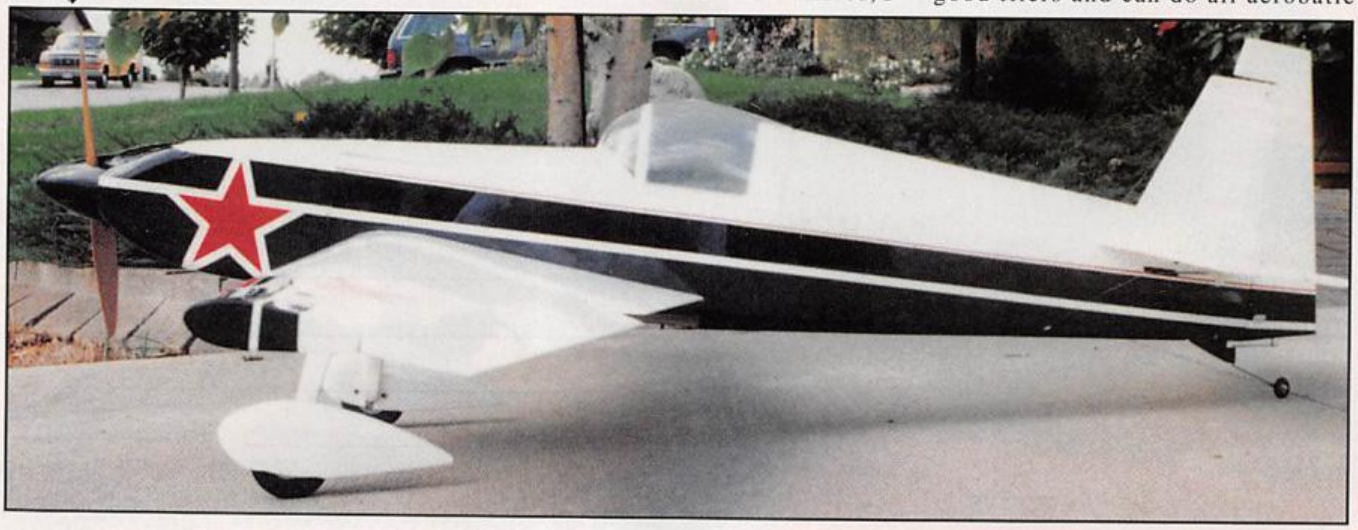
S-300 Staudacher

By L. Mikulasko

A Sport Scale Aerobatic model for a .40-.46 2-stroke, or a geared 25 electric motor

The full-size Staudacher is a fully aerobatic competition plane and follows the trend set by the European designs in the last decade.

I learned about the existence of the Staudacher when I came across a Repla-Tech ad in one of the books showing the side view of it and was impressed with the shape, so I ordered a set of 3-views from them. After the 3-views arrived, I decided to build the model in two versions. One for a .46 2-stroke engine and the other one for the Astro 25 geared electric motor. Both are identical in size. To make the strong fuselage, I decided to have a plug-in wing. To have easy access to the radio compartment, the top of the fuselage from fire wall to the back of the canopy is removable. Both models are good fliers and can do all aerobatic



STAUDACHER S-300
Designed by:
Laddie Mikulasko
TYPE AIRCRAFT
Sport Scale Aerobatic
WINGSPAN
53 Inches
WING CHORD
8-7/8 Inches (Avg.)
TOTAL WING AREA
477 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
45-1/4 Inches
RADIO COMPARTMENT SIZE
(L) 14" x (W) 4-1/2" x (H) 3"
STABILIZER SPAN
19-3/8 Inches
STABILIZER CHORD (inc. elev.)
6 Inches (Avg.)
STABILIZER AREA
117 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Middle of Fuselage
VERTICAL FIN HEIGHT
6-1/2 Inches
VERTICAL FIN WIDTH (inc. rud.)
5-1/4 Inches (Avg.)
REC. ENGINE SIZE
.40-.46 2-stroke/Astro Geared 25
FUEL TANK SIZE
10 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
C.G. (from L.E.)
3-1/4 to 4 Inches
ELEVATOR THROWS
1" up / 1" down
AILERON THROWS
3/8-1/2" up / 3/8-1/2" down
RUDDER THROWS
1-1/2" left / 1-1/2" right
SIDETHRUST
None
DOWNTHRUST/UPTHRUST
None
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa
Empennage ..... Balsa
Wt. Ready To Fly ..... 80 Oz. (5 Lbs.)
Wing Loading ..... 24.7 Oz./Sq. Ft.

