

LOWER WING BUILD UP SECTION III

- To get started, you will need the following list of tools.
 - 36" metal straight edge
 - Ruler (can be part of straight edge)
 - Thin, medium, and thick CA glue
 - 5 to 10 minute epoxy
 - Exacto knife with replacement blades
 - Razor saw
 - T-pins
 - Small hammer to tap pins into building table
 - Small pliers to remove pins following assembly
 - 80 grit sandpaper and sanding block
 - Wax paper
 - Fine tip pen or pencil

- Parts list:
 - 1/4" X 1/4" X 36" spars (4) basswood (std)/balsa (min wt)
 - 1/4" X 1/4" X 36" leading edges(LE)(2) balsa
 - 1/16" X 3" X 36" LE sheeting (4) balsa (std)
 - or: 1/20" X 3" X 36" LE sheeting (4) balsa (min wt.)
 - precut aft center sheeting (2) 1/16" plywood
 - 1/16" X 3" X 36" center sheet (1) balsa (std)
 - or: 1/20" X 3" X 36" center sheet (1) balsa (min wt.)
 - Precut, tapered aft spar stock (2) 1/4" balsa
 - Extra Large triangle stock balsa
 - 1/16"X4"X36" Cap strip sheet
(left over from Section II)
 - 1/8" X 1/8" stock (section I scrap) basswood
 - Bag #3 contents:
 - Standard ribs (12) 1/16" balsa
 - Saddle ribs (2) 1/8" lite ply
 - Strut ribs (2) 1/8" lite ply
 - Inner spacer ribs (2) 1/16" balsa
 - Outer spacer ribs (2) 1/16" balsa
 - Center rib 1/4" plywood
 - Precut spar splices (2) 1/4" basswood
 - Precut front servo spacer (2) 1/4" balsa
 - Precut LE blocks (2) 1/4" balsa
 - Wingtip blocks (2) 1/4" balsa

- Servo mount plates (2) 1/8" lite ply
 - Servo box short ribs (2) 1/8" lite ply
 - Precut trailing edge blocks (2) balsa
 - Outer strut mount blocks (4) 1/4" plywood
 - Otbrd servo plates&covers (2) 1/16" plywood
 - Otbrd servo screw plates (4) 1/8" lite ply
 - Otbrd servo cover strips (4) 1/8" lite ply
 - 1/4" spar sheer webs (5) balsa
 - 1/8" spar sheer webs (7) balsa
 - 3/32" spar sheer webs (7) balsa
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- Re-check you building surface to make absolutely certain it is perfectly flat. The top wing is built upside down, but is otherwise similar to the lower wing.



- Using the 1/4" X 1/4" basswood spars and the basswood splice, build two spar assemblies as shown. Glue with thick CA or Epoxy.



- Mark the center of one of the spar assemblies as shown. The marks are center, 1/8" either side of center, and 3/16" either side of center and are square to the aft edge of the spar doubler. Sand a small flat spot between the two 1/8" marks as shown.



- True one edge of a **1/16" X 3" X 36" balsa** sheet using a straight edge as shown. This may also be done using sandpaper and a long sanding block. Be certain this edge is absolutely straight by sighting along the edge.



- Using the 9 degree template, trim the end of the sheet as shown here. The true edge you formed in the last step should be down in the photo.



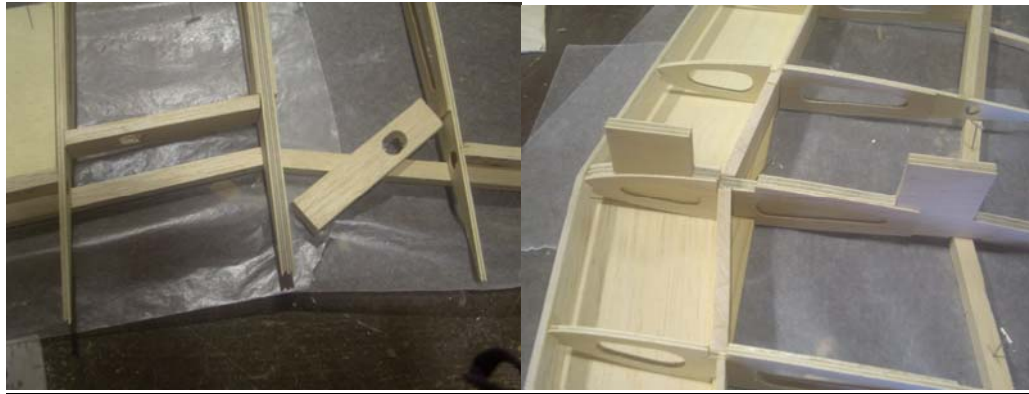
- Glue the trued edge of the balsa sheeting to the spar assembly as shown.
 - Lay at least 72" of wax paper on your building table.
 - Place the angled side of the balsa sheet on the marked centerline of the spar assembly as shown. Join the sheet along the full length of the spar and use your straight edge to ensure it is flat against the building table.
 - When satisfied, glue the sheet with **thin CA**.

