a peanut scale

Staggerwing

The Beech Staggerwing has always been a favorite of mine. With its big radial engine and negative stagger wings, it has a macho appearance unmatched in more modern planes. Surprisingly, it also has good proportions for a peanut. At first glance the wings look too small, but since there are two of them, there's more area than you think.

Beech introduced the Staggerwing design in 1934 with fixed gear and a 700 hp. engine. It evolved to its more familiar form with retractable gear and more economical engines. By the late 1930's its performance rivalled that of pursuit planes then in use. During the war, all three services used the Staggerwing Beech as an instrument trainer and personnel transport. By 1948, the design was obsolete and Beech replaced it with the "V" tail Bonanza.

The model presented in this article is the last version model G-17; only 20 were sold. It is the cleanest and sleakest of the Staggerwings. Building the model with gear retracted, as I did, simplifies construction and saves the weight of landing gear. However, the wing structure is strong enough to support the gear so the drawings also show the gear-down alternative. If you build the gear up version, omit the tail wheel also, as it retracted on the prototype. Either way you build it, there are opportunities for more scale detail. For example, add door outlines if the gear is retracted, or include doors and gear detail if the gear is down.

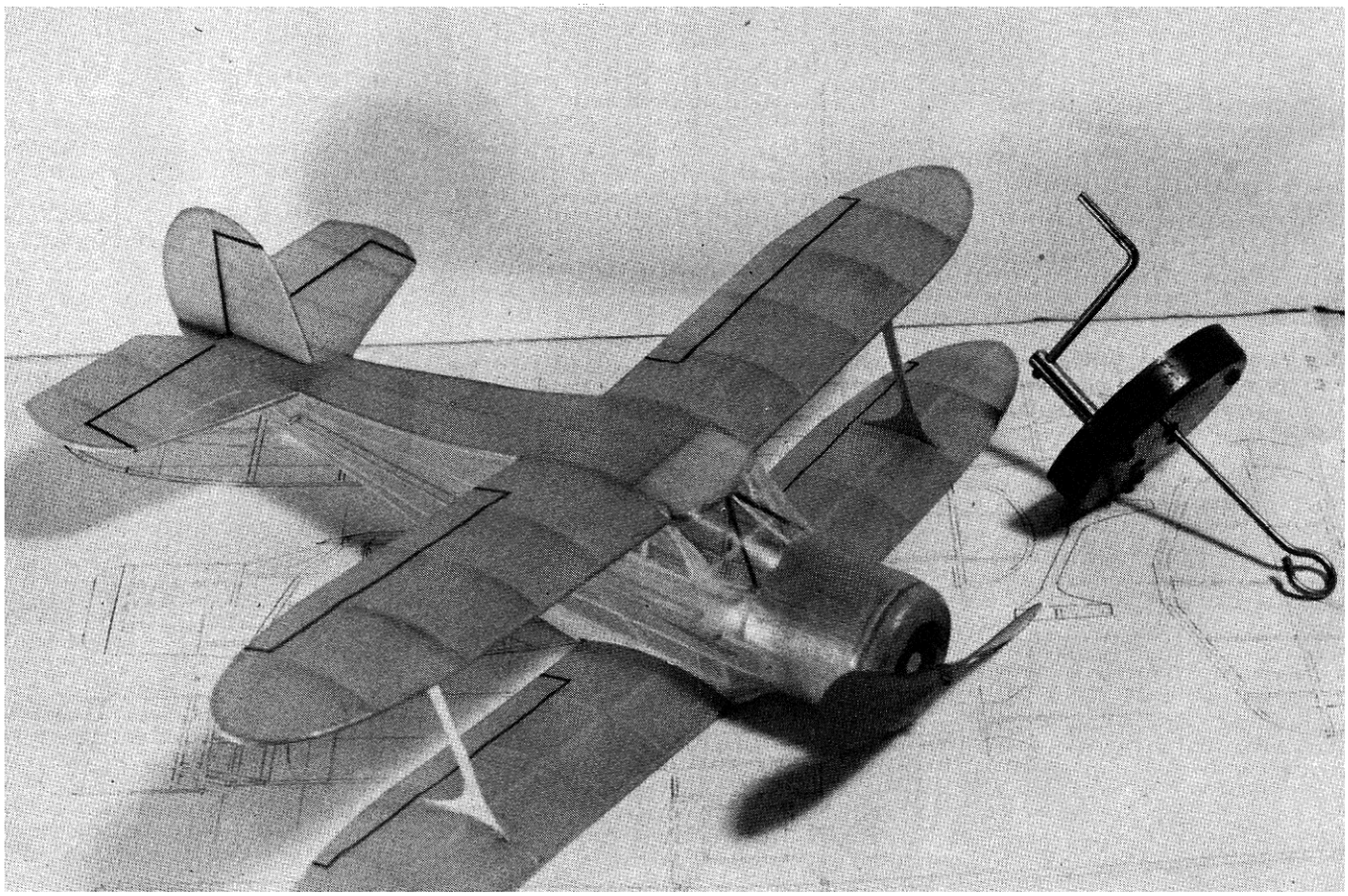
Most biplane models come out tail-heavy. The risk is possibly greater on this model because the fuselage is wide enough at the rear to extend the motor farther aft than in most peanuts. There is a great temptation to extend it all the way to the rear of the fuselage frame. While that will give you one of the longest motors of any peanut, it will create balance problems.

