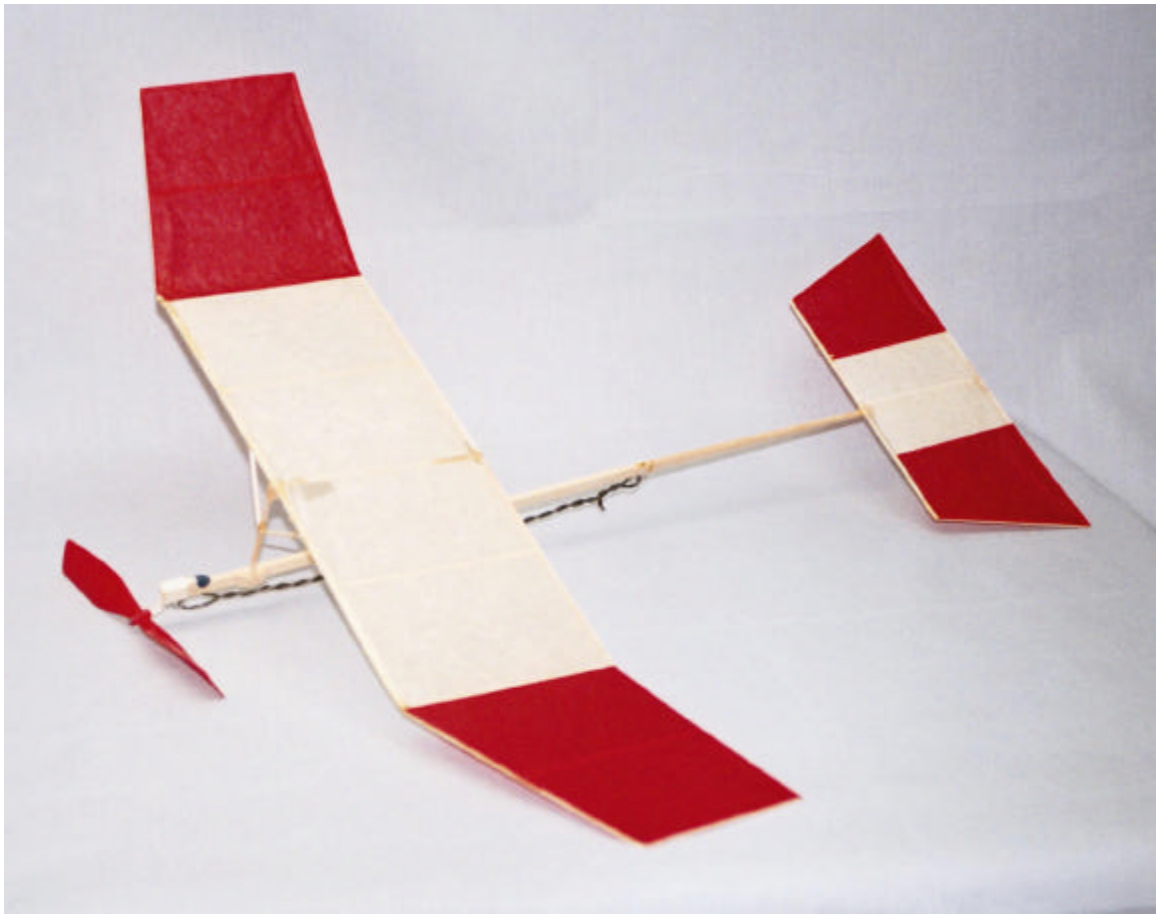
Double Whammy

By Chuck Markos



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DOUBLE WHAMMY was designed to be a simple model to introduce Indoor rubber trim, handling, and some building techniques to modelers who had never before tried the fascinating world of Indoor model aircraft.

It has been a most successful airplane in that scores have been built by people of all skill levels and regular contests have been scheduled for this as a "one-design" event using a mass-launch approach. It is quite spectacular to see 25 or more of these brightly colored aircraft simultaneously circling towards the ceiling.

