Cool Cat

A UNIQUE .25-.32 POWERED SPORT FLIER THAT'S LOADED WITH PERFORMANCE

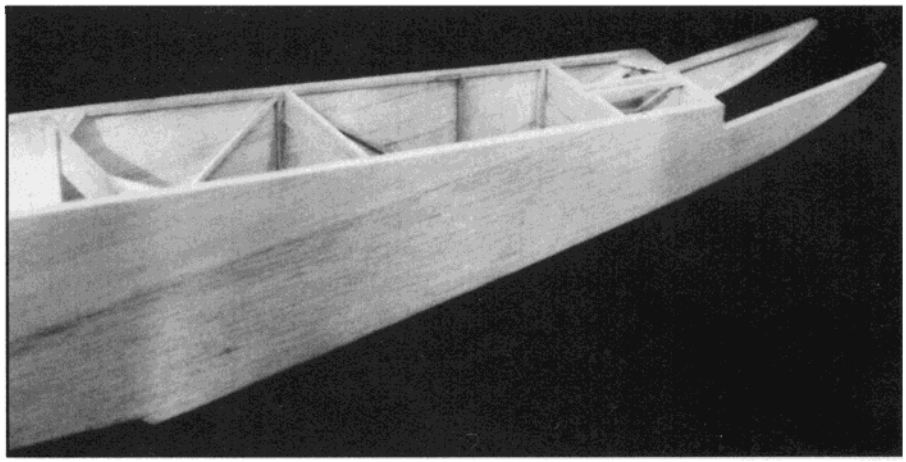
The "Cool Cat" is the sixth in this line, featuring a lifting fuselage. The fuselage is configured to produce lift at high angles of attack. This is most apparent during take-off and landing.

I was prepared for the above, as my Sport Scale Shorts SD3-30 commuter (also a lifting fuselage design) has the same characteristics; however, I was not prepared for all the added gravy. A dead engine at low altitude (such as shortly after take-off) results in double the glide length expected. This fact does in no way infer that this design is a "floater." Simply lower the nose to just off the runway, level out, and then raise the nose for a "delta style" landing. Try that one with the average trainer type.

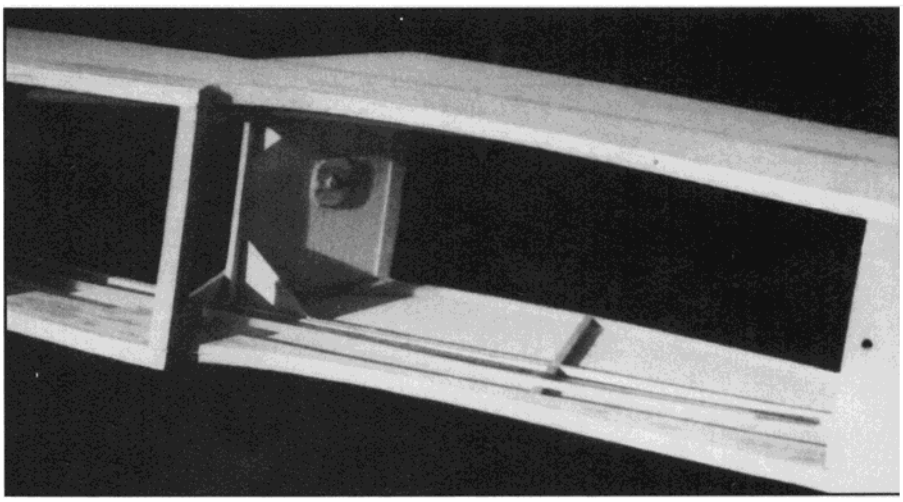
A mild stall is simply a "bump" -- canard type. A severe stall "blanks out" the vertical stabilizer, causing a "tail wag" and a warning -- get the nose down. Even in this severe stall, the wing can be kept level with ailerons, as you recover with little loss of altitude. Despite all this tame behavior, the Cool Cat is highly aerobatic.