Every model has deviations from scale, some deliberate, some not. In this case, the fuselage is simplified by reducing the number of stringers to a manageable few. The stabilizer is enlarged somewhat, and the dihedral is increased slightly. The wing rib spacing is not scale but intended to make use of the sliced ribs, single spar and struts to eliminate warps and keep weight down.

The photos show a simple trim scheme common to many of the Beech Staggerwings. For maximum points a particular example should be modeled. The original source I used for this model was The Best of Wylam, Book I. The same source also shows features of other models of the Staggerwing and a specific marking example.

Construction

The key to strong, light construction is to make sure the parts fit well before gluing. I use all kinds of glues. Each has its own purpose, but none of them can make up for a bad



fit. The foam used in place of balsa blocks requires special handling to avoid melting by the solvents in conventional glues and dope. It is glued with white, water based glue and filled with a coat of white glue mixed with an equal volume of water.

Wings

The first step in building the wings is to laminate four wingtips using two strips of 1/32" x 1/16" balsa for each tip. Cut a form the size and shape of the inside outline of the tip from either 1/16" basswood or photo mounting board. Coat the edges of the form with candle wax or crayon to make it easy to remove the completed tips. Soak the strips in hot water for 20 to 30 minutes (or longer if necessary to soften the wood). Remove excess water from one strip and coat one side of it with white glue. Place it, glue side out, on the edge of the form. Add the second strip to it, sandwiching the glue between the two strips. Tape the end of the strips down to the form and slowly start working around the form, pressing the strip/glue sandwich to the form. Press the strips against the form with the index finger of one hand while keeping tension on the strips with the other hand. As you progress, stop frequently to tape the strips to the form. When finished, allow to dry overnight, or dry in a low oven with the door open. Be prepared to scrap one or two pieces until you get the hang of it. Each time I make a new model, I have to learn this technique over again. If you make a second form, you can speed things up. I also form the rudder outline and the stabilizer tips at this time using the same technique. When the tips are dry, frame up the wing outline and add the 1/16" square strips that form the lower part of the strip ribs. If you are weight conscious, 1/32" x 1/16" strips can be used. However it will still be necessary to use 1/16" for the root ribs and strips to provide a firm glue joint where the wings join the fuselage.

