Q-Tee-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

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,

Douglas Hart
Willy Nillies
1588 E Bryan Rd
Marietta, IL 61459
www.WillyNillies.com
Phone: 309.648.0449

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

Introducing the Q-Tee- 250!

The Q-Tee has always been a great trainer that is easy to build and a great choice for a first airplane. Our version of this classic aircraft is both easy to build and graceful in its docile flight characteristics making this the perfect Sunday relaxed flyer or trainer! Enjoy it with a 1306 brushless motor or use a Cox Pee Wee .020!

We have recreated this wonderful little airplane at a slightly smaller size to come in under the 250-gram weight limit for the upcoming FAA RID rules. This means NO FAA rules or regulations for the Q-Tee-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 a couple hours for experienced builders to frame up and have ready for covering! Beginners should allow a couple of evenings and a visit or two to our builders group to get any questions they have answered very quickly.

Q-Tee-250 specs:

Wingspan: 28"
Wing Chord: 5"
Wing Area: 140.75 sq in
Fuselage length from front of fuselage to tip of rudder: 19.5"
Flying Weight Brushless or Glow: 5 to 6.5 ounces.
Wing loading 6.69 oz/sq.ft.
Wing Cube loading : 6.8

Features:

Build as 2 or 3 channels (Rudder, Elevator, and Throttle)
Easy access battery hatch
Built in servo tray in fuselage includes 3rd servo cutout of throttle for Pee Wee .020 users
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
.052 K&S music wire for Landing Gear and Elevator Half connection
Laser cut Wheel Retainers
Motor mounting Screws, Blind nuts, and Washers
Universal Quad Motor mount (Fits most 1306 motors)
6 each number 32 rubber bands for attaching wing

Recommended equipment:

2 or 3 each Emax 9051 4.3g or equivalent micro servos. Rudder and Elevator, or with optional Throttle.
Power: 1306 - 3100kv, 1-2S brushless motor, or Cox Pee Wee .020 glow engine
Battery For Brushless - 350 mah 2S Lipo battery, minimum 8 amp ESC, Gemfan 5030 or 6003 propeller or equivalent
**** Our 1/4a TD .020 LITE completion packages are a perfect match for this airframe***
**** 2 cover packs are required to cover entire airframe***

General Practice for assembly:

Join all of 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. Using other glue types is your choice, however, you also assume the integral responsibility and weight penalties.

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. (The tabs might be tighter sometimes, due to tolerances in wood thickness)

Control Throws:

1. Control throws are VERY critical to the characteristics of our aircraft designs and 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: .35" up and down, measured at the trailing edge immediately aft of the control horn.

Rudder: .45" 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 effectiveness of the controls near center.

Center of Gravity:

1. The best all-around C of G is at 1.5 inches aft of the leading edge measured from the leading edge. (Middle of the Spar). Adjust your Battery forward or aft to achieve this placement for your first flights. 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 and sporty type aircraft with a wide speed range. That said, don't be afraid of it! If you have followed our instructions and have set control throws accordingly with the proper Center of Gravity, you will be rewarded with a fun all around airplane.

Words of Caution:

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

2. 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 very important.

5. That all said, if you manage your throttle at 50 or slightly less, it is a tame and gentle performer and a blast to fly at high power settings also!

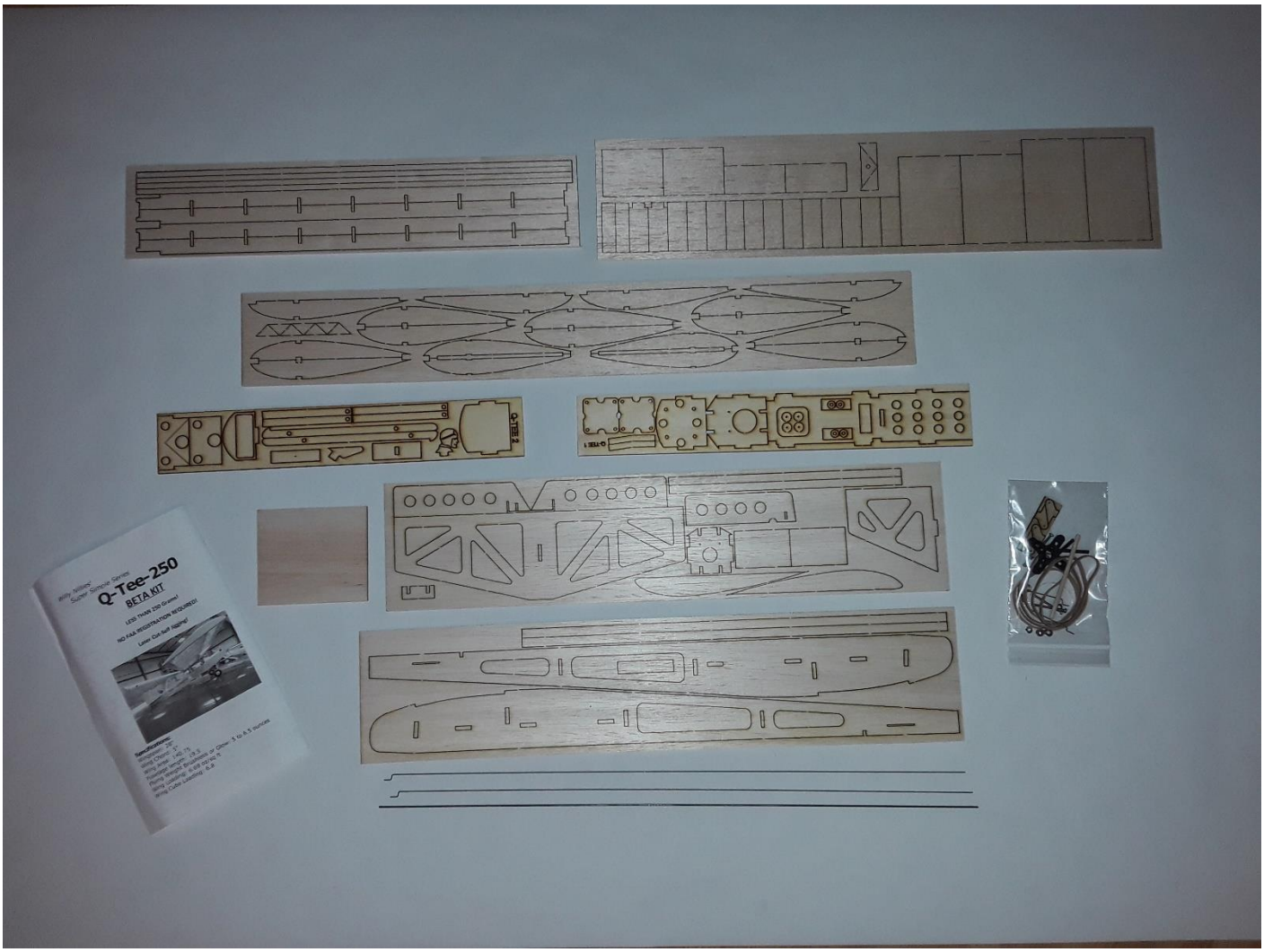
Flight Video: https://www.youtube.com/watch?v=bEd7VPcU3Ls

Q-Tee-250 Assembly Guide, Rev: B, 11/05/2020

This guide is a list of steps accompanied with photos on how to assemble the Willy Nillies Q-Tee-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.

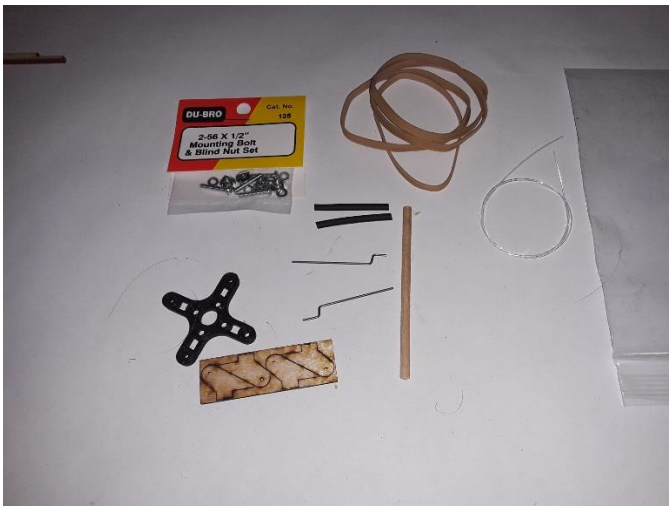
All Willy Nillies planes have been Flight tested and built from random production selections to ensure you are getting a great product. With that in mind, you may feel free to be creative and make your own modifications, however, realize that any changes made by the Builder become the responsibility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

Contents of Q-Tee Beta Kit:



Top Row; **Sheet 1**, Spars, Leading and Trailing Edges. **Sheet 2**, Wing center section sheeting, Shear Webs and landing gear sandwich filler sections.
Second row; Wing Ribs, Triangle braces
Third Row; Plywood, **Sheet Q-Tee 2**, Landing gear laminations, Former 2, Cabane uprights and Wing mounts, Hatch Ledge, Tail Skid, Pilot Shelf, Pilot head, Blank Firewall. **Sheet Q-Tee 1**, Optional motor spacer plates, Dihedral Braces, Drilled Firewall for Electric Motors, Former 3, Main Tray for Servos and Battery containing wheel collars and additional motor spacers. **Fourth Row; Sheet 1**, Upper forward Fuselage sheeting**. Sheet 2**, Horizonal Tail and Elevator, Former 5,

Upper Fuselage Stringers, Rudder, Vertical Tail, Former 4, Hatch covers, and Wing Tips.
Fifth Row; Fuselage sides, Lower Fuselage stringers, and Battery hatch support.
.032 K&S music wire pushrods (2)
.052 K&S music wire for Landing Gear and Elevator Half connection.
Parts not shown: As this instruction is being written based on the first run Kits, Updates are being made to the kits to include notches at the rear of the Fuselage for the Tail Skid Plate which is a triangular shape with a lengthwise slot.



Bag of small parts contains (4) Blind nuts, (4) Washers, (4) 2-56 Screws, (6) #32 Rubber Bands, (2) Sections of heat shrink tube, (2) “Z” bent Pushrod ends, plastic Motor Mount for Brushless motor, (1) Dowel rod, (1) sheet of plywood Control Horns, and a coil of fishing line for making hinges.

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 taped around the handle of your knife is handy and gives a nice grip as well.

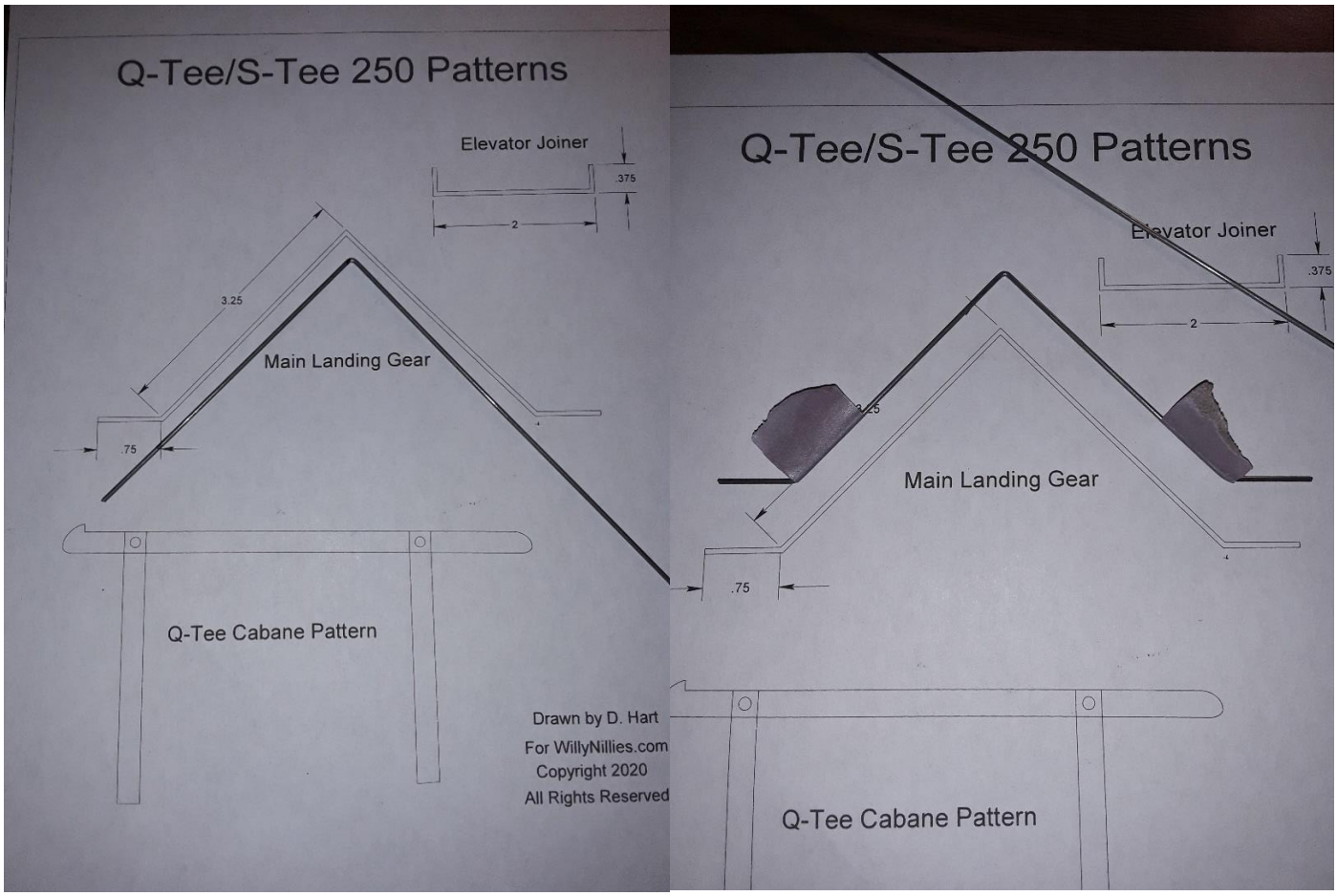
Preparing to Build:

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.

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.

Prepare your subassemblies before you get started. This will build confidence in your abilities and familiarizes you with the parts so once you start building you can move right along.

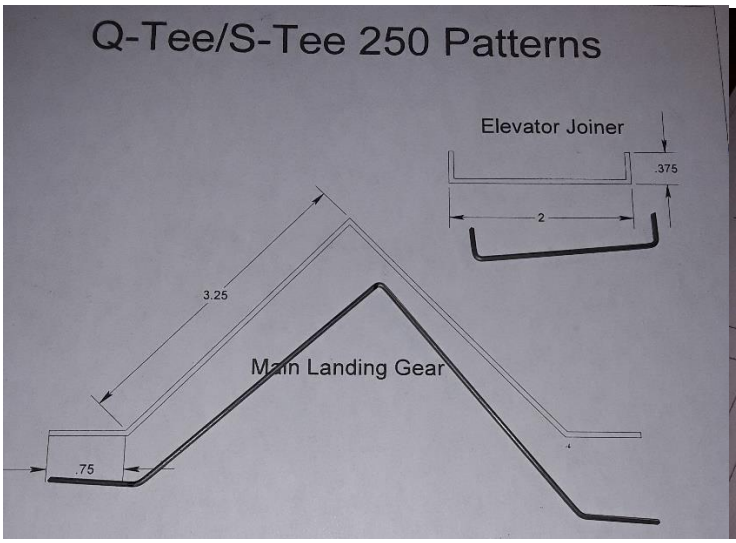
We will start with the Landing Gear and Elevator Joiner. The pattern sheet for the Sioux can be found in the “Download” section of the Willy Nillies website and on the FaceBook Group page “Files”.

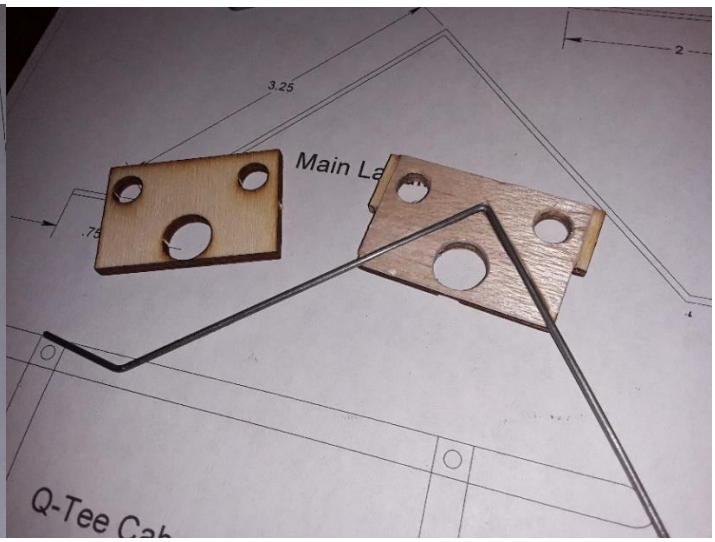


The pattern sheet for the Q-Tee/S-Tee can be found in the “Download” section of the Willy Nillies website and at the end of this document.

Mark the center bend on your wire leaving a little extra for the Axle where the wheels mount. Next you can mark the bend locations with tape. This gives an edge to set your Pliers and bend the axles.

The Elevator joiner is made in the same fashion.



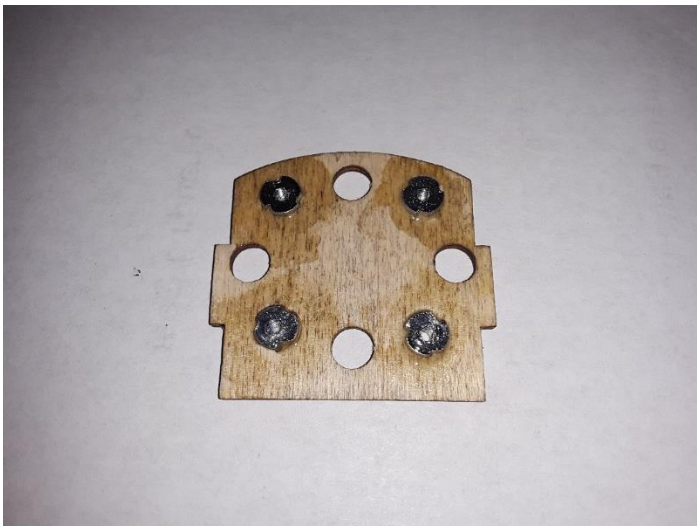


These are the finished pieces ready to be Installed.

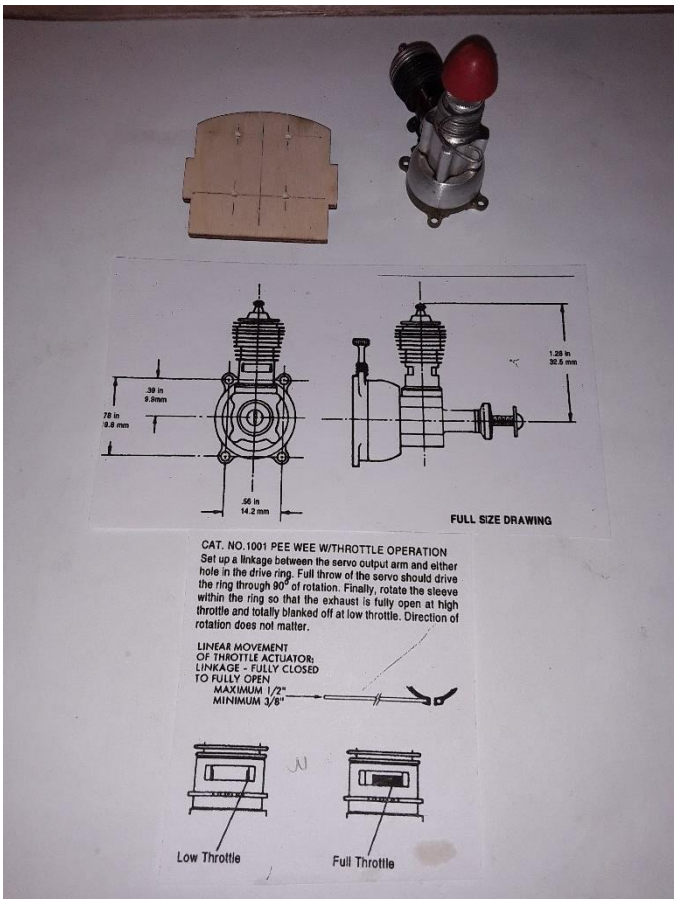
The Landing gear sandwich is prepared by laying the gear legs over the location marking on the tabbed bulkhead and adding Balsa filler pieces. Do not glue in the gear at this time. The second plywood un-tabbed bulkhead will be used to finish the sandwich when installing the gear once the Fuselage is assembled.