The wing concept deserves much of the

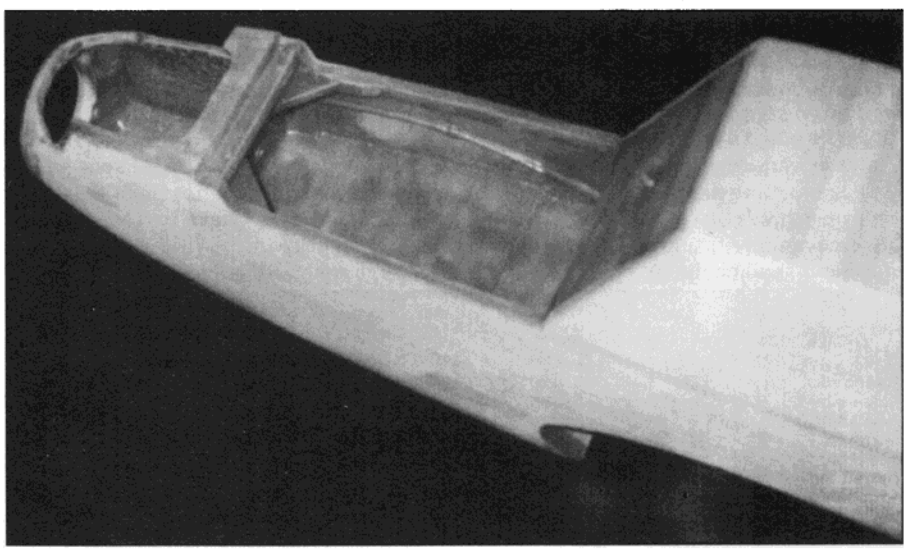
NAME
COOL CAT
Designed by:
Ralph H. Pearson
TYPE AIRCRAFT
Sport Aerobatic
WINGSPAN
50 Inches
WING CHORD
8-1/2 Inches (Avg.)
TOTAL WING AREA
425 Sq. Inches
WING LOCATION
Bottom of Fuselage
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1-5/8 Inches
OVERALL FUSELAGE LENGTH
37-1/2 Inches
RADIO COMPARTMENT SIZE
(L) 9" x (W) 3-1/4" x (H) 4-1/2"
STABILIZER SPAN
18 Inches
STABILIZER CHORD (inc. elev.)
5-3/4 Inches (Avg.)
STABILIZER AREA
103 Sq. Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
6-5/8 Inches
VERTICAL FIN WIDTH (inc. rud.)
6 Inches (Avg.)
REC. ENGINE SIZE
.25-.32 2-stroke
FUEL TANK SIZE
6 Oz.
LANDING GEAR
Tricycle or Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Basswood, Ply, & Balsa
Wing ..... Basswood, Ply, & Balsa
Empennage ..... Balsa
Wt. Ready To Fly .. 55 Oz. (3 Lbs. 7 Oz.)
Wing Loading ..... 18.6 Oz./Sq. Ft.



Aft fuselage, showing gussets used (top and bottom) to hold alignment. Fin guide rails are in place.



Radio compartment. Note gussets still in place. Can be removed after fuselage assembly is complete.



Fuel tank and engine compartments with first coat of epoxy paint. Canopy/Hatch also fuelproofed in lower section.

credit for the behavior of this model. Actually, having a 1% greater thickness at the tip than at center, to prevent tip stall, is not new. Also, forming ribs for a tapered wing as I have done, goes back at least 25 years. I simply put the two concepts together 20 years ago.

CONSTRUCTION

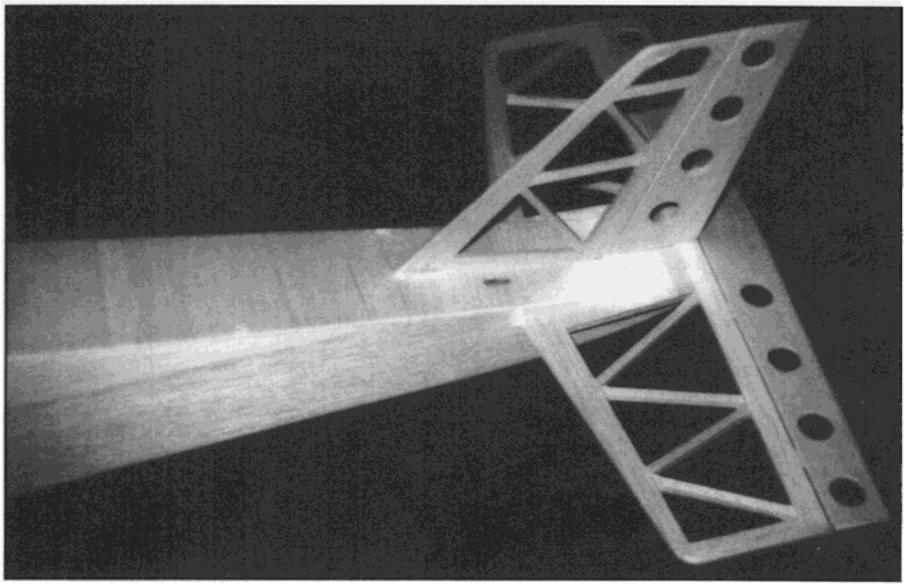
There is no need to be skeptical about your ability to form wing ribs in the manner shown. The alternative; making 12 patterns to cut out 24 ribs, really scares me — and it should. This is one reason why we have foam wings today.

Fuselage:

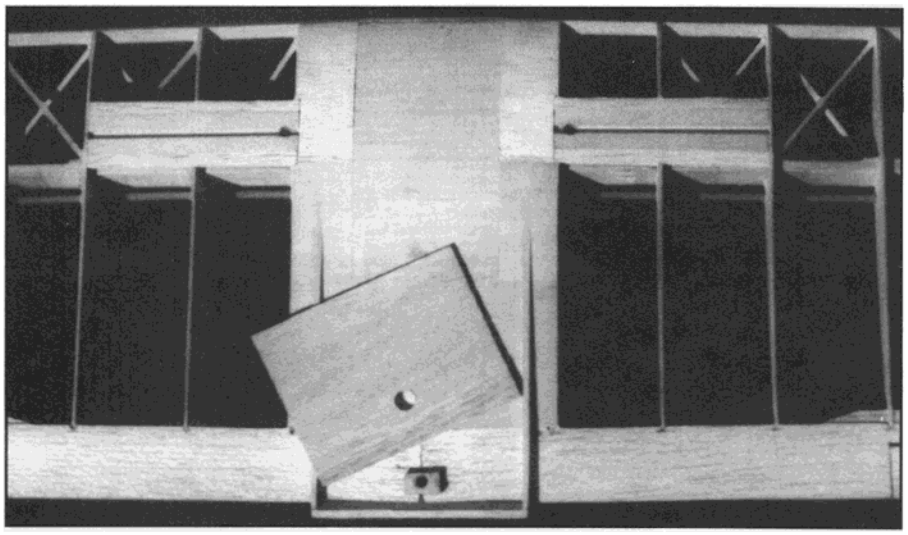
Make two identical wing saddle doublers. These are one piece from behind the fire wall to F3. Make a vertical cut at wing leading edge. Cut the remainder to within 1/16" of the wing seat. This will be removed when you "fine tune" the wing position. Use plastic wrap or wax paper over the plans. Pin down a wing saddle member first. Using a sandable glue, add the 1/8" sq. balsa perimeter, verticals and diagonals to create the inner framework. I needed to split the last 5" at the bottom rear, and also soak with water.

