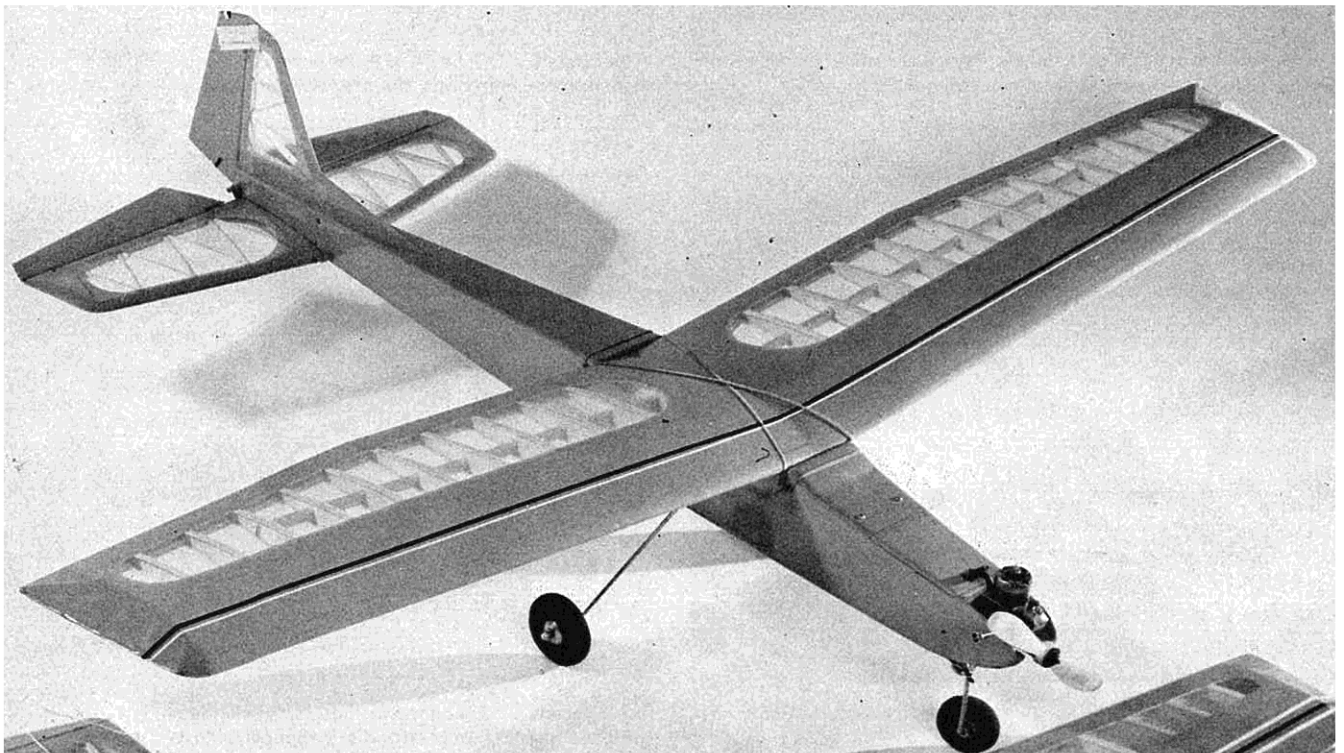


# EVOLUTION

SEVEN AIRCRAFT IN ONE, THE EVOLUTION IS ONE OF THE MOST VERSATILE AND GENTLE AIRCRAFT YOU'LL EVER FLY. IDEAL FOR THE R/C TYRO.

By BOB BRUGGER



Laziness is the mother of expediency. Poverty is the father of economy. The combination of the above produced "EVOLUTION". (You archaeologists and paleontologists, please don't throw stones at this theory. It was rock-bustin' that caused my need for a new airplane!)

