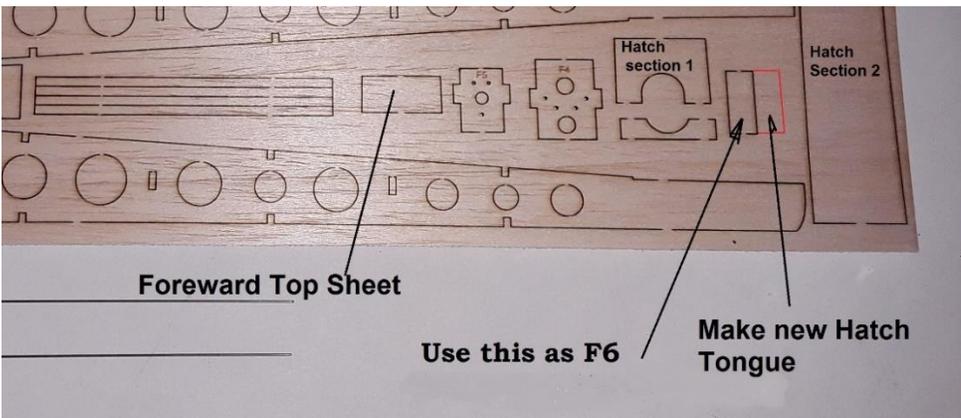
**Fourth Row; Sheet 1,** Horizontal Tail, Elevator, and Tips. Vertical Tail, Rudder and Tips. Sheet 2, Has been replaced by a sheet of 1/16 x 3" Balsa that is installed cross grain and cut by the builder. Old Kits; Fuselage Top and Bottom rear sheeting.

**Plywood Sheet; Detailed separately.**

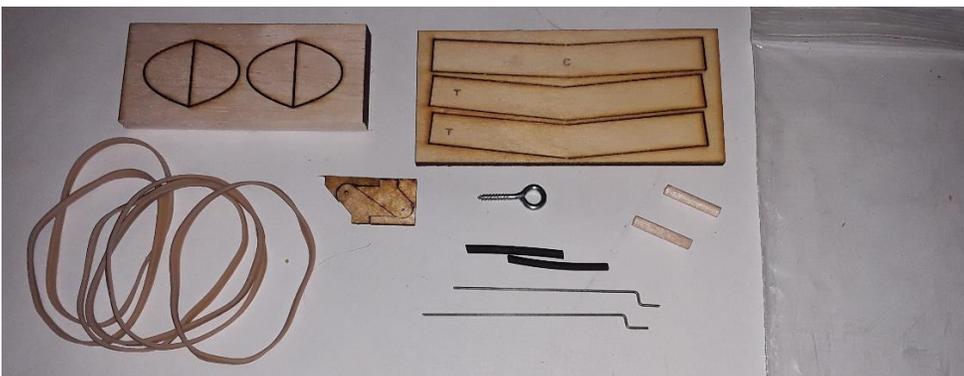
**Fifth Row;** Bag of Small Parts, detailed separately. **Sheet 1,** Bottom forward Sheeting. **Sheet 2, (2)** Fuselage Sides, Dihedral Gage "T" for Wing Tip Panels Ribs, Dihedral Gage "C" for Main Wing Panel Root Ribs, (4) Cross Braces, Forward Top Sheet, Former F5, Former F4, Hatch Rear Section, Hatch Tie Down Plate, Hatch Tongue, Hatch Plate. (2) .032 Wire Pushrods and Gentle Lady Information Sheet.



Plywood Sheet Detail: (A) Hi-Start Hook Plate, (B) Hook Plate Doubler, (C) Hook Plate Side Braces, (D) Blank Firewall, (E) Main Fuselage Tray, (F) Brushless Motor Firewall, (G) Former F2 Lower, (H) Former F3, (I) Former F2 Upper.



The Early Beta Kits need to have a Former F6 fabricated and installed at the front of the Stabilizer cutout. The Hatch Tongue is the perfect width and is trimmed to height after installation as detailed during construction. A second Hatch Tongue can be fabricated from the scrap right next to this part to get the proper width.



The Bag of Small Parts contains; 1/4 Sheet with Nose Blocks, Plywood Sheet with Dihedral Braces, (6) #32 Rubber Bands, (2) Sections of heat shrink tube, (2) "Z" bent Pushrod ends, (2) Dowel Rods, and a sheet of (2) plywood Control Horns.



Some of the tools you need are a knife for trimming and some sandpaper for dressing edges and smoothing out joined areas. The minimum of tools needed is a benefit of the Laser cutting process and the design of the kits. These sanding blocks are made from a 1 x 2 Poplar with nice square edges and are 6" long. The paper is wrapped around tight and stapled to make it easily replaceable. These are easy to make up with different grits from 120 to 600 depending on the task. Sanding sticks to match are easily made by gluing strips of sanding paper to Craft sticks or Tongue depressors. For round areas, a strip of Sandpaper taped around the handle of your knife is handy and gives a nice grip as well.

## Preparing to Build:

Once you have inventoried all your parts you may punch them all out and sand the edges lightly to remove the nubs and any charring left by the Laser process. Some builders prefer to punch the parts out as they go. This allows them to reference the sheet layouts for the items they are building. Keep your scraps, during the build some of it may be needed.

Occasionally there is a hole that needs a slight cut to remove the slug. Use caution so that excess Balsa is not removed. The fits of the Tabs and Slots are self-jigging to align the assembly to build a straight and true airplane.



Install a capillary tube to the Thin Cyanoacrylate glue for precision placement of the glue. A wrap of tape around the joint of the tube and bottle can keep small leaks from happening.

## Fuselage assembly:

If you haven't already done so, start by punching out the Fuselage sides and formers. Test fit your parts in all the slots before starting to assemble. Note that the F3 and F4 Formers have small holes Laser cut in them for the Pushrod guides. Makes sure they are open by sticking the end of a Pushrod through them BEFORE you assemble the Fuselage.



Here are the parts required to assemble the main Gentle Lady Fuselage with parts positioned and laid out to be installed. Note the Hi-Start Plate and Doublers are mocked up as they will be installed. If you are planning on using the 1306 Brushless Motor, the Firewall with the mounting and air holes would be used in place of the blank Firewall.

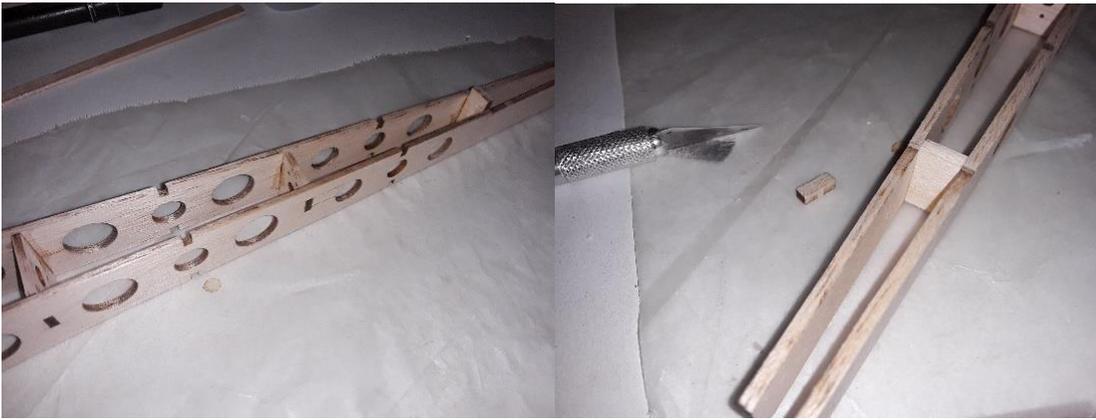
If you need to adjust fits, a light swipe with fine sandpaper is all it takes. Avoid going overboard as the snug fit of parts is a crucial part of the self-jigging. Occasionally, the balsa tolerance falls thicker, so pinching the tabs may be needed to put them in. Don't force them.

Once satisfied with the fits, mark a centerline down the top side of the tray for aligning servos later, then square up and glue the Tray, Formers F2 Upper, F2 Lower and F3 to establish the initial main framing.



These are detail pictures showing the installation of the Hi-Start Plate and it's doublers installed in the Fuselage from the bottom and top views.

Don't be stingy with the gluing as it will be taking the stress during launch. If you are not planning on using the Hi-Start or Winch system for launch, the doublers can be left out. Save them in case you change your mind later. Fit and install the Firewall to complete this main structure.



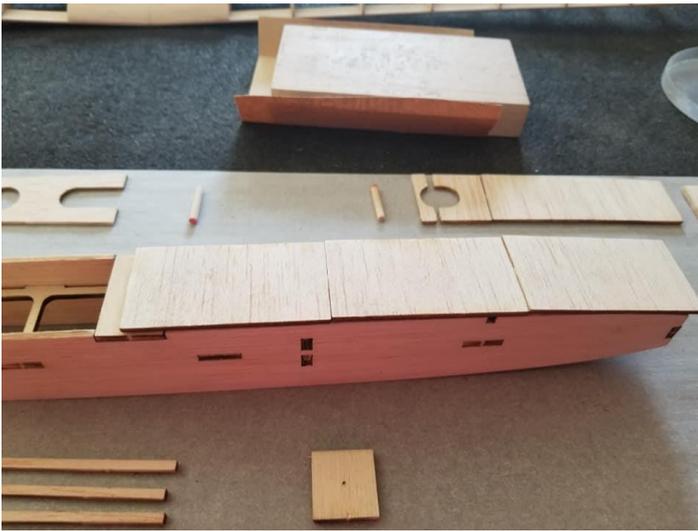
Formers F4 and F5 are test fit. Set the Fuselage on a flat surface to check for square. Glue using Thin CA. Place F6 at the front of the Stabilizer notch and square it vertically before applying the Thin CA to set it in place. The end of the Fuselage will end up with about an 3/16" to 1/4" gap for the Elevator Pushrod and Control Horn clearance.



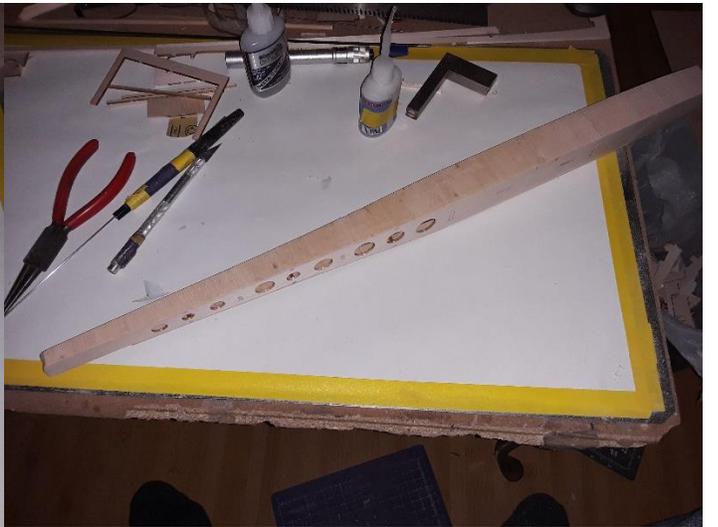
Trim the top of Former F6 and lightly sand flush with the top of the Fuselage. Check the fit with the Stabilizer. The 3rd picture shows how the notch fits the Fuselage. Install the cross bracing in the notches of the top and bottom Fuselage sides. Simply lay them in, glue and trim. Once they are all installed a few swipes with the sanding block will dress them down.