Punch out the Elevator halves and sand the edges to remove the nubs. Assemble them with the wire joiner using Epoxy and align with a straight edge.

Weight or pin down the parts to keep them aligned while the epoxy cures.
Note the wax paper over the edge of the scrap Balsa straight edge to keep it from being bonded too.



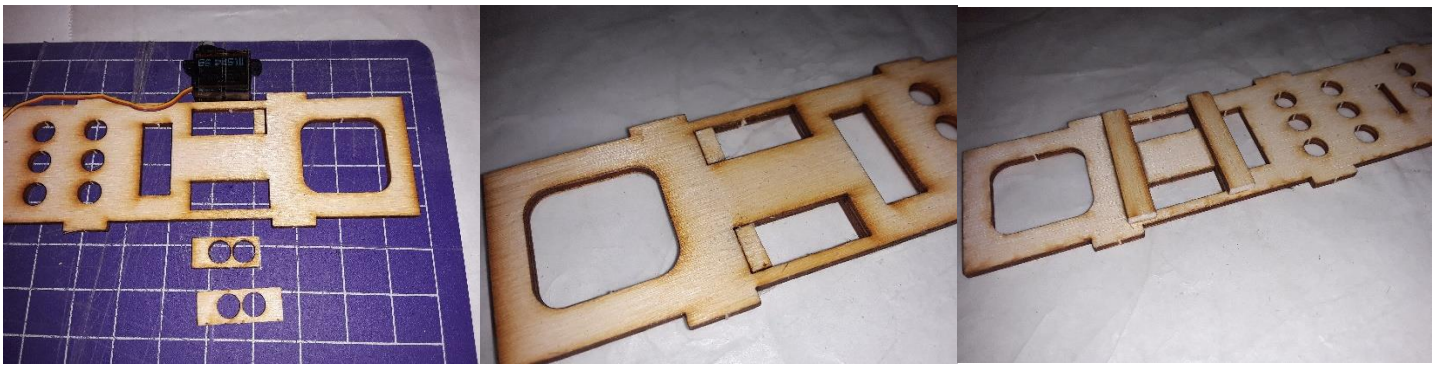
Punch out and prepare Firewall. Above is the Firewall for the Brushless motor with the blind nuts installed and a small amount of epoxy applied to secure them in place. If you are using another motor type or the Cox .020, the blank Firewall has been provided to allow drilling the needed hole pattern as noted below.



Laying out the blank Firewall for the Cox .020 is accomplished by positioning the motor and seeing how much needle valve will be above the top of the Fuselage. In this case the lower holes are located 9/16” (.560) from the bottom edge

of the Firewall and the mounting holes are laid out per the dimensions provided in the Cox .020 pamphlet. The instructions for connecting the throttle barrel are also included if you plan on setting up the Throttle control.

Before we start gluing it's a good time to Install a capillary tube to the Thin Cyanoacrylate glue for precision placement and restrict the flow of the glue. A wrap of tape around the joint of the tube and bottle can keep small leaks from happening and running down on your fingers.



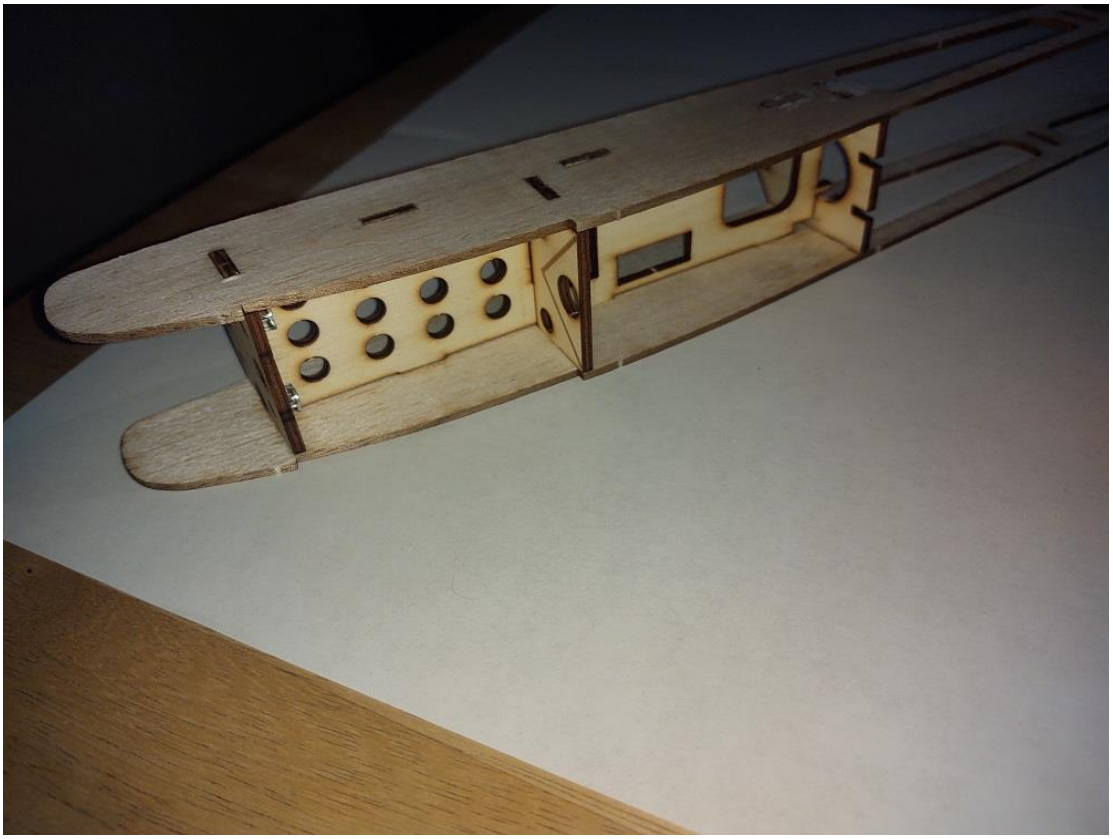
The Servos for your tray should be test fit since the holes are cut to accommodate various sizes. In this plane we are using the Emax ES 9051 which is a perfect servo for this being Digital, powerful, and light weight.

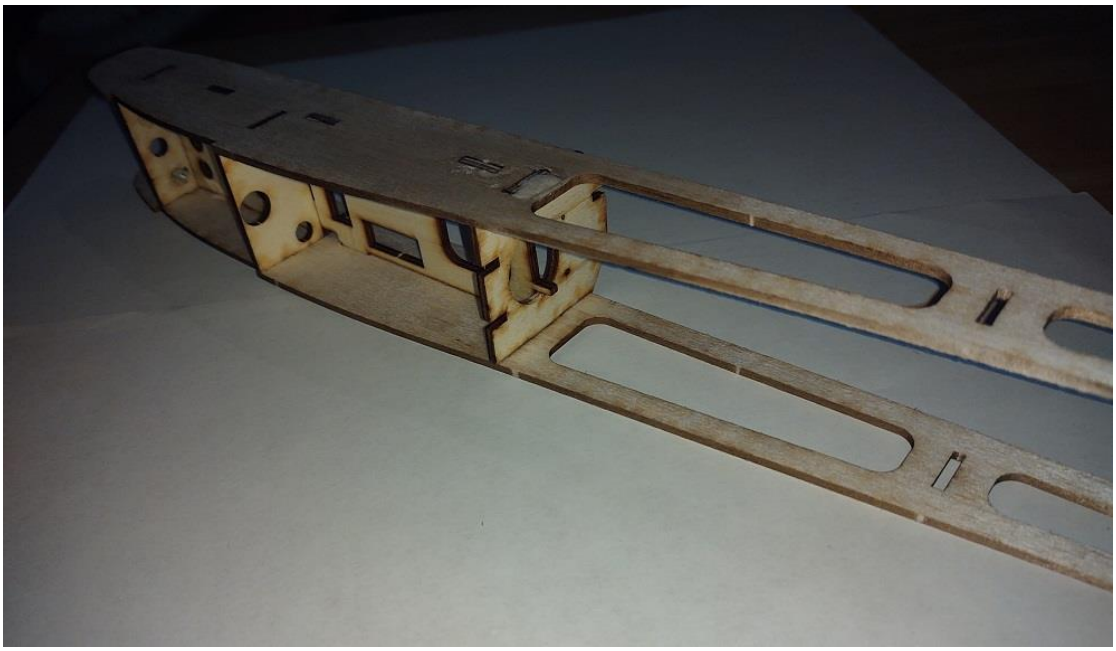
Using the scrap from the Servo tray cutout, cut a small section and glue it back in. Additional scraps from the edges of the Plywood sheet can be used on the bottom to support them and give a good base for the servo screws.

The picture shows the tray from the S-Tee as this is a common first step for all the Williy Nillies planes with Servo trays.

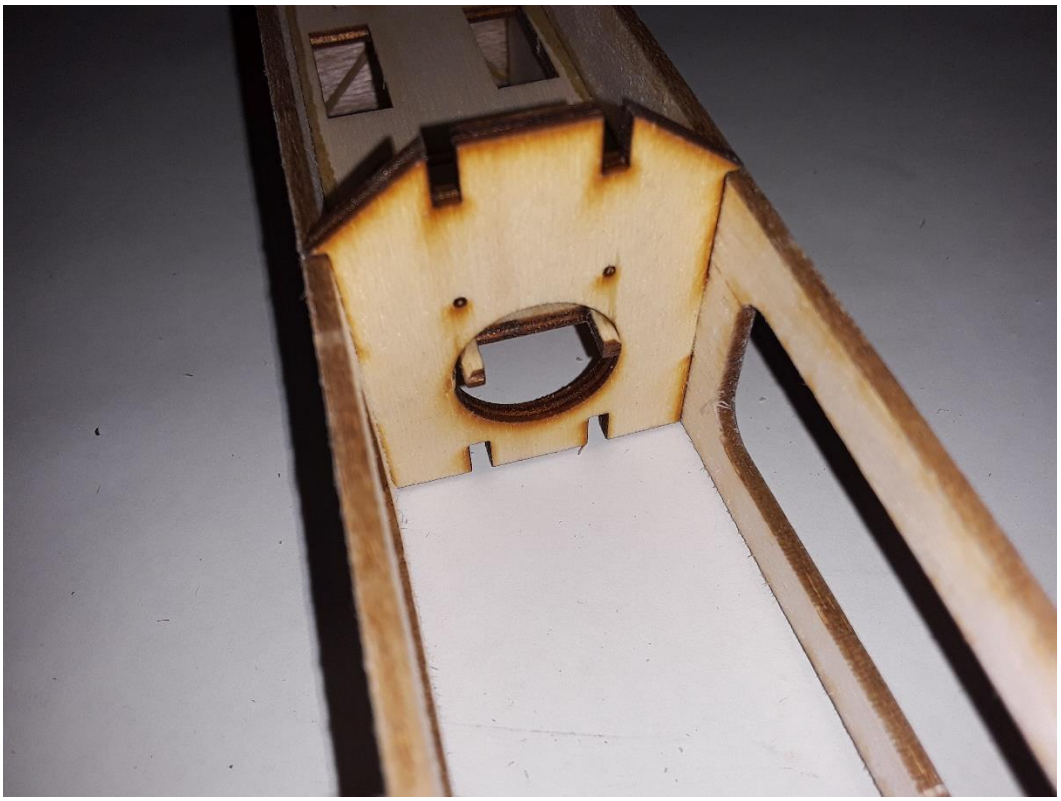
Fuselage assembly:

If you haven't already done so, finish punching out the Fuselage sides and Formers. Test fit your parts in all the slots before starting to assemble.

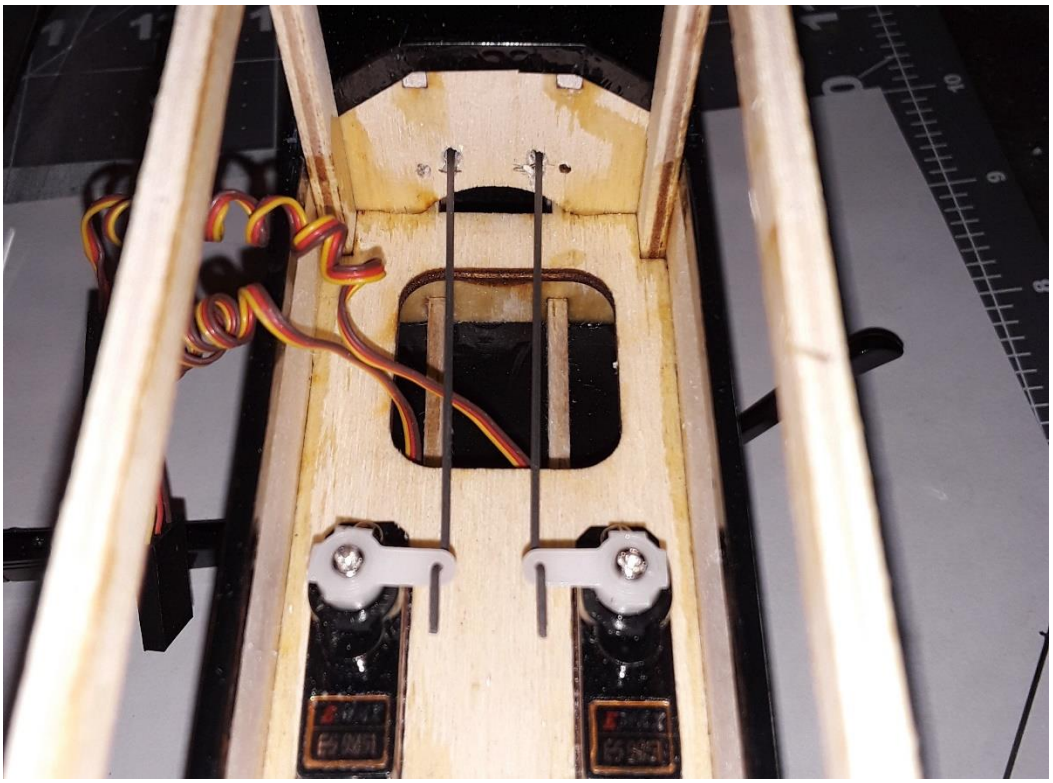




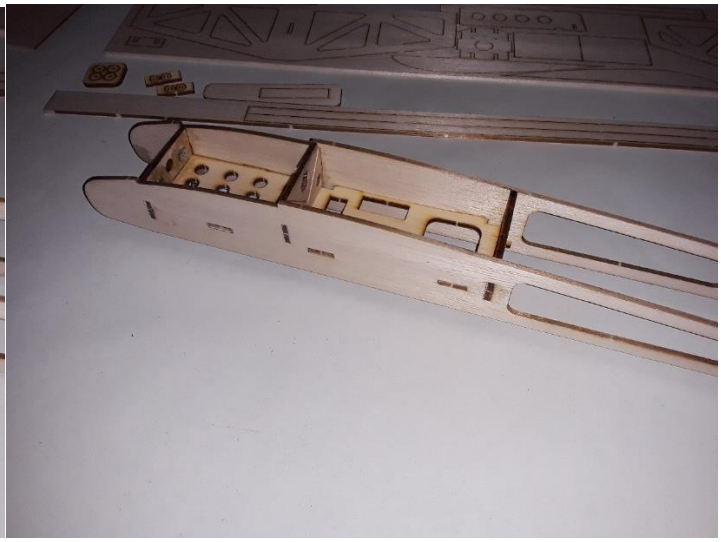
These pictures show the locations and positions of the primary structure parts. Note the orientation of the Landing gear former, The Sandwich assembly must face forward so there is clearance for the front Cabane strut. You can see by the tilt of the Firewall that the Servo/Battery tray needed a couple of swipes with the sanding block. Be careful not to go overboard adjusting a fit.



The two little pegs needed just a little angle sanded on them to align properly.

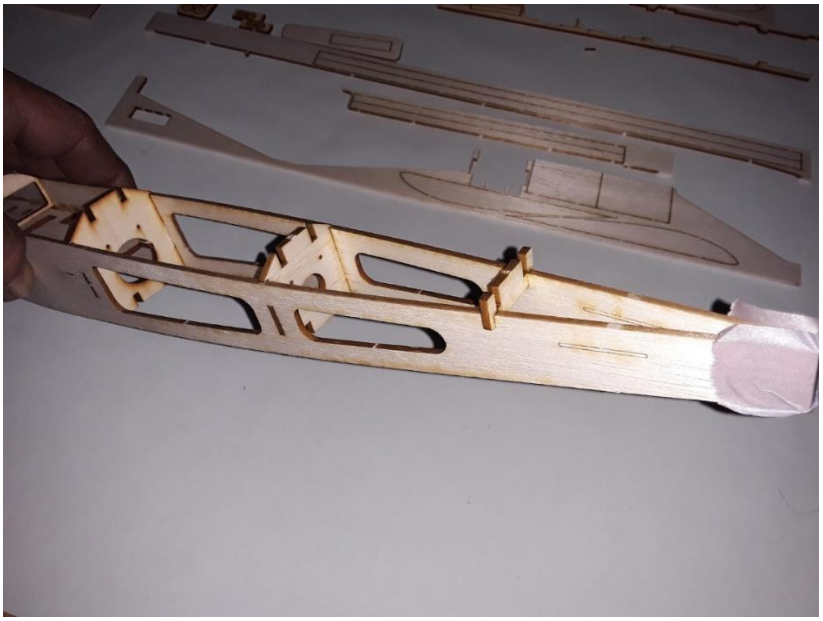


We found while installing the Servos that the Pushrod guide holes in the F3 Former needed to be moved for better alignment and to remove binding. As you can see in the picture, the holes were each moved 1/8” inward and 1/8” upward. It’s best to make this modification now before the Former is glued in.

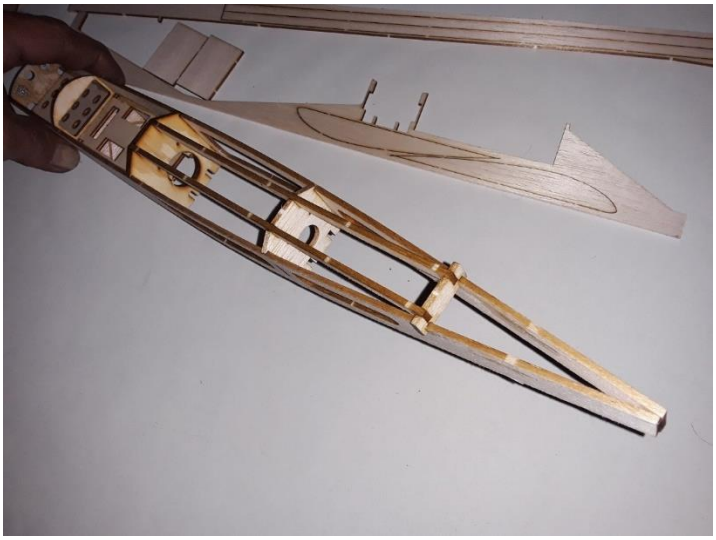



Once you are satisfied with the fits and have checked to make sure it is square you can glue this assembly up using the Thin CA adhesive. Beware that holding the fuselage with your fingers over the tab holes while gluing will get you stuck to the Fuselage.

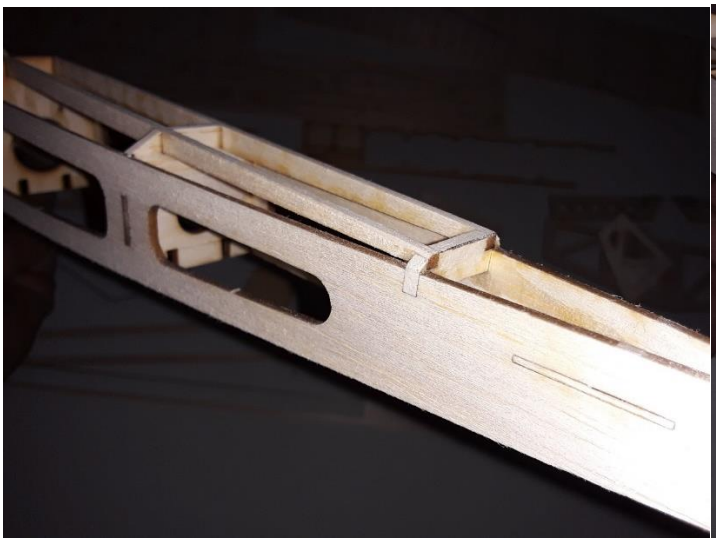
While carefully holding fuselage so that all parts stay aligned, glue battery trays, then F2, then F3 and Landing gear former into place. The Landing gear will be installed after completing the top of Fuselage.

