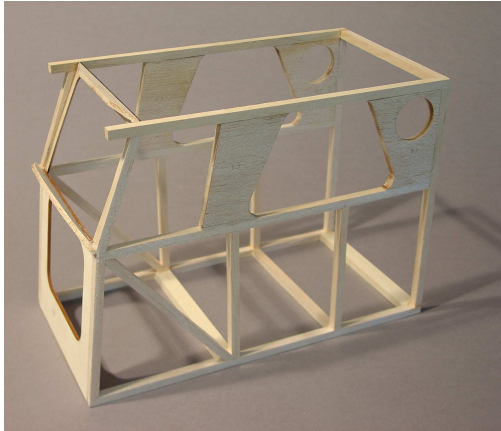


ERC-1 The ELECTRIC BEAVER - Photo-Instructions for the Assembly

Please read and familiarize yourself with the construction prior to starting.

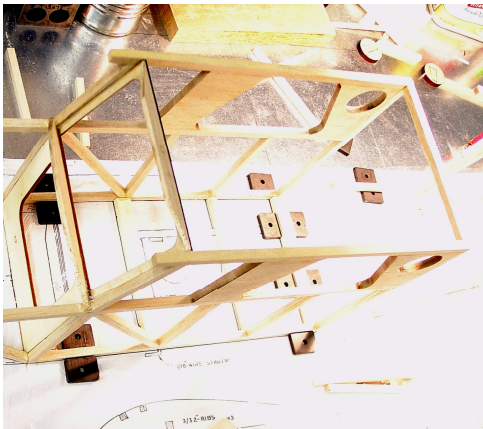
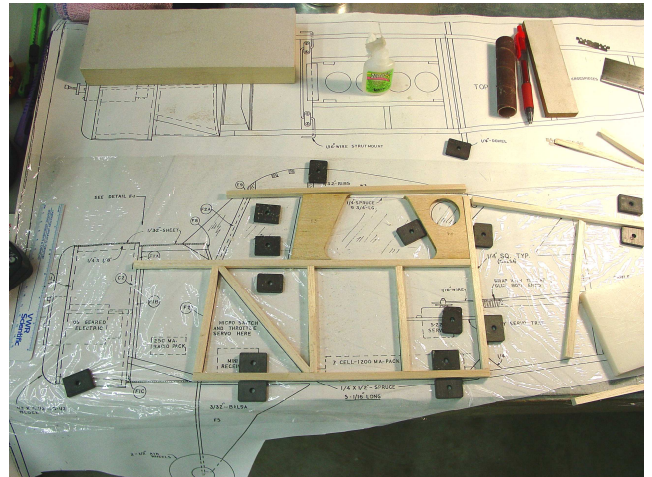
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1. Items required to complete this model include: Glue, pins, covering material, wheels, an electric motor, straight or gear drive, battery pack for motor, 3 channel radio, micro-switch, motor controller (optional), propeller to suit motor, paint to suit model and of course your tools and building board.
2. General Instructions: Lay plan flat on a building board. Place a piece of wax paper or stretch wrap over top of the plan. This will prevent the parts and glue from sticking to the plan. Do not push pins through the wooden parts. Place against each edge.
3. Use glue sparingly, glue adds weight. Organize your building materials and check the drawings for correct placement before starting to build model.



4. First you will build the parts for making the cabin of the fuselage. This is the main component to which you will add the remaining structures. You want to take care to build it square and symmetrical. Making sure your cuts are accurate and gaps in the joints to an absolute minimum, this will ensure you have the strongest joints possible.
5. Layout your plan on a clear building surface. Cover the plan with wax paper or plastic before starting building. Shown here is the model being built using Easy Built Models' Magna-Board. The small black rectangles are magnets to hold the parts in position. You can find these at www.EasyBuiltModels.com You may substitute pins and your building board in place of magnets

