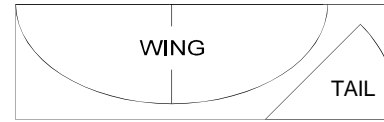


# FREEBIRD

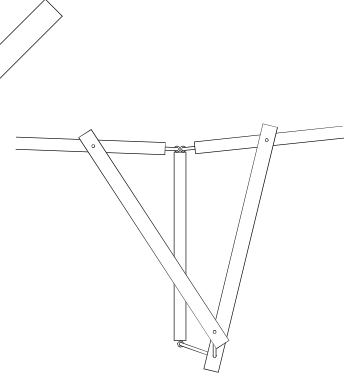
ORNITHOPTER - FLAPPING WING MODEL KIT

Congratulations on choosing The Ornithopter Zone's Freebird ornithopter kit designed by Nathan Chronister. It's the perfect introduction to building your own ornithopters! To build this kit, you will need scissors, a hobby knife, needle-nose pliers, straight pins, white glue, and epoxy or CA instant glue. Read all instructions before you begin.



Arrange wing and tail outlines on the tissue sheet as shown. Carefully mark the centerline on the wing. Save the excess tissue for later.

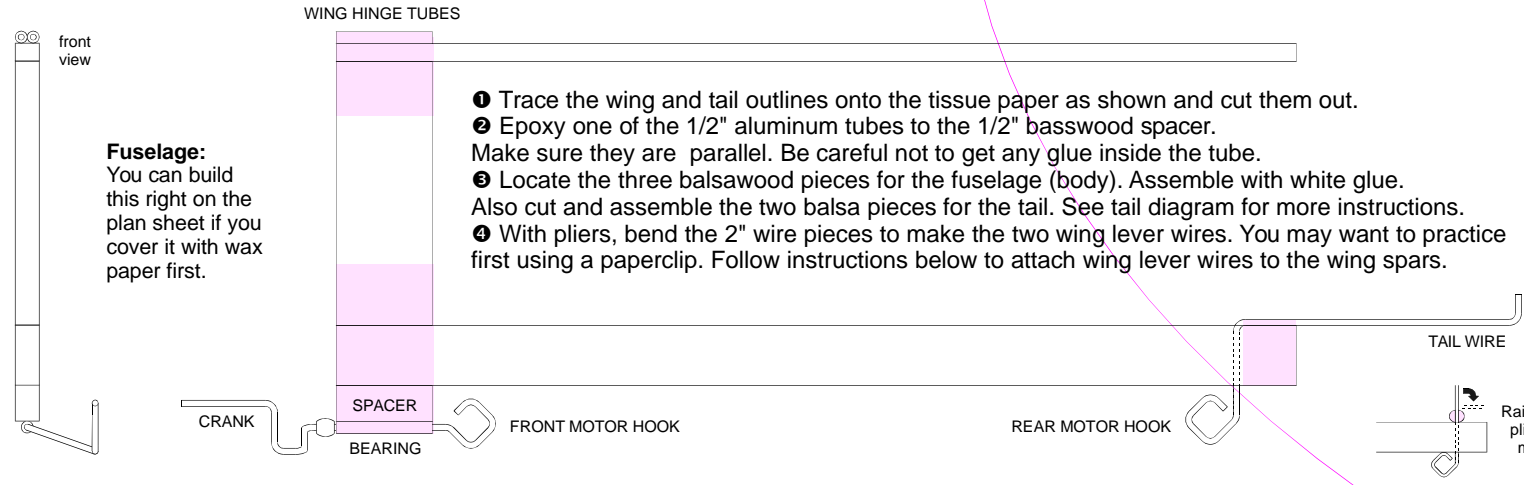
LEADING EDGE



front view of assembled mechanism

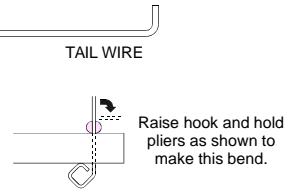
THE ORNITHOPTER ZONE  
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CENTERLINE



**Fuselage:**  
You can build this right on the plan sheet if you cover it with wax paper first.

- 1 Trace the wing and tail outlines onto the tissue paper as shown and cut them out.
- 2 Epoxy one of the 1/2" aluminum tubes to the 1/2" basswood spacer. Make sure they are parallel. Be careful not to get any glue inside the tube.
- 3 Locate the three balsawood pieces for the fuselage (body). Assemble with white glue. Also cut and assemble the two balsa pieces for the tail. See tail diagram for more instructions.
- 4 With pliers, bend the 2" wire pieces to make the two wing lever wires. You may want to practice first using a paperclip. Follow instructions below to attach wing lever wires to the wing spars.

