"YELOISE"... a Manhattan

By RON WILLIAMS . . . One of the newest classes of indoor model, the Manhattan is a curious mixture of old time stick-n-tissue construction and the fragile delicacy of the highly scientific "microflimsey".

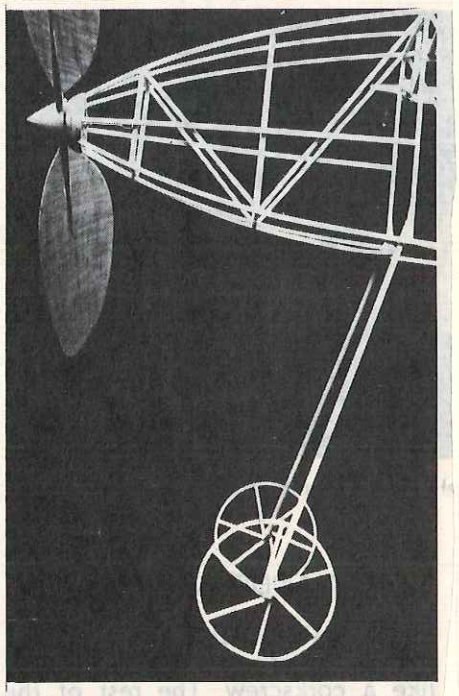
• The first time I saw a Manhattan was at Columbia's Low Library Rotunda. It was Ed Whitten's "Riversider", and it seemed gigantic. I couldn't help but think of it as, perhaps, an "Old-timer", and found myself looking up into the dome to reappraise the space in terms of this great clunk of a plane. Richard, Ed's son, wound, as Ed held the plane . . . the rubber seemed enormous . . . and I wondered. It took off quite gracefully and began a dignified climb toward the high arched windows into the streaming sunlight.

I was distracted momentarily by another flyer, and then turned to Richard to ask where the plane came down. His reply, that it was still flying, astounded me. I was used to anything resembling the Manhattan, such as a large indoor scale job, returning to the floor after at most, a minute's flight. This flight lasted more than two minutes, and that to me was really something. Indoor had previously meant planes that were hardly there or planes that were hardly up. But the Riversider, at more than 10 grams and what seemed great bulk, was something else.

I immediately promised myself I'd build a Manhattan, but one thing led away from another until some time had passed and a few other flyers built them and enthusiasm mounted, and . . . well, I began sketching, trying to come up with an idea worth following. The bulk of the required fuselage "container" and the other limits for the class gave a very definite shape to a conventional format. I looked at what photos and layouts I'd found of other Manhattans and remembered John Triolo's "Skyscraper" with its pink, merthiolate-dyed frame and tissue.

From some corner of the woodwork came the notion of a plane with the appearance of being alive, like an insect or an animal. The sketches began to look like a cross between a bug and a mouse. I called it "Yeloise," after Eloise of the Plaza, a children's book character, my daughter called it "The Flying Yellow Mouse", and Ed Whitten saw it as the "Gold Bug". As I worked some structure into the scheme, it began to look possible and so the lines became harder and harder until I could start laying up the balsa.

The fuselage was built in two sections, the pod (thorax?) and the boom or tail cone. The construction was conventional, with two sides being built simultaneously and then cut apart on removing from the building board. The longerons were cut very slightly at the outside corners at the front and back of the center "required" box, after the box was framed. This allowed the sides to be pulled together toward the nose and tail without distorting the center box. The longerons were laid up wet and wet again when framing the nose. The cracks were glued when everything was framed with two or three thin coats of Titebond. (Titebond was used throughout, with the exception of the rolled paper tubes, but more about those later).



Dig those racy "wire spoke" wheels! Prop designed to flare forward for low ceiling flying.

The tail cone was framed and glued to the main fuselage with a minimum of fuss, but slowly and carefully. Diagonals between pod and boom were soaked, bent, cut to fit, and installed, using tweezers to locate them. The horizontal (top and bottom) diagonals were then installed and everything double-checked for alignment over the plans.

