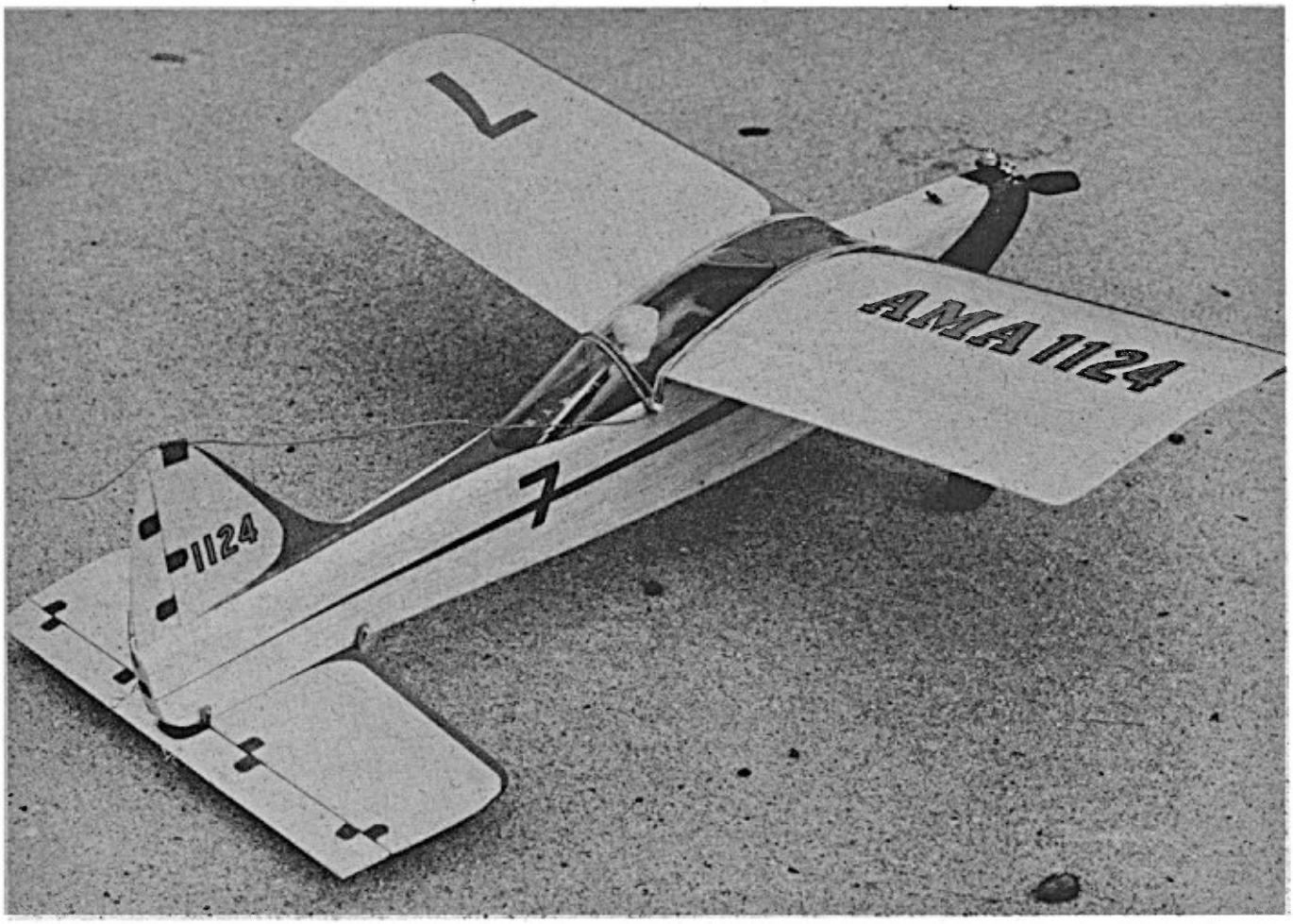
