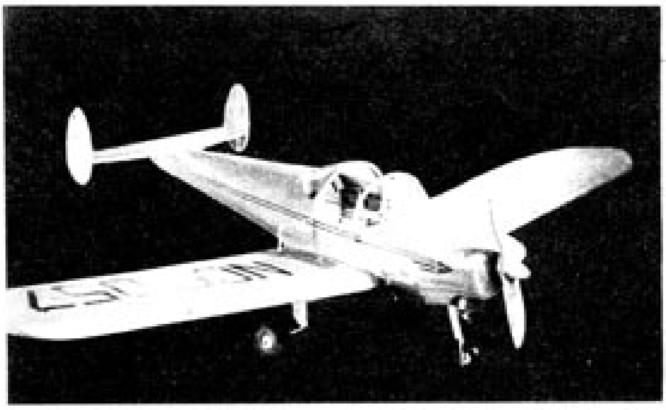
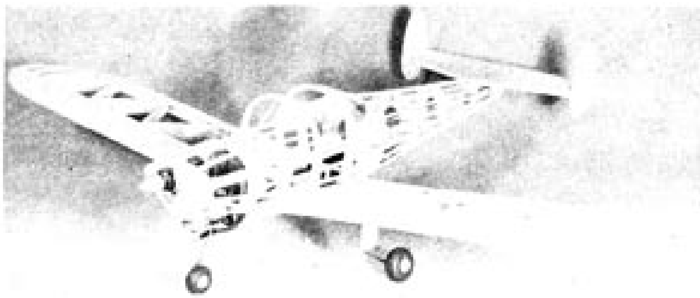
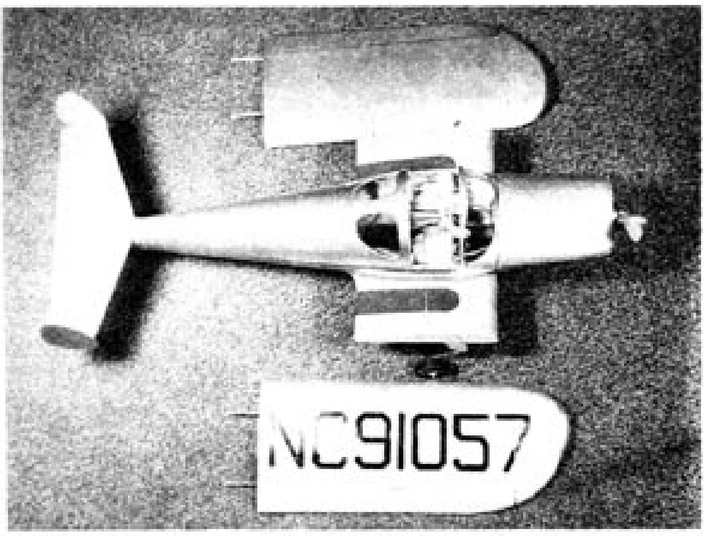
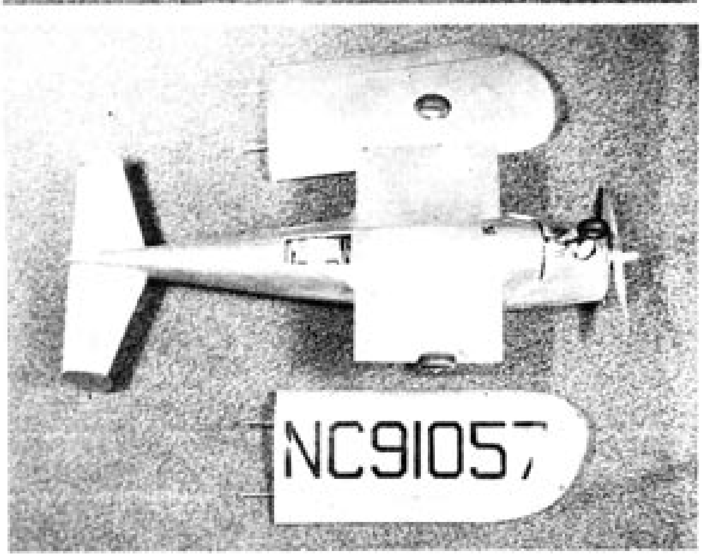
MINIATURE ERCOUPE



by **MORRIS MOUNTJOY**







This model is exact scale, even to the form of wing construction

IN designing the *Ercoupe* light plane, many unusual features were incorporated which have given private aviation an improved safety record and a greatly increased utility value.

