#916

Piper Malibu Mirage

The Malibu Mirage has perfect proportions for a rubber-powered model. The spinner is decorative; it is removed for flight.

■ Mark Fineman

Private aircraft is ideal Giant Scale Rubber project

Large rubber-powered Scale models are spectacular. They float and soar majestically, thrilling the spectators below who involuntarily let slip the occasional "oooh" or "aaah."

The officers of the Flying Aces Club (actually, everyone is an officer; it's a club rule) understand these subtleties, and have created competition classes for these mammoth models: Jumbo Scale, for monoplanes of at least 36 inches in span, and Giant Scale—for the ultimate sky titans that must span at least 42 inches.

Remember that these are *rubber-powered* Scale models.

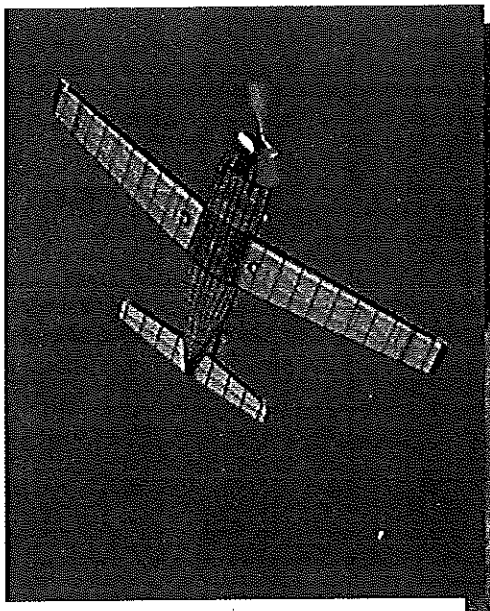
I selected Piper's graceful Malibu Mirage for my first Giant Scale subject because it has so much going for it. It combines good nose and tail moments with a high aspect-ratio wing, reasonable dihedral, and relatively simple structure.

The full-scale Malibu Mirage is a sleek and luxurious low-wing monoplane that combines a well-appointed pressurized cabin with a powerful engine within a highly streamlined airframe optimized for high-altitude performance.

The first Malibu Mirage was rolled out in 1984, and production continues to this day. A turboprop variant, the Meridian, was recently certificated.

Because the Malibu Mirage has been around for so long, there are many color schemes that have been documented in magazine articles and on Internet sites.

Photos courtesy the author Graphic Design by Jill Ann Cavanaugh



This is a stable and capable competition model. It features scalelike flight profile.

Oddly, though, it was difficult to obtain a good three-view for my project. The three-view that was the basis for this article was one I created from several sources.

Only the wing of this model departs from conventional construction techniques. Otherwise, the model's design will be familiar to anyone who has ever built a Comet Scale model using the ubiquitous "half-former" technique.

Let's take a closer look at the construction, step-by-step.

CONSTRUCTION

Wing Assembly: At the heart of the wing is a truss-type spar assembly that was popularized by Dave Rees. Many of us call this style a "Rees Wing."

Each wing panel is built in two stages. The truss assembly is built directly over the plan and allowed to dry. This assembly consists of two taped spars connected by appropriately tapered diagonal crossmembers. Once dry, the truss assembly is removed from the plan and set aside.

Ribs are the sliced type. An individual rib is made from a lower 1/16 square strip topped by a curved airfoil component. The tops are made in production-line fashion with a thin plywood template cut to the rib shape.

Select a length of 1/16 sheet that is slightly longer than the rib template. Make sure the grain runs in the direction of the chord, left and right. Use a sharp knife or razor to successively slice the ribs, moving the template down in 3/32-inch increments as you go.

Once the 1/16 square rib bottoms are pinned over the plan, glue the truss assembly in place, followed by the leading and trailing edges, and topped with sliced rib uppers, in that order.

As the wing tapers, cut off the rib tops from the rear to make them fit. Add the solid-balsa or foam wingtips, and carve them to shape.

Leave out the center top ribs until both panels are completed. Block up the halves to

This photo gives a good indication of the Malibu Mirage's actual size. To realize the best flight performance, this sleek aircraft must be built light!

