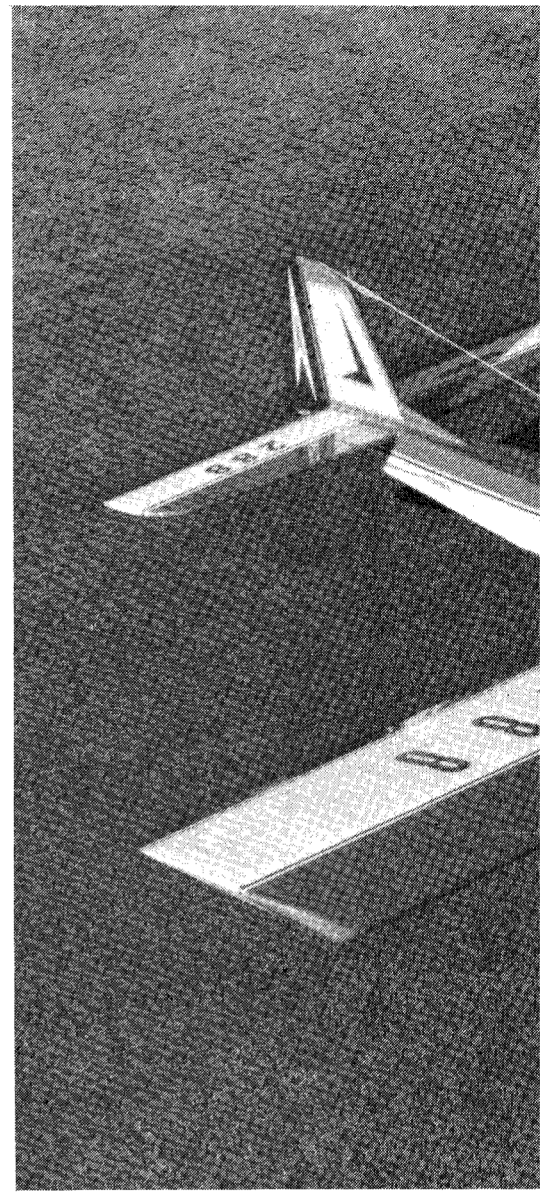
# BRIDI G.L.A.

## This four-channel trainer is truly a "GREAT LITTLE AIRPLANE." Follow the step-by-step instructions and you can't go wrong.



**Designed by Joe Bridi**
**Text and photos by Al Tuttle**

**G.L.A.**
**TYPE:** RC Basic Trainer
**WINGSPAN:** 59¼ inches
**WING AREA:** 625 square inches
**LENGTH:** 47 inches
**WEIGHT:** 5 pounds
**ENGINE:** .25-.45
**RADIO:** 4-channel

• Construction of the "Great Little Airplane" is straightforward and requires no exotic or odd-size materials. All hardware is readily available from your hobby dealer. The canopy, dural landing gear, and motor mount are available from Bridi Hobby Enterprises, 1611 E. Sandison St., Wilmington, CA 90744.

Because this aircraft is aimed at the newcomer to radio control, the instructions may seem to be oversimplified to you old-timers—remember, we were *all* neophytes once. For example, you will notice that I keep harping about minimum or no gap at the control surfaces. Though a seemingly insignificant point, much of how well or how badly the aircraft performs is due to this little detail. How many newcomers (and "experts" too) have you seen at the field who wonder why their aircraft response in the air is so sloppy, only to find a gap of 1/16" or more at the control surfaces? If the instructions are carefully followed, you should end up with a straight, strong, and excellent flying basic trainer.

For adhesives to use, I'd recommend 5-minute and 30-minute epoxies, Hobbypoxy Formula 2 epoxy, Wilhold or Franklin aliphatic resin (Titebond), Hot Stuff, ZAP or its equivalent, and Duco cement or its equivalent for attaching the canopy, although the cyanoacrylate adhesives (Hot Stuff, etc.) can also be used.

To make sure all parts—such as leading and trailing edges, empennage, and control surfaces—get sanded evenly and straight, make up a couple of sanding blocks to be approximately 12" to 18" long and 2" to 3" wide. I use ½" x 3" wide aluminum channel stock with the sandpaper attached to the block with double-sided tape. This makes it easy to replace the worn-out sandpaper.

The building sequence is as follows: wing and ailerons, empennage, fuselage and hatch, final-sanding and covering, and equipment installation. *Read each step completely and carefully!*

### WING CONSTRUCTION

*Pre-construction:*

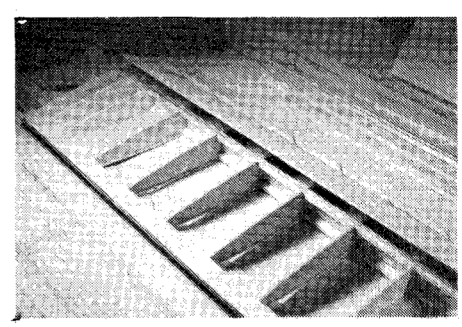
___ 1. Cut 22 ribs from 3/32" sheet balsa stock.

___ 2. Make four trailing edge pieces ⅞" wide from 3/32" sheet balsa and cut to length.

___ 3. Cut to length: four ¼" x ⅜" balsa spars, two ⅜" x ¾" balsa leading edges, and two 3/16" x ¼" trailing edges.

___ 4. Cut two ailerons 1 1/16" wide from ¼" sheet balsa. *Do not trim to length or round edges yet.*

*Note:* If stick stock is not available, the spars and trailing edges can be stripped from ¼" sheet stock. The leading edges can be cut from ⅜" sheet stock.



**STEP #5**

___ 5. With a soft lead pencil or fine ball-point pen, draw a guide line on the ¾" wide side of both leading edge pieces (one side only), to match the centerline shown on the rib.

___ 6. Place the ribs over the plan side view of the rib and mark the centerline on each rib.

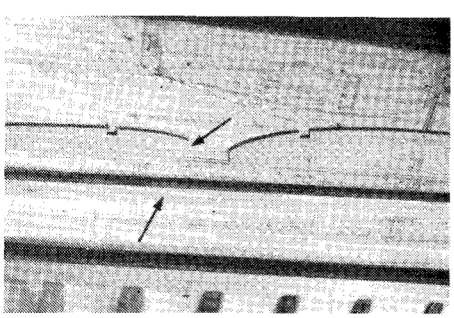
*Right-hand wing panel construction:*

**Shoulder-wing layout and long tail moment make the GLA a stable four-channel trainer. It's easy for the beginner to fly, provided he's helped by a qualified instructor during the first flights.**

Before starting, place a piece of waxed paper or plastic wrap over the plans to protect them and keep the adhesives from sticking to them.