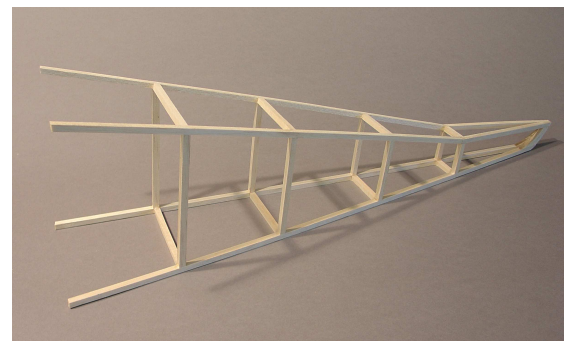
6. You need to make two identical sides of the cabin. Some people like to build the first one, place a layer of wax paper over it and then build a second identical side over the first. How you build it is your choice the need is for them to be as close to identical as possible so the plane comes out symmetrical. Layout the center horizontal $\frac{1}{4}$ " square balsa part to start your side. Position the bottom strip and then cut the uprights to size and glue them in position. Next place parts F3 and F4 place glue into position and then top off with the $\frac{1}{4}$ " square balsa strip cut to length. Note, in the photo the center $\frac{1}{4}$ " square piece was cut oversize at the time of this photo. See above photo for actual termination point. Glue the joints and set aside after the glue dries.

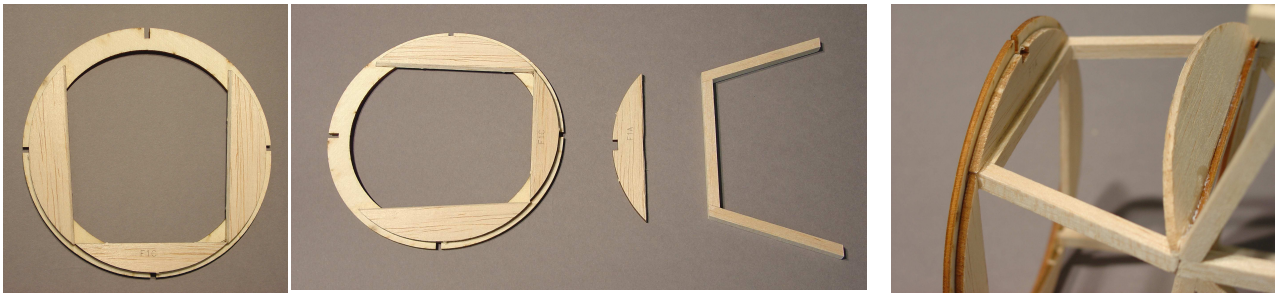


7. Once you have both sides assembled and the glue is dry use a sanding block to smooth and even up the surfaces. Using the top view cut the cross members (2 pcs - $\frac{1}{4} \times \frac{1}{2}$ " basswood and 3 pcs - $\frac{1}{4}$ " square balsa) to size that will connect both sides of the cabin. You will also need laser cut plywood parts F2 and F2A Use a square or a block to hold each side vertically square to the building table, and fit each cross member into the appropriate position. Test fit and adjust the parts first until you have good tight joints then glue together. After the glue dries apply some additional epoxy in the corners to increase the strength of the joints. Set this aside and let the glue joints completely harden.

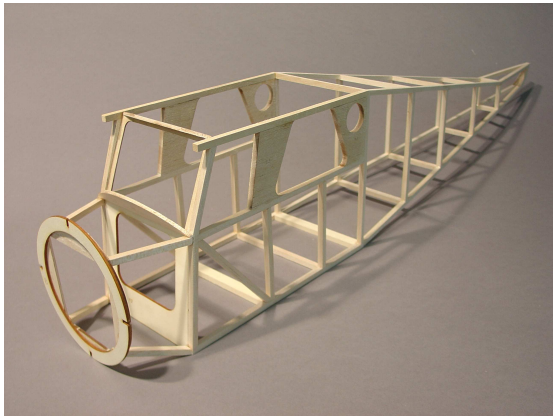
8. Build the tail boom for the fuselage much in the

same manner as the cabin only it is made completely of $\frac{1}{4}$ " balsa. Start by making the sides. Be certain that the end that will butt up against the cabin matches the dimensions. When the sides are dry, sand and test fit the angle where they are joined together at the tip of the tail. The better the fit the stronger the joint. Also it is important to make sure the structure is square and the parts where the stabilizer will eventually be positioned are both flat. When this is dry you can glue it into position on the rear of the fuselage cabin.