The supplied sheeting is laid cross grain on the Fuselage and cut to length, butt each section together starting flush with Former F3 and ending at the Stabilizer notch in the rear. I prefer to leave a small overlap to trim once the pieces are glued on and sanded flush with the Fuselage sides. Take your time setting and test fitting before you glue the pieces in place. I ran my pushrods at this point and leave them in the Fuselage before closing the bottom. There are larer cut holes in the formers but I add my own near the back for the Rudder. Much easier to make the routing now.



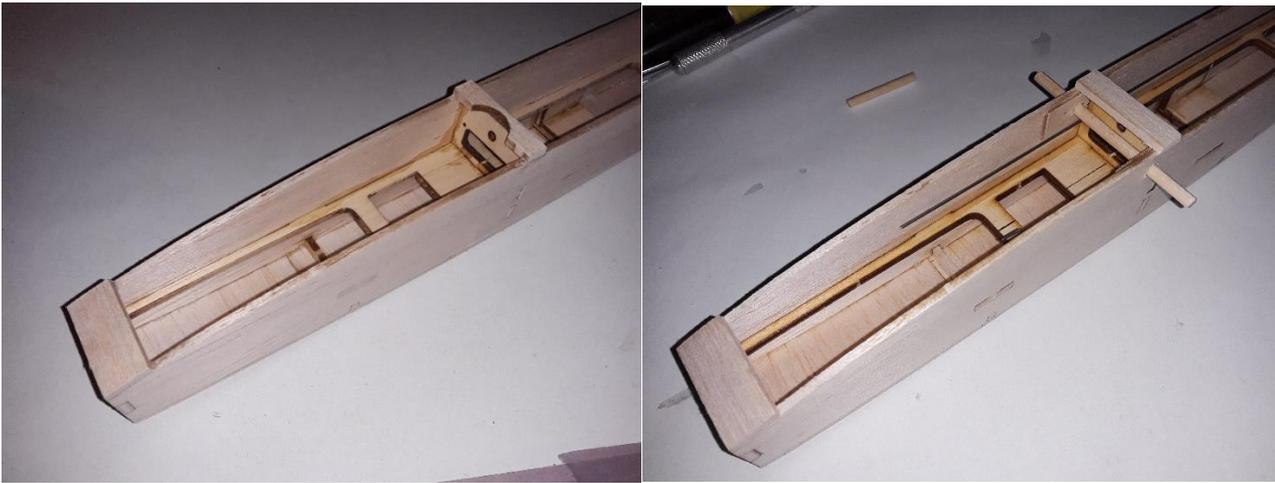
For the bottom, start with the first of the three 3/32" sheets flush to the Firewall edge, glue and add each one remembering to edge glue the joints. The last sheet should cover half the Hi-Start Plate as shown. Depending on the version of the Gentle Lady kit you received, the Hi-Start plate may be fully covered. For my version I added a piece using some leftover scrap 3/32 and left about a 1/16" (1.5mm) of the plate exposed to give a firm area to start the 1/16" sheeting on the bottom rear of the fuselage.



As with the top, the bottom sheeting is installed cross grain to the fuselage sides and edge glued at the joints. Once glued in place, the sheeting is sanded flush with the sides of the fuselage and the small overhang at the rear opening is trimmed. The mismatch in thickness at the Hi-Start Plate is blended during this sanding taking care not to sand a hole in the thinner sheeting.

The last picture shows the completed bottom sheeting sanded and trimmed at the tail opening for the Elevator Horn connection.

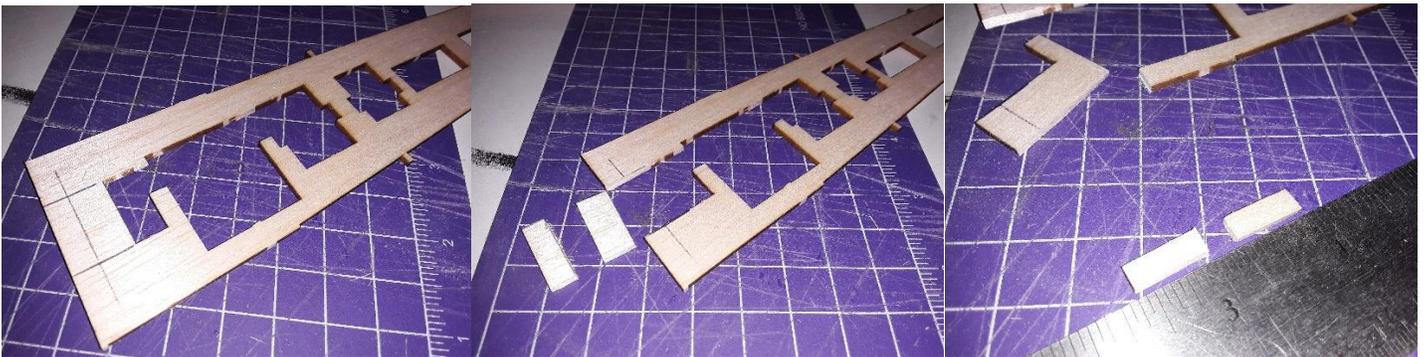
Next, we will cover the Front battery Hatch.



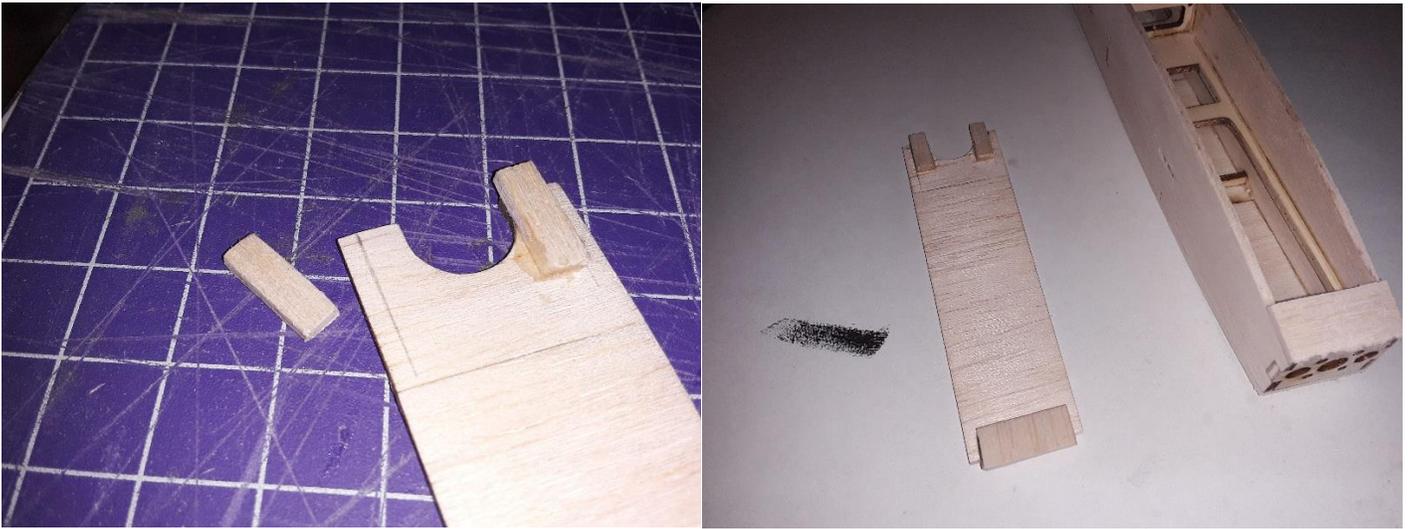
Putting together the Battery Hatch is straight forward. The Forward Sheet is attached flush with the Firewall and the Hatch Tie Down Plate is attached flush with the back of Former F2. This sets up the size of the opening for the Hatch. The first picture shows the Kit setup with one dowel for the Wing, the second shows my setup that gives a 3 point wing attachment. I've added 1/32" ply doublers that are 5/16" tall x 1/2" long. Notice the Pushrods routed and left in Fuselage.



Align the edges of the two Hatch Cover sections 1 & 2 and butt glue together. We like to sand the top and bottom of the Hatch before continuing to dress the joint. The sheet of sandpaper laying under the Hatch Cover keeps it from moving around while you sand. Do the bottom first and then the top. Don't get carried away and sand it too thin.



As mentioned earlier, a new Hatch Tongue is made from the scrap 3/32' Balsa. Two more small tabs are made as "Hooks", 5/8" long and 1/4" wide. Note grain directions.



Measure the Fuselage opening at the Hatch Tie Down Plate and mark that measurement centered on the Hatch Cover. Align and glue the two “Hooks” made allowing a  $3/32$ ” overhang as shown. With the Hooks in place, test fit the Hatch and check the length for fit. Leave a small gap for covering on the ends of the Hatch and the mating parts. A swipe or two with the sanding block can square it up and set the length. The Hatch Tongue is made in the same manner that you set up the hooks by measuring the opening and centering the measurement on the Hatch. Check the tongue width and the Fuselage and adjust the fit if needed. Once happy with the fit, center it between your marks and glue in place allowing an overhang of  $3/16$ ” to  $1/4$ ”.



Once you have glued the Hooks and Tongue, a quick swipe with sandpaper can even things up. Setting the sanding block on the Hooks and Tongue take a light swipe to reduce the thickness slightly for clearance of the covering.

Installing the Hatch cover is as easy as inserting the Tongue and flexing the Hatch, putting the Hooks in place. The Hatch assembly should now look like the picture showing it installed. Dress down the edges to make them flush with the Fuselage sides. Ta Da! Nice Hatch! Light weight and simple!

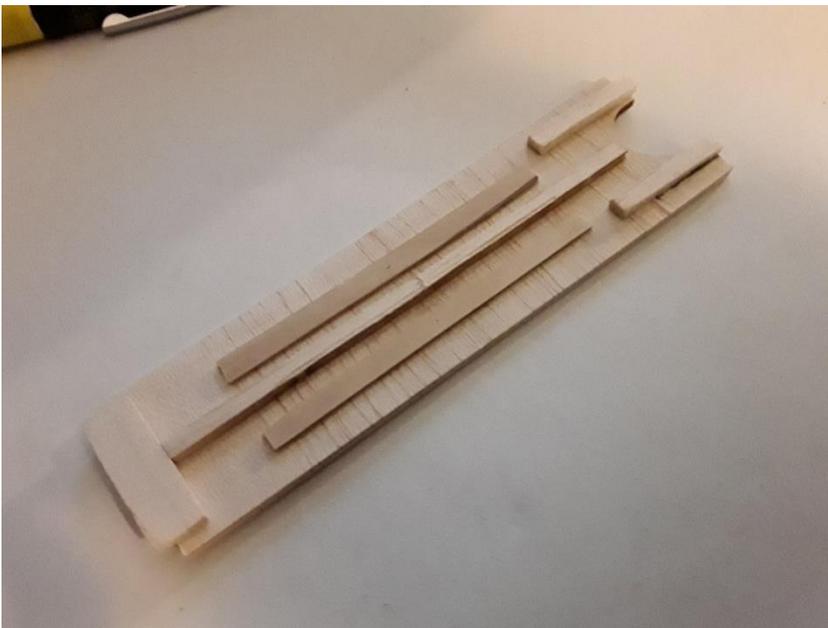
The next page gives you some tips on building the Hatches for these small planes, heck, even big planes! If you happened to break your hatch while building it and trying to make it curl, read on!

