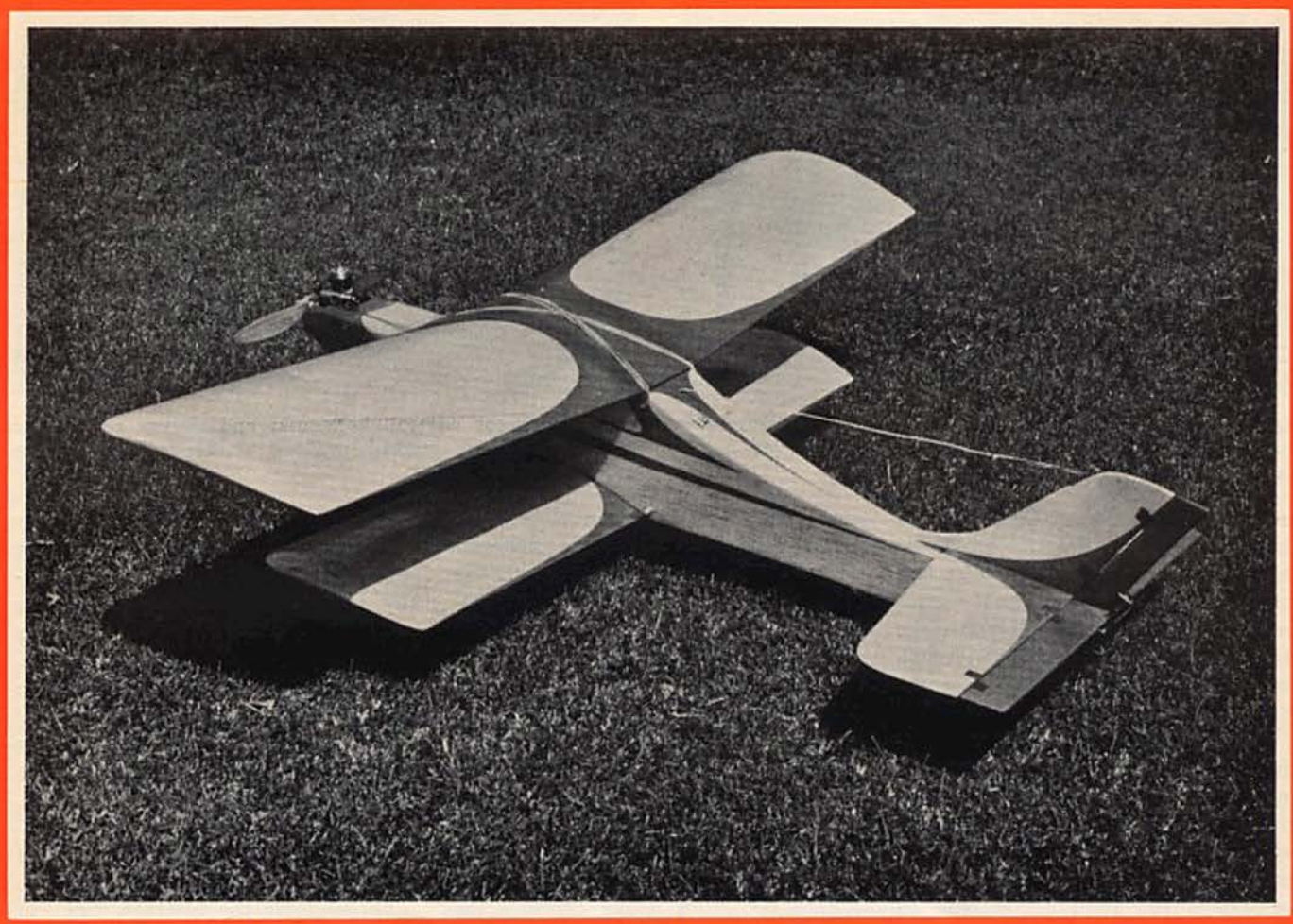


The Maestro's latest single channel sportster is characterized by a flair for appearance and performance that promises to outdo even its renowned predecessors.

THE SCHOOLGIRL

By
KEN WILLARD

For the last couple of months I've been promising to publish the plans for a new sport biplane, only to keep postponing the deal because you fellows have been coming up with some timely items. Since I showed you the teaser picture in the January issue, I'd better get with it and put out the plans, so here they are.

