



THE SKYFARER

FIRST PLACE WINNER IN RCM'S 1968 DESIGN CONTEST, THE SKYFARER IS AN EASY-TO-FLY SCALE MODEL OF A LITTLE-KNOWN 1940 VINTAGE AIRPLANE BY GENERAL AIRCRAFT CORPORATION.

BY VERNON G. SCHROEDER

Most aviation buffs, whether their interest lies in full scale aircraft or in modeling, tend to favor one period of aviation history more than others. It takes only one brief reminder to fill them with nostalgia and transport their hearts and minds back to the days of yesteryear and their fond reminiscences of aviation at its best. More than likely, as with myself, this period dates back to their childhood days, when the fire was kindled and still glows, never to be extinguished.

For the older buff it may be the World War I or the Barnstorming era; for the teenager it will probably be the jet age. But for this writer, the World War II era, 1939-1945, has always been

the most outstanding.

In spite of the emphasis on military aircraft during that period, several commercial light planes were developed. It is one of these aircraft that we have chosen for presentation here. Little known and long forgotten by most (for to this writer's knowledge no reference has been made to it in any of the model magazines for over twenty years), it was one of the most interesting light aircraft to be designed during its time. So, to use an age-old cliché, "without further ado," we now present - "The Skyfarer."

Designed by Otto C. Koppen, professor of Aeronautical Engineering at M.I.T., and developed by the General Aircraft Corporation of South Lowell,

Massachusetts, the Skyfarer made its appearance in the early 1940's. Acknowledging the fact that most flying accidents are caused by pilot error, it was designed with supersafety in mind. With its extreme inherent stability, the Skyfarer rendered impossible many of the common errors in pilot judgement. It could not slip, spin, skid, nor lose control when stalled and was described by the C.A.A. as "characteristically incapable of spinning."

The Skyfarer was a high wing, two place, side by side cabin monoplane featuring tricycle landing gear and twin vertical fins. The unusual feature was the fact that there were no foot controls except for hydraulic brakes which were

operated by a single foot pedal; however, unlike the Ercoupe which also had no rudder pedals but used coupled ailerons and rudders, the Skyfarer had no movable rudders, turns being accomplished with the use of ailerons and elevator only. Both the steerable nose wheel and the ailerons were moved by the steering wheel, which made it possible to steer it both on the ground and in the air, much like an automobile. It was said that a person with normal driving experience could learn to solo in just two hours and it was advertised quote, "As simple to drive as your car." Flaps were also incorporated to aid in take off and landings.

The wingspan of the Skyfarer was thirty-one feet, five inches and the length twenty-two feet. It was powered with a four cylinder, geared, seventy-five horsepower Lycoming engine, had a gross weight of 1,350 pounds, and a useful load of 460 pounds.

Performance-wise, the Skyfarer compared favorably with other planes in its era. Its top speed was 100 miles per hour and it was able to cruise for 400 miles at 92 MPH, using about one gallon of fuel every twenty miles. It climbed at a rate of 550 feet per minute. With flaps, landing speed could be reduced to 45 miles per hour.

Accurate three view plans for the Skyfarer proved much harder to locate than photos and specifications. The only three view drawing we were able to find looked very questionable as to its authenticity; so consequently, much of the design was evolved from magazine and kit plans dating back more than twenty years, plus several photographs which we were able to locate. Therefore, no effort was made to retain "exact scale" and whatever changes were deemed necessary to add strength, shorten building time and improve performance, were made. At the same time, we tried to preserve the good looks and its scale-like appearance as much as possible.

Our model was designed to give us a wing area of 360 square inches, thus letting all other dimensions fall as they may. The scale is approximately 1-5/8" = 1'.

The full size plane had a rather high aspect ratio and thin wing; so in the interest of strength and ease of aileron servo mounting, we increased the chord and airfoil thickness as much as practical, decreasing the span slightly to maintain the same wing area. The stab area was increased to about 20%. Although the full size plane used no dihedral, a small amount was added purely for

looks. The fuselage profile was kept as close to scale as possible but slab sided construction was used, omitting all side stringers for simplicity.