## Tips for the Hatch Assembly:



This particular sanding block is made from a 1 x 2 Poplar with nice square edges and is 6" long. The paper is wrapped around tight and stapled to make it easily replaceable. 220 grit paper was used and works well for blending the joints. Use caution as this is aggressive enough to over sand or gouge into the soft Balsa.

When adjusting the fit of the Hatch, you can adjust side to side by taking a quick swipe on the Tongue to set it centered. The Sanding Block can be used in the same manner to give a quick swipe to remove a small amount of material for Covering clearance and at a slight angle can make insertion easier.

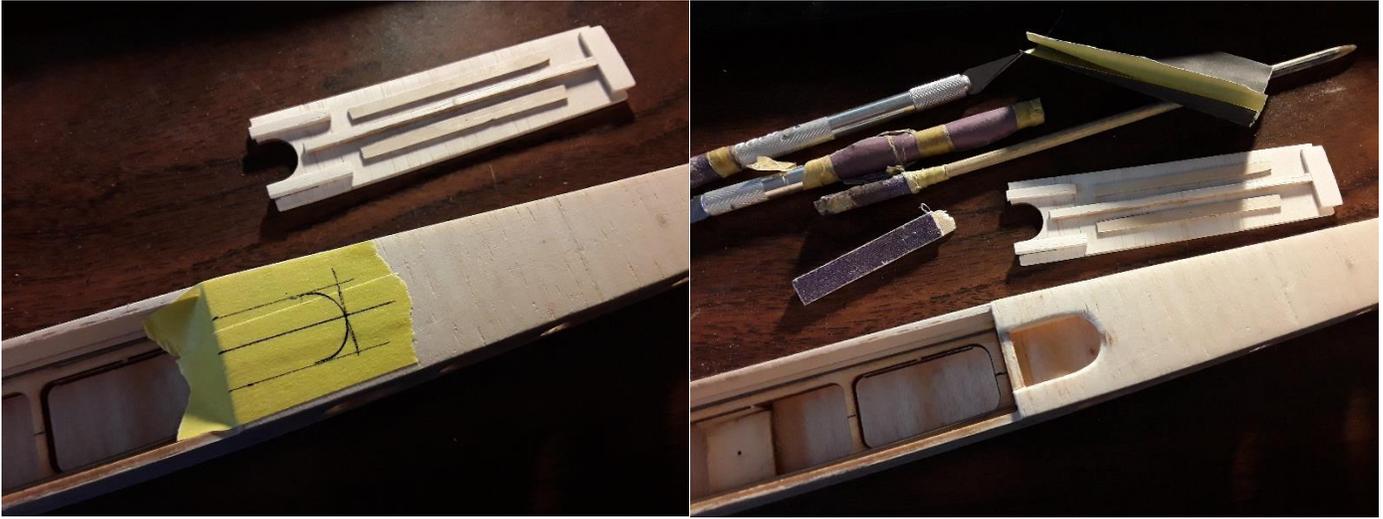


This is a common occurrence with a Flex Hatch design. Sometimes the wood is too soft, or too hard and results in breaking it in half. If this has happened, Don't Panic!

As you can see from the picture, the strips were added to spread the bend rather than concentrate it at one area. By the crack you see in the center Stiffener, that piece was too soft for the job and broke. The 2 strips of 1/32" ply works great! It's flexible without being too stiff, spread the curve over a longer area, and is light weight. I always keep some on hand for doing little jobs like this.

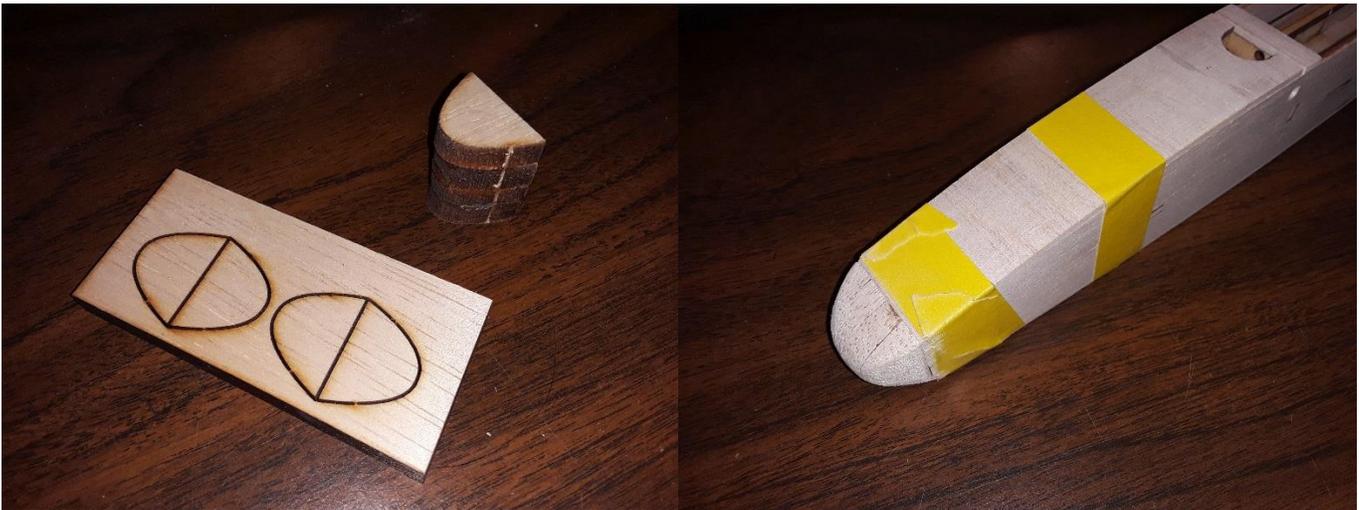
## Finishing the Fuselage:

Unless you are bolting your wing in place, we still need to cut open the area for the Rear Rubber Band Peg. This is a simple thing to do, however it needs to be big enough and it needs to look nice and neat.



The earlier kits had the cutout that matched the front and were 1" from the inside face of the Bulkhead, so that's where we start. I put some tape on the Fuselage and marked the centerline and the 1" length. I then took the Hatch cover and trace the radius onto the tape. Cut out the marked area and leave a little margin for sanding. Finish with a round sanding tool and finish off with some fine paper and there you have it.

At this point, if you are using the Brushless Motor setup you are finished with the Fuselage assembly and can do some finish sanding.



The Nose cone on the Gentle Lady is made up by sandwiching the 4 pieces together. Try and square them up as evenly as possible as they aren't made much oversize. In the picture you can see the sheet as they come and the glued stack. Once the glue has dried from putting it together, sand the mating surface flat and test fit. If you are happy with the fit, glue it on.

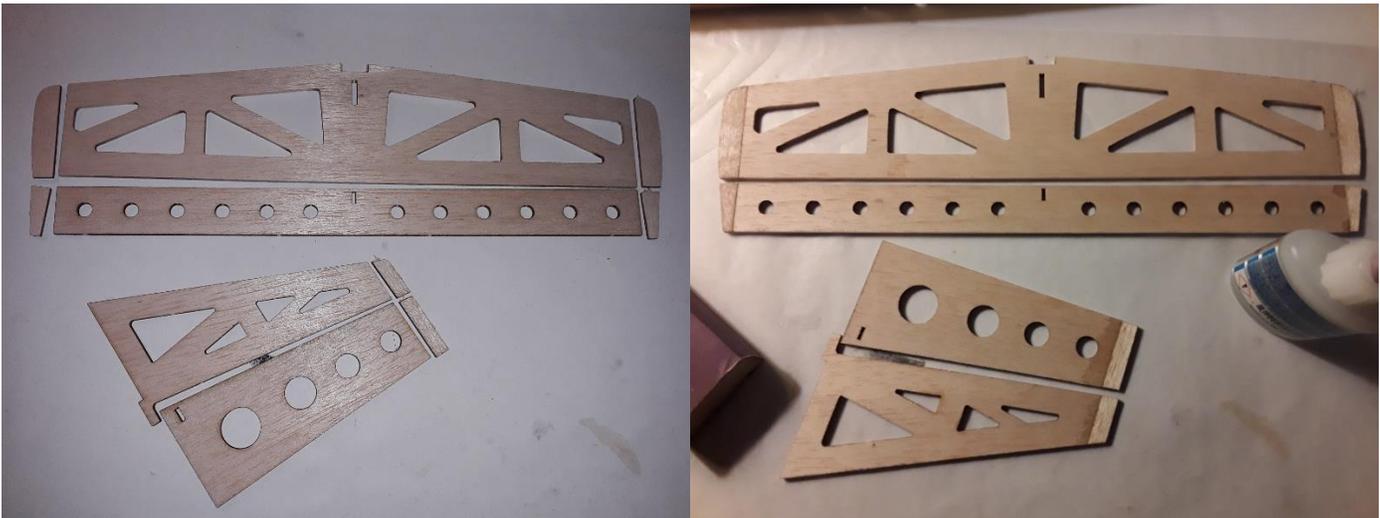
I wrapped the Fuselage with Tape to avoid over sanding while I worked to get the shape I wanted, the Nose pieces are Hard Balsa and take a bit of work and/or heavy grit, be careful. Second Pic shows it ready for a final hand sand.

Finish Sanding is all that left on the Fuselage at this point. Go easy you just want to smooth it out and get it ready to cover. If you get too aggressive it may change the fit of your Horizontal Stabilizer. Don't Panic! All it requires is a couple of small scraps glued in the notch of the Stabilizer and sand to re-fit.

The choice of ESC is left to the builder, using only 2 servos you can opt for the just a simple UBEC or the full 12A ESC that is carried by WN.

Congratulations!

## Tails Assembly:



The tail assembly is straight forward, Punch out all the pieces, dress the edges, and glue the tips to the main structure.

Once that's completed you can sand the surfaces to prep for covering and assembly. The rudder is shown being finish block sand while laying on another piece of sandpaper to keep it in position, just sand flat and you will have a nicely sanded part.

That's It. Congratulations! You are ready for Covering of the Fuselage and Tails!

## Wing Assembly:

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Let's get started with the Wing.



These sheets contain the parts required to build the wing.

Top Row; Wing Tip Blocks.