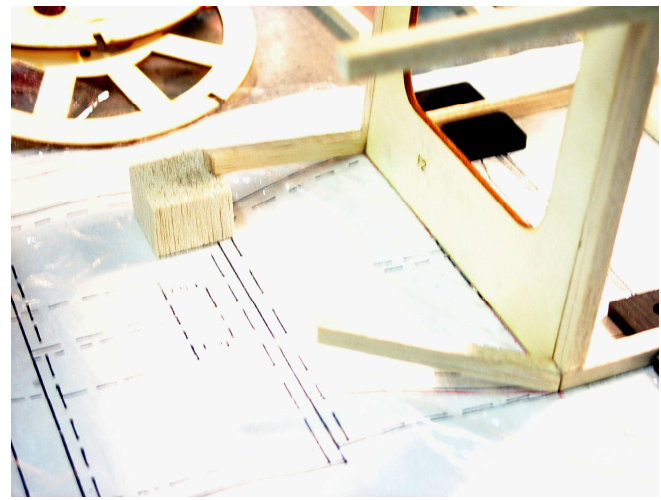
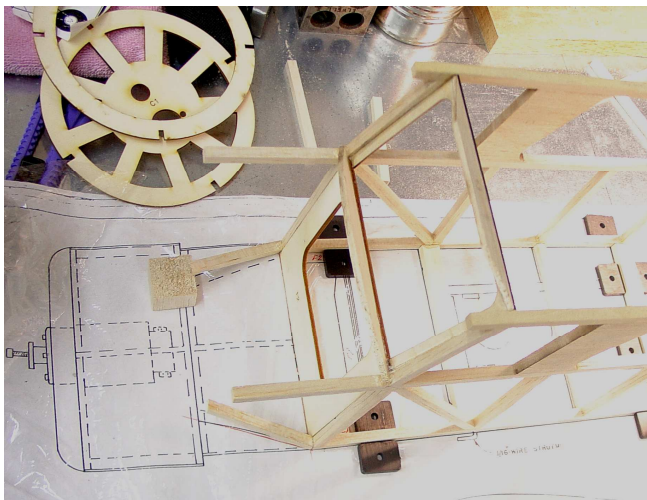
9. This step makes the sub-assemblies that will be the structure from C2 to F2. You will need laser cut parts C2, F1A, F1B (2 pcs), and F1C. Lay C2 on a flat surface and then glue the F parts around it as shown in the cross section F1 on the plan. You want the outer curved edge of the F parts to form a uniform inner circle. This stepped edge it creates will be where the 1/32" sheeting will be positioned & glued on. Save part F1A for gluing on later.



10. Make the top brace shown in the above photo on the right hand side from 1/4" square balsa. Using the top view of the plan you can make this part to size. Eventually you will have to sand the angle into the part where it butts up against the cabin so that it continues the straight line as seen in the side view.

11. Starting to make the nose assembly. Start by cutting the excess 1/4" balsa sticking out in front of the front uprights of the cabin and sand smooth. Next sand the angle into the top brace made in the last step so that when in position it has a good joint while continuing a straight line when viewing the side of the fuselage. Glue this into position when it fits. The next step is to cut to size the 1/4" balsa parts based on the figure for "lower longeron length". Cut them slightly long and you can sand the final angles into them. Next position the cabin of the fuselage over the top view of the plan and hold in position. This

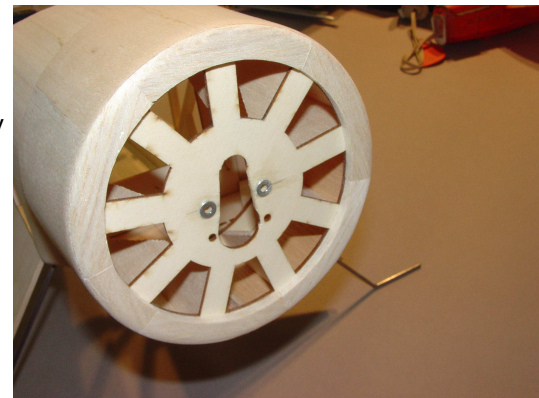
will allow you to start setting the parts up for permanently gluing C2 in the final position as described in the next step.



12. Recognize that the bottom portion of the cabin sticks further forward than the top part so use the rear of the cabin for positioning on the plan. With your cabin firmly held in position over the plan, now take and position the bottom longerons for test fitting. Use a small block to temporarily hold at the correct height as shown in the picture. Don't glue until you've placed the C2 sub-assembly in position to verify that you have all the angles matched. C2 will be perpendicular to your building table surface. (Note, the 1/4" square balsa sticking out in the front and center of each side needs to be cut flush with F2.)