The one criterion was that all materials and equipment for construction and flying must be readily available. Three items not normally found in the workshop are required:

- A box for transport of the model to the Indoor flying site. This container should allow the disassembled components to lay flat on the bottom. Unfortunately the very popular box for copier paper is just a little too small. The importance of a proper box cannot be overstated; most Indoor models are broken by mishandling, and hardly ever by crashes or flight stresses.
- A geared winder. The Sig catalog lists a 16:1 winder for less than $20. Since the rubber motor will require well in excess of 1,000 turns for respectable flights, hand-winding or using a winder with a lesser gear ratio could be quite tiresome.
- A good supply of 1/16 width TAN-II rubber (FAI Model Supply) for motors.

DOUBLE WHAMMY

Type: Free Flight Indoor

Wingspan: 17 inches

Flying Weight: 5-6 grams

Motor: Tan II rubber strip

Construction: Built-up

CONSTRUCTION:

Use firm balsa for the motorstick, the inner portions of the wing leading and trailing edges, and the vertical wing posts. All other balsa should be quite lightweight.

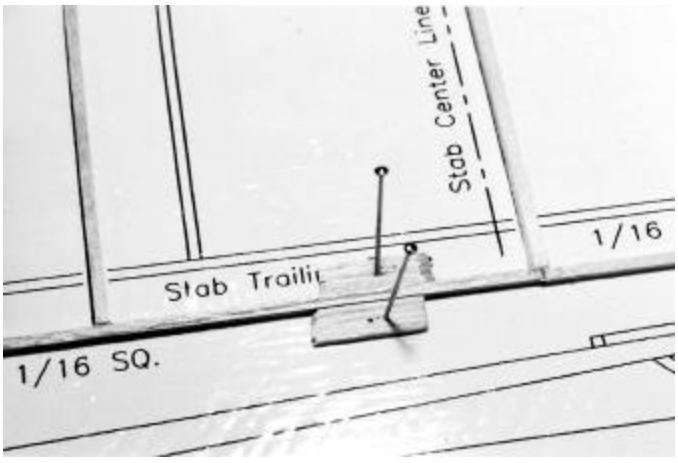
Proper wood selection is of the utmost importance to an Indoor model. Making incorrect choices when selecting wood may result in a finished model that is in constant need of repair (too light), or one requiring excess ballast to maintain the center of gravity (CG), or one that is just plain overweight (a heavy model is not necessarily a strong model).

Most precut strip balsa is firm enough for the high-stress components above. The rest can be cut from sheet balsa of the appropriate thickness and density by using a metal straightedge and a single-edge razor blade.

The finished airframe should weigh five to six grams.

Carefully splice together the plans by cutting one plan on the splice line with a straight edge and razor. Then tape this cut half on top of the other half, carefully aligning the splice marks and wing LE to form a straight line. Place the plans on a surface which will accept pins easily; I use a Celotex ceiling tile. Cover the plans with a plastic food wrap before construction, to keep glue from sticking the structure to the plans. Please note the technique illustrated for holding the strips of balsa in place by using opposed scraps and pins to gently clamp the pieces in place.

Use either Duco or Ambroid cement. To apply small quantities, make a glue well from a short section of a plastic drinking straw pushed into modeling clay. A toothpick can be used to transfer the glue to the joints. Make sure the glue gets between the two pieces of wood to be joined.



Scrap balsa is used as wedges on each side of strip to hold in place without having to pin through the wood (which causes splitting)

Rudder construction under way. Wedges used again to hold pieces in place. Drinking straw glue "well" at right.

Tailboom/Fin and Stabilizer: If you cannot form a double-tapered boom as shown on the plans, it's okay to use medium-weight 1/16 balsa sheet and a single taper cut from 1/16 x 1/4 to 1/16 sq. over its length. Make precise bevel cuts in the soft 1/16 square fin LE and TE pieces to match the angle of attachment to the tailboom. These should be slightly overlength when they are glued in place. Did you use the scrap balsa and pins to hold everything in place?