The original model used one of the older proportional rigs with the Orbit PS-2 type servos and a .19 engine. Except for the few ounces of extra weight, the only difficulty encountered was with the aileron servo, which, because of too little wing thickness, extended below the lower surface of the wing about 1/4". The fuselage cabin is plenty roomy for any type of gear. And since there are no rudders, only three servos are needed, unless a fourth is added to provide a steerable nose wheel. With one of the new, lightweight proportional sets, the aileron servo should fit nicely inside the wing; and possibly, with the construction lightened somewhat, a .15 engine could be used. On the original ship, with the heavier equipment and our usual beefed up construction, we thought it best to start with a .19 engine. With a scale model it is always a good policy to provide plenty of power, so the .19 size engine is recommended.

To those readers who may be familiar with the Skyfarer, one explanation may be in order. All of the plans and drawings which have been published and dug up to date show a slightly different engine cowling design with more "suarish" lines. This is entirely correct since there are photos to prove it. Apparently this was the original pre-World War II design.

A large, full-color centerspread photo appeared in the May, 1945 issue of Air Trails magazine and another in the September 1967 issue of Sport Flying. Both show a different cowling design, perhaps with a larger, more powerful engine. Our model uses the cowling, colors, and markings as they appeared in the 1945 issue of Air Trails.

Before beginning construction, study the plans and photos carefully. These should reveal most of the construction details and little difficulty should be encountered.

To conserve space, only one half of each bulkhead is shown. It is a simple matter, and probably more accurate, to trace one half the bulkhead onto the balsa and flip it over and trace the other half. In this way you will be assured of having both sides identical.