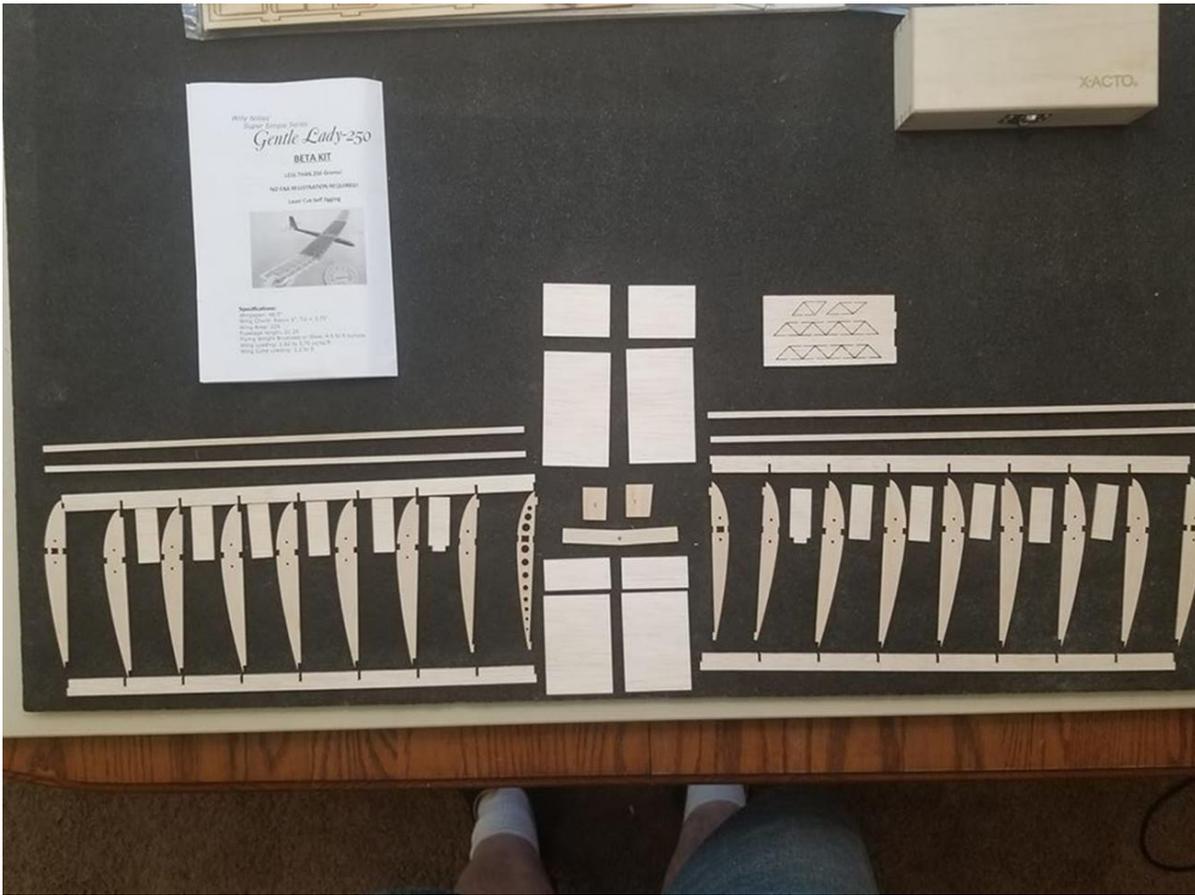
Second row; Plywood Sheet containing the Dihedral Braces, 1 Center Section Brace (C) and 2 Outer Wing Panel braces (T). and the Balsa Sheet containing Spars and Leading/Trailing Edges for Outer Wing Panels.

Third Row; Wing Ribs for Outer Wing Panels.

Fourth Row; Sheet containing Leading/Trailing Edges and Spars for Main Wing Panels and Triangle Braces.

Fifth Row; Wing Ribs for Main Wing Panels.

Sheeting on the far right contains the Center Section Sheeting and Shear webs.

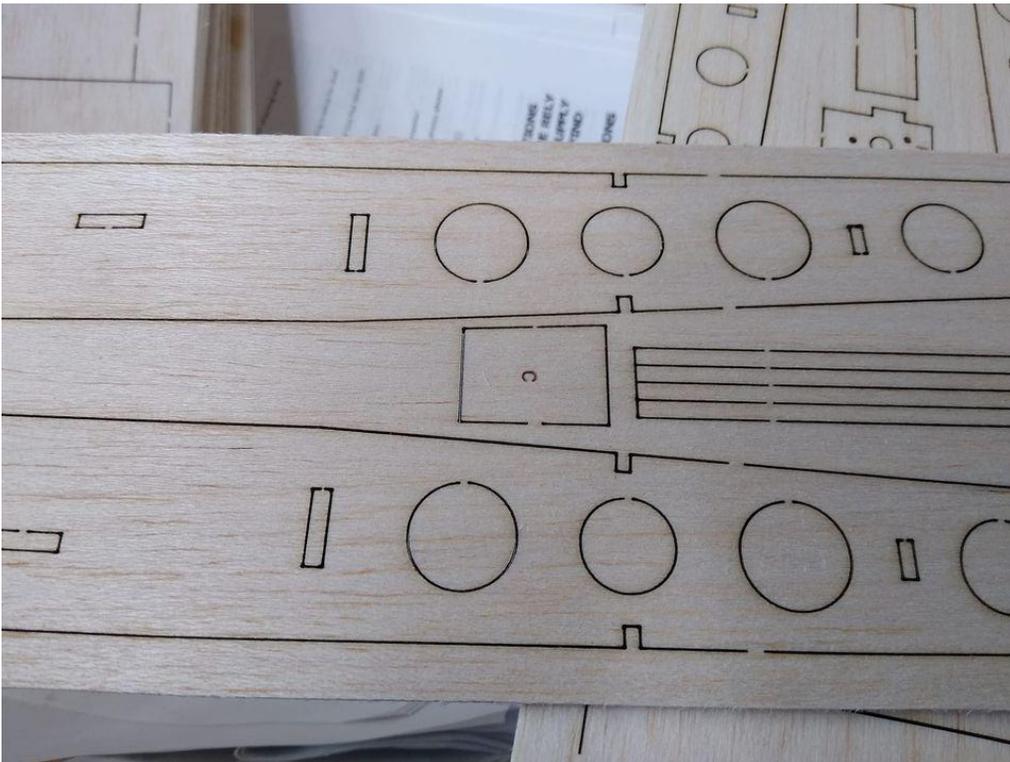


Laying out Main Wing panels. Note that the Center Section Ribs are cut smaller for the sheeting and one Center Rib has holes to use for gluing the two sections together. Also of note is the notches in the Shear Webs used in the second bay of each Wing Panel.

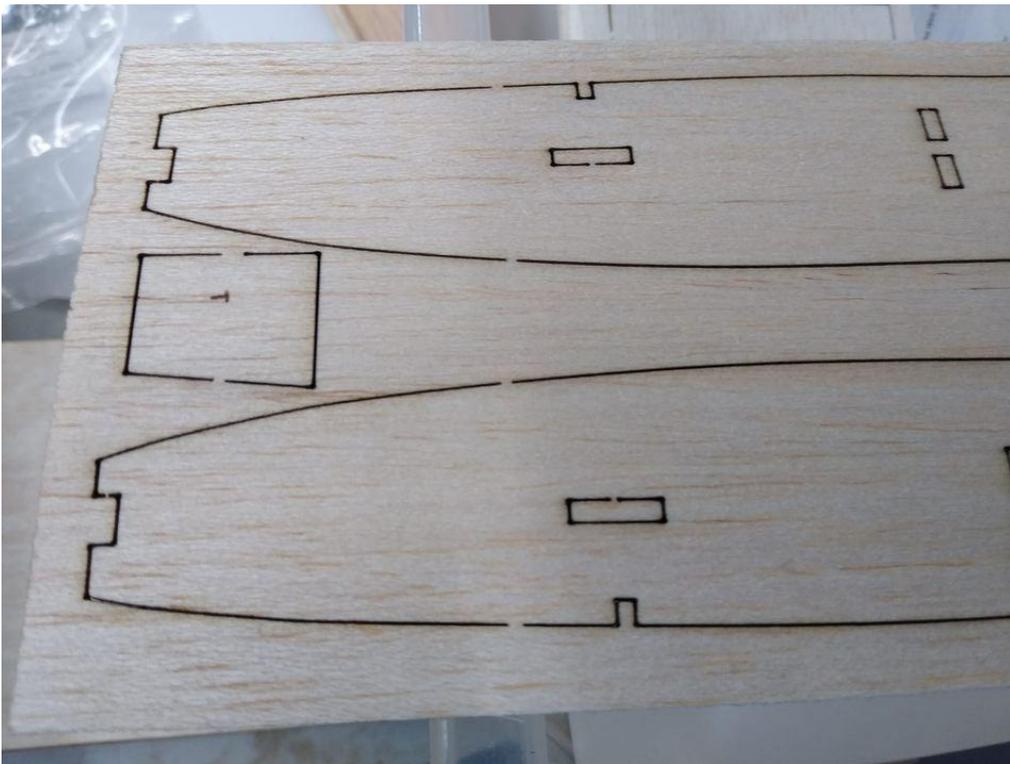
Trial fit all parts BEFORE gluing to ensure proper fits. The Wing Panels are assembled inserting the Ribs in the notches of the Leading and Trailing Edges and squaring up the panels. This is easily achieved by the fit of the notches themselves. Set the Root and Tip Ribs to the proper Dihedral angle using the supplied gauges as shown in the following pictures and glue in place using thin CA.

The Upper and lower spars can be installed and glued allowing the spars to hang over the ends. These ends can be sanded flush once the Wing Panels are assembled.

Test fit you lower center section sheeting. The sheets should butt up to the spars and Leading/Trailing Edges. Some light sanding of the edges may be required. Once you are satisfied with fit, glue the sheeting in place.

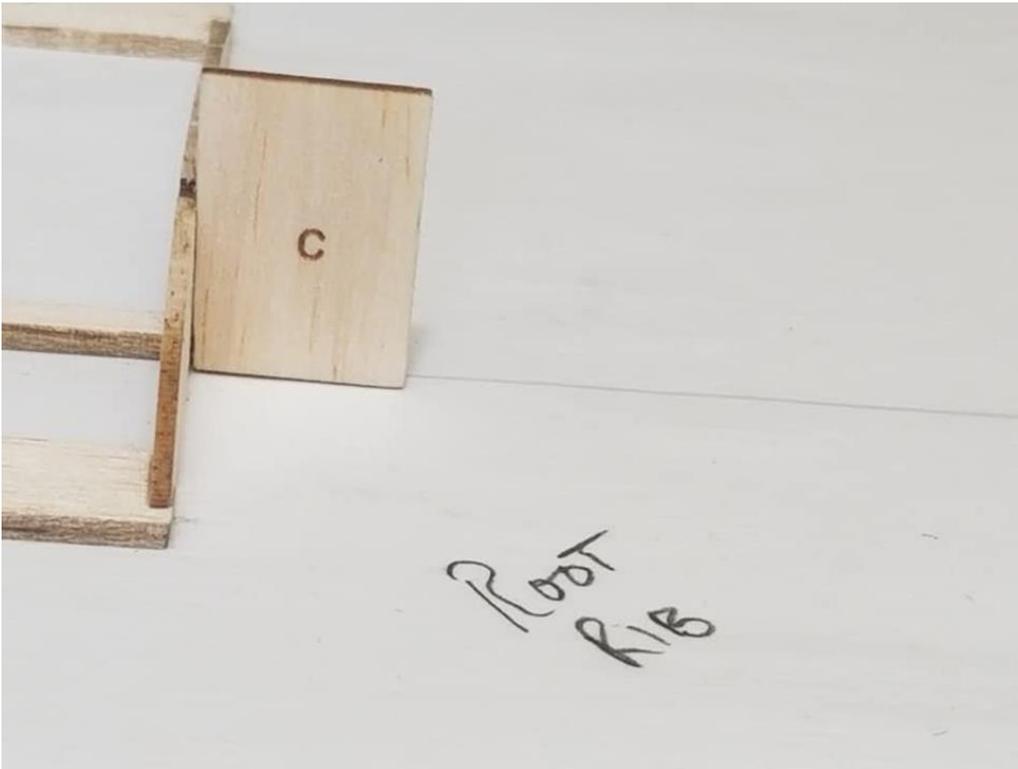


The "C" is used to set the Dihedral angle for the Center Ribs.

