

# Cessna 180 Builder's Manual



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## Required Equipment

- ❑ Xacto with #11 blades
- ❑ Thin and Thick CA – Cyanoacrylate glue (Super Glue)
- ❑ Sanding block with 200 grit sandpaper
- ❑ Smooth, flat work table
- ❑ Wax paper to protect plans
- ❑ Needle nose pliers
- ❑ Wire cutters
- ❑ 1/8” drill bit
- ❑ Hobby Iron for applying covering – also called a sealing iron
- ❑ Three channel radio
- ❑ Two micro servos: Hitec HS55s or GWS Picos recommended
- ❑ GWS IPS DX A motor with 9x7 propeller
- ❑ Electronic Speed Control (ESC) capable of handling at least 2 amps
- ❑ Battery pack: 7 cell 300mAH Nickel Metal Hydride recommended

## Parts List

- 1 ea – 1/32” laser cut balsa sheet
- 4 ea – 1/16” laser cut balsa sheet
- 1 ea – 1/8” laser cut balsa sheet
- 1 ea – 1/32” laser cut plywood sheet
- 1 ea – clear plastic windshield sheet
- 2 ea – 3/16” x 3/16” x 18” balsa leading edge
- 2 ea – 1/8” round x 1/2” hard wood wing dowel
- 1 ea – 1/16” plywood battery holder
- 2 ea – 1/16” x 5.5” main landing gear wire
- 1 ea – 1/16” x 2.625” tail landing gear wire
- 2 ea – .025” x 18” thin music wire for pushrods
- 2 ea – 10.25” plastic pushrod tubing
- 1 ea – 2” Heat shrink tubing for pushrods
- 1 ea – 1/2” Heat shrink tubing for wheel retainers
- 1 ea – 6” Velcro strip for mounting the battery and receiver
- 1 ea – 4” Tail Tire Rubber
- 2 ea – 3/32” x 3/4” Aluminum wheel axles
- 1 ea – 3/16” x 5/16” x 2 1/2” Motor Mount Stick
- 2 ea – Light weight wheels
- 1 ea – 4-40 wing screw and blind nut
- 2 ea - .060” x 3.25” carbon fiber rod

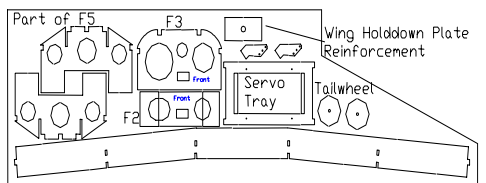
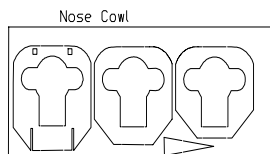
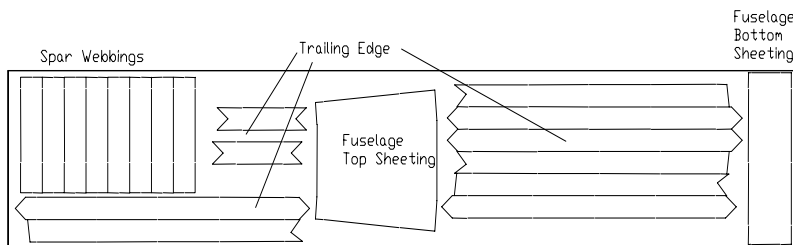
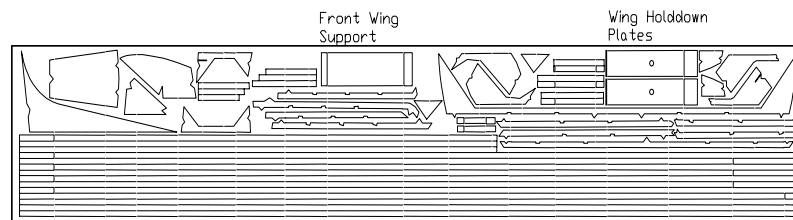
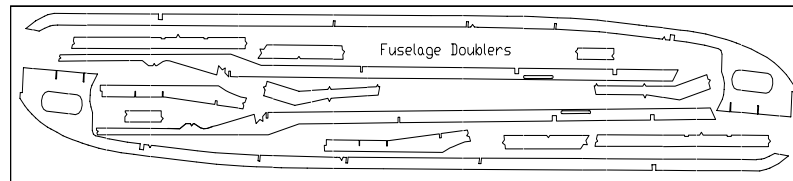
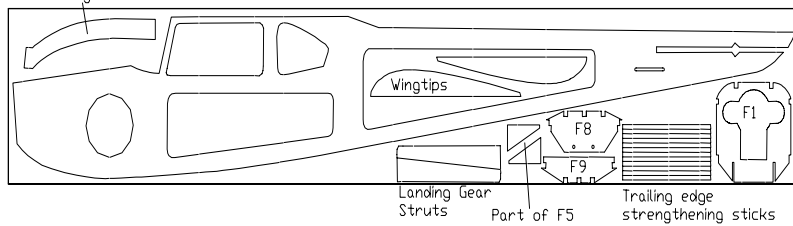
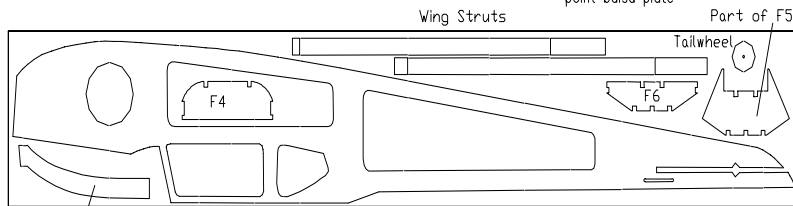
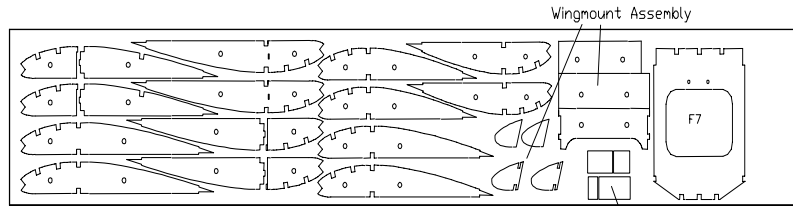
## Specifications

Wingspan: 36.5”

Wing Area: 200 sq. in.

