a trophy stalking Cougar!

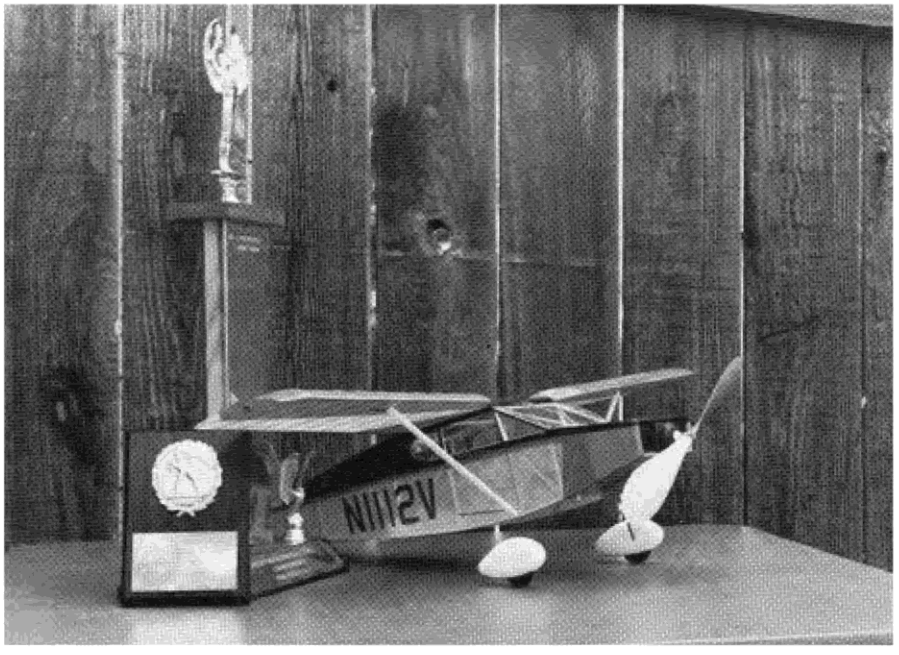
Challenge the supremacy of Fikes and Laceys.

By Perry Peterson

Even though the *Cougar* spans only 25 inches, its low aspect ratio wing and boxy fuselage make this a bigger plane than some jumbo rubber models.

The Nesmith *Cougar*, like the *Tailwind* it emulated, is one of the more flyable designs available to scale builders and I think it looks better than the *Fike E* or *Lacey M 10. Fike's* and *Lacey's* have a lot more wing area, but for some reason, I often see them out performed by the *Cougar* which has a much higher wing loading. My own personal experience has shown that my old, tired, nine year old peanut *Cougar* has never been out flown by a *Lacey* and the only *Fike* to do it belonged to Bob Willey's Nats winner (my *Cougar* came in second).

One of the nice things about modelling a home built plane is the freedom of colors and color combinations that can be used to finish the model. The freedom to alter aircraft design can also be available to the modeller. Often full size *Cougars* were built with different window and cowl treatment to suit the builder. Also many different colors and color combinations were used. If you are not building for a contest, the sky is the limit to color selection and minor design variations. As you build, imagine you are building the full size plane and do your own thing!



Even with a higher-than-normal wing loading, the author claims the plane flies "like a home-sick angel." The trophy hardware next to it, from the Rocky Mountain F/F Champs seems to vindicate the author's claim.

For this project, I chose a *Cougar* built in the late 1950's by C. Warren Cronce of Lockport, NY. The project was finished in 1960 and flew for the first time on July 27, 1960. According an article found in *Cougar* Stories, which accompanied a *Cougar* 3-view I purchased from EAA several years ago, the paint job on the Cronce *Cougar* was designed and tested on a scale model by a friend of the builder. About ten years ago I purchased a color photo and several black and white photos of this plane from two of the now defunct companies selling aircraft photos. The 115 HP Lycoming powered Warren Cronce *Cougar* is quite striking with it's Halloween colors of orange, black and white.