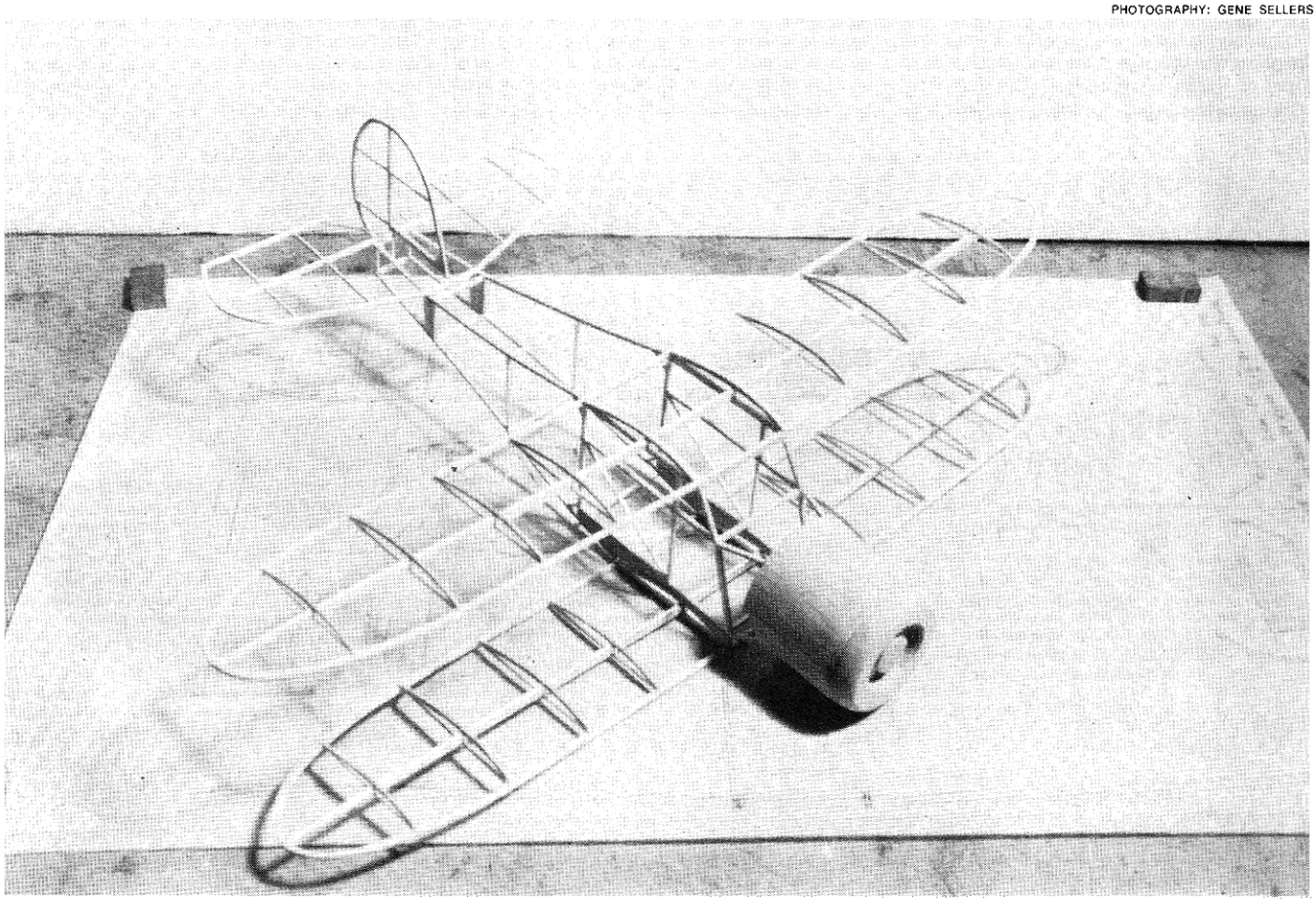
The use of strip ribs can be somewhat tricky. They are made by cutting them from a piece of 1/16" or 1/32" balsa using a template the shape of the airfoil cut from thin aluminum or basswood. Start with a piece of balsa with the grain running chord-wise and cut to the width of the wing. Lay the template on the wood, and make the first cut at one end. Move the template 1/16" and make the second cut to form the first rib. Continue until you have all the ribs you need. When installing, use the sandpaper to trim them to a perfect fit. For the straight portion of the wing, trim from the trailing edge of the rib. At the tips, trim both ends to maintain the airfoil shape.

