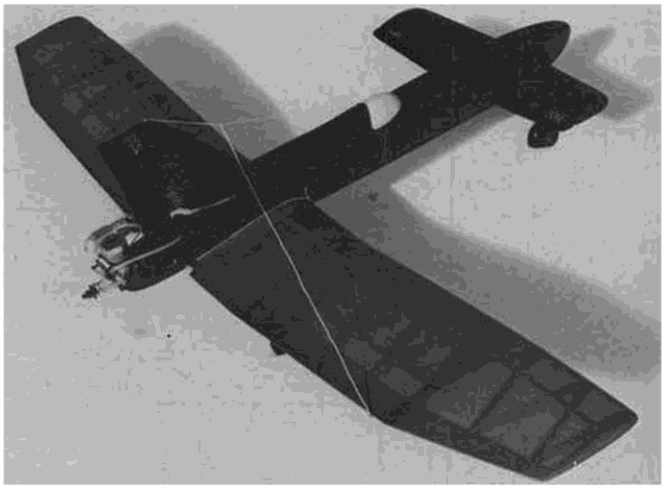

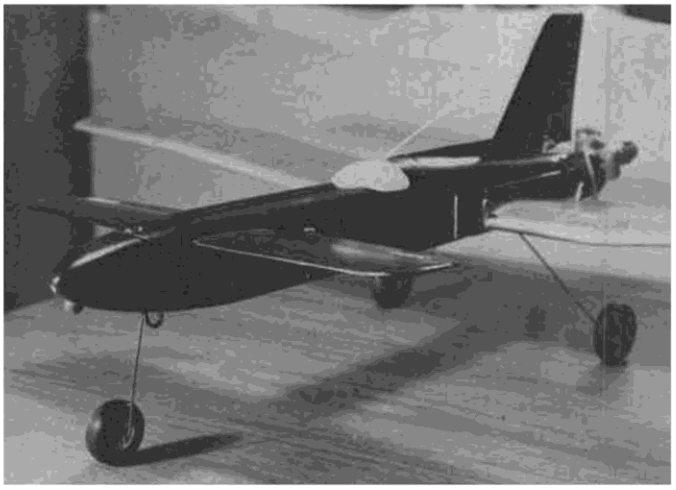

No, that's not a taildragger with its fin and rudder on the wrong end, it's a canard by the name of Epi-Sue, and it flies just fine the way it is, bass-ackwards. Robust construction and stable flying characteristics are the main features of this sport plane.

EPI-SUE

By DOMINIC APIKOS . . . If you're tired of flying the same old sport plane week after week, then maybe you should give this unusual *backwards* airplane a try . . . but be prepared to answer some dumb questions!

• Just about as far back as I can remember, those crazy "wing-in-the-back" airplanes have held a particular fascination for me. In 30 years of model building, I have made many models of this unusual configuration, from hand-launch gliders through free flight models, and now R/C. This unique system (*canard* is the technical name) deserves a lot more consideration than the occasional model which appears on the scene. After all, if you will recall, the Wright Brothers' rig was a canard!

The XB-70, the Japanese Shinden, the Curtiss XP-55 Ascender, the Vari-Eze, and the Swedish Viggen were all canards. Not to mention Cecil Paoli, a pioneer of model aviation fame, with the "Paoli Racer" . . . again a canard.

So, with a sincere desire to rekindle a well-deserved rebirth of a nearly forgotten concept, I present EPI-SUE . . . a contemporary descendent of noble ancestry and heritage!

The airplane described in this article began as a 1/2A free flight model that flew surprisingly well directly from the drawing board. EPI-SUE (Greek for *backwards*) evolved from that free flight model, and, like its ancestor, it is an extremely stable aircraft. The design was based on criteria which I've tried to incorporate in all my models:

1) It must *look* like an airplane (unusual, OK; but not unreal).

2) The construction technique must be simple, but rugged (in my case, an absolute necessity!).