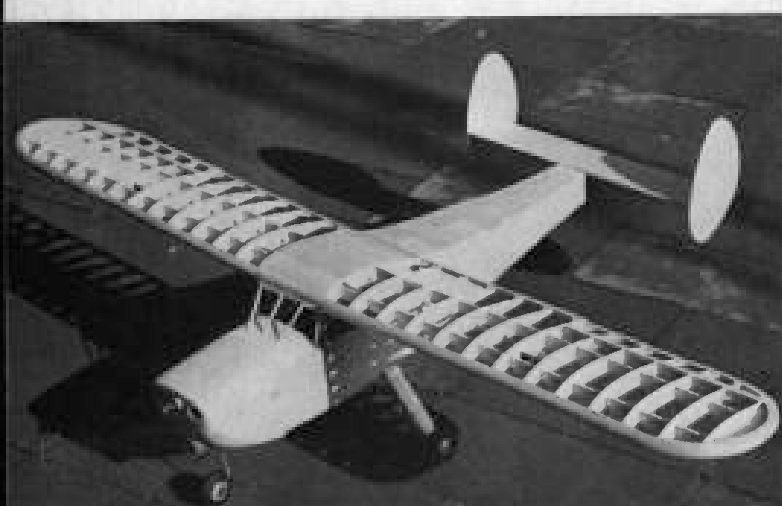
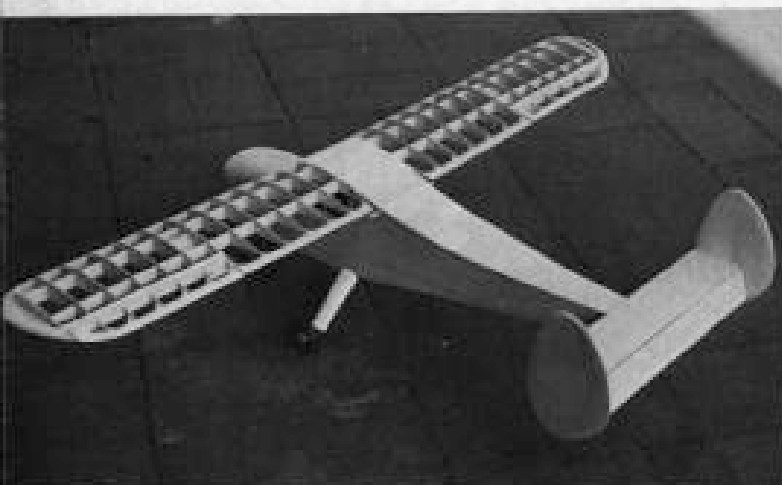
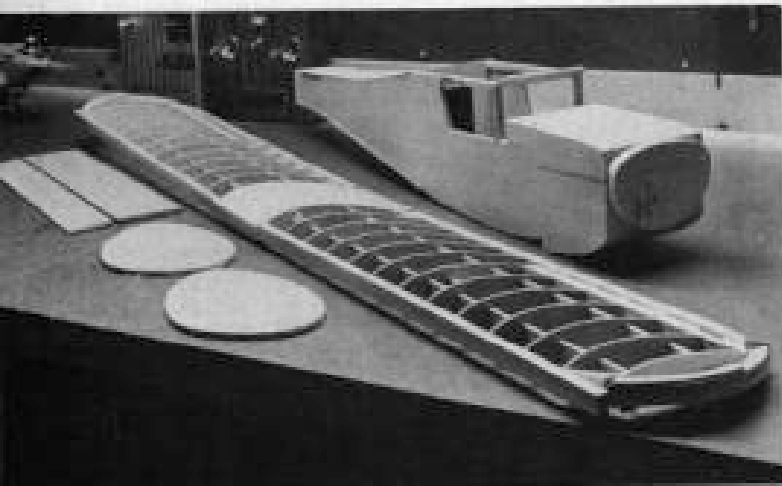
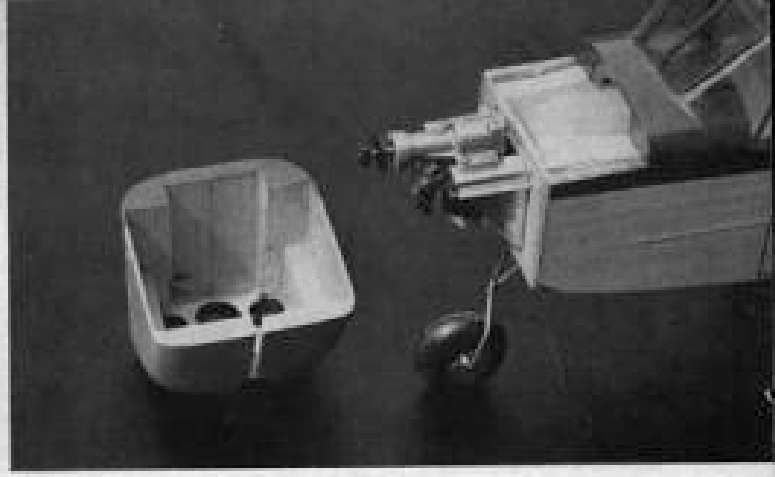
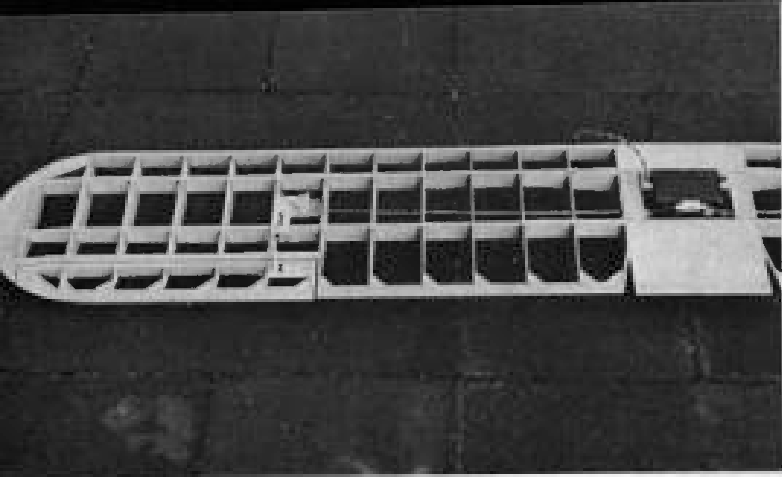
You will note also that only one wing is shown. While it prevents both wings from being built simultaneously, it also assures us that both wings will be identical. Don't forget to turn the plan over when building the second one. No one has yet found a use for two left wings! If you can't see the lines from the back side of the plan, a little oil rubbed over the desired area will allow the lines to show through nicely.