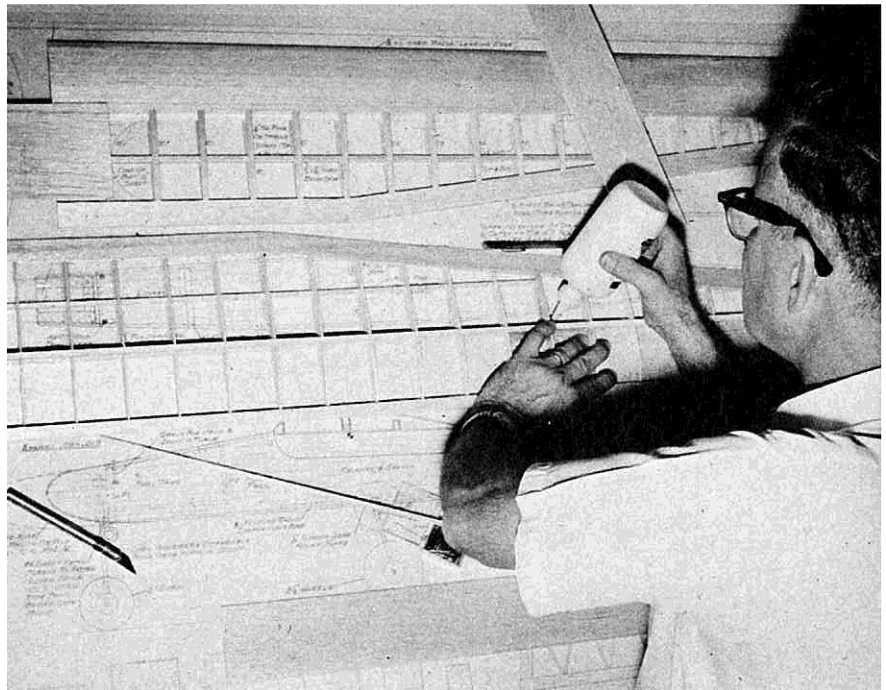
Living in Tucson, the sun city, where it can get quite windy (as well as nice and calm and hot, hot, hot!), and having a mountain top, with a beautiful amphitheater about one-half mile across, just ten minutes away (go ahead and weep, you lovers of the green and snow country) I wanted to be able to fly any way, with one airplane, and not have to change radio gear back and forth. A friend of mine, Bill Painter, who now lives in Stockton, California, built a very nice flying seven foot glider with .049 power assist that not only had appealing lines, but showed great possibilities for other types of flying.

Plans of composite or multi-purpose planes had been published before, but I didn't know of any that could be set up for the wide range of configurations I desired without each one looking like a compromise of another. The next step, therefore, was to see what correlation there was between the proportions of various designs of the desired types.

Four tested designs of shoulder wing trainer-sport planes and three soaring type gliders were chosen for review. All dimensions of each category were mathematically correlated and then the two categories cross-proportioned. It was surprising to see how narrow the dimensional gap was between the two. After several hours of engineering (that's the word for 10% design calculation and 90% doodling) the result was "EVOLUTION", a machine with seven configurations. Start out with a powered sport plane and a few parts, and in five minutes or less you can be set up to fly a very stable trainer (try to stall out your plane four feet off the ground and recover to a smooth landing or go around again), a slope soarer (or put it up with tow-line or high-start and fly the thermals). If that's too much trouble, leave the engine in the nose, or strap on the power pod, and reach for the thermals the easy way.

Basically, this airplane is for beginners. Yet, when you tire of its gentleness and want something hotter, you don't have to start all over building again. You just change parts.

So choose your pleasure. Build one set-up and have a ball flying while you're trying to find time to build the other parts. If you are new at R/C start



out with the six foot wing on the sport configuration and an .09 or .10 up front. Please accept this as a challenge to find another design as gentle to help you learn. Then, as your prowess develops, change to the short wing. Then try a .15 engine. Follow the same procedure until you graduate to using a .19.

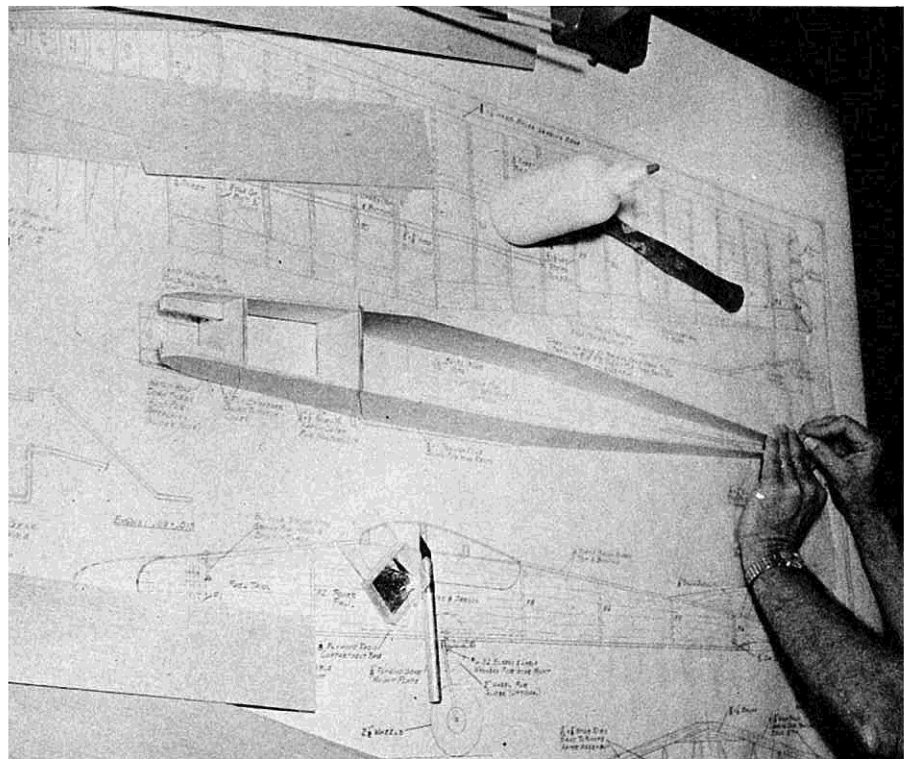
But if you want some real flying, then unbolt that dirty, noisy old engine and jerk off that ugly landing gear. Strap on that gracefully long wing, give her a streamlined nose up front, and toss her off the top of a hill. Ah, such