My model of this *Cougar* was built just prior to the annual Rocky Mountain Free Flight championships held Labor Day weekend, 1988. It was flight tested two days before the contest in winds too gusty to properly evaluate the glide. The day of the contest was not as windy; only about 5 to 6 miles per hour. After one more test flight, I put two officials "in the bank". As it turned out, the *Cougar* won first place and the big travelling trophy. In spite of a wing loading a little higher than I like in a rubber model, this plane flies like the proverbial homesick

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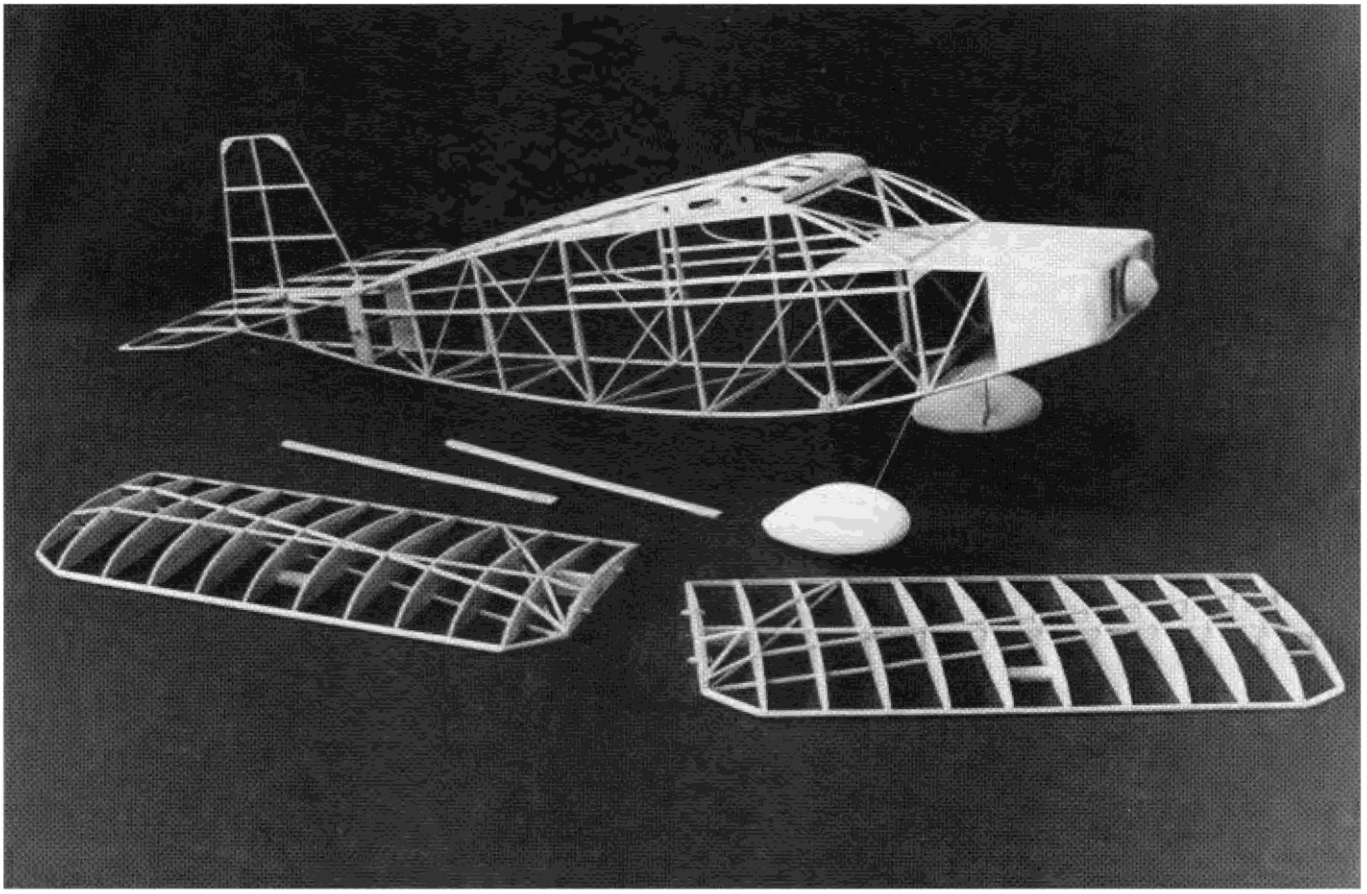

The large fuselage is framed up mostly from 3/32nd square balsa while the tail feathers use smaller 1/16th square stock in the interests of weight saving. Adding the cross pieces to the fuselage side frames is a little tricky since the bottom of the fuselage is narrower than the top.

angel! Like the full size plane, the wide fuselage acts as a lifting airfoil section.

Fuselage

Even though this plane has a wing span of less than 26 inches, the fuselage is wider and almost as long as most jumbo rubber scale models. Use very firm balsa strips for the longerons and cross pieces. If you leave out the "holding block" gussets shown on the side view, the nice graceful curve you put in the lower longeron will probably not stay and part of that curve will be transferred to the top longeron when unpinned from the plan!

