Author holds his free flight scale plane aloft for all the world to see. This view shows in full detail the intricate and minute design of the Demoiselle.

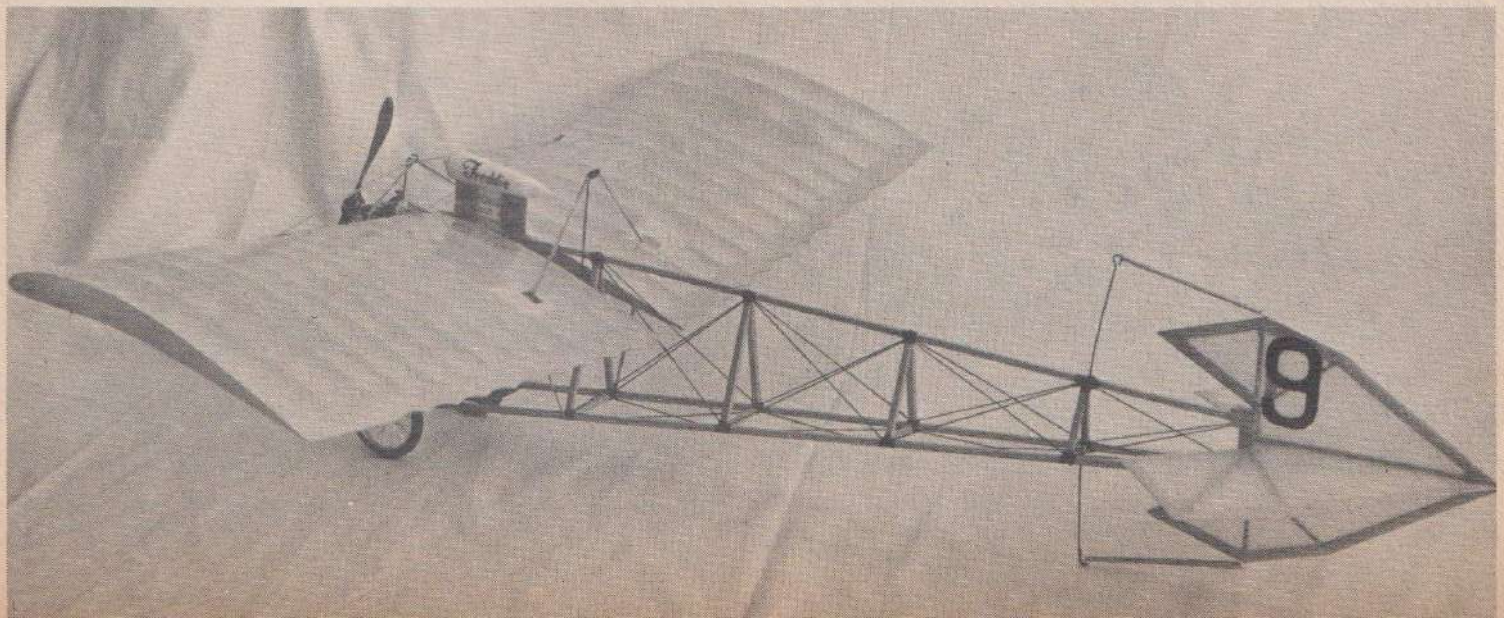
THE DEMOISELLE

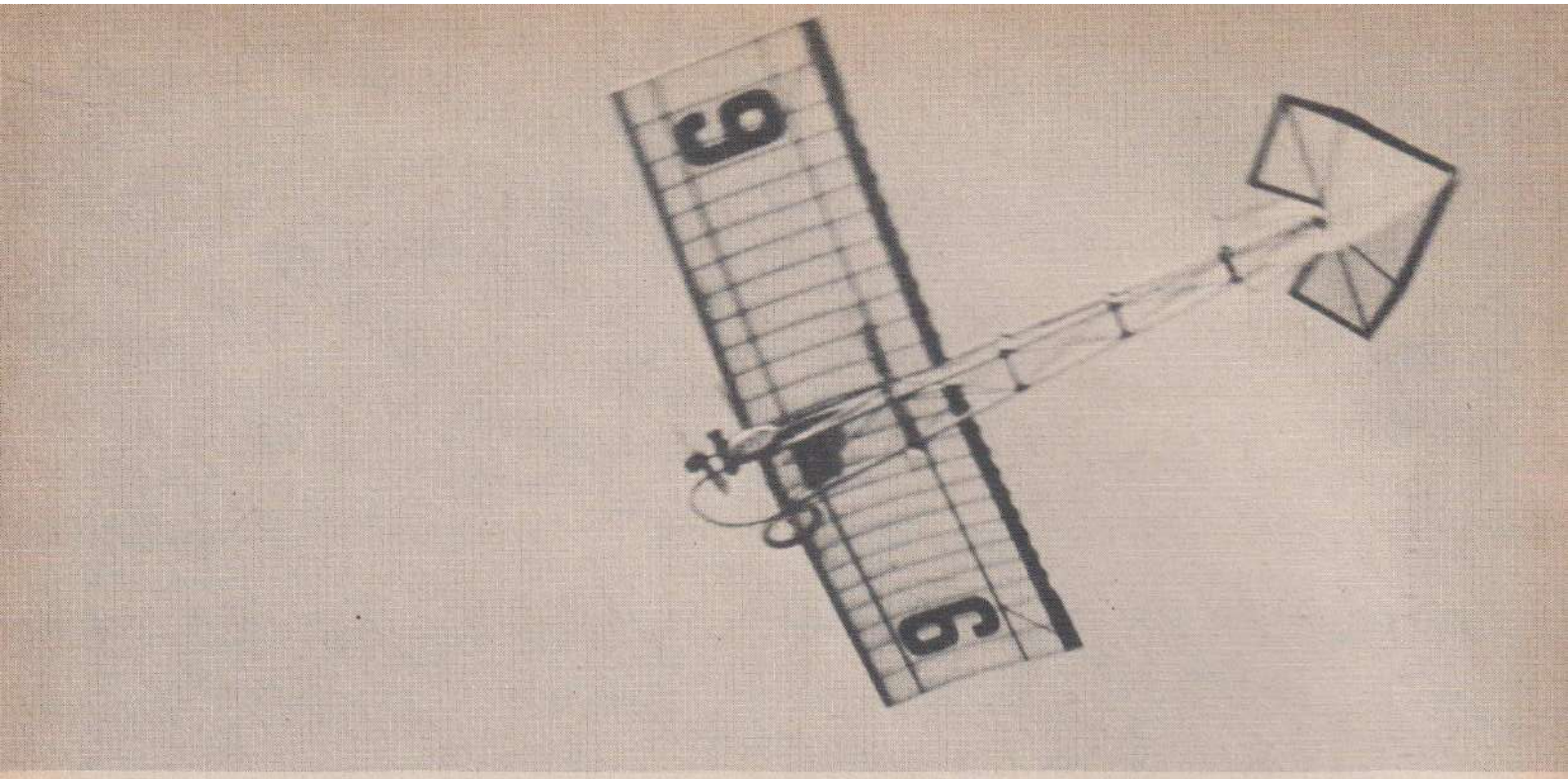
By STUART MAC PHERSON . . . Exciting and mysterious, best describe this free-flight scale right out of the past of aviation. Inspired by the incredibly funny movie, "The Magnificent Men and Their Flying Machines," this pretty bird recaptures a very important part of aviation history.

► I believe that the first time I encountered the Demoiselle was in something called, The Golden Book of Airplane Stamps. Being young and completely fascinated by everything aeronautical, an airplane made from such things as bicycle wheels and bamboo naturally caught my imagination. Being a bit naive, I quickly reasoned that with a few nights work, those old bamboo poles behind the garage, and the wheels from my brother's bike, I could build my own airplane, my very own airplane! Think of it. Boy, would I ever be the envy of the kids at school. And for an engine I'd, I'd, hummmmmmm. Well, heck, Mom probably wouldn't let me fly it anyway.

A few years later, I came across the Demoiselle again. This time in the Popular Mechanics Aviation album. It seems that

Standing at rest. Note how the wing is held in place by stringing hold-down elastic bands through the wing panels, also fuel tank above the wing.





Here, we have the little free flight scale machine doing the thing it likes the best: FLY. Interesting profile while it is gliding by the cameraman.

DEMOISELLE

in 1910 Popular Mechanics ran a construction article in its magazine on the little plane complete with half a dozen "working drawings." Learning this, of course, rekindled my old interest and I was off to the library for photostats of the article. The drawings proved to be surprisingly detailed and I eagerly began speculating how to raise enough money to buy an engine for my bamboo bomb. Figuring the sale of my wheel-less bike and other quickly negotiable items, I calculated that it would take close to a year to accumulate the necessary amount. In the meantime I decided to construct a scale free flight of the Demoiselle with which to analyze its flight characteristics. However, as most of my projects usually fare, the Demoiselle soon found its way to a pile of "started" models where it was soon forgotten. It remained thus until the release of the film, "Those Magnificent Men" which quite naturally inspired me to complete the model.

