HOT DAWG

The original "Hot Dawg," it weighed 4 lbs., 4 oz. with an O.S. .52 4-stroke.

By Bobby W. Baker

A Sport Fun-Fly Model For .40-.52 Engines

The author with his two "Dawgs."

I gotta confess. I am an airplane junkie. Even worse, I'm a long time junkie having acquired the habit at a young and tender age. There is no known cure, thank goodness. So I have blissfully gone on my way designing, building, and flying everything from 1/2A single channel to several full-size homebuilts. The Hot Dawg is my 56th R/C design.

Due mainly to time restraints, I've previously not submitted any of my R/C designs for public consumption, but the Hot Dawg project turned out so well that I felt this one had to be shared. The finished plane is one piece with radio and tank accessible through a top mounted hatch. The wing, tail surfaces and fuselage are joined permanently after covering is applied. The very thick symmetrical airfoil, light wing loading, and gobs of thrust make the 3-D maneuvers like hovering possible. I built two prototypes and powered both with O.S. 52 4-strokes turning 11 x 4 APC props. After building a new plane and getting 50-100 flights, I usually get bored and want something new. But the Hot Dawg has been a different story. Between the two prototypes, I've got 500-600 flights and every time out is still exciting, especially with the control throws really cranked.

The design is a great teacher since it can perform most all maneuvers in close, low and slow, with plenty of throttle left to fly out of any possible stall. Take-offs can go immediately vertical and out of sight, and landings can be made as slow as the lightest high wing trainer. I'm using Futaba T6XA computer radios that have mixing on the elevator and aileron-flap surfaces. At 50% mix, loops can get really tight.

If I've got your interest stirred up, let's start building!

CONSTRUCTION

The two prototype Hot Dawgs were built almost completely with thick and thin CA glues, using baking soda as a filler for those less than perfect joints. Aliphatic or "carpenter's" glue works well but requires longer curing times.

A 24" x 48" ceiling tile "spot" glued to a hollow core door makes an excellent building board. Cover the plans with waxed paper or Saran Wrap to prevent the structure from sticking.

Wing:

Place the 3/8" x 3/8" x 48" balsa spars and leading edge in place over the wing drawing and mark the rib locations on all three at the same time. Place a 1/8" x 3/8" x 48" balsa strip over the main wing spar position and pin the bottom spar over this. The 1/8" shim will elevate the spars and ribs above the drawing at the correct building position.

Set all ribs in their correct location and pin in place. Install the top spar and leading edge, and pin to hold in place. Make sure the building tabs are also pinned down securely and all ribs are square with the building surface. Slide the 1/4" o.d. carbon fiber arrow shaft into position through the 1/4" holes and wick thin CA into all the ribs, spar, and arrow shaft joints.

Using thick and thin CA, glue in the five front balsa shear webs. Do not attach the rear shear webs at this time. Attach the top two 3/32" x 4" x 24" leading edge sheets with carpenter's glue, using tape and pins to hold them in place. Moistening the outside of the sheeting with water will help curve the skins if needed. Attach the top 3/32" x 1-1/2" x 48" trailing edge sheeting in place with carpenter's glue. Allow wing to fully cure before removing from board.

Remove wing from board, turn upside down and pin back to drawing using filler balsa at trailing edge. The 3/8" square fuselage longerons work well here. The rib building tabs may be removed at this point.

Fit small pieces of 1/16" scrap balsa between arrow shaft and mating surfaces of front shear webs. Also spot-glue pieces to rear of arrow shaft face and install rear shear webs, making sure that glue is in contact at all points. The properly installed arrow shaft is critical to the wing's strength. Glue into place the front leading edge sheets and rear trailing edge sheet. After curing, wing can be permanently removed from board.