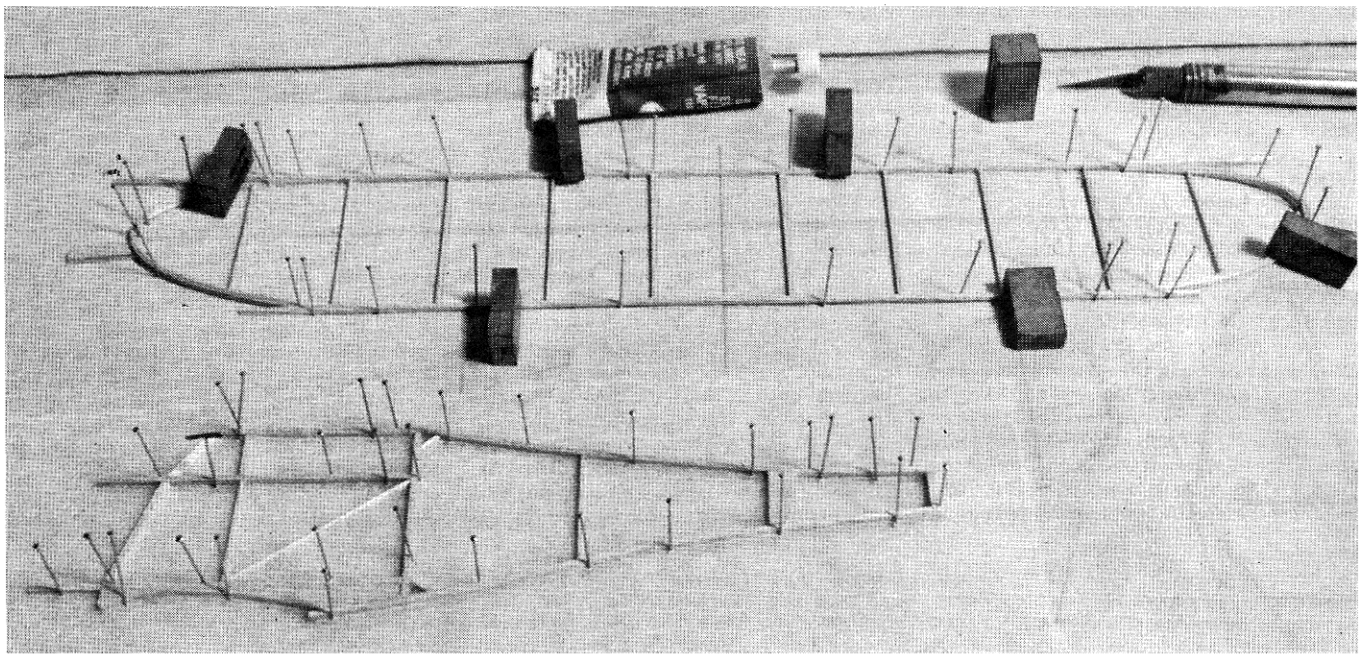
The main spar is cut from a single piece of 1/16" balsa to provide strength and to simplify construction. Glue it down to one side and fit the ribs in place over it on that side. Then crack the leading and trailing edges at the dihedral joints. Lift the completed wing, and

Beech

This peanut scale airplane with full-size plans right here in FM is of a famous private airplane of the 1930's that could outrun some pursuit planes of the time/**Gene Sellers**