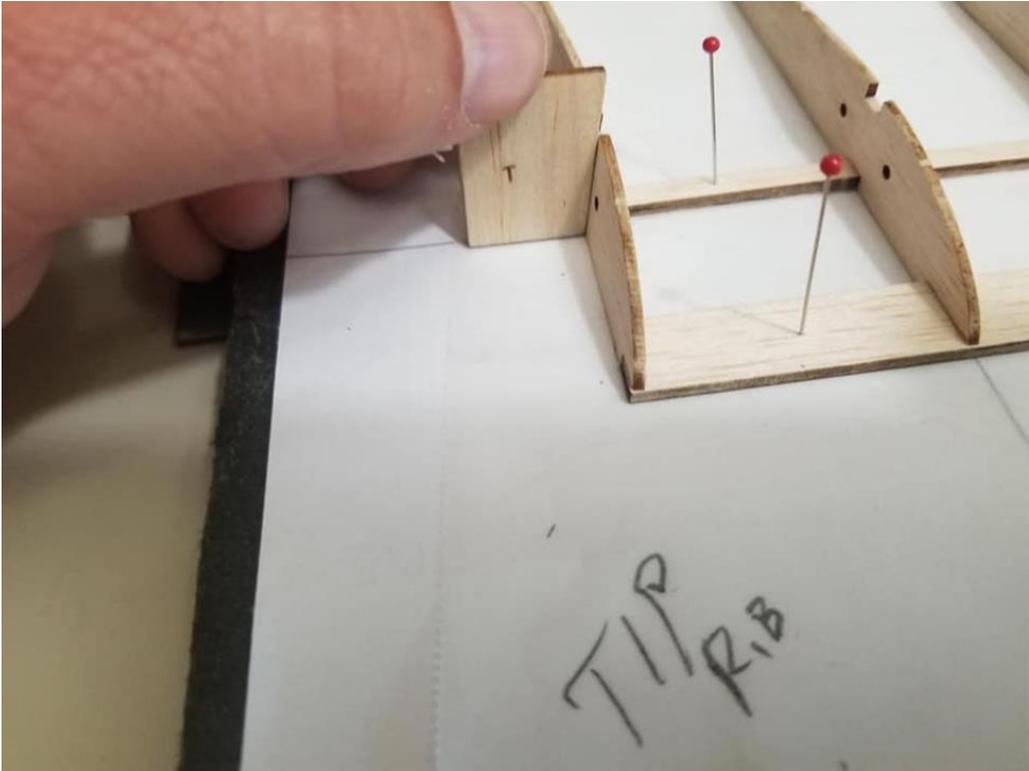


The "T" is used to the Dihedral angle for the Tip Ribs.

The next steps require these Dihedral braces that are located on the sheet with the Fuselage sides in the locations shown above.



This is the orientation of the Dihedral gage for setting the Main Wing Section Center Ribs. Note: BOTH Root Ribs must be set.



This is the orientation of the Dihedral gage for setting the Outer Wing Panels. The End Rib of each Main Panel MUST be set as well as the Root Rib of each of the Outer Bay Panels.



Right side Main Wing Panel with bottom sheeting installed.



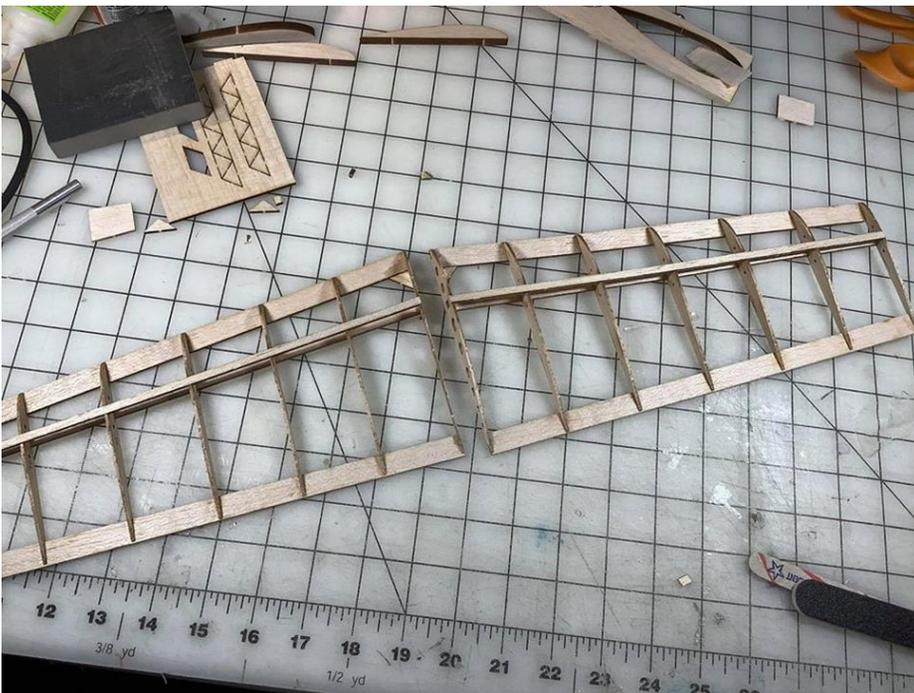
Left side Main Wing Panel with bottom sheeting installed.

There are small rectangle cutouts in the two center Ribs between the spars. You will need to cut these to the spars and test fit the Dihedral brace. The Rectangle hole was left small for added Rib strength during initial assembly. You may need to do some light sanding to the brace depending on the fit and length variance created during assembly. Don't Panic! It's normal. The brace should slide between the two spars and butt up to the second Rib of each panel.

Once you have fitted the spar, you can assemble the two halves together. The Brace will set the Angle of Dihedral and while holding the sections together apply the thin CA through the holes in the rib. The CA will wick in around the holes and bond the two halves together. You can now check the brace alignment and bond it in place.



Outer Wing Sections layout. Note the Root Rib of each section has the Laser cut circles for gluing. The 2 Dihedral braces are marked "T".



The Outer Wing Panels are assembled the same as the Main Wing Panels. There is a Sweep to the Leading Edge and you can check the squareness at the Root Rib and Trailing Edge. Note the Ribs with Laser cut holes (Root Rib) and the Dihedral tilt.

Install the Dihedral braces as you did with the Center section. The end marked with a "T" is tapered to match the tip geometry and will only go in one way. Glue the Outer Panels to the Main Wing just as before and then glue the brace.



Connecting the wing bays with the Dihedral braces you will need to cut out the section between the Spars as shown in the first picture. The rectangle is pre-cut by the Laser process so it is pretty easy to finish the corners and pop them out.

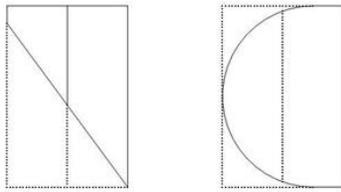
Clean up any excess adhesive from building the wing section and test fit the brace sliding it in between the spars and the sliding on the mating section. Once you are happy with the fit, glue them up.



The finished joint should look like this.

## Gentle Lady 250 Wing Tip Choices

Forward view

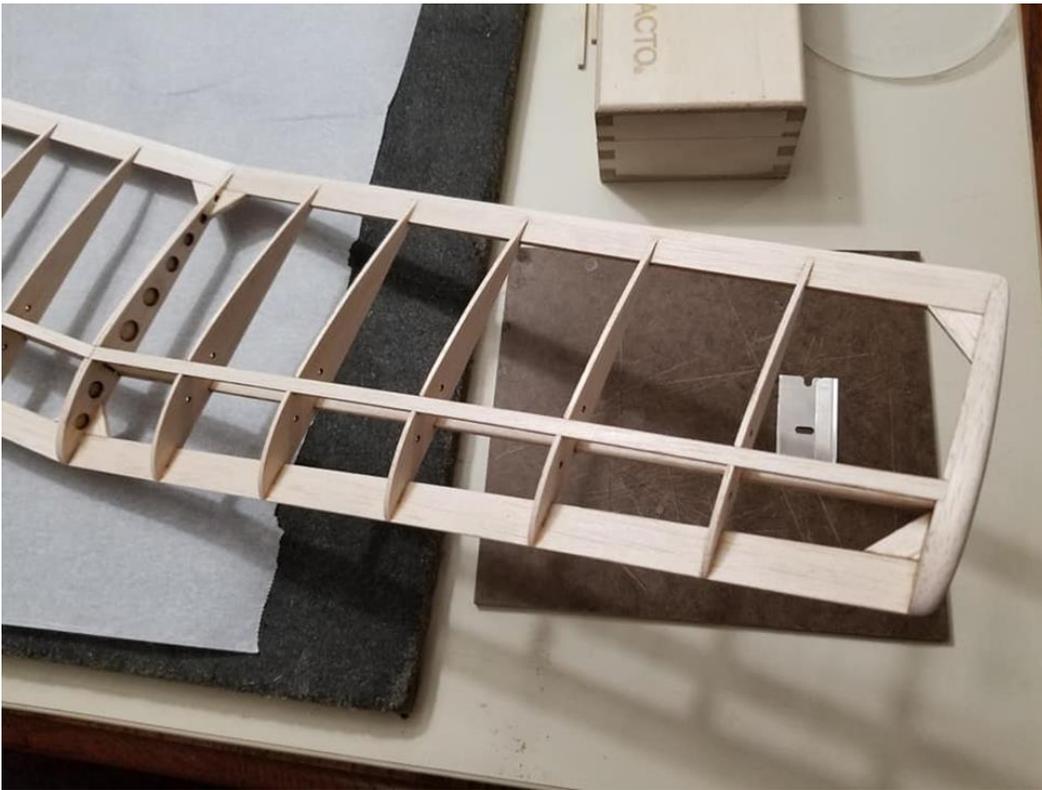


The diagram above shows the Triangle shaped Tip like the original Gentle Lady or simple Rounded Tip to be the Builders choice. Two of the tip blanks are bonded together for each tip and then rough shaped before gluing to the Tip Rib and finish sanded as seen in the pic below.



If you haven't already install the Shear webs and Gussets, You should complete those items before finish sanding the wing tips to add some strength.

Finish sand the Wing Tips and sand the completed wing to removed nubs and glue edges creating a smooth surface for your choice of covering.



Note the shaped Wingtip blocks and Triangle Gusset placement.



Note the Shear Webs go between Ribs on the forward side of the spars. The center wing gets them except for the most inner bay and most outer bay (dihedral braces go there). There are extra triangle gussets. Two go on center section at outboard leading and trailing edges. Four go on outer wing panels in all four corners.



Completed and sanded Wing ready for covering. Note the placement of the Triangle Gussets.

Congratulations! You now have a wing!!

