



MINI BIRD

By MARK SMITH . . . A two-meter version of Dave Thornburg's "Bird of Time" by one of our nation's foremost glider guiders. The "Minimoa" wing planform is a trademark of this design.

• Mini Bird is the answer to the question asked by many R/C sailplane pilots, "What can I build that is not a fragile blimp, that can be flown in both calm and windy days, yet won't have the flight characteristics of a brick outhouse?"

We think you will agree with us when you see your two-meter Mini Bird "scoot" up to the top on tow, streak off to a thermal, then slowly circle up and up until it is a mere speck against the clouds.

If the plane has drifted with the wind, as it circled in the thermal, you will be pleasantly surprised by the way Mini Bird can penetrate the headwind and return to the launch area.

Before you start construction you have a major decision to make. What airfoil do you want on your Mini Bird? Mark's Models has introduced a new concept to sailplane kits by providing two sets of wing ribs in this kit. If you decide to build the 11% thick wing then go over the die cut rib sheets and apply

cyanoacrylate adhesive to the cut that forms the 8% ribs.

If you do not know which wing to build then build the 11% wing. Thin wings are fast in flight but a lot of skill is required to fly an 8% wing. So, if this is your first or second sailplane then build the 11% wing. If you are the local "hot pilot" on the R/C sailplane contest circuit and you know you can handle a 8% thick wing, then go for it! (I wonder what kind of a wing you could get out of the thin ribs that are left over when you build an 8% wing!) Another decision is a two-piece or one-piece wing. The one-piece wing is easier to build and a little bit lighter, while the two-piece wing is easier to transport.

WING CONSTRUCTION

1. Tape the drawing of one of the inner wing panels to the work surface. Tape a sheet of wax paper or plastic wrap over the drawing.

2. Place the bottom 3/32 x 1/4 x 18 inch hardwood spar in place over the

plan. Shim the leading edge up off the work surface with scrap bits of 1/16 balsa and pin the leading edge in place. Shim the K10-W1 ribs above the work surface with 1/16 inch balsa and glue all of the ribs in place.

3. Cut the 1/8 sheet balsa shear webs to fit and glue them in place. Be sure that none of the shear webs extend so high that they will hold the spar above the top surface of the rib where the 1/16 sheet balsa is glued in place. Do not install the 1/8 poplar dihedral brace at this time.

4. Glue the top spar in place.

5. Glue the 1/16 plywood shear webs to the rear of the spar. Leave the front of the spar open so you can install the 1/4 o.d. wing tire tube. If you are building a one piece wing, glue in the front 1/16 plywood shear web.

6. Build the other inner wing panel to this stage of completion.

7. Install the wing wire tube in each panel for the two piece wing. Drill an oversize hole in the ribs to provide

clearance for the tube. Plug the ends of the tube with 1/16 balsa, use the tube itself as the "plug" cutter. Chamfer the inside corner of the tube that will be at the junction of the wing panels. Remove any tarnish from the outside surface of the tube with sandpaper and wipe the surface clean with a cloth and acetone. Coat the center of the 7/32 dia. wing wire with parafin or oil so the epoxy will not adhere to it. Set one center section panel flat on the work surface and butt the other panel up against it with the wing tubes and wire in place. Raise one panel so that the end is 2 inches above the work surface as shown in the 1/8 scale drawing on the plan. When the panel is blocked up to the proper height and the panels are aligned with each other, put the 7/32 filler blocks under the tubes and epoxy the tubes in place with spots of five-minute epoxy, or cyanoacrylate and baking soda.

8. After the epoxy has cured, remove the panels from the work surface and complete the installation of the tubes. Fill in the voids between the tubes and the spars with filler blocks and epoxy. As soon as the blocks and epoxy are in place, install the front 1/16 plywood shear webs. The wing panels will have to be resting vertical on the trailing edge until the epoxy cures.

9. Sand the leading edge so that it blends into the curve of the ribs. Section C-C shows how the top 1/16 sheet bends over the leading edge. Use a sanding block that is at least 3/4 x 2 x 9.

10. Pin the wing panel flat to the work surface and apply a filler of aliphatic resin glue to the junction of the 1/8 shear web and the bottom spar. Coat the top spar, the leading edge, and the ribs with glue on the surface that contacts the top leading edge sheeting. Pin the sheet in place.

11. Let the panel dry for several hours before you remove it from the work surface. If you are building the 8% wing, then cut away a 1/16 wide strip from rib K10-W2 and K10-W1 to permit the installation of 1/16 plywood shear web doublers as shown on the plan.