quiet serenity! All this and just one airplane!

But, times a-wastin'. Let's get with it. Most of the construction is fundamental, but some of the following information may help you save time and prevent your working yourself into a corner.

### FUSELAGE

Epoxy all the nose section plywood parts first, being careful to maintain  
*(continued on page 56)*



good alignment. To this box section glue the sheet sides, pull the tail ends together, and glue in the rest of the formers.

It helps a lot to make razor saw cuts in the side pieces to aid in bending the sides below the leading edge and the trailing edge of the wing. Make these cuts on the inside, the full width of the sheet, but do not saw clear through. Then crack the sheet toward the inside enough to give a good bend. During assembly of the fuselage fill these cracks with glue.

Assembling the above over the fuselage top view will assure a true alignment. Next, install the nose gear mounting nuts, after which the bottom sheets may be glued on. Be sure to install your tail surface controls before gluing on the top sheet. (I used large size plastic soda straws, glued into the fuselage to contain my control arrangement installed later.) Also, cut out the fin slot in the rear top sheet before gluing it to the fuselage.

## WING

Pin the leading edge and the bottom trailing edge strip to the plan. Glue in the bottom center section sheeting, then all the bottom cap strips. Using scattered ribs loosely for guides, glue the lower front spar and the rear spar to the lower sheeting and cap strips. Now glue in all the ribs except the R1-A's and R1-B's. Since the ribs are cap stripped, 1/16" sheets may be used for making on the stripping and sheeting. Taper the top spar as noted on the plan and glue it in place.

At this point, (if you haven't built two wing panels of the same side!) you should trim the center sections so both panels fit together with the proper dihedral, then glue them together. Glue in the 1/16" plywood dihedral braces and the R1-A's and R1-B's. When the dihedral joint is dry you may glue on the top front sheeting, top trailing edge strip, center section, tip sheeting, and the cap strips, in that order. This top work should be done on one side of the wing at a time (right or left side) while that side is pinned down. (When you lift the glider-length wing off the work board you will notice a built-in twist with the leading edge warped down at the tip about one to two degrees. This is desirable and should be maintained when covering since it will prevent tip-stall while in flight.) Glue the wing tip on while that side is pinned down.

## EMPENNAGE

Construct the fin and stabilizer over the plan. When pinning down the leading and trailing edge of the fin, slip a strip of 1/32" sheet under them to compensate for the difference in the wood thicknesses. Do not glue the dorsal fin to the main fin until you assemble both to the fuselage.

Epoxy the elevator coupling mechanism to the stabilizer before covering. The notch for the tubing should be just deep enough to insure the centerline of the wire being right on the elevator hinge line to prevent binding. Cover all surfaces before hinging together. Use your favorite hinge arrangement. I prefer figure 8 thread stitching, using braided nylon fishing line, 15 lb. wood, but not around hinging area.