The Demoiselle was originally built in 1908 by Santos Dumont. It was constructed basically of bamboo and wire with muslin covering and was powered by a 35 horsepower water-cooled Darraque engine. The wingspan measured 18 feet and was 20 feet in length. Top speed was around 45 mph with such things as range and ceiling determined more often than not by what the pilot had for lunch on a particular day. The model in this article is constructed to a scale of 1.5 inches equals 1 foot. The only variations in detail from the original are in the airfoil and the elimination of a cutout in the leading edge to accommodate the propeller. This latter modification is consistent with the Magnificent Men's Demoiselle which in fact had many minor details and construction modifications incorporated to increase strength and safety. A Cox .049 Babe Bee is used to power the model as it was found that the .020 pictured was too underpowered to yield satisfactory performance. With the .049, performance is just about perfect, having enough power to overcome the huge drag of exposed sticks and wires while maintaining the slow and often comically erratic flight characteristics one associates with such an "aeroplane."

Construction

Building the Demoiselle will probably be a bit different from other models you've built. This is due to the use of some unconventional structural features designed to maintain scale appearance while permitting the use of rubber bands in assembly. And although

Front shows how tie-down rubber bands string through wing and attach to wheel hub, also to leading edge of wing. See paddle wheel prop.

Thread bracing in fuselage structure adds considerably to strength and helps with finish details. Add dummy Cox .049 cylinder to make twin eng.

some parts may appear at first glance to be rather difficult, I am sure they are by no means beyond the capabilities of the average model builder (if there is such a creature). So, assuming that you are sufficiently enthused and forewarned, let's start building.

Tail Surfaces

The rudder and elevator are constructed over the plan. Cut the outline pieces from 1/6" sheet and glue together as shown. Next cut the 1/16" square diagonal braces and add these to the structures. Remove the rudder and elevator from the plan and gently round all outside edges, being especially careful of the elevator which at this point is somewhat easily broken in the middle.

To assemble the rudder and elevator into a single unit it will first be necessary to cover both structures. Before covering give both parts a liberal coating of a 50-50 mixture of cement and clear dope. Cover with white Japanese tissue being sure to run the grain of the tissue width-wise to prevent warping of the forward areas. Shrink the tissue with water and when dried, apply two coats of clear dope.

Cut two of the parts numbered T-2 on the plan and cement to either side of the rudder in the area where it meets the rear of the fuselage. Remove the tissue from the 1/16" channel in the middle of the elevator and, spreading glue in this channel and on the center of the rudder, slip the elevator onto the rudder. Fit the two 1/16" square nubs on the front of the elevator into the notches of the T-2 braces and square up

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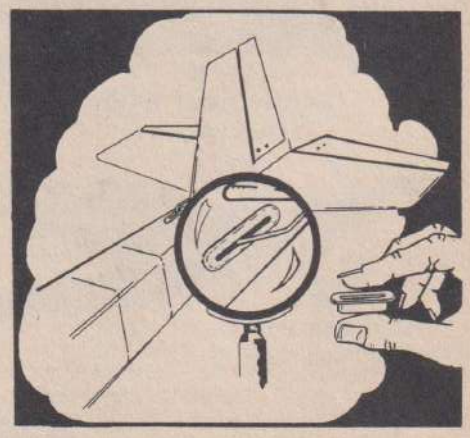

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We're always happy to receive news and photos from model builders who use our products – and whenever possible, to include such material in these regular Ambroid ads. This month, we'd like you to meet the Detroit "Strathmoor Model Club's" fightin' five-man combat team, who must have sliced up plenty of tail streamers over the past few years, to collect that jungle of trophy-loot at their feet! Member John Kilsdonk tells us that although the team uses a wide variety of model designs, they only build with Ambroid adhesives, to ensure the toughest possible joints, so essential for the grueling conditions encountered in combat flying. The boys use Ambroid "Regular" Cement for general construction, Ambroid White Glue for hardwoods and Ambroid "Extra-Fast" Cement for those hectic between-rounds repairs.

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Clockwise from upper left: Ambroid fans John Kilsdonk, Howard Mickle, Roger Sweet, Larry Palmer & Art Jerome

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the whole structure. While this is drying, bend two pins to the outline shown on the plan and stick them into the top and bottom of the rudder. Cut two T-3's and glue them directly on top of the T-2 parts. Finish the unit with another coat or two of dope, straightening any warps that might have shown up.

