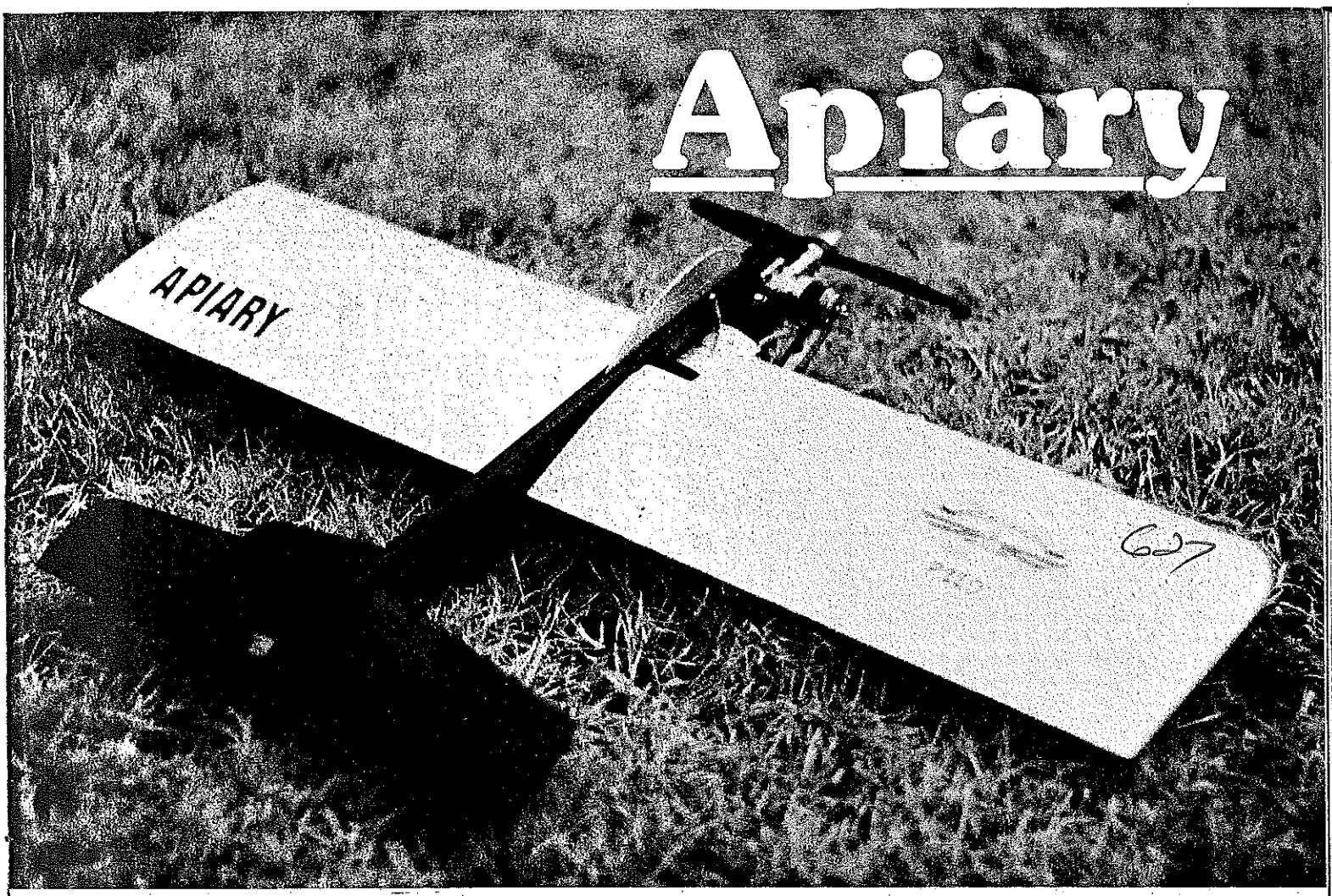
Apiary



This CL trainer for today's fledgling Stunter solves a major configuration problem posed by the layout of the new rear-induction Queen Bee engine with an innovative geodesic type wing construction.

■ **John Hunton**

Above: The Apiary uses a thick airfoil, making it an outstanding trainer for both Stunt and inverted flight. Note that the fuel tank slips into a niche in the leading edge of the wing. This is necessary because of the rear-induction arrangement of the engine. Fuel feed is excellent with the venturi located so close to the fuel tank. Below: Clay Hunton exhibiting the Apiary. This model provides excellent Stunt capability on short 27- to 35-ft. lines. The Cox Queen Bee .074 engine equipped with muffler provides the power.