Mark the location of the tip piece on the LE and TE and cut through, using a sharp razor blade so as not to crush the balsa. Hint: Use a scrap of manila folder paper under the two marked fin members so the cut doesn't go through the plastic wrap into the plans. The gap would allow excess glue to seep onto the paper and make removal of the completed fin difficult.

The 1/16 square fin tip is cut slightly longer than its final dimension and glued in place. Trim to length after the glue has dried.

The stabilizer was designed to be minimum area so it could be made from lightweight wood and still be rugged enough to withstand the rigors of handling and flying. The LE and TE are cut slightly overlength and held in place using balsa scraps and pins.

The crosspieces (ribs) must be fit precisely between the LE and TE. The technique to attain this fit is to place one end of the crosspiece against the LE while cutting partially through it at the location of the TE. The crosspiece can then be picked up as it grabs the razor blade and the cut can be completed on a cutting board.

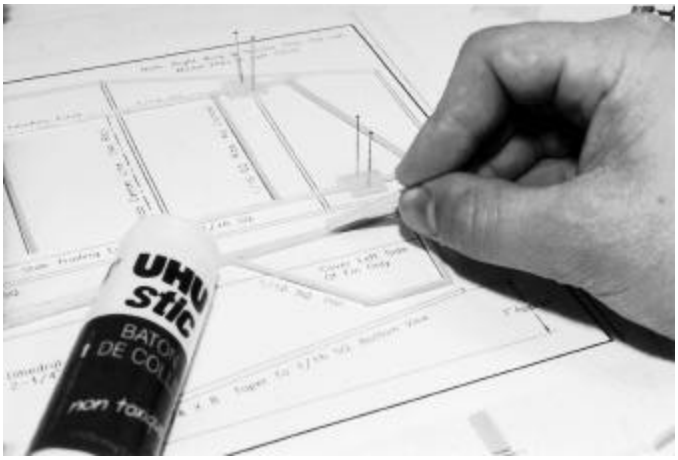
If the crosspiece bows or causes the LE or TE to bow, it is much too long and must be reduced in size. If it won't stay in place without glue, it is too short and it must be discarded (use the too-short piece as a gauge to cut its replacement just a hair longer). Do not depend on glue to fill in the gaps. That practice will result in a heavier and weaker structure than properly fitted pieces.

Once all of the crosspieces are glued in place and the glue has dried, trim the excess length from the LE and TE.

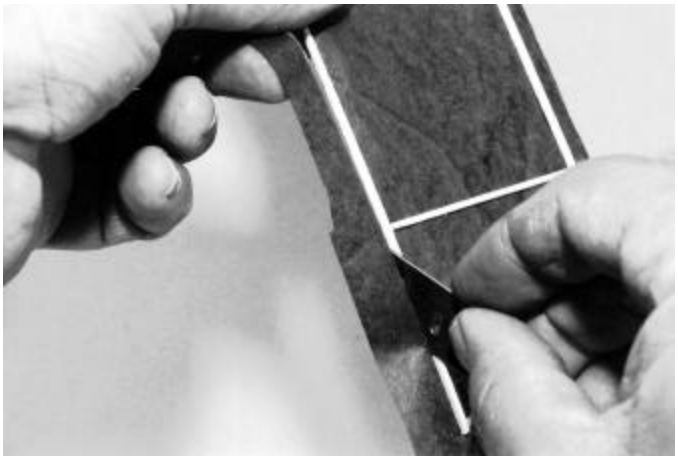
Cover the fin and also the stabilizer with gift-wrapping tissue while they are still in contact with the plastic wrap held by glue that seeped from the joints. Cut the tissue about 1/2 inch longer than the length and width to cover each piece. Make sure the grain of the tissue runs spanwise for the stabilizer.