13. Once you have the angles all set then glue them in position and use epoxy to re-enforce the joints. Don't get the epoxy on the outside where it may interfere with the 1/32" balsa to be wrapped around the nose.

14. Prepare to finish the nose. With the fuselage still held firmly in position over the plan, take a 1/8" x 1/4" piece of balsa cut to length that will go in the notch at the bottom of C2 spanning forward to C1.

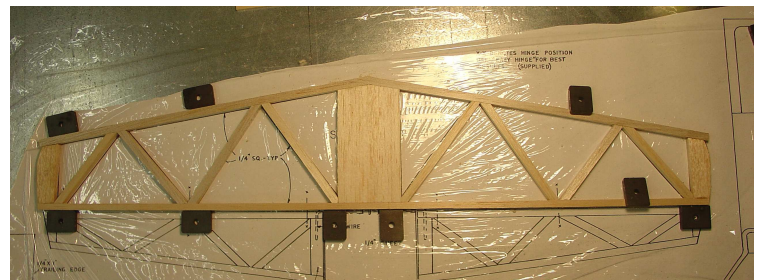


15. Place C1 over the 1/8" x 1/4" balsa lower center stinger using the notches. Now use a square to make sure it is perpendicular to the building board and parallel with part C2. Don't glue yet.
16. Now use more 1/8" x 1/4" balsa to fill in between parts C1 and C2 where the notches exist. Verify that everything is square then glue in position. After the glue dries you can move the parts. I made additional re-enforcements from 1/8" sheet on my model that braced against the front plate spokes, the side wall and C2 in between the 1/8" x 1/4" parts. Once the glue on the framework dries then you can add the 1/32 sheeting around the nose between C1 and C2. Wetting the balsa will make it easier to form around the circle formers, allow balsa to dry before gluing. Sand the 1/32" sheet flush where it overhangs the outside of C1 and C2. Now position the front nose pieces around the front of C1. After the glue dries then sand round and smooth with the 1/32" sheeting.
17. Join the tail section of the fuselage to the rear of the cabin, sand the longerons at the joint to make it tight. Use scrap 1/4" balsa to cut fillets to re-enforce the joints as shown on the plan. Install the dowel for the rear wing hold down.
18. Wire List: 1/8" x 22" – main landing gear wire; 1/16" x 5 1/2" – stabilizer; 1/16" x 3 3/4" – tail wheel; 1/16" x 8 – lower strut support (oversized, use excess for strut clips).
19. Now would be a good time to position the landing gear (LG) wire, drill holes for securing the LG with picture wire. Coat this with epoxy after securing the LG to the face of part F2.
20. Now add parts F8 and F9 sanding the lower edge of each to allow the part to match the angles shown on the plan. Use another 1/8" x 1/4" balsa strip between F8 and C2. The outer edge of this part is flush with the top of F8 and into the notch on the part on the back of C2. Now using short pieces of 1/32" sheet balsa, position and mark with a pencil the parts that go between C2 and the uprights of the cabin. Moistening the sheet balsa will make forming it around the curves easier. Another tip is to start at the center point on the bottom of the fuselage and work out from both sides. The grain direction for the most part goes from the front to the rear of the fuselage. Working with light posterboard to make patterns is another means to make the task easier. Consider saving the sharp corner where the landing gear wire comes out for last to fit in the balsa. This should be done with a small piece so that it doesn't break as you roll it into shape. Take your time, cut, test fit, sand, and test fit until you get a nice fit between the parts.



21. Fill in the underside of the fuselage at the very tail in with plywood provided in the kit. Then form a piece of 1/16" wire as shown in the picture. Use the provided screw and two washers to sandwich the tail gear but not so tight that it can't swivel. The swivel improves ground characteristics. Remove the tail skid once you have it all set and install again after you finish the covering.