____ 7. Pin the bottom 1/4" x 3/8" spar over the plans.

____ 8. Pin and glue ribs to the spar, making sure that ribs are perpendicular and square to the plan.



**STEP #9**

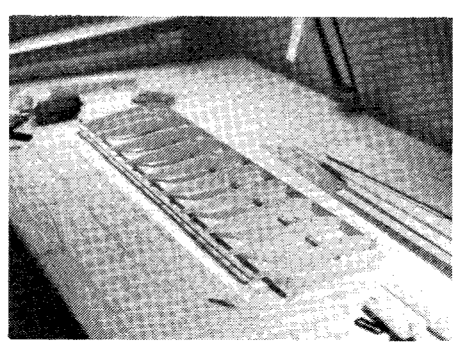
____ 9. When dry, block up the ribs inboard from their trailing edge (tapered trailing edge stock works fine). Glue the 3/16" x 1/4" trailing edge to the rib ends, making sure that the ribs are 90° to the trailing edge. In other words, be sure that everything is square.

____ 10. When the adhesive has dried, bevel the top of the trailing edge to match the contour of the ribs. Refer to the plan side view of the wing for proper shape.

____ 11. Add the top 3/32" x 7/8" trailing edge sheet.

____ 12. Glue the top 1/4" x 3/8" spar in place.

____ 13. Add the 3/8" x 3/4" leading edge, making sure that the leading edge guide line is on the side facing the ribs, and that this line aligns with the rib centerline.



**STEP #13 & 14**

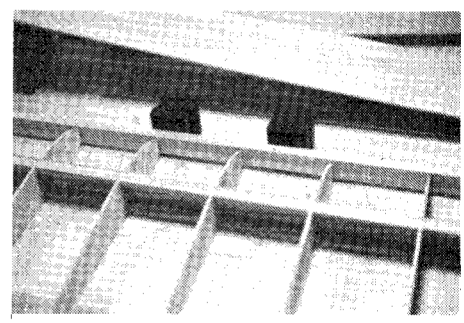
____ 14. Add the 1/16" vertical grain shear webbing. Refer to the plan view showing the shear webbing.

____ 15. Turn the wing panel over and place it upside down over the plans, and block up the trailing edge.

____ 16. Bevel the 3/16" x 1/4" trailing edge to match the rib contour and add the 3/32" x 7/8" bottom trailing edge.

*Caution:* Before proceeding to the next step, make sure that the wing is straight and square. Straightness can be checked by measuring the trailing edge height at each end of the wing. It should be the same; if not, adjust blocking until trailing edge is parallel to the work surface. Squareness can be checked either with a square, or by alignment over the plans.

Once you are satisfied that the wing is true, the leading edge sheeting can be installed. This step "locks" the wing, and if it is twisted now, it will stay twisted.



**STEP #17**

____ 17. The leading edge sheeting is installed as follows: Draw a centerline along the length of the 1/4" x 3/8" spar. Cut a piece of 3/32" x 3" x 36" balsa sheet to be approximately 1/4" longer than the wing panel. Bevel one edge so that it fits flush against the rear of the 3/8" x 3/4" leading edge, and against the ribs. Temporarily pin the sheet in place, and mark the sheeting at the spar centerline. Remove the sheeting and trim to width. When installed, the rear edge of the sheeting should stop at the spar centerline.

____ 18. Add 15- or 30-minute epoxy to the ribs and inside of the spar centerline. Do not put any on the leading edge. Apply 5-minute epoxy to the bevelled edge of the leading edge sheet and pin in place against the leading edge only. When the 5-minute epoxy has set, fasten the leading edge sheeting down on the ribs and spar.

____ 19. Add the 3/32" sheet center section and the 3/32" x 1/4" balsa cap strips.

____ 20. Turn wing panel over so that it is right side up, check to see that there are *no warps,* and repeat steps 17 through 19. When dry, remove from the plan and trim all sheeting and spar ends to be flush with the end ribs.

*Left-hand wing panel construction:*

This panel is built upside down over the right-hand wing panel.

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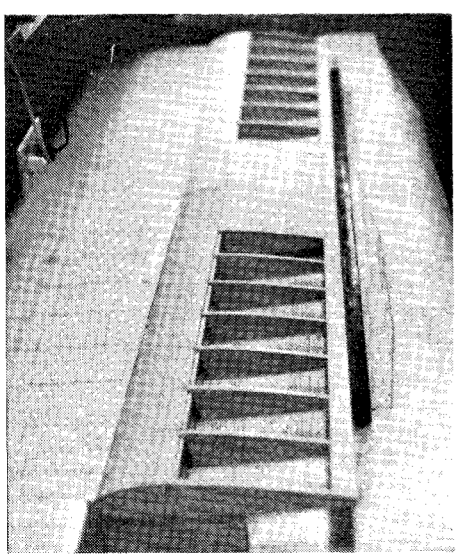
___ 21. Pin a 1/4" x 3/8" spar over the plans. (Since the panel is being built upside down, this is the top spar.)
___ 22. Glue the ribs to the spar, making sure that the ribs are perpendicular and square to the plan.
___ 23. When dry, block up the ribs inboard from their trailing edge. Glue the 3/16" x 1/4" trailing edge to the rib ends, making sure that the ribs are 90° to the trailing edge.
___ 24. When the adhesive has dried, bevel the top of the trailing edge (actually, it's the underneath or bottom side).
___ 25. Add the 3/32" x 7/8" bottom trailing edge sheet.
___ 26. Glue the bottom spar in place.
___ 27. Add the 3/8" x 3/4" leading edge.
___ 28. Add the 1/16" vertical grain shear webbing.

*Note:* Refer back to the "Caution" note between steps 16 and 17 before proceeding.

___ 29. Install the bottom 3/32" leading edge sheet as per steps 17 and 18.
___ 30. Add the 3/32" sheet center section and the 3/32" x 1/4" cap strips.
___ 31. Turn the panel over so that it is right side up, and repeat steps 17 through 19. When dry, remove from the plan and trim all sheeting and spar ends to be flush with the end ribs.
___ 32. Cut out the oversize 1/4" thick center rib (refer to the plans for rib template shape). Taper both sides so that when both panels are put together, a 1 1/4" dihedral at each tip will be obtained. There are several methods of doing this, two of which follow:

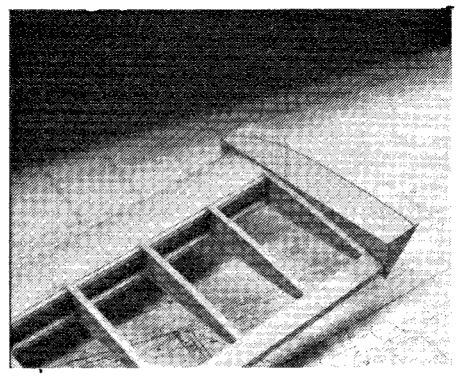
(a) Taper one side of the 1/4" rib as per the plans. Glue the tapered side to the proper wing panel root. Prop up the wing tip 2 1/2" and sand in the other angle as you would on a hand-launch glider wing.