The author gives the big Piper a healthy heave to start it off on another flight. This is a graceful and durable aircraft that can be flown on a regular basis.

the proper dihedral angle, then carefully add the center top ribs.

Once everything is in place, glue the joint with thin cyanoacrylate glue (CyA) since this adhesive will neither disturb the assembled pieces nor shrink the glue joints and alter the dihedral angle.

The finished wing will be remarkably light and strong. My Malibu's wing will flex, but it has never broken in flight.

Because this model's wing is designed to be a separate unit from the fuselage and tail assembly, it is easy to repair should the need arise.

Tail Surfaces: Build the vertical and horizontal tail surfaces directly over the plan. They are built from 3/32 stock.

When each has dried, add 1/32 x 3/32 capstrips. The capstrips run along the spar and crosspieces, but not the leading and trailing edges.

Once capstrips have been glued to one side of a tail surface, allow them to dry, flip the piece over, and repeat the process for the other side.

When the glue has cured, remove the completed tail surface from the bench and sand it to a symmetrical airfoil shape, with the spar as the high point.

Round the leading and trailing edges. (I use an emery board.)

The symmetrical airfoil shape looks more realistic than plain old flat surfaces—particularly on a model this size.

Fuselage: The plan clearly shows the location of 14 fuselage formers. All are constructed from 3/32 sheet balsa, although the four at the rear can be made from 1/16 sheet to save a bit of weight.

Because this is such a large fuselage, most of the individual formers are constructed from several pieces in order to properly align the grain, to maximize strength.

Build all the former halves, and set them aside. Lay down the top and bottom curved keels of the fuselage, each of which is made from two laminations of 1/16 square stringer stock.