The model is called the Schoolgirl — for obvious reasons. One short look at the plans and you'll note the family resemblance to the Schoolboy and the Schoolmaster. Actually, the Schoolgirl was designed to fill the gap between the Schoolboy and the Schoolmaster, with respect to the power range. The Schoolgirl uses .020 or .049 power and, like the others, is gentle with the lower power, and really zippy with the larger engine. In fact, with .020 power you'll have to use the Cox TD.020 with the special "high thrust" prop that's been designed for it. Otherwise, the model is sluggish. However, with that special prop, the Schoolgirl is a solid performer on .020 power, and will do excellent loops using the kickup elevator.

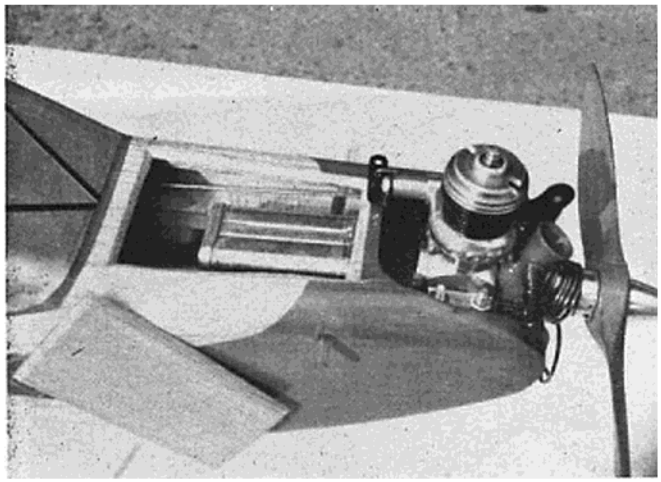
And why a biplane? Well, just because I love 'em, and it's been my experience that thousands of other modelers do, too. But if you're too lazy to build the lower wing, then leave it out and fly the model as a monoplane — it does a fine job. But to me it's a lot prettier as a bipe, and the lower speed makes it much more realistic.

So let's get on with the building and flying instructions. Actually, the building is simple and standard — just a few hints to go along with the plans are all you'll need.

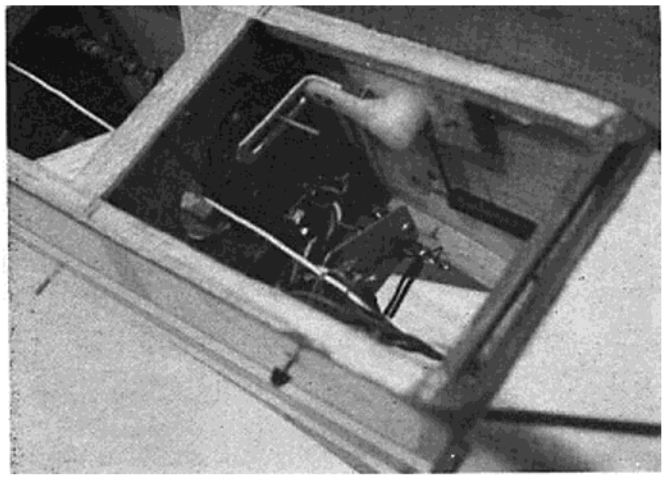
Wings

Both wings are what I would call "standard sheet balsa", as developed by Top Flite for their compact kits. Of course, they use a shaped leading edge, to the right contour. It's a chore, but it doesn't take too long.

For those of you who prefer built up wings, they fly just as well—They're just a little more work. If you want to do it though, I'd suggest a single 3/16" inch square spar along the top and exactly at the peak of the top camber. Cut out the ribs just as though you were using the sheet covering, then sheet the leading edge back to the spar on top and about one inch back on the bottom of both wings. Make the trailing edge either from trailing edge stock, or two pieces of 1/16 by ¾" wide sheet at the top



Engine control pushrod goes through firewall, then doubles back to loop through throttle arm. Note slant of hatch sides. Perfect #19 tank used.



View of motor control, bellcrank, and sleeves adjustment tube, on engine control pushrod. Latter allows infinite adjustments.

and bottom of the trailing edge of the ribs. Then cap strip the ribs from the spar back to the trailing edge and from the bottom sheeting to the trailing edge on the bottom. If you make the cap strips about ½ inch wide you can use the same rib spacing as the all sheet wing.