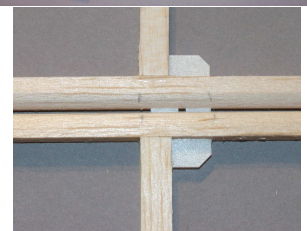
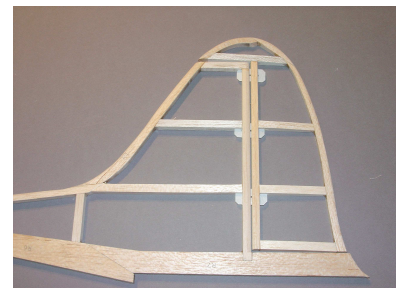
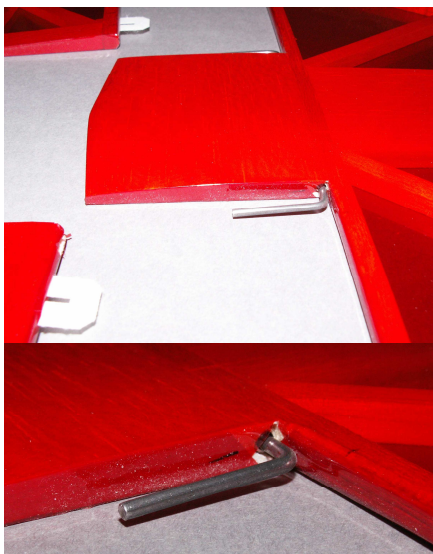
22. Now is time to build the parts for the horizontal stabilizer using 1/4" square and laser cut parts. You will also need to have your six Easy Hinges and the control arm for the final assembly of this part. You will make this in three sub-assemblies. Start by laying out the plan with a piece of protective wax paper over it. Lay the center 1/4" square that



runs from tip to tip down first as the base for the main part of the stab, position laser parts (S1, S3, S5), add the leading edge and finish by cutting in the diagonal braces. Glue and set aside.

23. Now make each of the control surfaces in a similar manner with laser parts S2 and S4. Pay attention to the use of 1/4" x 1/2" where the wire control arm is anchored into each. Don't glue or hinge these yet.

24. In these pictures of the covered stab parts you can see where a formed wire needs to be put in place prior to gluing S6 into position against the main portion of the horizontal stab. This wire is the control arm and is made from 1/16" wire supplied in the kit. The control surfaces slide onto these as you push the hinges into position. Set these parts aside for covering later. The control horn is added after assembly.



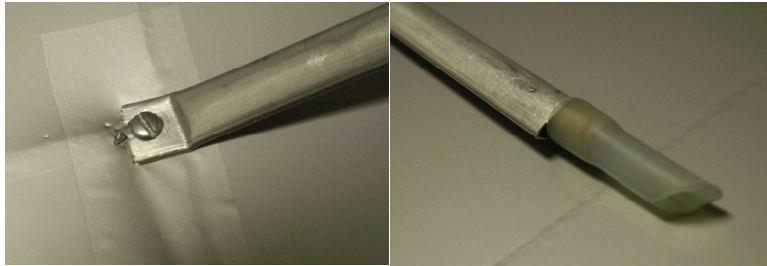
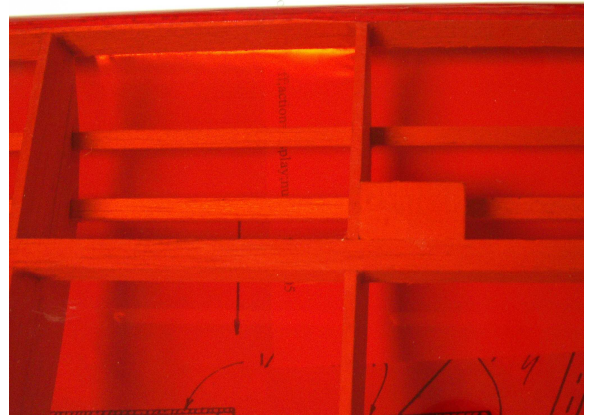
25. Next build the rudder much in the same manner as the stab. You will need laser cut parts R1 through R7. Build the rudder in two sub-assemblies, the tail and the control surface. Use ¼" square balsa for the construction of the rudder's frame. The control horn is added after assembly.
26. Before covering the tail surfaces is a good time to dry fit the Easy Hinges. After covering you can open the slits up through the covering and slip the hinges into position.

Some Tips on Using Easy Hinges - Easy Hinges is a product that revolutionizes the age old problem of hinging control surfaces. They are made of a space age material that will hold up to the most severe punishment that an avid R/C flyer can give to his aircraft. Gone are the days of glue stuffing, slot gouging, pinning and just plain hoping that the control surfaces will remain attached.