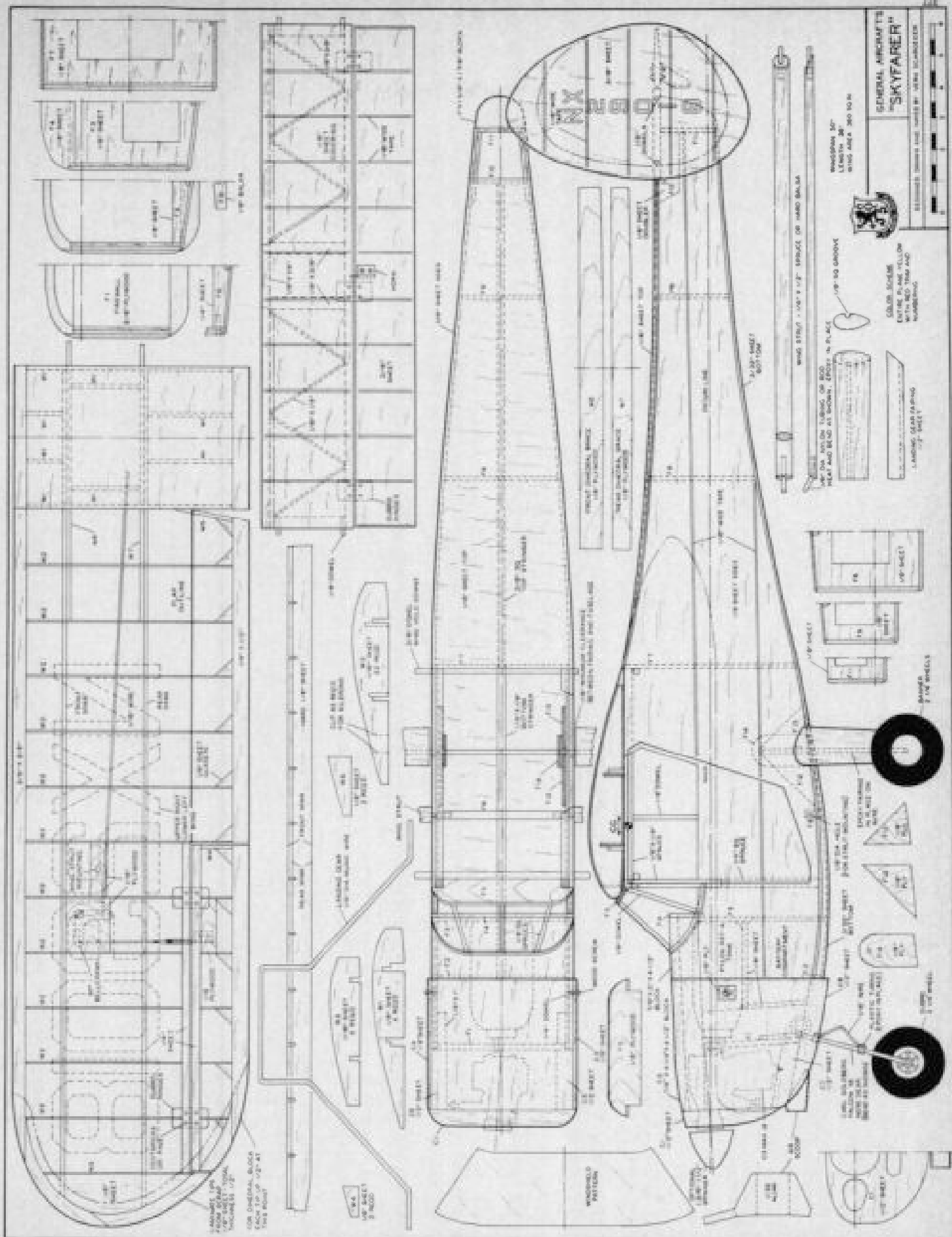
Check your building board to see that it has not developed any warps since its last use, tack down the plans, cover them with waxed paper and you are now ready to start the:

WING - Begin construction by cutting all ribs, except those used for the center section, from medium 1/16" sheet balsa. The four center section ribs are 1/8" sheet.