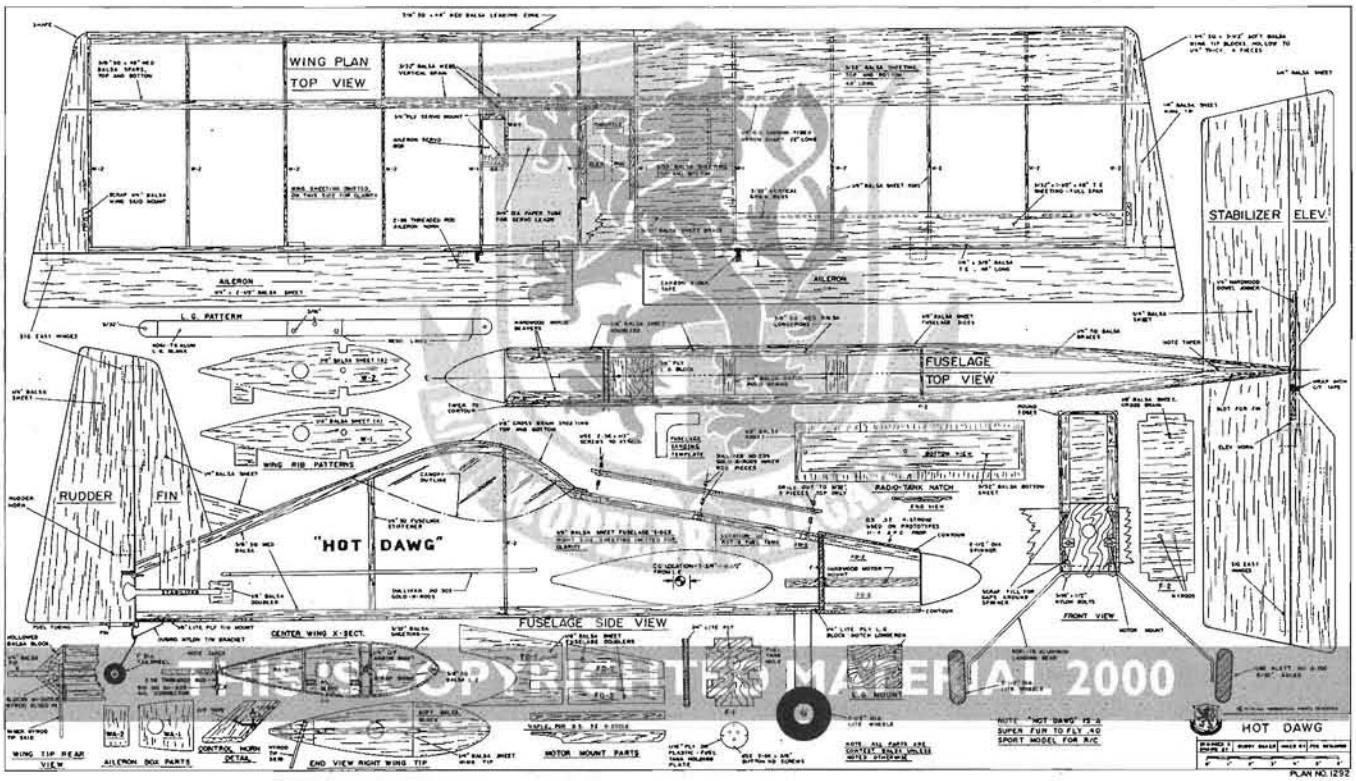
Glue in place the three pieces of 3/32" shear webs to the rear of spar, making certain glue is in contact at all the points. Attach the 1/4" x 3/8" x 48" balsa trailing edge, holding with pins or tape, and wick thin CA into the joints from "inside" the wing. Install the 1/16" balsa vertical grain shear webs between the trailing edge sheets. These webs add stiffness to the trailing edge while sanding and handling the rear of the wing.

Glue scrap 3/32" balsa to bottom of trailing edge sheeting between ribs W-1 and W-2 to allow support of center sheeting. Also glue scraps to rear of main spar to allow support at this point.