3) The design must be inherently warp free.

As you proceed with construction, I think you will agree that these rules were followed faithfully.

THE WING

Almost everybody likes building the wing the least, but this one is so different that it will almost be fun. Start by tracing all ribs onto 3/32 sheet balsa. Cut the ribs out, and sand them to shape. The wing will be built in five separate sections. I'll describe the center section assembly first, as the rest proceeds essentially the same way:

1) On the plan, pin down a 3/16 square strip of balsa along the back edge

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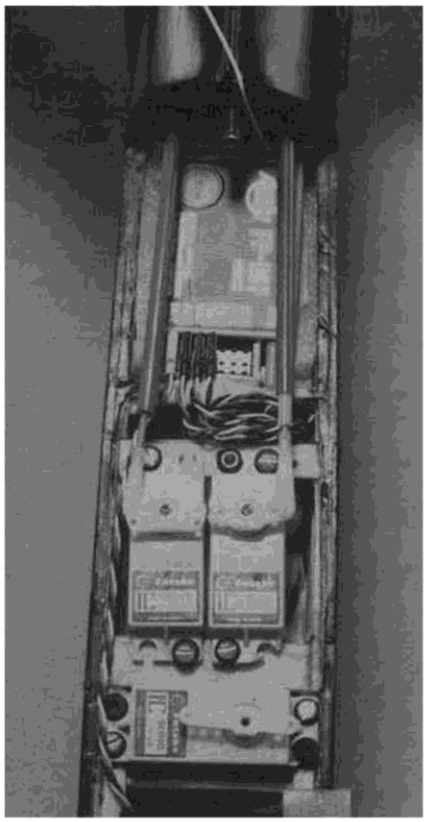
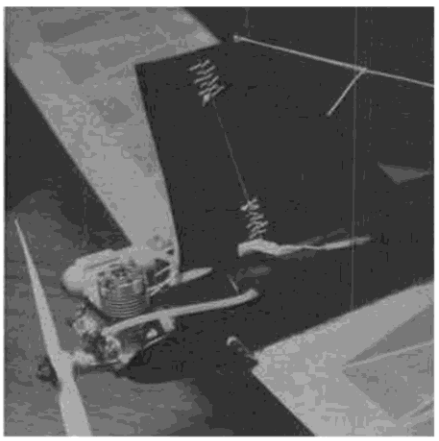


Neat and compact radio installation. Futaba receiver and FP-S16 servos are visible.

Epi-Sue designer and author, Dominic Apikos checks out the controls prior to flight.



Recommended engine sizes are .20 to .29. Old-style stitch hinges work well, are inexpensive.

of the 1-1/2 in. trailing edge (TE). Also, pin down a 1/16 x 3/16 balsa strip along the front of the trailing edge. Both strips must be pinned down *within* the lines which indicate TE position.

2) Cut the trailing edge for this section to length, and pin it in position on the plan, but supported now by the two alignment strips from Step 1. This puts the proper washout on the trailing edge, and aligns it with the ribs. Now, pin the leading edge to the plan, and glue the 1/16 x 2 in. panel to it while pinning it down firmly. It simplifies matters to have the leading and trailing edges marked at each point where the ribs will be attached. Glue and pin all ribs in place now. Pregluing these joints is a good idea (if you are using aliphatic resin glue) before final gluing and pinning.

3) Note that there is an R-1 rib at the end of each wing panel. These ribs are notched, and act as guides for making 1/8 x 1/4 spar notches on the R-2 diagonal ribs inside each wing panel. The *inboard* R-1 ribs of both the outer and middle panels must be tilted to the appropriate angle (see front view of wing) to allow for the proper dihedral angle when assembling the panels together. (Note: Glue the front ends of the R-1 ribs *very lightly* to the leading edge, as this joint will be cut away later to install the plywood dihedral braces.)

