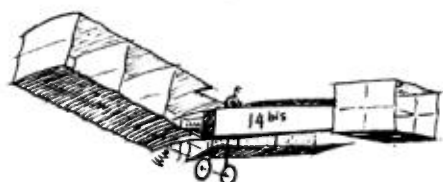




Tail First

Many great planes have flown backwards. So does this little rubber job.

KENNETH AND WILLIAM HANNAN



1906 SANTOS-DUMONT

DON'T feel backward about building this "wrong-way" flyer, because some of aviation's most important pioneers started off in this direction. For example, many of the Wright Brothers' machines featured forward-mounted "tails," as did Santos Dumont's Bis 14 (one of the first heavier-than-aircraft to fly in Europe). Even the famous channel-crosser, Louis Bleriot, built at least three canards, as tail-first aircraft are called.

The North American Aviation XB-70 Valkyrie is one of the more recent examples of the type. Incidentally, the forward surface on a canard is usually referred to as a "leading plane," rather than a tail, which after all is supposed to be on the south end of any north-bound animal!

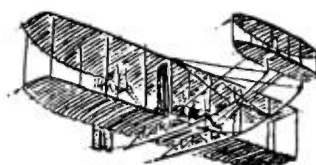
Much of the design effort and test-flying of our model was carried out by Tenderfoot Kenneth Hannan, who first became interested in canards while watching one being flown indoors by Walt Mooney, of San Diego, Calif.

Construction: First, take a good look at our plans and illustrations to be sure you understand how the various parts fit together. The model will perform best if it is light, so carefully select your balsa wood. Sight down each piece to be certain that

it is straight. Heft several pieces of wood, to tell which is the lightest.

Obtain a piece of Celotex, soft wood board, or even a flat sheet of corrugated cardboard, on which to build the wings and leading plane panels. We suggest you start with these parts so that they will have plenty of time to dry while you are working on other items. Since the plans are printed full size in the magazine, you can work directly over them. To protect the plans from glue, cover them with Saran-Wrap or waxed paper.

Wing: Select straight $\frac{1}{16}$ "-sq. balsa strips, and cut the two longest ones first. Pin



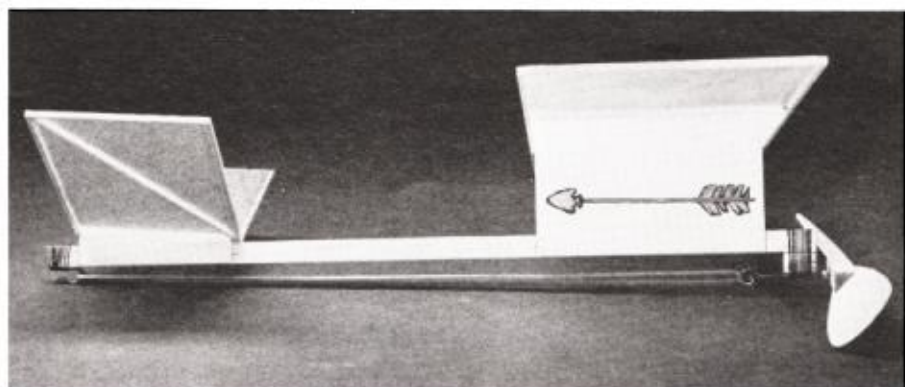
1908 WRIGHT

them in place over the plans so that they will be held flat while drying. Do not pierce the wood with the pins, but instead, put pins on each side at a slight angle, so that the wood will not be weakened.

Next, add the shorter pieces of $\frac{1}{16}$ " sq. strip which serve as ribs. Note that there are two of them glued together in the center of the wing. If you measure the length of the first rib accurately, you will be able to use it as a guide in cutting the remaining five pieces. Try to avoid getting too much glue on the joints; this looks messy,



NORTH AMERICAN XB-70



Model has naturally correct balance point with balsa prop. If you substitute a plastic prop, add weight at nose to compensate. Tenderfoot arrow shows flight direction.