Note that a short vertical is used at the F2 position and a double vertical (glue together) is used at F6. Use all gussets shown, as this holds an accurate outline. Allow to dry for several hours. In the interim, build the stabilizer and fin, using sandable glue, then make the fire wall and bulkheads.

Build another side, directly over the first, using plastic wrap between the sides.



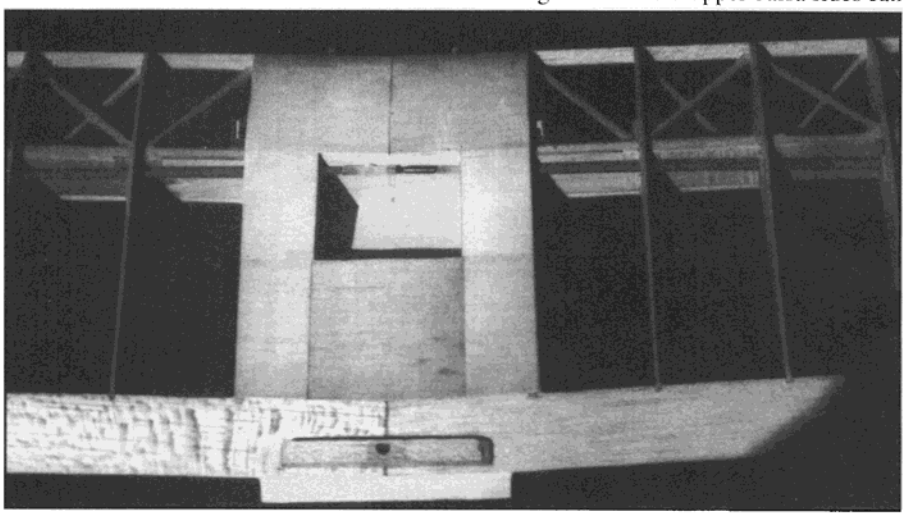
Aft fuselage before covering. Note rudder pushrod exit, flush with balsa surface.



Section of lower fairing cover, cut oversize to ensure centered and recessed nylon bolt head. Note stand-off. It is now ready to glue in place. Short pieces (1/8" sq.) of balsa should be glued to fill far ends of gear mount.

Allow the two sides to dry overnight, while you keep making parts; rudder, elevator, canopy/hatch sides, etc.

Remove inner fuselage sides from the board and sand each one on both sides. Look for bumps, lumps, etc. Match together, using pins and clamps to hold as one. Sand perimeter, to make two exact sides. Select light but firm 1/8" balsa, for the outer fuselage cover. Both upper balsa sides can be cut from the same sheet. This should be the lightest of the three.



Gold-N-Rod sheathing is installed short of servo well — for "flex." Du-Bro aileron connector shown in place.

Match the glue line as best you can, holding up to light. Don't forget that the lower sheet extends beyond the inner framework in front. Put the upper sheet in place and tape (masking tape) the two together. Open at the glue line, run some glue in the opening and close flat. Wipe up excess glue and lay the side on a flat surface. Keep turning over and over every few minutes. It should be ready to remove tape in 10 minutes or so. Now hold down with light weight for another 20 minutes. Do the same with the other side. To bring panels to full width, add small pieces at front and rear of wing saddle.

While these are drying, drill some 1/16" holes about 1" apart, through the wing saddle doublers. Remember, some CA can be "wicked in" from the top as well. Let the sides dry an hour more, and you should be able to sand the glue line smooth. Lay one side down and place the inner member on top, making sure it is 3/16" short of the outer panel in front, and even with the hatch/canopy seat. Check the perimeter, making sure all will be covered. Put drops of CA at holes in the saddle doubler and every 6" around the perimeter — always on the inside. You can pick up the side now, and hold in whatever position it takes to easily apply CA to all inner joints. Repeat for other side, making sure you build a left and right side.

Cut, plane, and sand excess material and clamp together again, with inner framework on the inside. Sand where needed to have identical sides. Make centerline marks on F2, F3, and F5, T&B.

Assemble the fuselage sides, using bulkheads F2 and F3 glued 90° to one side. Make sure F2 is flush with the bottom and F3 flush with the top. Use gussets to hold F2 and F3 at a 90° angle.

Clamp the two sides over the top view centerline. Use a board that will fit over the lower cross members of F2 and F3. Use weights on this board to hold the fuselage steady. The fuselage should be 90° to your work surface, and a board placed across the stabilizer seat should also be level with your work surface. Make any adjustments needed and then CA the bulkheads in place. Use gussets here also for a dependable box section.