The wings and tail surfaces were made by bending soaked wood around cardboard forms. I'm too lazy to make a trip to the water tap to soak a little piece of wood, so I run it back and forth through my mouth, working up a good gob of saliva to wet it down. Works fine (ugh!). A thin stream of Titebond was used to laminate the wing outlines. They were held to the cardboard forms by paper-lined strips of 1/4 inch wide masking tape (I make a whole bunch of tapes by laying a strip of bond paper or heavy tissue 1/2 to 3/4 inches wide on a linoleum surface, then laying 2 inch lengths of tape across this strip about 1/8 apart and then slicing through the paper between each tape strip with a razor blade. I peel them up from the linoleum as I need them to hold strip wood to the form.) The tail skid was made to the stabilizer outline. The edges of all the surface outlines were shaped by very light, careful sanding with No. 320 wet-or-dry sandpaper on a rounded-edge block. The ribs were sliced with a cardboard template and cut to fit the pinned-down outlines (the outlines were pinned with the pins on the sides of the wood, not through it).

It took a while to figure out how to mount the wings and landing gear satisfactorily, for I wanted the plane to be easily re-buildable. Paper tubes were used in the indoor tradition, with some thanks to recent experiences with R/C gliders for details. The tubes were made in two diameters, being rolled on 1/16 o.d. tubing and a 5/64 drill shaft. The larger ones were just right for the wings and the smaller ones were used for the landing gear legs. These tubes were made by moistening one end of a 5/8 by 1-1/4 inch piece of tissue, rolling it one turn on the tubing (near the end) between the left thumb and forefinger, applying a bit of Ambroid across the paper at the tube and continuing the roll by spinning the tube slowly with the right thumb and forefinger. It helps to moisten the outer end of the tissue slightly, too, so that it sticks well. Spinning the paper tube on the form between the fingers smooths the glue and tightens up the paper tube. Before it dries, like *right away,* it must be pushed off the form and not touched or moved until it's dry. The ends often get crumpled pushing them off the form but this can be trimmed to the final size with a razor blade after the tube's dry. About ten tubes

#10772

were made to get the six I needed for this plane. It takes a bit of practice.

Wheels. I've always looked at indoor wheels and thought maybe there'd be a Fulton Hungerford somewhere to buy them from when I really needed them. But no, I had to do them myself. I really soaked a piece of "A" grain, 1/32 square balsa about 12 to 14 inches long. I taped one end to a small 1-1/4 inch diameter bottle and pulled the strip around about six times. After taping it down and letting it dry, I pried it off carefully and salvaged 4 circles. The circles were spliced with a long diagonal cut and glued with first a coat of Titebond and then a spot of "Zap" cyanoacrylate cement. (The combination makes a terrific joint.) The "Zap" was applied from a drop on a glass plate with a dental tool. Each circle or rim was pinned over a drawing of the wheel. The hubs were made by drilling a No. 77 hole in the end of some 1/8 dowel and then cutting off 3/32 slices with a jeweler's saw. These were pinned to the board in the center of the wheel with a short length of .015 music wire. The spokes were cut from 1/32 square balsa, first with a 45° cut at the hub end and then with a 90° cut at the wheel rim to fit. Three of the spokes are on the outside of the hub and the other three are on the inside.

The finished wheels were a great source of satisfaction. They were mounted on short lengths of .015 music wire, which were, in turn, bound to 1/16 square (rounded a bit) struts with tissue and Titebond. Short lengths of "Hot-Stuff" applicator tubing were used to hold the wheels onto the wire axles.

The propeller assembly was the last major part of the plane to be built. The blades were cut to their pattern from .020 thick "C" grain balsa. They were soaked under the tap and then taped to a can at a 16° angle from the vertical. The can was 4 inches in diameter. Again, the tape was paper-lined so it wouldn't stick to the blades. The 16° angle was toward the direction in which the prop would turn, i.e., with the can vertical the angle should lean *left*. While the blades were baking in a 200° oven for 15 to 20 minutes, the propeller spar was tapered from a piece of 1/8 square medium-light balsa with a razor plane and then sandpapered. The dried blades were held flat with a weight while the spar was traced onto them with a razor blade, cutting a notch into which the spar would be glued.

