

Bill's Bristol was one of the favorite models of the spectators and contestants alike at the '79 Nats. Both photos by John Preston.

# BRISTOL *Flying* LABORATORY

By BILL STROMAN . . . The author is well known for his good-flying models of strange and obscure aircraft of the past. This time it's a flying test stand! Don't be fooled by its appearance, though . . . it's a great flier.

• "Good Grief, what the heck is that?" "Was there really a real airplane like that?" "You sure build the weird ones." These are a few of the statements you will have to endure if you build the Bristol Laboratory. But when you wind it up and watch it fly, it's worth it, for this is really a good model. It's not hard to build or trim, and it sure is a crowd pleaser.

The full-sized plane was built as a flying test stand to check the cooling problems of the Jupiter engines. It had a square plywood fuselage to which one or two round fairings could be attached. One was three feet in diameter, the other five (I chose to make the three foot one . . . less frontal profile). The large wing gap was to avoid any turbulence on the fuselage during the tests. The wide track landing gear was to avoid any ground looping. One good thing about this plane is that it was never registered, therefore, no markings appear on the wing or fuselage. Just to balance that, the one bad thing about it is that there were only two photos ever taken of the plane. Oh well, one can't have everything!!

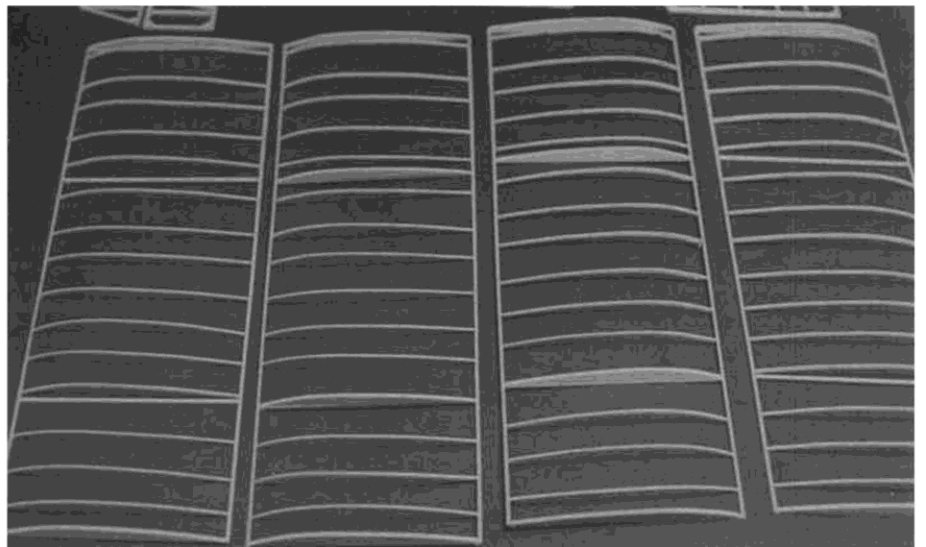
Before we start on the model itself, let's discuss the material we are going to use. I have not indicated on the plans what weight of balsa to use, and this is important. If the model is to be flown indoors, it should have the lightest balsa one can get. Take a small, accurate scale with you to the model shop and weigh each piece until you find the lightest piece. This may get some laughs from the R/C crowd in the place, but it will insure a better flying model. The same goes for the tissue; I used Peck-Polymer

white Japanese tissue on mine and it worked great, so be selective. By the way, if you can't get light balsa, send for the price list from Superior Balsa, they have great stuff.