Glue up the 3/32" balsa center sheeting, then fit and glue in place on "top" of wing as shown in drawing. Turn wing upside down and install the aileron servo boxes (parts WA-1 and WA-2, and

HOT DAWG

Designed by:
Bobby Baker
TYPE AIRCRAFT
Sport Fun Fly
WINGSPAN
53 Inches
WING CHORD
12-3/4 Inches
TOTAL WING AREA
653 Sq. In. (Approx.)
WING LOCATION
Low Wing
AIRFOIL
Full Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
0 Inches
OVERALL FUSELAGE LENGTH
43-1/2 Inches
RADIO COMPARTMENT SIZE
14-1/4" (L) x 2-1/2" (W) x 4-1/2" (H)
STABILIZER SPAN
26 Inches
STABILIZER CHORD (inc. elev.)
6 Inches
STABILIZER AREA
145 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
9-1/2 Inches
VERTICAL FIN WIDTH (inc. rud.)
6-3/4" Inches (Avg.)
REC. ENGINE SIZE
.40 2-Stroke, .48-.52 4-Stroke
FUEL TANK SIZE
8-10 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4 (with 5 servos)
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
C.G. (from L.E.)
3-3/4" to 4-1/2"
ELEVATOR THROWS
1/2" to 1" Up — 1/2" to 1" Down
AILERON THROWS
1/2" to 1-1/4" Up — 1/2" to 1-1/4" Down
RUDDER THROWS
1" to 2-1/2" Left — 1" to 2-1/2" Right
SIDETHRUST
None
DOWNTHRUST/UPTHRUST
None
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa, Ply, Carbon-Fiber
Empennage ..... Balsa
Wt. Ready To Fly ..... 64-70 Oz. (4 Lbs. to 4 Lbs. 6 Oz.)
Wing Loading ..... 14-15 Oz./Sq. Ft.



1/4" ply servo bearers to fit your particular servos). The aileron connector tube is easily made from stiff paper or thin card stock. Wrap the material around a dowel and tape it to hold in place. Glue into structure with CA. Add the two pieces of balsa center sheeting and cut out for aileron boxes after curing.

Cut the 3/8" square leading edge out at the center section. This will be the tank area when the wing is installed in the fuselage. Glue in 1/4" servo tray bearers.

Glue in place the 1/4" balsa wingtips, being certain to align them straight with the trailing edge. Cut and fit in place the four balsa block front tips. Hollow out excess balsa on inside before gluing into place. Fit and glue in place the 1/4" scrap balsa to support the outer NyRod tube for the wingtip skids. Drill holes and CA the outer tube sections into place.

Carefully shape the leading edge with a razor plane and long T-bar sander to the outline on the plans, then finish-sand the entire wing. Note taper on trailing edge spar to allow plenty of aileron movement.

Carefully sand the ailerons and contour the leading edge as shown on plans to allow a full 45° deflection in both up and down movements. Leave the trailing edges square.

Mount the nylon control horns to each aileron, then remove and saturate the holes on both the top and bottom surface with thin CA to harden this area. This completes the wing construction.

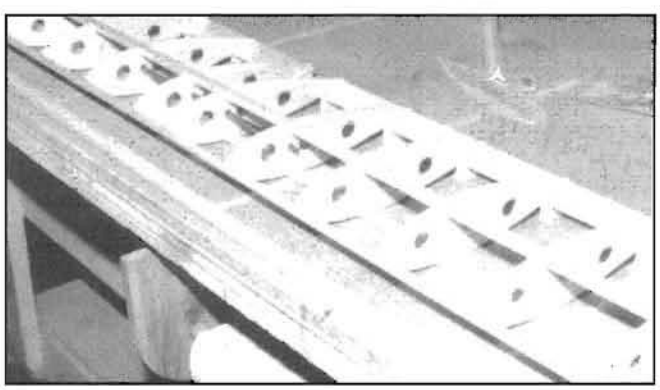
Note: If you decide to cover the wing at this stage, do not hinge and attach both ailerons, as this will prevent the wing from being slid into the fuselage.