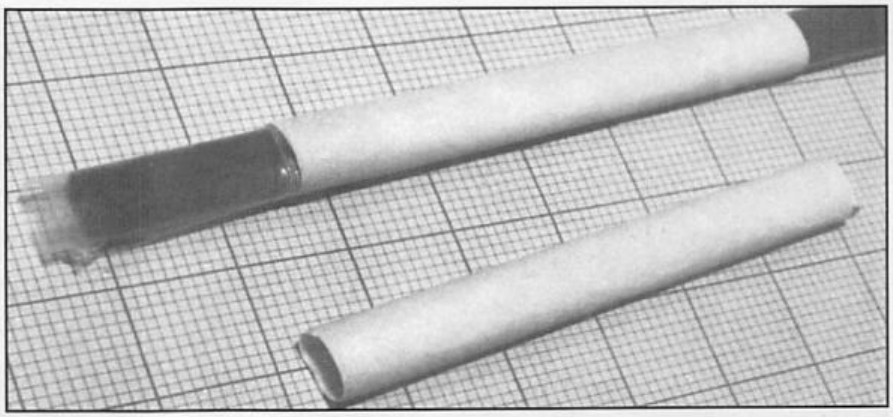
maneuvers with ease. The radio compartment is large enough to hold all the batteries and servos.

To build the model, I recommend you cut out as many parts as possible so the model can be built as a kit. The model is of straightforward construction using balsa, plywood, and spruce. It is easy to build, but is not a beginner's airplane. The outlines of the model are accurate as per 3-views. The wing has no dihedral, the top surface of the wing halves is straight. Only the natural taper of the wing at the bottom is giving it some dihedral.

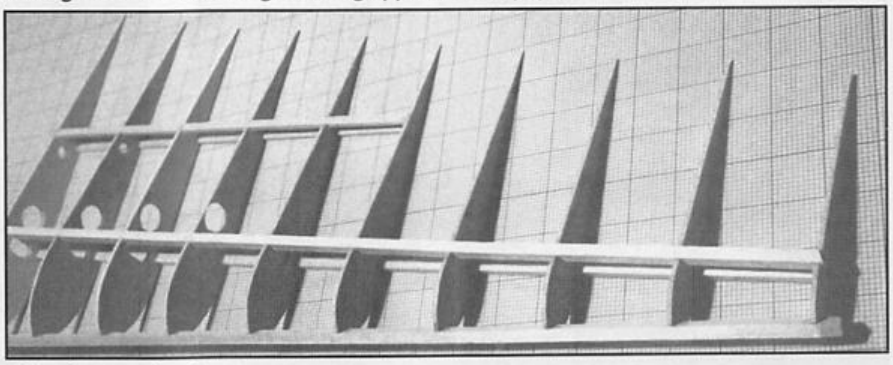
The following text describe the building sequence:

Tail Surfaces:

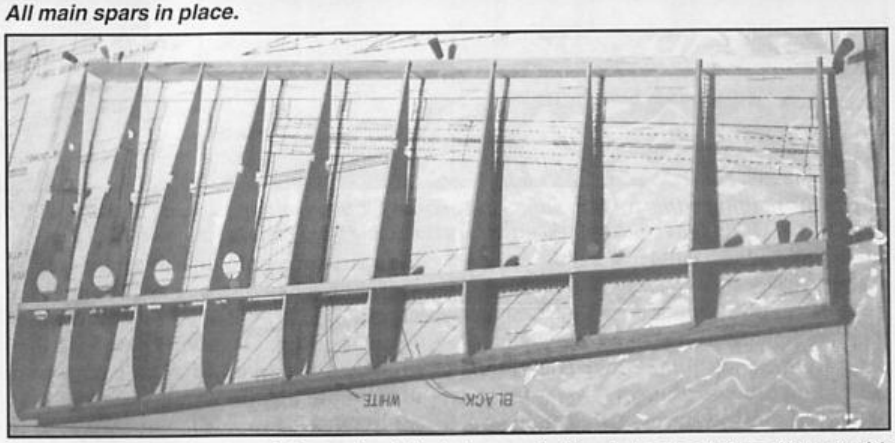
All the surfaces are built from the 1/4" sq. hard balsa and in some areas 1/4" thick balsa sheet. After the tail surfaces are built, sand lightly and round the leading