Fuselage

Begin construction of the fuselage framework by building the bottom over the plan. Use hard 5/32" square balsa for this as well as for the rest of the structure. When the bottom is dried remove it from the plan and tack cement the front and rear (T-1) jigs in place. After these have dried for about 5 minutes glue the top longeron on the jigs and line up the assembly over the side view. The front jig should line up with the second upright and T-1 should be angled as shown.

Allow this assembly to dry quite thoroughly and then mark off the position of the uprights on the top longeron as shown in the side view. Cut and bevel the uprights to fit between the top and bottom longerons and cement in place being careful not to bow the longerons in the process. It is best to install the middle pair of uprights first and allow them to dry before adding the others. Always install the uprights in pairs.

Before continuing with the construction of the fuselage, it will now be necessary to build and install the wire framework shown on the plan. Most models, especially scale ones, are plagued with their nightmares of wirework and I am afraid the Demoiselle is no exception. Its wire structure consists of a combination of struts, wing mounts, and axle all soldered into one pathetic complication. But have heart, if one as obviously unorganized as the designer could construct it, then, with the aid of a few chosen curses, it should be possible for most anyone.

Begin assembly of this unit by cutting and bending the components as shown on the plan. Struts A and B may be formed directly over the plan. Strut C must be cut to the length shown on the strut jig pattern with the ends left long enough to be bent as shown on the front view. Cut an axle from .075 wire and two pieces of 3/16" brass tubing ⅞" long.

The strut jig is now made from scrap balsa as shown. The front member of the fuselage jig may be removed and used in this or a new one made. When this is dried assemble the wires as shown in the three-quarter view by inserting them through the pieces of brass tubing which are slipped over the axle. Tape the assembly to the jig noting the proper positions and angles and flow solder into the two tubes to secure the wires in this arrangement. Finally, solder wires D and E in place and remove the framework from the jig.

To install this assembly in the fuselage epoxy the axle to the forward most cross member and the C struts to the second set of uprights. Add the remaining 5/32" pieces of balsa by cutting grooves in them to conceal the B and C struts. Glue scrap balsa to the forward area of the fuselage and sand into a flat surface to accept the firewall. Next, cut and drill the firewall gouging out a small groove to receive struts B and D and epoxy to the built up surface just constructed. Finish by adding gussets between the firewall and three sides of the top longeron.

Wing construction is quite conventional except for one or two points. To maintain the undercamber at the trailing edge, the wing cannot be assembled over the plan. Instead, glue the two end ribs between the

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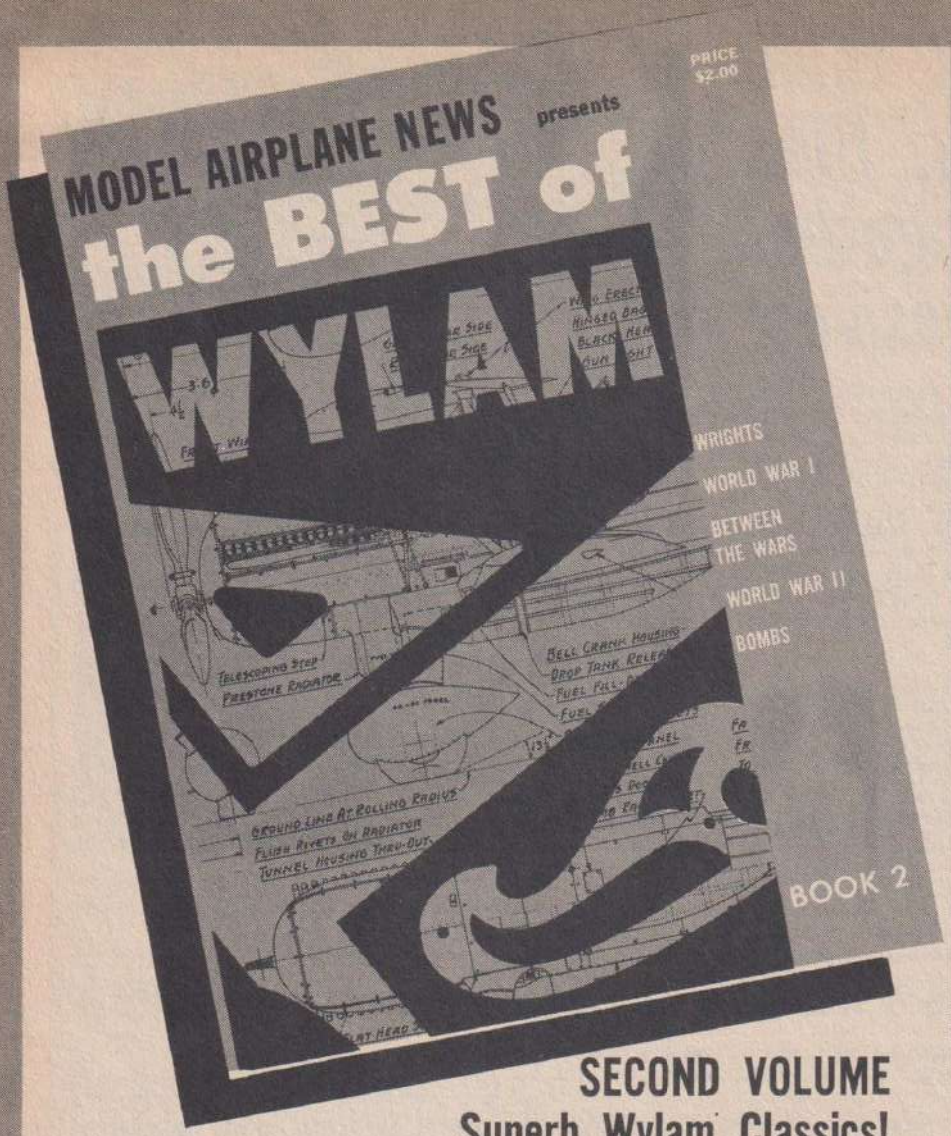