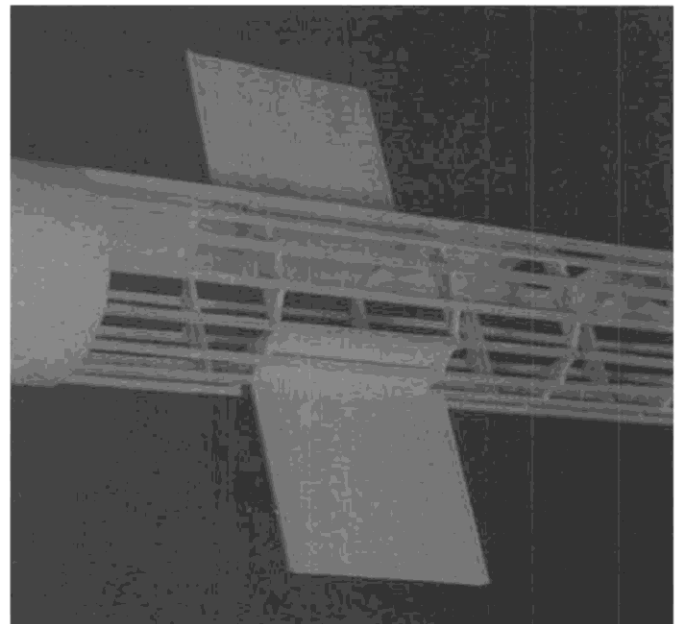
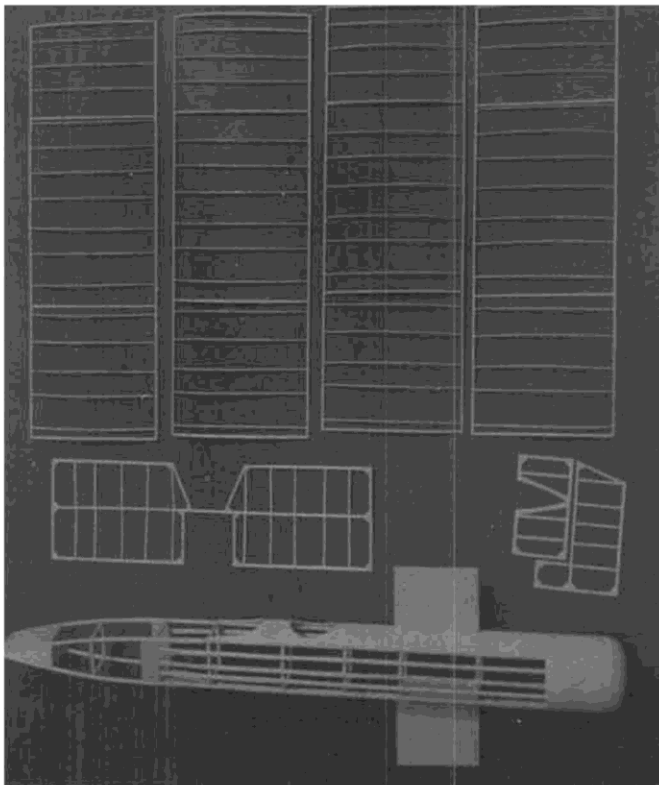
Well now, let's get to building. I like to build the fuselage first, as all the other things must fit onto this. Make the frame on the side view. Be sure to include the post for the rubber peg and the 1/16 sheet insert at the rear. Remove, and make another just like it. Put the two frames over the top view, and put in the cross pieces. While you are doing this, be sure to have the sides square to the table; use a small square or any right-sided object to do this. After this has

dried, glue in the insert at the rear as shown; also put the 1/16 sheet on top and bottom between section "C" and "D."

Cut and fit the formers for the sides, top and bottom. By the way, do you have trouble getting the stringers straight from front to back? Here's a method I picked up from Jack McCracken. Cut the slots out on section "A" only. Then, cut slots in section "F." Now lay a straightedge from "A" to "F" and draw a line at each slot. This will insure a straight stringer when the remaining slots are cut. Install the stringers now, doing one on each side at a time so as not to warp the frame.



The four finished wing panels. Ribs are sliced from 1/32 sheet, is not really as tedious as it might sound at first. Plans show internal spars for more strength and warp resistance.



Wing pylon is 1/16 sheet with basswood strips on both edges. Use the lightest balsa you can get.

The basic components, ready for covering. Note extensive use of corner gussets on tail surfaces.

Make the center pylon for the wing now, using 1/16 square basswood for the front and back and 1/16 sheet balsa for the center. After it has dried, glue it to the 1/16 insert between "C" and "D," making sure it is square. You will have to remove the bottom stringer to insert the bottom pylon; replace this with a 1/16 square stringer on each side to have a place to attach the tissue. This will also have to be done to the top pylon so the 1/32 sheet balsa can be glued in place. Now put the 1/8 balsa fillets in place to brace the pylons.