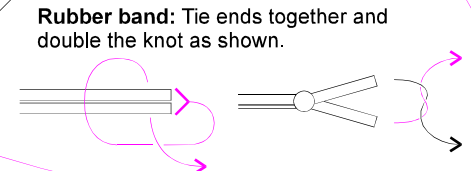
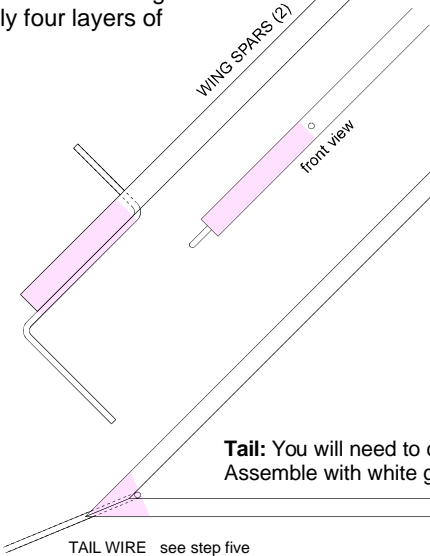
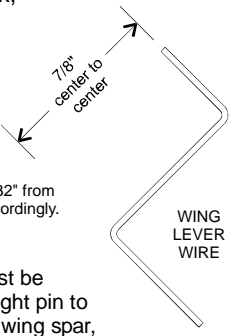
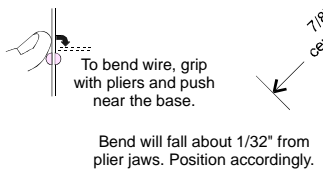
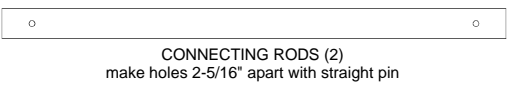


5 When the fuselage is dry, bend one of the 2-3/4" wire pieces to form the rear motor hook. Use a straight pin to make a pilot hole, and then insert the wire through the fuselage, applying glue to the wire to coat the inside of the hole. Bend the free end of the wire as shown. The last 1/8" at the end of the tail wire must be straight up and down.

6 Crank assembly: Bend one of the 2-3/4" wires to form the front motor hook. Insert the wire through the bearing tube. Add the small plastic bead. Bend the crank wire as shown in the front and side views. The crank radius should be 3/8" or slightly less. Glue the crank assembly onto the fuselage. Glue the two aluminum wing hinge tubes to the top of the fuselage, side by side. Be careful not to get any glue inside the tubes. Glue the tail to the tail wire as shown in the tail diagram. Put something under the tail to support it while the glue dries.

7 Using a one-to-one mixture of glue and water, reinforce shaded areas with tissue. Cut the tissue strips narrow enough so they don't stick out beyond the wood, and be careful not to get any glue in the wing hinge tubes. Apply four layers of tissue around the crank assembly and three wraps elsewhere.

8 Scrape excess glue from the wing lever wires. Fit the wing lever wires into the wing hinge tubes. Then add the connecting rods. Support the wings from behind so you don't bend the wing lever wires. The first connecting rod goes past the first two bends in the crank, and it drives the left wing. The second connecting rod goes on the outermost part of the crank and drives the right wing. Wings should move freely when you turn the crank. Cut the plastic tubing into three sections and slide it onto the wires to hold the connecting rods in place.



- 9 Move the wings to their lowest position. Apply glue/water mixture to the top of the wing spars. Glue the leading edge of the tissue in place and smooth out any wrinkles.
- 10 Make sure the spars are all the way into the wing hinge tubes. Glue the wing tissue to the top of the fuselage so that the marked centerline is parallel with the top of the fuselage.

**Flight:** Bend the tail up about 10°. Double the rubber band and hook it onto the motor hooks with the knot in back. The band will last longer if you rub it with vegetable oil before flying and store it away from light. You may also oil the crank wire. Wind up 80 turns and launch gently against the wind, pointing up 30°. If the ornithopter dives, bend the tail up more. If it stalls, decrease the tail angle. To make it fly straighter, try winding the opposite direction or add a little weight to one wingtip.

**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.