4) After cutting the 1/8 x 1/4 notches on all diagonal ribs, install the three 1/8 x 1/4 spars (a medium-hard balsa is good here).

5) With the exception of the exclusion of the 1/16 x 2 in. bottom panel on the wing tips, and a 1/8 plywood insert in the center section (for the landing gear), all five wing sections are built identically as described above. I glued additional balsa blocks around the plywood insert after the landing gear was mounted for added strength.

6) Final assembly is simply a matter of joining the mating panels to each other, and checking for the proper dihedral angle at each break.

7) When the entire wing is thoroughly dry, remove an 1/8-inch wide vertical section from the front of each R-1 rib at the dihedral break points. This allows room to insert the 1/8 plywood dihedral braces onto which the R-1 ribs are reglued.

8) If you don't like an external antenna, now is the time to install it inside one wing half.

9) I'm an old Silkspan fan, so my choice of covering material was two layers of Silkspan applied crossgrain to each other. However, you may use *your* favorite covering here with the secure feeling that your wing is highly warp resistant from the nature of the construction. The wing will show little tendency of warping, if it was built right in the first place.

EMPENNAGE

The rudder and canard surfaces are a snap, as they are all cut from solid sheet balsa. Using the sheet dimensions shown on the plans, use coarse sandpaper to round all edges and fair the 1/4-inch sheet horizontal stab with the 1/8-inch sheet elevator surfaces. Use top quality nylon hinges to attach all control surfaces, and use a U-control (pardon the expression) split elevator control horn. Remember to reinforce the elevator surfaces with some light gauge cloth or fiberglass tape where the control horn wires are buried.

FUSELAGE

Now comes the fun part!

1) Start by cutting out the left and right side panels. Trace the outline of the wing root on each panel, but *do not* remove yet.

2) With each side panel laying flat with the outside surface down, glue in the 1/8 x 1/4 framing and all plywood doublers to each side. Allow to dry thoroughly.

3) Cut out all body formers (grain running horizontally).

4) Using body formers B-1, B-3, B-6, and B-12, join the two side panels. A rubber band directly over each glued former will hold it firmly in place. After the rubber bands are placed, set the partial assembly over the top view of the fuselage to be certain there is no skewing left or right.

5) When the first four formers installed are thoroughly dry, fill in the remaining former stations, positioning them according to plan.

6) The fuselage bottom can now be installed. First, cut to rough outline, gluing and pinning to the underside of the fuse, and finally trimming to size with a razor. Sandpaper when dry.

7) Now you can carefully remove the portion of the fuselage directly below the wing root outline. This becomes the wing fairing that will be glued to the underside of the wing center section. Also remove the wing root outline at this time, plus 1/16 more to make room for the wing saddle sheeting and the wing itself.

8) The turtle deck is next. However, before starting, consider the installation of your tank at this time. Formers B-9 and T-6 must be notched out to make room for the tank, plus a thin wrapping of urethane foam to keep down vibrations to the fuel. I found that cutting the suction line in the tank so that the weighted end lays about midway inside the tank makes for the most efficient fuel feed and smooth engine running.

9) Add the remaining turtle deck formers and the single stringer along the top. Note: by installing two T-7 formers, a small access hatch is formed between T-7 and T-8. This can be cut away after sheeting the turtle deck by cutting between the two T-7 formers with a razor saw. You will need this opening for tank inspection, and the installation of the radial engine mount.

10) The turtle deck is sheeted as follows:

a/ Cut out five strips of 1/16 sheet balsa, 13 inches long, 1 inch wide at one end, 1/2 inch wide at the other.

b/ Wet one surface of the first strip so that it becomes very flexible in one direction.

c/ Glue the strip down (wet side out) to the fuselage side panel (narrow end to the rear). Then glue and pin the sheet to each former so that it conforms to the curvature.

d/ Repeat for remaining four strips until the turtle deck is completely covered. The last strip may take a little trimming to make it fit in the remaining space between the previous strip and the fuselage side panel.