PHOTOGRAPHY: GENE SELLERS





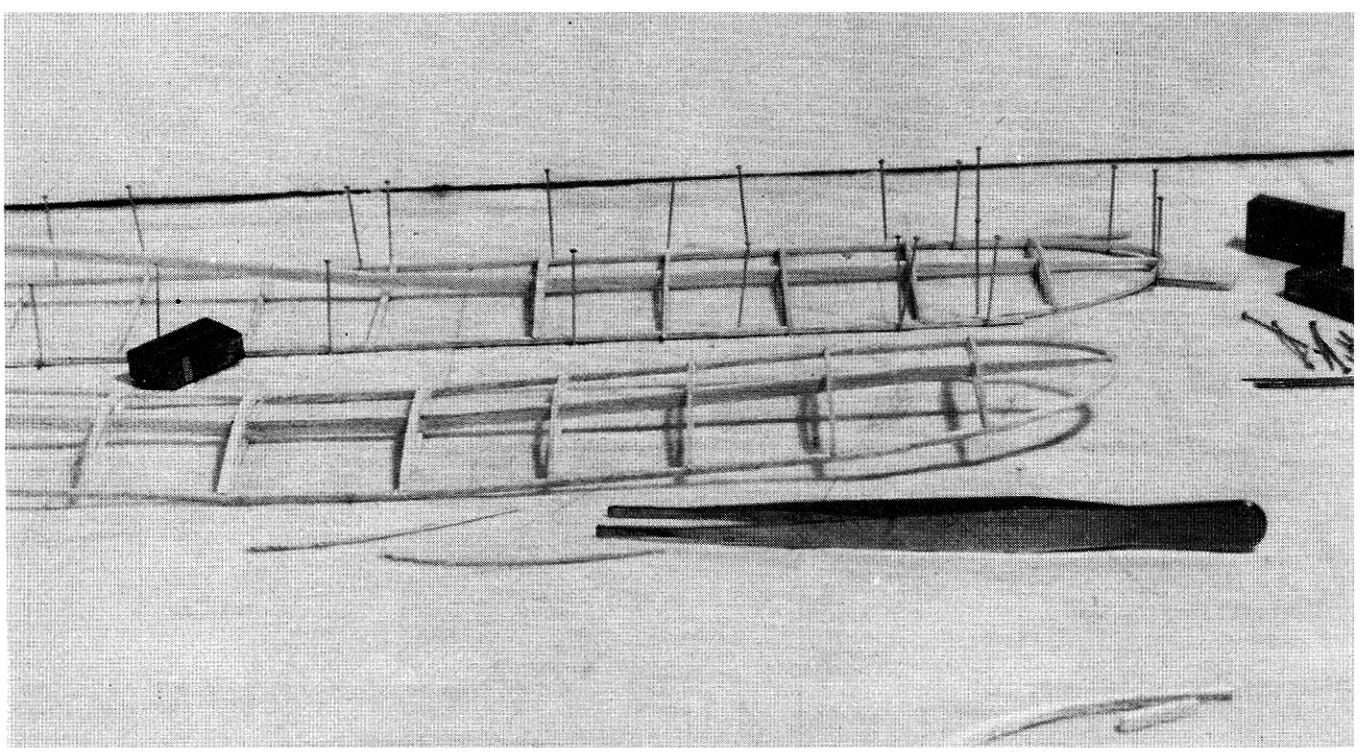
block it up to the correct dihedral. The spar should now rest on the strips of the other wing ready for gluing. Glue it now and install the ribs to complete the wing. If the landing gear will be built in, add the 1/16" square support and beef up that area by double gluing.