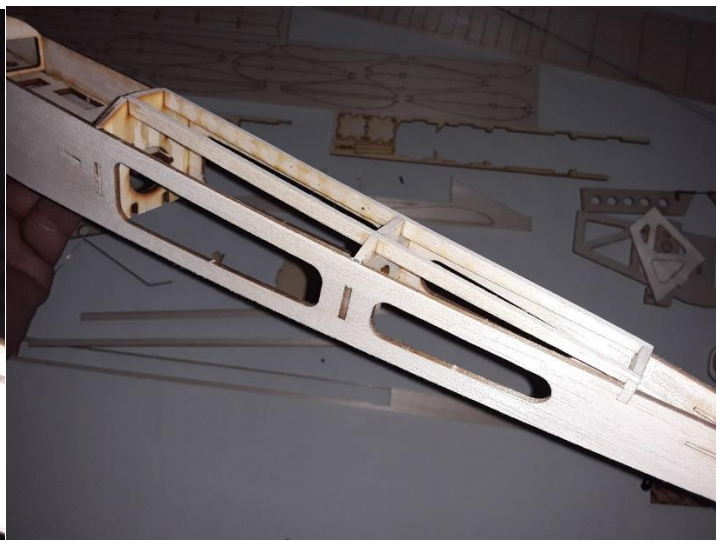


With the Motor and Cabin areas glued you can fit F4 Former. DO NOT GLUE YET. Pinch the tail of the Fuselage together and align the edges to each other. Use tape to hold them in place. Turn the assembly over and sight down the Fuselage to ensure that the tail area is centered, shifting them to adjust as needed. Once you are satisfied that the fuselage is straight and true to the center, glue it together and add F5 Former. As you see in the picture it is oversized to allow for differing bowing of the Fuselage sides due to Balsa density. Align the slots to center it and once again, when satisfied glue in place. You can now glue the F4 Former. Do not trim at this time.



Test fit, then install and glue the 2 top stringers as shown above.



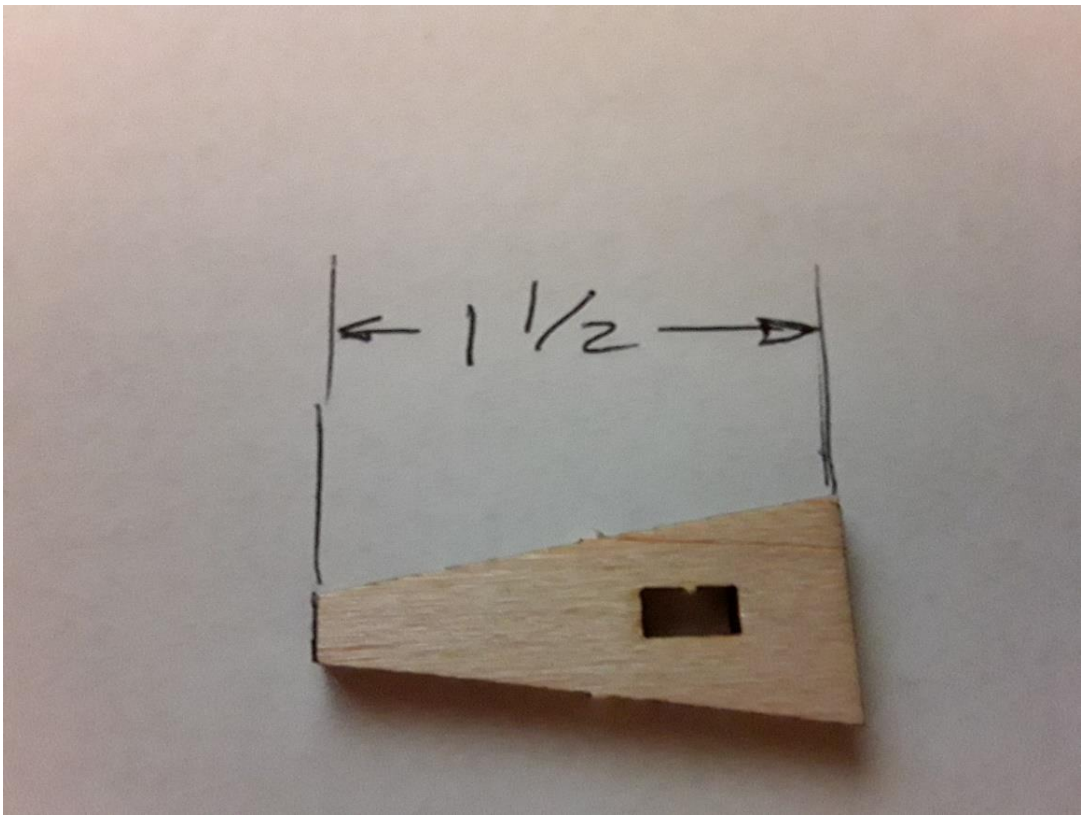


Lay the Horizontal tail in place and mark a line on the back of the F5 Former. Using the line as a guide carefully sand the F5 Former to the shape as shown above.

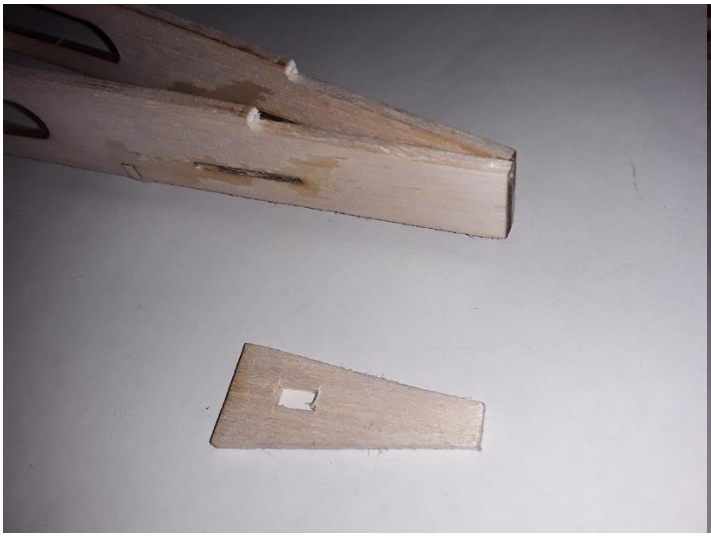
In the pictures above you can see how the Stringers and the Former have been shaped and sanded down to the line. The second picture shows the completed top rear of the Fuselage.

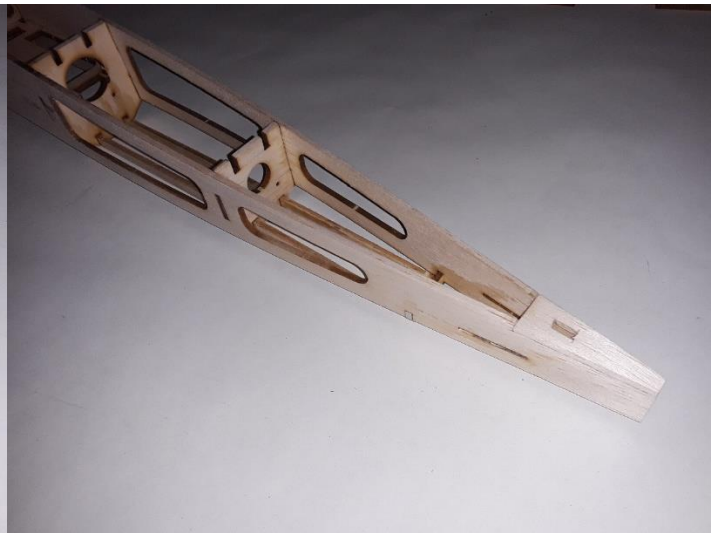
This sanding operation is best performed with a sanding block and 220 grit paper. Laying the block across the stringers and sanding with short strokes near the F5 Former while shaping it and then longer strokes to the length of the Stringers to even out their shape. This will make everything nice and even.

The same technique was used on the sides of the Fuselage to sand down the overhang of F5 Former.



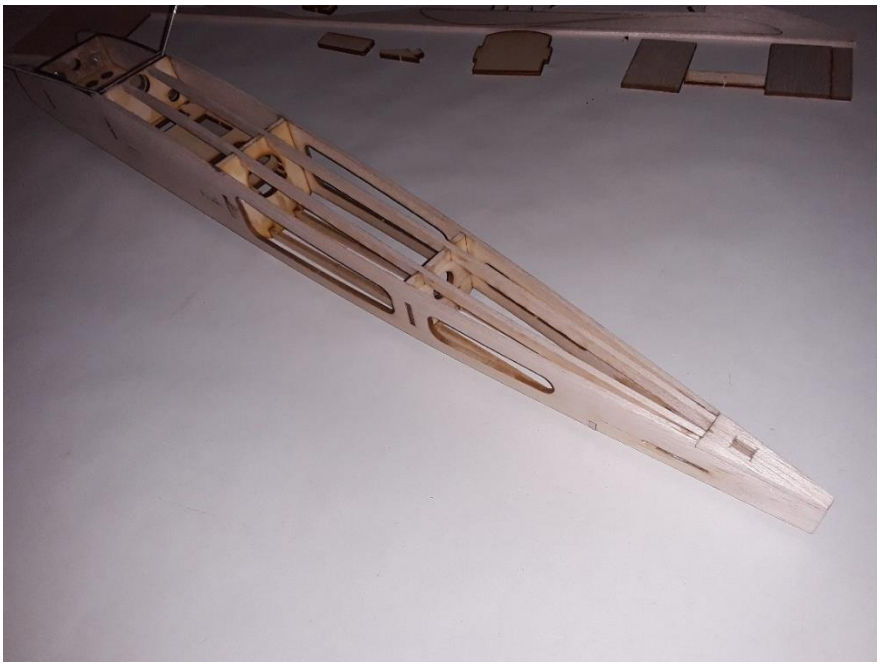
Early Beta Kits do not contain the Tail Skid plate. This can be easily made from a scrap of the Fuselage Balsa sheet.





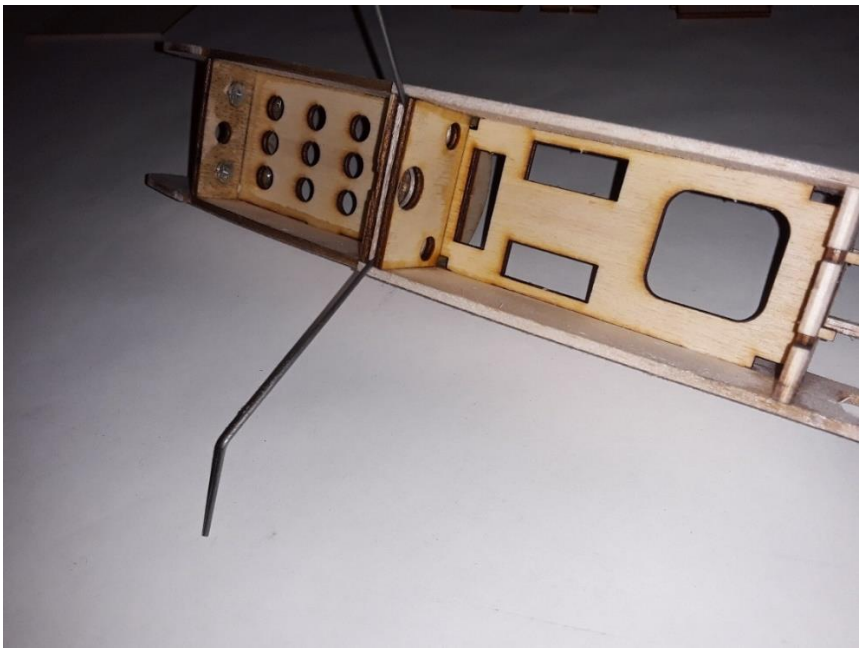
The Tail Skid plate is glued into the notches at the tail of the Fuselage. If you have the early Beta Kit, you will need to cut these notches. Measure 1-1/2 inches from the tail and cut a slit 3/32 down from the edge parallel to the bottom of the fuselage. Test fit and glue in place.

Sand the edges to finish the attachment.

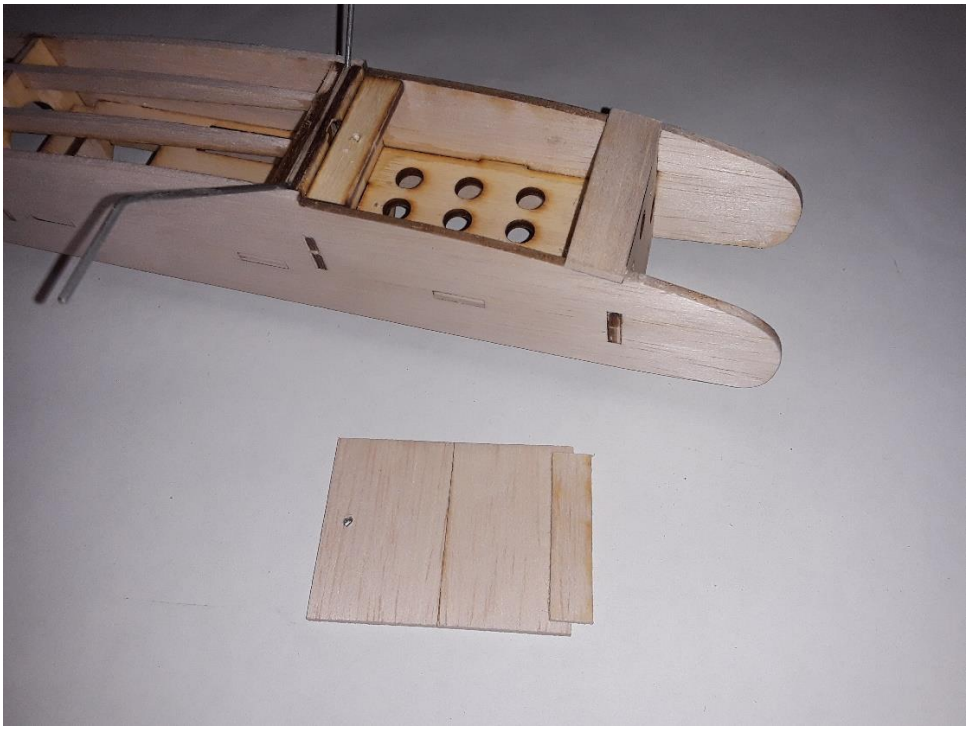


Trim the Stringers to length so that they are butted up snug with the Tail Skid Plate and the Landing Gear Sandwich. Start a little long and sand lightly until you have the fit desired. Once satisfied you can glue the Stringers in place. The Beta Kit stringers are straight and will stick above the bottom of the Fuselage at the Landing Gear sandwich. Once glued you can sand them to match the shape of the Fuselage sides as in the picture above.

As we did with the Top Stringers, use the Sanding Block with 220 grit across the Fuselage to keep the Stringers even starting with the raised section at the Landing Gear plate and working back, sanding with strokes the length of the Fuselage and sanding back and over the Tail Skid Plate. This will make everything nice and even.



The Landing gear sandwich can be completed at this time, use Epoxy or Medium CA in the slot and on the face of the Balsa Filler and clamp the Plywood in place. Note that this one was installed backwards blocking the Cabane slots. Don’t Panic if this happened to you. You will only need to cut the front Cabane uprights to sit on the top of the Gear assembly. The picture was taken before the installation of the Stringers for Clarity.



Install the plywood Hatch Tie Down plate flush with the edges of Fuselage and butted up to the Landing Gear sandwich. Glue in the narrow Hatch strip to the bottom of Firewall and along Fuselage sides.
Sand the edges of the 2 Hatch sections and join with Medium CA glue. You will need to make a tongue for the hatch from scrap balsa. It needs to fit between the fuselage sides and tuck under the fixed Hatch section.

Since we are going to cover the hatch with heat shrink covering, we need to leave room for its thickness. If you were slightly off center with the Hatch Lip, this step will also work perfect to get it fixed. Use the square edge of the sanding block and lightly swipe the edge of the Lip to shorten it slightly on each end. If you were off center a little, do the shortening on the long side only. Check your fit, it should be able to move slightly side to side.

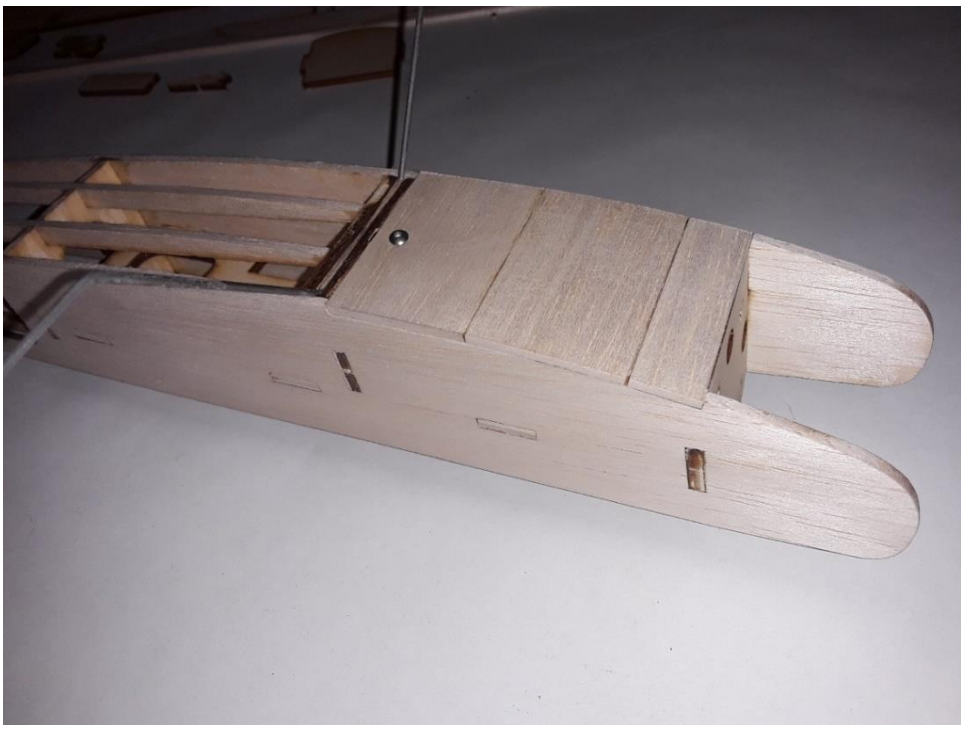
In the second picture, the front of the lip is also sanded lightly to reduce its thickness to allow for the double thickness of covering where it tucks under the Filler Strip.

Standard technique for installing the Tie Down Screw, pictures are typical of all Hatch istallations.

Use a piece of tape and mark the center location for the Screw hole. Next, measure the distance from the edge of the Filler Strip and transfer that to the Hatch. Again, to leave room for the covering, deduct about 1/32” (.6 mm) from your measurement.

Use a pin through the spot you marked and put the Hatch in place to see if the pin is aligned with the small hole mark in the Tie Down Strip. If everything is right, you should have a nice little gap at the front where the Hatch meets the Filler Strip and there should be a small amount of side to side play at the Lip between the Fuselage sides. If not, recheck your measurements and try again with a fresh piece of tape. Using the pin leaves a small hole and makes it easy to correct the hole position.

Once you are happy with the fit, use a small Drill or a Needle File and make the hole for a #2 Screw all the way through both the Hatch and the Tie Down Stip. Install a small #2 wood screw or Servo hold down screw to make the threads in the wood. Remove the screw and hatch and put a drop of Thin CA on the threads of the Tiedown Strip to harden them. Once cured run the screw back through to set the threads. Open the hole on the Hatch so the screw slips through and then use a drop of CA on the hole to toughen it up as well.



This is a picture of the Completed Q-Tee Hatch, note the small gap at the Filler Strip for the covering.

Forward Turtle Deck:

The froward top Turtle Deck as shown below has been saved to last.
This is an area that takes a little skill and patience but can be accomplished easily by a first-time builder. Experienced builders will have their favorite way to accomplish this, but the steps we show here are simple and forgiving.
It's best to read through these steps to get familiar before you start.