When F2, F3, and F6 line up, glue in F6. Use gussets here also. Remember, with this fuselage you can't pinch the sides together in the aft end. Glue in F4T and F4B and also the fin anchor plate. Do not glue in the fire wall yet. Put the fuselage aside for now.

Wing:

Make the spar first, as it will be needed to check the slots in the ribs. I used basswood for the spar. It is lighter, has a greater stiffness and bending strength than spruce. It is also cheaper and takes CA well. After cutting to length, save the leftovers, as much of it will be used on this model. Taper spars to shape shown on plans.

Sand off any slick release agent on the plywood spar braces. Lay some plastic wrap over the plan again and pin this member in place. Also, pin three "partial" shear webs,

at ribs 7, 9, and 11. Use slow epoxy on the plywood, and CA on the partials, as you line up the top spar. Do the same on the lower spar. Remove any excess epoxy and put weights on this area. Allow to cure and repeat for the other wing half.

Later, turn the spar over and glue on the rear spar brace. Clean up excess epoxy and use weights again. While this is curing, cut 1" lengths across a 3" piece of 1/16" balsa. You will need about 20, as some will be needed for the remaining partials.

Now is a good time to make the plywood rib formers. To check for accuracy, the large (center) template should measure 1-3/8" at its widest point and have a 5/16" x 1" spar opening. The tip template should measure 1-1/4" and have a 5/16" x 3/4" spar opening. Both templates should measure 5/16" at the rear. Both templates should have the same angle at the rear, for a distance of about 3-3/4". I made the spar opening by drilling a hole in each corner. Then, using a utility knife, I cut on both sides of the template to open the hole, and a small sanding stick does a good job of cleaning things up.

Ribs are formed sandwich-style, by bolting twelve 3/32" balsa blanks between the two 1/16" plywood templates. Bolts must be at least 1-1/2" long and the balsa blanks must be 3/32" stock for the proper outcome. Lay the tip template (centered depth-wise) over the center template, with spar slots in alignment. Drill holes where indicated. Harden the perimeter and spar slot with thin CA, before and after each sanding session. Be sure you make a left and right set of ribs.

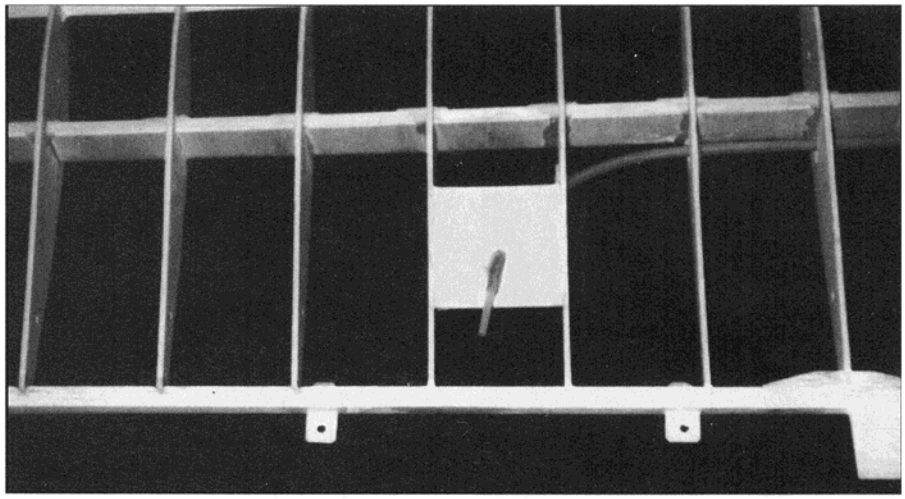
For "flat on the board" building, the templates have a 90° angle at the trailing edge. When making the bolt holes in the blanks, mark each one in turn with a soft lead pencil. Use a small (round or square) file or nail of suitable size, to make the holes. The first eight blanks on each side are no problem.

To avoid "short-sheeting" on the last four, use the tip template, centering it vertically, with 45% of the balsa in front and 55% in back. When tightened, the bolts should be parallel, top and end view.

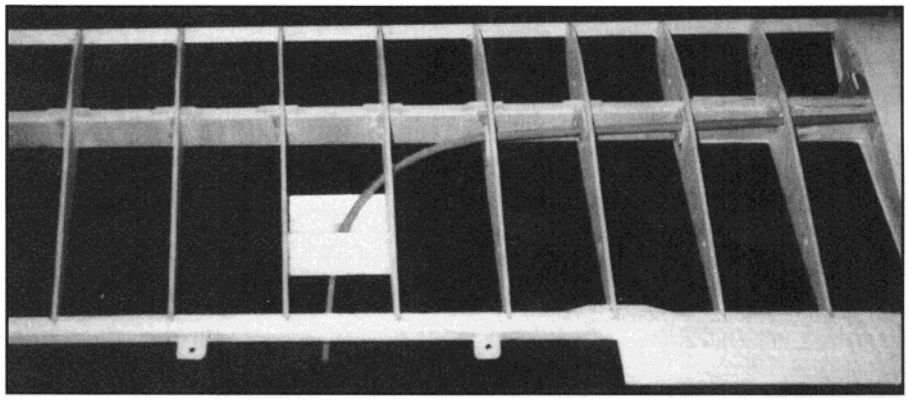
To shape the ribs to within 1/16", use a saw, knife, and a plane. Sand the remainder, always across the blanks, in the direction of taper. Try to avoid repeated contact with the templates. Use 60, 80, and finish with 150 grit. The leading edge seat can easily be cut with a single edge razor blade. Before unbolting, check spar fit. You may need more sanding in the slot or on the spar — I needed both.

