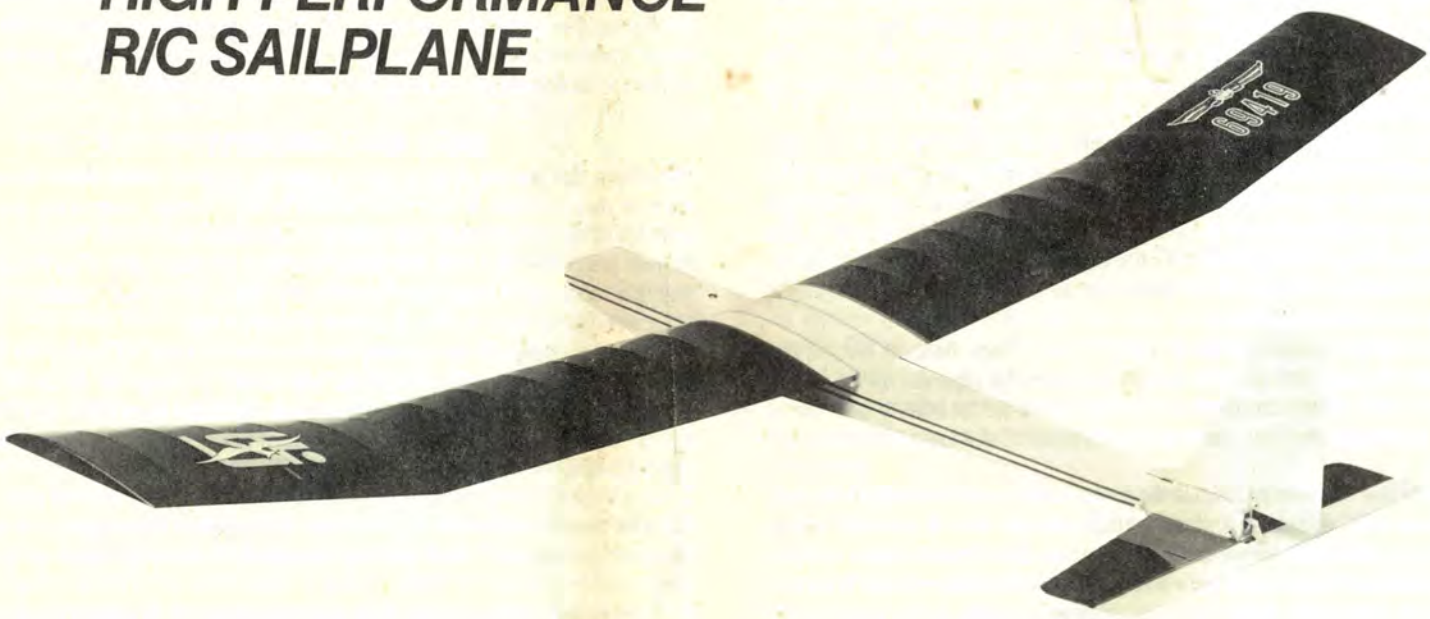
BUILDING INSTRUCTIONS FOR AIRTRONICS

SQUARE SOAR 72

HIGH PERFORMANCE R/C SAILPLANE



INTRODUCTION

The Square Soar is an easy to build R/C sailplane designed for the novice. The straight forward construction is similar to many free flight models and provides a rugged crash-resistant structure so important for surviving the first few flights. The constant chord wing and simple box fuselage make building and covering the model a simple task, even for the first-time modeler.

Don't let the appearance fool you. This model flies very well and will provide outstanding flights. Designed for thermal flight, it is also an excellent slope model in light to moderate wind conditions. The Square Soar has also been very successful as an electric powered sailplane, even at weights up to 45 ounces.

The model can be built in four different versions including a Vee-tail. This permits easy experimentation to compare the performance of different configurations. For all around performance and maximum stability, the conventional tail, polyhedral wing version is recommended.

This kit includes all wood parts and special hardware items required to build the model. Adhesives, covering materials and standard hardware items for the radio installation are not furnished. These are readily available from your hobby dealer. The following list is our recommendation, but you may, of course, substitute equivalent materials if you prefer.

(1) 26" x 72" roll of covering material—Super MonoKote
Rubber Bands to attach the wing and stabilizer.
Fishing sinkers or similar weights for nose ballast.
Radio system of your choice.
If you build the Vee-Tail version—(1) Airtronics Vector Director No. 909520.

(2) NyRod pushrod package—Sup-r-line No. SP-30 or equivalent
You will also need a few hand tools, pins, masking tape, and sandpaper. To assemble the model, we recommend the following adhesives:

For the wing and stabilizer: Wilhold aliphatic glue, Titebond or similar glues. For wing joints and fuselage: Hobbypoxy Formula One or Four, or Devcon 5-minute Epoxy. No special tools or jigs are required. Any smooth flat surface, into which you can push pins, at least 36" long and 8" wide is required to assemble the model. Use Handi-Wrap or similar material to protect the plans during construction.

CONSTRUCTION

The construction sequence described progresses from the most simple steps through more complex building requirements. If this is your first model, we suggest you follow the sequence shown. The advanced modeler will, of course, ignore all instructions anyway. To reduce overall building time, we suggest that you skip forward to the next step while the glue is drying. Just work carefully and be sure you understand all construction steps before cutting. Cut the plans apart if this is more convenient. Cover the plans with *Handiwrap* or *similar* to prevent gluing the wood parts to the plan. The instructions describe construction of the conventional tail, polyhedral wing version. Refer to the plan for description of the optional configurations.

TAIL SURFACES

1. Take the 1/8" x 3" x 17 7/8" sheet of balsa and lay it over the plans. Mark the sheet using a soft pencil or ball point pen following the guide lines on the plans. Use a straightedge and sharp knife or single edge razor blade to cut out the fuselage top and bottom sheet. Mark these to identify them during the fuselage assembly. Cut the dorsal fin from the cut-off sheet and sand the edges square and smooth.
2. Tape the plans to your work surface and cover the vertical tail section with transparent kitchen wrap. This prevents the glue from adhering to the plans. Align the pre-cut 1/8" sheet balsa fin over the plan and pin into place. Align the dorsal fin with the bottom edge of the fin and check that it fits properly. Use a ruler to align the bottom edges and glue the two parts together using 1 or 2 pins to hold the dorsal fin in proper position. Allow these parts to dry completely before removing them from the work surface.
3. The rudder is made from the 1/8" x 3" x 7" sheet. Place the sheet over the plan against the back of the fin and mark the rudder trailing edge. Cut off the long triangular strip using a straightedge. The cut-off piece will be used to form the tail skid so save this part. Use a sanding block to round off all edges except the leading edge.

Use the plan to locate the holes in the rudder for the control horn. Mark the holes and use a 3/32" diameter drill. Check carefully that the holes in the rudder line up with the holes which are molded in the horn base and nut plate. Locate the hinge positions from the plans and use a No. 11 X-Acto knife blade (or similar) to cut a 1/2" long slot in the front edge of the rudder. Work very carefully and be sure the slot is exactly on the center of the wood. Run the blade back and forth in the slot and trial fit the hinges until the tab is fully inserted in the rudder and the crease is lined up with edge of the rudder. Bevel the rudder leading edge as shown on the top view.