(b) Cut two oversize center ribs from 1/8" sheet balsa, and glue to each wing root. Prop up the tip 1 1/4" and sand in the angle. Do this to both wing panels.



**STEP #33**

___ 33. Prop up each wing tip 1 1/4" and glue wing roots together, making sure that both panels are even and that there is no sweep forward or back.
___ 34. After the adhesive dries, shape the leading edge. Use the plan side view for proper shape.



**STEP #35**

___ 35. Glue on triangular or square wing tip blocks, and shape per the plans.
___ 36. Sand the wing smooth. Do not round the trailing edge.
___ 37. Apply 4-ounce glass cloth to the center section. The cloth should extend a minimum of 3" beyond each side of the center joint. Cover the bottom first, let the epoxy cure, turn it over, and do the top. When applying the epoxy, let it extend past the glass cloth edges approximately 3/8". This will make it easier to feather the edges, allowing the cloth to be blended into the wing sheeting. I used Hobbypoxy Formula 2, as it is easy to use and the 45-minute working time is ample for doing a good job.
___ 38. After the epoxy cures, feather the glass cloth edges on both the top and bottom of the wing.
___ 39. Turn the wing upside down and cut out the aileron servo hole. Refer to the plans for the hole location and dimensions. Lay out and cut the hole to the inside dimensions.

(a) Cut out the center-section sheeting and remove the center rib.

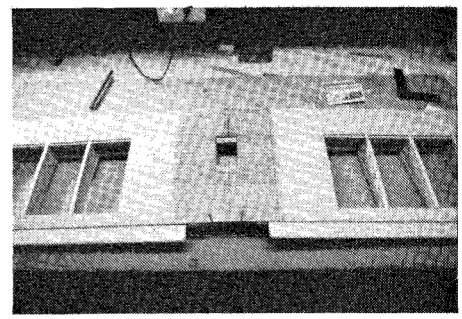
(b) Cut out and fit four 1/16" sheet balsa pieces—two for the front of the box and two for the rear. Glue these in place. The front pieces will go against the rear of the spar and against the edge of the 3/32" inner rib, and against the edge of the center rib. The bottom edge will fit under the 1/16" overhang. The two rear pieces are installed in the same manner, except that there is no spar to glue against. The grain should run parallel to the span. The bottom edge fits under the bottom center section.

(c) Using the wing rib template, place it over the plans at the servo box location, and with the bottom spar notch over the spar. Mark the template at the ends of the 3/32" servo box sides. From 3/32" sheet balsa, cut out two partial ribs and trim the rib ends to match the two marks made on the wing template. Fit and glue in place.

___ 40. Install the servo rails—dimensions to fit your particular servo. Rails can be of pine or 1/4" five-ply plywood.

### AILERON INSTALLATION

___ 1. Fit the ailerons to the wing (refer to the plans for aileron and hinge locations). You will notice that the wing trailing edge is thicker than the ailerons. This is okay, and is as it should be for this aircraft.
___ 2. Trim each aileron end to be the shape as shown on the plan top view. Do not round the edges yet.
___ 3. The hinges are centered along the wing trailing edge and aileron leading edge longitudinal axis. Mark hinge locations and cut the slots. (I like the Kraft-type polypropylene hinge; it has no hinge pin for glue to get into, and the control surface does not have to be notched to obtain a gapless installation. In addition to easy installation, it provides excellent damping against control surface flutter.)
___ 4. Drill and notch the aileron leading edge to accept the aileron control horn. Slot the wing trailing edge to accept the aileron control horn nylon bearing.



**STEP #5**

___ 5. Using the hinges, reassemble the ailerons to the wing and make sure that there is no gap between the two. Remove the ailerons and hinges, and round the ailerons' leading and trailing edges as shown on the plans (also inboard ends). Reassemble and check that there are no gaps, and that each aileron has an up-and-down movement of approximately plus or minus 1/2", for a total movement of 1".
___ 6. Cut out the 1/16" ply wing plate and install as shown on the plans. The plate extends past the wing center-section trailing edge 1/8". This completes the wing except for final-sanding and covering. Do not glue in the aileron hinges yet.

### EMPENNAGE (TAIL FEATHERS)

All parts are made from 1/4" x 36" sheet balsa.
___ 1. Horizontal stabilizer—Cut two pieces of 1/4" sheet balsa to length and strip to width (2 1/4") as shown on the plans.
___ 2. Edge-glue these two pieces together, making sure that it is a tight fit (no gaps, etc.).
___ 3. Using a template, cut the horizontal stabilizer to the shape shown on the plans.
___ 4. Elevators—Cut out the elevators to the shape shown on the plans. Use a template. Don't forget the notch for the 1/4" diameter birch dowel.
___ 5. Pin the horizontal stabilizer down on the workbench. Cut a piece of plastic wrap about 12" long and place it midpoint over the top of the stabilizer, letting half of it hang out past the trailing edge.
___ 6. Place the elevators over the plastic wrap and up against the stabilizer trailing edge so that the plastic is in between the two. The elevator tip ends should be aligned with the stabilizer tips. Pin down to the workbench.
___ 7. Cut a 1/4" hardwood dowel to fit in the elevator notches. The dowel should fit snugly against the stabilizer trailing edge also. Glue in place.
___ 8. Locate and mark the hinge positions. Remove from the board after the glue dries.
___ 9. Vertical stabilizer and rudder—Cut the vertical stabilizer, rudder and dorsal to shape as shown on the plans. Note that the vertical fin is notched 1/8" deep for a distance of 3/8" at the base of the leading edge to allow for fuselage top planking. Assemble over the plans and glue.
___ 10. Place the rudder up against the vertical stabilizer and mark the hinge positions. When the vertical stabilizer adhesive has dried, remove the piece from the plans.

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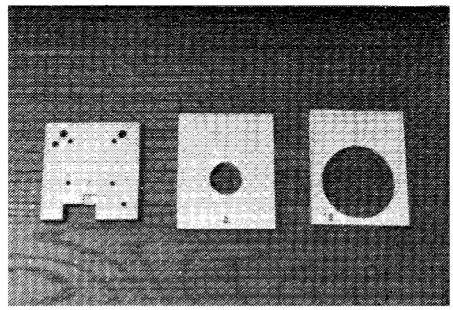
___ 11. The hinge slots for the empennage control surfaces can now be cut. After this has been done, sand the surfaces and round the edges as per the plans. Do not round the center portion of the horizontal stabilizer leading edge, as it is to fit up under the rear of the top fuselage stringer and against the top rear fuselage crossbrace. With the hinges in place but not glued, assemble the control surfaces and check that there are no gaps and at least plus or minus 3/4" control surface movement. Also check to make sure that during the sanding process you didn't remove too much material from the control surface ends. There is nothing more frustrating than discovering that one of the control surfaces is either shorter or longer than the stabilizers after you have covered and assembled the aircraft. This completes the empennage construction.

