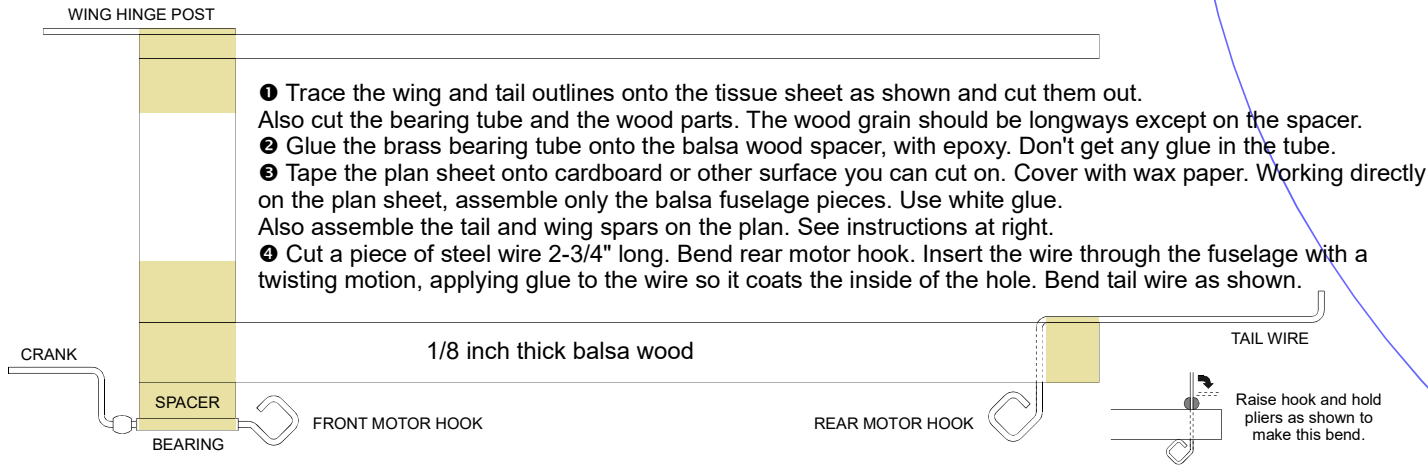


LUNA

ORNITHOPTER - FLAPPING WING MODEL KIT

Designed by Nathan Chronister. Required materials available at a hobby shop. Balsa wood, 1/32" plywood, 1/32" steel wire, 1/16" brass tubing, 1/8" model airplane rubber, tissue paper, plastic bead, earring backers. You will need scissors, a hobby knife, needle-nose cutting pliers, white glue, and epoxy to build this ornithopter. Read all instructions before you begin.



- Trace the wing and tail outlines onto the tissue sheet as shown and cut them out. Also cut the bearing tube and the wood parts. The wood grain should be longways except on the spacer.
- Glue the brass bearing tube onto the balsa wood spacer, with epoxy. Don't get any glue in the tube.
- Tape the plan sheet onto cardboard or other surface you can cut on. Cover with wax paper. Working directly on the plan sheet, assemble only the balsa fuselage pieces. Use white glue. Also assemble the tail and wing spars on the plan. See instructions at right.
- Cut a piece of steel wire 2-3/4" long. Bend rear motor hook. Insert the wire through the fuselage with a twisting motion, applying glue to the wire so it coats the inside of the hole. Bend tail wire as shown.

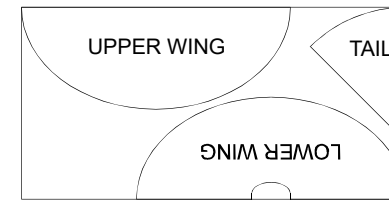
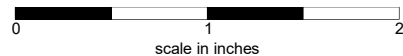
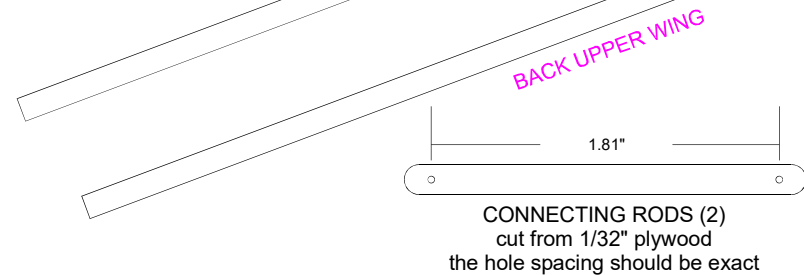
5 Crank assembly: Cut 2-1/4" of wire and form the front motor hook at one end. Insert the wire through the bearing tube. Add a small plastic bead, 1/32" hole. Bend the crank wire as shown. Crank radius should be 1/4". Glue the crank assembly onto the fuselage. Glue the wing hinge post (1" wire) in place. Glue the tail to the tail wire. Put something under the tail to support it while the glue dries.

6 Reinforce shaded areas by gluing layers of tissue onto the wood. Cut tissue strips narrow enough so they don't stick out beyond the wood. Don't get glue in the bearing tube. Apply four layers of tissue around the crank assembly and three elsewhere.

7 Assemble parts onto the wing hinge post: first the rear wing, and then the front wing.

8 Fit the connecting rods onto the wing pins and crank. Twist rubber stoppers (earring backers) onto the crank and wing lever wires to hold the connecting rods in place. Check for correct range of movement. If necessary, adjust crank radius or redrill connecting rods, using a straight pin. Wings may not move smoothly until step ten.

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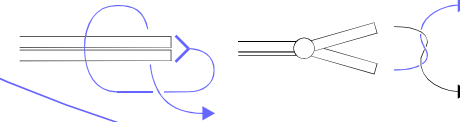


Trace the wing and tail outlines onto the tissue sheet as shown. Carefully mark the centerline on each wing.

THE ORNITHOPTER ZONE
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Wings: Cut the balsa pieces to match the plan. Make holes by twisting the sharp wire end through the wood. Cut two pieces of wire, 3/8" long, to make the wing pins. Glue wing pins into holes, pointing straight up from the plans. Assemble balsa parts.

Rubber band: Cut an 18" strip. Tie ends together and double the knot as shown.



9 For upper wing, align tissue with leading edge of front spars but glue only to the top of the upper wing spars. Remove excess tissue. Glue along top of fuselage with the tissue centerline offset by 1° (1/16") to pull back the rear upper wing slightly.

10 Attach bottom wing to the bottom surface of the lower wing spars. Tissue should be offset 1° to pull back the rear lower wing.

Flight: Bend the tail up about 10°. Tie and lubricate the rubber band. Double the rubber band and hook it onto the motor hooks. Wind 80 turns for test flights. Launch gently with nose high. Adjust tail up or down as needed. If the ornithopter turns tightly, try winding in the opposite direction. Max 220 turns, lubricating before each flight, or 120 without lubrication.

Tail: You will need to cut an angle in the tail pieces so they fit together as shown. Assemble with white glue. Apply tissue to the tail frame using white glue and one part water.

TAIL WIRE

Use only performance grade rubber band intended for model airplanes and sold at hobby shops.