4. Remove the fin from the work surface. Sand the leading edge round on both the fin and dorsal fin. Align the fin and rudder and mark the hinge positions on the fin. Cut slits in fin trailing edge and fit hinges. With the surfaces pushed together, check that the rudder swings freely and moves at least 30° each side of center. Check that all edges line up and final sand all over.
5. Cut the 3/16" triangular stock fin reinforcement pieces to length and shape the front ends as shown on the plans. Make one for each side of the fin. With a piece of kitchen wrap over the surface of your work bench, glue the triangular pieces to the bottom of the fin. Use a square or triangle along the side of the fin while you glue these pieces in place to assure the fin is at 90° to the surface of your work bench.
6. Lay the 1/8" x 1 3/8" x 17 7/8" elevator stock over the plan and check that the leading edge is straight. Use a straightedge to trim the edge if necessary. Mark the location of the notch at the center and cut out the notch. Align the base of the control horn and mark the location of the horn mounting screws. Drill two 3/32" diameter holes. Mark the hinge position on the elevator and cut the hinge slots following the same method described for the rudder. Check fit the hinges, then remove them and pin the elevator in place over the plans. Be sure to cover the plans with kitchen wrap as you did for the fin assembly.
7. Cut the stabilizer trailing edge from the 3/16" x 1/4" x 36" balsa strip and pin down against the elevator leading edge. Cut the center and tip ribs from the 3/16" x 1 3/8" x 5 7/8" stock, being careful that the grain direction is as shown on the plans. Be sure that these parts fit the plan and that the edges fit tightly against the trailing edge. If you are using aliphatic or similar glues, we suggest that you pre-glue the end grain of these parts. This is easily accomplished by applying a coat of glue and letting it dry for 10-15 minutes before applying the final coat of glue. It is also wise to trial fit the parts together before using any glue and to correct any mistakes before continuing. Pin the end ribs in place gluing them to the stab trailing edge. Also pin and glue the center rib in position. Cut the leading edge pieces from the 3/16" x 1/4" strip, and fit the center joints so that both pieces butt tightly together then pre-glue this joint. Apply glue and pin the leading edges in place.
8. Cut the angled ribs from the 3/32" x 3/16" x 36" strip. It is best to cut these ribs slightly oversize so that you can trim the excess for an exact fit between the leading and trailing edges. Work from the center toward the tips and glue each rib in place after fitting. Let the completed stab dry thoroughly before removing from the building surface. This means at least eight hours if you have used aliphatic glue.
9. Remove the stabilizer from the board and mark the hinge locations on the trailing edge. Cut the hinge slots and install the hinges in the stabilizer. Bevel the elevator leading edge as shown on the fuselage side view to provide clearance and slip the elevator onto the hinges. Check that the hinges work smoothly but don't epoxy them in place yet. Remove the hinges and sand the elevator and stabilizer rounding all edges. Round the leading edge and tips then use a sanding block to sand the top and bottom surfaces smooth. Be sure that all ribs are flush with the leading and trailing edges as any high or low parts will show up as flaws when you cover the model. Correct any problems now, before covering. This completes the construction of the tail surfaces and now you are ready to tackle the wing.

BASIC WING ASSEMBLY:

We suggest that you use aliphatic glue to assemble the wing panels except where epoxy is recommended. If your work surface is large enough, constructing both wing panels at the same time will speed-up overall construction time. Cut out the dihedral gauge from the plans and glue it to a piece of scrap balsa or cardboard, then trim accurately to final size. Tape the plan tightly to the work surface and cover with kitchen wrap to avoid gluing the wing to the plan.

1. Separate the wing ribs by removing the pins from the stack. Be careful not to break the ribs. Set aside six of these ribs and remove 1/16" from the top surface, marking these as center-section ribs. It is necessary to modify these ribs so that the top 1/16" sheeting will be flush with the leading and trailing edges. Now pre-glue to seal the leading and trailing edge ends of all ribs.
2. Use a small square or straightedge to cut four pieces 1 5/16" wide and four pieces 3 1/8" wide from the 1/16" x 3" x 17 7/8" sheet. Be very careful to make the 1 5/16" wide pieces exactly the same width and that the grain direction is as shown on the plans.
3. Pin the trailing edge in place over the plans. Before you do so however, look at the end of the pieces of trailing edge stock. With the bottom side down, the wider end will be at 90° to the surface of your work bench. If it slants back, turn the stock upside down. Using the center rib and tip rib as a guide, pin the 1/8" x 1/2" x 36" hardwood spar in place. When the spar is properly located, the ribs should fit snugly against the trailing edge. Because the spar is hardwood, it is pinned in place by using groups of three pins in tripod fashion. That is, two pins about an inch apart on one side of the spar and a pin between them on the other side of the spar. Use several groups of pins in this way down the length of the spar to make sure it will be flat against your building board. Don't try to push pins directly through the spar as the wood will split.
4. Glue the center rib to the spar and trailing edge using the dihedral gauge to tilt the rib slightly toward the tip. This will ensure a tight fitting joint when the wing panels are joined together. Next, glue the tip rib in place, making sure that it is aligned perpendicular to the work surface. Now you can glue the remaining ribs in place except the ones at the polyhedral joints and the center ribs. Be sure that the ribs are tight against the trailing edge, adjusting the spar location if necessary. Also be sure that all ribs are pressed down against the work surface. Use pins to hold the ribs in position if needed.
5. Place a drop of glue on the forward end of all ribs and push the hardwood pre-shaped leading edge against the ribs. Be sure that the 1/4" wide edge is against the work surface. Use pins to force the leading edge tightly against the ribs and also tight against the work surface. Avoid pinning through the wood as this may weaken the structure or split the leading edge. Check once more that the leading and trailing edges, spar and all ribs are tight against the work surface.
6. Install the ribs at the polyhedral joints making certain that they are properly aligned over the plans and perpendicular to the work surface. Use one of the center ribs as a temporary spacer to keep the joint ribs properly spaced. Check alignment once again and remove the spacer.
7. Next you'll need to custom fit the 1 5/16" bottom center section sheeting pieces. They are to be glued in place between the center and No. 2 ribs in the area in front of and behind the spar. Since these pieces are 3" long, measure and cut the piece

to fit in the area in front of the spar. Use 5 minute epoxy to butt glue the scrap from that piece to a second piece of 1 5/16 x 3". Wipe off any excess glue. After the adhesive sets up, custom fit the piece in the area behind the spar. Next, glue these bottom center section sheeting pieces in place. Pin them down to assure they'll be flat on your building board. Now install the other center section ribs. Be sure that the No. 2 rib fits tightly against the edge of the bottom center sheet.

8. Cut the triangular shaped gussets from the 1/8" x 1/2" balsa stock exactly as shown on the plans. Use your sanding block to custom fit each one so it fits squarely to the rib and leading or trailing edge. Pin the gussets in place such that they are tight against the work surface.