Among the advantages of this new kind of airplane is the feature of coordinated aileron, rudder, and nose wheel controls, resulting in the complete elimination of rudder pedals and automobile type steering while taxiing. Expensive flight training and practice is therefore cut to a minimum, and the result is an airplane that is not only simple and easy to fly, but quick to learn to fly.

Another major innovation has been the disposition of propeller torque by canting the engine 3½ degrees to the right and using twin rudders, spread apart, to keep them away from the whirl of the slipstream. Stall characteristics have been improved and the *Ercoupe* has been rendered spinproof by the addition of 5° downward thrust of the engine, limiting the elevator upward travel, and by designing a special fillet which prevents the wing from stalling at its outer or tip portions.

Because of the stability which has been built into the full size *Ercoupe* it has been possible to reproduce a model to exact scale. The dihedral is especially advantageous with a high angle of 7° and is even sufficient for free flight. You will appreciate the nose wheel as a saver of propellers and also sparkplugs since the engine is inverted.

Begin construction by cutting the fuselage bulkheads from ⅛" medium balsa sheet. Make certain the ⅛" x ¼" holes for the main spars are all in line before glueing in position on the spars. Use a small triangle or a square object to make certain the bulkheads are in line and true.

Stringers are laid on after the bulkheads are secured, and may be made from either ⅛" sq. or 1/16" x ⅛" medium hard balsa. If the 1/16" x ⅛" stringers are used they may be laid about 15° apart thus assuring a full curve and no flat spots when the 1/32" sheet covering is applied.

Now cut front and rear spars for the wing centersection from ⅛" medium balsa and glue in place on frames D and F. Dihedral is formed by cutting these spars from sheet wood and using a protractor to incorporate the 7° upward slant. The 7° dihedral should line up correctly with the vertical centerline of the bulkheads in order that alignment between fuselage and wings may be exact.

Centersection ribs are clearly outlined on the drawing; however, before assembling them it is desirable first to fasten the main landing gear and the wing mount tubes. Notch the wing spars where necessary when splicing these units in place with thread. This prevents any high spots when the 1/32" sheet covering is applied.

The fuselage structure complete, you are now ready to mount the nose wheel and motor. The nose wheel strut is bent from 1/32" dia. steel wire and spliced with soft wire or bolted to the firewall. If wire splicing is

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ducing vibration and gear box wear.

Underlying all design and building problems for the model builder is the basic problem of flying weight. Unfortunately helicopters, model or full scale, are even more critical in this respect than fixed wing aircraft. Flying weight of the R.O.G. rubber power model illustrated is 2 ounces. The rubber motor weighed .4 ounce, giving only 30 seconds flight maximum. The model was stable and made over 56 flights. It is still in flying status, though very weighty due to age and many paint jobs. Flying weight for gas model helicopters is in the range of 20 to 30 lbs. per hp as compared to 14 or 15 lbs. per hp for full scale. The permissible disc loading in models is lower because model rotor blades are far lighter in proportion to total gross of the aircraft than in full scale. The determining factors governing rotor diameter in full scale are weight of material of blades for required structural qualities, control problems, and forward speed.

It should be borne in mind that blade weight goes up as the cube of the rotor diameter. Generally speaking, gas powered model helicopters are approximately 80% as efficient as full scale. Rubber power ships are only 30% as efficient as full scale. Rubber is an attractive power, however, because it provides gently decreasing torque, allowing the model to sink gradually under its own power without crack up on landing; this is also an advantage of electric power. Gas powered units require a free wheeling and automatic pitch change device to allow the model to autorotate when the engine stops, otherwise the model will be in a free fall from several hundred feet and cause quite a splash on landing.