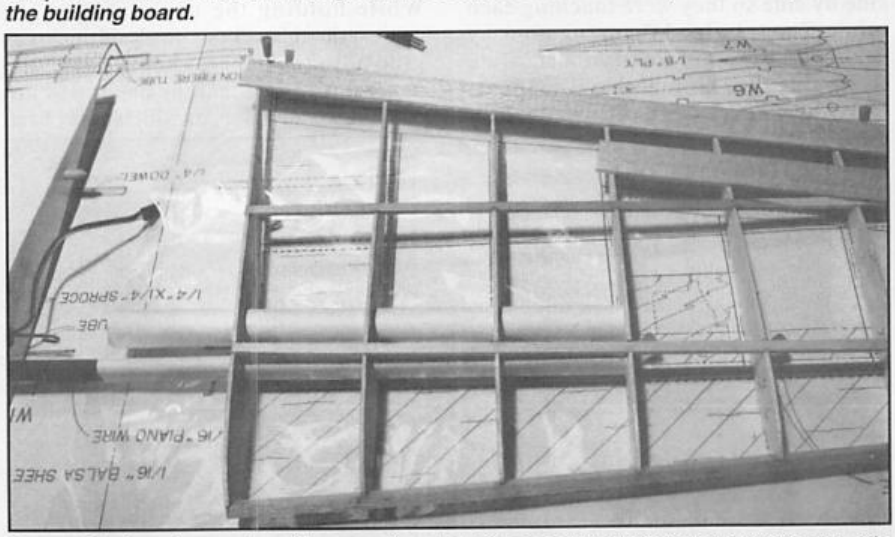
Making paper tubes for the spars. Note the clear plastic wrapped around the spars, protecting them from the CA glue being applied to the paper.



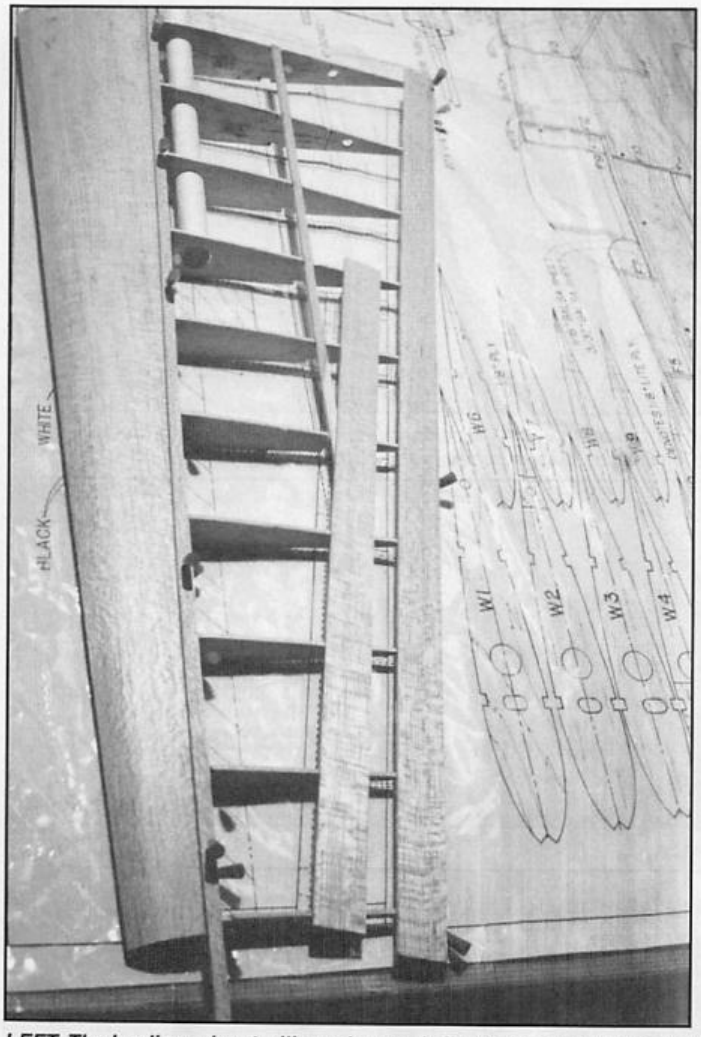
All main spars in place.

