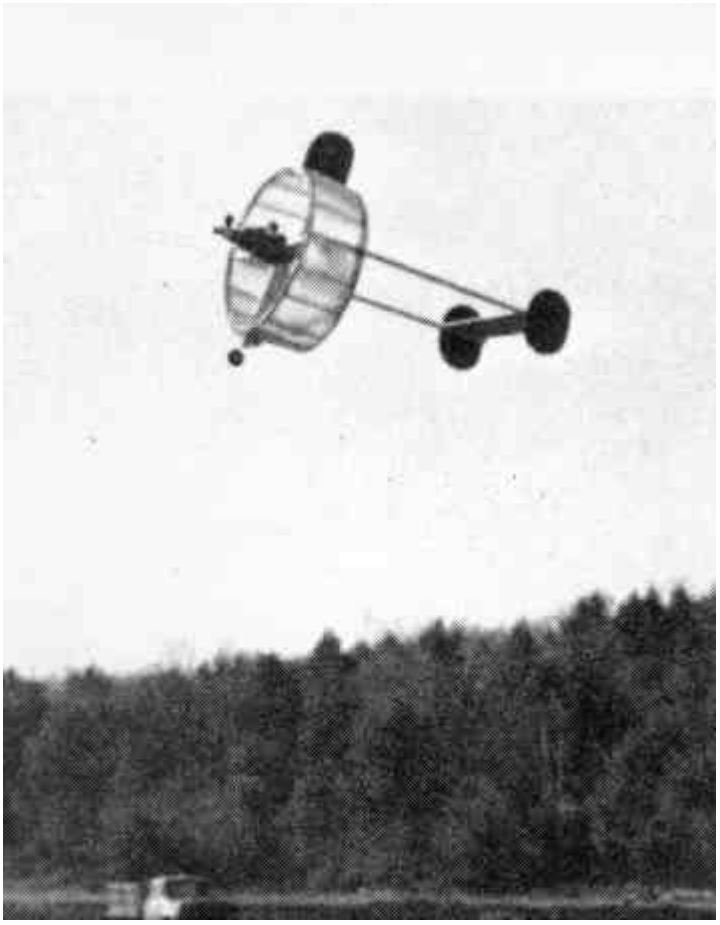
For a real eye-stopper, build "Hoopskirt"



By ROY L. CLOUGH, JR.

Flying barrels have been in the air since Bleriot, but this model proves they can still turn in a top performance

TROT THIS MODEL out on the field at your next meet and watch the eyes bug. If anybody snickers, put 'em in their place by reminding them that the annular wing is a very old aeronautical principle. Then launch your Hoopskirt. If its tradition hasn't impressed them, its performance is certain to!

At least a half-dozen full-scale planes (plus innumerable kites and gliders) have been built on the "flying barrel" design. One of the initial aircraft made by Ellehammer—the first Dane to fly—took this form. Louis Bleriot, the daring Frenchman who was the first to fly the English Channel, perched one on floats and tried, with indifferent success, to get it off the water. The French are still at it; their latest attempt at annular-winged aircraft is a tail sitting jet.

One of the big advantages of this design is its propulsive efficiency. Efficiency in a flying system is highest when the velocity of the discharged air is almost as great as the forward speed of the plane. This means that it's better to move a lot of air relatively slowly than a small amount at high speed. (It's rather like matching impedances.) The annular wing with a propeller ahead of it functions as an effective aspirator to increase the amount of air thrust backward.

Such a wing has more *lift* than you might think. The closed-circuit nature of the airfoil eliminates wing-tip vortices. Theoretically, a hoop-wing plane shouldn't have to bank in order to turn. This model does, however, because of the vertical stabilizing fin at the top of the wing. This was added to produce an effect comparable to dihedral.

The Hoopskirt is an extremely stable flying machine. It'll teach you a lot about this offbeat configuration. Don't let the circular wing scare you—it's quite easy to build. Any cylinder with a diameter of about 10 in. (a half inch either way won't hurt) can serve as a mold for the two spars. I used a straight-sided layer-cake pan. The spars can be of any lightwood that bends easily when soaked in hot water. Bind these

around the mold with a strip of rag. When dry, trim the ends in long, matching bevels to form the lap shown in the sketch; cement and bind with sewing thread.