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leading and trailing edges making sure the trailing edge maintains the undercamber and that the wing is square. Hang this structure up by the leading edge and allow to dry. Mark off the positions of the other ribs and install these so they all fit with equal snugness, trimming if necessary. If some ribs are fitted more tightly than others it is possible for warps to set in. Next, add the spars and the sections of tubing shown on the plan. Sand the entire structure to a smooth contour and add the trailing edge scallops using a large dowel wrapped with sandpaper.

Having already finished the tail, the only structure remaining to be covered is the wing. Seal the wing framework with a coat of 50-50 and cover with Japanese tissue or light Silkspan. Getting the tissue to conform to the undercamber is a bit of a problem. I found the best way to do this was to start at the wingtip and work toward the root progressively doping the covering to the rib bottoms. The wing is finished with three coats of clear dope which very nicely approximates the muslin of the original.

The fuselage is finished with a coat of 50-50 and doped until a slight luster is attained. Accessories, such as the fuel tank and seat, are now added and the black thread bracing wires installed. The tail skid is tied and glued in place and the front nose over skid bent and installed. All exposed struts are covered with black rubber tubing or clear fuel tubing painted black. The 2¼" wire wheels used on the model are a custommade product of Ernie Boling in Englewood, Colorado. They contribute considerably to the antique appearance of the Demoiselle but have the drawback of costing $8 a pair. A less esthetic but inexpensive substitution can be made with a pair of Williams Brothers' vintage wheels. The plane's only trim consists of the black racing numbers and small dabs of black paint on the fuselage where the thread is attached. To obtain the dual cylinder appearance of the engine, I filed the threads off the bottom of an old cylinder and epoxied it onto the crankcase opposite the real cylinder. This modification not only adds considerably to the authenticity of the model but also offers a handy place to keep a spare glow plug. Just don't connect your battery to it by mistake! The prop used was originally from a Thimble Drome Curtiss Pusher but works and looks fine on the Demoiselle. It should be available through your hobby dealer under the Thimble Drome catalogue number 5843.

Assembly is as shown in the photos. Hook rubber bands onto the strut ends as they protrude from their tube sockets and hook them, as determined by the individual rubber band, to similar struts on the opposite side or onto the wheel retainers. Dihedral can be adjusted by using tighter rubber bands on either the top or bottom of the wing. The empennage is placed over the tailpost of the fuselage and secured by running rubber bands from the tail skid to the pins on the rudder. Model should balance as shown on plan.

Choose a calm day and an area with a forgiving surface in which to conduct your initial flights. The normal glide of the Demoiselle is quite slow and rather steep. Adjust the center of gravity and elevator incidence (again with tighter rubber bands) to obtain this pattern and straighten any pronounced turns with a tape trim tab on either wing. Add three degrees right thrust and two degrees down, crank it up, and set it free. You should be rewarded with an amusingly erratic flight. If it is too erratic add more dihedral, if too stable take some out. After logging a few flights, try some rise off the ground type takeoffs.