Weight: 8 ounces AUW

Wing Loading: 6 oz/sq. ft



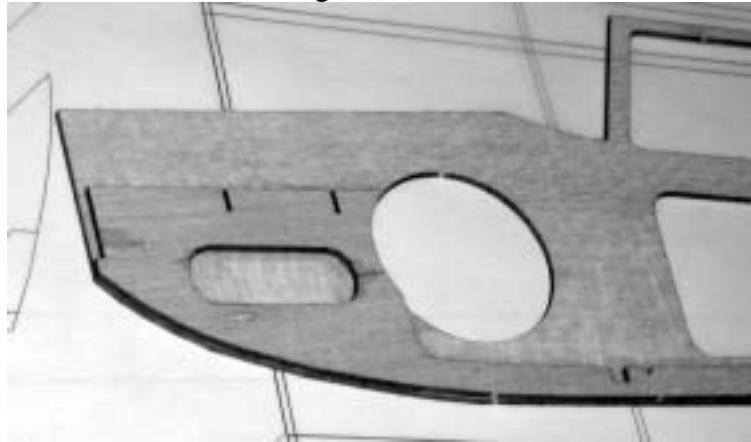
# Cessna 180 Assembly

## Tail Wheel Assembly

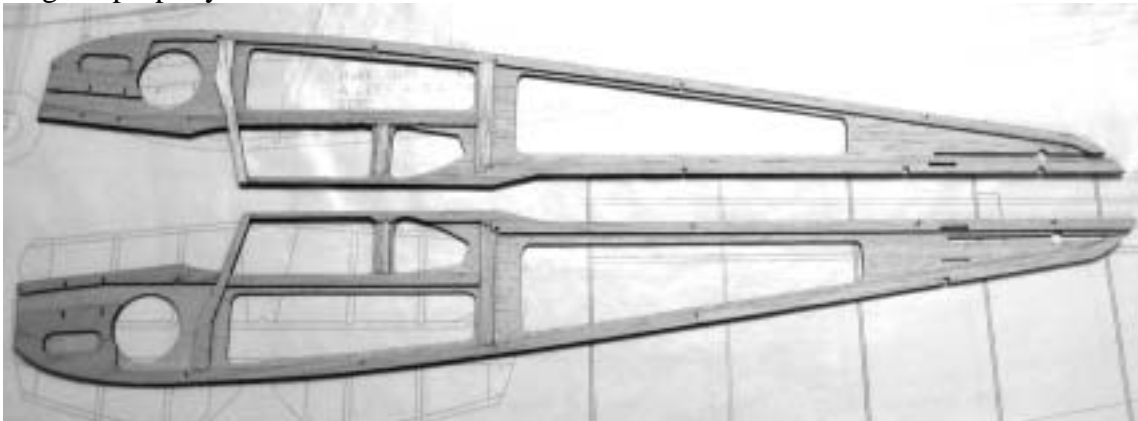
Sandwich the 11/16" diameter by 1/16" thick balsa tailwheel disk between the two 11/16" diameter by 1/32" thick plywood disks. Ensure the holes are lined up, then flow thin CA around the rim of the wheel. Wrap the wheel rubber around the wheel to measure it and cut it 1/16" too short. Be sure the ends are square. Place a small drop of thin CA to one end and press both ends together to form a ring. Give it a minute to dry then roll the ring on to the wheel and center it. Flow some CA around the ring to glue it into place.

## Fuselage Assembly

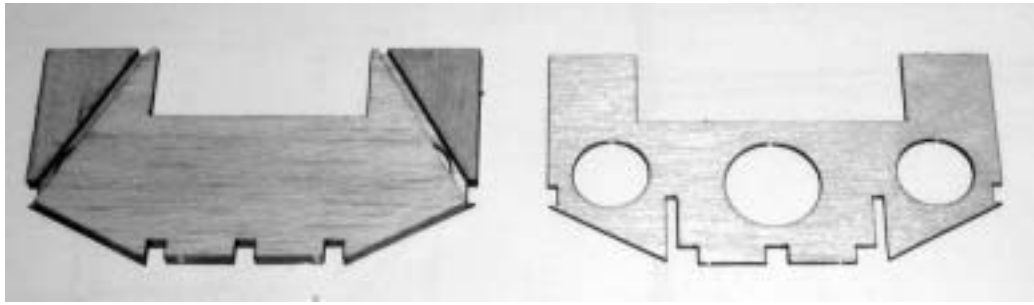
- ❑ Lay the two fuselage sides on a sheet of wax paper. **Make sure you lay them opposite of each other so that you have a left and right side.** The two sides are different in that the pushrod exit holes are in different places. Don't worry now about which side is which. That will happen when you install the control horns.
- ❑ Glue the bottom fuselage doubler to the fuselage side with thin CA. The doubler should be flush with the bottom and the front of the fuselage.