There are many methods of cutting ribs; but the one preferred by this builder is to pin the blanks together in stacks 1" high or more, trace the pattern onto the top of the stack and sand them to shape on a disc sander. The table must be set at exactly 90 degrees to the sanding disc or the ribs will vary from the top of the stack to bottom. The notches for the spars can be cut with a band, jig or razor saw before the ribs are split apart. An alternate method would be to cut a template from light sheet metal, pin it down on the sheet







balsa and cut around the edges, making one rib at a time. More time-consuming perhaps, but the results are the same.

The spars are cut from 48" long, hard 1/8" sheet balsa. The notches again can be cut very easily on a circular, band or jig saw, or by hand with a razor saw. If you prefer to omit the dihedral and build a straight wing, it can be built in one piece, saving considerable time; but if you've decided on dihedral, it must be built in three sections and joined together later.

Pin the spars down over the plan and after carefully checking each rib for proper fit, glue it in place with Titebond cement. Next, glue the leading and trailing edges in place. The leading edge must be blocked up approximately 3/32". Add gussets at the trailing edges for added strength. The laminated wing sheets can now be built up from 1/8" sheet scraps and glued in place. To insure a proper fit, the ailerons should be built at the same time as the rest of the wing. There should be at least 1/16" clearance between the aileron and wing on all three sides.

The center section including dihedral braces is now built and covered with 1/16" sheet balsa. The area beneath the wing, between the spars, is left uncovered for servo mounting.

When all three sections have dried thoroughly, join them together, blocking each tip up 1/2" and glue with Titebond or epoxy cement. When dry, carve and sand the leading and trailing edges and tips to shape. Do not cut the ailerons loose until this sanding operation has been completed. Now add the aileron bellcranks and mounts, cut the holes for the aileron pushrods, mount the aileron horns and servo and connect up all the linkages. Finally, check everything for proper operation. The wing is now ready for covering.

TAIL SURFACES - The tail surfaces on the original model utilized built up balsa covered construction. However, this builder believes that the weight saved in this case was infinitesimal and the extra amount of time involved was unwarranted. This type of construction is considerably more warp resistant and may be used if the builder so desires. Solid construction is shown on the plans with the exception of the horizontal stabilizer. Use a fairly soft grade of balsa to keep the weight to a minimum. The stab and fins are joined using epoxy cement and reinforced with 1/8" dowels as indicated on the plans. All edges must be rounded and given a thorough sanding in preparation for covering.

FUSELAGE - The fuselage construction, while not difficult, is a bit more complicated than the average sport model. It could be simplified by omitting the top and bottom stringers and reverting to the flat top and bottom common to most of today's planes. Likewise, the carved balsa cowl could be discarded in favor of a simple, flat-sided affair by extending the fuselage sides to include the entire forward portion of the fuselage. This would cut building time considerably but sacrifice much of the realism seen in the photographs.

As mentioned earlier, we tend to build on the heavy side; so at your own discretion, feel free to reduce any of the balsa sizes from those shown on the plan. The sizes shown are those which were used on the original model.

Begin fuselage construction by cutting two sides from medium weight 1/8" sheet balsa. Mark off all bulkhead locations and glue the 1/8" x 1/4" and 1/4" sq. spruce cabin reinforcement pieces in place using a good grade of epoxy cement. Now, using contact cement, glue the 3/32" sheet doublers in place from the wing trailing edge forward.

Next cut out all bulkheads from 1/8" sheet, the firewall from 3/16" thick plywood, and beginning at the nose, join the two sides using the firewall F1 and bulkheads F3 and F7. Hold together with rubber bands and pin inverted on a flat surface to dry. Check the squareness and alignment thoroughly before the cement sets. Use only epoxy cement on the firewall and Titebond on the bulkheads. Bulkheads F8, F9, F10 and F11 are glued in place next. Again, check alignment before the cement dries. Add F2, F5 and F6 and the top and bottom stringers.

Bend the main landing gear from 1/8" dia. music wire and mount as shown on the plans. The nose gear can be installed at this time using metal or nylon landing gear clips.