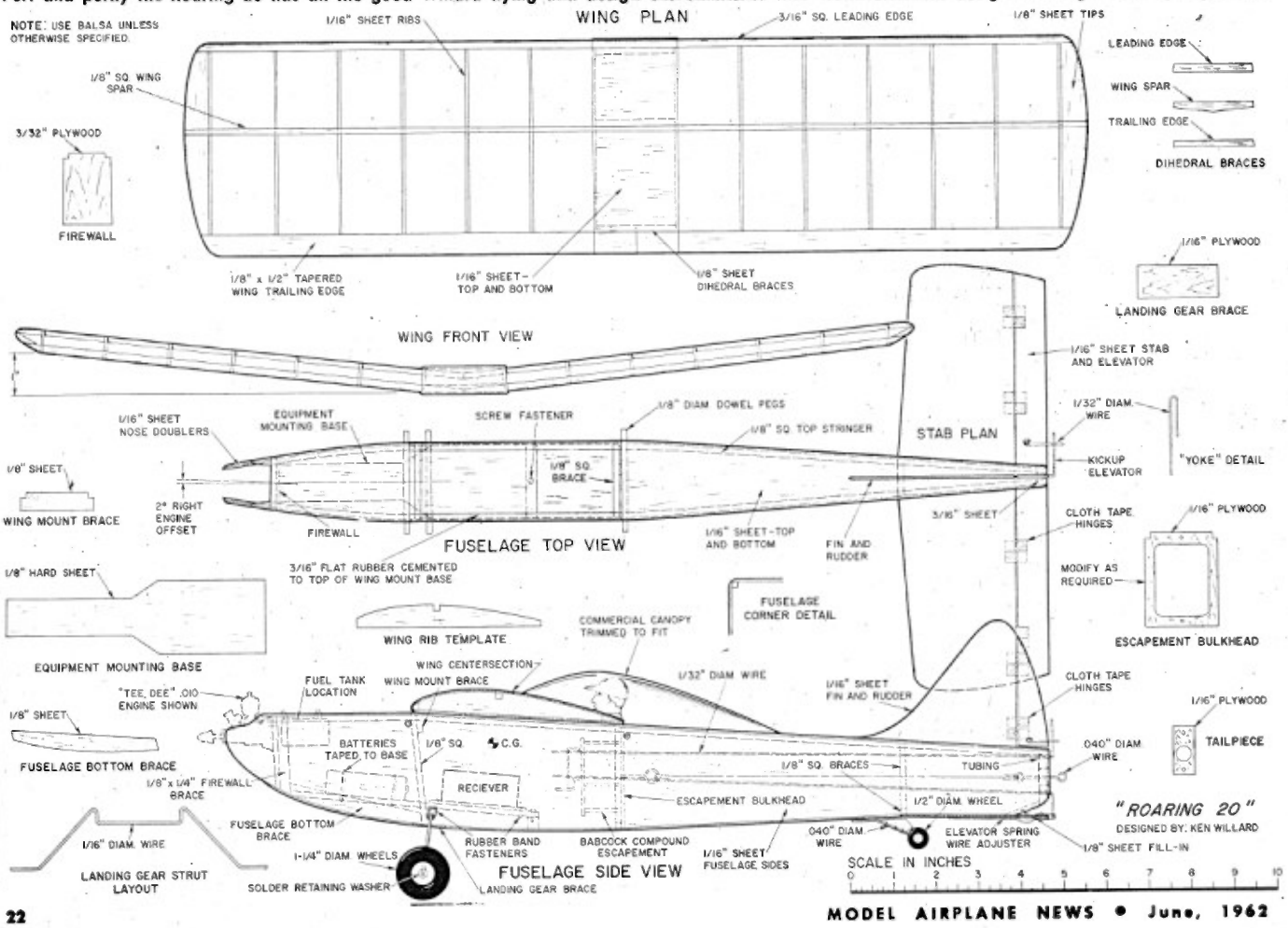