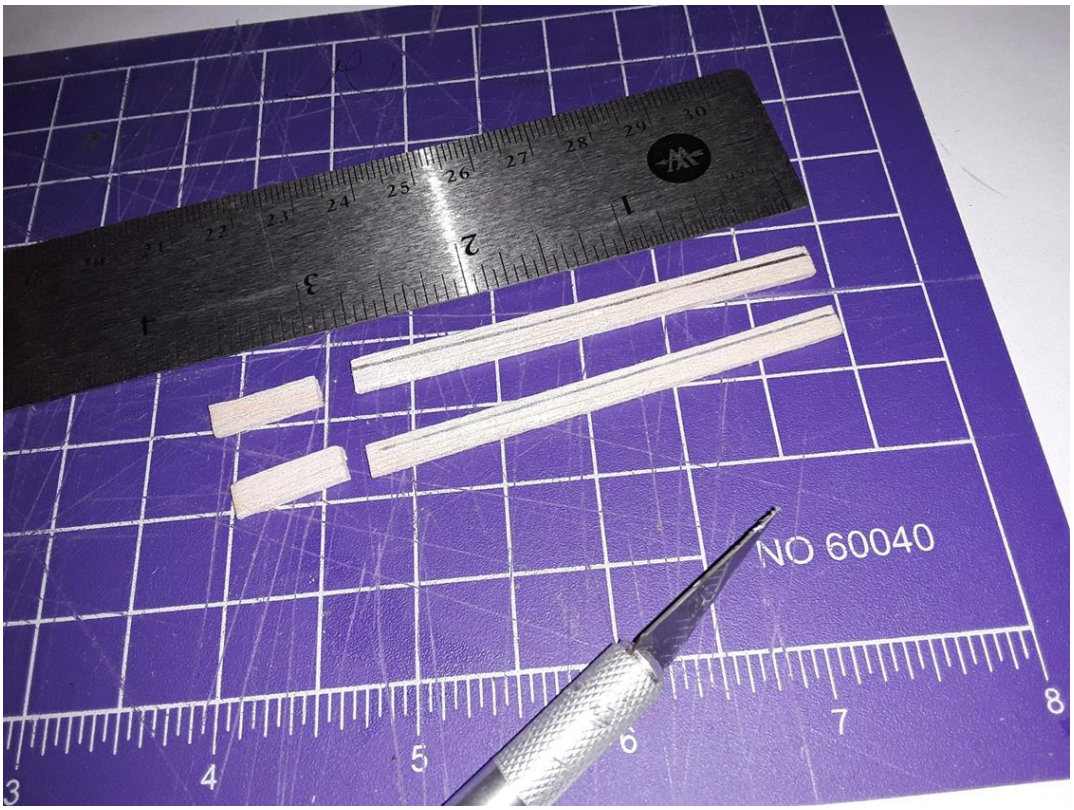
The 1/16" thick Balsa sheet supplied is oversized in both length and width. Start by cutting two strips from the edge 3/16" wide and set aside for later.

Run warm water on the to wet the balsa for forming.

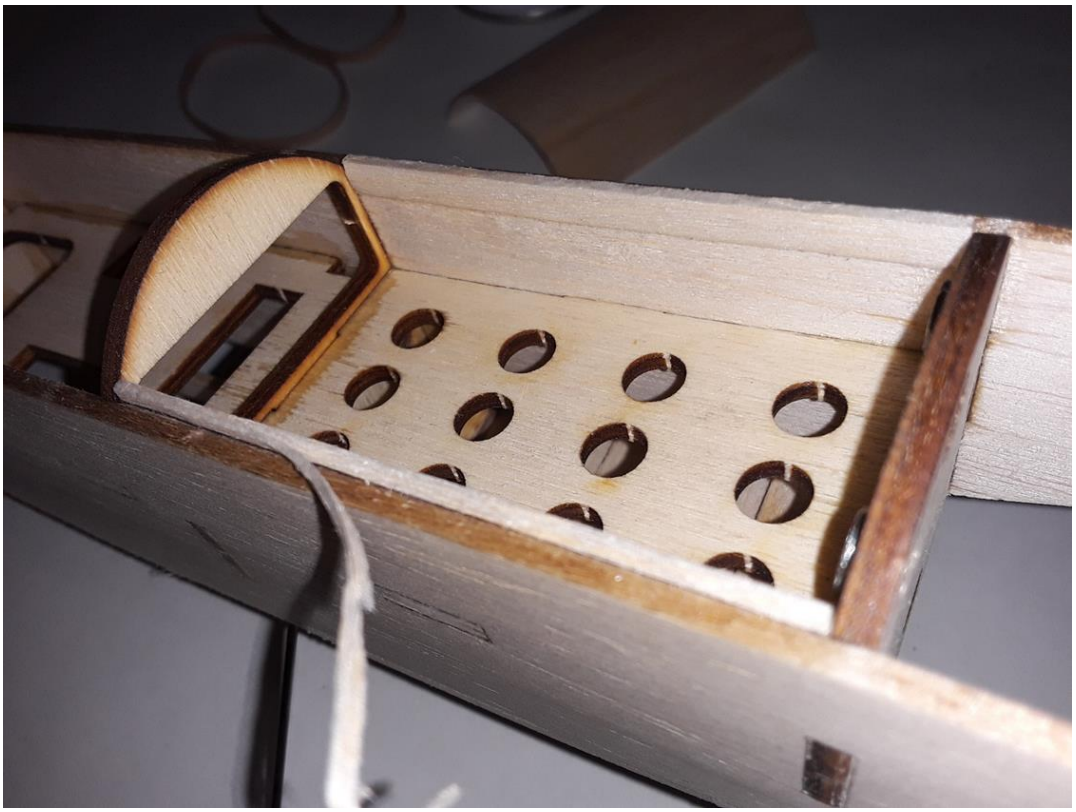
Blot the excess water with a paper towel, you want the Balsa damp, not dripping. Fold the Paper Towel over and let it sit for 4-5 minutes to allow the fibers to soak in the moisture and become more flexible.

Wrap the sheet around a Can or form similar in size to a Furniture polish can. In this case we are using a model spray paint. Use 2 of the #32 rubber bands to hold in place.

After the Balsa sheet has dried, usually overnight, it can be removed and test fit over the formers.

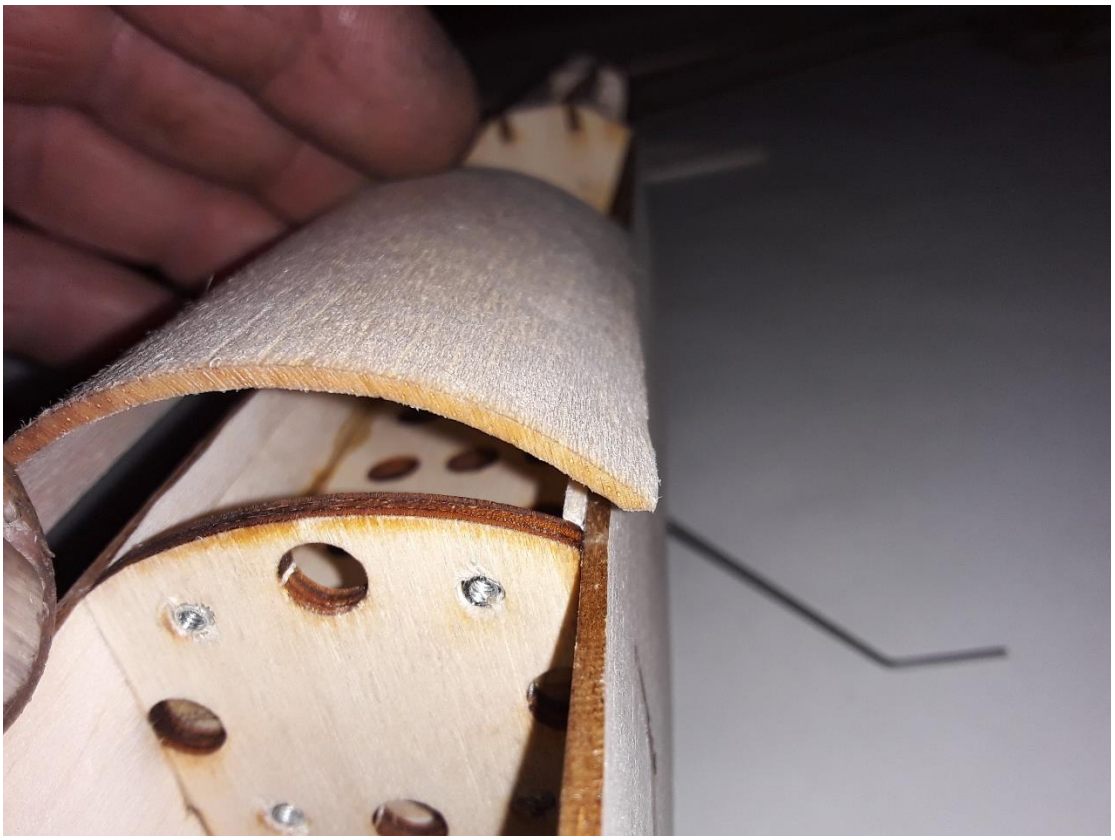


Get the strips you cut from the sheet earlier and cut the strips to 2-3/4” long and mark a line 1/16” in on one edge.

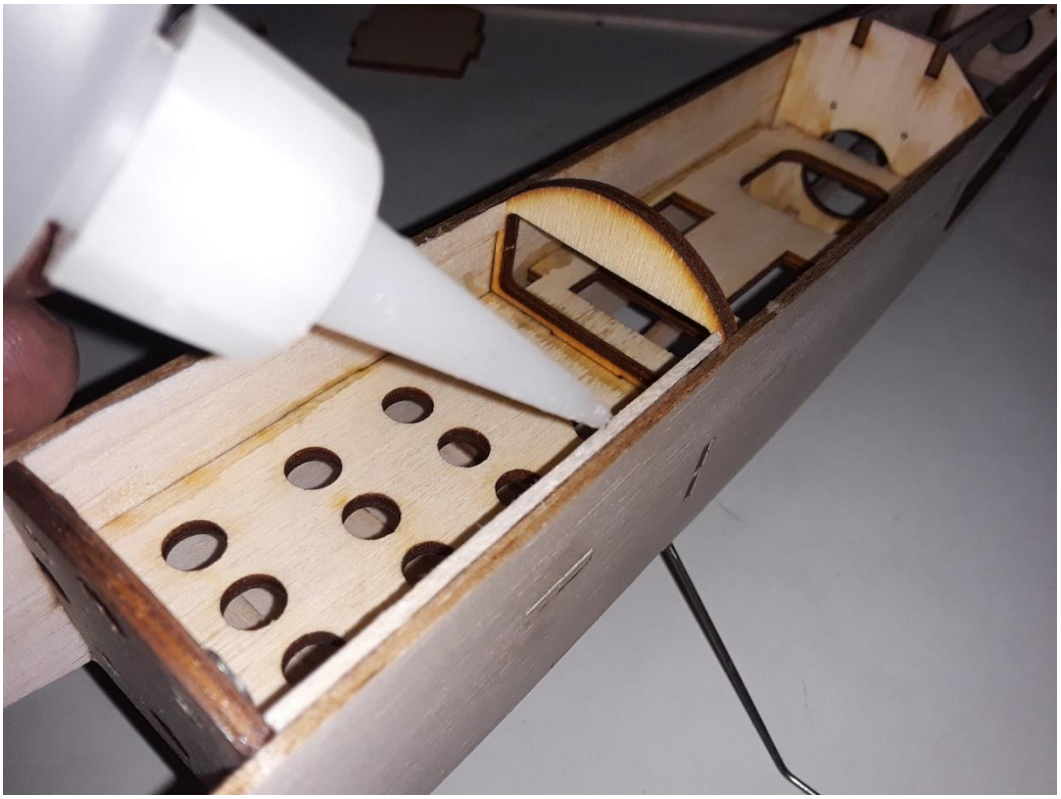


Test fit the strips along the top edge of the Fuselage side with the 1/16” edge up. Once satisfied with the fit, bond the two strips using medium CA glue.
Once the glue has set, carefully trim the 1/16” edge at an angle to intersect the formers. The strip is partially cut as you can see in the picture above. Take your time and use a sharp knife.

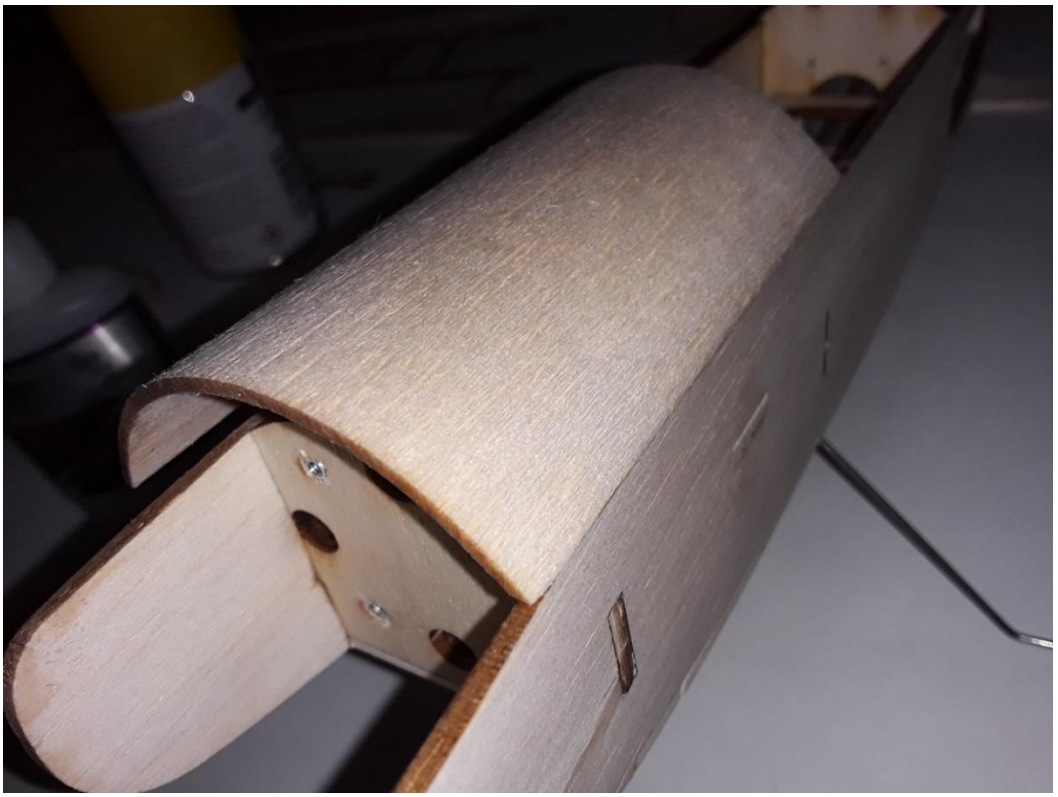
Sand an angle on one edge of the formed sheet to match the angle where the former tops meet the Fuselage side.



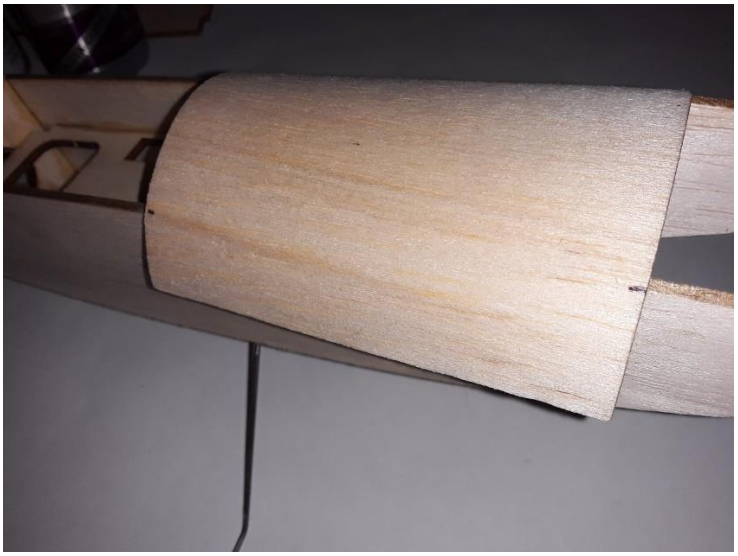
You can see the angle in this picture. Test fit the sheet and check the edge fit. Don’t’ worry about making it fit both sides. At this point we are only going to attach it to one side.



Once you are satisfied with the fit, run a small amount of Medium CA along the support strip that you made and place the sheet in place allowing some overhang of the formers.

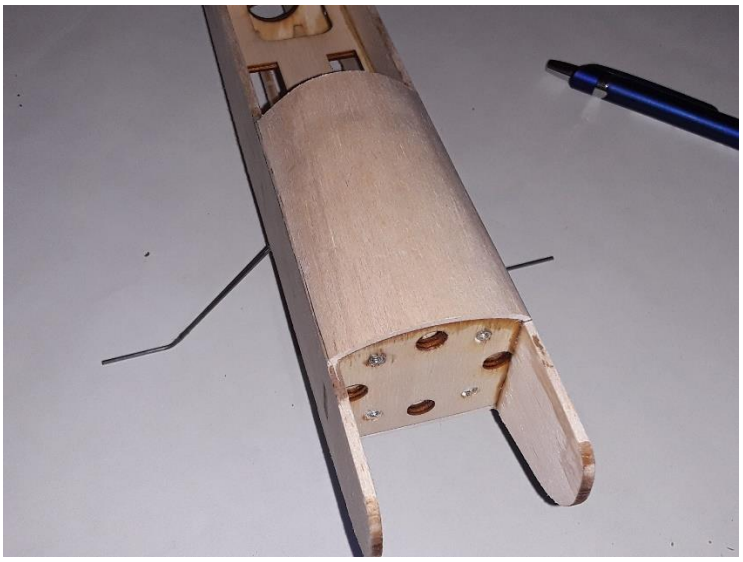


This is how it should look with the edge glued in place.



Marking the sheet for trimming.

Press the sheet down on the formers and run a little Thin CA from the middle top of the former to the glued edge side ONLY. This will help hold the sheet down while you trim the overlapping side.
Mark the sheet as shown above at the top corner of the fuselage side and using a straight edge, trim the sheet.
Trim a bevel on the edge of the sheet like you did on the first side. Trim a small amount at a time and test the fit.
Once you are satisfied with the fit, again, use the Medium CA along the support to glue in place. Using the Thin CA, finish gluing the formers from the middle top to the edge.
If you trimmed too much, it's ok, the support strip will hold the sheet. Cut a small bevel along the edge and using the Medium CA lay a strip from the trimmed sheet edge in the bevel cut. Once set, you can trim the filler and sand to shape. I did this on purpose for the picture below, note the double seam. It's been sanded to fair it in.
Trim the Balsa sheet to the formers using a sharp blade and finish with a small sanding board or fingernail file.

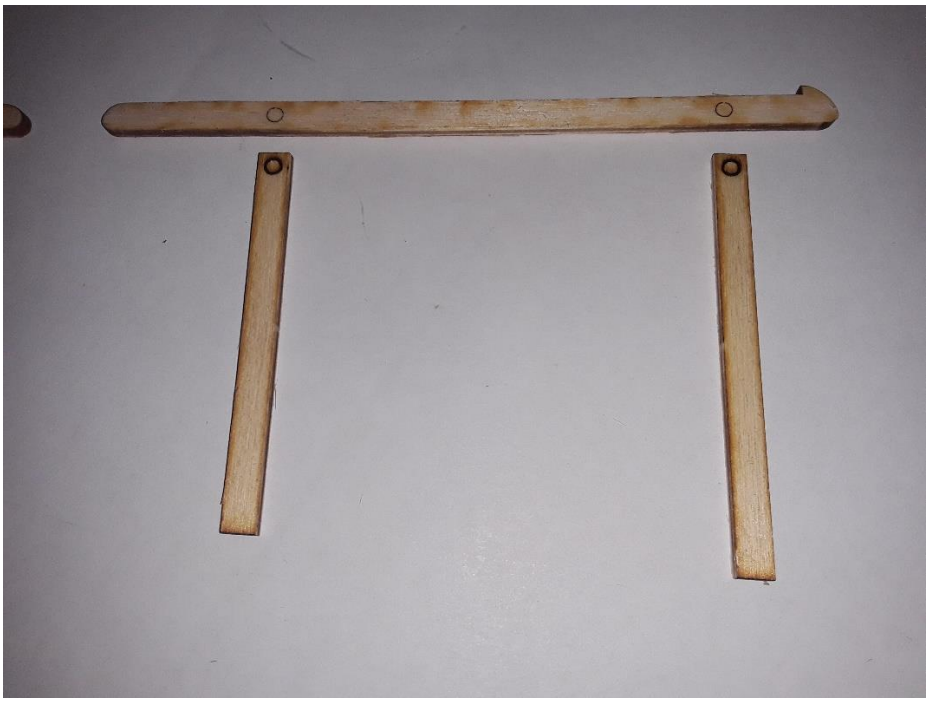


Congratulations! At this point the main Fuselage is completed. Take this time to sand the airframe before installing the Cabanes.
Start with 220 grit and work to a 600 grit to round the edges and smooth all the surfaces. Remember any imperfections will show up when you cover the aircraft and make it more difficult to achieve a smooth covering job.