I decided to try a 22 inch pitch and so built a jig for gluing the spar and blades together at the proper angle. This jig held the prop shaft of .015 music wire, glued into the prop spar, at a 90° angle to a base board. At the appropriate distance from this center point (3 inches), a 50° balsa angle bracket was mounted on the base. The propeller blades were lightly held to this angle bracket while the spar was tack-glued into each blade in turn. The final gluing was done with a fine bead of Titebond on both sides of the blades and then the angle was rechecked.

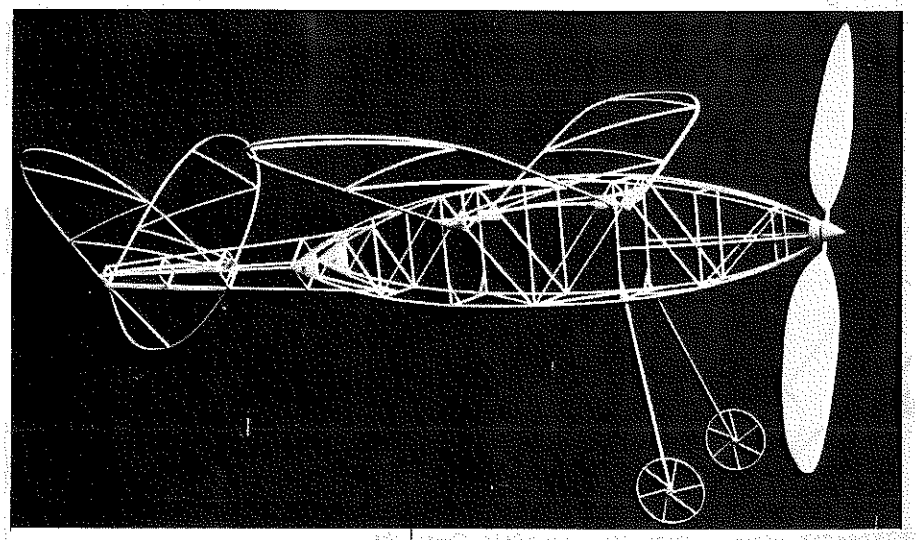
The spinner was carved from a block of soft balsa. It was notched at the back with a rat-tail file, hollowed out, and glued onto the propeller spar. The prop shaft bearing is a short length of 1/16 diameter tubing (aluminum) lined with a piece of 1/32 o.d. teflon tubing. The nose block is laminated from hard 1/16 sheet balsa.

The paper tubes were mounted in the framework with Titebond. They were mounted so they extended beyond what would be the surface of the plane and then sliced off with a razor blade. Small scraps of 1/40 balsa were fit around the tubes to receive the covering tissue and reinforce the openings of the tubes. Some shims and adjusting were necessary to get the tubes lined up right. This was simple, for they were only tack glued in at first, and the joints could be dissolved with a drop of water if required, without dissolving the Ambroid-glued paper tube.

I had decided to dye the frame of the plane as soon as I'd seen John Triolo's winner. It took a while for yellow to convince me that it was the brightest and prettiest of a gang of Dr. Martin's waxter colors hanging out on my paint shelf. After thinning the color with 90% alcohol, it was brushed on the entire frame. The propeller assembly was sprayed with water-thinned color via the airbrush.

I spent a week running around trying to get the framework photographed and figuring out how to cover the plane. It wasn't the covering so much as the installation of the windows and windshield, as required by the rules, that had me stumped. I decided that they should be difficult to measure and therefore of some unusual shape, to protest their absurd inclusion in an otherwise beautiful set of rules. The windshield is more than 2 square inches of ellipse and the side windows more than one square inch of circle (or eyeball).