Number and letter each rib after unbolting. Ignore the chisel shape at each end. The front isn't that severe and the rear will be "lost" in the trailing edge. Using the bare template as a guide, remove 1/16" from top and bottom of ribs #1 and #2. Rib #1 is out of "position" (close to #2) so put it aside for now.

I ordered 3/8" x 1-1/2" trailing edge stock. I cut off 1/8" at the rear and tapered these to 1/16" at the rear. Notch these carefully. Lay some clear plastic wrap covering over the plan and pin this member down. Starting with rib #2, slide all ribs onto the spar, about 2" apart — the partial sheer webs will help here. Holding sticks behind the spar, loop rubber bands from the bottom around the leading edge to the top of the sticks. Repeat at every second rib bay, making sure ribs are "seated" properly, at leading edge.

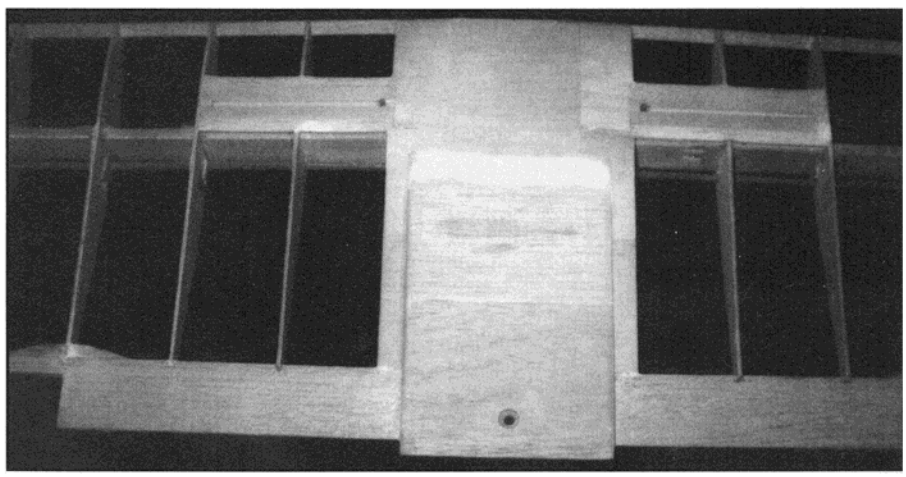


Bottom view of aileron pushrod exit. Sheathing should be cut flush with anchor plate for easier covering.

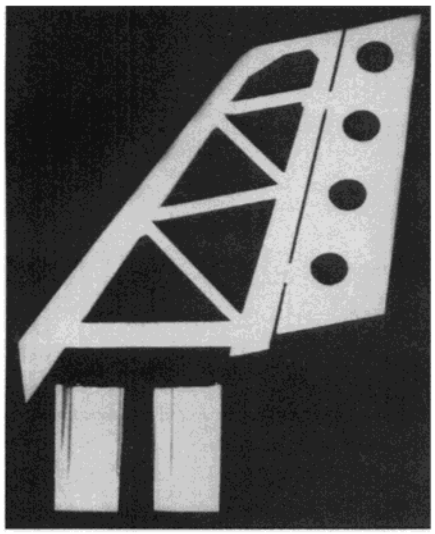


Top view of left wing panel. Note semi-boxed spar has partial shear webs at front of spar. Brace at rib #5 rear end, not used on final plan.

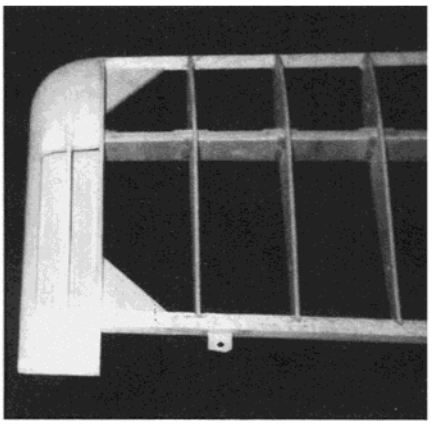
Lay this assembly over the plan, seating each rib into its notch. Hold in place, using sanding blocks (won't slide) and weights. Keep the leading edge in place, by using long "T" pins butted against each end. If you're using thin CA, I suggest you use baking soda to fill any voids left by the chisel shape at the trailing edge. Be sure you pin some 1/16" sheet under ribs #1 and #2. Rib #1 is cut at the rear of the spar opening and shortened behind S1 to fit properly. Glue in tip corner braces, remove from board and build other half. Use large template to trim #1 ribs for center and servo well sides. From the spar back, sheet the bottom of the wing. Add all of the upper sheeting. Form the leading edge, sanding a "flat" at front center where it meets the fuselage. Sand the top sheeting and add the basswood mounting bolt reinforcement. Forget all else for now and concentrate on



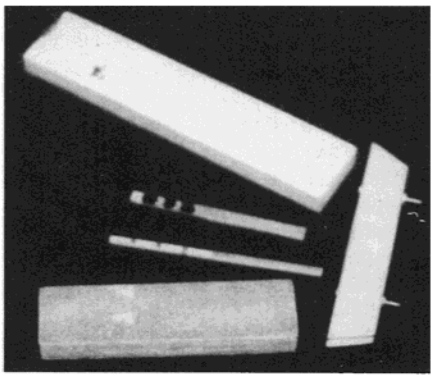
Bottom view of wing with fairing cover in place. Front cross braces -- much work for little gain, so not used on final design.