## PYLON

Tape aluminum foil smoothly over the center section of the finished wing. With the surface grain running wing span-wise, cut and trim the 1/16" plywood base plates so there is a good fit at the dihedral joint when curved to the airfoil section. To hold these plates securely in place, run a dowel under the wing chord-wise below the centerline of each plate to enable the use of rubber bands. Now epoxy the joint. Next, epoxy the 1/8" plywood upright core to the base. To keep it straight while drying, I used a long piece of Scotch tape stuck to the wing about a foot from the centerline, passed over and stuck to the top of the upright and stuck to the opposite wing panel. When cement is set, epoxy the 1/4" plywood engine mount and top plate in place and allow to set. Then glue on the balsa pieces in the following order: upright side pieces, base pieces, engine mount filler blocks. Better choose your fuel tank and get the proper sized cut-out before gluing on the top block. Observe all grain directions.

## GLIDER NOSE

Cut and form all pieces for a good, smooth fit around the curves. Bend the aluminum nose plate over the radius blocks so that no sharp bends result. It might be wise to drill a few random holes in the plate to insure better epoxy bonding of the wood nose to the plate. Have the plate screwed in place when epoxying the wood nose to it. If you expect the nose to receive much pounding on landings, it would be wise to fit the lead weight so there is very little

clearance between it and the engine mounts. If you should possibly not need weight, then substitute a wood block. This will discourage lateral movement of the nose tip.

## FINISHING

Now what do you intend to do with this masterpiece, stand back and look at it, or fly it? It was designed for flying, so for this part, I tried to do it fast and easy. Here's how. You critics choose your own punishment.

First, shape and sand all parts to a good smooth surface. Next, heavily dope, resin or epoxy all wood parts that will be exposed, such as the engine section, fuel tank compartment, radio compartment, surface hold-down dowels, etc. (If you use resin, be sure to wipe these portions with an acetone moistened cloth before applying anything else over it. If you don't, the wax on the surface will prevent bonding.)

Next, cover all parts, except the pylon and nose piece, with "MonoKote" or similar material. I used "FasCal", a mylar put out by Fasson Products, of Painesville, Ohio, using the clear and then doping on one color coat, using "FasCal" for masking. A final coat of clear dope seals and protects the job. Of course, with a colored covering you need no dope.

Sometimes, when using these plastic coverings, some parts are so tightly sealed that when heat is applied, the trapped air expands and won't allow the covering to tighten. To solve this problem, merely prick a hole with a straight pin through the covering in each troublesome panel near the trailing edge on the under side. Start out with one or two holes, then prick more if necessary.

Another tip. Perhaps, you know about this, too, but if you don't... Sometimes panels that have compound curves won't draw tight without leaving a few wrinkles. If so, lay your iron onto the surface as flat as possible. Then move an edge of the iron across the panel, moving slowly toward a corner allowing the wrinkles to follow to that corner and then disappear. It may take two or more tries before you accomplish the trick, but it will work.

Some may wish to mylar the pylon and glider nose. However, for those who are new at this, it may be easier to give them a few coats of clear dope to a nicely glazed seal, and then color dope. If you do any finishing on the aluminum parts, start out with a primer recommended for that purpose, or the

dope will probably flake off.

The rest is up to you. If you do not know how to install the radio gear or engine, then in all probability, you will need help and guidance when flying it, at first. Even though this model is extremely easy to fly, if you have no previous experience, **ASK FOR HELP FROM AN EXPERIENCED PERSON**, and save yourself a lot of discouraging moments. He will also help you with any construction problems.

However, if you insist on doing it alone (be selfish about it), here are a few suggestions.

Make sure the C.G. is at least 35% of the chord behind the leading edge. Set all controls at neutral using the outermost holes on the horns.

Start out by taxiing on the ground, back and forth, literally driving it like a car, getting the feel of the controls. Do this slowly at first. Then line "yourself" (the airplane, unless you have wings) up with the runway and try to "drive" in a straight line, doing it faster and faster, giving forward pressure on the stick to hold it to the ground. On one of these fast runs, when you have finally been able to do this with full power, you will very easily allow the pressure on the stick to ease back, and — surprise! You're airborne! Don't panic now! Just chop the throttle and let it come down again. Soon you will want to continue on around.

After you are in the air check your trim. Let's not get lengthy about this here, but if the plane insists on climbing with the engine at a cruising setting, then put in a little down-thrust, enough to maintain good level flight. This, of course, will have to be correlated with any elevator trim necessary to attain a good glide with engine at idle. You will find other valuable trimming suggestions in previous issues of this magazine. However, if you use care in construction, it may not be necessary for further trimming. When you become more sure of yourself and want more control, then start moving your controls toward the inner holes in the horns.

So there is your tinker-toy airplane, "EVOLUTION". Although two of the seven configurations we have figured out so far seemed pretty wild, we have found out that they will be just the set-up for a very important use. But, that is another story . . .