9. Unlike the bottom wing center section sheeting that fits between the ribs, the top sheeting is glued to the top of ribs No. 1, 2, and 3. Use 5-minute epoxy to butt glue 2 pieces of the sheeting together to make one piece 6" long. Cut it a bit oversize and sand it with your sanding block to get an exact fit between the leading and trailing edge. Glue it to the top of the three ribs and the leading and trailing edge. This completes the basic wing assembly. Remember that you must leave the wing panels pinned to your work surface for a minimum of eight hours to allow the glue joints to completely dry. Don't get impatient. (You can begin work on the fuselage while the wing is drying.)

FINAL WING ASSEMBLY

1. Remove the wing from the work surface carefully removing all pins or tape. If the pins are hard to remove, grasp with pliers and rotate the pin slightly to break loose any glue, then pull straight out. Use a flat sanding block at least 3" wide by 9" long, made of pine or plywood stock, with No. 180 or No. 220 sandpaper glued in place to sand the wing lower surface from tip to tip. Be careful to keep the airfoil section flat and not to change the rib shape. Cut away any excess blobs of glue as you progress. Cut the tips from 1/8" x 1 3/8" x 7 1/8" balsa as shown on the plan. Trim any excess material which protrudes beyond the tip rib and glue the tips in place, aligning the bottom edge with the lower wing surface. When dry, cut off the excess material to match the top rib contour.

2. Use a small razor plane or your knife to carve the leading edge to the shape shown on the side view. Work slowly with the grain of the wood and reverse the direction of cut if the wood tends to splinter. Remove material from the corners and carve and sand the leading edge to a nicely rounded shape. Be very careful to maintain the shape along the whole span of the wing and avoid shaping to a point. This is very important as the wrong shape, or different shapes on the right and left panel will cause serious problems when you fly the model. Now you can sand the top surface of the wing, using extra care not to change the contour of the ribs. Just blend the leading and trailing edge joints and the tips and center sheet.

3. Use a razor saw or hacksaw blade to cut the wing panels into two pieces at the polyhedral joint between the two ribs spaced 3/32" apart. Sand the leading edge, trailing edge, and spars flush with the sides of the ribs at the polyhedral joint.

4. Cut the 3/16" x 3/4" x 14" tapered stock to the width of the wing. With the inboard or longer wing section flat on your work bench, epoxy the tapered stock piece to the rib at the polyhedral joint with the thicker side down and the bottom flat on your work bench.

After the epoxy has set up, trim the tapered stock to the shape of the rib to which it is glued. To prevent splitting the wood, work from the spar forward to the leading edge then from the spar to the trailing edge.

5. Pin the inboard section of the wing panel flat to your building board. Put the outboard section in place, then block up the tip of the outboard section so it is raised up 2 7/8". Check the polyhedral joint. If the wing panels don't fit together properly, sand the tapered stock as necessary. When you are satisfied with the fit, apply epoxy to the rib and tapered stock and glue the wing tip section in place. Be sure that the leading edge and trailing edge of the tip section aligns with the leading edge and trailing edge of the inboard section. Pin the parts together while the adhesive sets up. When completely dry remove the panel from the board and finish sanding the joint. Repeat for the other wing panel.

6. Next, install the 1/16" ply polyhedral joint brace. Locate the pre-cut braces in the kit and study the polyhedral joint detail on the plans. The braces are installed just behind the spar. Use a razor saw or hacksaw blade to cut a 1/16" slot through the ribs and wedge piece just behind the spar from the bottom side of the wing. The slot should be snug fit for the brace and just deep enough so that bottom of the brace–the angled side–is even with the bottom of the wing ribs. Use epoxy to glue the ply polyhedral joint brace in place, clamping the joints if required to force the brace tightly against the spar.

7. It is easier to final sand the wing panels before they are joined together. Go over the entire wing with a sanding block and No. 320 or 400 grit sandpaper. Be sure that all joints are smooth and that no blobs of glue will contact the covering material. Be very careful not to change the shape of the ribs. When you are satisfied that you have gotten everything properly sanded you are ready to join the wing panels.

8. Carefully block sand the top sheeting leading edge, trailing edge and spar flush with the angled center rib. The easiest way to do this is to position the wing panel against the edge of your work surface with the polyhedral joint blocked up 1 3/8" above the surface. Hold the panel firmly in place and block sand the end of the wing panel using the end of the work surface to guide the sanding block. Sand both panel ends and trial fit together. With one panel flat on the work surface, and the polyhedral joint of the second panel blocked 2 3/4" above the surface the panels should fit tightly together. Correct any gaps by resanding the panel ends. It is very important that the panels butt tightly together to prevent breaking the wing during launches! Be sure they fit.

9. Use a straight pin to punch holes in the center ribs and trailing edge. Carefully mix a batch of epoxy and coat the ends of each panel. Place kitchen wrap under the joint and place one panel flat on the work surface, pinning it in place. Push the second panel tightly against the first, and adjust the blocks so that the poly joint is 2 3/4" above the work surface. Check to make sure that the leading and trailing edges are lined up and that the center rib is flat against the work surface. Pin the second panel in place and let the joint cure completely without moving the wing.

10. Remove the wing panels from the work surface and sand the center joint smooth. Cut the notch in the trailing edge for the reinforcing wire. Bend the wire to match the center dihedral angle and clean with sandpaper. Epoxy the wire in place, using masking tape to hold it while the epoxy cures. Don't omit the wire as it reinforces the thin trailing edge for the rubber bands which hold the wing onto the fuselage.

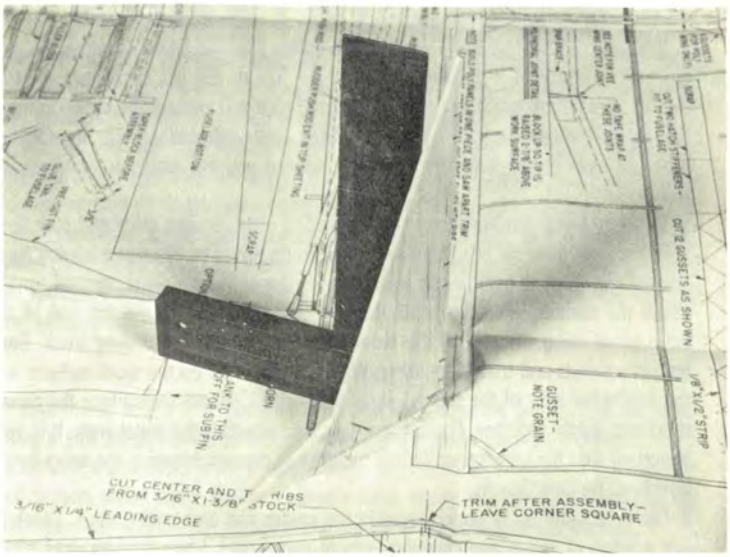
11. Sand the joint smooth and use Duco or similar cement to secure one end of a strip 3/4" wide by 14" long nylon tape to the bottom trailing edge. Then raise the tape out of the way and apply a heavy bead of cement to the bottom joint. Pull tape tight and squeeze down onto the cement. Use your fingers to rub the tape down firmly in place, allowing the cement to ooze through the pores of the tape. Add more glue, if necessary, to cover the dry spots and let dry a few minutes. Now apply cement to the top surface and pull tape tightly around the leading edge, across the top and down around the leading edge, across the top and down around the trailing edge, rubbing down as you go. When dry, trim off excess tape and rub in 2-3 additional coats to further strengthen the joint, rubbing the cement into the tape and adjacent balsa. Don't omit this step as the wing's strength depends on the tape and cement reinforcement! Sand the wing all over and it is ready to cover.