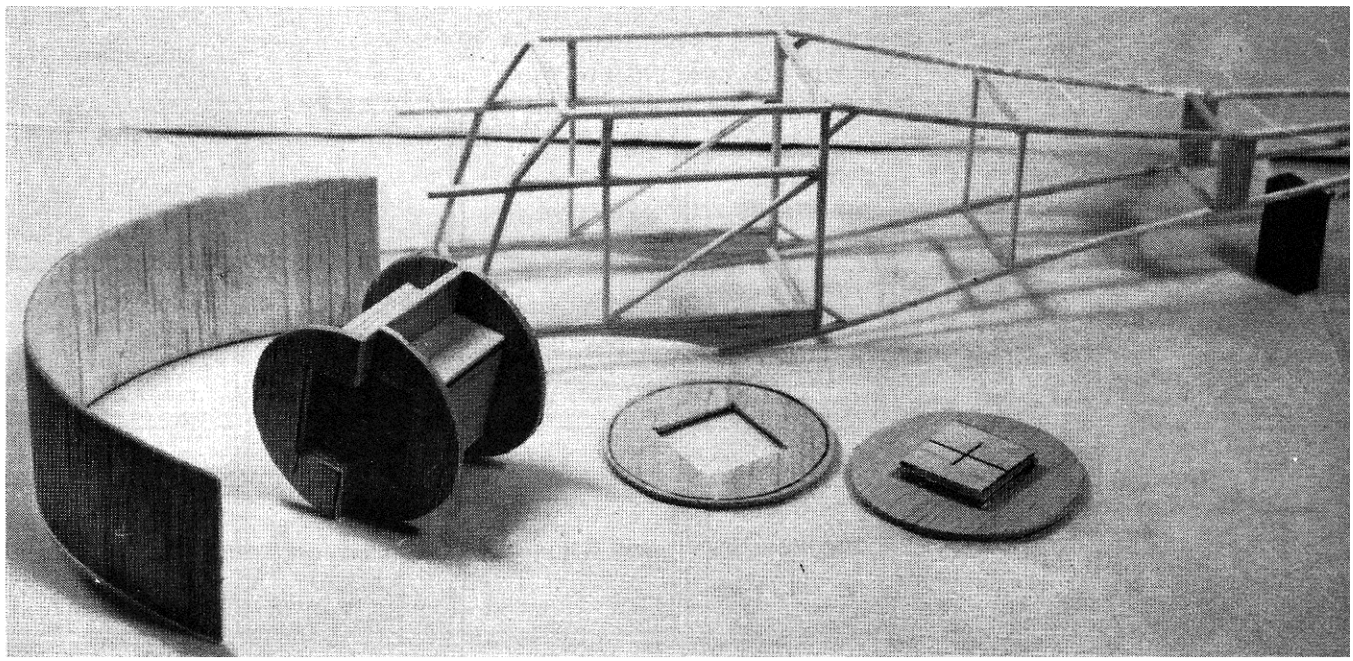
Fuselage

At this point the instructions always say, "The fuselage sides are built in the conventional way, one atop the other." After struggling years to build identical sides individually, I gave up and follow that advice religiously. Here's how it works. First cover the plans or a tracing of the plans with waxed paper or Saran Wrap to keep the glue from sticking to the paper. Frame up the first side using pins along the sides of the longerons to hold them in place. In curved areas, place a piece of scrap balsa or photo mounting board between the pins and the balsa to avoid damage. I also use small lead slugs given to me by a printer to hold pieces flat. Pin down the longerons first, then add the vertical and diagonal cross pieces. In fitting the crosspieces, cut them a little over size and trim them to fit by sanding lightly. Shape the ends to the exact angle required for a perfect fit. Apply glue to the ends and press in place. I use a fast drying conventional glue for this purpose. Cyanoacrylates can also be used but they soak into the wood so fast that they frequently require reglueing. Relieve any strains in the wood at curved areas by putting a drop of water on them and allowing to dry overnight.

Now, to build the second side over the first, remove the pins and place a new piece of waxed paper or Saran Wrap over the completed side. Fit the strips and pieces of the second side over the first and glue as before. Again moisten the curved sections and let dry. Don't let the delays get you down; there's plenty to be done.

The cowl is a cylindrical balsa structure that is built separately from the frame and the two are joined later. The cylinder is assembled around a box-like inner structure that acts as a jig to align the circular formers. The photos illustrate how the structure fits together. The top half of the rear former is located about ¼-inch aft of the bottom half. The skin is a piece of 1/32" sheet. The grain





runs across the piece, and it is cut a little longer than required. Dope one side and, when the dope dries, soak it in hot water for 15 to 20 minutes. As the wood takes up water and swells, it will begin to curl. The curled piece will be easy to fit to the formers and cut to length. Use a slower drying cement to apply the skin. Use masking tape to hold while the glue dries. Sand the edges to remove the excess and give a perfect fit. Mark the location of the stub ends of the fuselage longerons on the rear of former F-2. See the photo of the fuselage-cowl joint for details.

On my model, the skin shrank when it dried and made the cowl swaybacked between the two formers. There are two ways to fix this. Add supports top and bottom to keep the skin straight, or let the skin dry and shrink while taped over the formers. Then glue the preshrunk skin in place.