Fin, rudder, and fuselage fairing. "Built-up" fairing is easier than one formed from soft balsa block. Rudder post shown lengthened on plan.



Wingtip and wing panel corner braces.



Stacked and bolted wing ribs. Sanding blocks are pointed in direction of use. Sanding sticks make a neat spar slot.

fitting the wing to the fuselage properly.

Check the incidence of the wing at this time and adjust the wing saddle as necessary. (Note: The center of the leading edge of the wing should be 3/16" higher than the center of the trailing edge.)

A straight yardstick, held parallel to the stabilizer seat, makes a good reference line for the above measurements. If properly fitted, the wing will be centered, level with the fuselage, and measure equally, from a pin centered at F6 to each wingtip. It should also be as "deep" into the fuselage, as shown on the plan. The above is not an easy task, but is crucial (the key) to a good flying model.

Use pins and rubber bands to hold wing at pencil marks you have made. Drill dowel holes at marks indicated on F2. Dowels are pushed into retainer and CA'd from the bottom. More CA is used in front when the wing is removed.

Drill the wing mounting bolt hole from the basswood reinforcement side, as it is less likely to "drift." Mount the wing with plastic wrap at the rear and glue in the wing bolt retainer. Add triangle stock at each end. Drill and tap for a 8-32 nylon bolt. Notch rib #3 to receive the landing gear mounts. If the mount groove isn't centered, keep this in mind when installing the vertical anchor, or the drill will drift.

Make the 1/8" tip outline members before you cut out the ailerons. Center this at leading and trailing edges and mark its position at the rear of rib #12. Now, cut out ailerons. Sand the aileron seat (well) and install the wingtips.

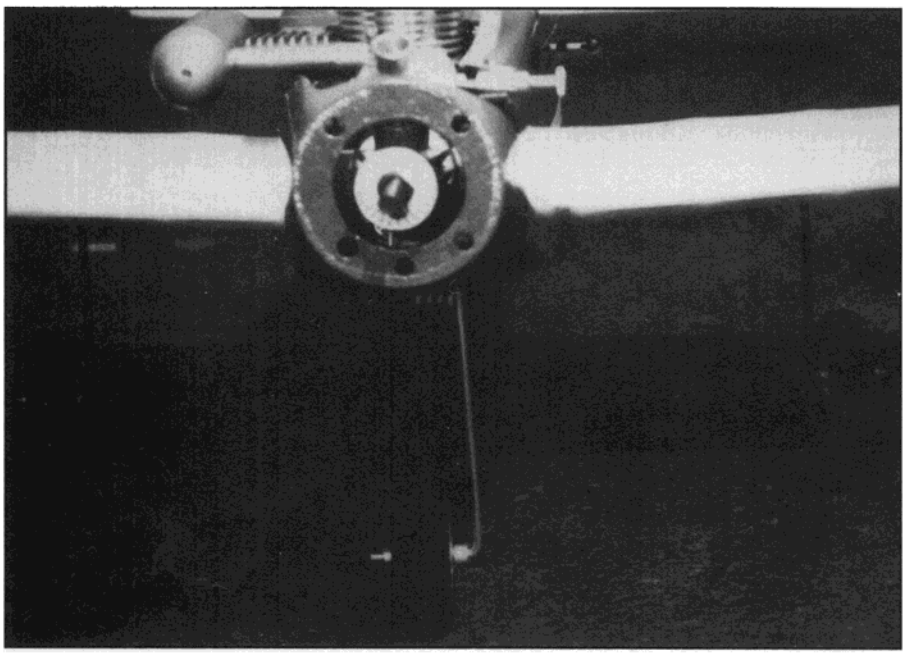
I had problems with the Gold-N-Rod aileron control system. It became necessary to cut large holes in ribs #5, #6, and #7. By using a heat gun and over bending, I was able to "hold" the bend. Then I had to spray the inner (yellow) with silicone and let dry. I'm okay now, it does move easily, but I recommend Du-Bro flex cable or bellcranks in any case. I used a Du-Bro #183 Aileron Dual take-off ball link in the servo compartment.

I've had problems with nose gear wires, bending at the lower edge of the mount. I reversed the common practice, by putting the coil in front. Now, I do have some "flex."

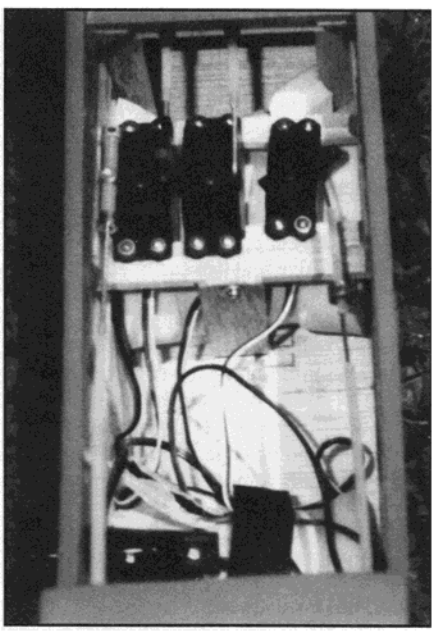
Temporarily, mount the nose gear wire with the tiller arm in the bottom position. Mark and drill a hole in the fire wall, directly behind the outer hole on the tiller arm. I opted for Gold-N-Rod here, as a small nylon clevis can be jointed flush to the inner rod using a 3/8" length of threaded rod. Part of the small clevis will enter the sheathing allowing ample movement for steering.