FUSELAGE ASSEMBLY:

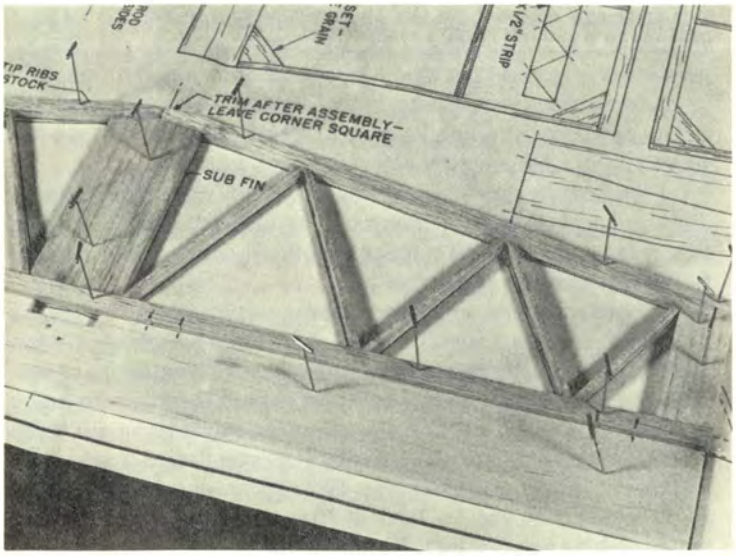
For the quickest assembly of your Square Soar fuselage, we suggest using 5-minute epoxy for most joints. Before you start please study the plans to be sure you understand the construction. The sides, formers, and forward top and bottom of the fuselage are all made from lightweight poplar plywood. This is a very strong material and will provide a very rugged fuselage that will withstand hard landings. Like most plywood, one face is of better quality than the other, and this should be on the outside of the finished fuselage. This type of plywood has a tendency to warp with changes in humidity before it has been assembled. This is not a problem since the construction method described will provide a straight fuselage. Also you can remove any warps by drawing the part over a table edge while applying downward pressure in the same way as curling a sheet of paper or thin metal. Just be sure that you follow the instructions carefully.

1. Align the right side over the plan with the forward edge against the line at the nose and the top edge 1/8" down from final position. Mark the position of the formers at the wing leading and trailing edge. Use a small square to draw lines across the sides showing the position of the former edges. Line up the left side with the right and transfer the marks to the left side, and draw the lines on the side. These lines will help to align the fuselage during assembly.

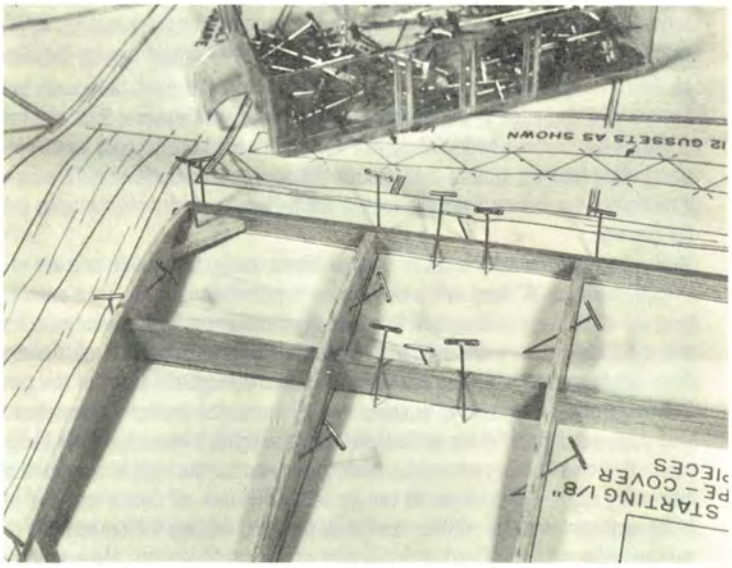
2. Epoxy the shaped nose block to the inside edge of the right side aligning the top and front faces with the edges of the side. Use a square to be sure that the noseblock is perpendicular to the side. Epoxy the leading edge former in place making sure that it is properly aligned. Let this assembly dry before continuing.



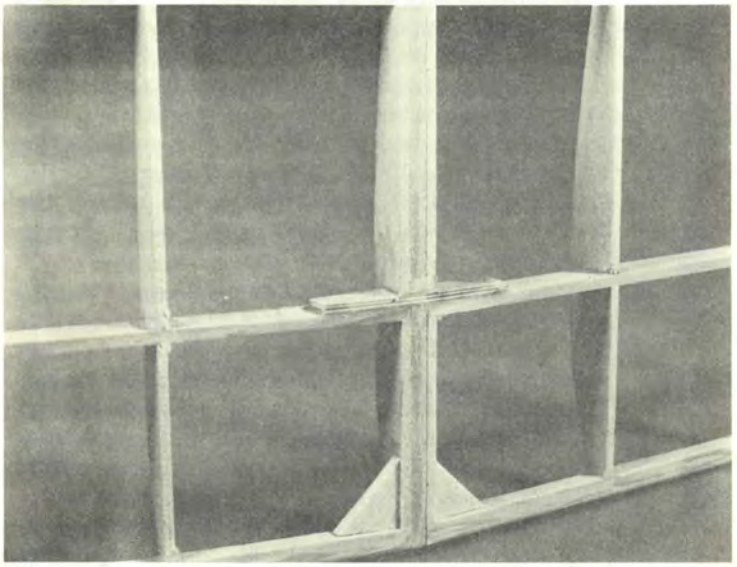
Gluing triangular reinforcement to fin and dorsal assembly. Note use of square for alignment.



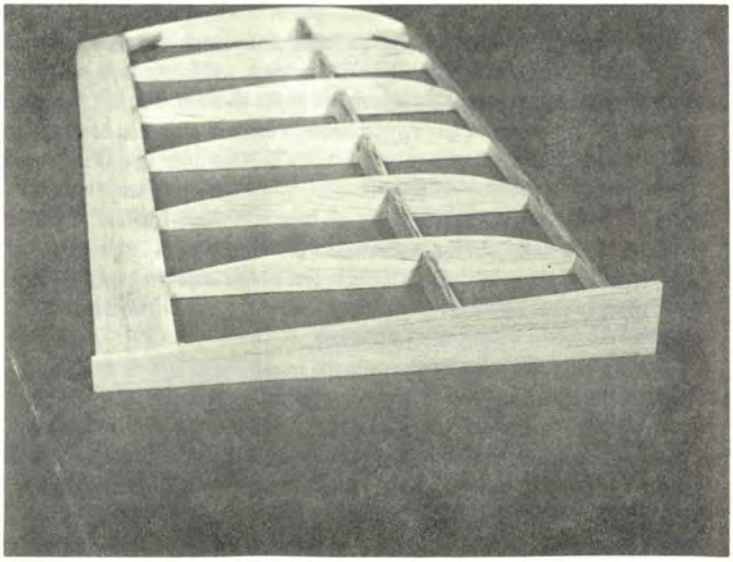
Completed stabilizer and elevator, ready to remove from work surface.