DESIGNED AND BUILT around the new Cox Queen Bee .074 engine, the Apiary is an excellent trainer for the newcomer to Stunt and inverted flight. It's capable of loops, inverted flight, and figure eights on 27-ft. Dacron lines—and on 35-ft. lines it can get even fancier.

The Cox Queen Bee .074 engine fills a timely niche. It has more power than the marginal .049 engines, yet is still small enough to be flown on short lines. The Queen Bee could well become the standard for schoolyard Control Line Sport Stunt flying, especially with its nice compact muffler to win your neighbors' approval.

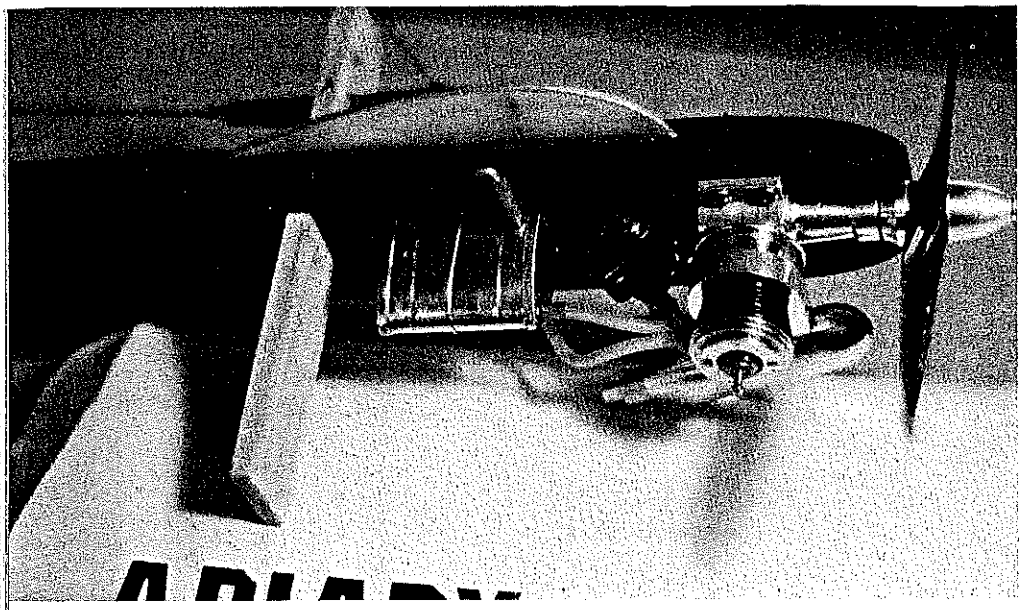
The Queen Bee configuration does have a quirk—a rear induction system which precludes a typical engine-fuel tank installation. The needle valve location is remote from the propeller, the spray bar is too close to the fuel tank for a good draw, and the engine fuel tank exceeds the norm.

Most CL models use a massive balsa- or sheet-covered leading edge D-tube to provide torsional and bending strength for the wing. Locating the fuel tank in such a way that it interrupts the continuity of this structure is unacceptable, unless adjustments are made. The Apiary solves this problem by using geodesics behind the spar to stabilize the wing against torsional stresses, an arrangement which permits the wing front section to be nonstructural so that it can be cut away to provide for a good fuel tank installation.

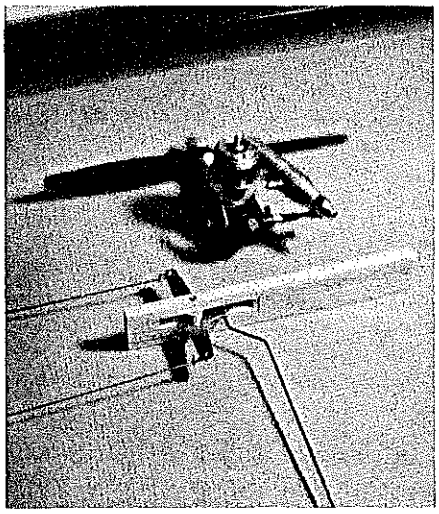
Construction

The wing employs an unusual construction procedure. It's built vertically rather than horizontally. Just as unconventional is the fact that it's built in halves (front half and rear half). This method of construction lends itself well to a small workspace. All the wing ribs are cut from $\frac{3}{32}$ balsa sheet. You may wish to reinforce the outer faces of the front ribs with cyanoacrylate glue (CyA), since they are rather thin.