12. Cover the top and bottom of the wing in the area of ribs K10-W1 with 1/16 balsa sheet. Butt the sheet balsa on the bottom of the wing center section against the leading edge, the spar shear webs, and the trailing edge. This is shown in the cross-section of the wing drawn on the fuselage side view.

13. Bevel the root ribs so that when the panels are brought together there will not be a large gap at the junction.

14. Skip this step if you are building the one-piece wing. Glue the 1/32 plywood root ribs in place. After the glue has dried use a model knife to open up a hole in this rib for the 7/32 dia. wing wire. Set the inner wing panels aside and start the outer panels.

OUTER PANELS

1. Cut out the drawing of the outer panel and repeat all of the steps required to build the inner panels to the point (step 3 or step 7) where the 1/8

balsa shear webs are glued in place. The ribs are, of course, different. Leave the leading and trailing edge about 1/8 long where they butt with the inner panel.

2. With the outer panel pinned to the work surface, glue the 1/8 shear webs in place. Fit and glue the wing tip block in place.

3. Use the 3/32 x 1/4 spar, temporarily set into the spar notches, to arrive at the proper thickness for the wing tip. When the glue has dried, remove the outer panel from the work surface and sand the leading edge and the wing tip so that they fair into the curve of the wing tips. Sand a shallow step in the top of the wing tip block where the leading edge sheeting glues to the block.

4. Check the height of the 1/8 poplar dihedral brace by setting it on the bottom spar and seeing how it matches the top spar notch in rib K10-W4. Next cut a 1/8 wide slot in rib K10-W3, between the top and bottom spars for the 1/8 plywood dihedral brace. Check the fit of the dihedral brace between the spars. If all of the parts fit, glue the dihedral brace in place in the outer panel. When the glue has dried, fit the inner and the outer panels together. With the inner panel flat on the work surface, block up the outer panel so that the wing tip is 3-3/4 inches above the work surface. Trim the dihedral brace until the wing tip is the proper height. Bevel the leading and trailing edges so they butt snugly with the inner panel.

5. Pin the inner wing panel to the work surface and glue the outer panel to the inner panel. Glue the triangular gussets to the rib K10-W3. Block up the outer panel to the 3-3/4 inch dimension while the glue is drying.

6. When the glue has dried remove the assembly from the work surface and pin the outer panel to the surface. Fit and glue the top spar in place. Glue and pin the top leading edge sheeting in place. Butt and fit this sheet against the inner panel and glue it to the top surface of the wing tip.

7. When the glue has dried, remove the wing from the work surface and coat all of the joints with aliphatic resin glue. Put plenty of glue on the spar/shear web joints. Add the one triangular gusset that you could not get in to step 4, then sand the assembly so there are no bumps to mar the covering.

8. If you are building a one-piece wing you can now join the panels. With one center panel flat on the work surface, block the other center panel up so the panel is 2 inches above the work surface as shown in the 1/8 scale drawing of the wing dihedral. Glue the panels together.

9. When the glue has dried, coat the center section sheeting with resin and lay a 2 inch wide strip of 4 ounce glass cloth in the resin. After the resin has cured coat the cloth with another layer of resin. When the resin has cured, sand the surface so that it blends into the sheet balsa.

10. The wing should now be ready for

covering. Cover the wing with Super Monokote; apply heat and pressure to each rib for maximum structure strength. Do not use any of the low temperature covering films or any of the fabric covering materials. Monokote has a very high tensile strength with very little elongation. This stressed skin effect provides necessary rigidity to the structure. For maximum visibility at extreme altitude, black Monokote on the bottom surface is excellent.

FUSELAGE

1. Tape the drawing of the fuselage side view to the work surface. Tape a sheet of plastic wrap or wax paper over the drawing.

2. Pin the 1/8 poplar plywood nose section over the plan and fit the 1/8 balsa rear fuselage side to the nose section. Glue and pin these sections together. Glue the 1/16 scrap balsa doubler over the joint. Draw lines across the fuselage side to show the location of the bulkheads K10-F11 and K10-F5. Remove this assembly when the glue is dry. This part is the left hand fuselage side.