11) The front hatch cover and nose block are carved from solid, medium soft balsa. I found it convenient to build up the necessary thickness from 1/2 and 1/4-inch sheets laminated together. The quickest way to get the hatch to the proper curvature is to trace the top view onto the built-up balsa block, then cut it out, "leaving the line" for final trimming. Do the same now for the side view. Now glue former T-1 to the back end of the hatch block, and shape the entire hatch to match this curvature. Drawing a center line the full length of the hatch cover helps to make the shaping symmetrical.

When the front hatch cover has been roughly shaped, proceed to shape the nose block, tracing and cutting out the top and side view outlines first. Now tack glue the front hatch cover down to the fuselage and permanently glue in the nose block. Final shaping and sanding of both pieces is now accomplished. Using a razor saw, cut diagonally through the front hatch cover at the front end as per the plan (be careful not to cut into the fuselage). Now you can remove both pieces of the hatch.

The front piece is glued permanently in place after installing the nylon break-away hold-down bolt. Note the use of 1/8 sheet plywood under this block for strength. Now the remaining hatch cover can be notched out to accept the horizontal stabilizer (remember 1/8 in. total positive incidence). After gluing the stabilizer in place, installation of the alignment and locking pin at the back end of the hatch cover completes this unit. An additional small block of balsa behind T-2 is in order for additional strength. Add the cowl cheeks and the wing saddle sheeting to complete the fuselage.

12) Finishing of the model consists of a thorough sanding of all balsa surfaces with 300 sandpaper prior to clear doping. I have found that three coats of clear dope and two coats of color, with light sanding using 300 wet or dry between coats, brings out a reasonably fine finish without too much fuss or time expended. Again, the new plastic sheet finishes can be used at the builder's discretion.

RADIO GEAR AND ENGINE INSTALLATION

The engine is mounted using a radial mount against firewall B-12. Access to the mounting bolts is obtained by removing the small hatch formed between T-8 and the second T-7 former (as described above).

The size and wing area of EPI-SUE lend themselves to the use of the lightweight radio equipment now available (10 oz. or less airborne weight). The elevator

servo is installed between B-2 and B-3 A, a small notch cut out of B-3 and B-3 A is necessary to clear the elevator push rod. The remaining two servos (for engine and rudder), the battery pack, and the receiver should be located in the remaining hatch space, so that the balance point (BP) falls 2-1/2 inches ahead of the leading edge of the wing. Some lead shot placed in a drilled out recess in the nose block may be necessary to attain the proper BP location.

TRIMMING AND FLYING

The engine (a .20 is ample; a .25 to .29 is very lively) should be mounted with the thrust line smack on the fuse center line. I found no adverse torque effects that required counteracting.

For the first flight, pick a calm to slightly breezy day. The engine should be at full throttle, elevator trimmed in line with the horizontal stab, and rudder neutral. Please note! On a canard, *down elevator* will have the effect of *up elevator* on a normal airplane! Think of the elevators as flaps and you can't go wrong. Be sure all trim levers are at neutral, so that you can apply appropriate correction, if it is required.

Unfortunately, our club (Thorn Creek R.C., Lansing, Illinois) is not graced with a field smooth enough to accommodate a small-wheeler airplane for takeoffs. Consequently, all my flights thus far have been from a hand launch. An ROG is preferred, but if your field is like ours, have your buddy give it the old heave, shoulder high, and in a slightly climbing attitude.

Once on its own, EPI-SUE will pick up air speed remarkably fast, and become immediately responsive to your control commands. Get a few hundred feet of altitude, then release the stick with the airplane heading *into* the wind. Note any pitching or yawing tendency, and apply the necessary trim. From here on in, the airplane will practically fly itself.

Have yourself a ball flying EPI-SUE and indulge in a snicker or two as you hear the exclamations from the unbelieving crowd as they watch you wheel EPI-SUE around the sky *episu*. •