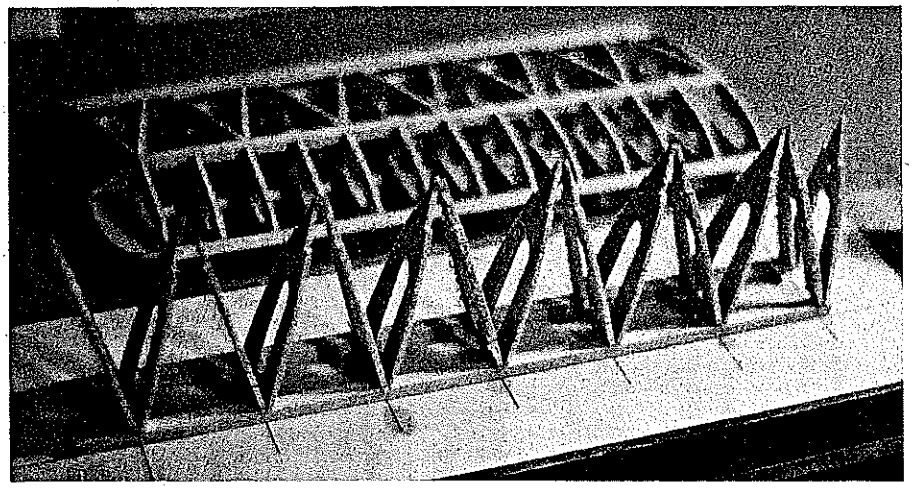
Pin down the ¼-in.-sq. spars for the first half of the wing to a flat work surface. Mark off 2-in. lines on the spars for rib spacing. Erect the rear ribs in pairs, tepee-



Note the close proximity of the fuel tank to the venturi. The muffler pressure piping system shown here proved to be unnecessary with the close tank intake arrangement. The Queen Bee comes equipped with a nice muffler. Also note that the head is tapped for a short glow plug—no more glow heads to replace. The stub spar seen in this photo has been installed through the fuselage. The construction method employed in the wings requires that they don't carry through the fuselage. Foam mounting for the fuel tank proved to be unnecessary.



The bellcrank-stub spar assembly shown ready to install in the fuselage. Be sure to make the top and bottom ¼-in.-sq. spar members from hardwood or hard balsa. The pushrod is made so that it exits close to the fuselage. The Queen Bee is seen next to the stub spar. Note the rear-induction system.



Triangulation of the rear ribs provides good torsional stiffness so that the leading edge of the wing can be cut away to allow for the fuel tank installation. Construction is light and simple.

fashion, and glue them in place. Install the trailing edges and the tip rib. The wing assembly is now structurally sound, and the remainder of the assembly can be done off the board.

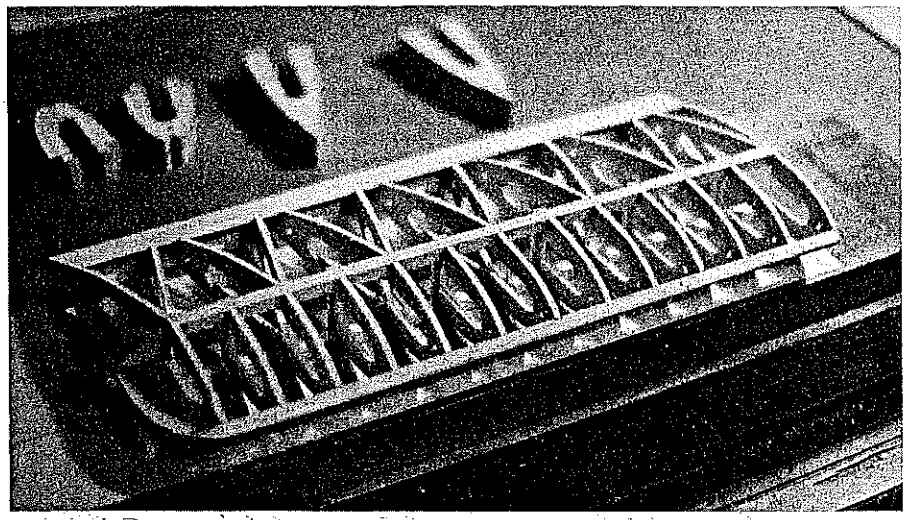
Glue the front ribs into place, then glue on the leading edge. Complete the basic wing assembly by installing the ⅛ x ¼-in. spar webs.

Build the other wing panel, then add the wing tips, root ribs, and all remaining details.

Sand the wings with fine paper on a long sanding block to produce a smooth surface. Install the weight in the outer wing and the line guides in the inner wing. Cover the wings with heat shrink material.