Pert and perky the Roaring 20 has all the good Willard flying and design characteristics and looks. Excellent design is being kitted by Top Flite.



FULL SCALE PLANS AVAILABLE—SEE PAGE 57

Here is carrying case mentioned previously—designed to airline specs it can be brought aboard and stowed under seat. Note xmtr lower right corner.

Roaring 20

THE MAN OF A THOUSAND MODELS HAS DONE IT AGAIN—AS USUAL IN THE SMALL ⅛ AND ¼ A RADIO CONTROL SIZE. TRAVELING IS PART OF HIS BUSINESS THUSLY NEED OF A CARRY-ON MODEL FOR AIRLINE TRAVEL—WE HAVE COMPLETE MODEL AND GEAR IN CARRYING CASE.

Ken and the little one rather stole the show at last year's Nats. Opening his pandora box always managed to draw a good sized crowd.

BY KEN WILLARD

Twenty inches long; twenty-inch span; superhot performance with a Tee Dee .020. And that's where the name "Roaring 20" came from.

But don't let it scare you from building it because you can build up gradually by powering the model first with an .010 until you learn all about its flight characteristics. For most fellows, the .010 version will be plenty satisfactory anyway.

The Roaring 20 is a direct descendant from the Gasser and the Scorcher. The same general force setup is used, but a comparatively thick airfoil tames the model down and makes it a very reliable and maneuverable job. The fuselage bellies down a little more—this is required in order to accommodate the Babcock escapement without having to cut it down.

Only the light weight transistorized receivers which operate on three volts are recommended, otherwise the weight builds up too fast and the model would be far too tricky. Also, you will note that the plans show the batteries soldered at the connections and taped to the mounting base. Two reasons for this—it saves the weight of a battery box, and with two Eveready E91 energizers that are really fresh when you put them in you can fly practically all summer.

Like all small models, (*Continued on page* 38)

Roaring Twenty

(*Continued from page 22*)

the Roaring 20 reacts rapidly, but by varying the amount of rudder throw you can go as gentle or as wild as you like. More about that later.

So, start it now, and fly it next weekend.

WING

The wing is conventional, single spar construction. Sometimes people ask me why I put the spar along the top. There's a good reason. When you cover a wing and the silk, or paper as the case may be, shrinks to the frame, it will pull down between the ribs on the top surface. This tends to pull the wing up and in towards the center, and the wing bows upward. But the spar on top prevents this from happening.

Medium grade balsa is used throughout —not only on the wing, but everywhere. These small models don't have the impact loads that the larger models have so you don't have to use hard balsa. And that makes a difference in the weight.

If you don't want to use a balsa block for the tips, you can use a piece of 1/16 inch balsa sloping up from the flat bottom surface until it touches the spar, then sand the spar to fit it. But the carved block tips look better—and they are a little more rugged.

The center section may seem a little oversimplified, but that's what makes it go together fast. You just build the wing as if it wasn't going to be covered across the center with 1/16 sheet, then cover it anyway. Now if this hurts your esthetic sense of construction, go ahead and cut the two center ribs down so the sheet is "inlaid" and you'll have a smooth line. But when you cover the whole thing with silk it tightens up and makes a flowing line that looks just as good for practical purposes. The decision is yours.

TAIL SURFACES

No problems here. Just cut them out of 1/16 medium sheet. Attach the hinges *after* you've completed doping the model; otherwise, they'll stiffen up and crack.

LANDING GEAR

This is undoubtedly the simplest shock absorbing landing gear you can use. Bend the 1/16 wire to shape so it fits the bottom contour and width of the fuselage. Then when you attach it with the rubber bands, it will absorb shocks in all directions. Notch the plywood reinforcement on which the landing gear wire bears and this will keep the wire from sliding out of position. The tail wheel is mounted on 1/32 inch wire which is backed up by a balsa streamlining block.

FUSELAGE

The fuselage is a simple box construction, with rounded corners on top made possible by the stringers. Assemble each side by gluing the stringers and upright braces in place. Be careful to align the braces accurately at the escapement bulkhead. Also, note the offset between the braces on the right and left sides at the firewall to give a little built in right thrust.

With the sides assembled, including the doublers along the bottom from the firewall back to the landing gear, you are ready to put them together. Glue the tail block and the escapement bulkhead in place, then, holding the tail together with rubber bands stretched around it, pull the forward end of the fuselage together and glue the cross braces in place at the wing leading edge station and across the bottom where the landing gear brace fits. Next, pinch the forward end of the fuselage at the firewall together and glue the firewall in place. Hold the sides together with rubber bands until they are completely dry. If necessary, use a couple of Tee pins going through the sides and sticking into the edges of the firewall.

Next, glue the cross braces in place at the leading edge of the stab. Then the 1/16 plywood tailpiece; then the ⅛ wing and landing gear dowels.