While discussing rotors, it is well to advise model builders to keep their rotor blade sections very thin; this is particularly true of rubber powered ships.

From careful study of photos of successfully flown full scale helicopters, the modeler can determine a good configuration and control arrangement. The major problems are: a sweet running rotor with some degree of reliability, proper CG location, and adequate torque correction.

Many hours of pleasant and instructive flying may be put in flying model helicopters. Helicopters provide a new dimension of flight and, as is the case with full scale, the models can be flown in small areas. You don't need all outdoors to fly model helicopters (but it helps!).

Miniature Ercoupe

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used, seal the wires together with small amounts of solder (acid core). Incidentally, a good tip is first to bend your landing gear parts from soft wire to make sure you have the proper shape before proceeding with the steel wire.

Any Class A and possibly some of the smaller B motors may be used. Mounting depends on your preference and the limitations of your particular motor. The author finds these small motors start and run equally well in an inverted position and certainly the more realistic cowling is desirable.

If you use a diesel motor it will be unnecessary to remove the two ⅛" x ¼" main spars. Otherwise, these spars should at least be removed between bulkheads C and G, as they have served their purpose of holding the fuselage straight until the stringers are in position.

Before covering the fuselage it might be an advantage to complete the tail surfaces. These are described in detail on the drawing and are of simple yet sturdy construction. Use aluminum sheet or soft wire for rudder hinges and tracing paper for elevator hinging. The elevator control horn is aluminum sheet or tin.

Engine ignition parts are installed now and are located approximately as shown on the drawing; they are then shifted fore and aft until balance is correct. The model should balance at a point ⅓ of the wing chord (width) back from the wing leading edge. When this is possible you have determined the proper locations for the ignition units and they may be permanently secured.

Installation of the elevator control bellcrank must be rugged; it is therefore attached to a ⅛" hardwood or plywood cross member. The control rod is steel wire held in position by small washers and solder. This entire assembly should work friction-free in order to insure efficient control of the model while in flight.

Use a flexible grade of 1/32" balsa sheet to cover the fuselage and glue only where necessary. Sand lightly and, if possible to obtain, fill in any low spots or cracks with Valentine spot putty. Tissue, silk or Silkspan is then covered over all wood surfaces except the cowling. Dope is applied only to the edges of each section covered by one piece of tissue, and the entire fuselage is sprayed with water to tighten the paper. Tissue covering over all concave surfaces (fillets, etc.) should be well secured with dope to prevent stretching and forming a flat spot.

The cowling for this model may be built up as shown on the drawing, or cut from solid balsa block. If the built up structure is used you will find it more satisfactory to cover the cowl with double thickness 1/32" sheet than to attempt applying tissue to the compound curves.

Finish for the cowling, rudders, elevators and other wood surfaces should include application of some light weight wood filler to cover the balsa grain. Valentine Lacquer Wood Sealer is excellent for this purpose and it will cover well with just one or two coats.

Structure for the outer wing panels is not standard in that diagonal ribs are used as in the full size *Ercoupe*. You will find them simple to plot and very useful for other models where lightness and strength are required. Wing mounting pins are 3/32" dia. steel wire and they must be located to give flush top and bottom surfaces, when the outer panels are matched with the centersection. Cover the leading edges of the panels with 1/32" sheet and the entire wings with tissue or silk. Again apply dope only to the outer edges of the section to be covered. Spray with water and let dry before doping with silver.

Trimming and lettering is done after the silver dope is applied. The silver should require two to four coats with light sanding between applications. Use Scotch masking or cellulose tape to guide the stripes and letters.

Control line flying is standard procedure and 35 to 50 foot lines are recommended. Note the rudders trim individually and outward only.

Happy landings, and let's see some of these *Ercoupes* entered in the scale and stunt events of the coming contest season.

PHOTO CREDITS

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