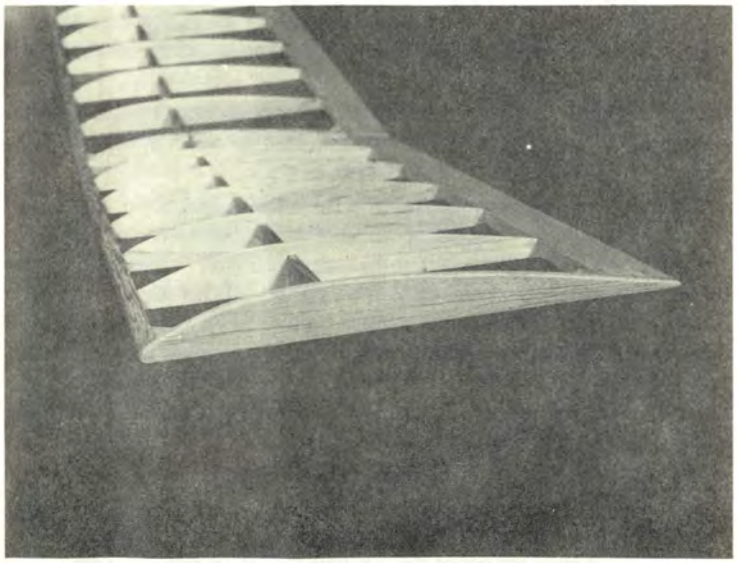
Wing panel assembly showing method of pinning hardwood spar in place.



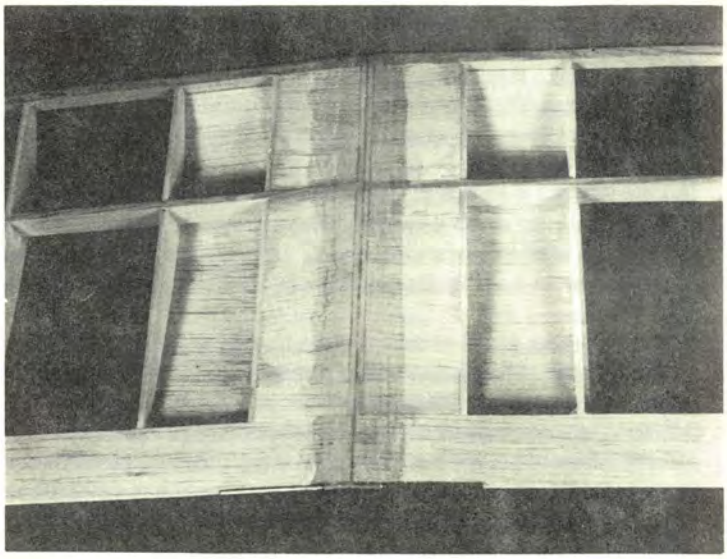
3/16" x 3/4" tapered stock glued to main wing panel at polyhedral joint.



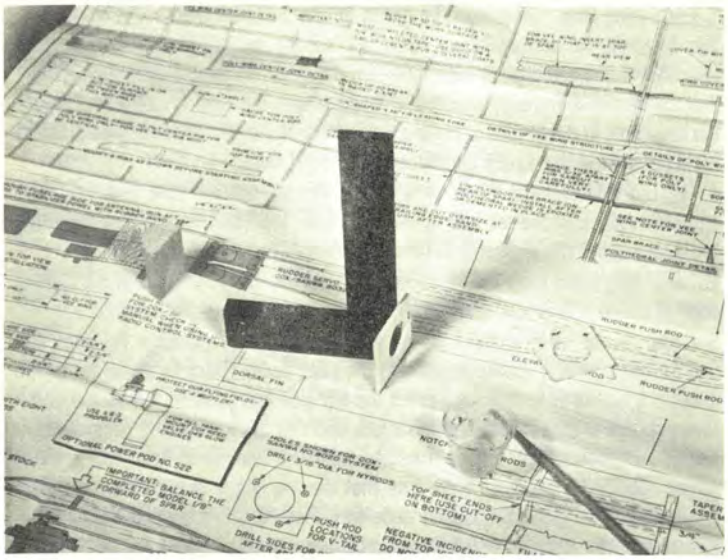
Wing tip blank glued in place after trimming trailing edge, leading edge and spar.



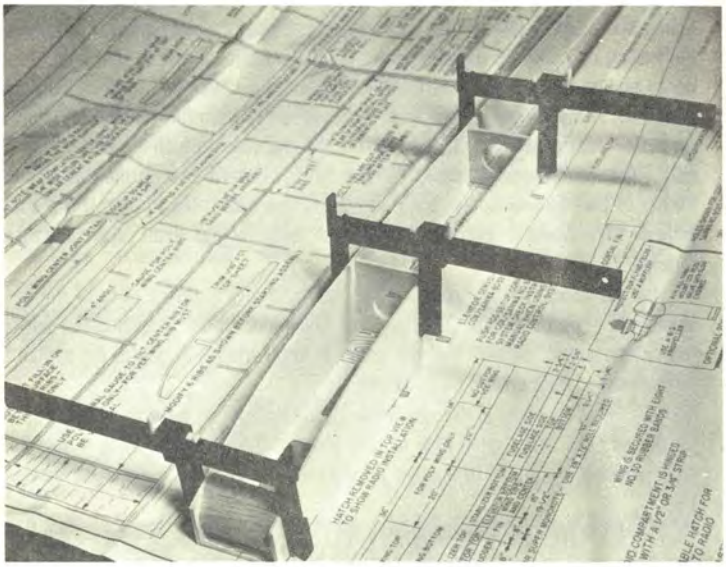
Finished tip panel after sanding tip blank and leading edge to final contour.



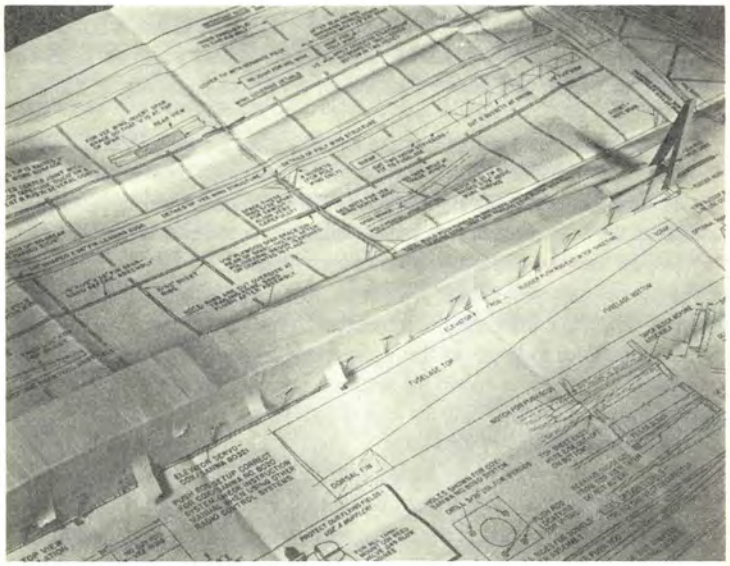
Completed center joint with reinforcing wire and nylon tape glued in place.