Before covering the top and bottom of the fuselage with 1/16 sheet, complete the installation of the escapement and torque rods. This way you can make sure they fit without any binding. Drill holes in the plywood tailpiece to serve as bearings. Make them just large enough so the rod fits loosely, but not so large as to have a lot of excess play. Now you may have some misgivings about using wood bearings, but forget it. In models this size, they work fine, just so long as they are loose enough so they don't bind as they get older and tend too swell a bit.

Also, drill the firewall with mounting holes to fit your engine. As for the mounting itself, there are several ways. If you don't want to make an access hatch, then

(*Continued on page 40*)

Roaring Twenty

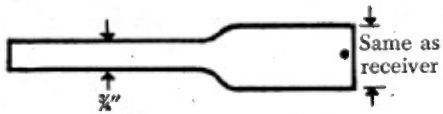
(*Continued from page* 38)

attach the engine mount nuts permanently to the rear of the firewall. This can be done by soldering the nuts, properly spaced, to a thin metal sheet and then attaching the sheet to the back of the firewall with epoxy resin. If, however, you prefer an access hatch, you can just drill the firewall out. Then, instead of permanently covering the forward top side of the model, make a hatch to fit, with ⅛" square aligning braces that fit snugly inside the ⅛" square fuselage stringers, and across the fuselage behind the firewall and ahead of the cross brace at the wing leading edge. If you make a hatch, mount the tank right to it, using epoxy resin adhesive, with the filler tubes and fuel line intake tube sticking out through the top. The hatch can be held in place either with rubber bands, pins, or, if you carefully clean the wood so that it is free of fuel, Scotch pressure sensitive tape, which comes in various colors and can be obtained at any drug or variety store.

OK. Now, cover the bottom. Note the stab serves to cover the bottom in back. From there forward to the landing gear plywood reinforcing plate, cover with 1/16" sheet, grain lengthwise. From the plywood forward, use 1/16" sheet with the grain going crosswise.

And this is the time to fit the radio and batteries in and be sure everything goes in and out all right before the top is covered.

Because the Pioneer, Citizenship, C & S and Otarion receivers are all a little different there are several ways of mounting. Let me suggest one which I like because it is easily removable, and can be adapted to fit other models, like the Schoolboy, and you don't have to have two radios. Cut out a mounting base from ⅛" balsa sheet, one end of which is the same width as the receiver, the other end tapered down to ¾" —like this:



Tape the pencell batteries together (Eveready E91 cells have very long life with these small receivers), solder the leads, then tape them to the base (you can tape them wherever they provide the right balance for your model). Mount the receiver to the base by strapping it on with rubber bands. The whole assembly slides in and out of the fuselage through the opening beneath the wing. You can make the switch leads long enough for this purpose, or maybe you'd like to use the switch I favor —a single prod and socket connection cut from an old Winchester plug. Bring the leads out on either side of the fuselage at the wing leading edge, and plug the "switch" together when you're ready to fly. It may not be elegant, but it works; it's light, and you certainly can tell at a glance whether your radio is on or off—and that's rather important.

To hold this radio and battery mount in place, glue in a piece of hard balsa at the point in the fuselage where the back end of the mount fits when the forward end butts up against the firewall. The mount then rests on the landing gear mounting dowel, the fuselage bottom behind the firewall, and the piece of strategically placed balsa. Screw it down to the balsa piece with a small wood screw and your radio and batteries are installed.

Everything fits? OK, take it out, and cover the top of the fuselage—or make the forward hatch and cover the rear. Add a 1/16" by 3/16" stringer along the fuselage sides at the top under the wing to give a smooth line, and you're ready for assembly and doping.

ASSEMBLY

Glue the stab in place on the bottom of the fuselage. To compensate for any misalignment of the sides when you assembled them, put the wing on with its mounting rubber bands and line the stab up. Shave off either side of the bottom of the fuselage sides as required to make the stab line up properly in the horizontal position. This may not be necessary if you've carefully lined up the sides before you glued them together, but it's worth checking.

Next, butt glue the fin to the top of the fuselage. Let it dry, then run a bead of glue along either side at the joint and let the glue dry thoroughly. It may not seem like a strong end joint, but again, you have to remember that these little jobs just don't take the beating the big ones have to.