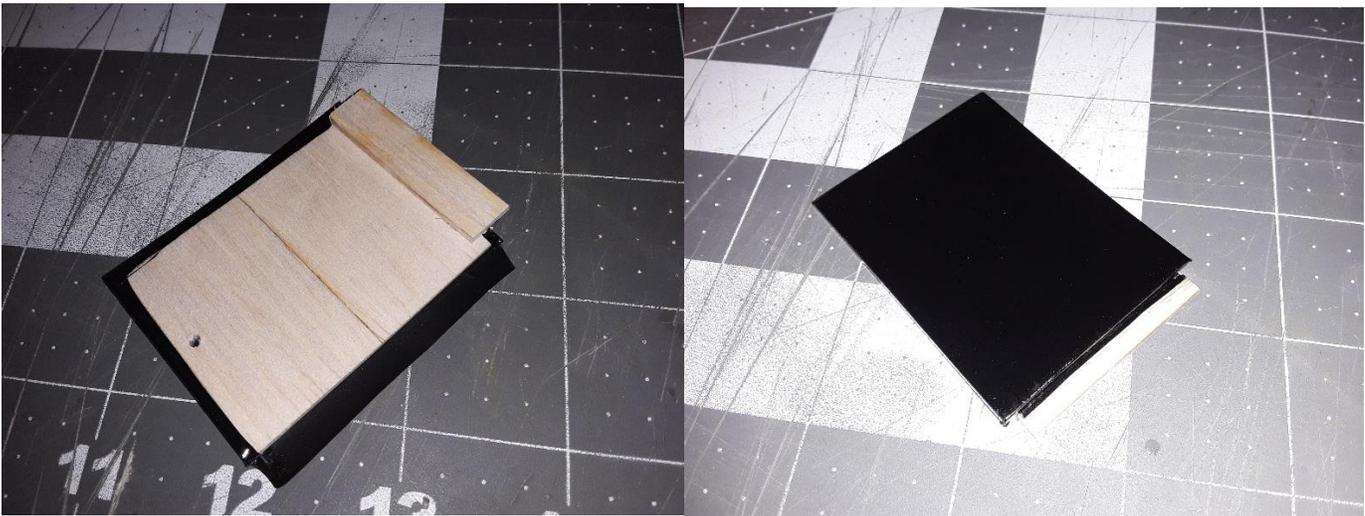


The Hook is formed by un-bending the Eye and forming it as shown. When you've got it in the shape, smooth the edges so that there is no snag coming off the Hi-Start. To install it, drill a 1/16" hole thru the Plate at the marked hole of the plate sandwich inside the plane. Screw it in and then remove it and put a drop of CA in the hole to harden the threads.

With all the parts of your Gentle lady built, it's now time to cover and install the radio equipment. The following section is generic to all model airplanes and gives hints and instructions for finishing your model.

## **Covering Your Plane:**

The following picture are representative and may not necessarily be the plane you are building.

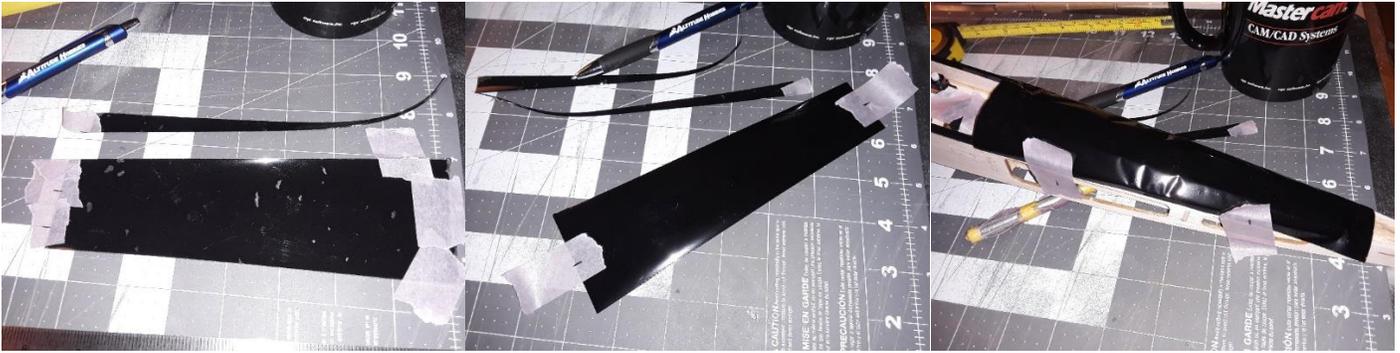


- (1) Setting up the Iron using a temp gage you need to be right around 310-315 degrees F. This is the Average tempeture setting used with the Willie Nillies coverings. Other covering materials may vary so be sure to read the instructions before setting up your Iron.
- (2) With the Hatch as the first piece you are starting with something small and easy to peel off and start over.
- (3) Start by cutting your piece about a ¼ inch over size. Remove the clear backing sheet exposing the dull adhesive side and center it on the Hatch with the the dull side to the wood. Iron the corner of the edge olny using a quick tap about 45 degrees to the surface and work your way down the edges, tacking as you go.
- (4) Once you’ve tacked the edges, roll the covering around the edge using the iron and seal it on the back side. Do this to each edge, relieving the corners with a sharp knife or small scissors.
- (5) With the edges sealed lightly swipe the iron across the surface to shrink out the wrinkles. Don’t press down, you just need to shrink the material, not seal it to the surface. This will leave you with a nice wrinkle free stretch. Ta-Da!

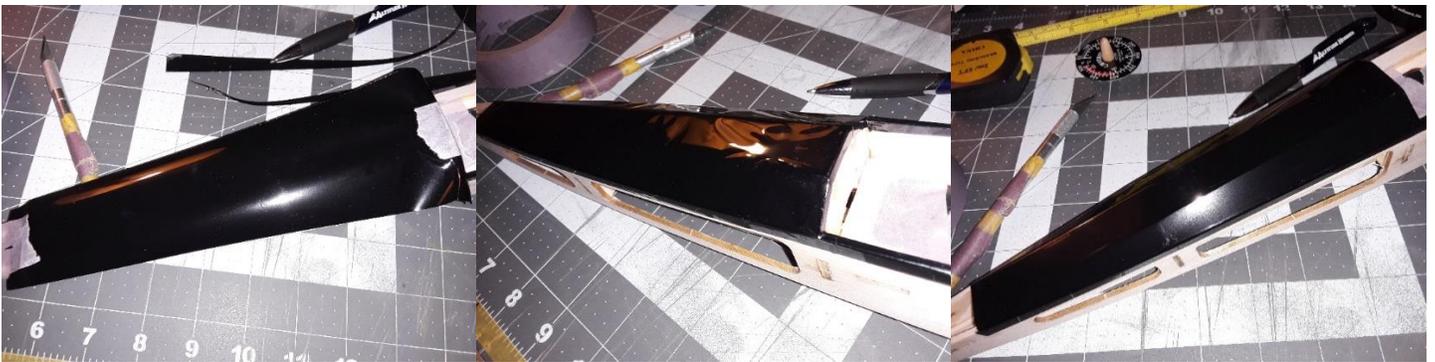
**Pro Tip:** Using a cotton Baby Sock on one of the Iron socks available through a hobby outlet will reduce the dust scratching that may occur during covering.  
 Poking a few pin holes through the hatch before you start keeps air from being trapped and ballooning the covering.

This series of pictures gives you an overview covering the Fuselage as a larger area, much like covering the Tail surfaces and the Wing. Always start small and work your way up to build confidence while reducing waste created by mistakes.

We start by covering the top and bottom of the Fuselage. In this manner the edges will be covered by the side covering concealing any ragged edges that you may have.



- (1) Start by measuring over the front and rear formers and added  $\frac{1}{4}$ " to each side for overlap. Measure the length as well and add a  $\frac{1}{4}$ " as well.
- (2) Lay out and trim this section using a straight edge and a sharp knife. Leave the center marking on the tapes as it allows you to lay it in place centered on the formers.
- (3) Tack it at the tops of the F3 and F5 formers, it's ok to heat through the tape. You can take them off once tacked in place.



- (4) Pull the covering down snug in the middle and tack the edge. Pull the covering down at the end Formers, add a couple pieces of tape to hold the edges down, then tack along the edge. Do the same with the opposite side and then finish tacking to the edges of the front and rear Formers. Don't tack to the middle, you want the covering to be able to move with the shrink to keep the covering shrinking evenly.
- (5) Go around all the edges to seal them down to about a  $\frac{1}{4}$ " in, trimming as needed and rolling the edge around to the face of the F3 Former. Once the covering is securely tacked lightly pass the Iron over the surface to shrink, making a few passes to get it shrunk evenly. Don't get in a hurry and hold the hot iron over the surface. It will cause uneven shrinking and to close to an edge can cause the edge to pull.
- (6) Finish the sides in the same manner. Mark your covering where the Pushrods exit and cut a small slit to slide them through. Align the covering along the top edge and tack to the Tail Post, then tack the front. Using the edge of the Iron, start tack the top edge of the covering along the Wing Saddle. Work your way along the edge to the back and then work up to the nose. Gently pulling the cover down, tack along the bottom edge in the same way as the top.
- (7) Once you have finished tacking the side, again, go around the edge to seal it down. Trim the excess covering leaving an edge around the nose and Tail Post to roll over and seal down. With the sealing completed, run your iron lightly over the surface to shrink it, working out any small wrinkles you may get.



As you can see in the picture, we have used a very contrasting covering to show the difference from the Top, Bottom, and Side covering and the results you are shooting for. The face of the F3 Former was covered with a separate piece where it is exposed above the wing.

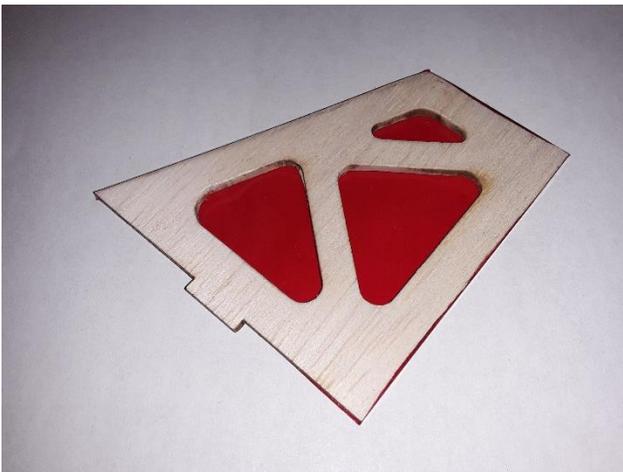
Note the covering rolled around the Nose and sealed in place. Another detail to point out is the use of 3/8" wide strips used along the Wing Saddle and the top and bottom of the nose allowing the covering to be rolled in and give a good transition without notching the long straight edge of the side covering.

The second picture shows the motor bay painted with Acrylic and sealed with EZ Dope for a clean look. If using a Nitro motor, a fuel proof paint or thinned Epoxy seal is a must. The Tail Skid and Wing Dowels are also installed and sealed.