You can trace the wing-rib pattern directly onto your balsa, stacking blanks to cut as many at once as you can manage. The slots in each end are 3/32 in. wide and 1/4 in. deep. The width should provide a snug fit over the spars. When these hoops are seated in the notches, their outer edges will protrude 1/16 in. for rounding off.

An easy way to space the ribs accurately is to set the spar-mold cylinder on a piece of cardboard and scribe around it to produce a circle the same diameter as the spars. Mark off sixteen rib positions by means of radius lines and assemble the wing vertically over this pattern.

Cover the frame one section at a time with light model-plane tissue. Sections into which the strut, fin or booms will pass can be left uncovered until assembly is completed—or you can cover the entire wing and then slit the paper

of these sections when you install parts that must be cemented to the ribs. Water-shrink the paper; when dry, give it a coat of clear dope.

Careful alignment of all balsa parts pays off in good performance. Don't diminish the strength of the rock-hard-balsa booms by sanding off the corners—leave them square.

The tail plane has a deeply notched trailing edge, backed up with parallel pieces of soft wire cemented to the wood. These wires—which can be snipped from a paper clip—will hold any flight-adjustment bends you may give the two elevator sections after trial runs. An annular wing operates at zero incidence, so you'll have to bend the elevators up two or three degrees to get an angle of attack for climb. Bending one elevator up more than the other makes the model turn in that direction. The rudders have no adjustments, and are simply cemented to the sides of the booms after the tail plane is in place.

The engine-pilot nacelle is given a coat of pigmented dope after the motor is fastened on its plywood mount. The color scheme of the model shown is: red nacelle, rudders and fin: natural white wing; silver booms, strut and tail plane—a highly visible combination against a blue sky.

For best performance, be sure the model balances at a point about 1-1/4-in. ahead of the trailing edge of the wing. An easy way to balance the plane is to stick straight pins into both booms 1-1/4-in. ahead of the trailing edges. Support the plane on these pins between two stacks of books, and add weight—in the form of bits of clay, small pieces of lead, etc.—to either the nose or the tail until the plane is suspended between the books in a level flight position.