Hold off on mounting the rudder and elevators with the cloth hinges until after you've doped the fuselage, stab, and fin assembly. This will keep the cloth from absorbing the dope, getting stiff, and cracking.

Fitting the canopy is a tailoring job that requires a little patience. A commercial canopy can be cut to fit, then glued to the wing (after covering) or you can hold it in place by running a rubber band over it and around the rear wing mount dowels. Of course, if you're the impatient type and can't wait, you can leave the canopy off. It's only for appearance and has no noticeable effect on the flight characteristics.

COVERING AND DOPING

Cover the wing with silk or paper in the conventional manner. Then apply four or five coats of dope, depending on how it

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brings up the gloss. If you use butyrate, no fuel proofing is necessary. Nitrate dope requires the added protection.

The fuselage and tail surfaces should have at least four coats of clear dope, then if you so desire, a coat of colored dope to suit your decorative taste. I prefer the natural wood finish with a colored dope striping job. One important point: When doping the fin and stab, be sure to coat both sides, one right after the other. If you don't, the surface will warp. The warpage is prevented when both sides dry out together. Any slight warp which might occur can be removed by holding the surface over a hot stove burner until the dope softens, then straighten and hold in position until the surface cools off.

FLYING

So the model is finished, doped, decorated, and ready for checkout and test flight. Install the radio and battery on the mount, hook up the escapement rubber, adjust the rudder and elevator followers for minimum travel (if you fly rudder only, the elevator can be permanently mounted with stiff aluminum hinges that can be bent slightly for adjustment purposes), run a distance check with your receiver, and you're ready for test flights.

One of the big features of these small radio models is that, in addition to their ease of construction, they are easy to fly—if you go about it the right way. You undoubtedly have heard it said that they are skittery, fast, jerky, and wild. Well, they are—unless you set them up right in the first place. You can make them as wild or as gentle as you like. And here's how.

The small RC models, weighing from 7 to 12 ounces, can be handled just like the old time sport free flights when it comes to the first test flights. Hand gliding, which is not too practical with the larger jobs, is very useful in adjusting the model.

Find yourself a large vacant lot, or a field that is overgrown with tall grass or green weeds. I know—this is the same advice you've been reading ever since you started building models—but this time I'm suggesting it from the viewpoint of radio jobs rather than free flight. Remember, tall grass isn't much of a cushion for a five-pound model, but it will save a lot of minor repair work on a ten-ounce job.

The real reason for seeking out the tall grass is to prevent damage in case your model is far out of adjustment. The worst damage is usually done on the first glide or two. For example, if the model is tail heavy, you launch it, it swoops up into a stall, falls, and dives into the ground nose first, and your whole radio installation is jarred so hard it may break loose. Or, if it happens on blacktop, you could damage your engine.

But if your model is pretty well balanced, no warps in the wing or stab, and the center of gravity pretty close to where it shows on the plans, the hand gliding will serve to adjust the elevators for the best glide. Incidentally, that is one thing to remember. These small jobs are sensitive to elevator setting more than their big brothers because their scale speed is relatively faster.

Let's go through the hand gliding sequence. Launch the model into the wind (and don't do this testing unless the wind is light). Launch it level, or even with the nose slightly down. Don't heave it up in the air! Try to estimate the speed with which you let it go so that it will be roughly equal to the normal gliding speed of the model (somewhere around 15-18 mph). If anything, launch the model too slowly at first, and gradually build up the launch speed. As you come up to glide speed, the ideal reaction of the model is to glide straight ahead for a short distance, then the nose should drop slightly and assume a gentle glide angle, at which angle the model should sink to the ground.

If the model noses up, stalls, and drops, then check two things: First, is your CG where it belongs? If not, move the batteries forward, as required. If, however, the CG is OK, then check your elevators, and by bending the adjustment wire, drop them slightly—1/32 inch at a time. It may take a combination of both corrective actions.

If the model dives into the ground, even though you launch it faster than glide speed, then move the batteries back, or bend the elevator adjustment spring up a bit—1/32 inch at a time.

If any tendency to turn is noted in the glide, check your wings, stab and fin for warps; also make sure the rudder is straight. Don't try to overcome any warps by using opposite rudder—this could be fatal when you apply power. Go home and straighten out the warps over a hot plate, then come back and continue the glide testing until you achieve the ideal pattern.