To ensure that the curved shape of the

Piper Malibu Mirage

Type: Rubber-powered Giant Scale

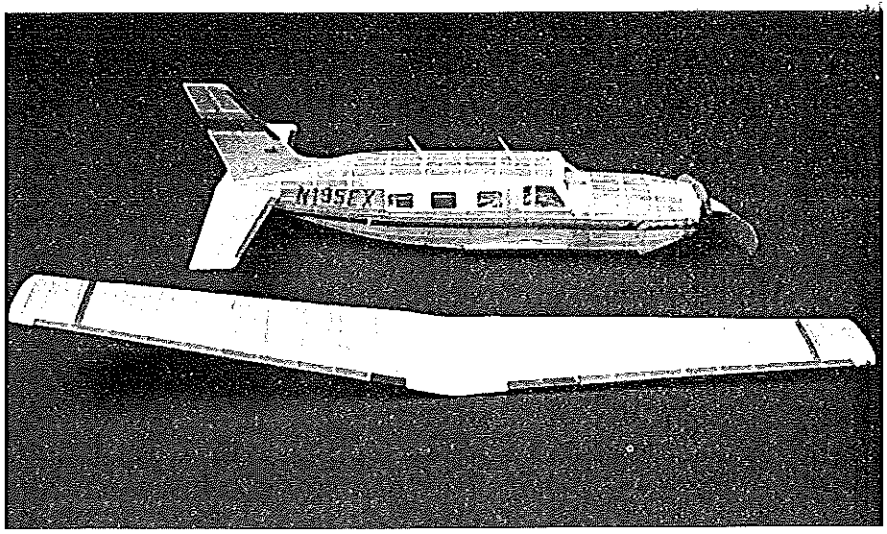
Wingspan: 43.5 inches

Power: FAI Tan II rubber

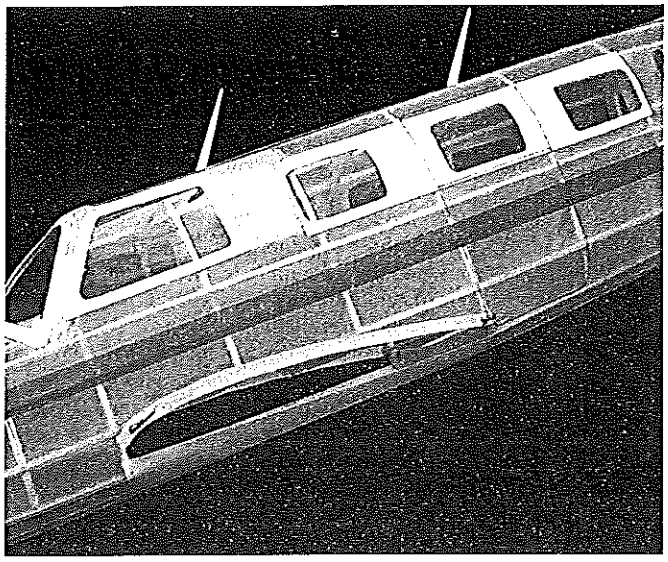
Flying weight: 4.2 ounces

Construction: Sheet and stick balsa

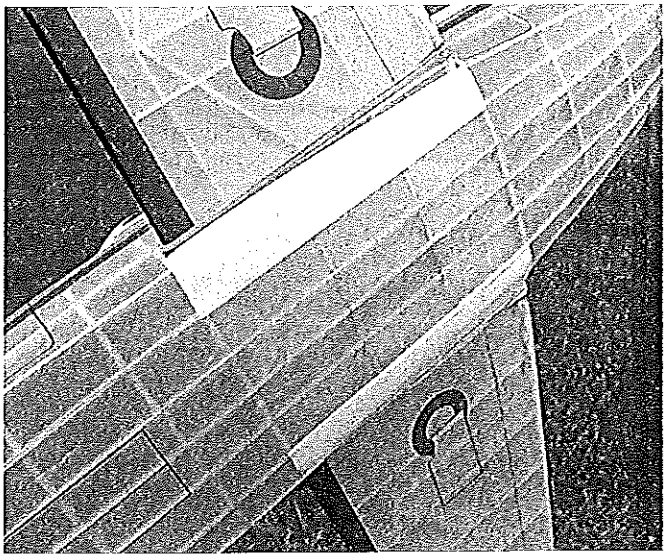
Covering/finish: Japanese tissue and modeling dope



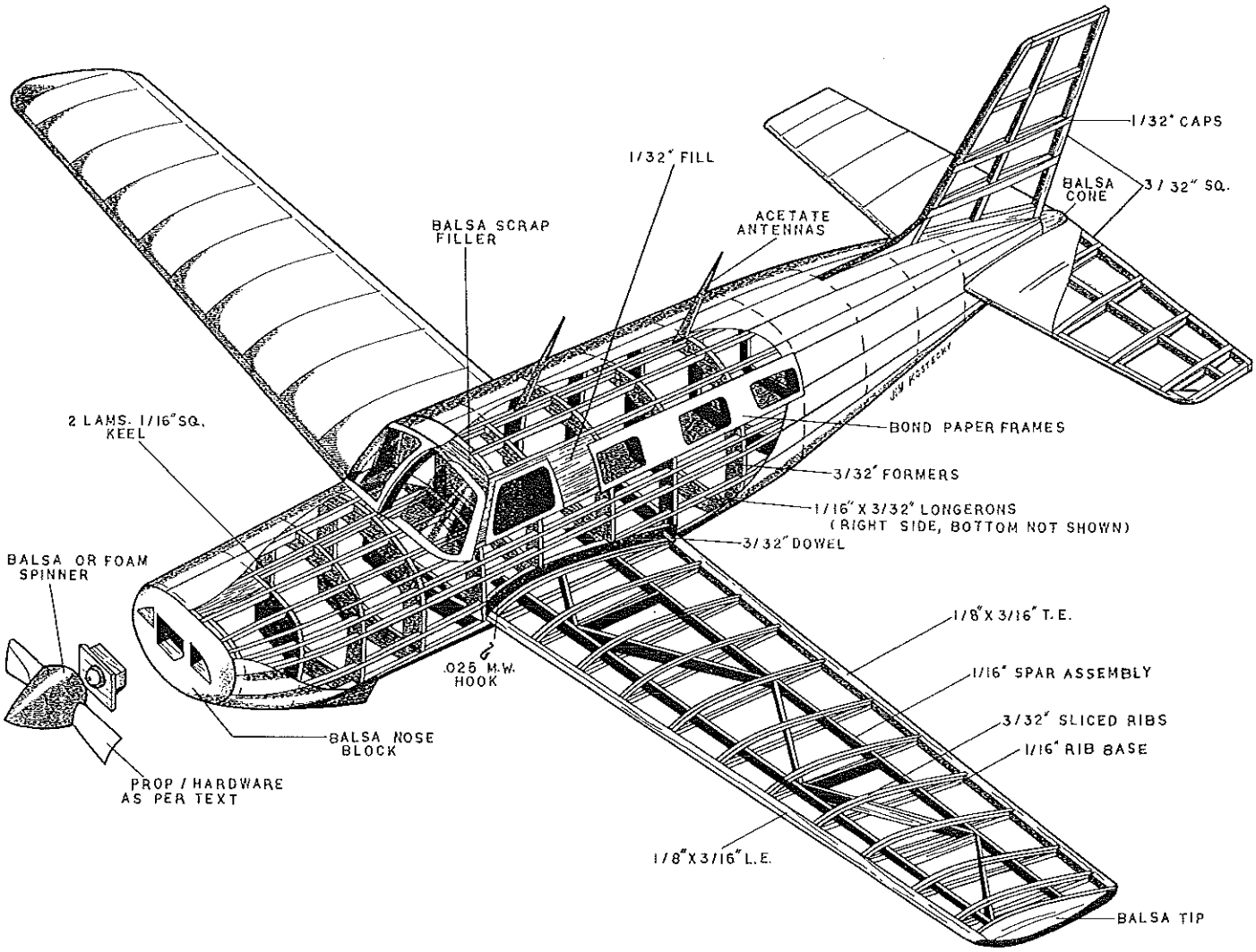
This model was designed with a removable wing, to provide ease of transportation and ease of repair. The wing slips smoothly into position in the fuselage.