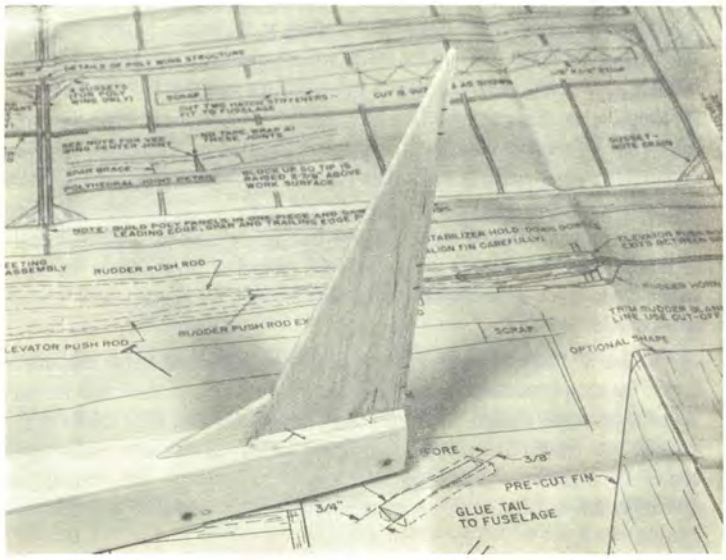
Sides marked with former locations with noseblock installed. Note use of square for alignment.



Assembling left side over top view. Model clamps used to secure side in position.



Installing bottom fuselage sheet. Masking tape and pins used to hold fuselage in place.



Fin assembly installed on fuselage top after fuselage assembly and rough shaping.

Optional power pod showing all parts assembled and ready to finish.

3. The trailing edge former must be drilled for the pushrods before it is assembled. The locations for a Cox/Sanwa radio are shown on the plan, but may need relocating if you use another type radio. Drill two 3/16" diameter holes, being careful that the former is correctly oriented by laying it over the view on the plan. Be sure the large hole in the former is toward the bottom of the fuselage, with the pushrod holes toward the top. Epoxy the former to the right side.

4. Cut the tailpost from the 1/4" x 3/8" stock. The post is 7/16" long and should be epoxied in place at the tail end of the right side, lined up with the bottom edge. The space above the tailpost is to provide clearance for the elevator pushrod.

Cut a 7/8" long piece from the same 1/4" x 3/8" strip, for the cross piece at the leading edge of the stab. This will be trimmed to exact length during construction.

5. Cover the top view of the fuselage with kitchen wrap and align the right side and former assembly *upside down* over the plan. Apply epoxy to the edges of the noseblock and both formers and press the left side into position. Be sure that the forward edge is aligned with the noseblock and that the formers are positioned between the guidelines. Use pins, masking tape and clamps to keep the parts in proper alignment. Check to make sure that the top edges of both sides are tight against the work surface. Use pins to be sure that the whole assembly is properly aligned over the top view of the drawing. Let dry.

6. Check that the formers and noseblock are lined up with the bottom edge of the sides. Use your sanding block to correct any problems. Apply epoxy to the bottom edges of the noseblock, leading edge formers and forward section of both sides. Install the plywood forward bottom using masking tape strips to hold it in position. Note that the forward edge is lined up 5/16" behind the forward end of the sides. Be sure that the bottom glue joints are completely dry before proceeding to the next step.

7. With the fuselage still aligned over the top view draw the tail ends of the sides together. Taper the face of the tailpost so that it fits tightly against the left side when both sides are properly aligned over the top view. Apply epoxy to the tailpost and clamp the sides together with spring clothespins or similar clamps. Make certain that the sides and tailpost are centered over the plans.

8. Position the wide edge of the 1/8" sheet aft bottom against the rear edge of the plywood bottom and mark the aft end position on the edge of the sides. Trim the 1/4" x 3/8" crosspiece to length so that it fits snugly between the sides forward of this mark. Be sure not to spread the sides too far apart. Epoxy the crosspiece in place making sure it is flush with the edge of both sides.

Cut the aft pushrod support from scrap 1/8" sheet and trim to length so that it fits snugly between the sides at the leading edge of the fin. Drill a 3/16" hole centrally located and epoxy the support in place. Be sure it is tight against the work surface.

9. Apply epoxy to the edges of the trailing edge former, aft crosspiece and to the edges of the sides from the ply bottom aft to the crosspiece. Apply epoxy to the forward edge of the aft bottom sheet and place the sheet in final position. Check that the sides are still in proper alignment and use masking tape strips to hold the sheet in position until the epoxy cures. When completely dry you may remove the fuselage from the work surface. Remove all pins and masking tape used for assembly.

10. Separate the inner and outer pushrod tubing and lay the outer tubing over the plans, then cut the elevator outer tube to length. Use coarse sandpaper to scuff the tubing where it passes through the trailing edge former and aft pushrod support. Fish the tubing through the holes in these parts, checking that the tube goes through the left side of the trailing edge former. Epoxy the tubing securely in place.

11. Examine the fuselage carefully to check if it is twisted, particularly behind the trailing edge former. If it is twisted it's easy to correct when you install the aft top balsa sheet. Apply epoxy to the edges of the trailing edge former, aft pushrod support and the sides behind the former. Place the top sheet in position with the forward end just covering the trailing edge former and use masking tape to secure it in place. Correct any twist by twisting the fuselage in the opposite direction until it is straight and hold it in this position until the epoxy cures.

12. Cut two pieces of 3/16" triangle stock which fit snugly between the sides. Epoxy one to the back of the noseblock and the other to the front edge of the leading edge former. Be sure that the top surfaces are flush with the top edge of the sides.

Temporarily place the wing on the fuselage with the trailing edge against the aft top sheet. Check that the wing fits between the formers and rests flat on both sides. Correct any problems before continuing assembly.

13. Position the power pod mount so that the aft edge is approximately 1/32" forward of the wing leading edge and mark this position on the sides. Remove the wing and epoxy the plywood mount to the sides and leading edge former. Use your square or the hatch to be certain that the mount is properly aligned.

Cut the two hatch stiffeners from the 1/8" x 1/2" strip so that they fit snugly between the sides. Epoxy these strips across the bottom of the ply hatch being careful that they are centered.

14. Place the hatch in position on the fuselage against the pod mount sanding the ends of the stiffeners slightly if necessary. Apply epoxy to the sides and top of the noseblock and install the ply forward top piece. Locate this piece so that there is a 1/32" space between it and the front of the hatch. Use tape to secure it while the epoxy cures.

15. Carve and block sand the front end of the fuselage sides, top and bottom to match the contour of the noseblock. Use coarse sandpaper or file to shape the plywood, then sand again with fine sandpaper.

Drill the 3/16" diameter holes for the holddown dowels. Be sure that the dowels are against the former faces and that the rear dowel clears the outer pushrod tubing. Check the fit of the dowels, but don't glue them in place until after the fuselage is covered. Also drill the 1/8" diameter hole for the towheel blind nut. This hole is located on the center line of the fuselage and 1 1/4" behind the leading edge former. Lastly, drill the 1/8" diameter holes for the stabilizer holddown dowels.