## FUSELAGE CONSTRUCTION

___ 1. Cut the fuselage sides from 1/8" x 4" x 48" sheet balsa. Both sheets should be as equally stiff as possible. If 36" stock balsa is used, it will be necessary to splice on another piece to get the proper fuselage side length. Cut the two pieces at a 45° angle and place the splice toward the front so that it will be under the 1/16" ply doubler (see side view on plan).

___ 2. Cut out doublers from 1/16" x 20" ply sheet.

___ 3. Glue the 1/16" ply doublers to the 1/8" balsa fuselage sides. Make sure that you have a left and a right side! Titebond or Wilhold aliphatic resin glue works well here, but epoxy is better. Place weights on the assemblies and let them dry overnight. If you are in a real hurry, you can use contact cement, but be sure that everything is aligned before placing the two pieces together. One way of doing this is to place a piece of waxed paper over the fuselage side and lay the doubler on top of the paper. Align, and while holding the two pieces firmly to keep them from moving, draw the waxed paper out from between the two.



**STEP #4 & 5**

___ 4. Cut the firewall (No. 1 bulkhead) from 1/4" aircraft ply. If you are using the Bridi motor mount, drill all holes as shown on the bulkhead 1 front view (see layout showing firewall dimensions, hole locations, hole sizes, etc.).

___ 5. Cut out bulkheads 2 and 3 from 3/16" balsa sheet. If you are going to use the nyrod type of pushrod, do *not* cut out the large hole in bulkhead 3.

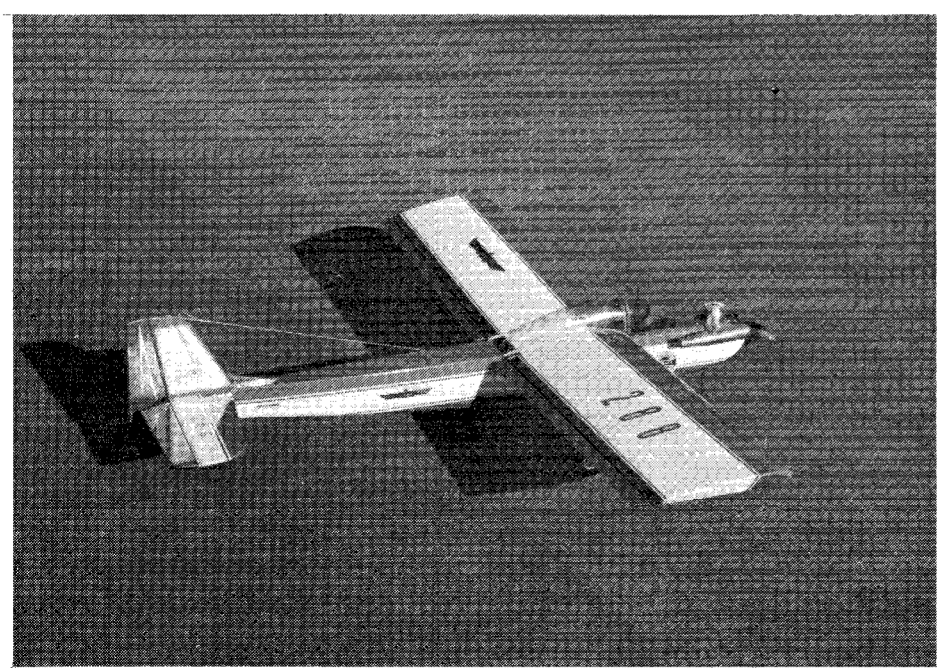
___ 6. On the inside of one fuselage side, mark the locations of bulkheads 2 and 3, and the two vertical braces aft of bulkhead 3. All lines are 90° to the top edge of the fuselage sides. Transfer these lines to the other fuselage side.

___ 7. Locate and mark the position of the 1/4" wing hold-down dowels, one in front of bulkhead 2 and one in front of bulkhead 3. The location of the holes is such that when a 1/4" diameter hole is drilled, one edge of the hole is just touching the bulkhead line.

*Helpful hint:* After the holes have been located, push a pin through the hole center mark from the doubler side, completely through the fuselage side. Turn it over (balsa side out) and mark where the pin comes through. Remove the pin and put a couple of drops of cyanoacrylate glue (Hot Stuff, Zap, etc.) at this place. This will prevent splitting of the balsa when drilling the holes. With the balsa side of the fuselage down, and against a piece of board, drill the 1/4" diameter holes.

___ 8. Measure and cut the 1/4" x 3/8" balsa top stringer to length and glue it to the top of the fuselage side (both fuselage sides should be pinned down to the work surface). Repeat for the other fuselage side.

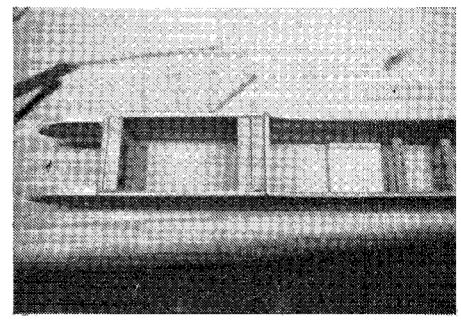
___ 9. Add the two 1/4" x 3/8" vertical pieces to each side.



___ 10. With the right-hand fuselage side pinned or weighted down (to make sure that it is perfectly flat), install bulkheads 1 (firewall), 2, and 3; be certain that they are vertical.

___ 11. After the adhesive has dried, and with the right side still pinned or weighted down on the work surface, add the left fuselage side. Be sure that it is square and perpendicular to the work surface.

___ 12. Install the 1/4" ply landing gear plate.



**STEP #13**

___ 13. Install the various crosspieces as follows:

(a) Install the 1/4" x 3/8" rear compartment top crosspiece. This butts up against the front of the rear top fuselage stringers.

(b) Install the two 1/8" x 1/2" ply crosspieces at the tank compartment.

(c) Install the four 1/4" x 3/8" vertical pieces, two in front of bulkhead 2 and two in front of bulkhead 3.

(d) Install the 5/8" triangular balsa crosspiece at the rear of bulkhead 1.

(e) Drill out the 1/4" wing hold-down dowel holes that were covered up by the 1/4" x 3/8" vertical pieces.

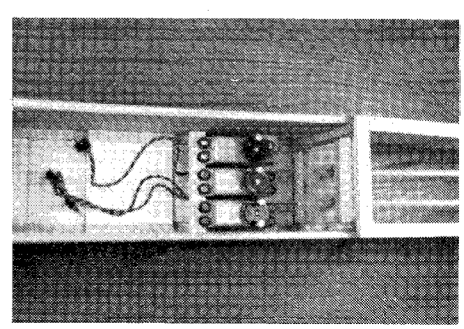
(f) Temporarily install the wing hold-down dowels, and glue in the 1/4" triangular dowel braces, making sure that the dowels are not glued in during this process. Remove the dowels after the 1/4" triangular pieces have dried.