Reminder: Don't forget to angle the ribs slightly at the center section joints so they'll glue together at the right dihedral. This butt glue joint, when reinforced by the celastic strip as shown, makes a very strong center section. If you can't get celastic locally, then complain to your dealer, because it's great stuff for strengthening joints, repairing breaks, etc. However, if he doesn't have any, then you can use linen, cotton, or nylon cloth — the weight that is used in bedsheets would be about right.

Tail Surfaces

Make these from medium grade 3/32" sheet. Don't use the rock hard stuff. You don't need that much strength, and it only adds unnecessary weight to the tail.

The elevator and rudder hinges are cut from linen or cotton cloth. You could also use the hinge material which the hobby shops sell with the "pinked" edges. Now here's an important suggestion. Don't attach the hinges until after you've finished dopping the surfaces, and when you do glue them in place, avoid getting glue on the cloth that goes through the hinge line. If you do, it'll get stiff and brittle, will crack and break, and won't work well. When the rudder and elevators are attached, they should flop freely, restrained only by the torque rod arms going through the retaining pins.

Landing Gear

Because it's simple, functional, and sufficiently strong, I like to use the bent wire gear, attached with shock absorbing rubber bands. However, it's a matter of choice, and the bent dural gear, which is so common, will serve equally as well. Just add another dowel to anchor the back to or else replace the ⅛" dowel for the lower wing with a 3/16" dowel that will serve a dual purpose.

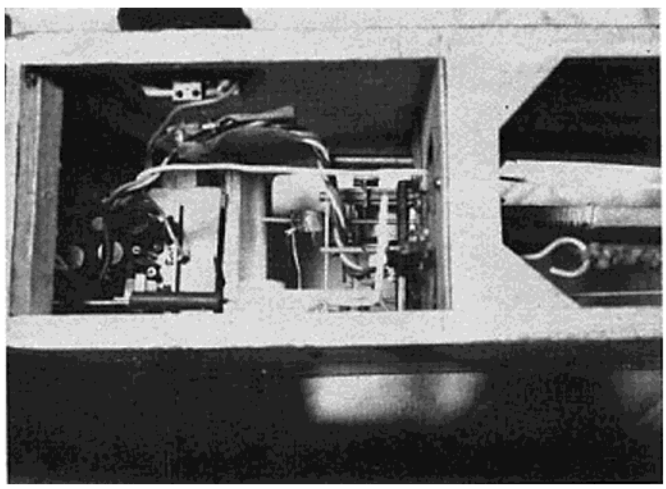
Fuselage

As always, this is the most complex part of the structure, therefore, I usually leave it to the last. Then the completed wings and tail surfaces hang around the shop, silently accusing me of being lazy, until I give them a body to which to belong.

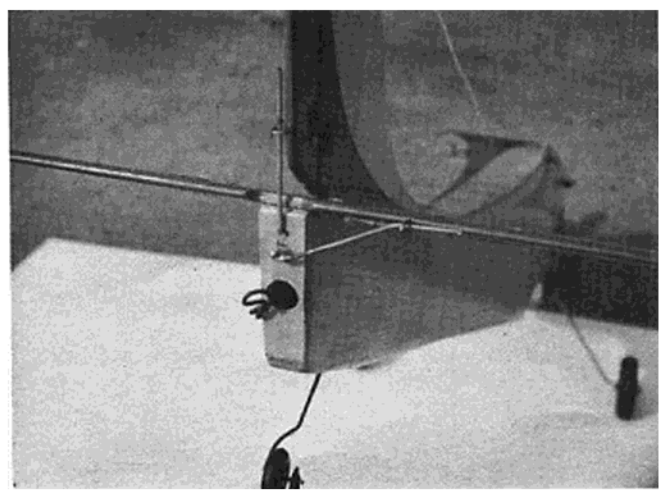
Even so, the Schoolgirl fuselage is quite simple in comparison to some designs. Yet the use of gentle curves, with rounded corners at the windshield and forward structure, results in very pleasing lines.