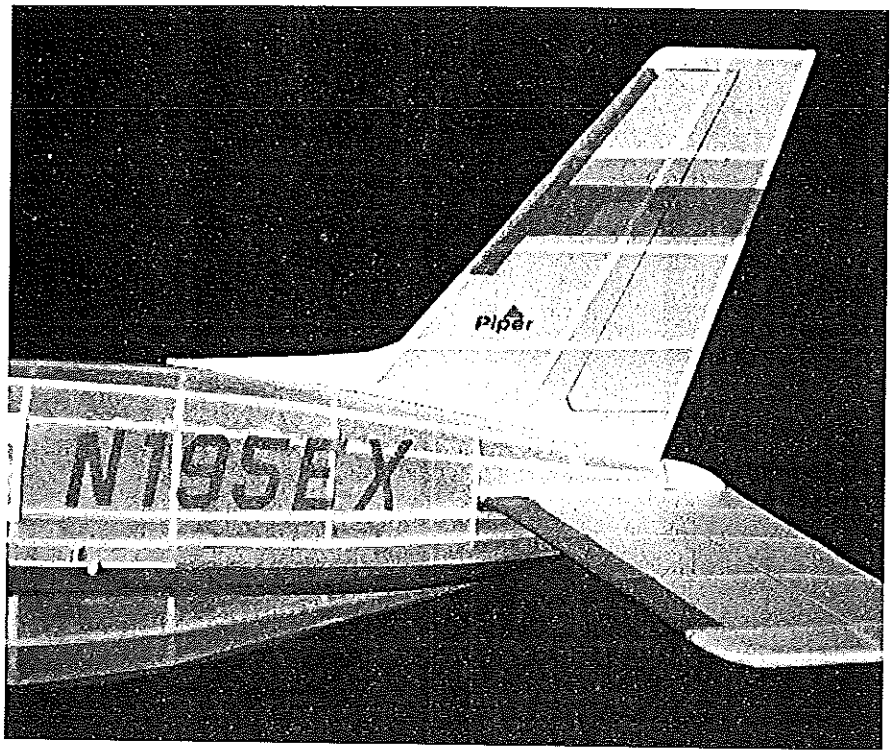


The wing saddle. Note music-wire hook at the leading edge and peg at the trailing edge. Rubber band holds everything together.



FAC rules permit retractable landing gear to be represented in "up" position. Inked detailing adds realism—and points!