Epoxy the fire wall in place using rubber bands to hold the front of the fuselage tight, and pins to hold the vertical position. A scrap piece of 1/8" balsa, used between F2 and the nose vertical doubler (about halfway down), can be used diagonally to correct any misalignment of the tank compartment. It's best to leave it in there until the top plywood corner braces and lower basswood brace are epoxied in place. Assemble the cowl pieces (including the triangle stock) over the plans and shape the 1/16" plywood nose ring. When dry, remove some of the triangle stock at left rear, so it will not interfere with the tiller arm and clevis.

Remove the muffler and mount the engine. Use fuelproof shims (at the fire



Holes in nose ring provide easy access to all fire wall mounting bolts. Wheels are Dave Brown "Lectra Lite" treaded.



Plenty of room for flight pack. Servos and battery favor left side to counter muffler weight.

wall) to bring the drive washer back to the centerline. Shims can be cut from empty fuel jugs, windshield washer jugs, spring water jugs — the list is endless.

Notch the needle valve area for clearance and temporarily pin the cowl in place. The Goldberg spinner backplate, when held into position against the drive washer, should be parallel to, and centered at, the cowl front. Make any corrections required (some slight sanding may be needed). Mark location and epoxy the nose ring in position. Check again with the spinner backplate before the epoxy cures. Remove the cowl, use epoxy and permanently glue the cowl in place.

Glue into position, both C1 pieces and the basswood screw retainer. I used short pieces of triangle stock and 1/8" balsa sheet to enhance the appearance of the engine opening. CA F2A to the fuselage. Use enough plastic wrap to protect both the canopy seat and back. Pin down the canopy back first and then the 1/8" sq. seat rails, allowing 1/8" for the side panels. Use sandable glue and pins to hold the sides in place. Next, glue on 1/16" firm balsa, for the front top cover.

Before removing any pins, make a hole for the aft canopy retainer. A rat-tail file is better than a drill here. I used a semi-pointed dowel to fit a short piece of Gold-N-Rod sheathing. Glue in the mid-canopy top brace and remove the canopy. Add the two 1/8" sq. "ceiling" supports, the 3/32" balsa ceiling, and CA the plywood (H1) in place.

All 3/32" top and aft bottom cover is "contest" type (4-6 lb.) balsa. I get mine from "Lone Star Models." For a small fee, they picked out choice 6 lb. stock for me.

The position of both Gold-N-Rods is shown on the fuselage side view. Affix at the rear and middle to the aft fuselage, and allow the front ends to rest free on the lower cross member of F3, until servos are installed. The elevator pushrod must go on either side of the rudder post, if you use the "taildragger" option. This option (as shown) has proven faultless over three seasons of flying. The main gear wire is simply bent at the anchor to bring the leading edge of the wheel directly below the leading edge of the wing.

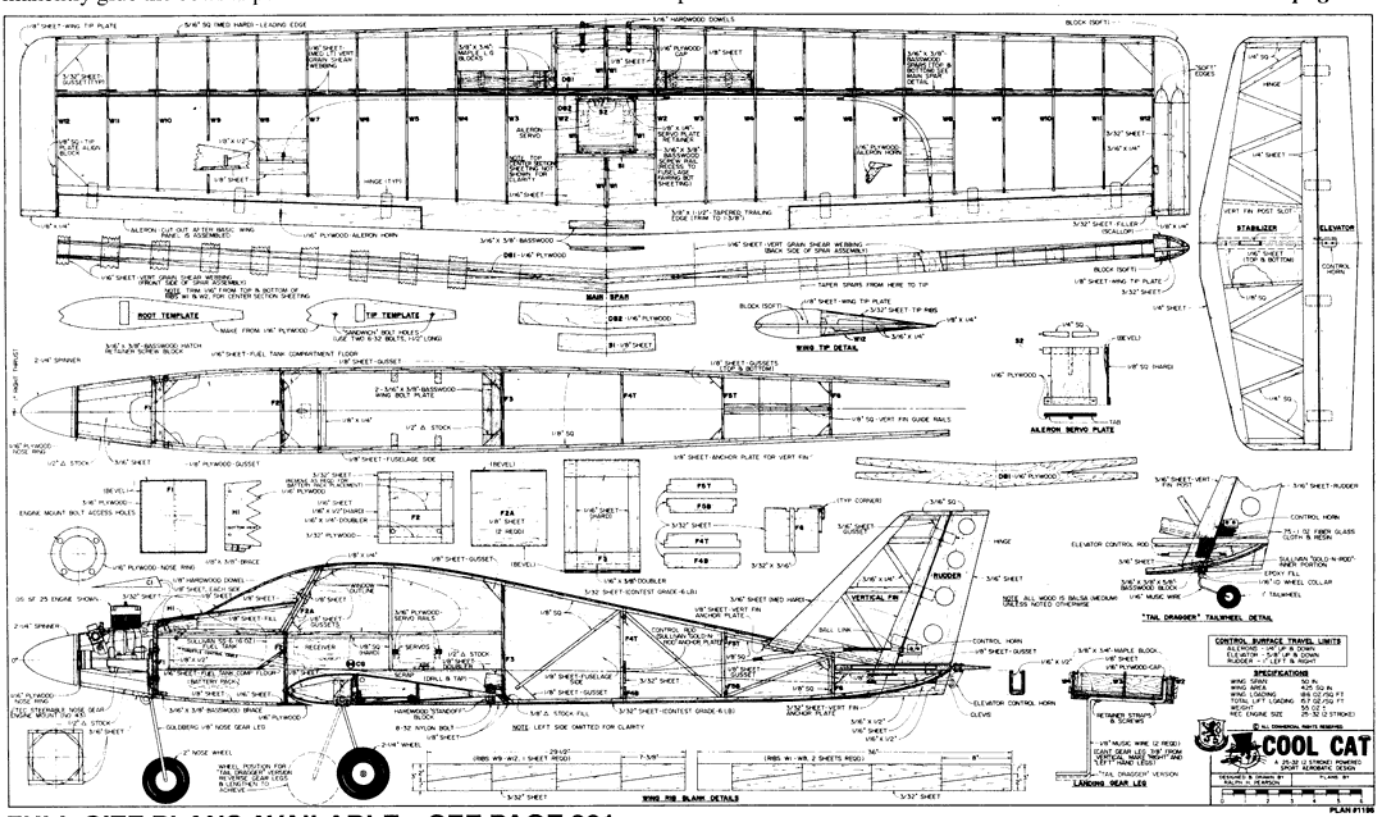
Bolt the wing in place and check the stabilizer alignment. Make sure it is level with the wing, centered, and measures equally from the hinge line to "set points" on each wing half. Pin in place and CA from the bottom (inside the rails) and at F6.