To assemble the fuselage, first cut out the sides and glue the doublers and braces in place. Next, lay one side flat on your worktable and glue the cross braces in place at the leading edge and trailing edge of the wing locations. Make sure they're at right angles to the side on the work table and quickly glue the other side to the cross braces. Prop the cross braces and supported side in place until dry, then add the cross bracing at the escapement bulkhead. This cross bracing should be of the "rock hard"

Looking down on receiver, Otarion switch, (no longer made) and Babcock escapements.



Rudder and elevator torque rod arms.



balsa variety, since the escapement bulkhead is attached to it with screws for easy access and removal.

After you get the cabin area structure firmly glued together, the nose can be pinched together to fit the firewall in place, then the tail pulled together and the tailplate glued on. When you do these two operations, be careful to sight along the centerline and make sure the two sides are pulled in equally. Otherwise, you'll wind up with a longitudinal curve in the fuselage centerline — and that can cause some real problems in the flying adjustments.

Now, just add the other crossbraces, the wing, and landing gear dowels, and you're ready to cover the top and bottom. Before you do that, though, I strongly recommend that you fit the removable escapement bulkhead in place and check the fit and operation of the torque rods. It'll be pretty close quarters, and you'd better make sure that all clearances are good before you close the fuselage. Note that the elevator torque rod is 3/16" balsa with wire ends, and the rudder torque rod is all one wire. This is to provide the clearance where they cross at the back.

After the top and bottom are on, you can shape the windshield corners and the fuselage corners forward of the wings into the slightly rounded contours which show in the photos. After the first coat of dope, add the celastic reinforcement to the bottom of the fuselage where the landing gear fits, or alternatively, you can dope that area locally before applying the celastic. Again, if you don't have celastic, then glue a piece of 1/16" x ¾" plywood across the bottom so the landing gear wire is held against the plywood.

The engine installation shown on the plans for the Cox Medallion .049 with throttle control will probably give you a few moments of trouble. The engine bearing plate bolts to the engine bearers, and the quarters are a little cramped. I suppose I could have left the nose a little wider, but I happen to like the sleek, tapered look, and figure it's worth the little extra effort required in fitting the bolts in place.

Note the downthrust and right thrust which is automatically provided by the placement of the engine bearers and the cutout in the engine bearing plate. You may find it necessary to add a washer under the rear mounting holes of the engine for a slightly increased downthrust angle if your flight tests show the plane having a tendency to climb too much under full power. We'll talk more about that later on.

The system which I have shown for engine control, using the Bonner SN, a Top Flite bellcrank, and a pushrod, has proven to be very reliable. For easy adjustment of the pushrod, I've made it two inches longer than the required length, then cut it just forward of the bellcrank. At the break, I've inserted the two ends inside a small diameter plastic tube about one inch long. Thus the two ends, overlapping about one inch, are held together in friction fit inside the tube. They can be, however, slid back and forth as needed for adjustment of the throttle linkage.

The receiver tray which holds the battery box and receiver as a unit, slides into the fuselage through the top opening. As it is inserted, the batteries fit underneath the fuel tank, and the forward end of the tray butts up against the firewall. Then the whole assembly is held in place with a small wood screw that goes into the cross brace.

Finishing

Whether you use dope or Hobbypoxy is a matter of choice; sanding, important first step, however, is not. Unless you have the wood sanded to a very smooth surface, neither dope nor Hobbypoxy can overcome a rough base.

Rounding the corners of the fuselage forward of the wings and landing gear can be done either by using a single edge razor blade — or Xacto knife, or by using rough sandpaper until the approximate curve is obtained. Then fine sandpaper is used to get a smooth finish.

The prototype was finished in butyrate dope. Four coats of clear, slightly thinned dope, with light sanding between coats, yielded a nice gloss to the natural wood finish. The red stripping was applied using masking tape; after it was located properly on the wood surfaces, it was sealed with clear dope before the red dope was applied. This prevents the red dope from seeping under the tape and spoiling the line.

After the fuselage is doped and finished, the access hatch above the fuel tank can be cut out. Cut the balsa on a slant, so the hatch will rest in place and not fall through.

When you're ready to fly, the hatch can then be spot-glued in place, or held on by a strip of tape or a rubber band.

The fuel tank — a Perfect No. 19 — is held in place by the three point suspension provided by the filler tube extensions through the sides, and the fuel line nozzle at the bottom of the tank which protrudes through a hole in the firewall.