Use a glue stick (Kidstick or UHU Stic) to coat all wood that will come in contact with the covering. Place the covering over the adhesive-treated structure and rub it gently with your finger to hold it in place. Use a scrap of manila folder cardboard to loosen the structure from the plastic wrap.

Trim the excess paper from the wood, using a very sharp razor blade. Be extra careful not to tear the paper when cutting across the grain. Place the stabilizer upside-down and glue the tailboom and fin to it at the LE and TE locations.



Glue stick can be used to apply adhesive to structure for covering. Soft balsa applicator makes job easier.



Trim Excess covering with sharp razor blade

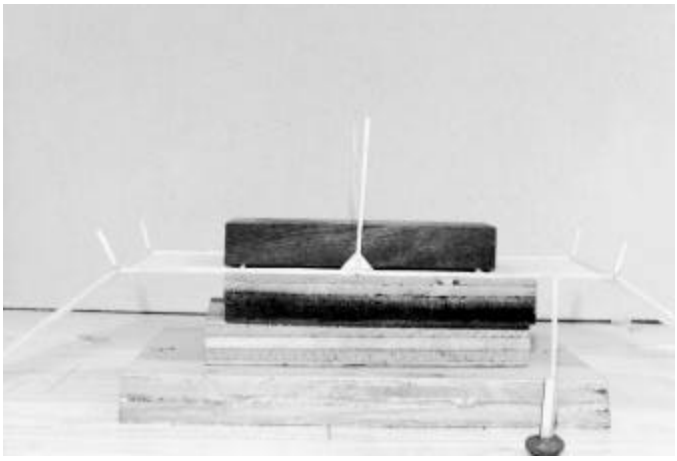
Wing: The wing construction is similar to the stabilizer. A major difference is the dihedral added to each tip section after covering. Prepare for this by placing some glue over the joints where the center section LE and TE meet the tip sections. This glue will act as a hinge later on.

Did you remember to cover the wing with the paper grain spanwise? Do not attempt to tighten the tissue by spraying with water or alcohol (as you might on an outdoor model). The structure of this model is not strong enough to resist warping when the tissue shrinks.

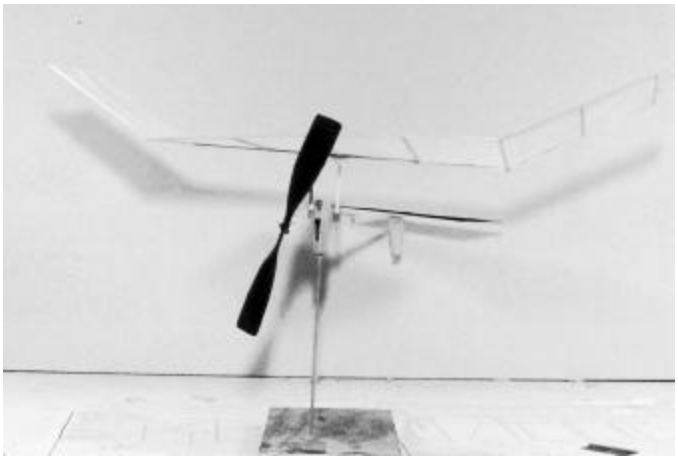
To add dihedral, the covered wing is placed upside-down on a support 2 ¼ inches high (three sheets of plywood) under the center section with the tips bent down and hanging over the edges. Place a weight on the center section to hold it in place while the tips are held down to the building board with scrap balsa and pins.

Sharpen four "stakes" from 1/16 square balsa, put a gob of glue on each, and also some in the gaps formed between the center section and tip LE and TE. Push the pre-glued stakes into the joints and let the glue dry for about one hour. Trim the excess away with a fingernail clipper. Prepare the two wing posts and gussets to be added at the "center" rib location. Be sure these posts will be skewed so the inboard wing will be washed-in (have a higher angle of attack than the outboard wing) when the wing posts are forced into a parallel configuration as they are placed into the sockets on the motorstick.