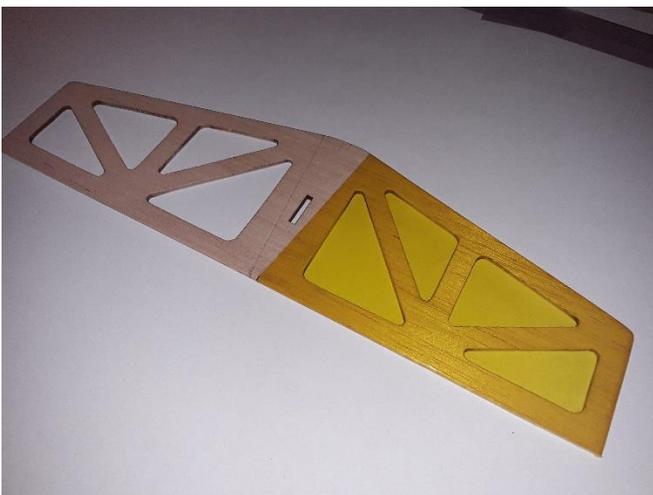
If you got carried away and covered the whole fuselage before running Pushrods, don't panic. Cut about a 1/2" hole just in front of Former #4 so you can reach through with small Needle nose Pliers or Hemostats to guide the pushrods through the holes. You can put a patch on or leave it open for air circulation. A steady hand and a heated-up Pin or a very sharp knife will do the trick.

Pushrods through the guides in the rear require a small hole punch or slit through the covering while you Tack and Shrink it in place. Once you've finished, use a sharp Knife or a heated-up Pin is used to cut the covering. The rods are trimmed off a little long at this point.



Covering is the same on the Tail and Stabilizer, tack down the edges, trim excess and relieve corners, roll around the edge and trim. Do BOTH sides before shrinking. You may want to iron in about ¼" on the perimeter of the mating edge before shrinking so there is less chance of pulling loose.

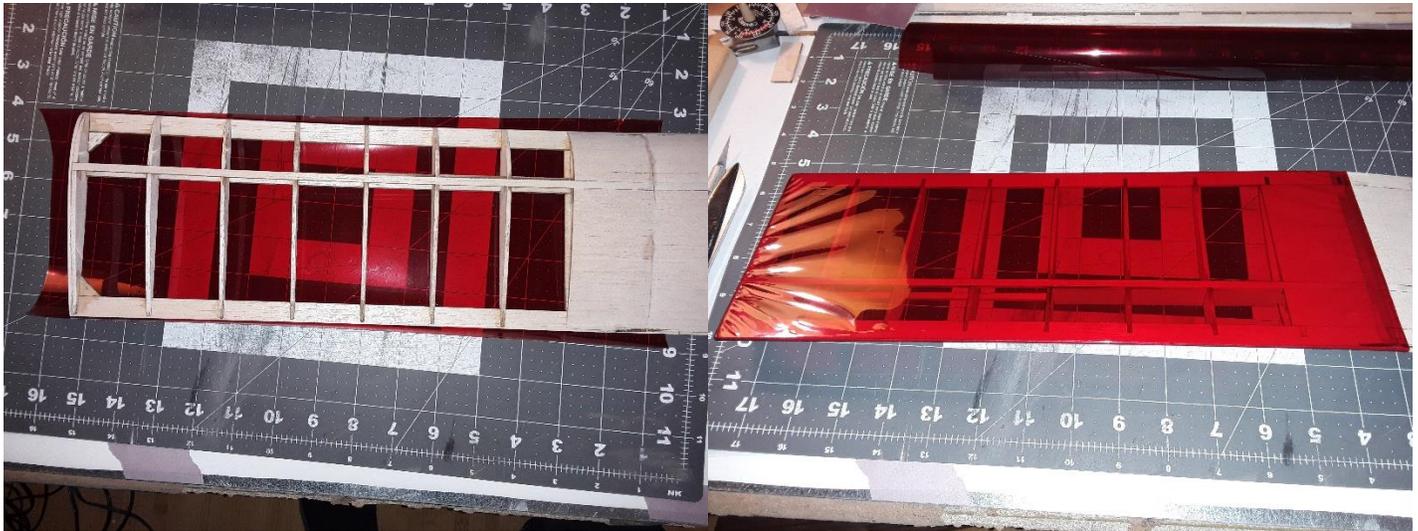
Note the tab is left bare so no trimming is required before gluing.



The Horizontal Tail was marked for locating the Vertical Tail and the Fuselage.

Start covering from the bottom so that the Edge Seam will end up on bottom. You can either cover your marks and cut the covering away or tack your first edge slightly inside the lines so that no cutting is required once you are finished.

## Covering Tips for the Wing:

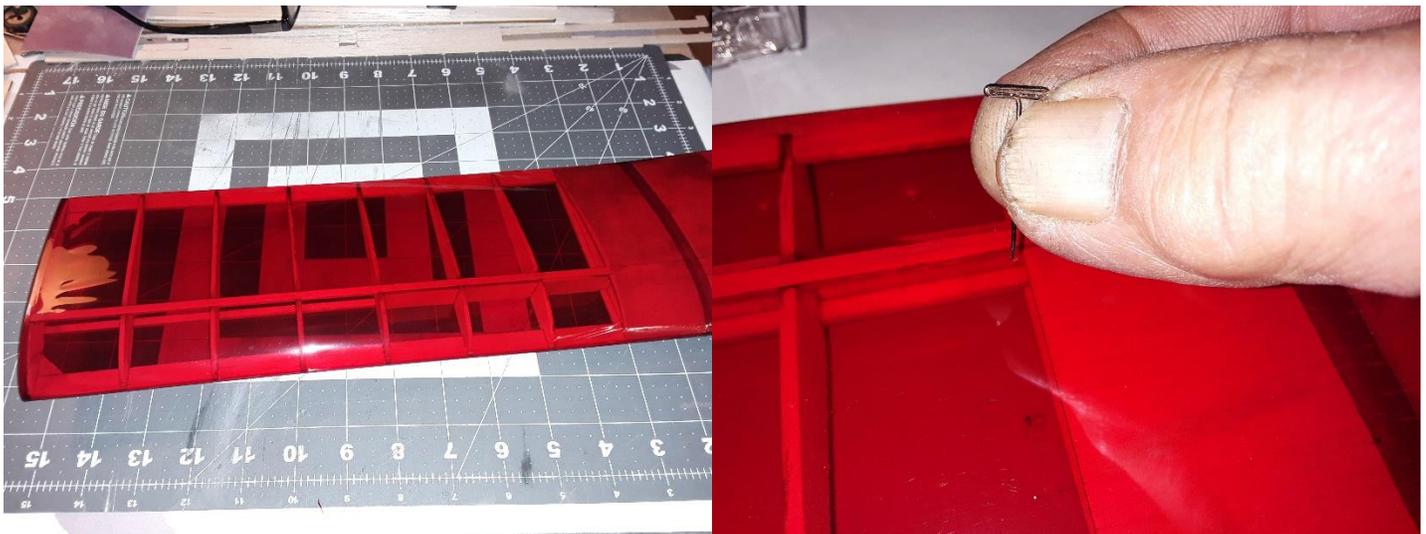


Cut your covering in panels leaving enough edge to pull and wrap around the surface edges. Note there is extra at the wing tip so we can cover it at the same time.

Tack the covering down at the wing root first, then the wing tip gently pulling the covering to take up the big wrinkles. If you need to reposition an area, a little heat over it allows you to pull it away.

Start by tacking on the leading or trailing edge from the center working your way to the ends, gently pulling the covering to maintain its placement. Do the same to the opposite edge, again working from center to the ends.

The Second picture above shows how it should look when it is tacked down. DO NOT Shrink it at this time.



Finish the 3 remaining panels using the same technique and your wing should look similar to the first picture above. Poke a pin hole in the bottom covering of each wing panel near the root sheeting and spar. You only need the one hole in each panel to allow the heated air to escape from the inside of the wing.

Go over the panels with your Iron lightly, work the top, then the bottom of each panel shrinking them a little at a time. This will help keep from shrinking a curl into the wing by evenly shrinking all the covering. Take your time, you'll do fine.

We'll add Washout to the wing in the next step.

Adding washout to the wing helps reduce tip stalling associated with Rudder and Elevator only planes and has been used on many designs with Ailerons as well. These wings are flexible this process is fairly easy. Twist the wing up slightly at the trailing edge of the Wing Tip and running the iron over the top covering to shrink and set the Washout. You may need a helper to twist while you iron. No matter the amount you get, shoot for between 1/8" and 1/4". Most importantly, make both sides the SAME!

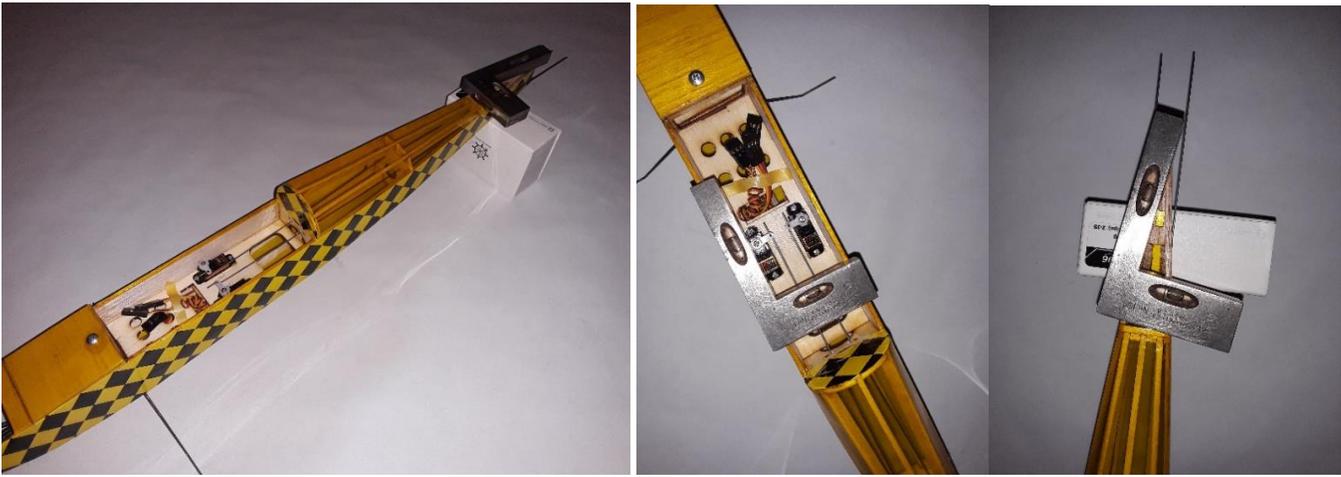
## Hinging:



Install the Control Horns by trimming the holes and covering as needed the length of the Horn. Glue with Medium CA. The fishing line included in the kit is for making hinges. Start by marking the locations with the two surfaces aligned. For the Horizontal Tail the marks are 3/4" and 3-1/4" from the ends on each side. For the Vertical Tail they are marked 1/2" and 2-1/4" from the tip. Use a Tee Pin to make the holes about 1/2" deep in each location. The line is cut to 3/4" long and pushed into the surface to 3/8" deep. A drop of CA is used to secure them. It's best to wait and glue the Hinges in the moving surfaces once the Tails are installed on the Fuselage.



This photo shows the surfaces mocked in place and the arrangement of the control horns.