- True another sheet and angle cut in a mirror image to your first sheet. Glue this sheet to the opposite side of the spar assembly as before.



- Beginning at the center mark on the spar assembly, mark every 4 inches along the spar in each direction. You should end up with marks at 4, 8, 12, 16, 20, 24, 28, and 32 inches. Using the 9 degree angle template, extend the lines onto the balsa sheets. Add marks 1/16" to the outside of each mark.
- Pin the spar firmly against the table. Place the pins away from the marks so there is room for the ribs.
 - Begin laying the ribs as shown in the photo. The order is as follows:
 - Center is 1/4" ply with tab as shown.
 - Glued onto each side of the center rib is a 1/16" balsa spacer rib.
 - 4" marks: Second 1/16" balsa spacer rib is glued to the inside of the lite ply saddle ribs.
 - 8" thru 20" marks: 1/16" balsa standard ribs.
 - 24" mark: Lite ply strut ribs.
 - 28" thru 32" marks: 1/16" balsa standard ribs.
- Sand a 9 degree bevel on one end of a 1/4" thick balsa rear spar cap. Note the caps are beveled on the top and bottom. The thick side will

go towards the front of the wing. Beginning at the inner end of each cap, mark at 4" intervals out to 32 inches.



- Pin your 3/8" spacers in place as shown so they will just catch the aft edge of the rear spar caps.
 - Glue the spacer ribs to either side of the center rib with **medium CA.**
 - Tack the center rib assembly to the front spar with **thin CA.** Ensure the back of the rib rests on your 3/8" spacer block.
 - Glue the spacer ribs to the inside of each saddle rib using **medium CA.**
 - Use the rear saddle spacers to position the saddle ribs. **Note that the upper wing does not have front spacers as the lower wing did.** Use the template to aid in positioning the saddle ribs and use a 1/4" sheer web to space the front of the rib. Ensure the bevels on the rear spacers are in the proper direction.
 - Ensure the rear of the saddle rib is in contact with the 3/8" spacer block.
 - When all is in place, glue the spacers to the ribs with **thin CA.**
 - Tack the saddle rib assemblies to the front spar with **thin CA.**



- Using your template and the marks you scribed, begin tacking the ribs in place as shown with **thin CA**. Glue to the rear spar cap and tack to the front spar. Do not glue the strut rib until the next step. Use caution not to glue the wing to the spacer block – wax paper may be necessary.



- Build the strut ribs as shown in the photo before tacking in place. The strut mounts are pre-cut **1/4" ply** blocks that are fit to the inside of the rib. You must sand a slight bevel in the fore and aft edges of the blocks to match the taper on the wing surface. The blocks should be square to the rib with a flush fit to the spars. Secure blocks with **large size** balsa triangle stock and **thick CA**.
 - Once the assembly is complete, tack the strut ribs in place as you did the other ribs.



- Glue the $\frac{1}{4}$ " X $\frac{1}{4}$ " X 36" **balsa** leading edges in place along the front of each rib with **thin CA**. You will have to bevel the ends that rest on the saddle ribs. Once in place, reinforce the joints with **medium CA**.





- Glue the leading edge sheeting to the ribs.
 - Ensure the aft edge and front spar are securely against the worktable. Weight and pin as necessary.
 - You will need to trim the leading edge sheets where they come together at the center of the wing.
 - Beginning at the center of each sheet, gently lift and tack in place against each rib with **thin CA**. Do not force the very front yet.
 - Using glass cleaner, wet under the front of the sheeting as shown. Allow about 5 minutes for the cleaner to soak in and make the sheeting pliant.
 - Beginning at the center once again, glue the sheeting to the ¼” square leading edge with **medium CA**. Zip kicker speeds the process considerably.
 - Once glue has cured, carefully trim the excess sheeting from the leading edge using a hobby knife.