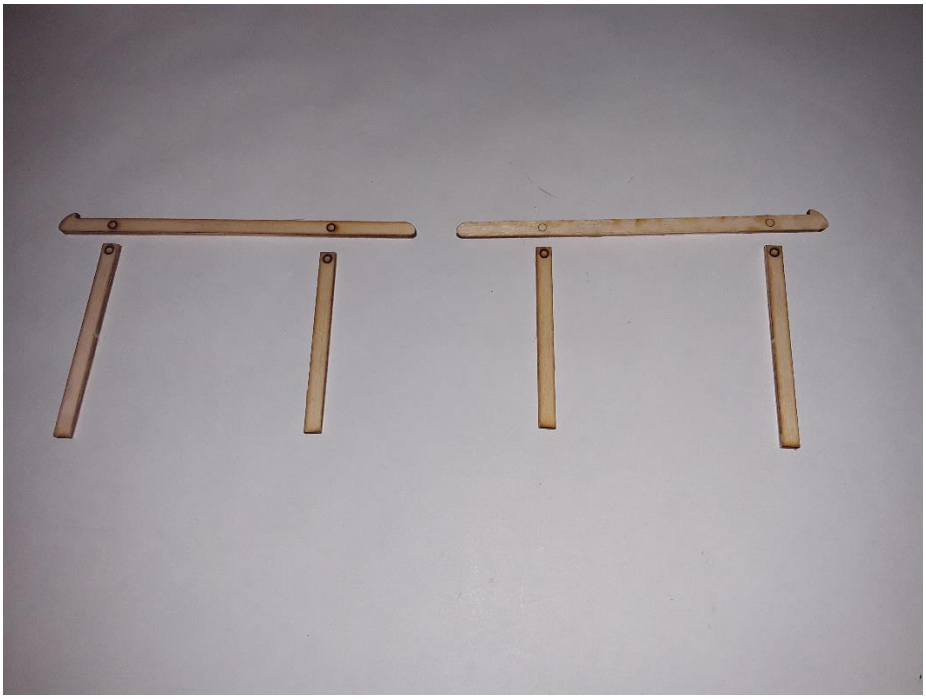
Cabanes

The Cabanes are not tough to build. As with the rest of the kit they are cut accurately by the laser for ease of assembly and alignment.

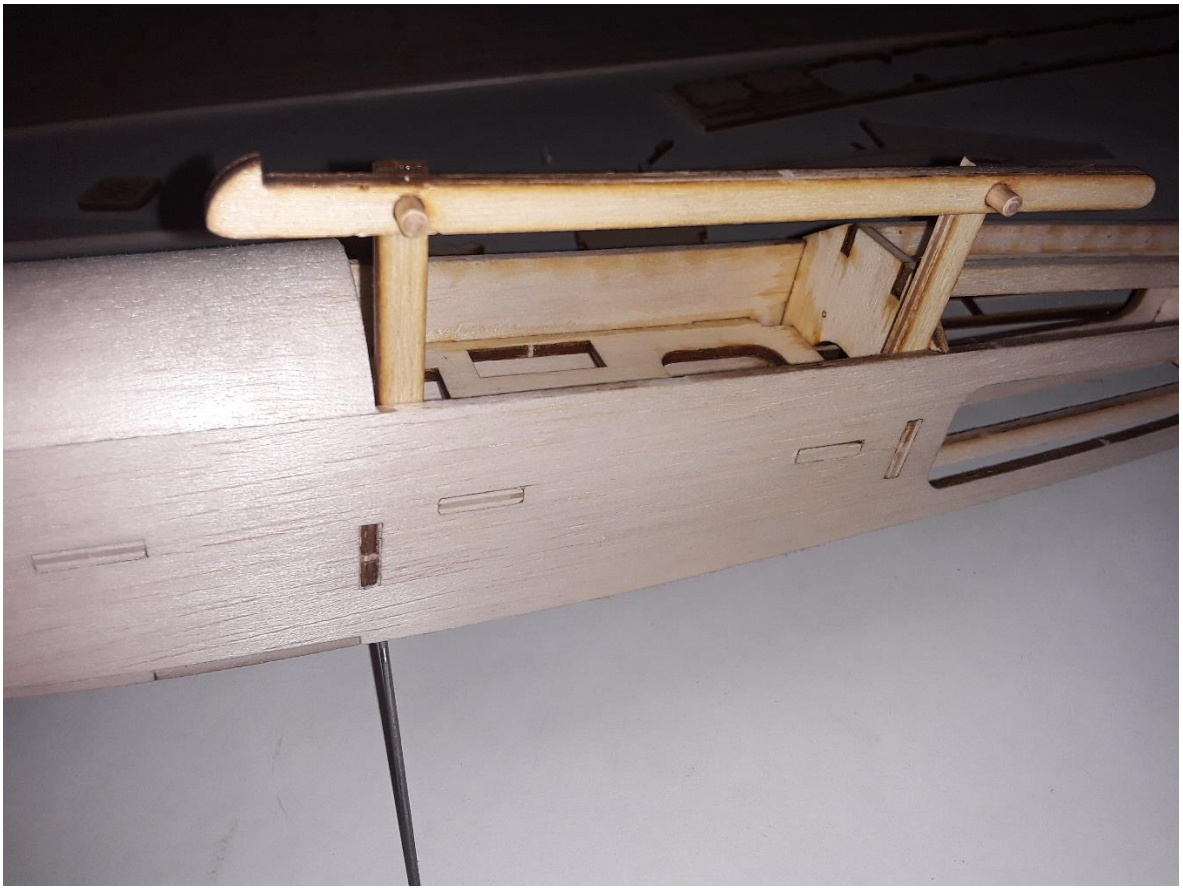
Before starting, look at the following pictures and note that we are building Right and Left side Cabanes. Lay them out so that you do not get them mixed up.

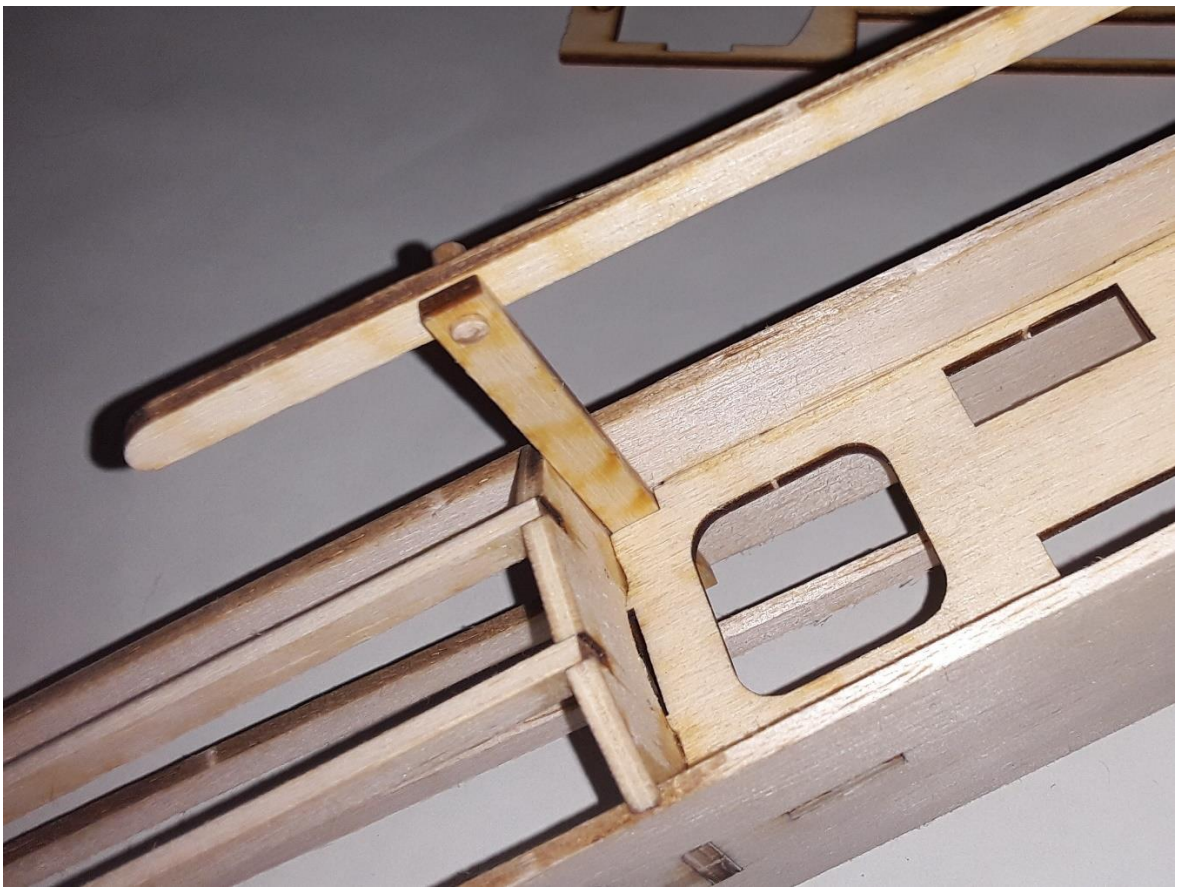


Note: The rear Riser is the short one and the bottom is cut at an angle. The angle follows the edge of the lower Fuselage edge when assembled.

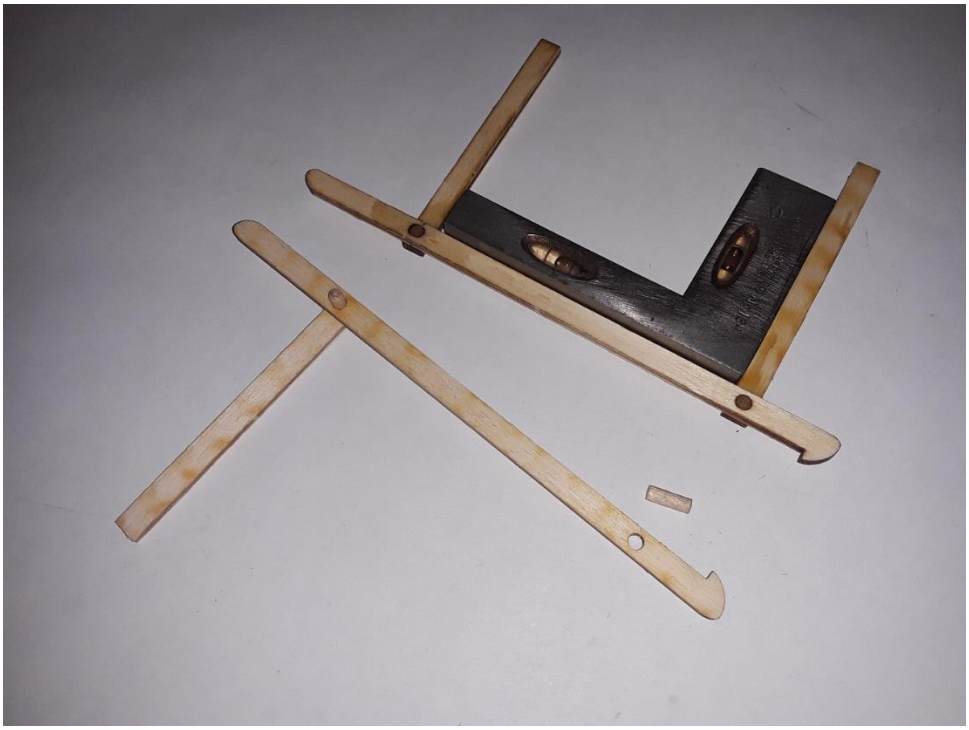


Note: The Cabanes laid out as a Right and Left. Carefully punch out the small circles and cut your Dowel into 4 pieces between 1/4” and 3/8” long. They are easier to work with a little long and can be trimmed after gluing.

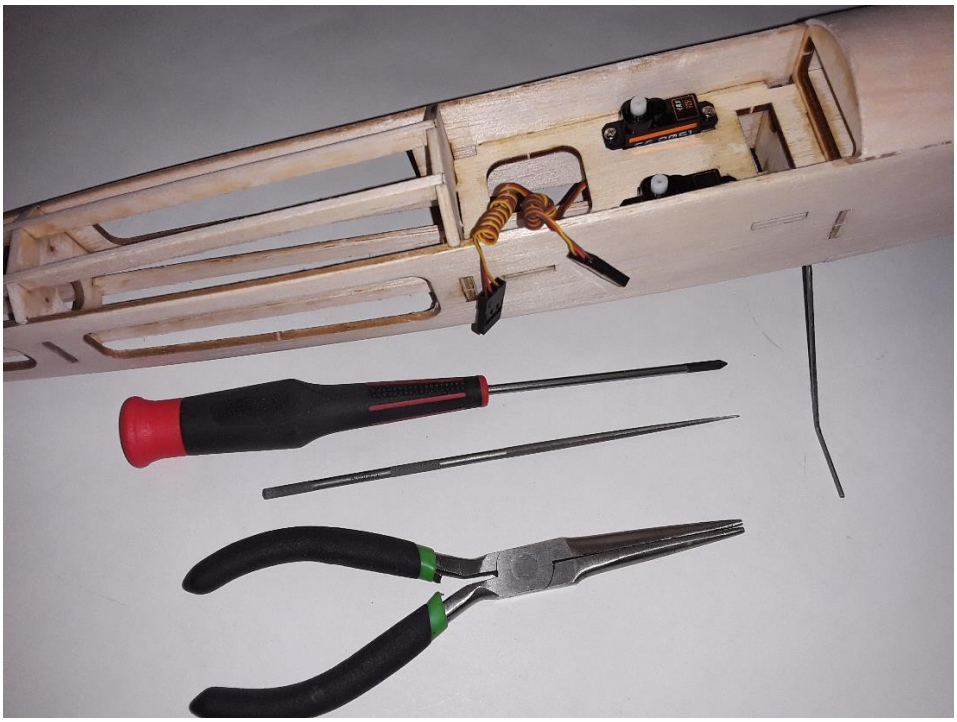




Take the time to test fit your parts and trim or make adjustments as necessary, but don’t glue them in at this time.



Glue up the Cabanes making sure to square them up. Experienced builders will again have a favorite method, however, we use and recommend Thin CA applied to each of the Edges allowing it to soak into the wood and create a very strong bond. Be careful of course not to use so much you glue yourself to the Cabanes.
Once you've completed the Cabanes, set them aside and read through the following instructions to decide how much prep you need to do before installing them. We will cover the installation and alignment in later steps.

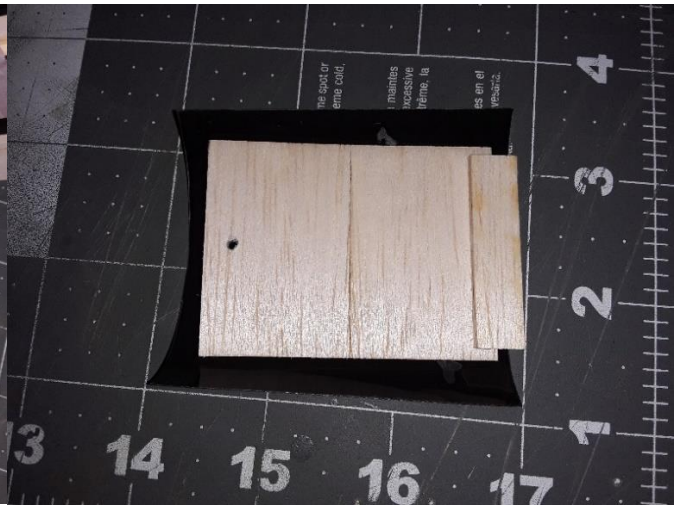
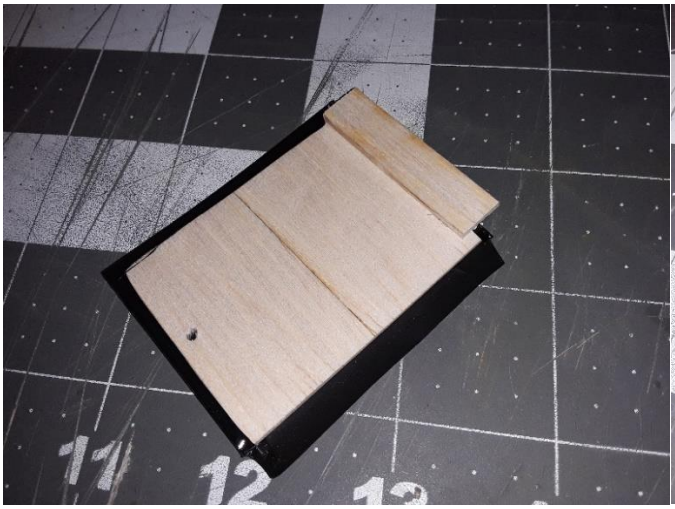
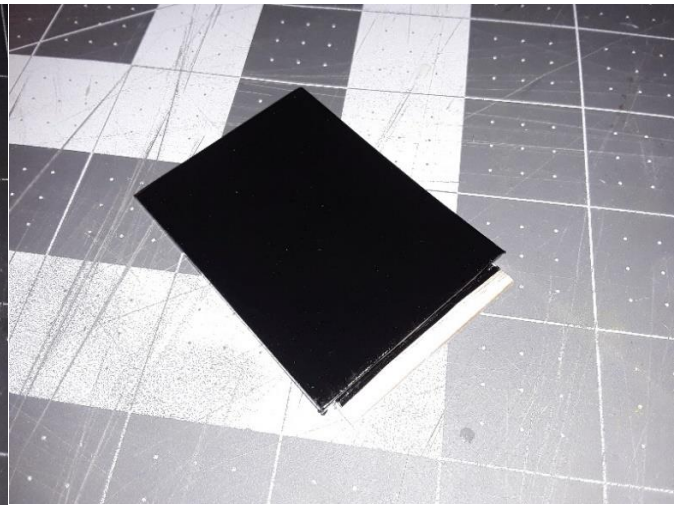


It's much easier without the Cabanes in the way to install your servos. These are my favorite tools for the job; A Needle File to mark and make the holes, Pliers to place the screw and a #1 Phillips Screwdriver. An option here for the small servos is a dab of hot glue on each tab. I rolled the Servo leads on the Screwdriver to make things neater.

As mentioned earlier, you have the option to do some covering before installing the Cabanes. As a minimum, we would suggest covering the rear deck and adding sealing strips around the Cockpit area.

If you are already competent in covering, you can jump down the Cabane Installation.

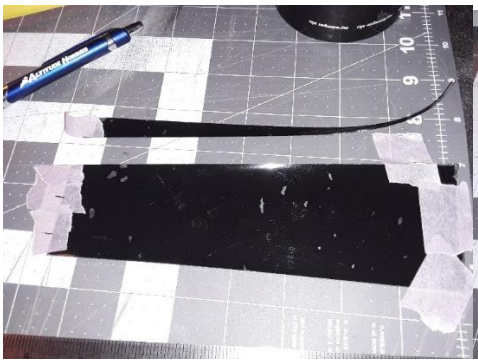
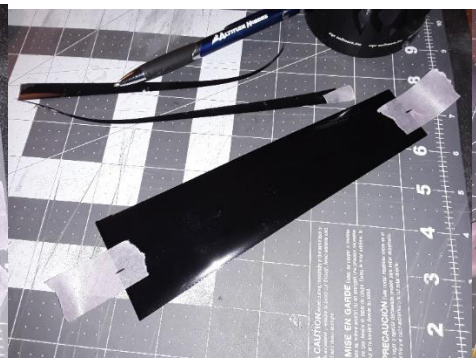
For folks covering for the first time, It's not as daunting as it seems. This series shows some simple coverig techniques for those just getting their feet wet. Start with small things that can be easy to strip off and start over if needed.

(1) Setting up the Iron using a temp gage you need to be right around 310-315 degrees F.
(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 edge olny using quick taps 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 them around the edge to the back using the iron and seal it. 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!

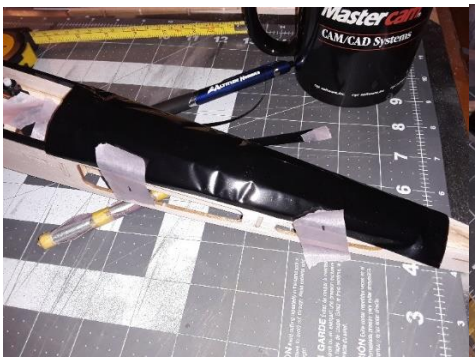
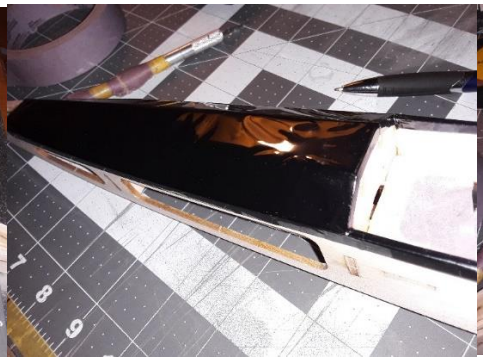
Pro Tip: Using a cotton Baby Sock on one of the Iron socks available through a hobby outlet will reduce the dust scratching that may occur during covering.
Poking a few pin holes through the hatch before you start keeps air from being trapped and ballooning the covering.

This series of pictures gives you an overview of covering a larger area similar to covering the Tail surfaces and the Wing.