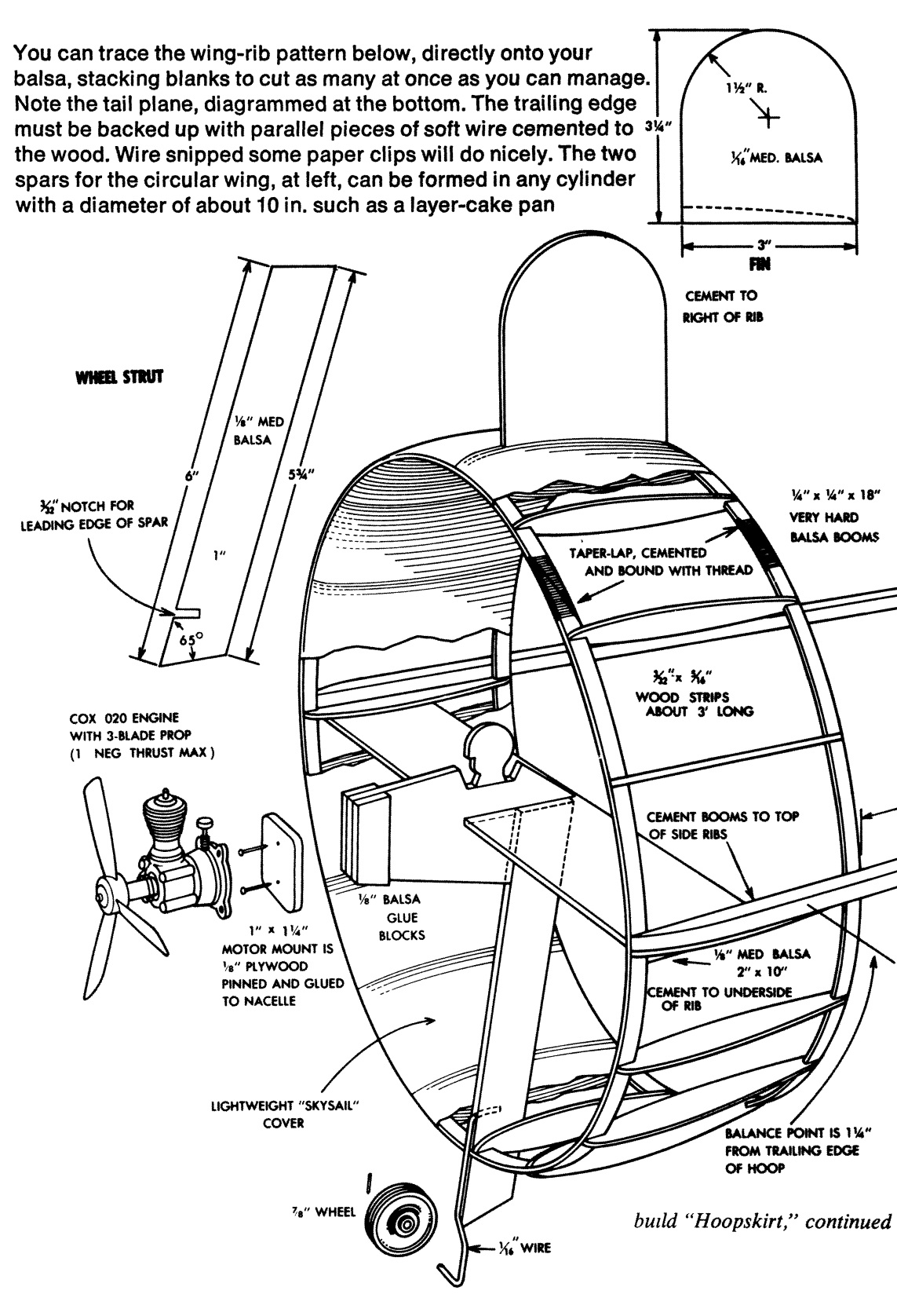
Hand launch the model over tall grass until, by bending the elevators up a little at a time, you get a flat glide. As a check on these adjustments try a flight with the motor running rich, then lean it out and watch your model zoom.

This is a free-flying model, and has not been adapted for control-line operation. It is a stable flyer, and when out of fuel, it will glide gracefully to a landing if you balanced it carefully.

If you're flying it in a limited space, it's a good idea to burn off some of the fuel before turning it loose, because the model travels at a good clip.

In any event, you'll draw a good many curious glances—and perhaps a few snorts of derision —when you take Hoopskirt out for its first flight. Any snickers in your direction, though, will quickly change to whistles of admiration when onlookers see the stability of the "flying barrel," one of the earliest of all aircraft designs.

You can trace the wing-rib pattern below, directly onto your balsa, stacking blanks to cut as many at once as you can manage. Note the tail plane, diagrammed at the bottom. The trailing edge must be backed up with parallel pieces of soft wire cemented to the wood. Wire snipped some paper clips will do nicely. The two spars for the circular wing, at left, can be formed in any cylinder with a diameter of about 10 in. such as a layer-cake pan