The hinges supplied are more than adequate in both size and strength for all aircraft through quarter scale. Don't let the small size fool you, they are incredibly strong. It is recommended for light aircraft and sailplanes that the hinges be cut in half lengthwise. Let's go through the simple process of hinge installation.

1. Using an X-acto #11 blade (or any blade that will cut a narrow slot) cut a slot approximately two thirds the depth of the blade and slightly wider than the hinge to be used.
 2. Continue cutting all of the slots on both pieces to be hinged.
 3. After all slots have been cut insert a hinge approximately one half inch into each slot on one piece that is to be hinged. Slide the matching piece onto each hinge at an angle left to right. For best results do not attempt to insert all hinges at the same time.
 4. At this point the surface to be hinged is attached but not glued. Align the two surfaces and adjust the distance between them as required.
 5. Flex the joint to the maximum deflection that you require. Place two or three drops of any cyanoacrylate adhesive (thin) directly onto the hinge. You will notice that the glue is wicked in to penetrate the wood and hinge. Continue this process with each hinge on that side, then turn the surfaces over and repeat the gluing process on the other side.
 6. After the glue has cured approximately one minute the joint can be flexed. You will notice a slight stiffness in the joint. This can be eliminated by flexing the surface to full deflection each direction approximately one hundred times. Do not worry about shortening the life of the hinge as they are almost indestructible.
-
27. Set the fuselage, the rudder parts and the stab parts off to the side. It's time to build the wing. Clear the table, layout the wing plan flat and cover with wax paper. Depending on the size of your building surface you may want to cut the wing portion of the plan into three separate parts for building over. Working directly over the plan, build the center section first, then the two wing panels, then finish by attaching the wing panels to the center setting the dihedral by lifting each wing tip 2 ¼".
 28. To make the center section of the wings you will need 3 laser cut W1 ribs and a laser cut 1/8" plywood dihedral brace. Start by placing a piece of trailing edge cut to size in position over the plan. Set a ¼" x ½" balsa spar and the dihedral brace against each other in position on edge and then place the three W1 wing ribs over them. Don't glue yet. Slide this group of parts against the trailing edge. Use pins or magnets to hold the ribs in position perpendicular to the building table and parallel to each other. Slide the 5/16" x ½" leading edge up against the nose of the ribs. Fine tune the parts sanding as needed to get the best fit. Once you are satisfied with the fit glue this center section together. Cover the top side only of the center wing panel with 1/16" balsa sheeting with the grain oriented from tip-to-tip so it follows the curve of the ribs easily. Butt the first piece of balsa sheeting against the back of the leading edge and continue all the way over the trailing edge gluing this as you proceed with the fitting. Let the glue dry and set aside.
 29. Build the outer panels next. You will repeat this step to make two wing panels. Lay the ¼" x 1" trailing edge over the plan and cut to size. Position the ¼" x ½" main spar over the plan and cut to size. Without gluing, position ribs W3 over the spar spaced as indicated on the plan. Add rib W2 on the inside again do not glue yet. Slide the spar with ribs against the trailing edge and then place the 5/16" x ½" leading edge against the front of the ribs. Hold these in place with pins or magnets.
 30. Cut out the paper template on the plan for setting the angle of the root rib. Glue this to a scrap of balsa to make it easier to work with. With the wing held firmly in place over the plan, slide the template against rib W2 to set the correct angle of the rib for the dihedral. It is now okay to glue this into position. Next go to the outside tip of the wing and add the wing tip. Sand the inside part of the laser cut wing tip to set the correct angle and get the best fit. You can lay a straight edge across the top of the ribs extending out over the wing tip, position the wing tip against the base of the outside rib, lift the outer part of the wing tip to contact the straight edge. Glue this into position.