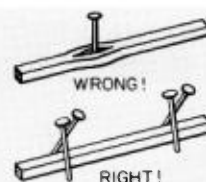


1911 BLERIOT

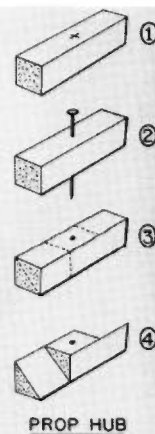
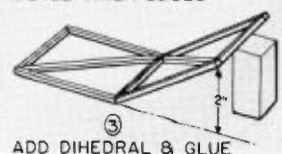
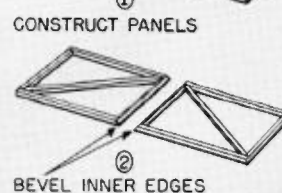
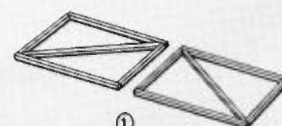
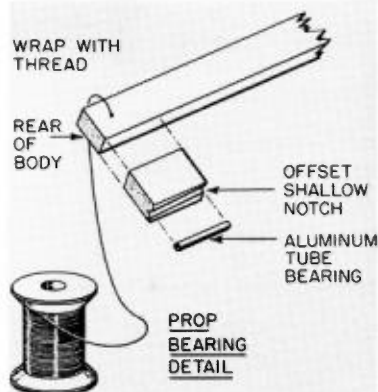
and adds unnecessary weight.

Leading plane: This is constructed in two parts, from $\frac{1}{16}$ " sq. balsa strips, which are pinned down to the plans in the same manner as the wing. Take your time to fit the diagonal sticks well, rather than trying to force them into place, or expecting the glue to fill in any cracks left by pieces that are too short. Patience here will pay off in

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PINNING DOWN $\frac{1}{16}$ " SQUARES



Tail First

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a stronger and neater appearing job.

After the two leading plane panels are thoroughly dry, remove them from the building board. Using a sandpaper block, bevel the two ends as shown on the drawings. Sand with a gentle pressure so that the structure will not be damaged. Next, apply glue to both beveled edges, place the parts on waxed paper, and elevate one edge 2", to achieve the correct dihedral (up-tilt) angle. It is important that this joint be allowed plenty of drying time.

Fuselage: Choose a light but stiff piece of $\frac{1}{8} \times \frac{1}{4}$ " balsa strip, and cut it 9" long. Another piece of the same stock is cut $\frac{3}{8}$ " long to serve as the bearing block. Cut a shallow notch in one face as shown on the drawing. This angled notch offsets the thrust line, and locates the prop-shaft bearing, which is cut from aluminum tubing.

Roll the tube back and forth under a sharp blade to score a groove around it. Then snap it apart, and use sandpaper to smooth the end. Roughen up the outside of the tubing with a knife or sandpaper, so that glue will be better able to adhere. Glue the bearing block onto the fuselage, add the tube bearing, wrap the whole assembly with sewing thread, and apply a thin layer of glue over the thread.

Using needle-nose pliers, bend the wire hook for the nose to shape, and apply it to the fuselage with thread and glue binding. While you are bending wire, bend the propeller shaft to the shape shown.

Cut out the leading plane mounts and wing mounts from $\frac{1}{32}$ " balsa sheet. Make paper patterns of these items to be sure that they are the right size and shape. Mark their positions on the fuselage sides with a pencil, and glue the parts in place.

Propeller: This little prop is not difficult to make, but take your time for best results. The hub is made from two pieces of $\frac{1}{8} \times \frac{1}{4} \times 1$ " glued together, or if you happen to have a scrap of $\frac{1}{4}$ " sq. balsa strip, use that. The wood for the hub should be medium hard, not soft. Find the exact center and push a straight pin through it. This is easier said than done, and you may have to try it more than once to get the hole properly centered. It might help to push the pin halfway through from one side, then halfway through from the other, until the holes merge. The object, of course, is to achieve a true-running propeller that will not wobble.

Next, measure and mark the portions of the hub which will be cut away to receive the prop blades. A diagonal line drawn on each end of the hub will help establish the depth of each cut. And speaking of cutting, watch out for your fingers while working on such small pieces as this. Shaving away the wood a chip at a time is safer than trying to hack out the entire corners at once.

The two prop blades are cut from $\frac{1}{32}$ " sheet balsa. It is well to use a paper pat-

tern as a guide for accuracy. Round the blade edges slightly with sandpaper. Glue the blades onto the hub, making every effort to center them properly. When the blades have dried, push a thin wire through the hole in the hub, and see if the prop balances. If one blade drops to the bottom, sand it to reduce its weight. Time spent on this operation will result in smoother flights.