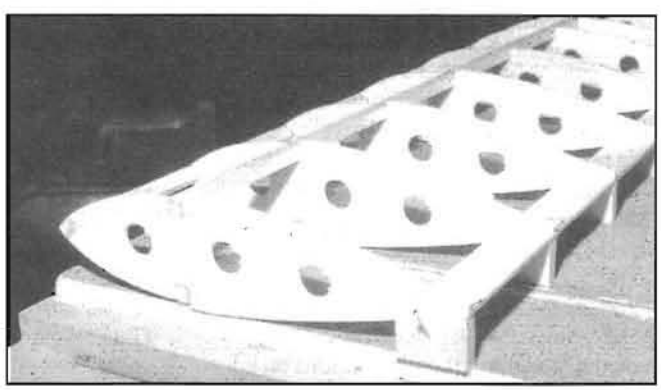
Fuselage:

Using the plans as reference, mark the location of the firewall F-1 and former F-2 on the **inside** of the two 1/8" balsa fuselage sides. Fit and glue in place the 3/8" square balsa perimeter pieces on the **inside** of each fuselage side. Make certain you have a right and left fuselage side! Before gluing the bottom 3/8" square stringers, cut the notch to accept the 1/4" ply landing gear block.

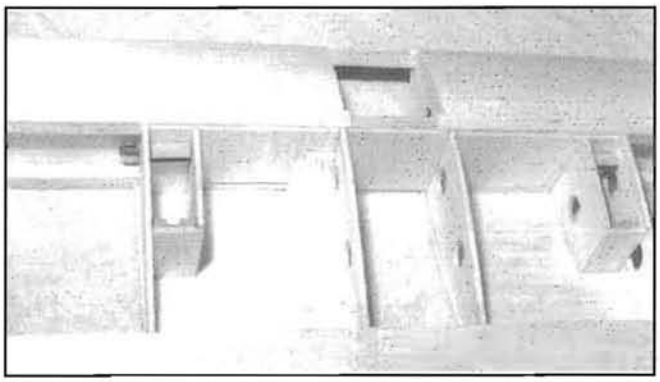
Glue the 1/4" square balsa vertical side stiffeners in place as shown on the plans. Glue in the 1/8" balsa stiffeners over the horizontal stab location.

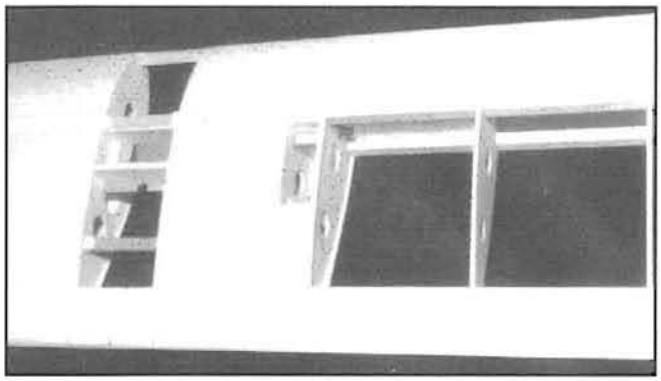
The hardwood engine mounts as shown are designed to accept the O.S. .52 4-stroke engine. The width between