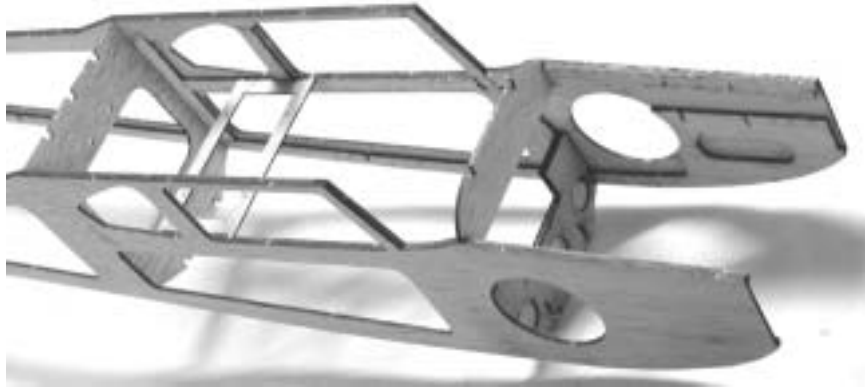
- ❑ Glue the remaining fuselage doublers into place. Position them before gluing to check that they are aligned properly.



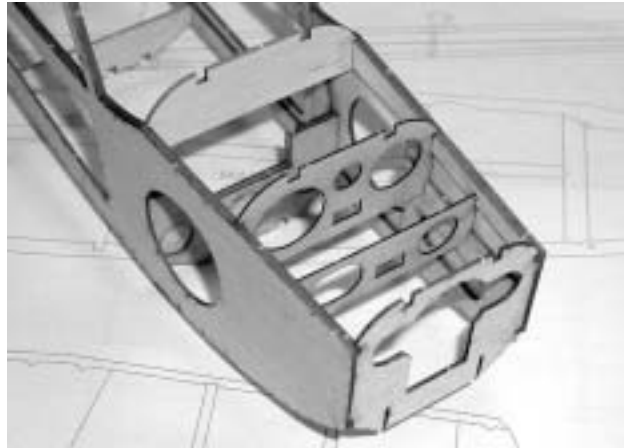
- ❑ Glue up the landing gear bulkhead F5 which is made up of two 1/32" plywood parts, one center 1/16" balsa part, and two 1/16" balsa triangles. Lay the center balsa onto one ply part, lining it up with the square notches on the bottom and glue with thin CA. Line up the triangular balsa with the outer edge of the ply part. The gap between the balsa parts is where the 1/16" landing gear wire will slide in later. Glue the other 1/32" ply part over the balsa parts forming a ply – balsa – ply structure.



- ❑ Attach the fuselage sides by positioning bulkhead F7 between the fuselage sides. Ensure that everything is square and glue with thin CA. Next glue the 1/32" plywood servo mount tray in place. Finally, glue F5, then F4, then F6 in place.



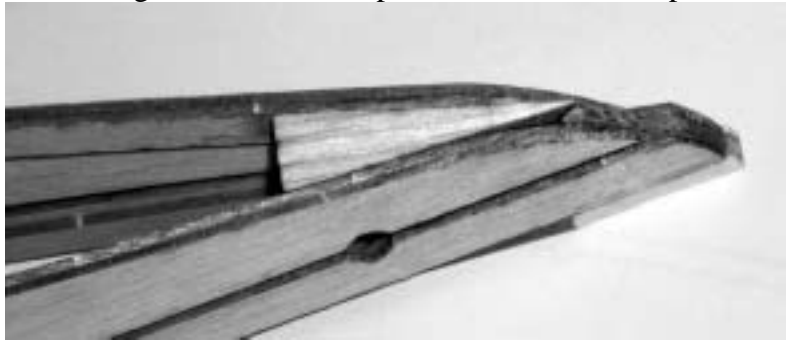
- ❑ Position and glue formers F1, F2, and F3. Be very careful with F1. Until the nose cowl is glued in place, F1 is very fragile. **NOTE: F2 and F3 must be oriented properly. Ensure the word "Front" faces forward.**



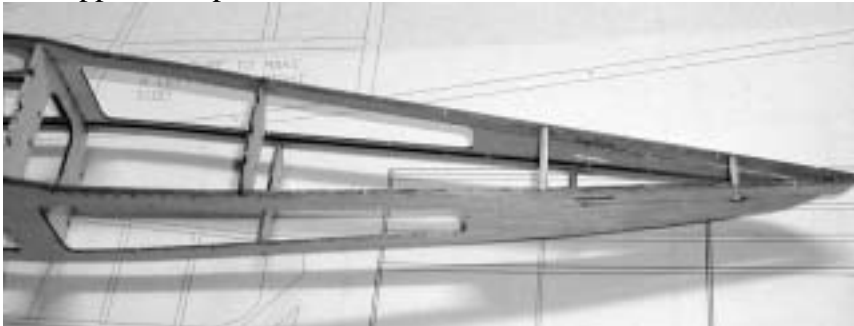
- ❑ You will now need to sand the fuselage doublers in the back so that the fuselage sides can come together at an angle. The easiest way to do this is to place some sandpaper between the fuselage sides while gently squeezing the sides together. Pull the sandpaper out and repeat till the very tips of the doublers are gone allowing the fuselage sides to touch.



- ❑ Glue the 1/4" balsa triangle between the fuselage sides at the bottom of the fuselage where they join in the back. This triangle will be used to provide an attachment point for the tailwheel.



- ❑ Glue bulkheads F8 and F9 in place and glue the backs of the fuselage sides together. There are two places on the top of the fuselage and one place on the bottom where you will need to glue a 1/8" square balsa support into place.