(g) Install the rest of the triangular stock as shown on the plans.

___ 14. Place the fuselage upside down over the top view of the plans, pull the sides together at the tail, and glue. Be sure that the fuselage is straight. After this has dried, add the 1/4" x 3/8" balsa rear crosspieces.

___ 15. Install the 1/16" ply bottom sheeting. Notch the front of the ply for nose-gear strut coil clearance. Now is a good time to notch out the firewall for the gear strut coil clearance if you haven't done so already.

If you are going to use nyrods or the Du-Bro Kwik-Rods, now is the time to install them before adding the rear 1/16" bottom and 1/8" balsa top sheeting.



**STEP #15**

(a) Install the servo rails and mount the servos. Refer to the plans for servo location.

(b) Install the rods and support them halfway down the rear fuselage. Note that bulkhead 3 is solid in order to give the outer rod a good gluing surface. Glue the outer rod at bulkhead 3 and the rear of the fuselage where the rods exit. Refer to the plans for the location of the pushrod exit holes. After the adhesive has dried, trim the rods flush with the fuselage sides.

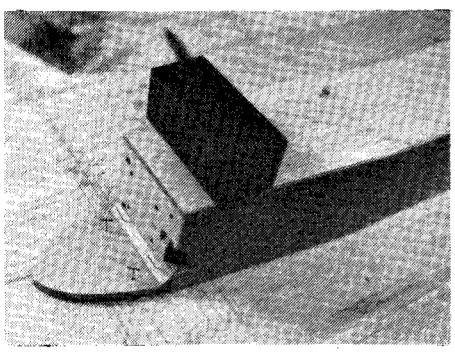
*Helpful hint:* For good glue adhesion to the outer rod and wood, roughen up the portion to be glued with sandpaper.

___ 16. Install the bottom rear 1/16" crossgrain balsa sheeting.

___ 17. Install the top rear 1/8" balsa sheet with the grain running lengthwise (along its longitudinal axis). Note that the top sheet or block extends out over the rear 1/4" x 3/8" top balsa stringers by 5/32". Hold down with weights. Trim to shape after the adhesive dries.

___ 18. Fit the wing to the fuselage wing saddle. There should be no gaps between the wing and the fuselage; it needs to be a good fit because no foam tape or rubber is used as a gasket or "gap cover-upper."

___ 19. With the wing resting on the fuselage and the 1/16" ply wing plate butted up against the front of the top rear balsa top sheet, fit the 1/4" triangular balsa piece on top of bulkhead 2 as shown on the plans. Shape this piece so that the wing leading edge will fit into it. When completed, the wing should fit perfectly on top of the fuselage.



**STEP #20**

___ 20. Add the 3/8" sheet balsa nose blocks.

___ 21. Hatch—The plans show the hatch being held on with a "tongue and groove" type of installation, as the Sig canopy is too wide to allow clearance for two rear bolts.

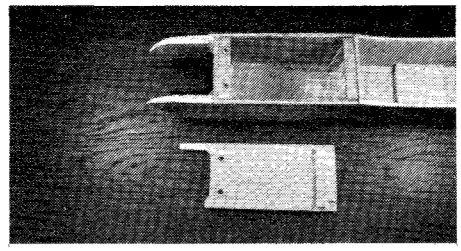
___ 22. Cut a piece of 1/16" ply 1" wide and long enough to equal the width of the tank compartment. Notch this piece to fit the 1/4" x 3/8" vertical pieces at the rear of the tank compartment.

___ 23. Push this piece under the rear 1/8" x 1/2" ply crosspiece. Make sure that it fits nice and tight, and leave it in place.

___ 24. Cut a piece of 1/8" ply 1/2" wide, with the length equal to the width of the tank compartment. Place this piece on top of the 1/16" x 1" piece that is in position under the 1/8" x 1/2" ply crosspiece. This piece should fit nice and tight. Make sure that it butts against and is even or level with the 1/8" x 1/2" ply crosspiece. Remove this piece, and using the 1/8" x 1/2" rear ply crosspiece as a reference, draw a line on the 1/16" ply piece.

___ 25. Remove the notched 1/16" x 1" ply piece and glue on the 1/8" x 1/2" ply piece so that one edge butts along the pencil line that you have just drawn.

___ 26. When the glue has dried, reinstall the assembled piece. Make sure that it is a snug fit and that the top 1/8" x 1/2" ply piece is even with the top of the fuselage sides and the rear 1/8" x 1/2" crosspiece.



**STEP #21-30**

___ 27. With the assembly still in place, put a *light* coating of 5-minute epoxy on top of the 1/8" x 1/2" ply piece that is glued to the 1/16" ply piece. Don't use too much epoxy, as you are going to put the hatch in place and any excess epoxy will squish out around the edges and permanently attach the whole mess to the fuselage. Put the hatch in place and hold it down with weights while the epoxy cures. When the epoxy has cured, remove the hatch by pulling straight toward the front of the fuselage.

___ 28. Install the two front 4-40 bolts and blind nuts.

___ 29. The following step is not absolutely necessary, but because balsa is quite soft, the hatch hold-down bolts do tend to compress the wood during use. To prevent this, 1/4" birch dowel inserts are installed as follows:

(a) Cut two pieces of 1/4" diameter birch dowels 3/8" long (thickness of the hatch).

(b) Using a No. 33 drill (a 4-40 clearance drill), drill a hole through the center of the two 3/8" long pieces.

(c) Put a couple of drops of cyanoacrylate adhesive on the hatch around the No. 33 holes already drilled. Do this on both sides of the hatch. Now open up these holes to 1/4" diameter. To assure a nice round hole, enlarge the holes progressively: 1/8", 3/16", then 1/4".

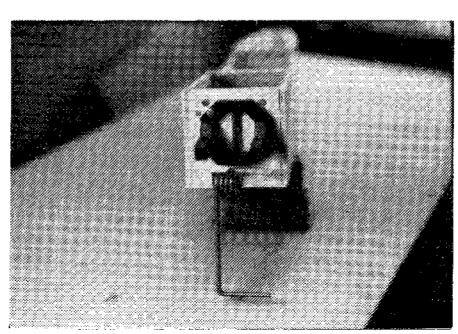
(d) With the hatch in place, take one of the drilled dowel inserts and put it on a 4-40 x 1 1/2" long bolt. Insert the bolt through one of the 1/4" diameter hatch holes, and thread it into the 4-40 blind nut. Making sure that the hatch is aligned, tighten the bolt; this will force the insert into the 1/4" diameter hole. Continue tightening until the insert is seated against the ply crosspiece. The top of the insert should be flush with or slightly below the top of the hatch. Leaving this bolt in place, take another 4-40 x 1 1/2" bolt and repeat for the other hole.