The early Piper logo on the model's vertical stabilizer is a computer-printout image. The other trim is cut colored tissue, which is doped in place.

keels stays in place, beforehand I soak the 1/16 square stringers in hot water with some household ammonia added, then towel them dry and pin them in place over the plan.

Use diluted white glue to laminate the pairs of keel strips. These will take several hours to dry. All stringers are 1/16 x 3/32. You may prefer to use 1/16 x 1/8 for extra strength.

I like to use a small metal triangle to ensure that the former halves run at right angles to the building board. Work slowly, starting with the rearmost former, and carefully glue each in place against the keels. Check repeatedly with the triangle, to make certain they remain square.

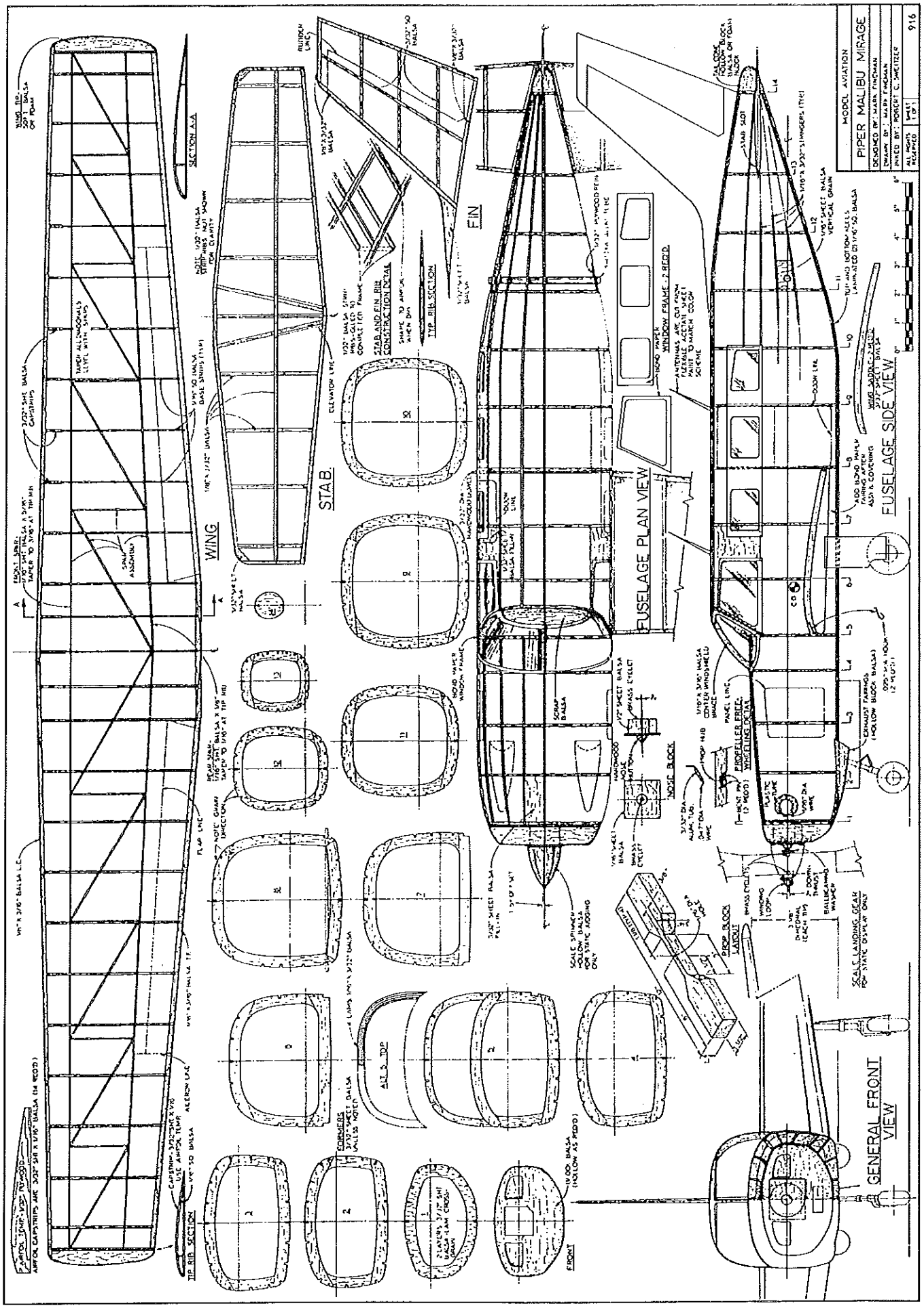
Add the main side stringer, checking carefully for alignment of the former halves. Add the remaining stringers. Stringer locations may have to be slightly adjusted to maintain straightness.