The basic box fuselage is built with 3/32 square balsa over the plan side view, with one side built over the other and separated after the glue is dry. Adding the cross pieces to form the fuselage box can be a little tricky because the bottom of the fuselage is a little narrower than the top. I solved this problem by using a template cut from poster board using the fuselage top, shown on the plans, as a pattern. Glue the fuselage sides together at the tail post and pin down over the plan top view. Add the fuselage top cross pieces (bottom cross pieces will be added later) working from the tail post forward using the template as a guide.

I let the side frames trap the template about half way up on the sides. Make sure the sides are at 90 degree angles with the building board. When the top cross pieces are dry, carefully remove the partly built fuselage and turn it upside down and pin it back on the plans. Remove the template and add the remaining cross pieces making sure that the side frames angle in the same amount on each side at the top (which will eventually be the bottom of the finished fuselage).

Add the fuselage stringers and fill in around the windows following the "Typical Molding" illustration shown on the plans. Also fill in at places between longerons and stringer where tissue pieces will meet during the covering process. Use medium weight balsa for the sheet fill in areas in the forward section. Don't forget to add the sheeted area between the base of the windshield and the top of the instrument panel area. Most *Cougar* models I have seen do not have this area sheeted. If you leave this out, your model will have less character and the windshield will not be protected from rubber lube spatter marks.

Drill the nose block for about two degrees of right thrust. Down thrust is built into the model. Key the nose block, as shown in the front view, to prevent inserting upside down when flying which will reverse thrust adjustments.

The curved portion of the windshield side frames and the outline of the rear side windows are made from laminated basswood available from Peck-Polymers. The angled "headache bars" behind the windshield are 1/16 dowel.

Bend the landing gear wire from .040 music wire. If most of your flights will be R.O.G. from anything but ideal take-off surfaces, you will want to use a little heavier wire to give a little better stability during take-off. Use the lightest balsa you can find for the wheel pants. Use medium weight balsa discs glued cross grain for the wheels. Glue a short length of aluminum in the center. After the wheels are sanded and painted, trap them inside the pants with the landing gear wire pushed in from the back side. Apply quick set epoxy sparingly to the short vertical portion of the wire where it is recessed in the back of the wheel pant as shown on the plan.

Cut the motor retainer peg from 1/4 inch OD aluminum tubing. If you use smaller diameter tubing, switch to copper tubing. The fuselage is still quite wide at this point and the stress of a well-wound motor requires a lot of strength. Drill the motor peg holes and strengthen the entire balsa anchor posts with CyA glue. When the glue has completely dried, test fit the tubing back in the holes and make sure there is a nice snug fit.

I used the plug in shock mounted wings as shown on the plans. Usually I don't use this wing mount method on scale planes less than 30 inch wing span, but this is a very large 25 1/2 inch wing span model. If you choose not to use this wing mount method, I would recommend building the center section integral with the wing and attach the whole thing in one piece rather than gluing each wing separately to the sides of the fuselage. The Robart hinge points I used to anchor the wing strut bottom needed to be slightly modified. It requires too much force when separating the points and could cause damage to a model this size. When I started using the Robart hinges, I would reduce the male end by shaving down slightly with a razor blade. It is easier to ream out the other end carefully with the tip of a sharp hobby knife. Strive for

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Eight-year-old Allen Peoples, the author's grandson **(above left)** pre-flights the *Cougar.* Pulling the nose block out **(above right)** Allen shows the "braided" motor which the author describes in the text. Lubing the rubber motor properly will yield many flights from the same motor.

just enough snap remaining in the points to hold the strut during flight. Please remember the struts are definitely functional.

Flying surfaces

Cut the wing ribs from light weight 1/16 "C" grain balsa sheet. I used upper and lower diagonal wing spars to separate the colors when tissue covering. If you use the same method, wait until the wing is otherwise complete before notching for the angled spars. Make a notching tool by gluing a 1/16th strip of 180 garnet paper to the edge of a 1/16×2 inch sheet of hard balsa. Glue a 1/32 balsa strip on each side to help act as a handle as well as keep the tool straight and true. Make the tool as long as you need for the size models you like to build. Two or three different tools of different lengths is ideal. Paint these notching tools a flashy color or they will get lost with building materials on your work bench. Tom Winter showed how to do this in a past issue of *The Winding Stooge,* the newsletter of the Nebraska Free Flighters.