(e) Remove the bolts and hatch, and glue the inserts in with cyanoacrylate adhesive.

___ 30. Cut out the hatch for engine clearance and shape to blend with the top of the nose block.

## ENGINE INSTALLATION

___ 1. Drill the motor mount to accept your particular engine.



**STEP #2**

___ 2. Temporarily install the motor mount onto the firewall.

___ 3. Trim the hatch and nose block to fit your engine. If the K&B .40 is used, you will have to remove the front right-hand portion of the hatch and notch the right-hand nose block in order to clear the muffler assembly.

___ 4. Locate and cut slots in the fuselage sides for the pushrod exits. Refer to the plans for location.

___ 5. Remove the engine and motor mount.

___ 6. With the hatch attached, sand the fuselage to shape, referring to the plan cross-sectional views and front top view for proper contours.

## ASSEMBLY OF EMPENNAGE TO FUSELAGE

___ 1. Temporarily pin the horizontal stabilizer (less elevators) to the fuselage, making sure that the stabilizer centerline is aligned with the fuselage centerline.

___ 2. When you sight down the length of the fuselage, from front to rear, the horizontal stabilizer should be at right angles to the fuselage sides. If it isn't, remove the stabilizer and sand down the high side at the fuselage.

___ 3. With the hatch removed, make a mark at the top center of the firewall and place a pin at this location. Tie a 4-foot piece of string, or heavy carpet thread, to the pin and pull the string straight back to the left-hand tip of the horizontal stabilizer. Place your finger or a clothespin at the place where the string and stabilizer tip intersect. Move the string over to the right-hand stabilizer tip. The string marker should intersect at the same location. If it doesn't, make adjustments to the stabilizer until both tips are equidistant to the firewall center mark. (A 48-inch straightedge or 6-foot steel rule can be used in place of the string.)

___ 4. When you're satisfied that the horizontal stabilizer is square to the fuselage, mark its position by drawing a pencil line on the underside of the stabilizer where it intersects with the fuselage sides.

___ 5. Remove the stabilizer and put adhesive on the portions of the fuselage where the horizontal stabilizer makes contact.

___ 6. Install the horizontal stabilizer, using pencil lines to locate it on the fuselage. Repeat steps 2 and 3 to check alignment.

___ 7. After the adhesive has dried, place the vertical stabilizer assembly (less rudder) on top of the fuselage and horizontal stabilizer centerline. Check that no gaps exist between these two assemblies. While holding the vertical stabilizer in position, put the rudder in place, check for proper fit, and make sure that no gaps exist between the vertical stabilizer and rudder.

___ 8. Glue the vertical stabilizer in place. It must line up on the fuselage/stabilizer centerline and be at right angles to the horizontal stabilizer.

___ 9. After the adhesive has dried, install the 1/4" balsa triangular pieces (fillets) as shown on the plans. The rear of the top fuselage block ends abruptly at the top of the horizontal stabilizer. A pie-shaped piece of 1/8" balsa can be butt-glued to this, and then blended into the top of the horizontal stabilizer and triangular crosspiece. Or leave it as is, and when covering the 1/4" triangular fillets, let the covering material extend forward over the top block by about 1". This will cover up the square end.

## COVERING

___ 1. Sand all parts so that there are no bumps, dings, etc. Use No. 280 grit sandpaper

*(Continued on page 89)*

*(Continued from page 33)*

for the finish-sanding. Using a coarse-grit sandpaper, roughen up the fiberglass at the wing center section. This will allow the covering to adhere to the fiberglass.

The next step is not absolutely necessary, but it is a method that I use to prevent bubbles and sagging when using iron-on materials. The reason for this procedure is that iron-on coverings tend to bubble when covering solid or sheeted surfaces. In addition, after covering and if there is moisture in the wood, when the airplane sits out in the sun for a while, the moisture will start to "cook" out and cause wrinkles or bubbles to appear over the sheeted or solid portions of the aircraft. Coverite markets a product called "Balsarite," which is applied over the entire airframe prior to covering and effectively seals the balsa. It also makes the adhesive in the covering material stick better.

___ 2. Apply the Balsarite to the airframe as per the instructions on the can, and let it dry.

___ 3. Take a common pin or T-pin, and prick holes all over the solid and sheeted portions of the airframe, making approximately six to eight holes per square inch. They don't have to go completely through the sheeting; 1/16" deep is a good average. By now you are probably thinking that all the sanding effort has gone to pot. Not to worry, as this does not affect the final finish at all. *Do not sand* the airframe after punching the little holes. Don't forget to put holes in the control surfaces also. The airplane is now ready to cover. Top Flite Super MonoKote was used to cover the two prototypes.

___ 4. The wing is covered first. If you haven't already done so, now is the time to purchase or borrow one of those small sealing irons. The Top Flite MonoKote iron is an excellent choice. If this is your first time using MonoKote, carefully follow the directions enclosed with the roll. *Before* covering the wing, temporarily install the ailerons and balance the wing. If one panel is heavier than the other, glue a weight to the inside of the tip rib of the lighter panel.

___ 5. Cut two strips of MonoKote, each one about 2" longer than each wing panel (one-half the span). Cut each strip wide enough so that when it is applied to the trailing edge, it will overlap both sides of the wing by 1/16" to 3/32".

___ 6. Apply the strips to the wing trailing edges, making sure that the MonoKote edges are well sealed.

___ 7. Using a razor blade or other sharp implement, slit the MonoKote at the trailing edge hinge slots. Seal the covering edges at the slots with the iron. Glue in the hinges. After the adhesive has dried, drill two 5/64" diameter holes 1/8" in from the trailing edge (TE), and completely through the wing and hinge. Put some glue into each hole and insert a round birch toothpick into each. Repeat for the rest of the hinges. After the glue has dried, cut off the toothpick ends flush with the wing TE planking. Sand smooth so that there are no bumps.

___ 8. Cover the rest of the wing, bottom side first. Let the covering overlap the TE by 1/8".

___ 9. Cover the rest of the aircraft.

___ 10. Slit the MonoKote at the hinge slots and seal the edges. Roughen the flat hinge surfaces with sandpaper to allow the glue to adhere to them. Mix a batch of Hobbypoxy Formula 2 or 30-minute epoxy. Take a T-pin, or long common pin, and bend a small hook at the pointed end. (A piece of small-diameter wire can be used if it's stiff enough.) Place a small amount of epoxy on the hinge slot, and with the hook end of the pin, work the epoxy down into the slot. Repeat this until the slot is filled. Insert the hinge and wipe off any excess epoxy that oozes out around the edges. Repeat this for the rest of the hinges.