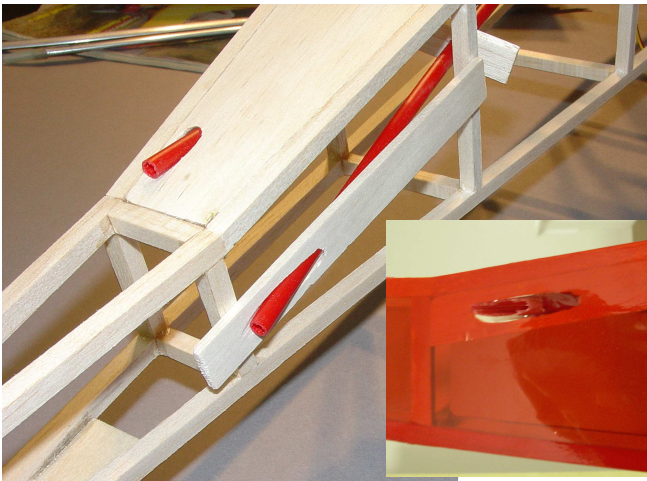
31. Now take two strips of 3/16" square balsa placing them in parallel in the notches across the top front of the ribs. Approximate the angle at the end where they butt against the wing tip, use a sanding block to get the best fit. Recheck the position of all the parts to be sure they have not moved. Once you are satisfied then glue the wing panel together. Make a 1/4" x 1/2" x 1" block from balsa and glue in position as the point for attaching the wing struts as shown on the plan. This part is flush with the bottom of the wing. Let the glue dry and then set the wing panel aside. Repeat the steps for building the wing panel making certain to build an opposite side so you end up with both a left and right side wing panel. Sand the outside of W2 ribs to be flat.



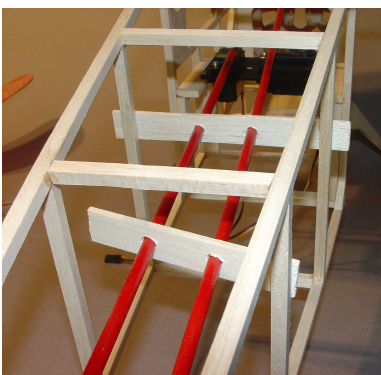
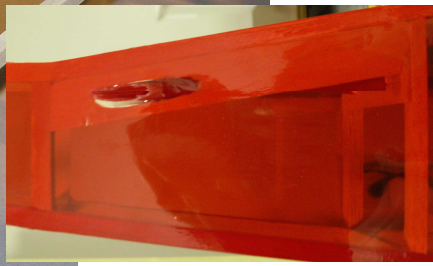
32. Before covering form the wire clips to be used to attach the wing struts to. The kit comes with 1/4" x 1/2" basswood – cut to length, sand an airfoil shape and finish by gluing in the wire ends. Using short lengths of small diameter fuel tubing join the matching points of the strut and anchor by slipping the music wire from each into opposite sides of the tubing. Optional: In my model I chose to use a

technique shown to me by my friend Sal Cerrie from Erie, PA for the wing struts as shown on his model here. Working with streamline tubing for the strut, flatten one end and notch. Place a screw in the block for the strut to slide under. At the other end epoxy a dowel inside the strut, slip a piece of fuel line over this. Mount a similar sized dowel with its ends sticking out each side of the fuselage where the wing struts will anchor. When mounting the wing for a flight, the fuel line on the strut's end slips over this dowel protruding from the fuselage, tighten the screw and you are ready. This makes for an easy to remove yet sturdy strut arrangement.

33. Once you have the three wing sections begin assembling them into one unit. Pin the center section of the wing down and slide the outer wing panels into position. Raise each tip the desired 2 1/4" to set the dihedral, glue solidly in position. After the glue and epoxy dries then sand the leading edge round and smooth the structure overall using a large sanding block in preparation for covering.



34. Let's go back to the fuselage and start adding the control rods. Start by filling in these sections at the rear of the fuselage where the control rods exit to connect with the tail surfaces using a light 1/8" sheet balsa. Carefully cut and sand to final shape for a good fit. Glue flush with the outside, sand any imperfections. The top rod goes to the rudder and is ready to cut flush with the outside surface. The side rod goes to the stab and is shown in preparation for cutting to size. Don't glue the push rod sleeves in position yet. The photo of the covered fuselage shows the finished exit point for the stab control.