16. Cut a slot 3/16" wide x 1 1/8" long in the top sheet for the rudder pushrod tubing, being careful that the slot does not interfere with the dorsal fin. Scuff the pushrod tubing and insert it through the slot and push forward. Reach through the hole in the trailing edge former to help guide the pushrod through the former hole. Apply epoxy around the slot and rotate the tubing and push back and forth to distribute the epoxy inside the slot, then remove excess epoxy from the top sheet. Hold the protruding tubing with your fingers so that the end lines up with the position of the rudder horn until the epoxy cures. Pull the tubing forward through the trailing edge former to take up any excess slack and epoxy this end to the former. Use a sharp knife or razor blade to trim the tubing flush with the top sheet where it passes through the slot.

17. Use the switch plate furnished with your radio as a template to mark the fuselage for the switch cutout. Drill mounting holes and cutout a rectangular slot for the switch handle. Be sure that the cutout is large enough to permit the switch to move freely to both on and off positions.

Drill a 1/8" diameter hole in the side opposite the switch just forward of the receiver for the antenna. It's a good idea to glue short length of small tubing in this hole after covering the model to prevent the antenna from chafing against the fuselage side.

18. Epoxy the forward servo mounting rail (3/16" x 5/16" x 1 13/16" spruce) to the fuselage sides locating the rail as shown on the side view. Using the servo as a spacer epoxy the aft rail in place. Be sure the rails are parallel and securely glued to both sides.

19. Use your sanding block to sand the completed fuselage, starting with coarse sandpaper. Be careful not to round off the edges as the square corners provide extra strength and make covering the model with plastic film much easier. Leave the hatch in place during sanding so that it will match the final shape of the fuselage.

20. Now you are ready to mount the fin assembly to the fuselage. Mark the center line of the top sheet at the tailpost and trailing edge former and draw a centerline on the sheet. Apply epoxy to the bottom edge of the dorsal fin and to the triangular reinforcements, then align the fin carefully and place on the fuselage top. Check that the fin is perpendicular to the fuselage by checking with your square. Also, be certain that the fin is exactly aligned with the centerline. Pin the fin to the top to secure it and check alignment once more. Don't disturb the fuselage until this joint is dry.

21. Cut the 1/8" diameter stab holddown dowels to length and install temporarily. Locate the completed stabilizer in position on the fuselage and check that the leading edge fits tightly against the bottom sheet. Trim the leading edge square so that it won't rock around during flight. Temporarily mount the stab with rubber bands and check alignment. Be sure that it is parallel to the wind mounting surface. When you are satisfied with the fit remove the bands, stabilizer and holddown dowels.

Cut the tailskid to shape, using the cut-off from the rudder for stock. Round the edges slightly. Don't glue the skid to the stabilizer until after covering both parts.

SANDING

Sanding is intended to smooth the surfaces of the wood so that the finished model will look better. Any defect will not be hidden by the final finish, but will show up more visibly. The care and patience spent now will reward you with self-satisfaction of doing an outstanding job. The difference between a good looking or poor model is usually sandpaper and there are no substitutes. One hour with a sanding block now will provide satisfaction for the life of the model. We suggest that the following tools and materials will make this work easier and provide better results: A small block plane such as Sears No. 37057 is great for shaping the leading edges and hardwood parts. In addition, a razor plane is excellent for shaping balsa. Several different sanding blocks, covered with different grades of paper, will give true flat surfaces. Emery boards are also helpful for tight corners or stubborn spots. Use the better grades of sandpaper such as Aluminum Oxide or Silicon Carbide open coat. Garnet paper is also satisfactory, but the more common grades of flint paper wear out so quickly that their low cost is offset by the inconvenience and wasted time. Check the shelves of your local hardware store or automotive supply outlet, if you can't find these materials elsewhere. We recommend that you use No. 120 for rough sanding, switching to No. 220, then to No. 320 or No. 400 for final sanding. One sheet of each grade is more than enough to complete this model. Use long strokes and blend the surfaces smoothly. A little saliva on dents may raise the wood fibers enough to eliminate the need for filler in most cases. Bad dents or cracks should be filled and sanded smooth. Re-sand all surfaces with worn No. 320 or No. 400 paper by hand and you are ready to cover and finish your model.

COVERING

Every modeler usually develops his favorite methods of covering and finishing models. Many times, however, a great deal of weight is added to the model trying to get a super finish. This is bad for any model. For a small airplane, disastrous! Whichever method you choose keep it light! We strongly recommend that the entire model be covered in Super MonoKote. We know of no other way to get a slick, good looking surface with minimum weight built up. Remember that you have to see the model clearly while in flight, to be able to control it properly. Use high visibility colors such as orange, red or yellow for the flying surfaces. The fuselage can be the same or a contrasting color. A longitudinal trim stripe on the top or bottom surface of the wing will help orient the model when it's far out. A few areas of chrome MonoKote or Mylar trim will give excellent visibility on sunny days. The transparent colors are effective and look good with this type of structure. It's your choice and a good opportunity to express your individuality. The wing is covered in eight separate pieces and the stabilizer with two pieces. Follow the instructions provided by the supplier, if you use Super MonoKote or similar material. Be careful when shrinking the material to avoid warping or distorting the structure. Be sure to adhere the covering to the ribs on both the top and bottom surfaces for greater strength. Be sure to check that you have not twisted or warped the flying surfaces of your Square Soar during the covering process. One of the great things about Super MonoKote is that it's easy to remove warps by twisting in the opposite direction, reheating the film and letting it cool while twisted. A little patience and care will ensure straight, true flying surfaces.

IMPORTANT NOTE

For better turn response and stability both wing panels must be washed out slightly at the tips. This is easily accomplished by twisting the wing tip so that the trailing edge is higher than the leading edge and using your iron to re-shrink the MonoKote. The proper amount of washout is shown on the plans and be sure that both tips are the same.

FINAL ASSEMBLY

After all parts are finished to your satisfaction, and you have checked all the flying surfaces for twists or warps, and removed any present (except the wing tip washout noted on the plans), you are ready to start final assembly.

1. Remove a narrow strip of covering material from the bottom of the stabilizer under the skid. Epoxy the skid in place to the center rib. If you are going to fly on hard surfaces such as asphalt, epoxy a straight pin on the bottom of the skid to prevent wear. Remove a strip of MonoKote from the forward bottom floor and epoxy the 1/8" x 1/4" x 7" spruce skid in position. Use tape to hold it in place until the epoxy cures.

2. Cut the MonoKote around the mounting holes and install the wing and tail hold-down dowels and glue them in place. Be sure that the dowels project equally from both sides of the fuselage.

Cut the MonoKote away from the rudder pushrod exit, towhook mount, switch cutout and antenna leadout. Mount the towhook, tightening the locknut securely to prevent rotation of the hook during launch.