Assemble the fuselage frame over the top view on the plans. Again use the cut and fit method to accurately join the sides. The only flat, straight part of the fuselage sides is where the top wing attaches, so the fuselage is assembled upside-down. Use a triangle or jig to keep the sides vertical while the crosspieces are glued in place. First join the front part of the fuselage, where the sides are parallel. Then crack the longerons where indicated and pull the sides in at the rear. When the crosspieces are in place, rub glue into the cracks made when the sides were "bent".

Now join the cowl and fuselage frame. Stand the cowl up on the front former (F-1), and position the frame vertically above it. Nothing matches! Crack the stub ends of the longerons and carefully bend them in to the locations marked on the former. Put a little baking soda on the joint, and add a drop of cyanoacrylate. The cyanoacrylate acts fast, so it isn't necessary to construct elaborate jigs in order to align the cowl correctly. Again rub cement into the cracks and the fuselage structure is complete. Add the side stringers but wait until the wings and tail are on to add the top and bottom stringers.

Tail surfaces

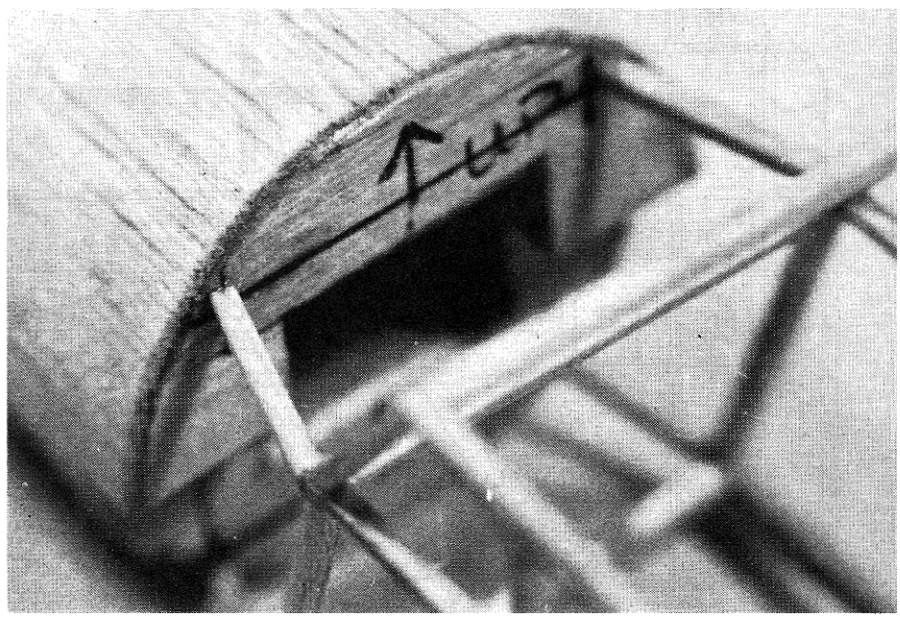
If you haven't already done so, make the forms and laminate the outlines of the rudder and stabilizer. Frame the structure with 1/16" square and 1/32" x 1/16" as shown. Choose light wood to keep the weight down.

Assembly

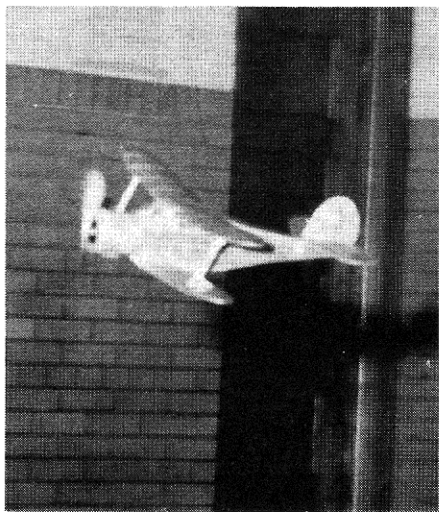
Cover the wings and tail surfaces before assembly, using Japanese tissue. Leave the center section of the wings uncovered until the stringers can be installed on top and bottom. Carefully align the tail surfaces, and glue them to the fuselage frames. If you've been careful, there should be no problem with alignment. If it's off, shim to bring everything into line before gluing. Block the fuselage and top wing into perfect alignment on the bench and glue. The fuselage sides should mate exactly with the center ribs to give a good solid joint. Add the cabin roof which consists of a 1/32" base and a piece of foam. Shape the foam to fit with light sanding and seal it with white glue diluted 1:1 with water. Add the three top stringers from the cabin roof to the tail. The center stringer is supported above the frame with scaps of 1/32 balsa. The two side stringers extend over the stabilizer to give shape to the fuselage.