Slide the propeller shaft through the bearing tube and add a couple of glass "seed beads" to serve as thrust bearings. Place the prop on the shaft and check that there is enough clearance between the blades and the end of the fuselage. It may be necessary to use an extra bead or two to provide the proper spacing. Using needle-nose pliers, bend the end of the prop shaft into a "U" and force it into the prop hub. Apply a film of cement over the area to keep the wire in position.

Covering and decor: Select the lightest grade of tissue that you can find for covering. Only the tops of the leading plane and wing are covered. The original was covered with red, white, and blue tissue, which is quite effective. The leading plane is red, and the wing is white with blue tip panels. Another interesting scheme would be all-white with red and blue "racing stripes." The small "Tenderfoot arrow" may be emblazoned on the side of the wing mount if desired.

Have your mother, sister, or girl friend iron out the tissue prior to using it to make it as smooth as possible, since it will not be water shrunk on the model. Allow the tissue to cool to room temperature before applying it. With care a tight job will result, since there are no curves involved.

We obtained good results using Sig "Lite-coat" as a tissue adhesive; it is heavily plasticized (prevents over-shrinking) and resists warping. It is also possible to use rubber cement to attach covering material, and you may wish to give it a try. By experimenting with different approaches to model building, you will soon discover the system that works best for you. Trim the excess tissue off with a sharp razor blade.

After the wing is covered apply glue to both sides of the center rib and insert it between the wing mounts. Press down until the wing mounts touch the underside of the wing's tissue covering.

The leading plane now may be glued in place. Check that it is correctly aligned as viewed from both the front and side of the model. Add a drop of oil to the prop-shaft bearings and you are ready to go.

Flying: Since this model is small and light, it should be flown only under calm conditions. If you have access to a suitable indoor flying site, such as a gymnasium or hangar, so much the better. Indoors, or under dead calm conditions, the model may

be flown with very low power. It is better to start with too little power rather than too much, at least until an understanding of the model's flight characteristics has been gained.

A couple of gentle test glides will probably establish the need for a tiny bit of clay ballast at either the front or rear of the fuselage. Next, try a few hand winds, and observe the flight pattern. With the offset thrust line, the model should circle to the left, assuming that there are no serious warps, and that the power is kept fairly low. If the model resists turning to the left, a small amount of clay can be added to the left wing tip. Other turn adjustments can be made by means of paper wing-tip tabs, if necessary.

When satisfied with the results, wind in perhaps 100-150 turns and try again. With low power, the model should behave quite docilely, but with great power increases, you may note a pronounced tendency to roll to the right, when first released. Through the years, model canard designers have contrived many different ways of combating this problem, such as alterations in wing positions, other dihedral combinations, counter-rotating props, and so on.

There is another, rather sneaky, approach to the rolling-to-the-right problem that seems to have been largely overlooked. Simply launch your over-powered canard straight up! The model may roll to the right as usual, but in the near vertical attitude, who cares! It seems that once the critical stage has been passed, the model regains its composure and continues on in fine fashion. On the other hand, if it is launched horizontally, the roll to the right is apt to be rudely terminated by contact with the ground.

This is an excellent model to experiment with since it is quick and inexpensive to build, and if damaged, can be repaired easily. After you have succeeded in getting good flights from your "Tail-First Tenderfoot," why not build another, but higher performance version? Here are a few suggestions: 1) Use lighter wood, 2) Sand the corners of the fuselage to reduce weight and streamline, 3) Blend in the wing and leading plane mounts to the fuselage, by careful sandpapering, 4) Round all leading and trailing edges, 5) Try different power combination, 6) Use rubber lube and a wind-er, 7) Keep experimenting!

Suggested tools list: Pencil, ruler, single-edge razor blade, modeler's knife, wire cutters, needle-nose pliers.

Miscellaneous supplies: Sandpaper (No. 400 or 600), sandpaper block, Celotex or equivalent building board, Saran-Wrap or waxed paper, glue, straight pins.

Materials: Two $\frac{1}{16}$ sq. x 36" balsa strips. One $\frac{1}{8} \times \frac{1}{4} \times 36$ " balsa strip. One $\frac{1}{32} \times 2 \times 36$ " balsa sheet. One piece music wire (.025-.045 diameter). One piece $\frac{1}{16}$ " outside-diameter aluminum tubing. Lightweight tissue paper. Sewing thread. One piece $\frac{1}{8}$ " flat brown rubber or $\frac{1}{16}$ " Pirelli. Two or three glass "seed beads."

Note: except for the $\frac{1}{16}$ " sq. balsa strips, enough material will be left over to build additional models.