Start sheeting the fuselage at bottom rear, beveling the first piece for a neat fit against the stabilizer. Use sandable glue, pinning down each piece in turn, as you complete all top and bottom sheeting. The small fairings (each side of fin) should be well sanded, to fit exact before gluing in place.

The hood exit, used to protect the elevator horn, is most easily formed as shown on the plans. Before installing, sand the entire fuselage, using silicon carbide 150 grit, followed by 320 grit. Don't oversand the corners — note plans.

Mounting the servos on the prototype was done using (double stick) servo mount-

Continued on page 62



FULL-SIZE PLANS AVAILABLE – SEE PAGE 201

Continued from page 58

ing tape. If you do use this method, be sure to seal the wood surfaces with epoxy for good tape adhesion. The plans show 3/16" x 1/4" plywood mounting rails for the fuselage mounted servos, and a removable plywood mounting plate for the aileron servo. The aileron pushrod sheathing should be flush with the retaining plate at ribs #7 and #8. The other end is short of rib #1 — see plans.

I use RC 56 glue to install my "easy" type hinges. I cut the hinges (on this model) to 1/2" wide and made a 1/8" hole at each end. You must enlarge the knife slit to a thin slot, using a broken off piece of razor saw. This method will also help to straighten cocked knife slits. Experiment on scrap balsa first. If you can pull the hinge out the next morning, you're not getting enough glue into the slot. One half of the hinge must dry first. This method is time consuming, but your servos and battery will thank you.

Taildragger Option:

Make sure the 1/16" tail gear wire fits the Gold-N-Rod inner rod snug, but without any binding. Cut the wire to 6" and the inner rod, slightly longer than needed. Mark and drill a hole in the rudder at the position shown, 90° to the front edge. Bend a 90° angle, 3/4" long at one end of the wire. The wire is held tight to the rudder as you put a few drops of thin CA into the hole and a drop or two, to hold alignment. I use thin CA, to attach fiberglass reinforcing cloth also.

The hinge post is inset 1/32" into the fin post, from top of stabilizer to the base. Use a metal straightedge and razor blade to keep a parallel line. Hold the inner Gold-N-Rod in position, using the rudder taped in place. Hold the inner rod with tape also and tack with thick CA. Pull out the rudder assembly and glass the "bearing" in place.

Make the hinge slots (the steering gear acts as a third hinge) and glue the fin in place now while you can see what you're are doing.

Put a 1/16" diameter wheel collar on the tail wheel wire now so you won't forget it. The covered rudder will be the last item to be attached to the fuselage — don't forget, the wheel collar before any bending for the wheel.

Covering:

I used Super MonoKote for covering and UltraCote Plus for the trim. Avoid chordwise bands of trim near the wingtips. This could negate some stall control. Sunburst trim should be okay, but keep well back at tips. Visibility bands, if used, should be no further out than rib #7.

Flying:

Trike or taildragger, handling is easy on take-offs. After trimming, get some altitude and do mild stalls. The model should recover straight ahead. Do some slow flying to get the feel of how slow the "Cool Cat" can safely fly. Landings are nose high, to take advantage of the lifting fuselage. Now, go back up and stunt like crazy.

I wish to thank Mel Young, Gordon Johnson, and my son Bill, for their camera work. Thanks Charlie Scholeno, for test flying the Cool Cat. I knew you had it "made," after that first beautiful take-off. Thanks also, to Don and Elane Dahlgren, for your efforts on my behalf.