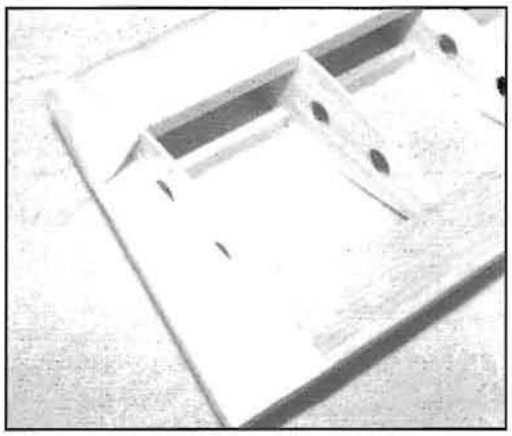


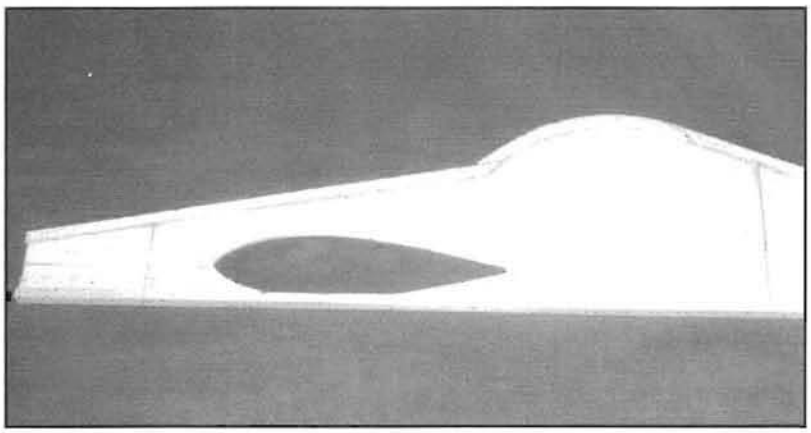
LEFT: The basic wing structure is very straightforward, with the exception of the 1/4" o.d. carbon fiber arrow shaft used to strengthen the center section. RIGHT: Spacers were used to support the trailing edge on the author's prototype, but for your convenience, the plans show the spacers as a temporary part of the ribs.



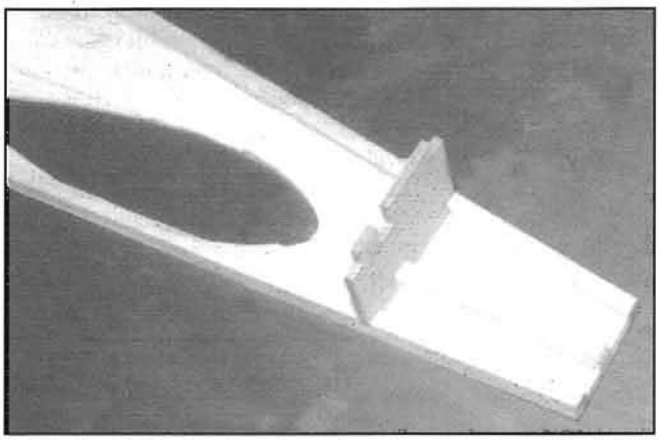


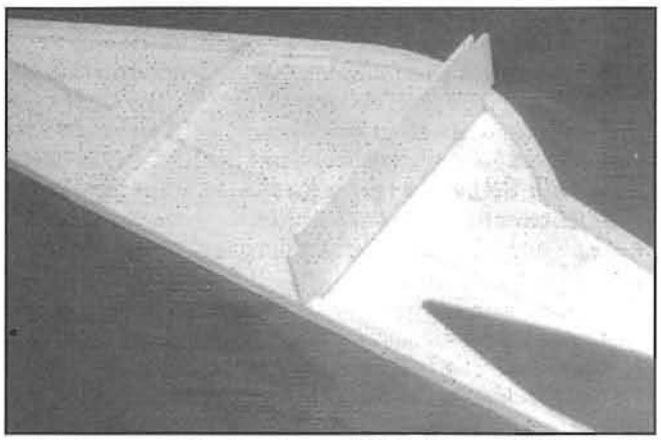
LEFT: Bottom view of the wing. The aileron servo boxes are added prior to sheeting the bottom center section. Note that the sheeting does not cover the leading edge/center portion that fits inside the fuselage. RIGHT: Wing center section completed. Note the servo mounts for the rudder, elevator, and throttle servos are now in place.