They were mounted thusly: Micro-lite clear film was sandwiched between two sheets of bond paper. The circles and ellipses were traced on the bond paper, 1/8 inch larger than the required size, and cut out with scissors. Using templates, and before covering, the proper size shapes were cut from the tissue, which was stretched on a wooden frame. The upper layer of the bond-paper-Micro-lite sandwich was removed after laying it on a dark surface. Then a small bead of shellac (thinned) was run around the opening of the shape in the condenser paper. The condenser paper, on its frame, was lowered down to the exposed Micro-lite shape. The glued edge was pressed carefully to the Micro-lite all around the edge. After lifting from the table, the remaining piece of bond paper was peeled off the Micro-lite. Micro-lite is so thin it's difficult to handle . . . so much so that it *shouldn't* be handled, unless it's mounted on a frame or between heavier sheets of paper. Wrinkles in it can be removed when it's lying flat by gently *blowing* the film flat.



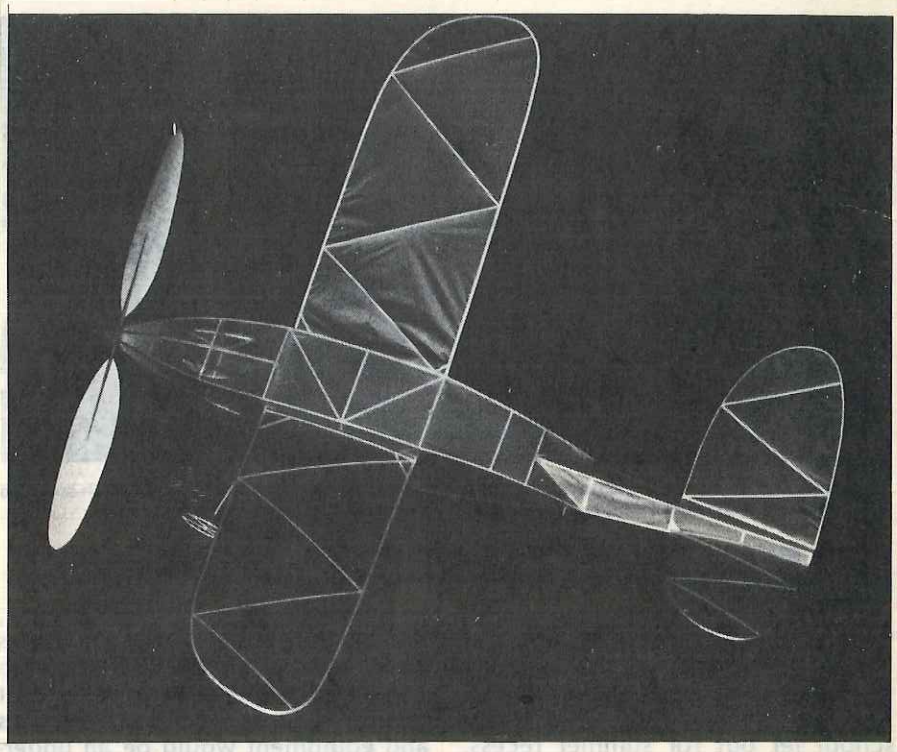
Side view of the complete uncovered structure. Beginners can go with 1/16 sq. construction in the fuselage, and heavier spars, until they get the "feel" for indoor building.

#10772

The tissue . . . condenser paper . . . was dyed by spraying it with many thin coats of water tinted with Dr. Martin's yellow water-color, using an airbrush. The condenser paper was pre-shrunk. This was done by what's known as the alligator skin method. Using a pump spray, I first washed the front of our refrigerator, then wet it again. The sheet of condenser paper was held in front of the door and blown against it, then wet again with the sprayer. The spraying process was repeated about 5 or 6 times. The dried paper was quite wrinkled with a small overall texture. Though the plane could have been covered with the paper in this condition, I wanted a smooth covering job. To accomplish this I placed the condenser paper between two sheets of newspaper, sprayed them with water, and ironed it flat.

The tissue was attached with saliva. I found it frustrating to wet a brush with my mouth and brush it on, tried dipping it in the saliva and ended up licking the frame with my wet tongue. I am told that a beer or coke before covering helps a lot, but I didn't find that necessary. The covering job was conventional and straightforward, except in the area where the fuselage pod meets the tail boom. This area required a little extra care. After the tail boom and stabilizers were covered, the extensions of the stab spars were pushed through the covering on the boom and attached to the boom's framework. The job was kept neat by starting the holes with pins and using a minimum of glue. The rear spars were attached to the end of the boom with a small amount of glue so they could be removed and adjusted if necessary.