(1) Start by measuring over the front and rear formers and added ¼" to each side for overlap.

(2) Center marking the tapes allows you to lay it in place centered on the formers.


(3) Start by removing the backing from the covering. Sometimes the covering is stubborn and may require you to put a piece of tape on each side of the sheet at a corner and pull them apart.

(4) Tack it at the tops of the front and rear Formers, it's ok to heat through the tape. You can take them off once tacked in place.

(5) Pull the covering down tight and add a couple pieces of tape then tack along the edge. Do the same with the opposite side and then finish tacking to the front and rear formers. Don't tack to the Stringers and middle Formers, you want the covering to be able to move with the shrink.

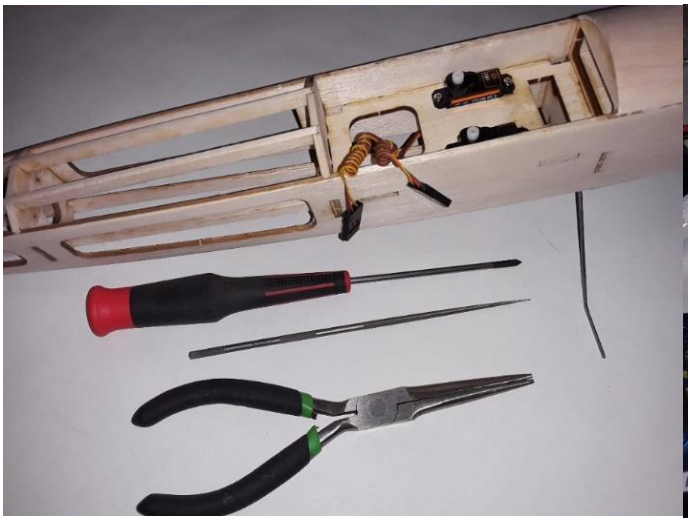
(6) Go around all the edges to seal them down, then lightly pass the Iron over the surface to shrink, making a few passes to get it shrunk evenly. Don't get in a hurry and hold the hot iron over the surface. It will cause uneven shrinking and too close to an edge can cause the edge to pull.

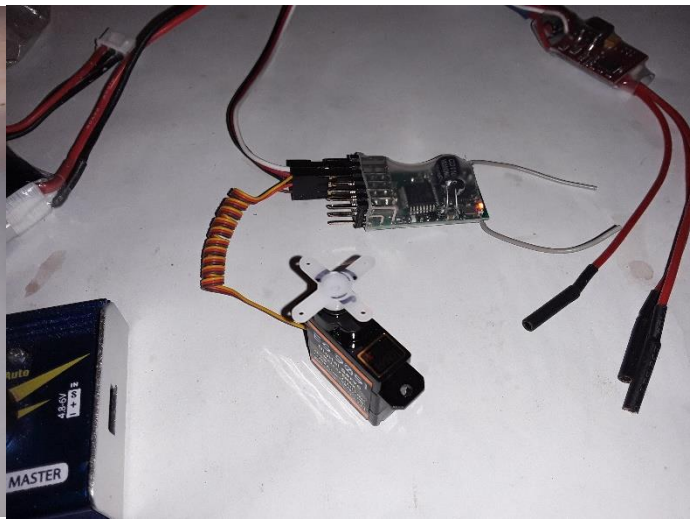
Note: The 3/8" wide sealing strips around the Cockpit area that have been edge rolled to the inside. That gives you something the cover up to after installing the Cabanes without fully covering the Fuselage at this point. An added bonus is if the glue gets away from you, the covering will hide it.

The next Steps will be installing the servos and pushrods since the Cabanes will limit your working space for completion of the installation.

There are more Covering Tips in the pages following the installation of the Cabanes that you can reference for finishing the Fuselage.

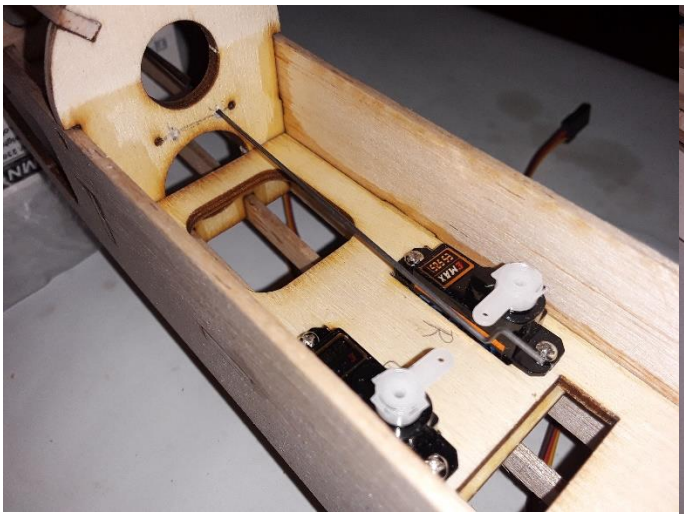
This Series on setting up the servos applies to all the Willy Nilles planes so Fuselage shown may not be the Q-Tee.

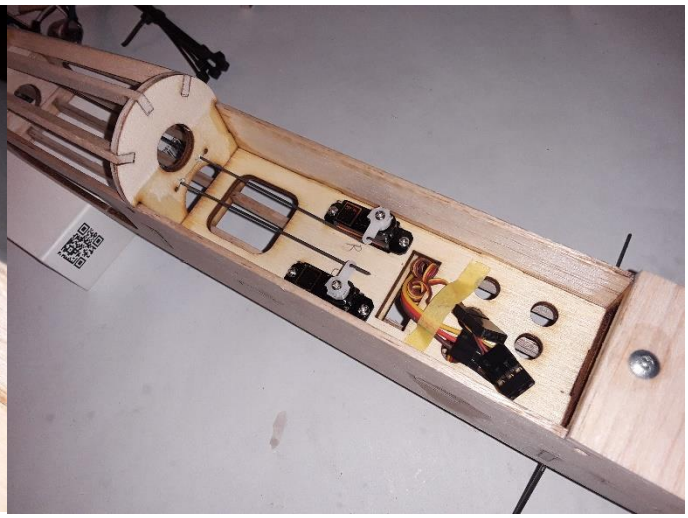




It's much easier at this time to install your servos and check the routing of your Pushrods. Shown are my favorite tools for the job; A Needle File to mark and make the holes, Needle Nose Pliers to place the screw and a #1 Phillips Screwdriver. An option here for the small servos is a dab of hot glue on each tab.

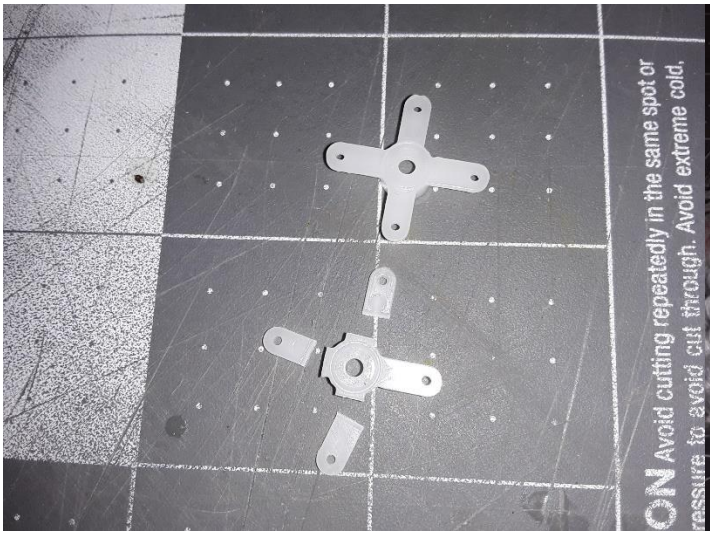
Set up and Bind your Receiver or use a Servo Tester to establish center on your Servos. Using the small cross Servo Arm set it in place on the output splines. If it doesn't line up at 90 degrees take it off and set it to the next Arm. The Splines in the Arms are cut in such a way that you can try the 4 and find the one that lines up closest to the 90 degrees. Mark the other 3 arms and trim them off. Note the marks on the Servo arm in the second picture. I rolled the Servo leads on the Screwdriver to make things neater. Keep this Servo and Arm together as a pair and set up the next Servo.

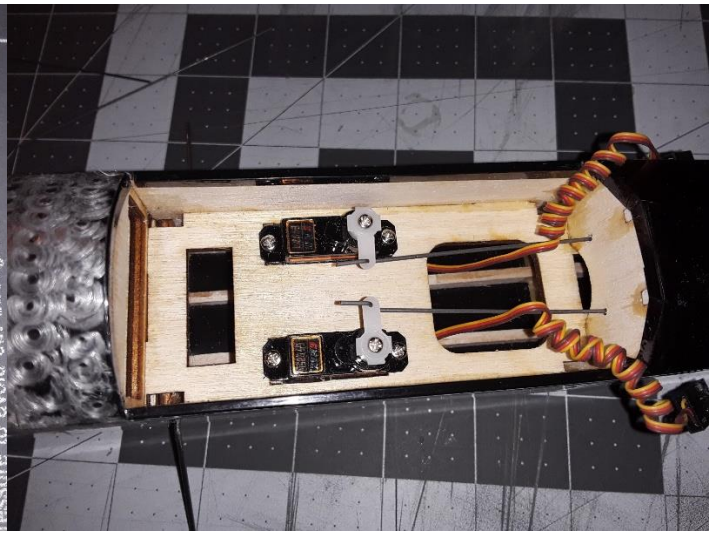




With the Servos and Arms installed in the plane, run the Pushrods through the guide holes of the Formers and out the Slots in the rear of the Fuselage sides. You can see in the pictures that we added 2 new holes to allow better alignment and remove friction on the Pushrods. Note the "Z" bend is now aligned at a relaxed position with the hole in the Servo Arm.

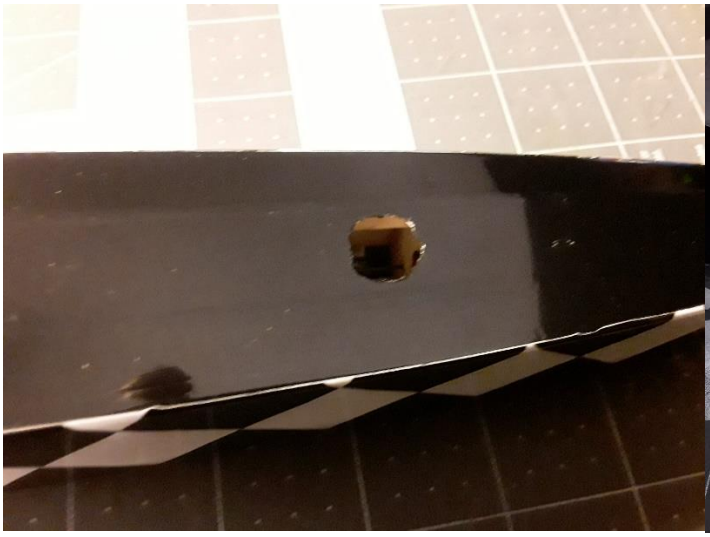
Once you have the Servos and Arms set up and the Pushrods installed, tuck the wires up in the Fuselage in preparation of the covering. Doing it this way allows you to reach through the uncovered Fuselage with the Needle Nose Pliers to get the pushrods threaded through. It also allows for any adjustments you may need like moving the guide holes.





(1) The servo arms are trimmed to fit in the small Fuselage by clipping off the arms as noted in the Servo set-up instructions. These small crosses are plenty big for the throw requirements of the Q-Tee.

(2) Shows the servos with arms and Pushrods installed threaded through the holes in the formers.



(3) If you get carried away and cover the whole fuselage before installing the Pushrods, don't panic. Cut about a ½" 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.

(4) Pushrods go through the guides in the rear. Here again, a sharp Knife or a heated-up Pin to cut the covering in the slots. The rods are trimmed off a little long at this point.

Cabane Installation:

We Suggest you review the following instructions to get familiar with the task and gather the tools you may need.

By this time, you have test fit and built your Cabanes as covered earlier in this instruction. We get started by inserting the Cabanes in the Fuselage and checking that we have the Right and Left sides correct and the Wing Saddle notches to the front. Slide the Uprights down until the bottom edges are flush with the bottom edge of the Fuselage. Do not glue them yet.

Block up the tail of the Fuselage using Small cans, boxes, or Balsa blocks. You want the blocking to be stable. Shim the blocking as need under the rear of the Fuselage until the saddle of the Horizontal Stabilizer is level front to back and side to side. Tweaking or shimming the Landing gear is the easy way to accomplish the side to side Level. Tweaking is better so that once you have it on the wheels it will sit level.

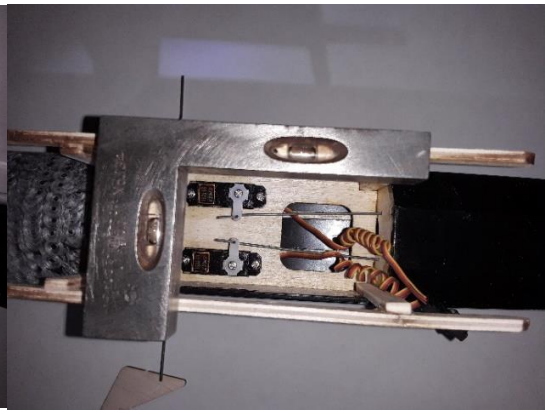
Once you have the fuselage level, check the saddles of the Cabanes. You want to Adjust the height of the Uprights as needed to get them level with each other and the Fuselage front to back and side to side.

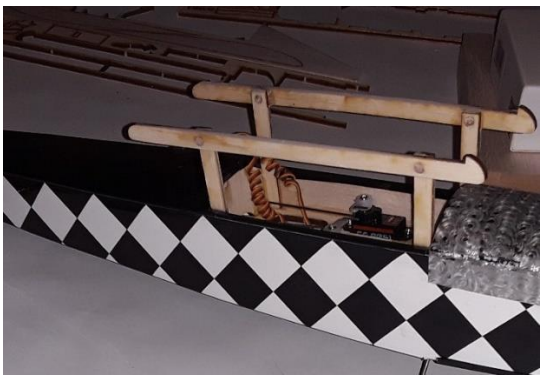
Double check the Horizontal Stabilizer saddle is still level, adjust as needed and re-check and set the Cabane Saddles.

Take your time, check a couple times and you will have a nice straight setup.

Gluing up the assembly can be completed once you are satisfied that your Saddles are straight and true with one another.

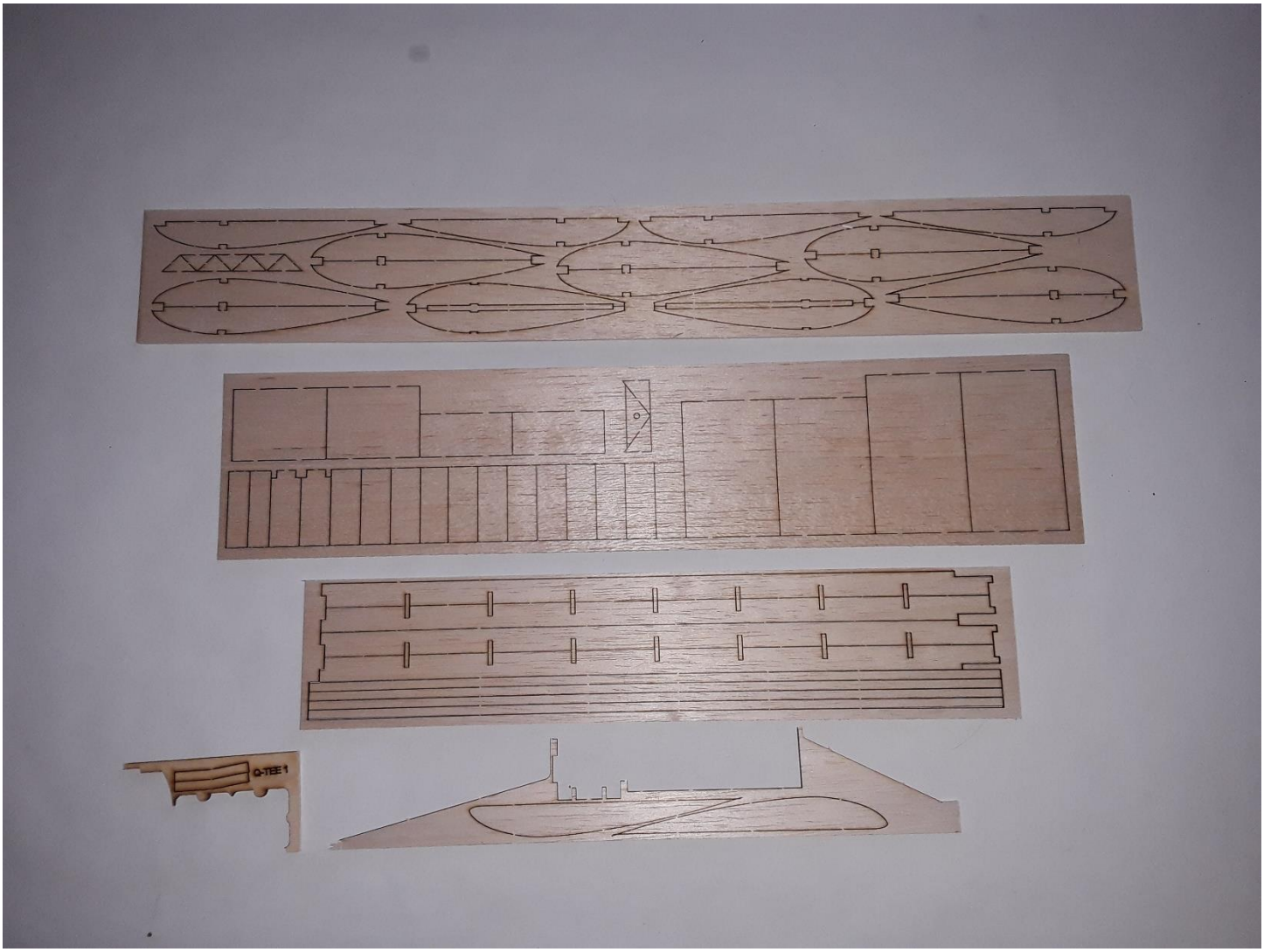
Note: We suggest using thin CA and letting it wick in the joint down the length of the Cabane upright. If you feel the need to use Epoxy, we suggest using 20 minute setting to allow for time to re-adjust the alignment before it sets up. Adhesives such as Titebond can set up in a matter of minutes and isn't suggested unless you are Familiar enough with it's use and your abilities to create the correct alignments.





Wing Assembly:

Like all the Willy Nillies kits, the wings have been designed to be self-jigging and can be assembled on a flat surface.



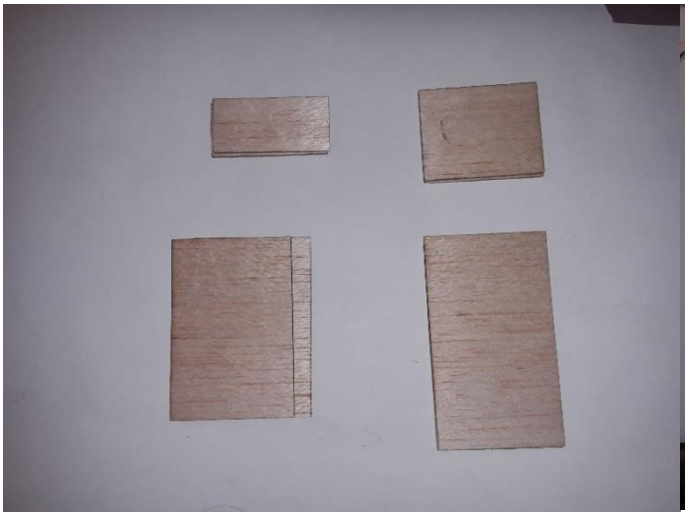
Top Row; **Sheet 1**, Wing Ribs, Triangle braces. **Second row**; Wing center section sheeting, Shear Webs.

Third row; Spars, Leading and Trailing Edges. **Fourth row**; Dihedral Braces and Wing Tips.

Punch out the parts taking care to sort them into like groups for ease of assembly.