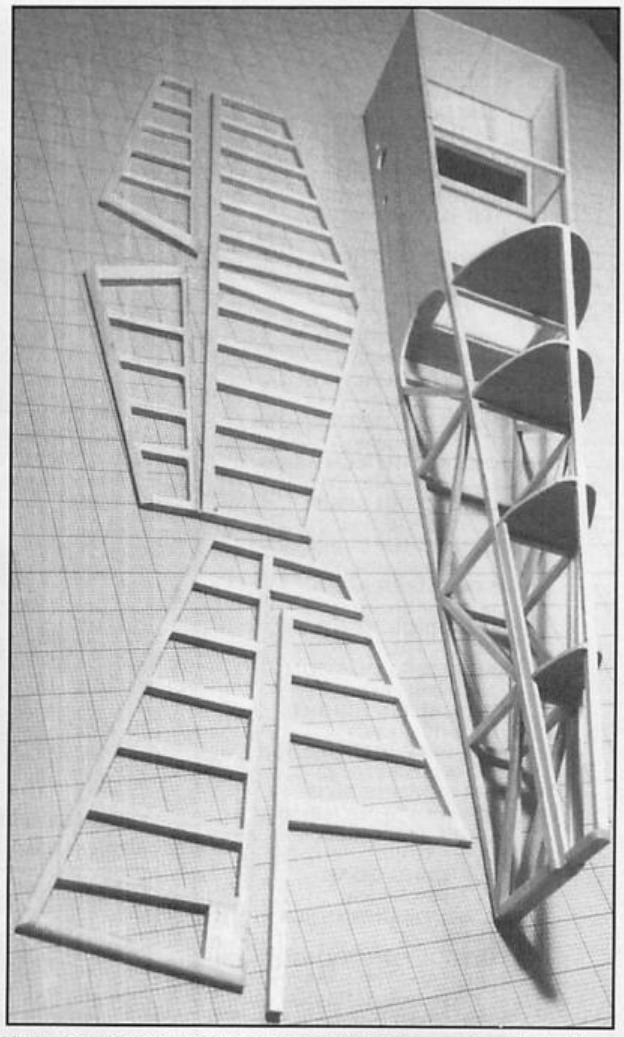


Simple construction used throughout. Note tapered shim to keep all ribs aligned with the building board.



Paper tube housing carbon fiber spar (see text for spar details) is being glued in place in the wing. The wing is shimmed up so that everything is aligned with the building surface prior to gluing the tube in place. The large paper tube is for the aileron servo wires and plug. When completed, rubber bands will be used to pull wing panels together at the fuselage.





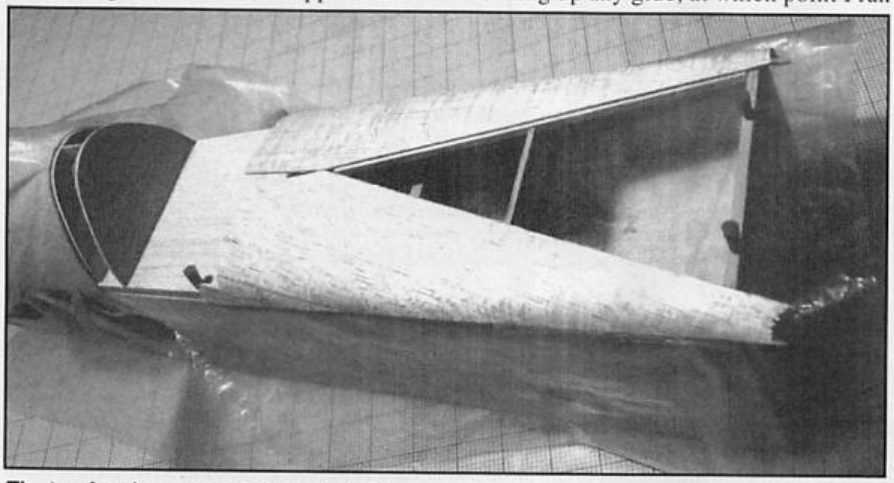
LEFT: The leading edge, trailing edge, and aileron hinge sheeting is glued in place with the tapered shim still in place under the trailing edge. RIGHT: The fuselage and tail structures utilize a very simple framework.

and trailing edges. Put it aside for now.

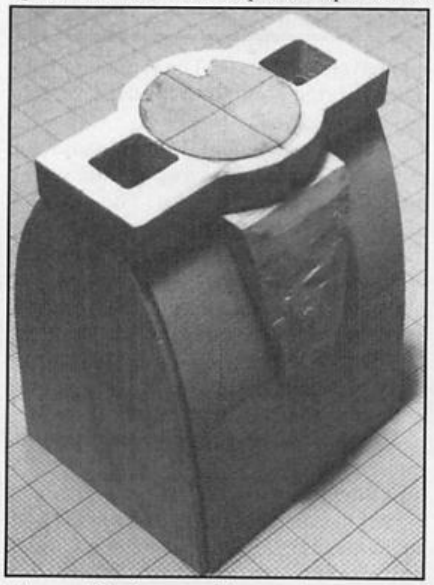
Wing:

Before you start building the wing, do this step first. Since I wanted the model to be as light as possible, I devised a lightweight method of plug-in wings; I took 5/16" o.d. hollow carbon fiber tube and cut two 21" long sections. I placed them side by side so they were touching each other. Then, I glued them together by running a bead of thick cyanoacrylate (CA) glue the full length of the tubes. Once the glue was hard, I flipped it over and ran more glue on the other side as well. I now had a strong spar to hold the wings. To make the outer tube into which this carbon fiber spar will plug in, I then wrapped the carbon fiber tube once with stretchable plastic wrap, such as Saran Wrap. Next, I took the sheet of typing paper and rolled it around the tubes once. While holding the paper sheet tight against the tubes, I ran beads of thick CA glue onto the paper. I kept rolling the paper until I saw that the paper was not soaking up any glue, at which point I ran more glue and kept rolling until I put on approximately five wraps of the paper around the carbon fiber spar. When the glue started to heat up, I pulled the carbon fiber tubes out. The second tube was then made for the other half of the wing.

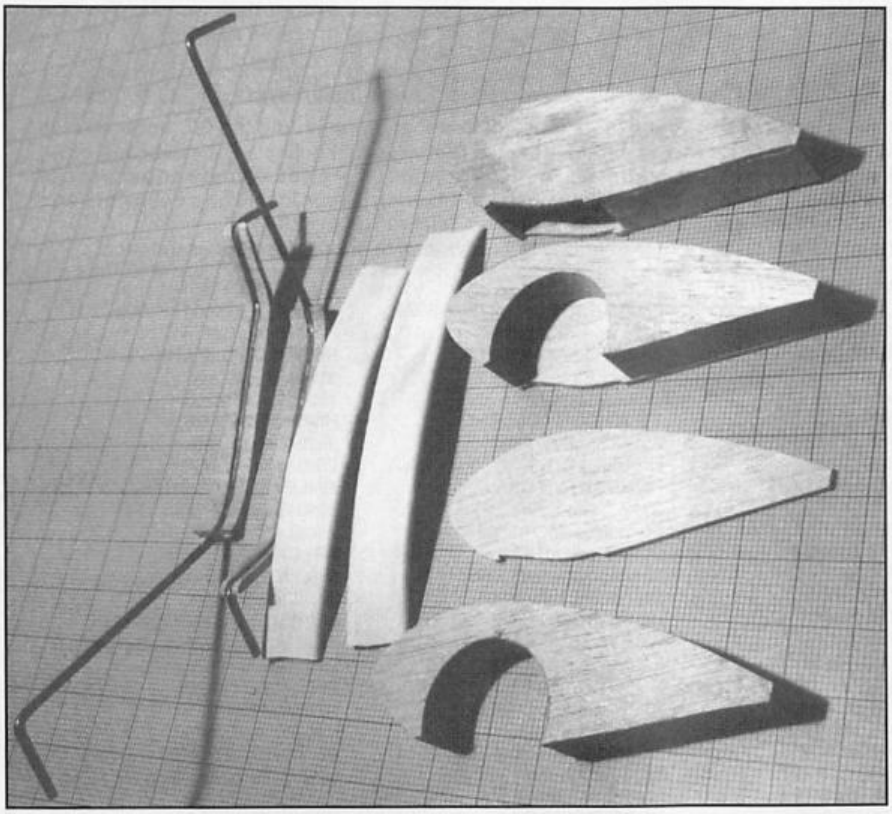
Now you can start building each half of the wing. Each half of the wing is built upside down. Pin the top main spar of the



The top fuselage hatch being sheeted.



The cowl before sanding to shape.



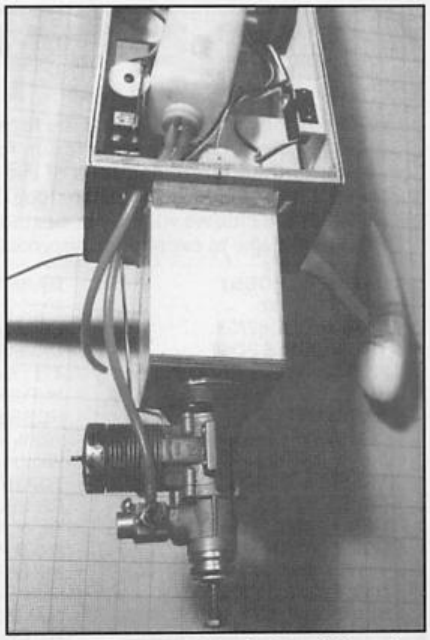
Main gear and wheel pants. Note balsa strips glued to L.G. wire to form the scale legs. The white pieces are heat shrink tubing to go over the legs after the balsa has been glued in place.