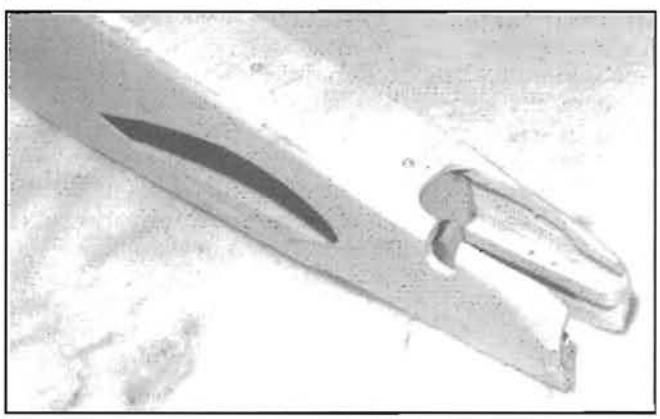


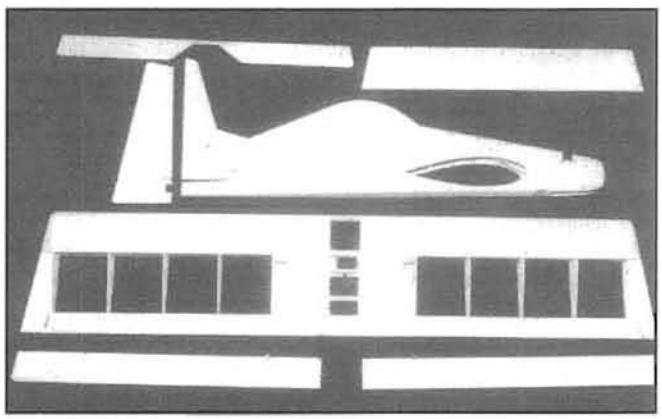
LEFT: The wingtips are simple built-up balsa. Construction details are shown on the plans. RIGHT: Right fuselage side shown with balsa doublers and perimeter pieces glued in place. Be sure to make both a right and a left side.





LEFT: The 3/8" x 1/2" hardwood engine mount and the 1/4" plywood F-1 are now glued in place. RIGHT: Former F-2 is glued in position, then the fuselage sides are joined together.





LEFT: The front of the fuselage has now been rough-shaped, and the engine has been test-fit into position. RIGHT: All the parts, ready for final sanding and covering.

the bearers will also accommodate Magnum .40-.46 engines, although the mounting holes will be different. Adjustments should be made at this time for different engine choices.

Cut the taper on the balsa longerons at the rear of the fuselage sides where they will be pulled together.

Lay one of the fuselage sides flat on the building surface with the inside face up. Fit and glue bulkhead F-2 in place using a small square or triangle for vertical alignment. Using carpenter's glue or thick CA, glue in place doublers FD-2 and FD-3 followed with an engine bearer. Glue firewall F-1 in place followed by F-3 doubler. Set this assembly aside and place the other fuselage side face up on the work surface. Glue in place the three balsa doublers and the other engine bearer to the side, leaving a 1/4" slot for the firewall. Allow assembly to dry.

Mark a centerline on the bottom edge of F-1 and F-2. Join the two fuselage sides upright over the top fuselage drawing for a trial fit to check alignment. After a satisfactory fit to the parts is obtained, and making certain fuselage is perpendicular to the work surface, align the structure over the plans and glue the sides together by wicking thin CA at the joints. Pin or block and weight the fuselage so it will not be able to move while pulling the sides together at the rear. The center of the fuselage ends should pull together exactly over the drawing outline. When satisfied with alignment, wick thin CA at the rear of the joint. After curing, remove the fuselage from the building board and go over all glued joints with thin CA, using baking soda to fill any gaps.

It is much easier to install the elevator and rudder NyRods before sheeting the top and bottom of the fuselage.

Drill the two exit holes in the fuselage at the position shown on the plans and drill two 3/16" holes in the former F-2 to suit your servo installation. Use coarse sandpaper to roughen the outer surface of the NyRods where they will be glued. A length of 1/8" music wire or dowel rod will help to hold the outer tube straight while glue sets. Use thin CA and baking soda for secure joints. As the NyRods will be close to touching the two 1/4" balsa stiffeners inside the fuselage, use scrap pieces of balsa for shims, and glue the NyRods to these as well for added support.

Pin the fuselage back over the drawing. Next, using 1/8" x 3" balsa, begin sheeting the fuselage **top** starting at the rear. The sheeting will run cross-grain to the fuselage length. You will have less waste in the 1/8" x 3" sheeting if you reverse the sheet after each cut.