The first version of the plane had an 18 inch fuselage. This, together with the V-tail configuration, made for an almost impossibly trimmed plane. The center-of-gravity had to be at about 25% of the wing chord, which meant ballast in the nose. My first thoughts were that the V-tail was the culprit, but tests with a conventional tail showed the problem truly to be that of C.G. location.



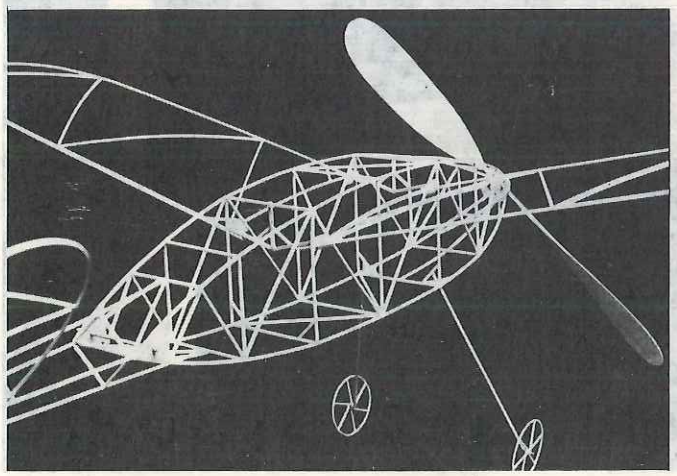
"Yeloise" on her way for another quiet investigation of the upper structure of an indoor site.

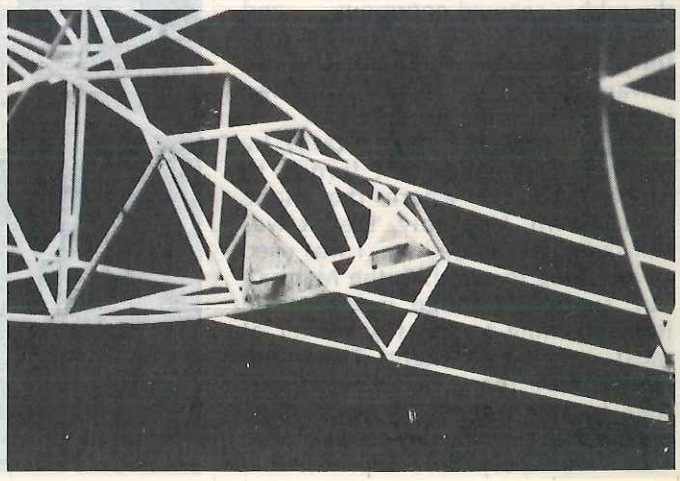
The configuration shown in the drawings was arrived at through cutting the rear of the plane off at the end of the pod and rebuilding to a 20 inch overall length with lighter construction. This obviated the need for nose weight and brought the weight down to 4.25 grams. In its latest configuration, the plane flys very consistently to the left with the tail tilt shown, a slightly (1/8 inch) washed-in left wing tip and about 2° left thrust. The size of the flight circle is adjusted with side thrust . . . the optimum is about a 40 foot circle for the force set-up shown.

In constructing the plane from the drawings, one can select a heavier, sportier airframe, or use light indoor wood in smaller sizes. It is not difficult to build to the 4 gram weight using light wood for all the structure, except medium 1/16 square for the fuselage pod longerons. The plane is still a satisfying flyer at 6 grams, although its flight is not quite so buoyant and times are shorter. Yeloise likes a 16 inch loop of .080 to .085 older and better Pirelli wound into her for 1200 to 1500 turns for an average flight. When the Lakehurst season starts, she'll get her belly full and an opportunity to stay up as long as she can.

For more information about Manhattans, send a buck or two to Ed Whitten, c/o Star Skipper's, P.O. Box 176, Wall Street Station, New York, NY 10005; he'll keep you posted. Let him know your thoughts and feelings on this growing new class. ●

MODEL BUILDER





#10772