wing to the building board and position all the ribs in the right spots on the spar. Insert the bottom spar into the ribs. To build the wing straight, the trailing edge has to be supported. From balsa sheet, cut out the shim (3/8" x 7/8" x 25") to go under the trailing edge of each rib so the centerline of each rib is perpendicular with the building board. Pin this shim to the building board and position all the ribs so the trailing edge of each is resting on it. Glue all the ribs to the spars. Insert and glue rear spar in place. Next, glue on the trailing edge sheeting and the sheeting over the aileron hinge line. Glue 1/4" sq. balsa leading edge to all ribs. This next step is important: Temporarily remove one half of the wing from the building board and insert the paper tubes you made to fit into the W-1 to W-4 ribs in both wing panels. Insert the carbon fiber tube inside it. Slide the half of the wing that was removed onto the tube and pin the spar back to the building board. After you have checked that all is square, glue the paper tube to the ribs. Make the round paper tube and insert into the ribs W-1 to W-4 to get the aileron servo's plug out of the wing and into the fuselage. To the inside of this tube, glue in the wire hook with silicone glue. The hooks should be protruding approximately 1" out of the wing. Glue on the leading edge sheeting and sheet the root of the wing over ribs W-1 and W-2. Glue on all the capstrips.

Build the other half of the wing to the same stage.

Remove the wing halves from the building board. Next, flip the wing over and pin the main spar to the building board. Again, place the shim under the trailing edge. Glue on the trailing and leading edge sheeting on this side. Insert and glue in the 1/4" hardwood dowel into ribs W-1 and W-2. Glue on the remaining sheeting and capstrips on this side.

Remove the wing from the building board again. Draw the lines on the top and bottom sheeting to separate the ailerons from the wing. Proceed by cutting right through the top and bottom sheeting and separate the aileron from the wing. After separation, glue on the aileron's leading edge and close the opening in the wing by gluing in the hinge spar.



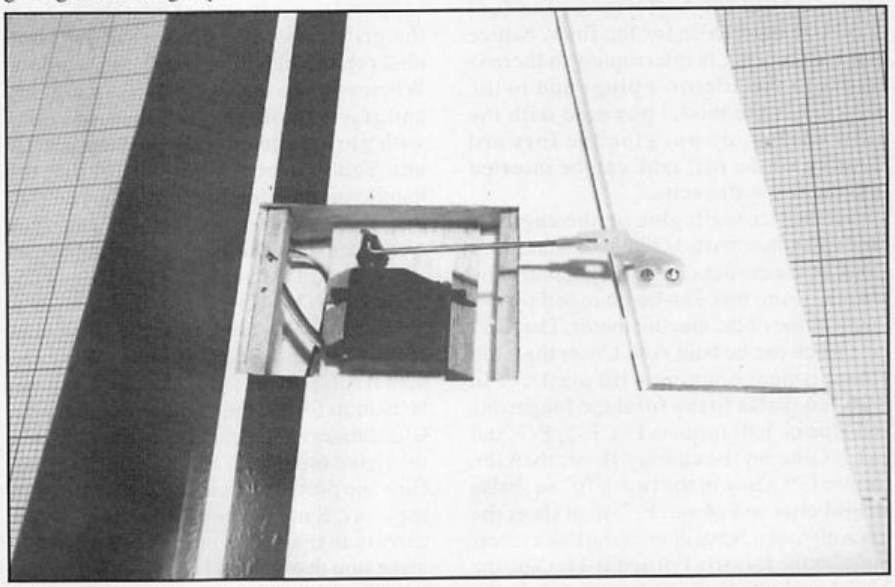
Original location of the fuel tank. Location was later moved to engine mounting box as shown on the plans.

Glue in the mounting plate to hold the aileron servo and make the hatch to cover the servo. Finally, sand the wing halves to your satisfaction.

Fuselage:

To reduce the flying weight for electric power, the fuselage uses lite ply sides up to former F-10. If you are going to fly on glow power, you can go with the plywood all the way to the tail. Pin the plywood sides to the building board and glue the top and bottom longeron to it; then glue the uprights and the diagonal braces in place. Build one right and one left fuselage side. On the inside, glue in the 3/16" sq. balsa to support the fuselage floor.

Pin the fuselage sides upside down to the building board, over the plan. Position formers F-3 and F-10 in their proper spots, making sure that they are square with the building board, then glue them in place. To give the fire wall more



Aileron servo is mounted flat in the wing.