I made the top decking of 1/32 balsa in three pieces, the first from "A" to "C," the next from "C" to "D," and the last from "D" to "G." As the top is the same radius the length of the plane, it should be easy to glue on. After it has dried, sand the edges smooth, and mark and cut the cockpit holes. The rear one will be about 1/8 inch wide at section "G." Cover the sides and bottom between "A" and "B" with 1/32 sheet and sand smooth. Put the 1/8 balsa insert in the nose. Make the nose block from a piece of balsa, or laminate one from some 1/4-inch balsa, being sure to let it dry before carving it. (Didn't do this once, was just about done carving it when it came apart. Heard reports that people heard me as far away as Catalina!) Cut a 1/8-inch piece to fit firmly in the hole in section "A," glue this to the noseblock, then put it back in when dry and final carve and sand the noseblock to a final fit. I've found that an emery board is handy for this; it's firm and doesn't cost much (I learned this when I used to carve gun stocks. Never know when something from one hobby can help another, can you?). Now give the whole outside three coats of dope, sand between each coat, and sit down and

admire it; that part is done!!

The rudder and elevator are made to be adjustable. This will add a little weight, but is handy when you fly in a smaller room and have to turn tighter or when climb is limited due to a lower ceiling. The hinges are made of small aluminum wire that is inserted between the moving surface and the stabilizing surface, then glued in place. Make the whole works out of light 1/16 square balsa. Don't forget the fillets where

shown on the plans, they will reduce the chance of warping and of the tissue getting wrinkles at the corners. Give the surfaces three coats of dope and set aside.

The wings shown on the drawing are different from my original model. Mine didn't have the spars in the wing. Sure, it was lighter, but developed more warps than a Corsair, hence the spars in the drawing to reduce this problem. Lay

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"I hate to build, but I love to cut out ribs."

down the leading and trailing edges on the plan. Make a rib curve template from cardboard or sheet aluminum. Get a piece of light 1/32 balsa sheet, and lay the template at the top edge of the sheet. Follow the template with a sharp knife on the balsa, and remove the piece. Now, lower the template 1/16 inch and make another cut. How about that, you made your first rib!! Do this 68 more times and all the ribs are done . . . doesn't take as long as it sounds. Pin down the forward spar on the plan, then glue each rib to the leading edge, the spar, and the trailing edge. Both the top and bottom wings are the same, so when one is done, remove it and make the other one. Turn the wing upside down on the plan and add the rear spar, and add the bottom of the ribs also. You guessed it, give it three coats of dope and set aside.

Make the landing struts by first bending some 1/32 wire as shown, and let the wire project a little into the wing to serve as a firm attachment. Then make the strut from 1/32 x 1/8 balsa, make a groove in this for the wire (a pencil can be used for this), and glue a second sheet of 1/32 x 1/8 balsa to cover the wire. Make two of these, as the plane won't R.O.G. with one wing dragging on the floor. Speaking of landing gear, make the tailskid from 1/32 round bamboo. Where does one buy 1/32 bamboo? Buy some bamboo skewers in a market and split them down to size, or do the same with bamboo chopsticks. Bend the end by holding it over a soldering iron until its flexible, bend to the curve and remove from the heat. It will keep the curve from now on.

I made my 1/8 x 1-1/2 wheels on a small lathe, but one can chuck them in a 1/4-inch drill, or hand carve them to shape. Paint a black tire on them (if you are using gloss black dope, put a pinch of cornstarch in a capful of dope . . . makes a flat velvet finish like rubber). Put a 1/16 aluminum tube in the center for the axle, and you are done.

Now that all the structure is built, let's cover it. The fuselage is the most time consuming, so do it first. Cut a piece that will cover the back flat part of the bottom, from section "G" to the back. Put dope on the frame, lay the tissue on it, pull out all the wrinkles, and dope over all the frame areas on top of the tissue. Trim off the excess on the sides with a new razor blade. Now do each side and the top in the same way from section "G" aft. Cut a piece of tissue slightly wider than the width of the stringers, and starting from the bottom-most stringer, dope on the tissue. This strip should cover from section "B" to section "G." Trim off both sides of the first strip, and working up from both sides, cover the bottom and the sides. Now use one sheet to cover the sides and bottom from "A" to "B." Cover the top from "D" to "G" in one piece, then use two pieces on each side of the pylon at "C" and "D," then one piece from

"A" to "C." Cover both sides of the pylon now, top and bottom, and the fuselage is done.