The horizontal stab was built with a slight airfoil. After the stab was removed from the building board, I made mini-ribs by adding soft 1/16 strips to the top and sanding to an airfoil shape with a sanding stick. Using a flat bottom airfoil on the stab has let me balance many a scale model a little further aft than normal requiring less clay nose ballast. I have used this method for years with good results even though some experts have told me the stab, on scale models, should be flat on both sides or air-foiled on both sides.

Covering and finishing

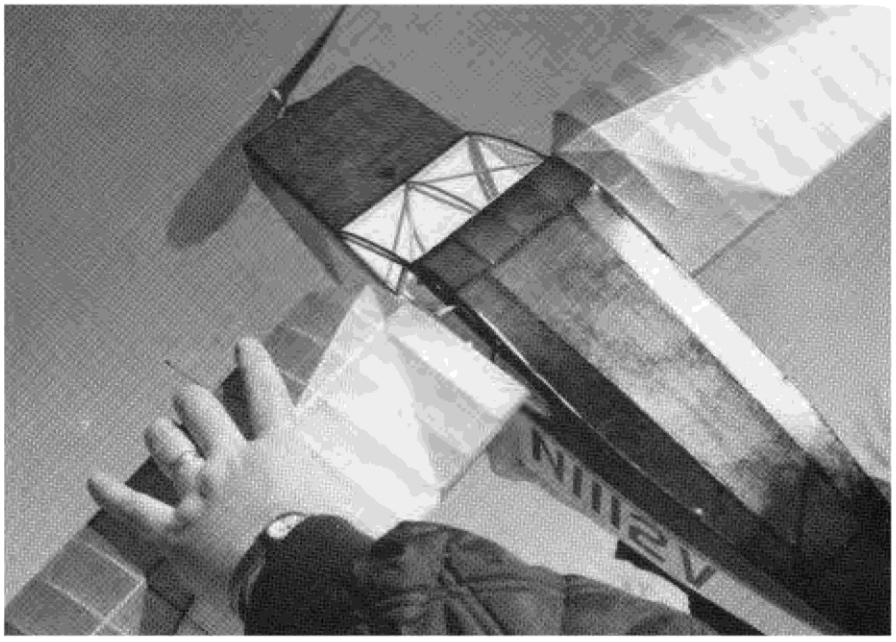
Brush on a coat of thinned dope to the longerons, fuselage cross pieces, flying surface outlines, and anywhere else you will need to brush on the thinned white glue tissue adhesive. Use about half white glue and half water. Brush this solution on the outside framework of the area to be covered by a piece of tissue. Lay the tissue over this area and gently pat down and carefully pull out any wrinkles. Keep your fingers moist as you go.

Tissue grain should run span wise on the flying surfaces and fore and aft on the fuselage. Some of the heavier domestic tissues have no grain. If you are using a good grade Japanese Tissue (I used Japanese tissue from Oldtimer Models) you can tell grain direction by tearing a corner. It will tear straight with the grain but not against the grain.

Shrink the tissue by spraying on a mist of water. I use a squeeze trigger sprayer found at garden supply counters. Adjust the nozzle for the finest spray. Spray into the air and wait a second for the heavier droplets to fall before letting the fine mist fall on the tissue. Don't get the tissue saturated. Just enough to sag the tissue. I hurry the drying process with a blow dryer. Brush on non-shrink dope thinned 50 percent with dope thinner. Use two or three coats on the flying surfaces and three or four coats on the fuselage.

The black and white color separation on the fuselage was accomplished by changing color at a stringer. The white and orange on the wings met at the angled wing spars. The Orange on the fuselage must be doped over white tissue. Cut pieces of orange tissue in the proper size and shape and lay in place. Brush on dope thinner, allowing the dope underneath to soften and create a bond. Again, if you are not building for a contest, most any colors would be appropriate.

Use a good light acetate for the windows. I used the very excellent light material from Micro-X. Glue in place with RC/56 glue. Clean the acetate, removing all finger marks, etc. Apply the glue sparingly at one end, lay the acetate in place and carefully add glue, applied with a toothpick, working to the other end. The RC/56 glue will dry clear, but if you smear a little, remove it with a cotton swab because it will show. Don't be afraid to cut a new piece of acetate if you goof. When someone looks at your model, the first thing they usually see is the window area, so do your best work here.