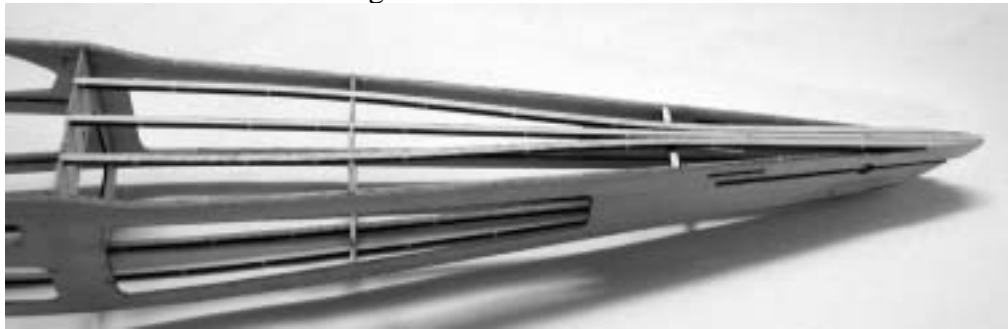
- ❑ Glue the two 1/16" balsa bottom front stringers between F1 and F5. Note that they extend past F1.



- ❑ Glue the three 1/8" square bottom rear stringers into place starting with the center stringer. The stringers run from F5 to the tail of the fuselage. Extend the outer stringers forward 1/2" to connect to the two forward stringers you just glued. Sand the tail ends of the stringers to match the shape of the rear fuselage.



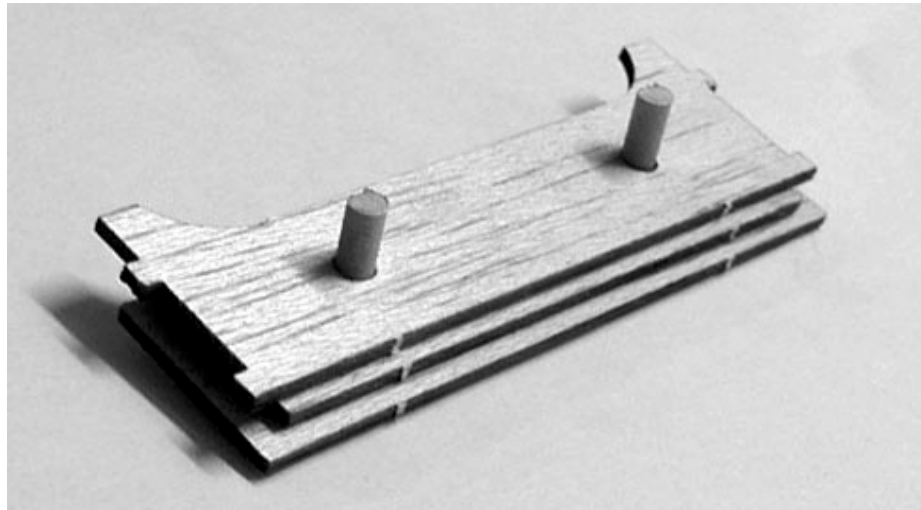
- ❑ Glue the three 1/8" square top rear stringers into place starting with the center stringer. The stringers run from F7 to the tail of the fuselage. Pull the stringers together at the forward 1/8" square cross stringer. This will give you a platform to attach the vertical stabilizer later. Sand the sides to match the sides of the fuselage.



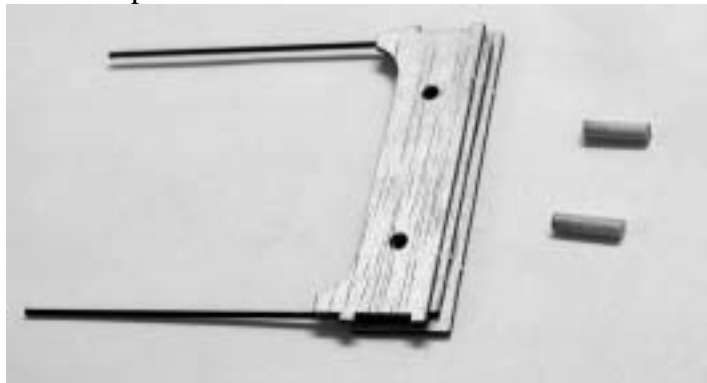
- ❑ Run the two pushrod tubes through the holes in F7 and F8 then out the slots near the rear of the side fuselage.
- ❑ Glue two 1/8" square stringers then the 1/16 plywood battery holder to the tops of F5 and F6. Apply some Velcro to the batter holder.



- ❑ Align the three front wing mount parts with the notched part in the front and the least wide part in the middle. To help with the alignment, insert the two 1/8" dowels through the holes. The tops of the three parts should be staggered and the bottoms flush with each other. The parts are staggered so that you can later sand them to conform to the shape of the wing.



- ❑ Set the assembly on top of the fuselage with the notched part flush with the front of the windshield post. This will make the parts angle back. Adjust the dowels so that they are parallel with the top of the fuselage and the front and back wing mount parts are resting on the top of the fuselage.
- ❑ Carefully remove the parts from the fuselage while holding them together so as not to lose their alignment to each other. Remove the dowels and glue the parts together. Position the .060" carbon fiber rods so that they are between the front and back part and even with the top of the notched part. Glue the carbon rods in place.



- ❑ Set the wing mount assembly back on the fuselage again with the notched part flush with the front of the windshield post and glue in place.