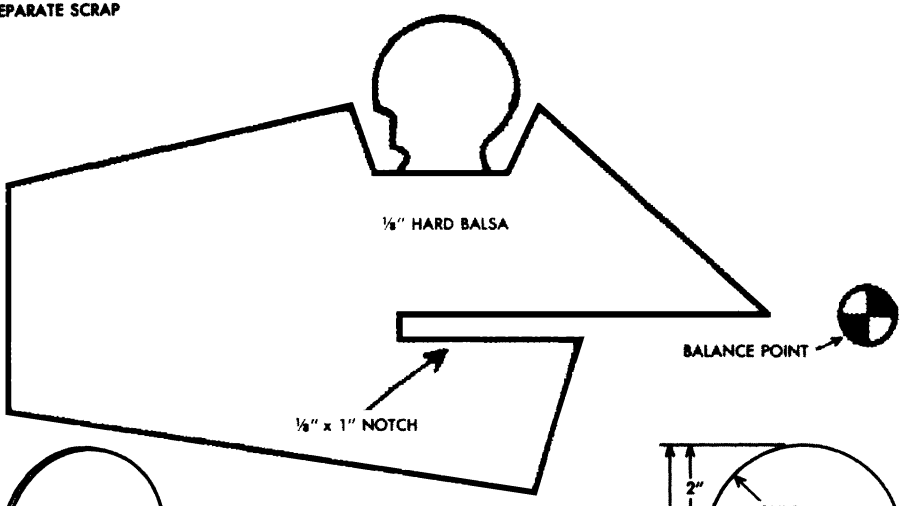


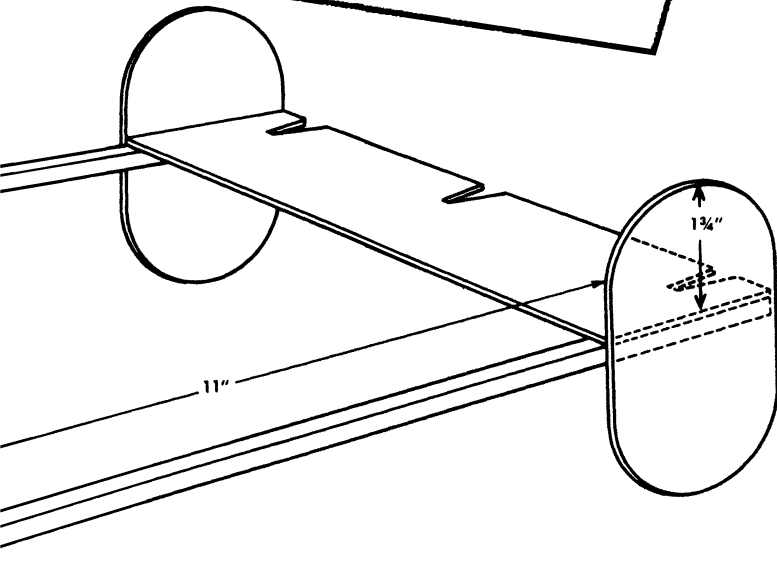
build "Hoopskirt," continued

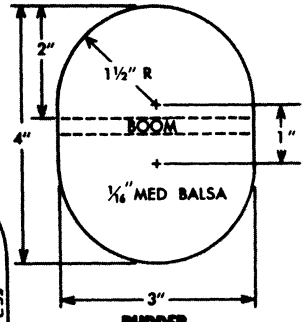
"Hoopskirt"

NACELLE

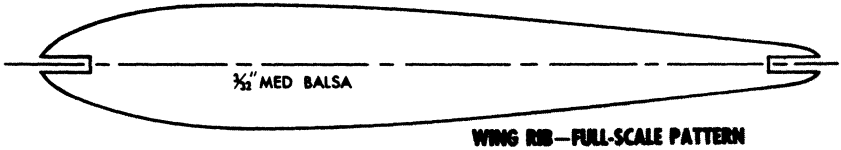
PILOT HEAD CAN BE SEPARATE SCRAP



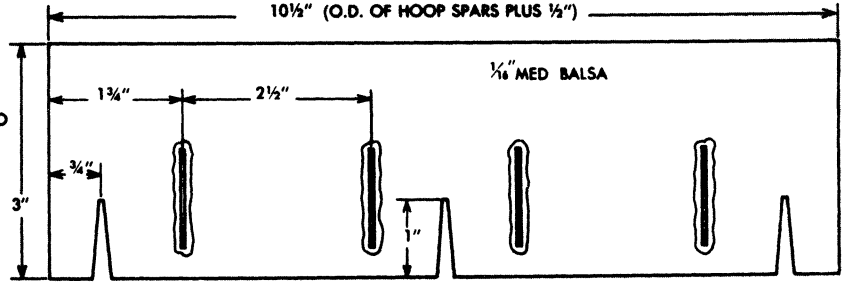




RUDDER
MAKE 2



WING RIB—FULL-SCALE PATTERN
MAKE 16



TAIL PLANE
SOFT WIRE CEMENTED TO UNDERSURFACE TO HOLD ADJUSTMENTS