Lift the fuselage half from the building board, and repeat this process for the other side.

Add the fuselage cowl front and tail cone, and carve to shape. Those parts can be made from light balsa block or foam.

Notice that former five is made from two pieces. The upper part may be cut from sheet or laminated from three strips of 1/16 x 3/32 balsa, for a more warp-resistant job.

The upper part may require you to add scrap balsa, in order to create the slightly


MODEL AVIATION
PIPER MALIBU MIRAGE
DESIGNED BY: MARK FINEMAN
DRAWN BY: MARK FINEMAN
TRACED BY: ROBERT C. SMETZER
SHEET 1 OF 1
916
WING
STAB
FIN
FUSELAGE PLAN VIEW
FUSELAGE SIDE VIEW
GENERAL FRONT VIEW
SECTION A-A
TIP RIB SECTION
STAB AND FIN RIB CONSTRUCTION DETAIL
TYP RIB SECTION
FORMERS
ALT. TOP
NOSE BLOCK
PROP BLOCK LARGE
SCALE LANDING GEAR
FOR STATIC DISPLAY ONLY
SCALE SPINNER
FOLLOW BALSA
FOR STATIC DISPLAY ONLY
FRONT

rounded shape that will blend in with the curve of the windshield.

The side window frames are constructed from bond paper, 1/32 sheet balsa, or, as I have done, a combination of the two. Fill in the top center area with balsa near the propeller, and build up with scrap to make the bulged fairing behind the propeller.

Covering, Finishing, and Final Assembly: The entire model is covered with light Japanese tissue—white in the case of my model.

The markings on my Malibu are early Piper style, and were created from a combination of cut colored tissue and computer graphics, such as the Piper logo on the tail.

When the model has been fully doped, install the windshield acetate and fair with bond paper. Glue the vertical and horizontal tail surfaces to the fuselage. Leave room for the stabilizer to be shimmed for flight adjustments. The slot can be faired in later.

This model's wing is intended to be removable, to facilitate transportation, access, and repair. The wing slips into its slot and rests against the wing saddle of the fuselage. Dowels and/or fine music-wire hooks placed at the front and rear of the saddle allow rubber bands to hold the wing against the saddle.

Because these hold-downs are on the bottom of the wing adjacent to the fuselage, they are almost invisible. The antennas are painted acetate sheet that will bend, but will not break off.

The rear peg is subject to a great deal of stress and must span quite a distance across the fuselage, so I made it from a length of 3/32-inch-diameter fiberglass rod I obtained from a kite-supply catalog.

I carved the propeller from a balsa block measuring 1 x 1½ x 12 inches. The freewheeler is a simple length of 3/32 brass tube with a ramp filed into it, and it's glued into the prop-shaft hole with thin CyA.

Flying: My giant Malibu Mirage required no nose weight, and came in at an overall weight of 4.2 ounces including rubber. It is powered by three 27-inch-long loops of 3/16 Fédération Aéronautique Internationale Tan II rubber.

The turned balsa spinner is entirely decorative; it is pressure-fit to the prop for Scale judging, but is removed for winding and flight. I highly recommended that you use a winding tube to avoid the inevitable consequences of a burst motor.

This model has a very long, thin wing that may inadvertently introduce unwanted washin or washout that makes it turn too tightly in the glide, so carefully check the flying surfaces for warps before flying.

The model presented no unusual flight problems during testing. It will climb out majestically under power, followed by a floating power and glide portion.

My Malibu Mirage has only been flown a few times in competition, but it managed to secure third place at the 2000 Flying Aces Club Nationals with flights in excess of a minute. MA

Mark Fineman
1244 Wolf Hill Rd.
Cheshire CT 06410