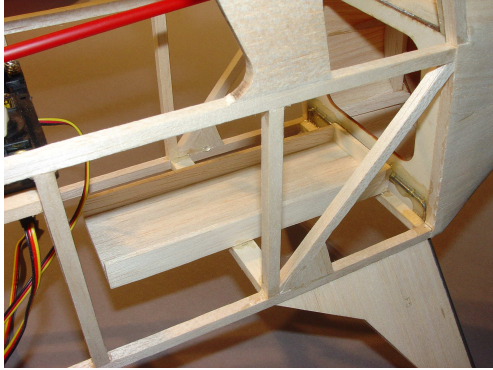


35. Here are several photos that show the position of the control rods. You can either purchase your favorite push rod or make yours with the wire and 1/4" wood provided. Anchoring the push rods will give more positive response as it prevents them from flexing when you apply force to the controls. First I made some oversize anchors from 1/8" x 3/4" balsa long enough to span across the fuselage. Make three of them to form at each station between the rear of the cabin and the exit point of the push rods. Now stack them and drill holes for the sleeve. Pass the sleeves down through the



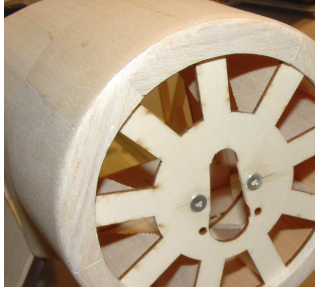
fuselage through the anchors at each station. Don't glue anything at this point, it makes it easier for you to find the best position with the least resistance if you wait until you have servo's mounted.

36. The servo tray is the standard supplied with a Hitec radio system; you will need to adjust for your brand and choice of installation. Use the 3/16" x 3/4" basswood provided for the braces to mount the servo tray to. Once you have the servos in place and established the location of the rear exit points for the push rods you can glue the anchors in position and trim them flush with the outside of the fuselage. Sand flush with the outside of the fuselage for best appearance.



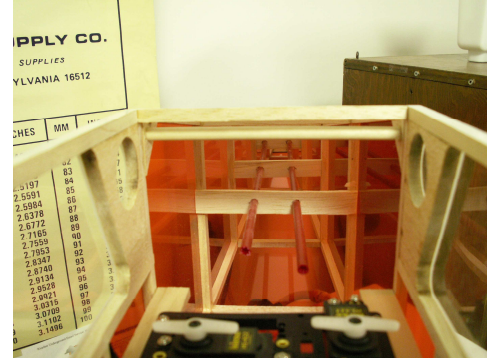
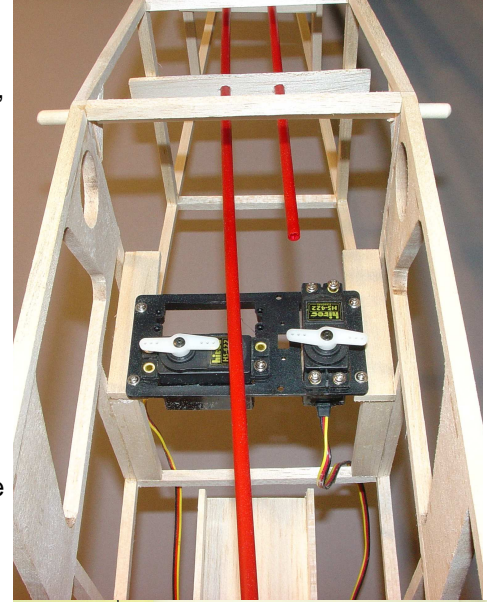
37. Build a tray for your batteries and then glue in position. Use the 3/16 sheet balsa for the base and the 3/32" x 3/4" balsa for the sides. Decide how you will hold your batteries in place and make provisions for that now.

38. Install your motor in the nose of the plane now. I've put some washers on the front outside of the nose where I will use screws to hold the motor in place. You will need to adjust the motor mounting holes for the motor of your choice.



39. Add the F5 LG fairings leaving them outside of the music wire so they don't interfere with the flexing motion of the LG on landings.

40. If you haven't already, install F9 at the angle shown. The top of the windshield will attach to this.



41. Cut to size and glue in the plastic to create the side windows. After the glue dries then cut out the front windshield and glue it in position.
42. After you are sure you've got everything shaped and sanded smooth you can move on to covering with the material of your choice.
43. After the covering is done then finish off the landing gear, the stabilizer and rudder. Make sure everything stays square as this will make the plane easier to trim for flight.
44. Install the control horns and make the connection to the servos.
45. Finalize your radio gear and battery installation following the instructions supplied by your radio manufacturer.
46. Verify that everything has been installed to the plan. Test the function of your r/c equipment. Now go through your normal trim testing of the model. Have fun.

Many thanks to Steve Gray of Kitchener, Ontario, Canada for this fine contribution to our line.

Photos and construction notes from fellow builders at our web site.



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