3. Repeat the above step except the plywood nose section is shimmed up off of the work surface so that it will be flush with the rear fuselage side. Do not glue the 1/16 doubler in place or mark the position of the bulkhead until the glue is dry and you can turn the fuselage side over. If you make this second side exactly the same as you made the other side, you would have two left hand fuselage sides! Don't! (Unless you plan to build two Mini-Birds! wcn)

4. Place the fuselage sides on the workbench so that the surfaces that will be on the inside of the fuselage are up. Glue the 1/16 doubler on to the right hand fuselage side and the 1/4 triangle corner gussets and the 3/16 square wing rests onto both fuselage sides. Note that the bottom gusset extends to the front edge of the fuselage side. Be sure you do not make two identical left hand fuselage sides! (Unless... etc., etc wcn)

5. Draw a vertical center line on the bulkheads K10-F3, K10-F5 and K10-F11. Glue the plywood doublers K10-F8 and K10-F9 onto their respective 1/4 thick bulkheads. Drill the assembled bulkheads for the 3/16 dia. dowels. If you plan to use pushrods to drive the elevator and rudder, cut a large hole in each bulkhead to permit the installation of the pushrods. Stranded steel cable in a tube will require the bulkheads to be notched to clear the tube. Drill the 1/16 dia. hole in the tow hook retainer K10-F6.

6. Draw a straight line on the plans from the rear of the fuselage to the front bulkhead. Use this line as a guide to keep the fuselage straight while the glue is drying. Glue the fuselage parts together. Bulkheads K10-F3, K10-F5, and K10-F11 along with the two hook retainers, K10-F6 and the cross brace K10-F12 are all glued together in one set up. Shim the tow hook retainer K10-F6 up off of the work surface with K10-F7. Do not glue K10-F7 in place. Use masking tape to hold the fuselage sides and

bulkheads together. Pin the assembly over the plan so that the straight line can be used to align the fuselage assembly. The bottom of the fuselage is resting on the work surface and pins are used to "nail" the assembly down until the glue is dry. Do not glue the rear of the fuselage together just yet.

7. When the glue is dry remove the fuselage assembly from the work surface and bevel the 1/4 inch triangle gussets at the rear so that the fin base K10-F8 will fit in place.

8. Glue the dorsal fin K10-F12 and the fin K10-F15 together.

Pin a piece of scrap 3/32 balsa to the top rear portion of the fuselage so that the fin assembly will be positioned properly. Use the fin assembly K10-F15 and K10-F12 to align the fin base in respect to the fuselage. When you are satisfied with the fit, glue the fin base in place. Use pins or clamps to hold it all together while the glue is drying. Sight down the fuselage to be sure the fin base is straight.

9. Install the elevator and rudder pushrods, or cables and the tow hook. Drill a hole in the 1/16 plywood doubler K10-F7 and slip it over the tow hook.

10. Cover the top and bottom of the fuselage with 3/32 sheet balsa. Slot the bottom sheet to clear the tow hook. Glue the doubler K10-F7 in place between the retainer K10-F6 and the bottom sheet. Cut an access hole in the top sheet to permit access to the rear dowel that retains the wing rubber bands.

11. Spot cement the canopy block in place. Use a very small amount of cement (such as Ambroid) so that the application of thinner to the cement will soften it after the canopy block has been shaped. Sand the front of the fuselage flush with the bulkhead K10-F3 and fit the nose block in place.

12. Get out your whittling knife and get ready to "move wood." Round off all of the corners of the fuselage except where the wing rests on the fuselage. You can get an idea on how much wood can be removed by studying the cross-sections of the fuselage drawn on the plan. You can really remove a lot of weight in this step, so make a template to show the correct corner radius and use the template as you cut. Shape the canopy and nose block. When the knife work is completed, get out some rough sandpaper and finish off the corners and high spots. Finish up with fine sandpaper.

13. Bend two 1/16 inch dia. wire hooks as shown on the plan and epoxy them to the inside surface of the fuselage. These hooks retain the canopy hold down rubber bands. Glue the plywood rubber band retainer and the 3/16 square canopy alignment stick to the bottom of the canopy. The plywood rubber band retainer fits into a slot cut into the canopy.

FIN AND RUDDER

1. If you are going to Monokote the fuselage, then Monokote the top of the fuselage, from the wing to the rear, at this time.

2. Sand the fin assembly to a stream-line shape. Remove a 3/16 wide strip of Monokote and glue it in place on the fuselage. Note the balsa insert that is glued into the plywood fin base to permit installation of the bottom hinge.

3. Glue the rudder components together over the plan K10-R1 and K10-R2. Do not install the stab fairing K10-F14 at this time.

4. Sand the fin and rudder to a stream-lined shape and slot them to receive the hinges. Do not install the hinges just yet.

5. Cover the fin and rudder with Monokote.

6. Slot the rudder for the 1/16 plywood rudder horn and glue the horn in place. Be sure the hole for the pushrod clevis is in line with the hinge line.