Now add the top and bottom sheet balsa covering followed by the tail block, which is carved from soft balsa.

The engine cowling is perhaps one of the most difficult portions of the model to construct. It is built as one piece and is removable, giving access to the engine, fuel tank, nose wheel and engine mountings. It is held securely in place, using only two wood screws threaded into a short piece of 1/4" hardwood dowel cemented into the fuselage sides.

Eight pieces of balsa, numbered C1 through C8 are cemented together and carved to shape as shown in the cross

sectional views. The material sizes are indicated on the plans.

To insure adequate fuel proofing, the interior of the cowling and fuel tank compartment should be coated liberally with epoxy cement.

Our original model used home brew aluminum engine mounts, but the Midwest or Tatone aluminum mounts should work equally well. We used an inverted engine which enabled it to be completely cowed; however, for everyday sport flying, we don't recommend it, because of the problems involved with starting, cooling and exhaust relief.

COVERING & FINISH - With the many types of covering materials available today, it is often difficult for the builder to decide which to use. Each has its own advantages and disadvantages. Our model used an old-fashioned dope finish, but for a faster and lighter job, one of the new covering materials could be used.

The prototype was finished as follows: All parts were given a final sanding with No. 400 grit sandpaper followed by one coat of thin, clear dope.

Next, the simulated ribs and long-rons were applied to the fuselage and tail surfaces. These were made from masking tape cut into 1/16" wide strips. Any other light colored tape would work equally well.

All balsa areas were covered with lightweight silkspan and the wing with heavyweight silkspan, followed by two coats of a 20% talc and 80% clear dope mixture.

All surfaces were next sanded with No. 400 grit sandpaper and two more coats of clear dope applied.

The entire model was next given four coats of yellow dope, thinned 50-50 and sprayed. More coats may be necessary depending on the brand of dope used.

The trim areas were then lightly marked off on all surfaces and masked.

The use of masking tape as it comes off the roll is not recommended. It should be laid out on a piece of glass or similar material, and using a metal straight edge and a sharp new razor blade, cut into strips about 1/8" wide. This is necessary in order to lay it out around sharp curves and to produce a good clean separation line. The edge of the masking tape as it comes off the roll should not be used, since the adhesive tends to pick up dust and dirt which usually results in a poor, fuzzy separation line. This, and the use of clear dope to seal the edges, is one of the secrets of

obtaining good results with masking tape.

After the trim areas were masked off, and the edges sealed, three coats of red dope were brushed on. The masking tape was then removed by pulling back against the doped surface, but away from the trim areas, to prevent some of the finish from peeling off along with the tape.

License numbers were cut from red MonoKote.

It is often difficult to find a cement that will work satisfactorily to hold the clear plastic windows and windshield in place. It does not bond well to the plastic and often oozes from underneath and cannot be cleaned off, marring the appearance.

This problem was solved quite nicely by holding the windows in place with 1/2" pins (lills) pressed into holes drilled with a pin, held in a pin vise. They resemble rivets, which add a certain amount of realism, and hold the plastic in place securely.

The doors and flap separation lines are made with 1/32" wide striping tape.

The completed ship, with fuel tank empty, should balance at the CG point shown on the plans, or between 2" and 2-5/8" back from the wing leading edge. A more forward CG is usually preferred in a scale type model. With proper location of R/C gear, the correct balance point should be obtained with little trouble.

With radio gear installed, ready to fly, our original model weighed 3½ lbs.

Most builders will probably not be able to resist the temptation to invert the engine and conceal it within the cowl where it belongs in a scale model. If care is taken, some of the troubles which plague inverted engines can be avoided. Get to know your engine's starting characteristics and break it in well. Once the correct needle valve setting is found, it should not be necessary to adjust it between flights. A good, hot starting battery and a good glow plug are also helpful. Do not allow the plug to become loaded with castor oil; and finally, pinch off the fuel line at the carburetor between flights with an alligator clip. If all other methods fail, it may be necessary to start the engine with the model held in an inverted position.

No special instructions should be necessary for flying the Skyfarer. It is strictly a plane for the casual Sunday flier. If carefully constructed, the model should display all of the inherent stability characteristics of its full size counterpart.