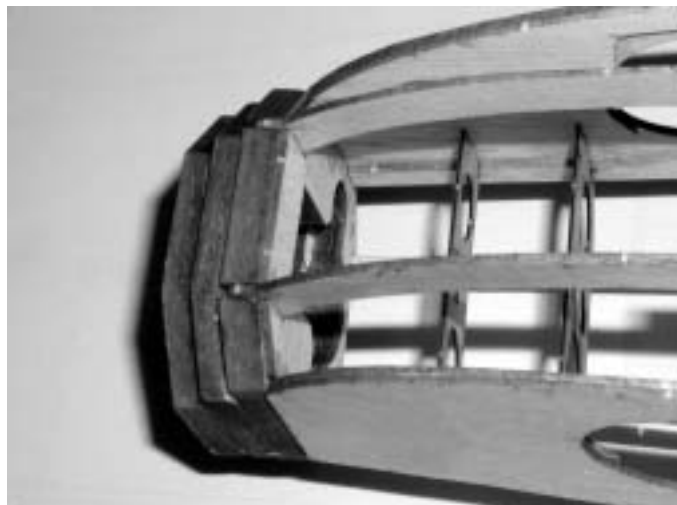
- ❑ Glue the two notched false ribs to the wing mount assembly then glue the smaller, non-notched false ribs inside the notched false ribs.



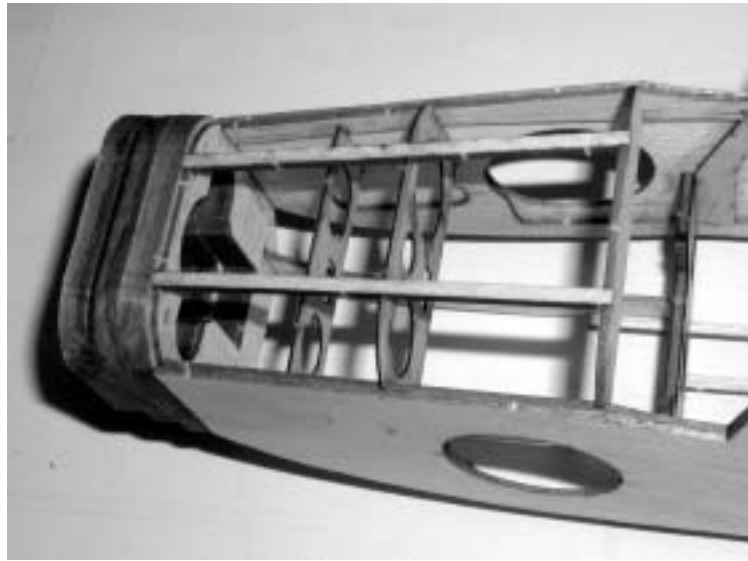
- ❑ Position the three nose cowl pieces so that the insides line up with the smallest piece first and the largest piece last. Glue them together.



- ❑ Glue the nose cowl to the front of the F1.



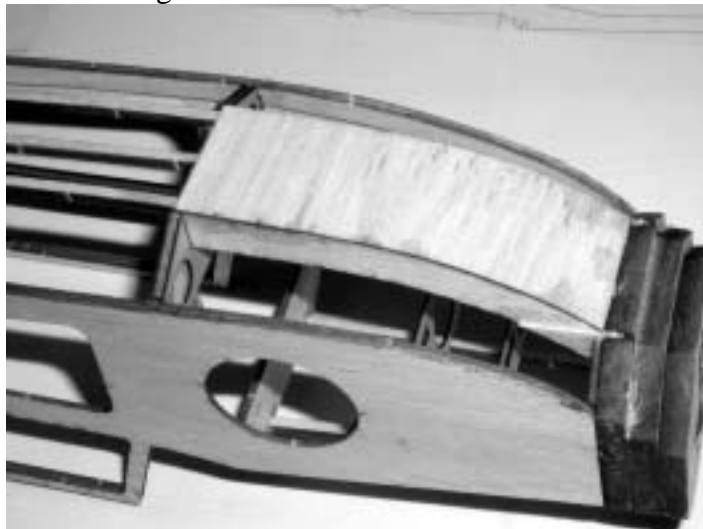
- ❑ Glue the two top front 1/8" stringers into place. Be sure to insert the stringer as far as possible into the nose cowl.



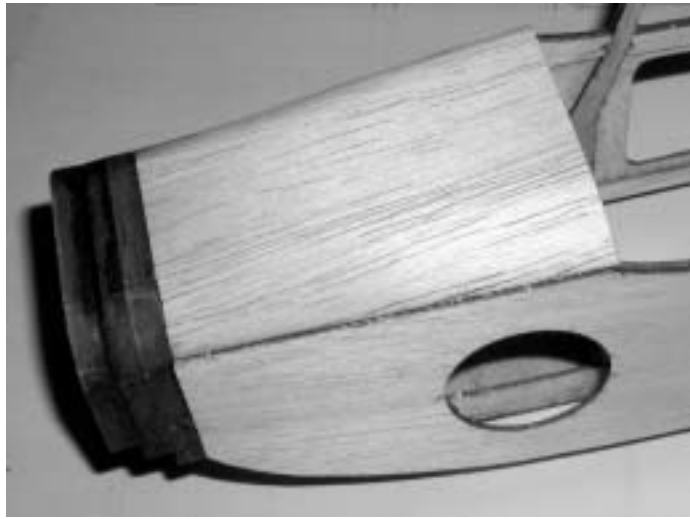
- ❑ Insert the  $\frac{3}{16}$ " x  $\frac{5}{16}$ " x  $2\frac{1}{2}$ " motor mount into F2 and F3. It should extend just past F3. Flow thin CA over the length of the motor mount stick to strengthen it.