- Install the sheer webs as follows:
 - Use 1/4" thick balsa sheer webs for the first two rib bays.
 - Use 1/8" thick balsa sheer webs out to the strut ribs.
 - Use 3/32" thick balsa sheer webs out to the tips.
 - Carefully sand bevels to fit between the ribs and glue in position against the spar and ribs with medium CA.

- Using another spar assembly: true, trim and attach the 1/16" X 3" leading edge sheeting as was done for the lower spar assembly. Mark the center location and sand a flat spot as was done to the lower assembly, but no other marks are necessary.

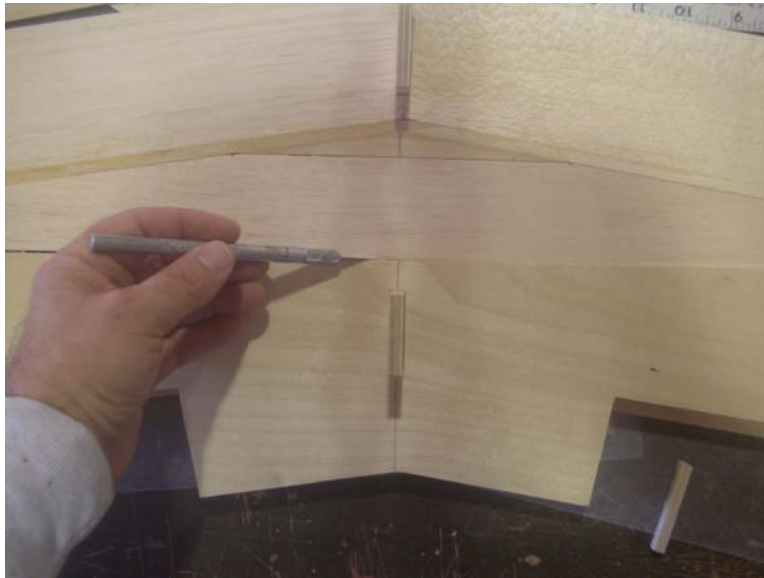
- In the following step you will enclose the leading edge of the wing. You must remove any pins still located forward of the front spar at this time. The wing should be re-pinned or simply weighted to hold it in place. Once the next step is complete, the wing will be permanently formed – either straight or warped! **MAKE CERTAIN THE ENTIRE LENGTH OF THE FRONT AND REAR SPARS ARE SECURED TO THE BUILDING TABLE!**

- Optional technique. Dope may be applied to all balsa surfaces to increase the strength and rigidity with almost no increase in weight. If you choose to do this, you will need to coat the inside of the leading edge box assembly now before it is sealed.