The tail is next. Cover the bottom of the elevator first, trim to the edges, then cover the top and lap over about 1/16 tissue to the bottom. I find it best to cut a slit about every 1/8 inch around the edges before I fold the tissue over; this seems to keep the stuff from wrinkling. Do the rudder in the same manner.

Cover the bottom of the wings first, then the top. Lap over the same as the tail section.

The best way I have found to shrink the tissue is to spray a mist over the work and let a fine mist fall on the tissue. If it is done in this way, all the large drops will go beyond the work and not make a puddle on the tissue that may produce a wrinkle later. Wet all the surfaces and let dry, then pin the wings and tail down for 24 hours. While this is pinned, give the fuselage two coats of 50-50 dope and thinner mixture. Dope the wings and tail the same way and pin down for another 24 hours. No sense sitting around all that time with nothing to do, so let's make the cylinders now. Get or carve a piece of 1/2-inch diameter balsa about seven inches long. Smear some glue on this and wrap some black thread around it, as one would wrap a fishing pole. When this is dry, cut it into 1/2-inch sections and glue around the fuselage as shown. Paint the tops with black paint. Now take a pin, cut off the head, and bend with pliers as shown in the drawing to form the pushrods, paint black and stick two in the top of each cylinder. Now would be a good time to form the landing gear wire also; just bend as shown in the front view. Make the interplane struts from 1/16 x 1/8 balsa, measuring from the side view (they will be the length from the bottom of the top wing to the top of the bottom wing at the rib section). Put a cut-off pin at each end of the struts to form a good attachment point to the wings.

Take the pins off the wings and tail, and check for warps. If any are found, remove by placing over steam or dry heat (a very low flame on the stove) and bending the warp out, then holding the piece, remove from the heat and check again.

Mark the ailerons on the bottom wing only with a strip of black tissue, a fine black marking pen, or black India ink in a drafting pen. Place the bottom wings on the pylon and shim the tip up as shown in the drawing, then glue in place. Put a 1/16 shim in the front and rear of the pylon to fill the gap, let dry, and then do the same with the top wing. Next, put the interplane struts in, checking that you don't warp the wings doing it (sometimes the struts need some cutting to fit properly).

The tail can be put on next. Make sure that the rudder is on straight and is square with the fuselage. The same goes for the elevator. There is a dashed line on the side view to show where the elevator is located.

Rig the wings next. Gray thread looks better than black to me, but suit yourself. Start at the pylon, and bring a thread down to the first interplane strut, loop around the pin, and continue to the next strut. Check that you haven't bent the wing, and glue the thread in. Bring a thread from the bottom of the pylon to the top of the first interplane strut, then down the bottom of the other strut, check and glue. Make an "X" at each interplane strut from back to front; check from the end of the wing and from the back to see if the wings have the amount of washout as called for in the drawing; if they do, glue in place. Now, rig the rear interplane struts the same way, checking for warps before gluing in.

The landing gear struts can now be glued to the wing. Make sure they are straight. After these are dry, put the triangular wire on the bottom of the pylon; be sure this is glued in well. Lay the axle on this wire, center it and bind with thread and glue. Bind the axle to the landing gear struts with elastic thread (can be found in dime stores, or remove from an old pair of socks), glue to the landing gear strut but *not* to the axle . . . this will help absorb landing shock. Glue the tailskid to the right side of the rudder (really, the real one is that way!).

Remove the nose block and drill a hole (note the angle shown in the drawing) to receive the 1/16 inside diameter tubing. Glue the tubing in place. Bend a piece of 1/16 wire to form the shaft, place a small washer on it, then the prop, and bend it at right angle to form the freewheeler.

Install the rubber, wind it about 50 turns, and glide it across some tall grass. If it stalls, add some clay to the nose until it glides smooth. Increase the winds and trim for a left circle of about 50 feet. Good flying!!