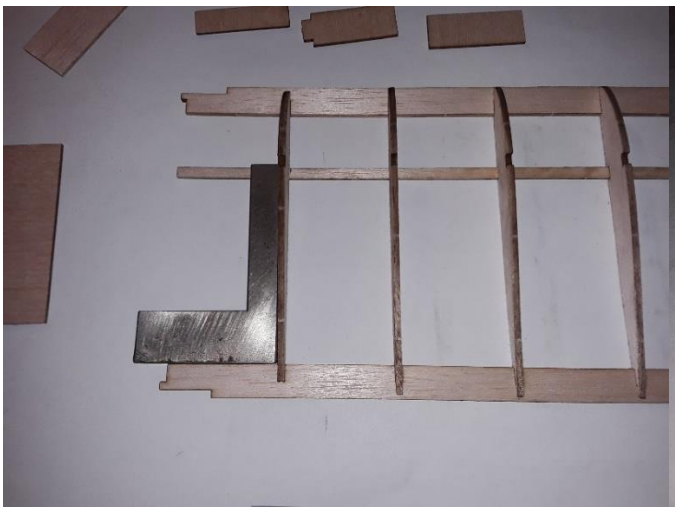
A light sanding will remove any nubs from the laser process so that parts will lay flat in position.

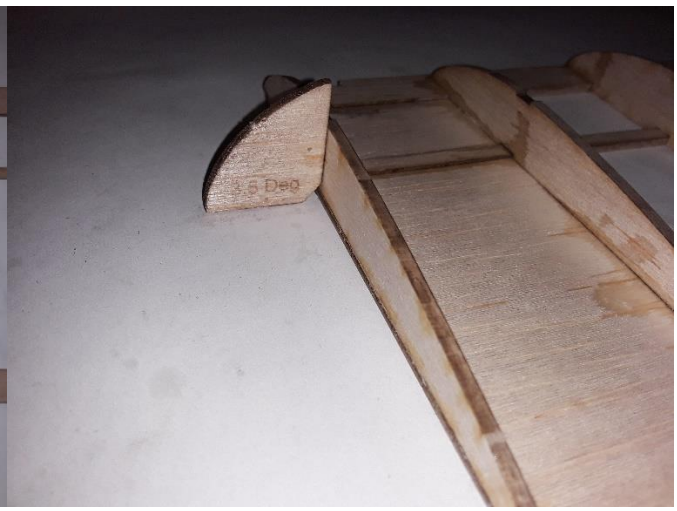
The Leading and trailing edges are designed to be identical so there is no need to try and identify one from another.



The first picture shows the wing center section sheeting. The pieces on the left are for the bottom of the wing and the pieces on the right are for the top of the wing. They are easy to tell apart since the tops are longer to go around the curve of the Ribs.

The second picture shows the parts layout of a wing panel, with the 2 smaller ribs for the center section sheeting placed at the notched ends of the Leading and Trailing Edges. The Shear webbing in the upper left corner are for the first three bays. The short one where the sheeting covers the ribs, the notched one where the web meets the sheet extension and a full height for the 3rd bay. There are enough shear webs to go all the way to the tips, however, the wing is plenty strong with only the first three bays shear webbed. **Note: Beginning builders should add all the webs to help keep wing from bowing during covering.**



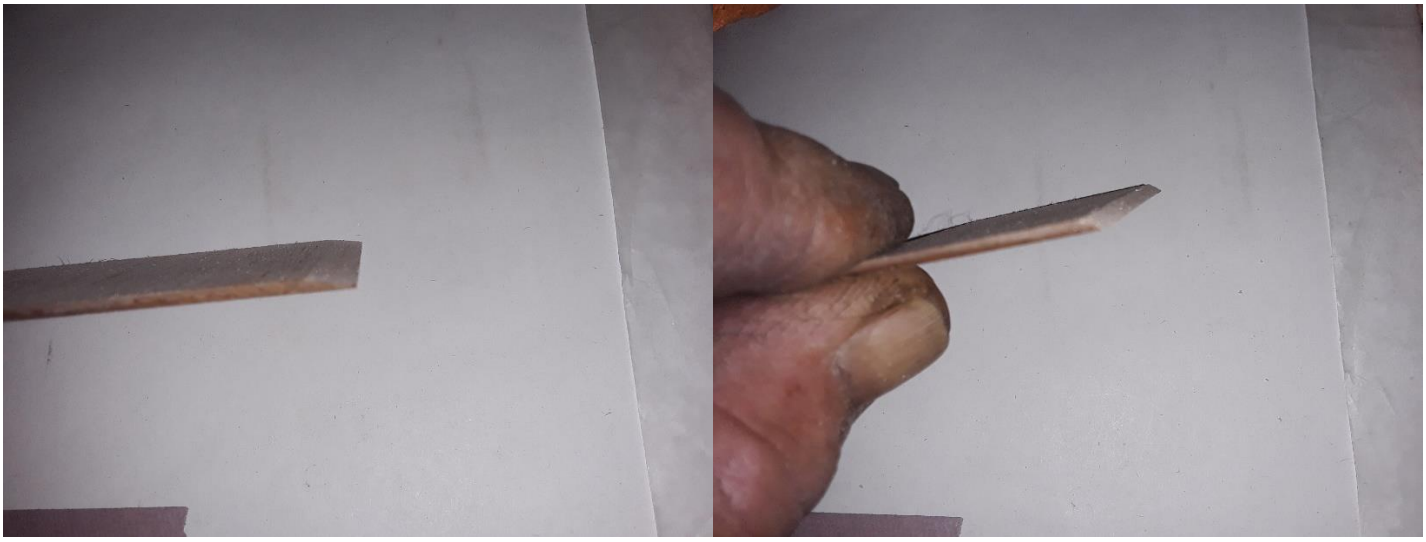


Start by placing the ribs into the slots of the Leading and Trailing edges and over the lower Spar. Checking for square is done as a habit of good building practice. Note that the root rib is left off for the step as well as the Tip Rib. Once you are satisfied with the layout you can apply Thin CA to the joints.

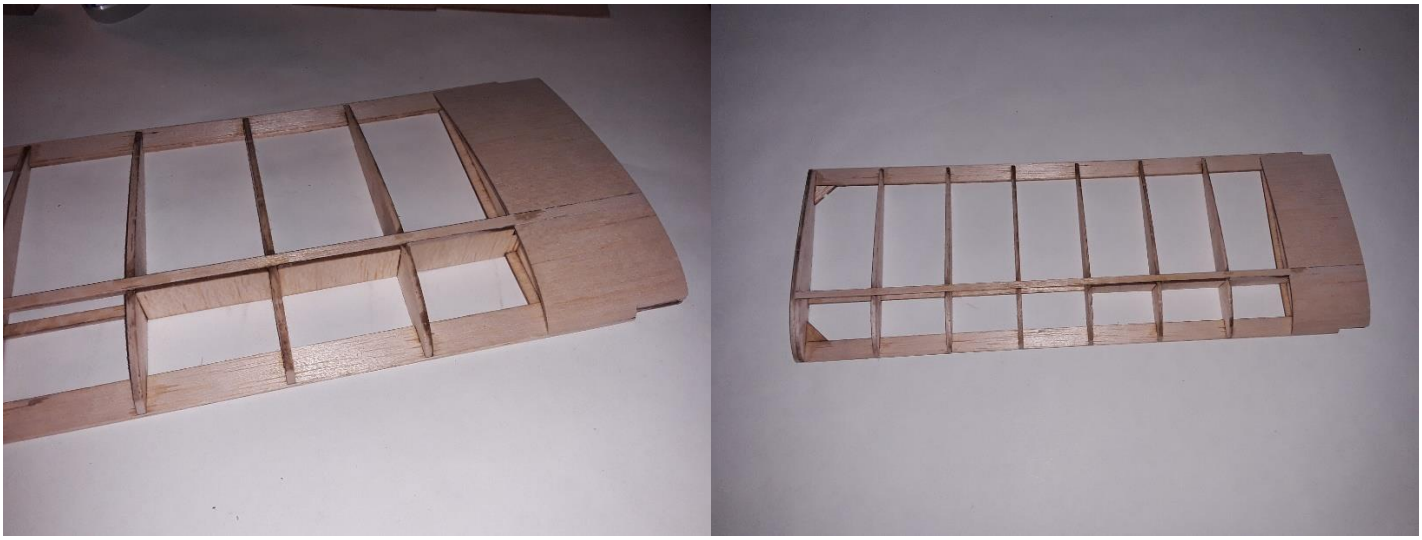
Use a scrap of balsa cut to the 3 1/2-degree angle for setting the Root rib. Here I'm using the gage from the S-Tee. Place the bottom sheeting in position and set the Rib in place. Again, use Thin CA to glue up the assembly.

The Tip Rib and top Spar can be installed at this time and glued in place.

Note: When you lay out the second wing panel, make sure you have a Right and Left. The Tip ribs will be at the opposite end of the Panel.



These pictures show the sanded angle in the top sheeting where it meets the Leading and Trailing Edges. The Rear sheet is on the Left, the Front sheet on the Right.



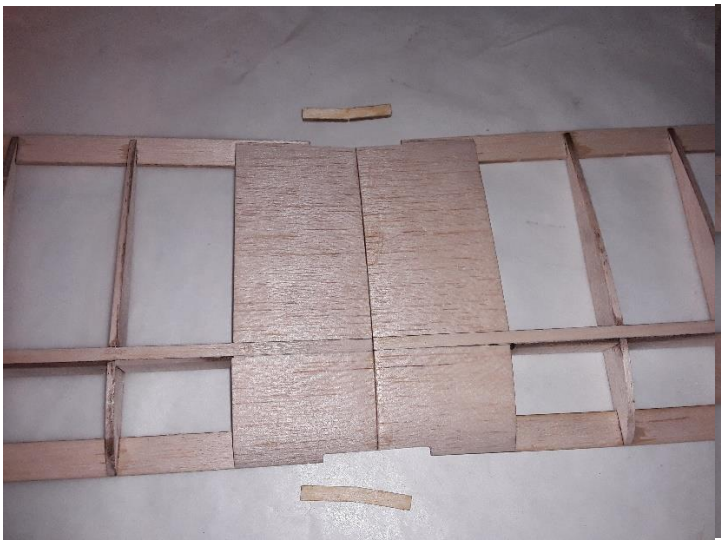
Medium CA is applied to the Ribs, Trailing Edges and the Spar Edge where the sheeting meets. Carefully butt the sheeting to the Spar and roll the sheet down to the Leading or Trailing edge. Holding it in place for a moment to allow the glue to set.

Add the 2 Triangles in the corners of the tip rib as shown in the picture.

Once these steps are completed, trim the Spars as needed and flat sand the sheeting to the Ribs of the Center section and Tip Rib. A sanding block as noted earlier is perfect for this job and will help keep the sanding flat and squared to the Ribs. Note the Notches of the Leading and Trailing edges are at the Wing root. These notches will be used for the Dihedral Braces when joining the wing.

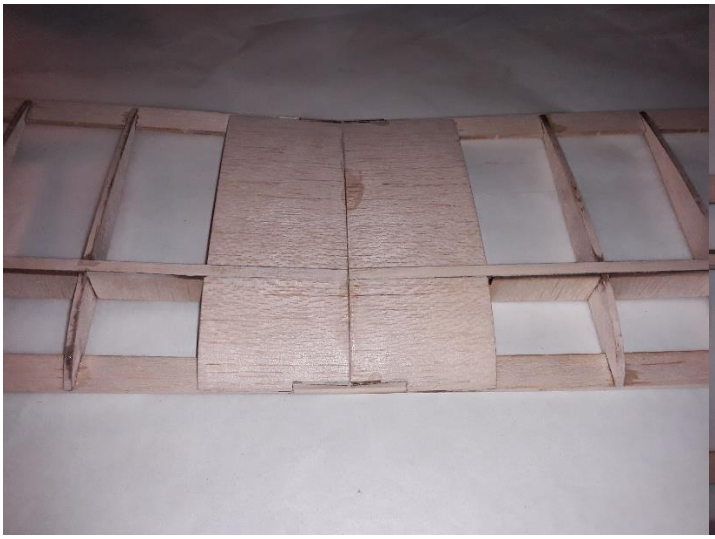
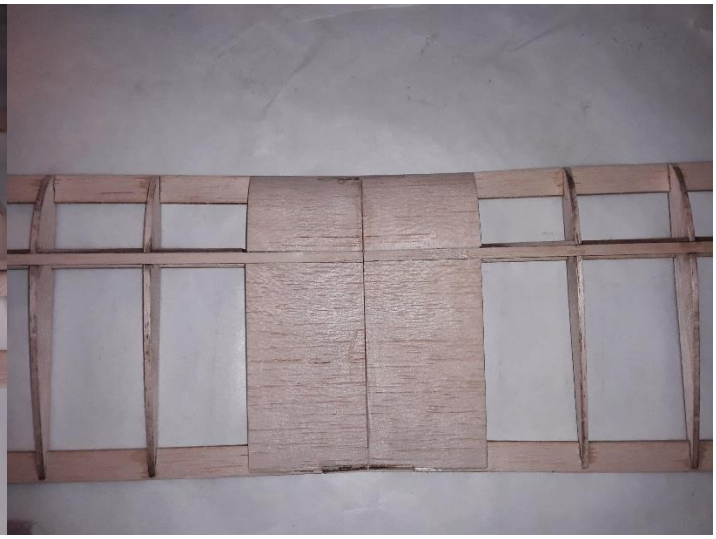
The Wing Tip Plate can now be glued on using the Med CA and finish sanded to shape.

Take your time and build the second panel the same as the first making sure you make a Left and Right Panel. Double check BEFORE you glue. Believe me, this happens more than you think.




Once you have built both panels, fit them together and check that the center joints are square to each other with your dihedral of 7 degrees. The 7 degrees can be checked by raising one wing tip up 1-11/16” (1.6875”/43mm) total under the one wing tip. Bond the 2 halves together using Med CA or a thin coat of Epoxy applied to each half and putting them together.

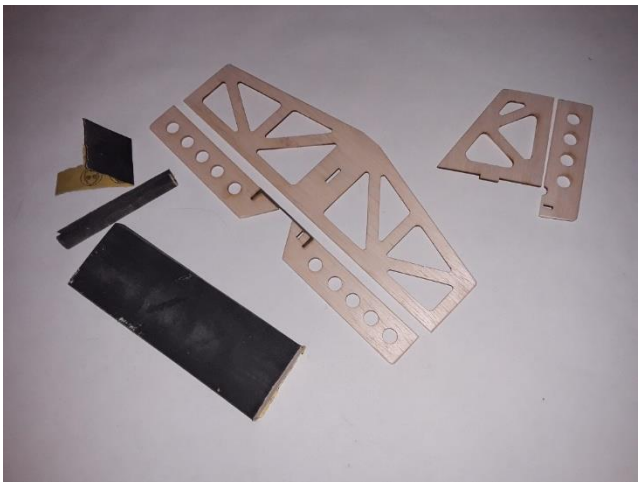
Trim the Sheeting to the notch of the Leading and trailing edges and test fit the Dihedral Braces. Once you are satisfied with the fits, bond them in place using Medium CA or Epoxy.

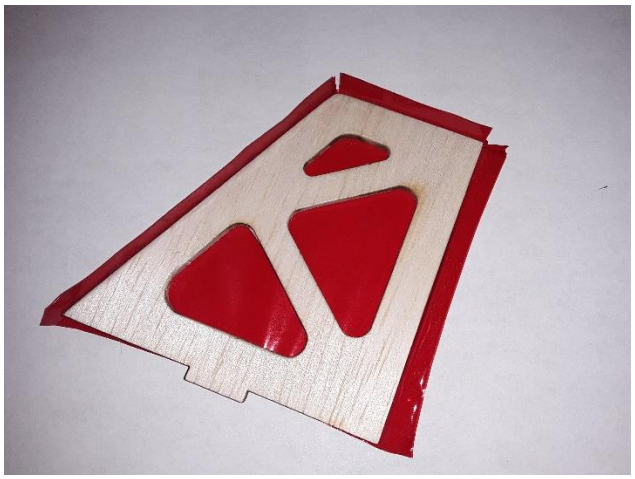
Once the adhesive has cured sand the braces to the shape of the wing and finish sand your assembly. Working your way up to a 400 to 600 grit paper.

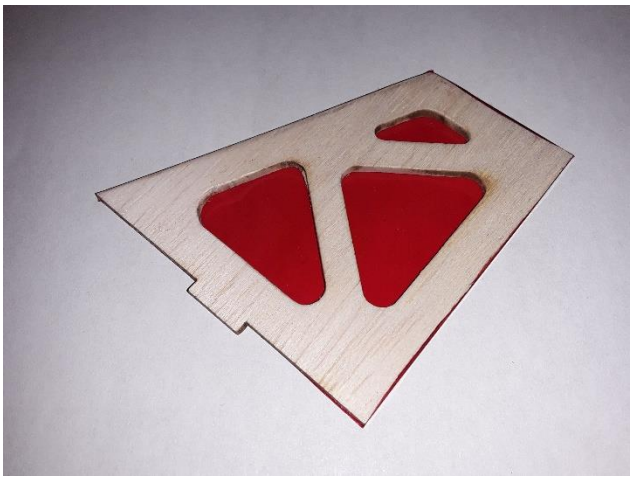
Congratulations! Your wing is now completed.

Putting It Together:

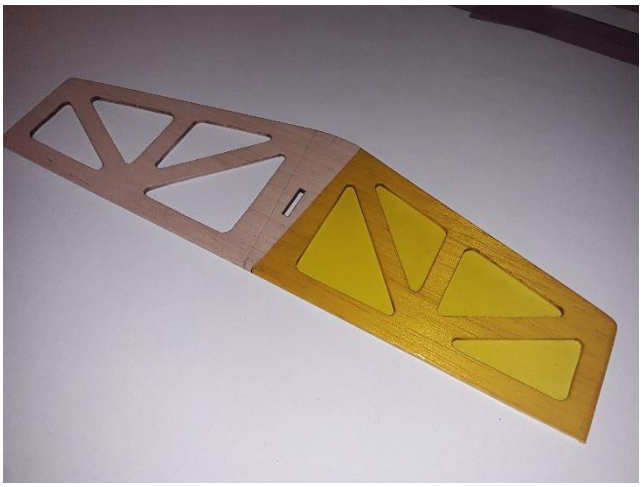
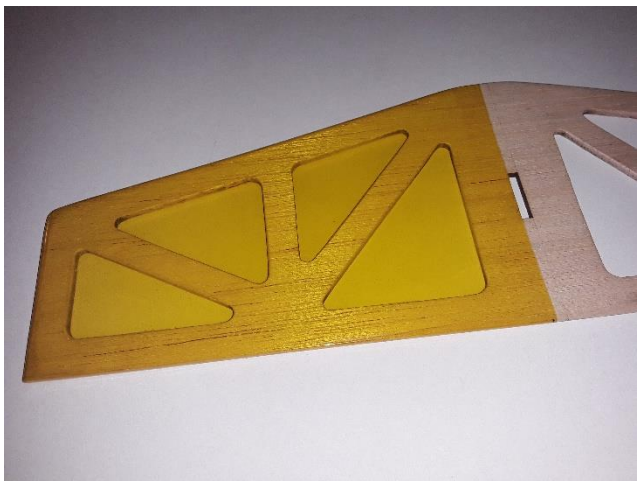


Sanding in preparation for covering starting with 220 grit and working to 600 grit. The sanding block is ¾”x2”x6” and is used for the nice flat surfaces and rounding the edges of Leading and trailing edges. Just like painting, time spent here can not only create a nicer finish, but also shave weight from the airframe.





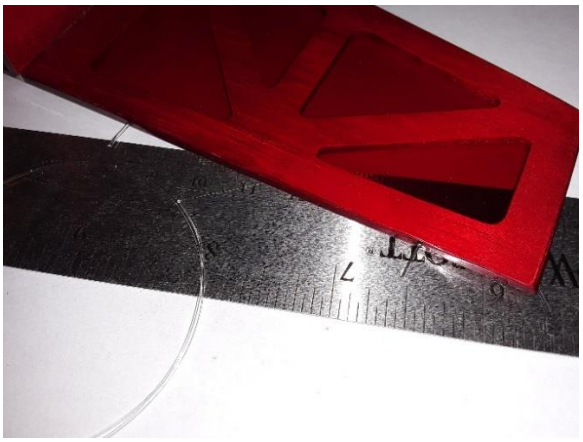
Covering is the same as we did with the Fuselage, tack down the edges, trim excess and relieve corners, roll around edge and trim. Do BOTH sides BEFORE shrinking. You may want to iron in the perimeter edge before shrinking so there is less chance of pulling loose. A small pin prick in the covering near a cutout will keep the covering from ballooning.
Note the tab is left bare.

Horizontal Tail marked for locating the Vertical Tail and the Fuselage. Start covering from the bottom so that the Edge seam will end up on bottom. When covering you can either cover your marks and cut the covering away or tack your first edge slightly inside the lines so no cutting is required once you are finished.