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support, glue triangular stock between the fire wall and the fuselage side. Next, glue in all the cross braces. In the rear, glue in the plywood plate to hold the tail wheel bracket. Glue in the hardwood blocks to hold the main landing gear legs. Glue on all the bottom formers from F-6 to F-16 and stringers. Turn the fuselage right side up and glue on the top formers F-12 to F-17. In the rear, glue on 1/8" balsa sheet stabilizer support. Glue on the top sheeting behind the canopy. Inside the fuselage, glue the flooring in place to hold the batteries or the fuel tank. Use hard balsa for the floor. Notice that the flooring is interrupted so there is access to the aileron's plugs and to the hooks. For the model powered with the glow engine, do not glue the forward flooring so the fuel tank can be inserted into the fire wall cavity.

To the fire wall, glue on the engine's mounting box with 1/2" balsa triangular stock in the corners for extra support. The length of the box can be changed to suit your engine or the electric motor. The fuselage hatch can be built now. Cover the radio compartment opening with plastic. Pin 3/16" sq. balsa to the fuselage longerons and glue on half formers F-4, F-5, F-7, and F-11. Glue on the canopy floor, then the former F-9. Glue in the two 3/16" sq. balsa strips between F-4 and F-7, then sheet the top with balsa. Next, glue on the balsa sheeting over the formers F-9 and F-11. Glue the 1/8" dowel into the F-11 former and, in the front of the hatch, glue the 1/8" plywood support for the holding screw.

To make the canopy, carve the plug from the balsa block and sand it to a smooth finish. Using acetate sheet you can vacuum form it or it can be drawn over the plug. For pulling the canopy over the plug manually, you must mount the plug on the 1" stick and have a partner to help you. Next, pin the sheet approximately 12" x 12" size to the 1/2" square sticks with thumbtacks on two opposite sides. Place the sheet into the oven, and support it so it is approximately 5" from the grill element. Turn on the grill and observe the plastic through the window. When you see that the plastic is sagging and starts smoking, grab the two sticks with gloves and quickly pull the plastic out. Your partner should be holding the handle on the plug firmly while you pull the plastic over the plug. If you want, you can order the canopy, it's available from Easy Build Models, P.O. Box 425, Lockport, NY 14095.

To make the cowl, glue the triangular stock to each balsa side first. Make the partial cuts into the triangular stock so it can be bent to follow the contour of each side. Glue formers F-1 and F-2 between the sides, then glue on the top and bottom sheeting. Glue the nose blocks to the front former of the cowl. Sand the cowl, rounding off the corners to the radius of the nose block. To make sure that the cowl mates with the fuselage, fasten it to the fire wall with four self-tapping screws through F-2 and into the cowl's former from inside of the fuselage, once the whole fuselage hatch is removed. To the outside of the fuselage, glue on the stringer on both sides of the fuselage. Now sand the whole fuselage. In the rear of the fuselage, cut out the slot to accept the stabilizer. Bend the 3/32" piano wire to a "U" shape to make the torque rod to couple the elevator halves. Insert it into the slot, and then insert the stabilizer. Check that it is square with the fuselage, then glue it in place. Glue on the fin as well.

Make the landing gear by bending the 5/32" piano wire to the shape shown on the plans to get the tapered shape of the landing gear legs as shown on the plans. Glue balsa sheet to the front and back of the wire with CA. To get a smooth and fuelproofed finish on the legs, slip white heat shrinkable tubing over the leg assemblies and heat the plastic; the plastic will shrink tight, giving the leg a smooth finish and will remain flexible.

The wheel pants are made out of balsa sheets and are sanded to shape. At this time, you need to provide for the attachment for wheel pants using whatever method you prefer. In my case I went for a simple approach — I covered the wheel pants with MonoKote film, and after that was done, I attached wheel pants to the leg with white silicone glue.

As a last step before covering the complete model, install all the servos and the engine with the muffler to check that all will fit. Depending on the engine and muffler you are going to use, the cowl may have to

have an additional hole cut out, unless you are using a Pitts-style muffler. Install the fuel tank inside the box holding the engine.

Covering And Equipment Installation:

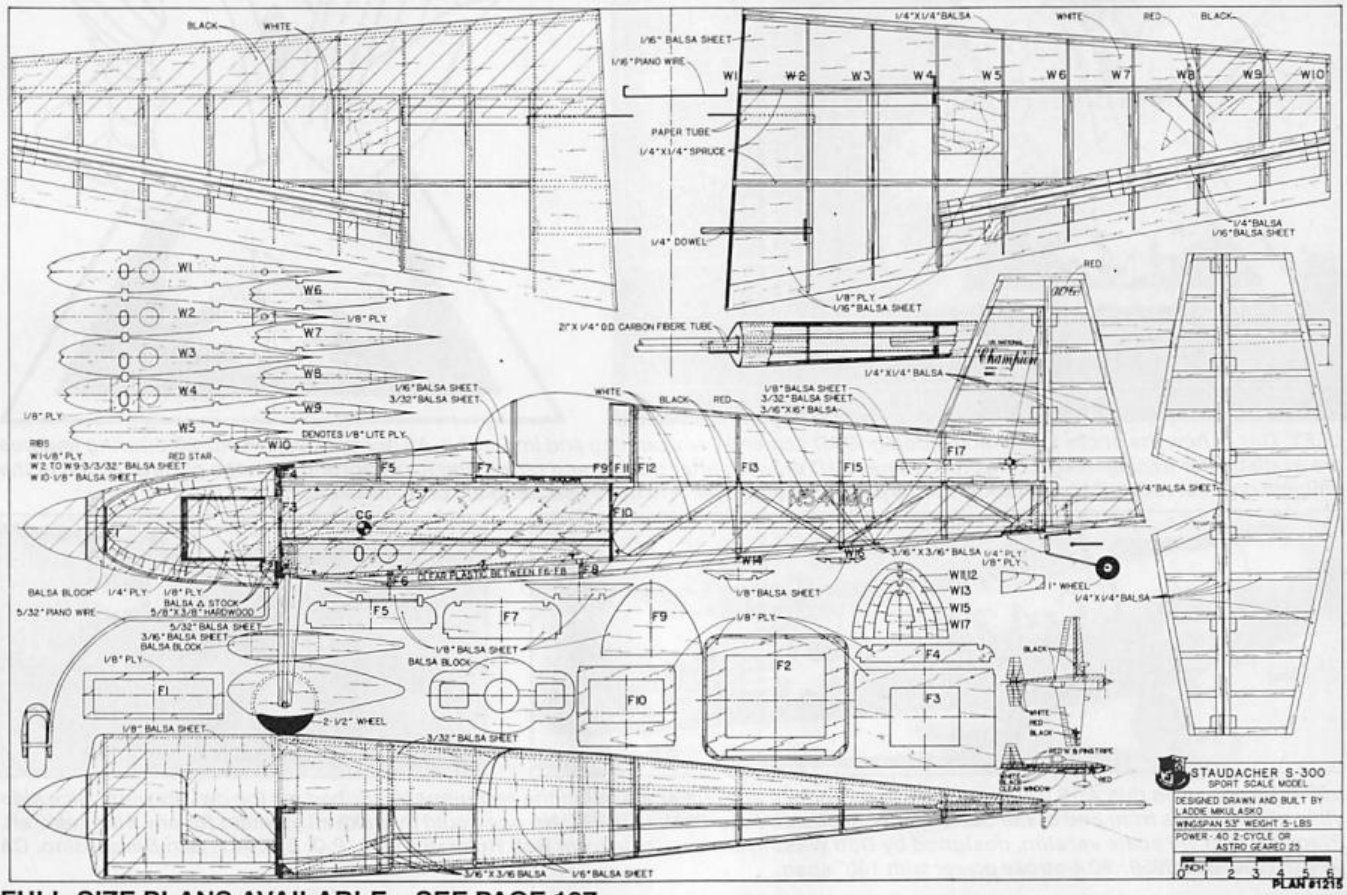
The color scheme on my model is of the plane that won the U.S. Nationals in 1990. I did not have any color photos of the full-size plane when I started building the model, but at the Toledo R/C show I asked Bob Banka, proprietor of Scale Model Research (3114 Yukon Ave., Costa Mesa, CA 92626, 714-979-8058), if he had anything on the Staudacher plane. How naive of me to think that he might not have it in his collection. Bob has over 5,500 Foto-Paaks for different planes, and over 30,000 3-views. Shortly after the show, the package arrived with excellent photos. In that Foto-Paak was photos of the second plane in a different color scheme, which is as attractive as this one.

Cover the model with your favorite material. I used MonoKote on mine. At the bottom of the fuselage, glue on clear plastic between formers F-6 and F-8.

After model is covered, install the hinges on all control surfaces. Install the engine and radio. All the switches for the electric or on-off switches are hidden under the hatch. Since only one screw is holding the hatch on, it is no problem to open it and turn on or off any switch. The individual throws on control surfaces should be as shown on the plan. You can change it to suit your style of flying. The aileron travel should be 1/2" in both directions. Check the C.G. so it is in the location shown on the plan.

The model will do all maneuvers with ease and can perform as well as any of the Extra or CAP planes. The electric powered version flies as well, but for a shorter duration.

I hope you will find this scale model of a USA aerobatic plane as attractive as I did. Good luck and have fun.



FULL-SIZE PLANS AVAILABLE – SEE PAGE 197