Install the hinges on the vertical and horizontal stabilizers first (wing hinges are already installed). After the epoxy has cured, install the control surfaces to the hinges already mounted. Clean off all excess epoxy. Hold the surfaces tightly against each other with masking tape and be absolutely sure that there are no gaps. Once the epoxy has cured, remove the tape and check control surfaces for freedom of movement. Remove any epoxy that may have oozed out from the hinge slots. Pinning the hinges is not necessary when using this method on solid surfaces.

If steel-pin type hinges are used, epoxy can be prevented from sticking to the hinge pin and joint by bending the hinge back on itself and dipping the hinged section into melted vaseline.

___ 11. Cut out the pushrod exits in the fuselage and seal the MonoKote edges.

___ 12. Turn the fuselage over and mount the main landing gear. Use No. 4 x 1/2" sheet metal screws. If using the Bridi dural gear, drill all holes as per the plans. For those of you who prefer a 5/32" diameter piano-wire type of gear, the layout is shown on the plans. Mount with metal clips and No. 4 x 1/2" sheet metal screws. This type of gear is being used on one of the prototypes.

___ 13. Paint the engine and fuel tank compartment with fuel-proof paint or epoxy, and let dry.

___ 14. Install the motor mount using No. 6-32 bolts. The bolts should be long enough to just protrude through the blind nuts by two threads. Mount the nose gear.

## EQUIPMENT INSTALLATION

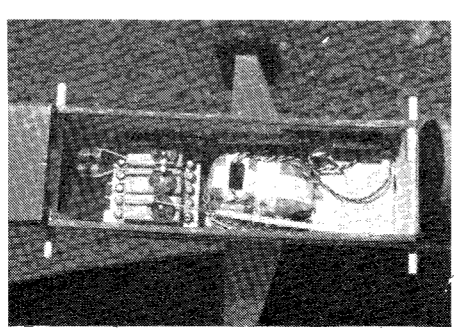
___ 1. Fuselage—Install the servo rails and mount the servos at the location shown on the plans. If you're using the Kraft KPS-14s, the mounting rail spacing can be taken directly from the plans. Be sure that there is a space between the bottom of the servos and the fuselage floor.

___ 2. Install the rudder and elevator pushrods and control horns. Goldberg pushrod connectors were used on the servo wheels and arms of both prototypes; they make pushrod installation and adjustments at the servo ends simple, and when the setscrew is tightened down, they will not slip.

___ 3. Install the nose gear and throttle pushrods. Hook up the nose gear arm to the pushrod, using the outer hole on the steering arm. A Goldberg pushrod connector was used here also.

___ 4. Install the engine and hook up the throttle pushrod.

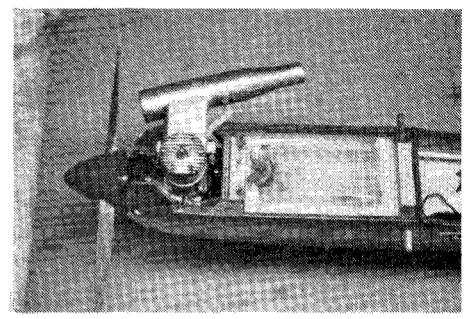
___ 5. Install the battery pack, switch harness, and receiver. The switch is to be mounted on the fuselage side opposite the engine exhaust. The receiver antenna wire should come out on the same side as the switch.



**STEP #5**

# G.L.A.

Both prototypes turned out nose-heavy, so the battery pack was located at the rear of bulkhead 2 and on the floor of the fuselage. A piece of 1/8" ply sheet was cut out and glued over the top of the battery pack to keep it from rattling around. Enough height was allowed so that the foam-wrapped pack would fit snugly in this space. For easy removal, a piece of 1" wide masking tape was wrapped around the pack, leaving a 1/2" long pull-tab sticking out toward the rear of the fuselage compartment. The receiver is mounted between the battery pack and servos, and is held down by rubber bands.



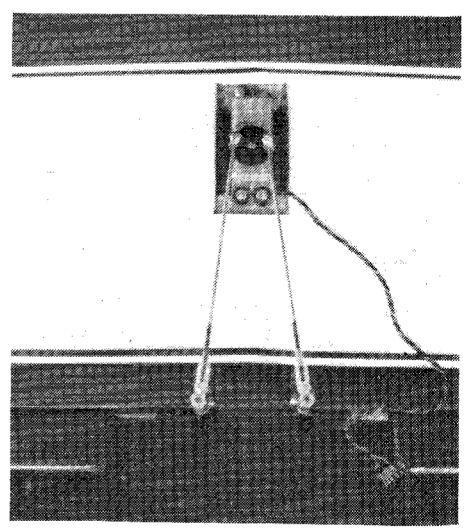
**STEP #6**

___ 6. Install the tank and fuel lines.

___ 7. Install the 1/4" diameter wing hold-down dowels. Do not glue; the wing rubber bands will keep the dowels from moving when the aircraft is assembled.

___ 8. Wing—If you haven't already done so, cut open the covering at the aileron servo hole. Seal the MonoKote edges.

___ 9. Shorten the 3/32" diameter aileron control horn wire to 7/8" long (measured from the inside bend radius).



**STEP #10**

___ 10. Install the nylon horn and metal retaining collar onto the control horns. The top of the assembly should be flush with the 3/32" diameter wire end. With the clevis holes pointing toward the wing leading edge, set the wing on the fuselage and check the ailerons for interference

# G.L.A.

by moving each aileron in both directions. You will probably find that the control horn assembly will hit the rear top wing hold-down dowel triangular crosspiece mounted to the front of bulkhead 3 when the aileron is in the "up" position. If it does, remove the interferring section. You may also have to remove some of bulkhead 3 in this area to obtain enough "up" throw in the ailerons. Aileron movement should be at least 5/16" up and 5/16" down.

____ 11. Install the aileron servo and pushrods.

____ 12. Plug the servos into the receiver. Using the transmitter, check that up is up, down is down, left is left, and right is right (don't forget the nose wheel steering), and that the throttle is on high (the hole in the carburetor barrel is fully open) when the transmitter throttle lever or stick is pushed to full forward.

### CANOPY AND PILOT INSTALLATION

____ 1. With the hatch in place, attach the wing to the fuselage with a couple of No. 64 rubber bands on each side. Do not crisscross the bands, as the rear portion of the canopy fits over the center of the wing.

____ 2. Fit the canopy to the hatch and wing as shown on the plans.

____ 3. Cut out the two canopy formers from 1/8" sheet balsa and install them at the location shown. Remove a section of MonoKote at the places where these formers attach to the hatch and wing.

____ 4. Install a 1/4" sheet balsa floor, located on top of the hatch and under the forward portion of the canopy. Remove the MonoKote from the hatch area where the floor attaches.

____ 5. Install the pilot onto this floor. Do a good job of gluing this in, as it will be inaccessible once the canopy is installed. The floor can be painted if desired.