Build the wing stub spar of ¼-in.-sq. stock. Use hardwood for the outer members if available; otherwise, very hard balsa will do. A 3-in. Perfect bellcrank was selected to use on the prototype. Though it has a nice center bearing, this bellcrank is too large and must be trimmed to utilize the inner holes. The head of the center screw should also be cut off. Drill the spar assembly for the bellcrank screw. Do not drill this hole oversize (use a No. 28 drill, 0.140 in.).

Assemble the bellcrank to the spar, using washers to suspend it near the center of the spar. Glue the bellcrank screw into place. Assemble the lead-outs so that they exit the bellcrank at a level near the center of the spar, aligning them in the wing rib slots. Bend the pushrod at its bellcrank end, and install it into the bellcrank.



Wing construction is unusual in that it is built vertically from the spar back, and is built in two halves. This method produces a structural unit which can be finished without being pinned down, and can be built in a very compact space. Note the stack-sawn ribs in the background.

The fuselage is cut from ⅜ x 2-in. firm balsa. Cut the side panels from 1/16 plywood. Use aliphatic resin (white glue) to attach the side panels. Press these parts together firmly until the glue dries. Sand the fuselage parts smooth. Cut in the stub spar slot, then drill the engine mount (No. 33, 0.113 in., for 4-40 screws) and the 3/32-in. landing gear holes.

The empennage and canopy parts are all cut from ⅛-in. medium stock. Sand to

round off the leading edges, then sand all the parts smooth. Drafting Mylar makes great hinges. Simply cut a slot with a knife, slip the hinges in, and apply a drop of CyA.

Finishing. Use an appropriate primer to prefinish the model. Apply two coats to all surfaces except the wing. Sand with fine paper between coats.

Scrape all primer from the mating surfaces, then assemble the empennage and stub spar to the fuselage with CyA. Use baking soda and CyA to form nice, strong fillets. Form the top loop of the landing gear, push it into place, and cement. Install the canopy and the tail skid.

Finish the model by applying two coats of color to the fuselage and empennage. Trim as desired when dry.

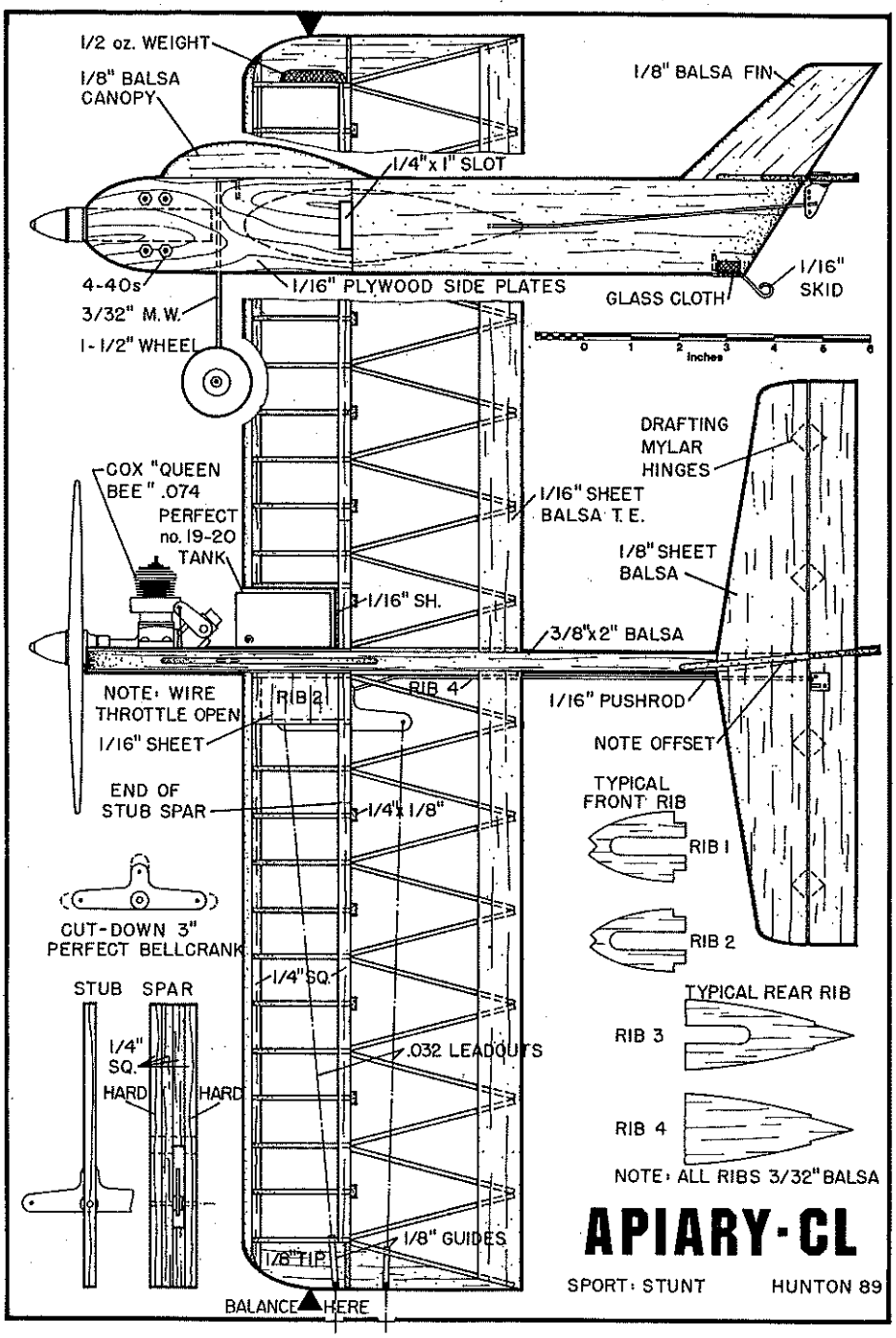
Final assembly. Inserting the lead-outs into the tip guides is deceptively easy. If you're using 1/8-in. guides, slip a 12-in. length of tubing into the wing through the guides. Slip the lead-outs into the 1/16 tubing, and push the wing assembly into place. Remove the 1/16 tubing, epoxy the ends of the wing panels, and press them into place.