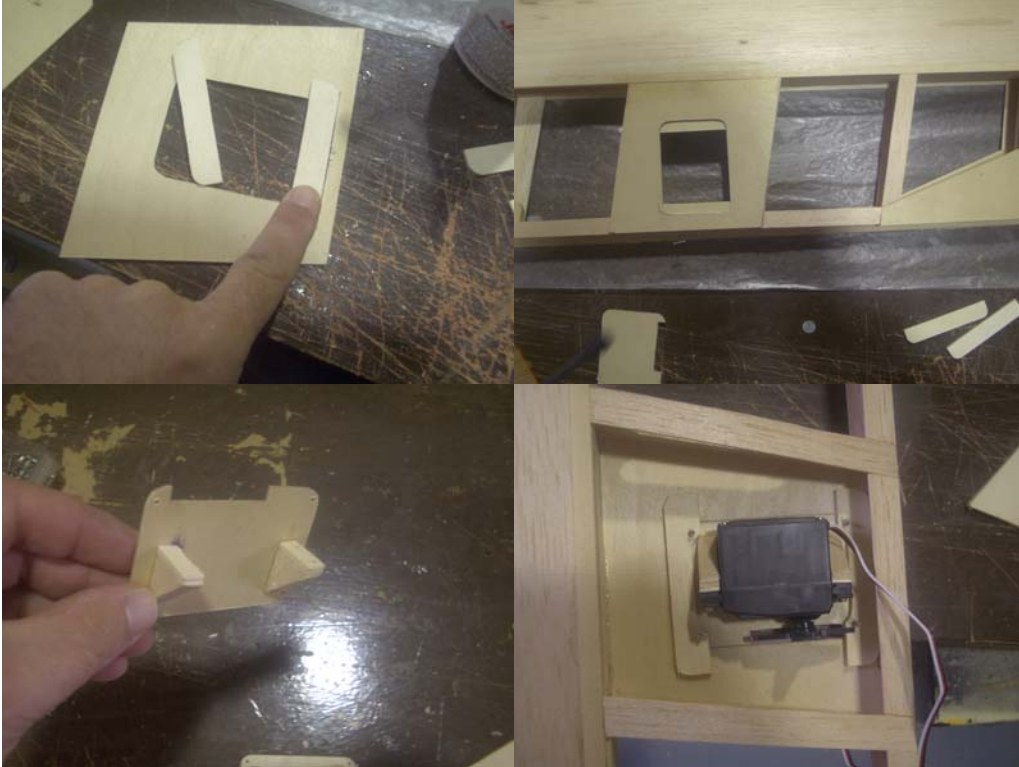


- Trim the upper spar sheeting to fit around the wing post as shown.

- Prior to the next step, reinforce all leading edge glue joints with **medium CA**.
- When satisfied with the fit, apply **thick CA** to all ribs and sheer webs and immediately position upper spar assembly in place.
 - Only glue the sheet to the ribs about two inches forward of the spar.
 - Weight the assembly until the glue cures.
- Wet the forward third of the upper leading edge sheeting with glass cleaner. Once pliant, glue in place along ribs and ¼" square leading edge using **medium CA**.
 - Once glue has cured, trim excess sheeting from the leading edge using a modeling knife.



- Sheet wing center as shown.
 - Use **1/16" X 3" balsa sheet** trimmed to fit the forward spar. Glue with **medium CA**.
 - Use the pre-cut **1/16" ply** rear sheeting. It will have cutouts for the servos, not shown in the photo. Glue with **medium CA**.
- The following step is for outboard mounted servos only. If you choose to use the direct drive system, skip to the next step.



- Add the **lite ply** backing strips to the **1/16" ply** servo mounting plate. Be sure to glue them to the appropriate side for a left and right wing panel.
- Glue mount into place as shown using **medium CA**.



- Glue 1/16" X 1/2" strips to the wing ribs and aft spar cap as shown. Use the leftover 1/16"X4"X36" inch sheet you used for the lower wing in Section II. Remember, you may also use up to 14" from the end of another 1/6X4"X36" balsa sheet.
 - Cut the strip that goes over the strut ribs wider, so it covers the strut block completely.

- Note how the caps strips covering the ribs extend over the aft spar cap. This is important for structural reasons.
- The strip on the wingtip ribs will go flush with the outside of the rib – not centered over the rib.



- Remove the wing from the building table. Trim the wingtip with a razor saw and gently sand the tip square.
- You will not be able to reposition the wing onto the table right side up, as the wing mount tabs will interfere. The following steps will need to be accomplished carefully to ensure a warp is not added to the wing.



- Build the direct drive servo mounts. You may omit this servo assembly from the top wing if desired.
 - Use **1/8" square basswood** to position the **lite ply** servo mount plates the correct depth from the bottom of the wing. Note the bottom of the wing is now up!
 - Glue the basswood square stock and plates in position as shown using **medium CA**.
 - Glue the **lite ply** servo mount half ribs in place against the inside of the servo plate as shown.
 - Glue the balsa wedges in place with **medium CA**.

- Sheet the wing center in the same manner as was used on the top of the wing previously.
 - Prior to sheeting, reinforce all glue joints with **medium CA**.
 - The pre-cut **1/16" ply** aft sheet does NOT have servo cutouts.
 - Check the fit of the sheeting prior to gluing. Especially ensure the trailing edge of the sheeting will mate properly. Use 80 grit paper and a sanding block to adjust the fit as necessary.

- Cut and add the 1/16" caps to the ribs and aft spar cap as was done on the top of the wing.

- Reinforce all visible glue joints with **medium CA**.

- Glue the pre-cut 1/4" balsa wing tips with **medium CA**.



- Using 80 grit sandpaper and a block, gently sand all seems until smooth.
 - Sand wing tips to match the wing shape.
 - Sand the leading edge to a symmetric rounded shape.
 - Sand rear ply sheeting to end at the aft edge of the aft spar cap.
 - Blend all sheeting seems.

- You have now completed assembling the upper wing.