Now you've finished the glide tests. It's time for the first powered flight. Set the rudder yoke down for minimum travel. Also, the elevator yoke if you're using one. (The elevator ordinarily is not required except when you want to stunt the models). Check out the radio range. Put in enough fuel for a short flight—about a minute or so.

All this discussion on gliding and checking assumes you are pretty much of a newcomer to the small RC model flying. But if you have flown sport free flight, you will recognize the great similarity. It continues even when you go from gliding to powered flight. The ideal flight path for small RC models is the same as that for

sport free flight models. They should climb in a sweeping left turn, and glide either straight or in a wide right turn. The wide right turn in the glide is really the safest, in case of radio failure, since the model won't go quite so far away.

So, fire up your engine, turn on the radio, check it with engine running (escapement wound?) then launch the model straight ahead and level into the wind. Don't heave it up! If you've done your glide tests carefully, the model should go into a very slight left turn and start climbing—just like sport free flight. If it does—and most of them will—then let it climb in free flight until it is about 60 or 70 feet up, then give it a short right rudder command. This should straighten the flight path out and make the model go into a right turn. It should be a gentle action, but let up on the rudder when it does get into the right turn, or the nose will drop. Let the model recover by itself and go back into the gentle climbing turn to the left. Now you can experiment a little—a couple of right rudder commands in sequence, maybe enough to make a complete right circle. Try not to hold any signal so long the model gets the nose down too far and picks up speed. This usually confuses the beginner and he tries to correct, only to make it worse.

If, when you give the first right rudder command, the model rocks violently over, then let it alone. You only put in a short run of fuel, didn't you? Chase it, a la free flight, and when it glides to earth, take it back, reduce the rudder throw even more (if this can't be done, cut down the area a bit, although this would be an extreme case) and try another short flight.

It could happen that, due to small variations in your construction, your model takes off in a right turn. This is not serious, unless the turn tightens up. If it does, you'll have to either let it circle down until it hits, or try to correct with left rudder. This is a little hard for the beginner, because the excitement usually is too much, and instead of pushing the button twice he hits it once or maybe three times. That's the beauty of the left turn characteristic; if you need right rudder you only need to push the button once—and that's pretty hard to bungle.

Perhaps the most conservative way, for someone who has never pushed a button but has flown free flight, is to make all your flight adjustments with short free flights. Keep your radio on anyway, but don't use it except in dire emergency. Make short flights until you get the flight path set—left turn under power, right turn in glide. Most of you know how to do this, adjusting the thrust line or the rudder, but I'll make a brief summary anyway.

1. Model climbs to left, glides to left; adjust rudder slightly to right.
2. Model climbs to right, glides to right; adjust with slight left rudder.
3. Model circles tightly to left under power, glides straight or to right. Put in slightly more right thrust.
4. Model circles to right under power, glides straight or to left. Take out a little of the right thrust.
5. Model glides fine, but swoops under power and tends to stall. Add a little downthrust.
6. Model glides OK, but dives in under power. Take out some downthrust (this is rare with the little jobs).

All the above adjustments assume that you've removed any warps, and your wing, stab, and fin are properly aligned. This is very important in small models, because an eighth of an inch misalignment in a small job is equal to a half inch in the big ones.

All the foregoing has been written in the assumption that you are pretty much on your own. If, however, you do have access to a radio control field where there are experienced flyers (and be sure they are as I've heard a lot of "word experts" give advice who have never flown a model), then ask for help. Take the approach that you're learning to fly and that just like in learning on the man carrying jobs, dual instruction is the best course to follow. No matter how much you read, you can't learn it all from books. A good instructor will save you a lot of repair jobs.

But if you live in the country, can't get help without a long drive, then find that big field with the tall grass, and teach yourself. And, by starting small, you can learn without the discouragement of major crashes. Sure, you'll bang the little ones around and have to repair them, but it isn't anywhere near the job that the big ones are. And you'll find that after you've gotten pretty proficient with your little models, the big ones come easy.

Start with the Schoolboy (a real good "learner"), then take on the Roaring 20 (a little hotter—especially with the .020) and from then on you're "hooked" like I am—a real RC addict. And that's the best kind.