Make the elevator pushrod end, and install the elevator horn. Make the bottom leg of the landing gear, and install the wheel. Make the lead-out ends. Install the fuel tank and engine. Use a 7 x 4 or 7 x 6 propeller.

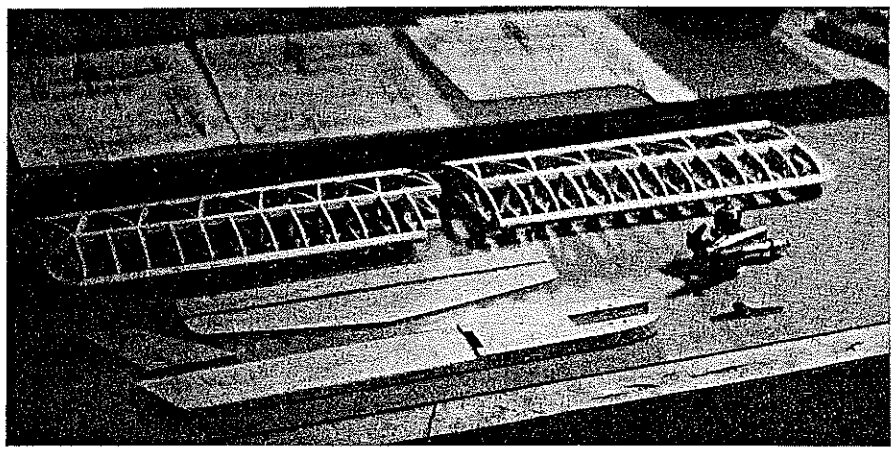
While the prototype uses a tapped muffler to provide pressure to the fuel system, this isn't really necessary. The model has been flown without the muffler and without pressure, and the fuel tank feeds just fine.

Flying. With the elevator in neutral, the Apiary will take off by itself. Maintain control. Line tension (needed for the controls to operate) is minimal when the plane is flying slowly, so don't rush the takeoff. Use gentle control input to keep the airspeed up. Once you're familiar with the model's flight characteristics, start practicing maneuvers. Begin with wingovers, then progress to loops.

The beginner in Stunt or inverted flight can't go wrong when the Queen Bee is in her Apiary. It's a nifty, up-to-date choice for a Sport Stunt CL trainer.



Full-Size Plans Available . . . See Page 170



Basic assemblies of the Apiary are shown ready for final priming and sanding. Primers can be either nitrate or butyrate clear dope if using dope as a final finish, or automotive primer if using epoxy, polyurethane, or enamel finishes. Test first to be certain. Sand between coats, then apply the finish coats. Wing covering can be silkspan or any lightweight heat shrink material. Cover the wing panels before final assembly. See the text for feeding the lead-outs through the inboard wing. Don't forget to install wing tip weight in the outboard wing panel.

Don't Fly Control Line Models Near Power Lines!