- ❑ Sheet the two front bottom stringers with the  $\frac{1}{32}$ " x  $1\frac{1}{4}$ " x  $3\frac{7}{8}$ " balsa.



- ❑ Sheet the top front of the fuselage with the other  $\frac{1}{32}$ " balsa piece.



- ❑ Sand the nose cowl to shape.

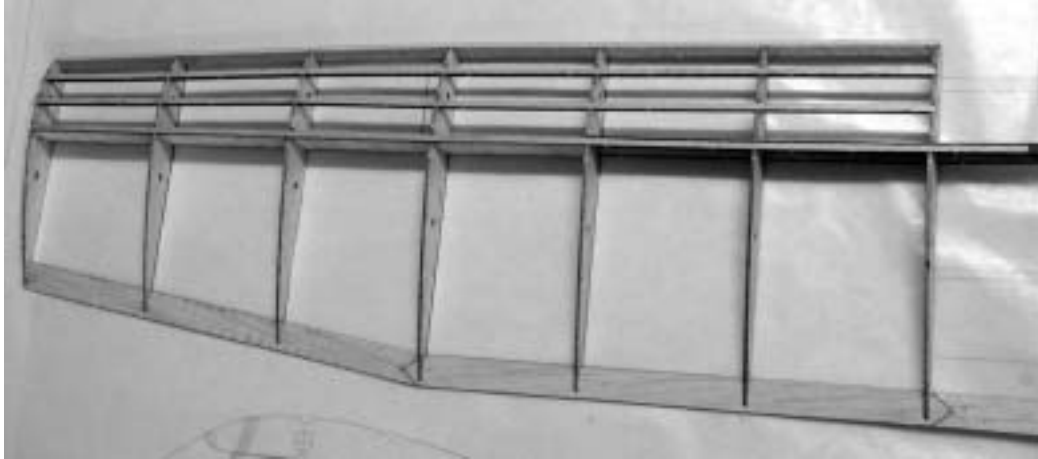


### ***Wing Assembly***

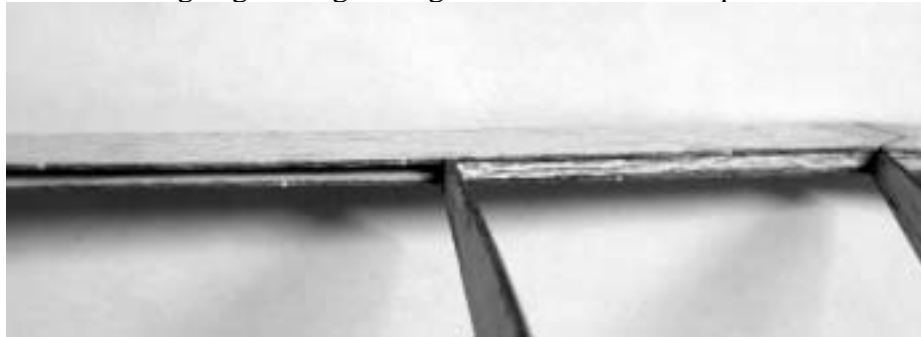
- ❑ Tape a sheet of wax paper over the plans to protect the plans and to prevent glue from sticking to them.
- ❑ Using the plans as a guide, make up two sets of trailing edges from the 1/32" balsa sheet. Set one aside and keep the other over the plans.
- ❑ Use one of the 1/8" square balsa sticks for a lower spar. With one end at the middle of the wing, cut the other end at the far left end of the wing.
- ❑ Position the 1/32" plywood center spar over the plans and glue the lower 1/8" spar to it. Just glue the end of the 1/8" spar. Glue two split ribs to the center spar in the center position.



- ❑ Rock the plywood center spar to the left so that the left side is touching the plans. Either weigh it down or just hold it there. Glue the rest of the 1/8" spar to the center spar.
- ❑ Glue another set of split ribs in the next location to the left of center. Glue the rib with the slit in the middle to the outer edge of the center spar.
- ❑ Glue the remaining left side ribs into place.
- ❑ Cut and glue the 1/8" square top spar to the center spar and ribs.
- ❑ Starting where the center spar ends, glue the 4 spar webbings between the top and bottom spar on the back of the spar.
- ❑ Glue the 3/16" square balsa leading edge in place.
- ❑ Glue the two 1/8" stringers to the ribs.



- ❑ Let the left side dry. Remove from the plans and relocate over the right wing plans. Rock the wing to the right by shimming up the left side, keeping it square and build the right wing as above.
- ❑ Once the wing is dry remove it from the plans. Glue the other trailing edge to the top of the ribs and glue the 1/16" trailing edge strengthening sticks between the top and bottom trailing edge.



- ❑ Position the 1/2" x 1 1/4" wing strut attachment point balsa plate to the bottom of the wing as shown in the plans.



- ❑ Sand the ends of the wing and glue the wing tips on as well as the wing tip braces.



- ❑ Glue the 1/8" square stringer between the two center rear ribs.
- ❑ Glue one of the wing hold down plates between the center two ribs, against the trailing edge, and flush with the top of the ribs.



- ❑ Glue the 1/32" plywood hold down plate reinforcement to the hold down plate. Be sure that the holes align.
- ❑ Place the wing on the fuselage and line up the ribs with the false ribs on the fuselage wing mount assembly. Slide the 1/8" balsa front wing support between the center two ribs and pressed against the wing mount assembly. Remove the wing with the front wing support still in place and glue the wing support to the ribs.
- ❑ When dry, position the wing back on the fuselage. Using a 1/8" drill bit, drill two holes in the wing support using the holes in the wing mount as a guide. Be sure that the drill is parallel to the top of the fuselage.