____ 6. Remove a very narrow strip of MonoKote where the rear canopy section attaches. Install and glue the canopy to the hatch cover, wing and two bulkheads. Do not let the glue get in between the two bulkheads. The front of the canopy bottom is glued against the edges of the 1/4" canopy floor.

____ 7. After the adhesive has dried, cut the canopy apart at the two bulkheads. Remove the wing by lifting straight up, and paint the exposed balsa bulkheads with fuel-proof paint or epoxy. A piece of 3/16" wide trim tape over the outside of the canopy at the bulkhead locations will cover up the bulkhead edges.

### BALANCING

Completely assemble the aircraft, including wheels, prop, and spinner.

____ 1. With the fuel tank empty, balance the aircraft at the center-of-gravity (CG) location shown on the plans.

____ 2. The nose of the aircraft should point slightly down at an angle of several degrees. If it does, this means that the airplane is slightly nose-heavy and is okay for flying.

____ 3. If the tail drops or is down by several degrees, this means that the aircraft is tail-heavy. Add weights to the nose, just behind the firewall at the tank compartment floor, until the nose points down at an angle of several degrees. Glue in the weights. *Do not* attempt to fly the plane in a tail-heavy condition or you'll be in for some nasty surprises, such as snap rolls at slow speeds when putting in too much elevator during climb out or landing.

____ 4. If the nose really drops down at a sharp angle (30 degrees or so), you should move the battery pack back to the radio/servo compartment; this was done on the prototypes. Refer back to step 5 under "Equipment Installation." Just remember that a slightly nose-heavy condition is okay, but if the model is too nose-heavy it will not spin or snap roll.

### CONTROL SURFACE DIRECTION CHECK

You should have already checked out the direction of the control movements, but do it again to make sure.

____ 1. Ailerons are really easy to hook up backwards, but there is a simple way to check for proper direction. Stand behind the model and move the transmitter aileron control to the right; the left aileron should go down and the right aileron should go up. Move the aileron control stick to the left; the right aileron should go down and the left aileron should go up.

____ 2. Pull back on the elevator control stick; the elevator should go up. Push forward on the elevator control stick; the elevator should go down.

____ 3. Move the rudder control stick (or knob if you're using a single-stick) to the left; the rudder should move to the left. Move the rudder control stick to the right; the rudder should move to the right. Check the nose wheel steering for proper direction at this time; it should move in the same direction as the rudder.

____ 4. Push the throttle stick forward; the hole in the carburetor should be open (full throttle or "high"). Pull the throttle stick all the way back; the hole in the carburetor barrel should be in the closed position.

### CONTROL SURFACE THROWS

With the transmitter and receiver on, and all transmitter trims at their neutral or center positions, all control surfaces should be at neutral, i.e., no up or down. If they're not, adjust the control surface via the pushrods until they are.

____ 1. Ailerons—5/16" up and 1/4" down.

____ 2. Elevators—3/8" up and 3/8" down.

____ 3. Rudder—5/8" left and 5/8" right.

____ 4. Throttle—Set up the throttle per the engine manufacturer's instructions. Total throw, however, should be such that the engine throttle servo will not be in a stalled condition when the throttle stick *and* trim lever are at their extreme high or low throttle positions at the same time; otherwise excessive battery drain will occur, and it doesn't help the servo any, either.

### PRE-FLIGHT PROCEDURE

Try to pick a calm day for the first flights, as it makes it easier to trim out the craft. If this is your first ship, or if you're fairly new at this game, enlist the help of an experienced modeler. It takes two people to perform several of the following steps.

Make sure that the transmitter and receiver batteries are fully charged according to the radio manufacturer's instructions. Assemble the airplane using at least five No. 64 rubber bands on each side of the wing. Don't forget to plug in the aileron servo before putting on the bands.

____ 1. Check the ground tracking of the plane by giving it a shove and letting it coast along the runway or pit area. If it goes to the left or right, adjust the nose wheel steering via the nose wheel steering arm pushrod connector until it tracks straight. Check that the transmitter rudder trim is at its neutral or center position before making these adjustments.

____ 2. Fill the tank and start the engine. Adjust the needle valve for a slightly rich high-throttle setting. Have your helper pick up the plane, and with the engine at high throttle, have him point the nose straight up. The engine should not sag or quit. If it does, the setting is too lean. Adjust the idle so that it is reliable yet slow enough to allow the aircraft to land.

*Note:* These adjustments are to be made with the transmitter and receiver on. Make it a practice to always start your engine at low or half throttle and with the radio turned on.

____ 3. Range-check the radio for distance as per the manufacturer's instructions. Do this with and without the engine running. There should be no significant difference in range between these two conditions.

____ 4. Top off the fuel tank, and turn on the transmitter and receiver. With the transmitter trims at their neutral positions, check the control surfaces for proper direction. Start the engine. While your helper holds the airplane, run the engine at full throttle and check the controls again for proper movement. If you have vibration problems, the controls will not react the way that they should. Do not attempt to fly if you notice any abnormalities. The majority of vibration problems are caused by an unbalanced prop and/or an off-balance or out-of-round spinner.

### FLYING

*If you have never flown RC before, do not attempt to teach yourself!* Find a qualified instructor and have him teach you. If you have flown before, read on.

Point the plane into the wind and ease on the throttle. The plane should track straight as a string. Once it has reached flying speed, gentle back pressure on the elevator stick will unstick it from the runway. Climb up to a safe altitude and trim the aircraft via the transmitter trim levers until it flies straight and level, hands-off.

Now try a steep turn. If the nose drops, the plane could be too nose-heavy; if it wants to climb, it could be tail-heavy.

Try a few stalls. You will notice that the stalls are gentle, and that the ailerons and rudder are effective right up to the stall. Lowering the nose a few degrees will get the aircraft flying again.

Do a few aileron rolls to check the roll rate. The roll rate on both prototypes was ideal. If you want a faster roll rate, move the aileron clevis assemblies in toward the wing for more throw.

Try a rudder roll. If the rudder has enough throw, you'll see an excellent rudder or dutch roll.

Although it is not recommended, the aircraft can be flown using rudder, elevator, and motor control only.

Once you're satisfied that the aircraft is trimmable, etc., go ahead and land it. Set up for a nice glide slope on final, and just before it touches down, flare it out ever so gently and it will grease right onto the runway with nary a bounce. If you find yourself having to feed in more elevator during the final approach to maintain the glide slope, then the plane is probably too nose-heavy.

Taxi back to the pit area and stop the engine. With the transmitter and receiver still on, check the transmitter trim positions and make the necessary control adjustments. Don't forget to return the transmitter trims to neutral before making the adjustments.

Remove the wing and inspect all mounting screws, bolts, etc., for tightness. Check the hinges also. In fact, check all parts that could loosen up and fall off.

That about does it. Have fun with your Great Little Airplane! ■