For easy storage and transport, the *Cougar's* wings plug into the fuselage and are retained by a rubber band. Two locator pins, one fore and one aft of the retaining hook on each wing panel, maintain the incidence.

Rubber motor

This model loves to fly, so let's make up a motor and head for the tall soft grass (if you find it tall and soft, let me know and I may move there). Make a 30-inch long motor us-

ing four strands of 3/16 inch FAI rubber. If you use SIG rubber, you will need to use 1/4 wide because it is not as thick. Lube the rubber with something that does not contain castor oil. A castor oil-based lube will force you to wash off the motor after every flying session or risk damage as the rubber will deteriorate much more quickly. I have used rubber lube from Peck-Polymers for years and have had no problem after many flights from the same motor over a period of several weeks (and I don't remove from the model to wash and re-lube after each flying session).

Install this motor in your *Cougar* and hold one loop with your little finger while you wind in about 75-80 turns *backwards* one loop. Switch loops and wind in the same number of turns *backwards* in the other loop. Make sure these turns are in each loop separately and wound backwards. Put both loops on the winder, without letting the previous turns unwind, and wind as if to fly. Let the motor unwind and presto - braided motor! Well, not really braided but pre-tensioned and it will look and act like a braided motor. If the motor is too tight and will prevent the prop from free wheeling, undo the motor and do the pre-tensioning again using fewer backwards winds in each loop. If the motor ends up too loose, go back and use more backwards winds during the pre-tension process.

Flying

Crank in about 200 winds and lock the prop with a pin in the rear of the nose block. Balance the plane at the point shown on the plans. Don't give this plane a toss to test the glide; it is not a Nordic, so don't try to make a Nordic out of it! Launch the plane with about 100 to 150 winds-just enough power to let it come back down on its own so you can properly evaluate the glide. Adjust for as flat a glide as you can with horizontal tail adjustments. Add a few more winds to get the *Cougar* a little higher to adjust the glide turn. The glide turn should be very gentle. A steep gliding turn will let your plane spiral down too quickly and will rob you of flight time.

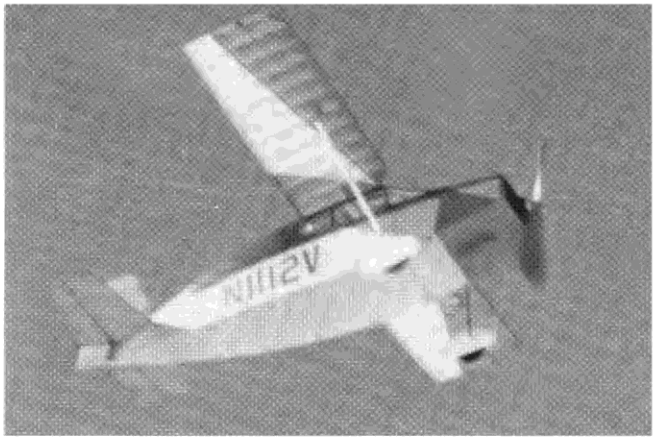
When you are happy with the glide, add another 75 turns to begin evaluating the powered flight pattern. You used tail surfaces to trim the glide so leave them alone and trim powered flight with thrust adjustments only, if you can. If you need to use tail surface movements for powered flight, you will need to go back and trim the glide all over again somehow. When you are satisfied with the last flight, add another 75 to 100 turns and fly again.

With a launch like that, Allen is going to make it to the F/F "major leagues" some day. The author uses a careful series of controlled power flights to gradually trim the plane to a right hand flight pattern.

Each adjustment should be slight and make only one adjustment at a time. It took a long time to build the model; so take a while longer to get it to fly well. I have seen too many models damaged because too much power was applied before proper testing.

I like to have a right turn (unless the plane has a low wing configuration, in which case it must fly left for best results) in both the power and glide portions of the flight. A right power pattern will gain more altitude and will also give a straighter, more realistic take-off during rise-off-ground flights. I like the glide path to be in the same direction as powered flight because there is a better chance the model will land closer to the launch area and my weary old legs will not have as far to walk during a long flying session.

Take your time during the flight trimming process and you will have a plane that you can depend on for hundreds of flights. I have had dozens of models that have each given me several hundred dependable, satisfying flights. Experience the thrill of watching your big fat-bodied *Cougar* spiral up into the sun!



Part of the model's excellent flying characteristics **(above left)** come from the wide fuselage that acts as an airfoil. Take the time to trim the model properly, and it will consistently give gorgeous flights **(above right)** time after time. A right hand pattern seems to give the most altitude.