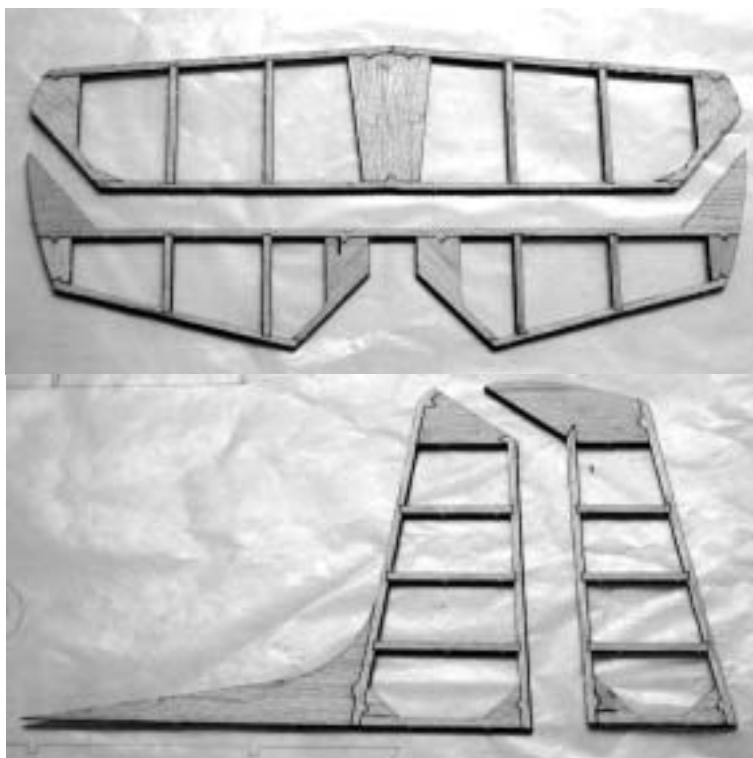


- ❑ Glue the two 1/8" dowels into the wing support. Make sure they stick out the front enough so that they are flush with the front of the wing mount when the wing is in place.
- ❑ Insert the 4-40 blind nut into the hole in the second wing hold down plate. Flow some thin CA over the hold down plate to strengthen it. Allow the glue to dry.
- ❑ Place the wing on the fuselage pushed tight against the wing mount. Place the 4-40 wing bolt through the wing hold down plate. Position the other hold down plate below the fuselage doubler and align the two plates with the wing bolt. Glue the lower plate to the fuselage.



### ***Stabilizers, Rudder, and Elevator Assembly***

The tail assemblies are made up from the 1/8" laser cut sheet. Lay the plans out on a flat worktable and tape them down, and then lay a sheet of wax paper over the plans. This will protect the plans from the glue. The pieces of balsa are positioned over the plans and glued together. Each joint can be glued by holding the two pieces in place and applying a drop of thin CA to the joint. In the past, you may have used pins to hold parts down, but I find this process to be faster and you don't have to worry about the pin damaging the balsa. You do have to worry about keeping your fingers far enough away from the joints or your fingers will become part of the model. Build one part at a time, removing only that part from the balsa sheet so that you don't mix the parts up.

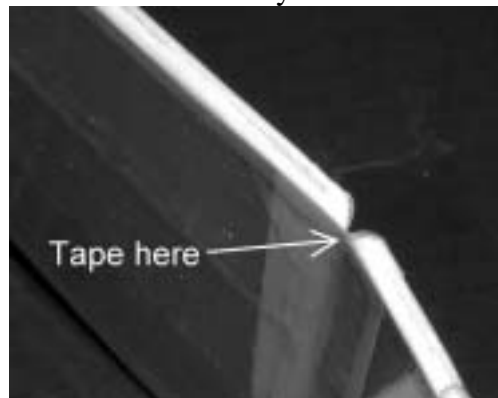
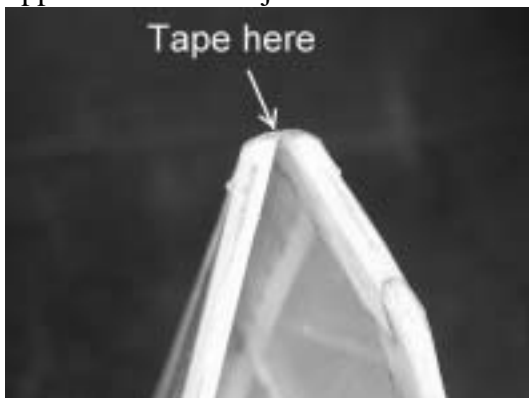


Once the parts are dry, carefully remove them from the wax paper then sand them. Round all the edges EXCEPT the bottom of the vertical stabilizer where it will be glued to the fuselage. Also, the rear of the stabilizers, the front of the elevator, and the front of the rudder need to have a 40 degree bevel sanded in to them.



### ***Fuselage Final Assembly***

- ❑ Cover the wing, fuselage, and tail surfaces with a lightweight colored covering such as Solarfilm Lite. Follow the manufacturer's directions to apply them.
- ❑ Apply the hinges to the control surfaces. I have had excellent results using clear tape as a hinge. Position the two surfaces being hinged side by side, bevels facing away from each other. Apply a piece of tape along the joint. Flatten out the two sides and place another strip of tape along the opposite side of the joint. Ensure the control surfaces move freely.