Form the tail cone of the fuselage from two pieces of foam. Cut the pieces to the outline of the lower edge of the rudder and shape to a smooth contour. Glue and seal with white glue. Add the cabin struts and glue the windshield in place. A template of the windshield is shown on the plans.

Peanuts need pilots. I use comic strip characters cut from the daily newspaper and glued to the inside of the window. Andy Capp



This close-up shows how the longerons are cracked and bent in to the marked positions on former F-2. The second fuse side is built over the first as shown here (**opposite page top**). Also shown is basic wing frame ready for spar. Wing construction details (**opposite page bottom**). Notice how the spar is raised above the unfinished side of the wing in back. Strip ribs and building tools also shown here. This shot of the cowl parts and fuse frame shows how sub-assemblies are built (**top**).



These two photos show the Staggerwing in its natural environment doing what it does best . . . flying. The finished model less rubber motor and balancing clay weighs less than 12 grams (**bottom**).

flies my Beech. General Halftrack, Beetle Bailey and Hi, of Hi and Lois, pilot some of my other Peanuts.

Cover the fuselage sides and cowl before adding the bottom wing. This gives enough room to do a good job of covering without interference. Apply the tissue to the foam pieces with white glue to keep the dope from disolving the foam.

Now fit the bottom wing into the cradle on the bottom of the fuselage. Align by shimming and sanding before gluing. The bottom stringers are now installed. Leave the last bay open for access to the rubber motor. Add the pieces between the cowl and the leading edge of the bottom wing. Now cover the rest of the fuselage and the centers of the wings.

Make the nose piece of 1/16 and 1/4-inch balsa as shown on the plans. Add a commercial prop bearing with a small bead or washers to allow the prop to clear the radial nose block. If you build the gear-up version, use a 5-inch plastic prop to avoid having it broken on landing. The outer ring of the nose block is covered with wet tissue to match the cowl.

The last parts installed are the interplane struts. Slit the covering and slip the struts over the spar against the rib. Push the covering flush against the strut and dope in place.

Shrink the covering lightly by spraying it with rubbing alcohol. Give the model one coat of thin dope to seal it. My model was covered with orange tissue. Trim strips were cut from red tissue and doped in place. Control outlines are 1/32-inch strips of black tissue. A single "X" of 3 lb. monofilament is stretched between the fuselage and the struts to represent the flying wires on the original. Refer to the Wylam plans.

Flying

My model showed from the very first that it wanted to fly. Trimming was straightforward. The first session was outdoors at dusk with very little wind. A low power flight with a few hand winds indicated the need for clay in the nose. After that was taken care of, a power stall was found. Down thrust was added, but it was then too late to continue. The next session was indoors in a very small gymnasium. The turn had to be tightened to keep from hitting the walls. This model has a natural left turn tendency, so I decided to fly it to the left. The plane began to show some of its potential now, but this session was too short to get everything sorted out. After repairing some damage due to brushing a basketball net and spinning in, I took it to the next club meeting. Using a 15-inch loop of 3/32" rubber, flights of 20 to 25 seconds are made with about 2/3 the maximum turns. With a higher ceiling and a longer motor it should be capable of much more.

My model weighs 16 grams ready to fly, with a 15 inch loop of 3/32" rubber and clay to balance. The bare airframe, less rubber and clay, weighs just under 12 grams. There are plenty of places to save weight compared to my model. My balsa was not carefully selected for indoor work. It is generally over-built from a size standpoint. Smaller wood could be substituted in many places. With careful choice of wood and minimum use of dope the airframe could come in at 10 grams. A flying weight of 12 grams might be possible.

Overall, I'm very pleased with the performance of my Staggerwing. I hope yours is even better.