STABILIZER

1. Tape wax paper over the plan and pin the leading and trailing edges over the plan. Build both stabilizer halves at the same time. Do not put K10-E3 and K10-E4 in place just yet.

2. Cut the 1/16 x 1/4 balsa strips (ribs) to fit between the leading and trailing edges. Cut the 1/16 x 1/4 strips that form the root rib. See section A-A for the location of these strips.

3. Epoxy the 1/8 dia. aluminum tube to one 1/8 x 1/4 hardwood spar and epoxy the 3/32 pivot wire to the other spar, there is really no need to shim the wire away from the spar if you build both stab halves at the same time. Wrap the tube and wire with thread then glue and pin the spars in place over the ribs. Let the 3/32 wire extend into the aluminum tube to align the spars.

4. When the glue has dried, remove the pins from the leading and trailing edges and shim them up with 1/16 sheet scrap.

5. Install K10-E3 and K10-E4, then glue and pin the top 1/16 x 1/4 ribs over the top of the spar. Mark the locations of the tie wire to its aluminum tube.

6. Now is as good a time as any to install the 1/16 piano wire (tie wire). We can call it a tie wire because it ties the stab halves together. Drill a hole for the wire and tube in each stab half then epoxy them place. Let the epoxy cure while the stab halves are pinned over the plan.

7. When the stabilizer structure is dry remove it from the work surface and sand the structure to the streamlined shape as shown in section AA and BB. The sharper the leading and trailing edge, the less drag, so get that surplus wood off!

8. Fit the small fairing block K10-E5 onto each stab half and glue them in place. Sand them to fare into the stab.

9. Cut a 1/16 deep notch in the left hand stab half to receive the 1/16 plywood elevator control horn. Let the aluminum tube protrude.

10. Cover the stabilizer with Monokote.

11. Glue the 1/16 plywood horn in place.

This concludes the festivities having to do with the cut and glue mode of construction. Now we can get it all

together.

GETTING IT ALL TOGETHER

1. The wing is complete, covered and ready to fly. You have checked for warps and removed them with a hot iron.

2. The fuselage needs the wing saddle or rest trimmed to fit the bottom of the wing and the canopy needs a tunnel cut to allow clearance for the rubber bands that retain the wing. Then you have to decide whether to paint the fuselage or Monokote it.

3. The fin and rudder are covered, but the rudder is not yet attached.

4. The stab is complete but the stab fairings K10-F14 are not yet shaped or installed and the 1/8 dia. pivot tube through the fin has not been epoxied in place.

5. The radio has not been installed.

LET'S START WITH STEP NUMBER 2!

6. Set the wing on the fuselage and see where the fuselage interferes with it. The front bulkhead K10-F11 will have to be trimmed a bit to allow for the wing dihedral. The 3/16 square wing rests are also sloped to provide for the dihedral.

7. The 1/8 o.d. x 3/4 long pivot tube is mounted in a hole drilled undersize in the fin base. Use the pivot wire to locate the pivot tube in the fin base. Cut a small circle of Monokote from around the pivot tube hole then press the pivot tube into the hole. Do not install the fairings K10-F14 but slide the stab halves together on the fin. Use the stab to align the pivot tube in the fin. Make big epoxy fillets around the pivot tube. Sight down the fuselage both from the front and rear to be sure the stab is aligned. Let the epoxy cure.

8. Install the radio. Do not depend on the canopy to hold the batteries in place. Hold them in with rubber bands, tape or screws, but do not trust the canopy. Be sure the rudder clevis at the rudder horn rotates freely on the threaded portion of the push-pull cable or rod. The rudder horn is at an angle to the rod so as the rudder swings through its travel the clevis must rotate on the threads. Use a metal clevis.

9. Three-quarter ounce glass and resin on the forward fuselage bottom won't hurt anything. The plane will be a little heavier but much stronger. If you paint the fuselage, then glass the nose. If you Monokote, do not bother with the glass.

10. Paint or Monokote the fuselage.

11. A skid is only necessary if you plan to fly the plane over dirt or pavement.

12. Attach the rudder.

13. You are correct... we have the plane ready to fly but we never did get the stab fairings installed. The reason is we never have been able to figure how to get the fairing onto the fin at the correct angle!

14. Fly the plane and get it trimmed out the way you like it... THEN glue the fairings in place so they align with the stab! You can do this at the field. Let the fairings slip over the pivot tube then when the stab angle is correct glue the fairings in place while the stab is installed.