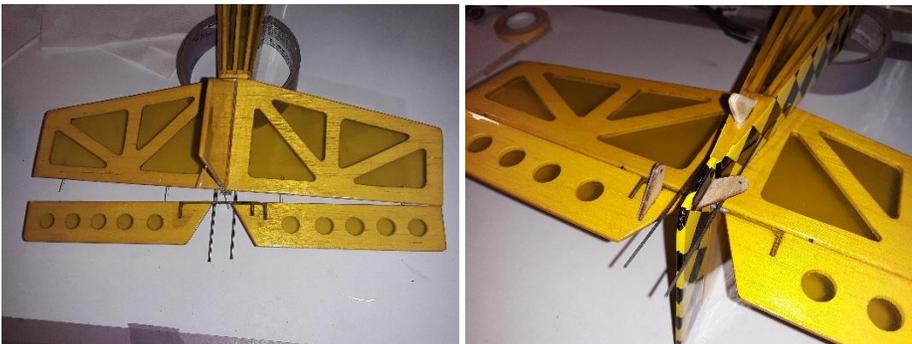


Check the Tail saddle for squareness to the Wing Saddle, blocking it up as shown. Again, with the way these are designed and the laser cutting being precise, this should just be a habit check. Since the wing saddle is covered do any adjustment you may need to the Horizontal Tail Saddle. Remember, a little goes a long way.



Test fit the Tails to the Fuselage prior to glue up. We found the tails needed to be moved back  $3/32''$  to be flush with the Tail Post (end of Fuselage) and a scrap was added to compensate. The surrounding areas were taped off to keep from marring with sandpaper and the piece faired in with light sanding. A small strip of covering was added.

Once you are satisfied with the alignments, you can choose to do the gluing with Thin CA, Medium CA, or an Epoxy. The Epoxy is the most forgiving because it gives you time to ensure the alignment and adjust if needed.



The surfaces can now be attached. Start one hinge and then tilt into each of the rest. Start with the Elevator and push the surface up tight. Flex it about 30 degrees to set the gap. Add a drop of Thin CA to each of the hinges to secure them in place. Continue with the Rudder following the same sequence. Make sure that when you flex the Rudder there is no binding with the Elevator Joiner. Make adjustment if needed and finish by using the Thin CA on your hinges. Test your surfaces by flexing them back and forth. If you need to, clean any CA residue on the surfaces with Acetone. Attach your Tail Skid the same as the Control Horns by trimming the covering and gluing in place.

## Attaching the pushrods to the surfaces:



In the first photo, the pushrod is bent at a 45-60-degree angle near the point where it exits the slot. You may want to mark the wire and remove the Servo arm to slide the rod back. Be careful to bend it in the right direction if you do. Once the first bend is made, you can re-install the arm and center the servo again. The second bend is made to align the rod with the control horn.

Trim the pushrod to length and rough up the surface with 400 grit sandpaper. Slide the heat shrink tube up the rod. Rough up the control link the same as the pushrod and install it into the Control Horn. You may need to trim the length but keep it long as possible. Carefully slide the heat shrink tube over the link. Place a piece of card stock or equivalent behind the junction and shrink the tube with a lighter, soldering iron or your covering iron. Using the Heat gun will blow too much hot air and possibly pull the edges of your covering.

Check your Servo Arm has not moved, then align the two tail surfaces so they are even. Apply Thin CA to the ends of the heat shrink letting it wick into the joint.

This makes a very secure joint and the pushrod can be bent slightly at the bends to adjust length if needed.

Note: Most newer radios allow you to use Sub Trim if you need to make a small adjustment but it's best to start as straight as possible.

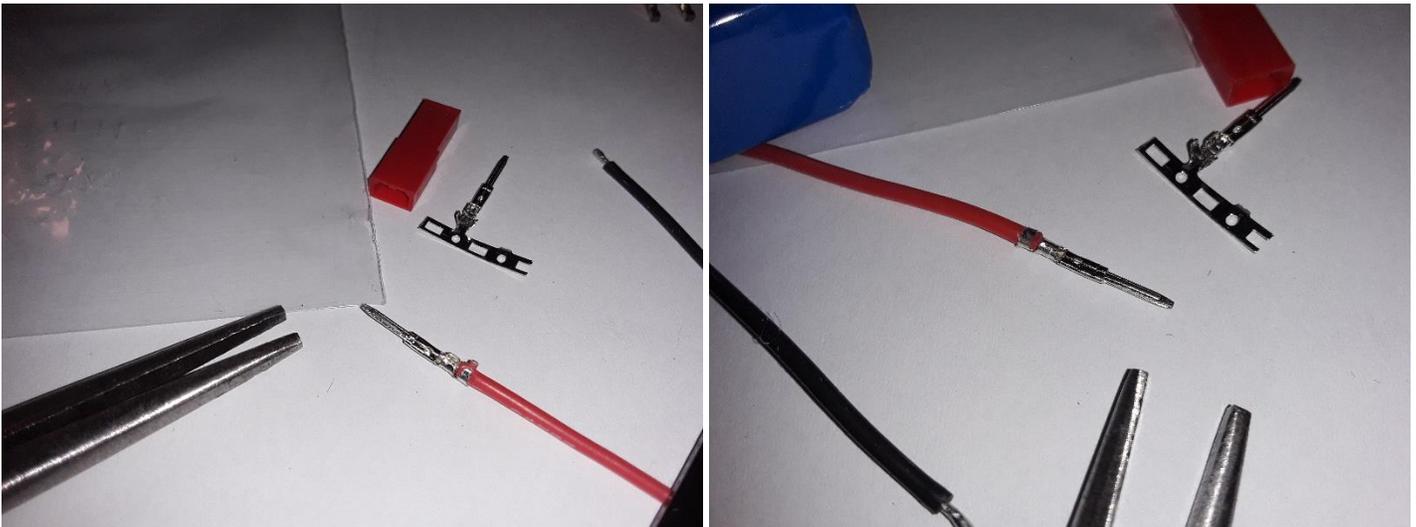


## Details and Finishing up:



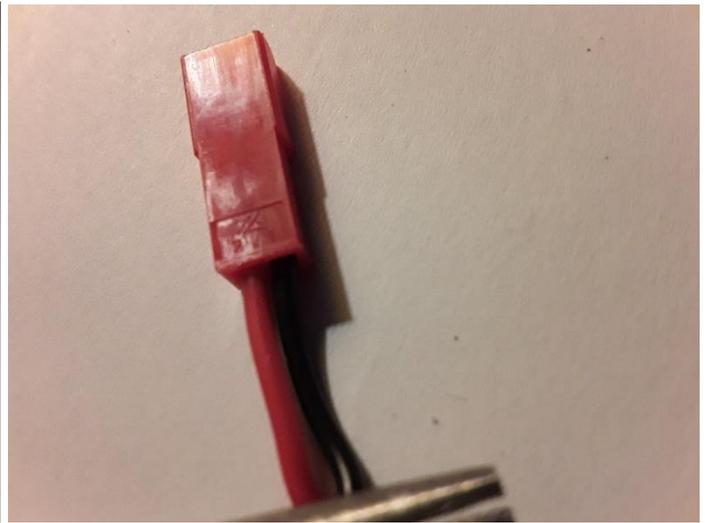
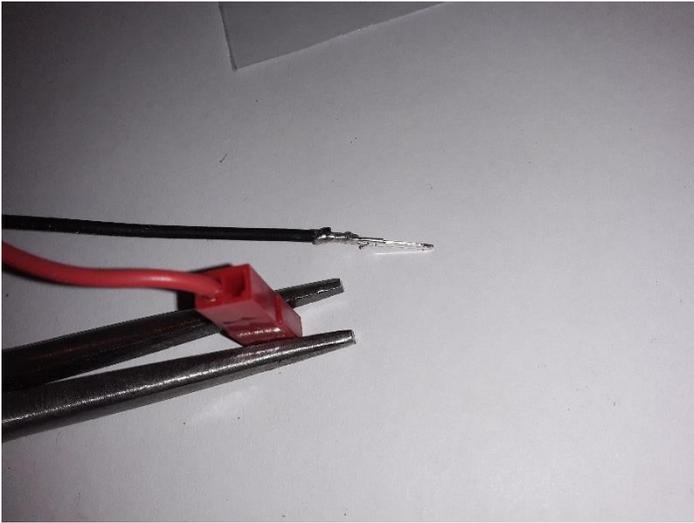
The motor is attached to the mount by applying a small dab of Blue Loctite to the supplied 2mm screws and using a 1.5mm Hex Driver. Snug the screws in a criss-cross pattern to ensure even tightening. Do NOT over tighten or you may crack the plastic mount.

Alternately you can use the mount supplied in the kit. This assembly will need to be spaced from the Firewall using the Spacer plates supplied.



Connecting the JST connector to the ESC for the Battery can be completed in or out of the plane and is easy to accomplish using a small tight pair of Needle Nose Pliers.

Turn the pin to about 45 degrees and start the crimp of the tab over the stripped wire. The flat on the bottom of the connector will roll in on the tab and wire as you squeeze. The first picture shows one tab rolled over, crimped to the stripped wire. The second picture shows the completed crimp on the bare wire and the insulation. Take your time and make tight crimps.



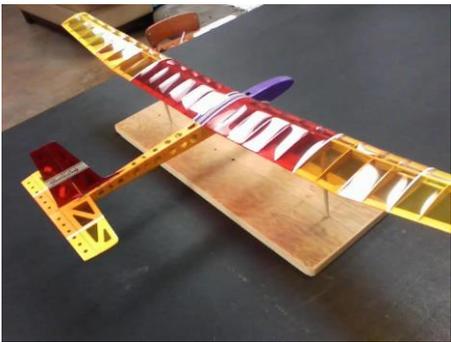
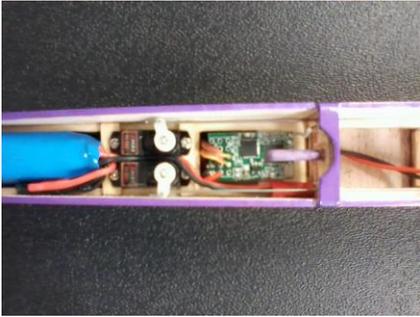
The small, raised tab on the pin you see on the black wire is aligned to the small notch in the hole of the connector. Slide the pin in until it locks in place. Give a tug to ensure it is locked. The second picture shows the Red wire in hole #2 and Black Wire in hole #1, if in doubt, put the connector housing on the battery before installing the pins to double check the positions for polarity.



Alternately, if you are confident in your soldering abilities, there are connectors available with pigtailed that can be soldered directly to the PCB of the ESC in place of the wires installed. If not, there are Crimping Pliers designed for this specific job that are available online for around \$20. They are a good investment if you use them for more than one plane. They will also crimp the pins for the common Servo Connectors. This pair is made by IWISS and is part # IWS-2820M.

Use a Servo Tester, or. setup and Bind the Receiver to determine the motor direction so the wires for the ESC can be marked for soldering or installing Bullet Connectors before the installation in the plane. If you have installed the ESC and sheeted the bottom of the forward Fuselage as we did, this step is the same, just a smaller working area.

The Receiver location in the aircraft depends on the space needed and the balance of the aircraft. If built as shown in this instruction, the light weight Receiver available through Willy Nillies will normally be placed forward of the servos for the Electric powered version.



James in Kansas