Flying

Out of respect for the well founded observations of my friend, Tom Stence, whom you read in the January column, I'd better give some instructions on adjusting and flying the Schoolgirl, and not brush the subject off with "It's been covered so often before." So here are a few things to do before launching the model on the maiden flight.

First, is the preflight checkout. With apologies to Tom, I have to say that in the February, 1964 issue of Radio Control Modeler I went into considerable detail on how to check your model for balance and for possible warps in the surfaces. True, the discussion was slanted to the Virus beginner's model, but the basic requirements are the same for all models. I'll review them briefly.

To check the center of gravity location, pick up the Schoolgirl by the top wingtips, with your fingers in line with the desired location of the C.G. as shown on the plans. The model should hang level. If it doesn't then move the batteries and receiver forward or back as required on the receiver tray. (The battery box and the receiver are held in place with rubber bands around the tray, so this is easy.) In this regard, it's a good idea to check the location of the batteries after any hard landing, just in case they jar loose and slide forward.

After checking the C.G., check all surfaces for warps. You're not likely to have any in the wings, since they are built on a flat surface and once they are finished they're practically the same as a box spar. This may not be the case if you make built up

wings, since the covering sometimes can pull the wing slightly out of shape. Sight along the bottom surface of the wings and if the bottom of the tip rib isn't parallel with the center section rib, you'll have to warp the wing back into line. Heat the wing over the kitchen range until the covering becomes pliable, then twist the wing while you hold it in place. While you're heating the wing, keep running your hand under it to prevent it from getting too hot.

Next, check the tail surfaces to be sure they're not twisted. If they are, you can realign them by the heat method described.

So, your model is balanced and checked for alignment. Next check the operation of the controls. The tail control surfaces should flop easily in following the torque rod arms. Particular attention should be paid to the elevator; make sure it returns to neutral from the kickup position. If your hinges are stiff and it doesn't drop easily back, then fix it — or you'll have to repair the whole airplane later! All models are very sensitive to elevator trim.

If you are using engine control, the Bonner SN hook up to the bellcrank must follow freely without binding, and up in the nose the exhaust baffle should slide freely back and forth. This may not be the case if the engine is cold and the baffle is a little sticky, but as soon as you run the engine briefly the exhaust will free up. In addition, you'll have to use very pliable fuel line, since the throttle system requires that the fuel line twist slightly.

So, the airplane is now balanced, the controls work, the surfaces are true, and you're ready to fly. Wait a minute! Did you check out your transmitter and receiver batteries? And did you check the tuning? You did? Okay. Let's fly it.

Fire up the engine and check out the controls with the engine running to be sure that vibration doesn't affect the controls. Check the quick blip, and incidentally, check the speed with which you can get left rudder (two pulses and hold) without getting an unexpected engine speed control because you pressed and released too fast in going from the first pulse to the second. That's one of the little hazards of quick blip.

Think we should try a hand glide? You can if you want to, but if you've done all the things described above, I doubt if it will prove anything (unless you've done something wrong.) But if you have a nice field of soft turf, and there's a slight breeze of about four to six miles per hour, you can glide it a couple of times and check the elevator trim and C.G. location.

Now for the first flight. If you have a friend that can give you a good hand launch, level and at the right flying speed, use him. If not, then try a takeoff (make sure the wheels spin freely.) Or if you're an old hand at it, you can launch the model in one hand with the transmitter in the other, though sometimes this gets troublesome if the model happens to slip or get caught by a gust before you can get your finger on the button.

About the only thing I can think of for you to watch for with the Schoolgirl is that it has the normal tendency of all bipes to lay over in a turn — and stay there. This is no problem unless you have a slight nose-down tendency, then the turn will develop into a spiral dive. Otherwise, the bipe will hold a turn and maintain altitude until you pull it out into straight flight.

Earlier, I mentioned that you might have to add some downthrust. This depends on the final balance of the model and also depends on whether you want a floating type glide or a fast one for flying into the wind.

I can't think of any real tricks in flying the Schoolgirl, except the same ones that apply to all models; for instance pulling the model out of a stall by turning it into a climbing turn with rudder. Of course, if you haven't lined up the surfaces carefully, or the C.G. location is off, a lot of tricks might be necessary, but in the sage words of Tom the philosopher, you'll make out all right as long as the "number of trials exceeds the number of errors by one . . .

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