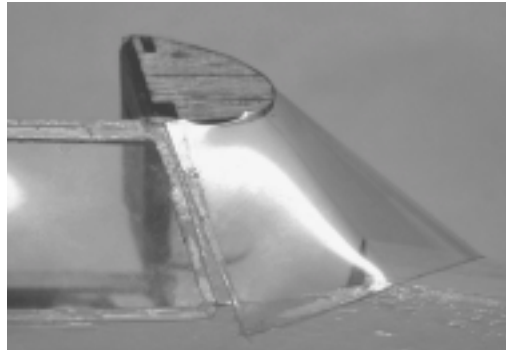


- ❑ Cut covering from the slots for the control horns and glue the control horn in place with thin CA. **Note: the side the control horn goes on depends on where the pushrod exit slots are on the fuselage.** The low slot is for the elevator and the high slot is for the rudder. The elevator control horn goes down.
- ❑ Carefully remove a strip of covering from the top of the fuselage 1/8" wide and from the tail to 4.25" in front of the tail. Glue the vertical stabilizer in place where you removed the covering.
- ❑ Slide the horizontal stabilizer in place and glue.
- ❑ Bend the main landing gear wire as shown on the plans. Carefully push the wire through the covering and into the slots in F5. The wire should just poke through the top of F5. Align the wire so that the wheel will run straight and glue the wire to F5.
- ❑ Slip the 3/32" aluminum tubing over the 3/4" bend of the landing gear and glue. Place the wheels over the tubing and retain by shrinking some heat shrink tubing over the axle and adding a drop of CA.
- ❑ Bend the tail landing gear wire as shown on the plans. Carefully push the wire through the covering and into the 1/8" triangular brace in the tail of the fuselage.

- ❑ Place a 1/8" long piece of heat shrink tubing over the wire, up to the first bend and shrink it. Place the tail wheel over the wire and ensure it spins easily. Retain the wheel with another short piece of heat shrink followed by a drop of CA.
- ❑ Glue the landing gear struts to the landing gear wire. Only glue to the fuselage and partway down the leg or the strut will break off in a hard landing when the gear flexes.
- ❑ Cut a 1" piece of .025" music wire and glue it to the end of a wing strut so that it extends past the wing by 1/4". Use a pin to poke a hole in the fuselage about 1/4" behind the landing gear strut and 1/8" up from the bottom of the fuselage. With the wing in place, place the wire end of the wing strut in the hole you just made in the fuselage. **You will NOT glue the strut to the fuselage.** Mark on the wing where the strut ends. Clear away a bit of covering and glue the strut to the wing. To remove the wing from the fuselage, you will bend the strut so that it pulls away from the fuselage.



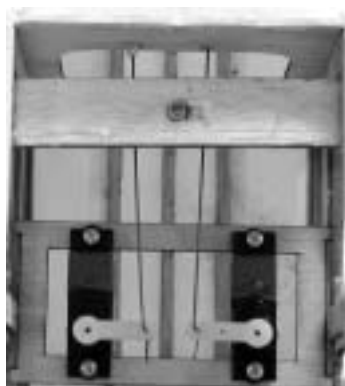
- ❑ Glue the windshield in place with thin CA. The smooth side of the plastic should be out.



- ❑ Cut out and glue cowl vent, exhaust pipe, and steps as shown on the plans.

### **Servo Installation**

- ❑ Install the rudder and elevator servos in the servo tray.
- ❑ Install single arm control horns to the servos after first attaching the pushrods through the outer hole of the control horn.



- ❑ Cut two pieces of heat shrink tubing 1/2" long.
- ❑ Slide a piece of heat shrink over the back of the rudder pushrod.
- ❑ Cut two pieces of .025" music wire 1.25" long. Measure in 1/4" and make a 90 degree bend.
- ❑ Take one of the music wires and insert the short end in the rudder control horn.
- ❑ Slide the other end of the wire into the heat shrink and heat the heat shrink. You will adjust the length so that the rudder points straight back. Use a drop of thin CA on the heat shrink to prevent the pushrods from slipping in the heat shrink.
- ❑ Do the same for the elevator control horn.



### ***Final Assembly***

- ❑ Mount the receiver underneath the servos with Velcro.
- ❑ Push the motor onto the motor mount while supporting the mount from behind. Reach in through the cockpit to do this.
- ❑ Set your servo throws to give you +-1" of rudder and +- 5/8" of elevator. Check that the controls don't interfere with each other.
- ❑ **This is most important: You must give the wing at least 1/4" of washout.** Working slowly, heat the covering with a heat gun and twist the tip of the wing so that the back of the wing comes up. Holding the twist, let the wing cool and check the washout. Repeat until you have 1/4" – 3/8" washout and both sides are even.

### ***Flying***

Attach a battery to the Velcro strip on the wing inside the fuselage. Check that none of the control surfaces are binding and that everything, including the battery, is secure.

Before you fly the 180, check that the control surfaces move the correct directions. Always check the directions while you are behind the airplane. I highly recommend that you check the control surfaces before EVERY takeoff.

Check the center of gravity (CG) carefully. It should be under the wing spar. With the battery installed, place a finger on each side of the fuselage under the spar and lift the airplane. It should balance there. If not, adjust the battery forward or backwards till the CG is correct.

Adjust your radio trim so that the elevator and rudder are straight back.

For your first flight, be patient and wait for a calm day. Choose a large field where you have a smooth surface to use as a runway. Set the plane down pointing away from you. I would say to point it into the wind but it's a calm day, right? If everything goes well, applying full power will result in a short rollout and a gentle climb. Initiate turns slowly until you get used to the way the airplane flies.

Happy flying.