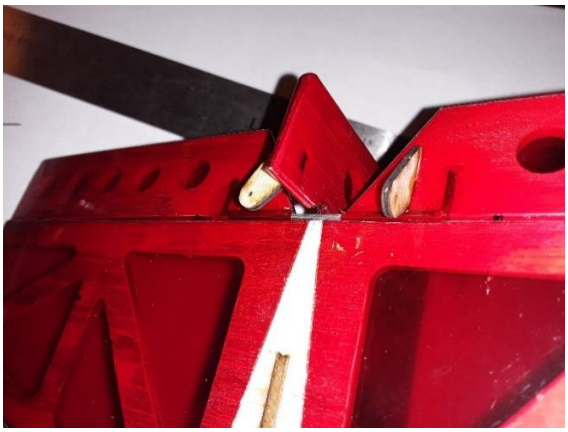
Hinging:



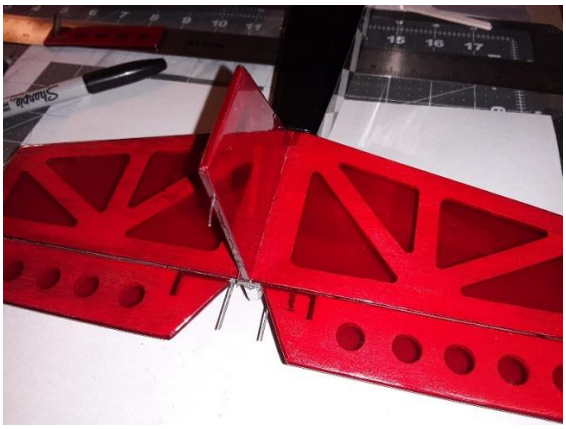


The fishing line included in the kit is for making hinges. Start by marking the locations with the two surfaces aligned. For the Horizontal Tail the marks are ¾" and 3-1/4" from the ends on each side. For the Vertical Tail they are marked ½" and 2-1/4" from the tip. Use a Tee Pin to make the holes about ½" deep in each location.

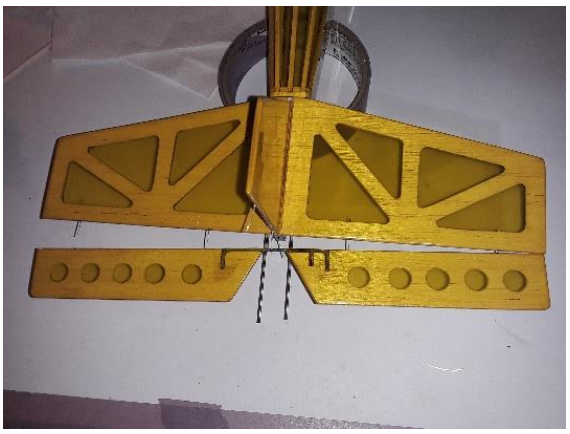
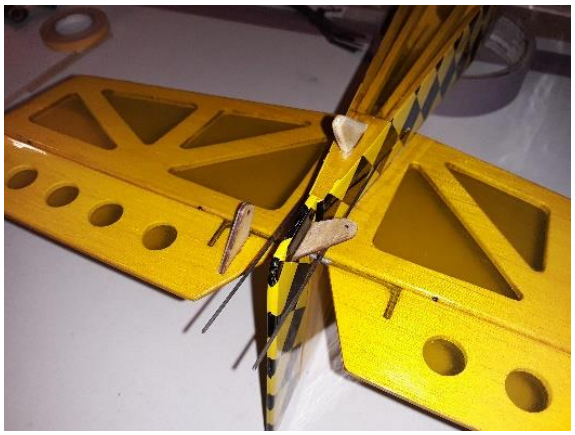
The line is cut to ¾" long and pushed into the surface to 3/8" deep. A drop of CA is used to secure them. It's best to wait and glue the Hinges in the moving surfaces once the Tails are installed on the Fuselage




install the Control Horns by trimming the holes as needed and install with Medium CA.

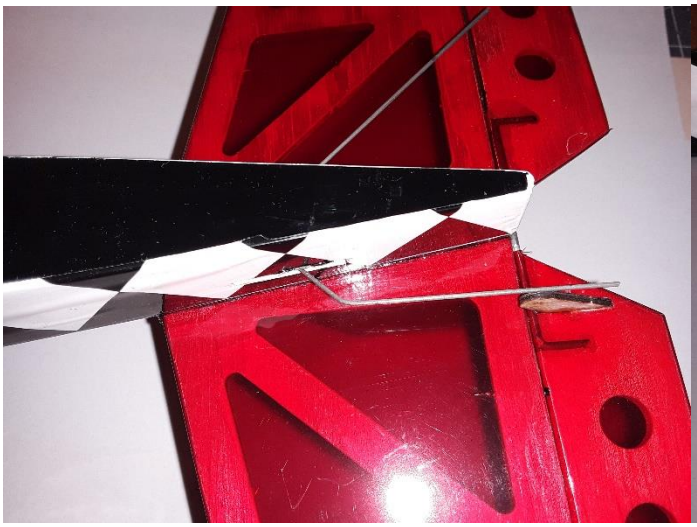



Test fit he Tails to the Fuselage prior to glue up. Check the saddle for squareness to the Cabanes one more time blocking it up the same as before. Once you are satisfied with the alignments, you can choose to do the gluing with Thin CA, Medium CA, or an Epoxy. The Epoxy is the most forgiving because 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.

Attaching the pushrods to the surfaces:



In the first photo, the pushrod is bent at a 45-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.

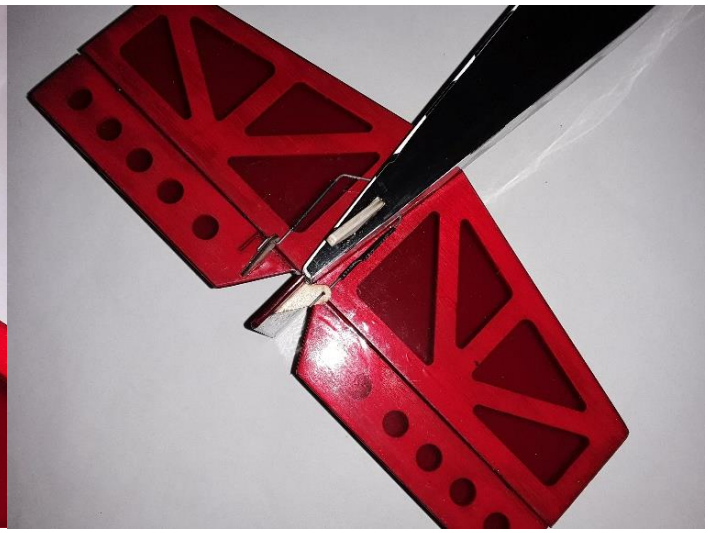
Once the first bend is made, you can re-install the arm and center the servo again. The second bend is made to align the rod with the control horn.

Trim the pushrod to length and rough up the surface with 400 grit sandpaper. Slide the heat shrink tube up the rod and install the “Z” bent control rod in the control horn. You may need to trim the length but keep it as long as you can.

Rough up the control link the same as the pushrod and install it into the Control Horn. 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.

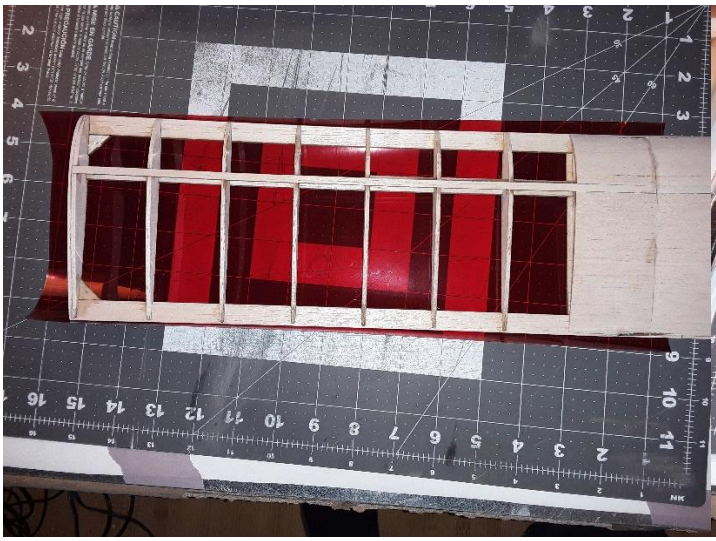
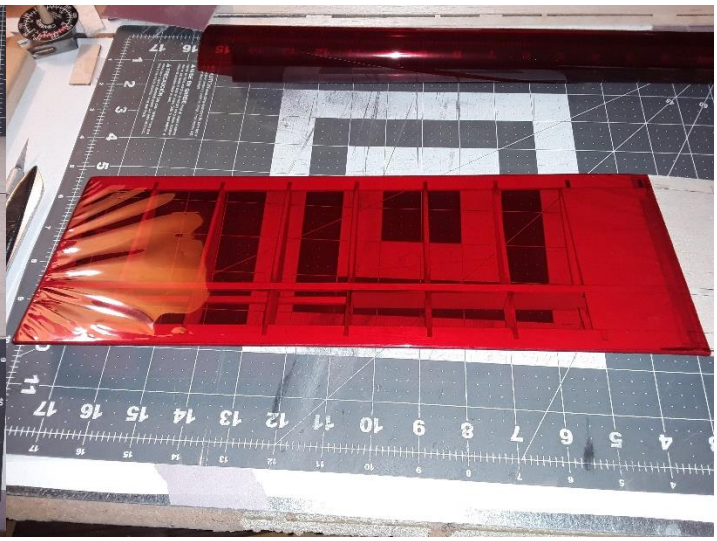
Align the two surfaces and apply Thin CA to the ends of the heat shrink letting it wick into the joint.

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.



As with the Control Horns, trim the slot and covering to install the tail skid with Med CA.

Covering Tips for the Wing:

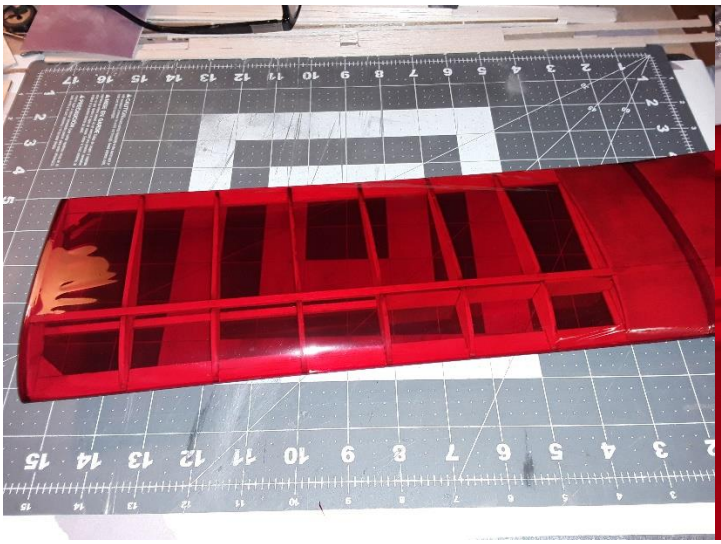



Cut your covering in panels leaving enough edge to pull and wrap around the surface edges. Note there is extra at the wing tip so we can cover it at the same time.

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, or the Tip Rib and Spar. You only need the one hole in each panel to allow the heated air to escape from the inside of the wing.

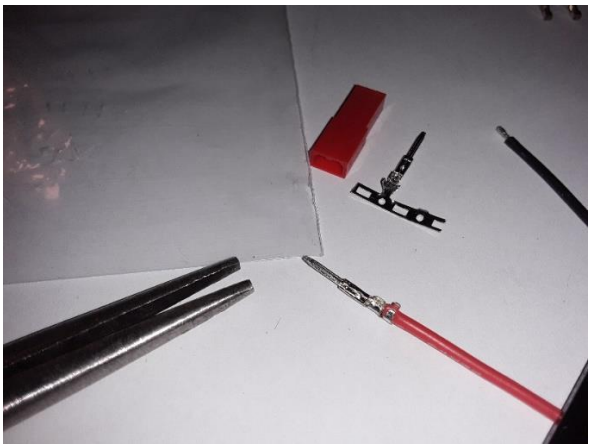
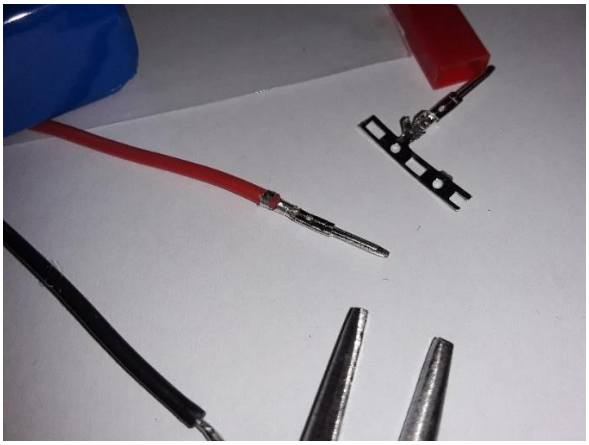
Go over the panels with your Iron lightly, work the top, then the bottom of each panel shrinking them a little at a time. This will help keep from shrinking a curl into the wing by evenly shrinking all the covering. Take your time, you'll do fine.

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

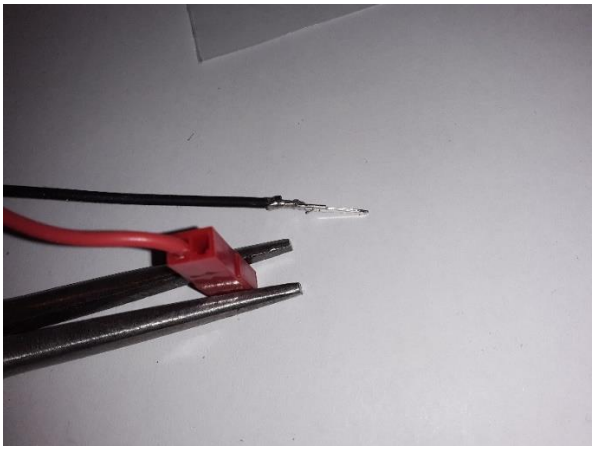
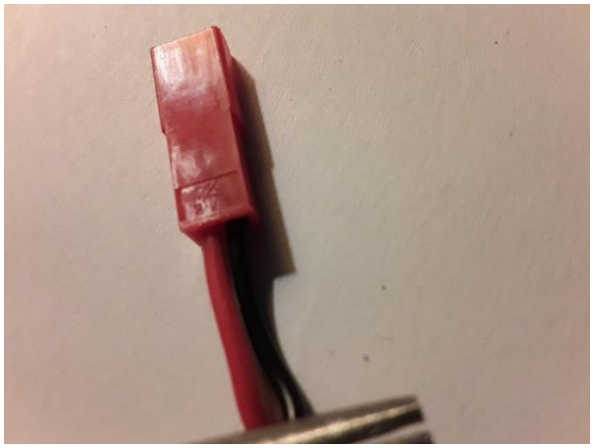
Adding washout to the wing helps reduce tip stalling associated with Rudder and Elevator only planes and has been used on many designs with Ailerons as well. These wings are flexible this process is fairly easy. Twist the wing up slightly at the trailing edge of the Wing Tip and running the iron over 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 ¼". Most importantly, make both sides the SAME!

Details and Finishing up:

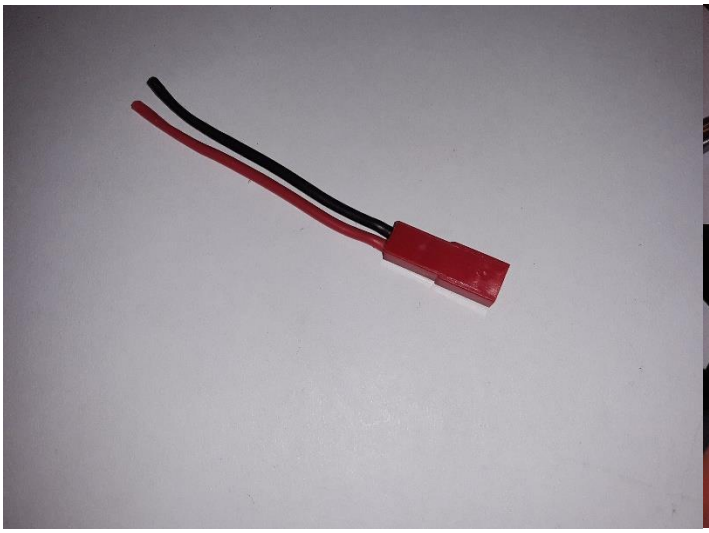
With the Horizontal and Vertical Tail surfaces installed you can finish hinging the Rudder and Elevator. It is easily done by tilting the surface, start the first line in then push each of them in one at a time. Once they are all started, push them up tight and then flex the surface about 30-degrees in each direction this plenty to set the gap. If you sanded a 45-degree angle on each side of the surface edge, the gap should be minimal. Finish with a drop of Thin CA in each hinge.

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.

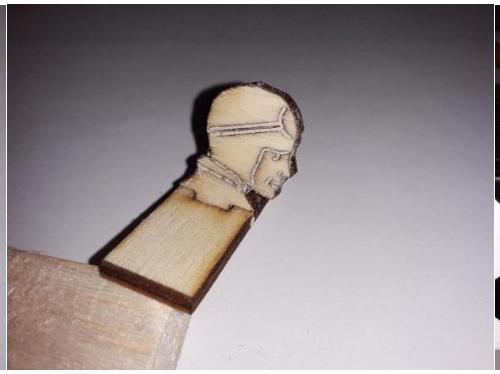
The small, raised tab on the pin you see on the black wire is aligned to the small notch in the hole of the connector. Slide the pin in until it locks in place. Give a tug to ensure it is locked. The second picture shows the Red wire in hole #2 and Black Wire in hole #1, if in doubt, put the connector 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 pigtails installed the can be soldered directly to the pc board 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.

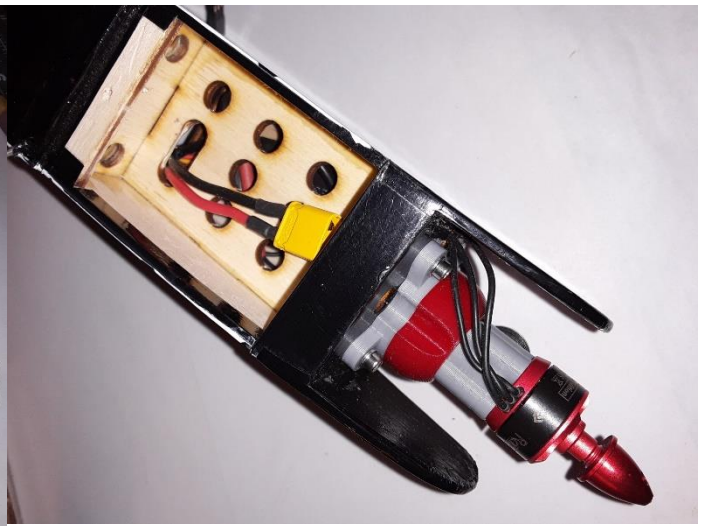


(1) Sometimes the Laser cutting causes the pilot to fall out in pieces. Tape the back of the Pilot before popping out of the Plywood so it comes out as one piece. Use Medium CA to fill the cuts and then sand the surfaces of both sides lightly.
(2) The supplied Pilot sitting on the mounting plate for painting.

The supplied Pilot and mounting plate are shown in place. This model will be getting a painted plastic bust mounted in place of the included Pilot.

The Wheel Collars are the round Plywood discs and are installed as shown using a dab of 5-minute Epoxy on the outer sides where they meet the wire. Depending on the size wheel you use, you may need a wrap or two of cellophane tape wrapped around the axle to take up the slop.

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.



Finish up the radio system installation by installing the ESC under the front Upper Cowling and running the motor and Battery wires through the holes in the tray. The 2nd picture shows a slot cut between 2 of the holes to fish the bigger XT30 connector through to the Battery compartment.

For the best Weight and Balance on this model we've found that with the Battery in the Lower Hatch, the ESC under the Front Turtle and the receiver ahead of the Servos usually gets us spot on for the Brushless motor setup with the .020 Motor Mount. The Receiver can be located depending on the space needed and the balance of the aircraft. Opening up the unused Throttle Servo hole for placement of your receiver is an option as well.

Changes to the build, weights of different brands of coverings or use of the Nitro motors, especially with a separate tank will require moving things around to achieve your proper balance.

Don't get discouraged if you find you need help, come to the FB group page and ask for assistance, there are members that have made these changes that can assist.

NOTE:
The ESC's come without connectors. These pictures show the use of the 2mm bullet connectors between the Motor and ESC. The Bullet connectors are available through Willy Nillies. Optionally, you may solder these wires when installed in the plane to save weight. Marking the wires after testing rotation direction before installing in the plane will save you from changing wires in the cramped area.

The small 2s Batteries come with JST connectors standard. The XT30 battery connectors shown in the picture were the choice of the builder. As with the ESC connections, the choice is up to you to decide. The Bullet connectors and JST plugs are available as a package through Willy Nillies.