Use masking tape and pins to hold the sheeting in place. When sheeting over the cockpit area, moisten the sheets on the outside of each sheet to help curve the wood. Stop the sheeting at the hatch locations. After top sheeting has cured, remove the fuselage from the building board. Glue in place the 1/4" ply landing gear block and the 1/8" ply tail wheel support. Glue in place the balsa triangle stock to support the landing gear block and the firewall. The bottom cross-grain sheeting can now be applied.

Build the hatch cover as shown on the plans. Fit and glue in place the three 1/4" balsa hatch hold-down pieces. Install the NyRod sections and screw the hatch in place.

Trial-fit your engine of choice with a 2-1/2" spinner attached, leaving a 1/16" gap between the back of the spinner and the front of the fuselage. The prototypes used 6-32 x 1" socket head screws for engine installation. After drilling the holes and tapping with the screws, saturate the holes with thin CA to harden the threads. Or, if you prefer, you can simply drill the holes for 6-32 blind nuts.

With the engine and spinner bolted in place, draw around the spinner rear outline and then remove the spinner. Use 1/4" balsa scraps to fill in the voids and shape the fuselage nose to fair in with the spinner. If using a 4-stroke engine, the throttle pushrod will require bending into a "U" shape to prevent binding on the throttle arm. Note that the throttle NyRod passes through the main wing spar assembly just underneath the top spar.

The fuselage can now be sanded to final shape by rounding the outer edges as shown on the plans. Note that these outside edges will be less "rounded" at the rear of the fuselage and around the landing gear block. The removable hatch should be in place when final shaping is done to assure a smooth contour.

Tail Surfaces

Tail surfaces are simple 1/4" balsa sheet construction and require little explanation. The vertical fin and dorsal are made in two parts and need to be glued together. The elevator halves are joined as shown on the plans. Place the halves over the plans and glue in the 1/4" dia. hardwood dowel joiner. Use slow CA or epoxy to install the joiner.

Carefully sand and shape the control surfaces as shown, making sure to allow plenty of control surface movement. Drill and test-mount the nylon control horns and use CA to harden the areas.

Final Assembly, Finishing, And Flying

Both Hot Dawg prototypes were covered in MonoKote. I like to rough-sand with 80 grit to contour the wood, then switch to 120 and 220 grit for the final sanding. I also brush on one coat of Coverite's "Balsarite" or thinned nitrate dope to all parts of the structure where the MonoKote will touch. This helps seal the wood against oil or moisture absorption, as well as providing more adhesion for the covering film.

It is much easier to cover the wing and fuselage before final assembly. Trial-fit the wing to allow it to slide smoothly into the fuselage. Make absolutely certain the wing is square to fuselage before gluing. I tack-glue the joint with CA to hold in place, then use thick and thin CA on the inside for final gluing. You may find it easier to use a slow-curing epoxy for this step.

The covered horizontal stab can now be glued in place using the same process. Again, make certain it is properly aligned. The vertical fin is next to be attached, making certain it seats and is glued to the top of the horizontal stab.

The movable control surfaces can now be hinged in place. I used Sig Easy Hinges on both prototypes and thin CA to wick in place.

Carefully check the Center of Gravity and set the control throws at the minimum for initial test flights. Full power take-offs will require quite a bit of right rudder input. In the air, pull back to half throttle or less and get the feel of the plane. Please note that the Hot Dawg is not designed for full throttle operation for extended periods especially if built using the lighter weight contest balsa. The first prototype used average weight wood and the O.S. .52 could be flown full bore straight and level without flutter. The second prototype using contest balsa **will** flutter at full bore. Learn to use the throttle! I only use full throttle for take-offs or vertical out of hover. Most maneuvers require less than 1/2 throttle.

After the initial flights, the more advanced pilots can move the C.G. aft to the farthest recommended location (4-1/2" from leading edge) by locating the battery pack behind the servos. Gradually increase the control throws until you're fully comfortable with the plane. At maximum aileron throw, rolls are so fast it is difficult to count them.

I think you will find the Hot Dawg a unique flying experience, and one that, with practice, will greatly enhance your R/C flying skills. Fly safely and enjoy!