3. Install the hinges into the stabilizer, using a pin or No. 11 X-Acto blade to force epoxy down into the slot. Be sure that the molded crease in the hinges are lined up exactly with the stab trailing edge, and remove any excess epoxy that oozes out before it cures. Allow to dry thoroughly, then install the elevator, being very careful to ensure free action and to remove any excess epoxy. Next, install the hinges in the fin first, then add the rudder, once again checking that the surfaces move freely.

4. Mount the control horns to the rudder and elevator using a nail or toothpick to punch through the film covering over the mounting holes. Cut the horn and nut plate apart with a razor blade or knife and mount using two No. 2-56 x 5/16" long screws. Don't overtighten the screws as this will crush the balsa under the horn base.

5. Thread the No. 2-56 x 1" studs into the end of the inner rudder pushrod at least 3/16". Use pliers if you can't turn the stud with your fingers. If you have access to a No. 2-56 tap, we suggest pre-tapping the pushrods and clevis to make assembly easier, but it is not necessary. Install clevis on the other end of the stud and position clevis so that approximately 1/8" of the stud protrudes into the slot in the clevis. Insert inner pushrod into outer tube from the rear until it comes through in the servo compartment. Spread clevis with a small screwdriver and insert pin through outer hole in control horn. Make up the rear end of the inner elevator pushrod the same way and insert through the outer tubing. Attach the clevis to the elevator horn and rubber band the stab in place.

Push the inner pushrods back and forth from the servo compartment end. Be sure that the control surfaces move smoothly and freely. Correct any binding before proceeding to the next step.

6. Position the servos carefully and drill 1/16" diameter pilot holes for the servo mounting screws. Don't try to force the screws into the wood without pre-drilling as the rail will split. Tighten the mounting screws securely and remove the output wheels from the servos.

Make a 90° bend in the end of each pushrod link, push through the servo wheel and reinstall the wheels on the servos. Cut off the excess inner pushrod tubing allowing 3/16" extra length to thread the link into the tubing. Thread the links into the pushrod tubes until the control surfaces are in neutral position.

7. Install the switch in the fuselage side and wrap the battery box and receiver in 1/2" soft foam rubber. Connect the radio system together and turn on the transmitter and receiver to check proper radio operation. Be sure that the control surfaces move in the proper direction and that both are in neutral position, with the transmitter sticks and trim levers in neutral. Correct any misalignment by screwing the clevis in or out of the pushrod stud. When everything is operating properly, turn off the radio system.

8. Fish the antenna through the lead out hole, run it along the side of the fuselage and secure the free end with a piece of tape or rubber band. Hinge the front edge of the hatch with a strip of MonoKote or transparent tape. Be sure to retain the rear of the hatch with a strip of masking tape or a rubber band looped around the fuselage.

9. Mount the wing on the fuselage using eight No. 30 bands, four on each side. Check the balance point by picking the complete model up with your fingertips just outboard of the wing center sheet. The fuselage should hang level when supported just forward of the wing spar, if it does not, move the battery pack and receiver to help balance. If necessary, add weight to the nose in front of the battery until the model balances properly. A tail heavy model is very difficult to fly and will probably crash. Don't worry about adding weight–just be certain that the model is properly balanced.

PRE-FLIGHT

At this point you are ready to make the pre-flight checks before going flying. A few minutes spent now will give you more confidence and help to eliminate any problems at the field.

1. Inspect the model carefully. Wiggle the tail surfaces to make sure the joints are secure. Check that the radio equipment is securely mounted.

2. Check that the surfaces are not twisted or warped. Correct any warps.

3. Mount the wing using four No, 30 bands on each side. Align the wing so that both tips are the same distance from the nose, the equidistant from the center of the fuselage. To check, tie a length of thread to the tail skid and use it to measure the distance to one tip at the trailing edge. Mark with your fingers and swing to the opposite tip. Adjust wing position until length is the same. We suggest you mark the lower surface of the wing on both sides of the fuselage to provide line-up marks for quick checking of wing alignment.

4. Check the balance point. Add or remove weight from the nose until it's correct.

5. Check the radio operation. Try ail the control positions and make sure the controls move in the proper direction. Check that the surfaces are at neutral position when the transmitter trims are at neutral. Adjust clevises, if required.

6. Check your batteries, both in the transmitter and airplane. If you are using dry batteries, be sure they are fresh; if Ni-Cads, that they are fully charged. Remember that more radio failures occur from defective or improperly charged batteries than any other cause. Don't be a statistic!

LAUNCHING YOUR SQUARE SOAR

For thermal flying you can use a Hi-Start, winch or power pod. We suggest the Airtronics Standard Launch Pail, Cat. No. 909504, as the easiest method. This will require a smooth flying site at least 800 feet long to stretch out the Hi-Start.

If you don't have access to such a flying site then you may use our optional power pod, Cat. No. 909522. This pod uses any of the Cox reed valve, tank mounted, .049 engines and is very easy to assemble. It screws onto the ply plate in front of the wing and is easily removable. The added weight in front of the balance point will make the Square Soar slightly nose heavy. This provides safe power flight while climbing and you can easily flatten the glide with a little up trim. The power pod with a full fuel tank will climb the model 700-1,000 feet high, so be careful.

Good Lift,
Lee Renaud

TO COMPLETE YOUR SQUARE SOAR 72 MAY WE SUGGEST...

COX/SANWA **2 Channel System**
Cat. No. 8020

We are proud to present a true breakthrough in radio control systems–the Cox/Sanwa 2 channel system. For the first time a true digital proportional radio system offering independent, simultaneous control of two control surfaces is available at an affordable price. This sytem will attract many newcomers to the sport of R/C modeling, resulting in increased growth of the sport.

This is a complete system which uses inexpensive and readily available alkaline energizer pencells to power both the transmitter and airborne system.

Just plug in the batteries and the system is ready for operation. Try the smooth single-axis control sticks and ratcheted trim levers. Note how easy it is to hold the lightweight compact sized transmitter and you will realize that this is a high quality well engineered system which incorporates the features found on our more expensive systems. Whether your interest is in sailplanes, 1/2A R/C aircraft, boats or vehicles this system is the way to get started in R/C. If you are already involved in the sport this is a way to have a friend or son share in the thrills and challenge of R/C models.

SPECIFICATIONS:

TRANSMITTER
Size: 4.7 inches high x 5.4 inches wide x 1.93 inches deep
Weight: 12.4 ounces

RECEIVER
Size: 0.8 inch high x 2.28 inches long x 1.65 inches wide
Weight: 1.06 ounces

BATTERY
Size: 1.2 inches square x 2.26 inches long
Weight: 3.25 ounces with four E91 pencells

FOR LAUNCHING YOUR SQUARE SOAR

HI-START LAUNCH PAIL

Launches your R/C sailplane to thermal altitude. Basically a big rubber band which is staked at the upwind end of the flying field with a length of monofilament line attached. The line is hooked to the model, the rubber stretched by walking back 200-300 feet. The model rises steeply up to 500 foot altitudes.

CAT. NO. 909504

POWER POD

Uses any Cox reed valve engine with fuel tank. Nylon mount and pre-cut wooden parts plus all hardware. Two hole mount for quick change.

CAT. NO. 909522

COX HOBBIES INC.
1505 East Warner Avenue, Santa Ana, Calif. 92705
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