Be sure that all of the glue joints are dry before the wing is assembled to the motorstick.



Wing is held flat. Note offset/twist built into wing posts, which gives left main panel wash-in for proper climb.



Completed Double Whammy at rest in run-down stand. Note wash-in in left main wing panel. Bong Eagles and other groups have used this design successfully with youth.

Motorstick: The motorstick is a ten-inch length of 1/8 x 1/4 balsa. Using wood from the same hard piece, prepare the two notched sockets. These will be fitted into place later.

Bevel the end of the tailboom so it will be offset to the left by about one inch when it is glued to the motorstick, then glue it at one end of the motorstick with about 1/2 inch of "up" in addition to the left offset.

Push a straight pin into the motorstick at the end by the tailboom and assemble the propeller and bearing to the front of the motorstick using a scrap of 1/8 balsa to fill in the gap. Prepare a rubber motor loop of about 15 inches in length. Double it and connect it to the thrust hook and the rear pin. Find the location where this assembly balances on your finger and mark it. Place the two socket pieces equidistant from this balance point on the left side of the motor stick; total distance between sockets should be 4 1/16 inches.

Completed motorstick and tail assembly is balanced to find proper horizontal Center of Gravity location. Though not shown here in this picture, the rubber motor (doubled to take up slack) should be attached for this procedure.

FLYING:

An Indoor rubber model is different from other models in that it has asymmetric construction to fly in left-hand circles. Note that the left wing is longer than the right. Make sure the assembly of the wing to the motor stick maintains this orientation.

As noted in the construction section, the wing is also twisted to provide more incidence inboard than outboard. If the model doesn't demonstrate this twist when assembled, reposition the wing posts to correct it.

The other built-in "adjustment" is the offset fin. The model may also need some left thrust if the flight circle is too large in diameter to keep the model from hitting the wall of the flying site. This can be accomplished by removing the propeller and bearing, slicing a thin wedge from the right-front of the motorstick, and gluing the same wedge to the left-front side before replacing the propeller and bearing.

The only adjustable part of the model is changing wing incidence by sliding the wing posts up or down in sockets to correct stalls or dives.

Initial flights should have about 200-300 turns in the motor. After the motor is tied to form a single loop, coat it with some commercial rubber lube, or as a substitute, hand cream. This will increase the number of turns that may be put into the motor and also decrease the internal friction as it unwinds to power the propeller.

Have a helper hold the model at the thrust bearing while you stretch the rubber motor rearward, to about four or five times its relaxed length, with the winder. As you wind, move in so the last winds are put in just as you approach the rear pin.

Take the motor off the winder by pinching it (so it doesn't unwind) and attach to the rear pin. Take the propeller from your helper in one hand and hold the model at the motorstick, just under the wing, with the other. Simultaneously release the propeller and give the DW a gentle push forward.

For Indoor rubber models, there should be no nonpowered/deadstick glide phase of flight. For best duration, the model should be under power from launch until touchdown, using every bit of energy stored in the motor, so every turn put into the motor is used up.

If the model lands with too many turns left in the motor, it may be too heavy. One way to use more of the motor is to change the propeller to a lower pitch by twisting both blades to a lower angle. A more-drastic change is to cut the diameter of the propeller.

Impressive increases in flight duration can be obtained by optimizing the propeller-motor combination of an already trimmed model.

Double Whammy will outperform a Delta Dart, but the intent of the model is to teach newcomers some of the basics, not to make a performance model.

However, the model can be converted into a Pennyplane by changing to a 12-inch-diameter wood prop, and the wing to a cambered airfoil. Such changes will result in a model capable of five-minute flights. This was the original intent of the design: two for one, thus the name Double Whammy. Editor's note: If there is sufficient reader response, we may run a follow-up article on the Pennyplane conversion.

(Note: indeed a follow on article was written. It was called: "Double Whammy Pennyplane" and will be reprinted here soon)

Happy Landings!

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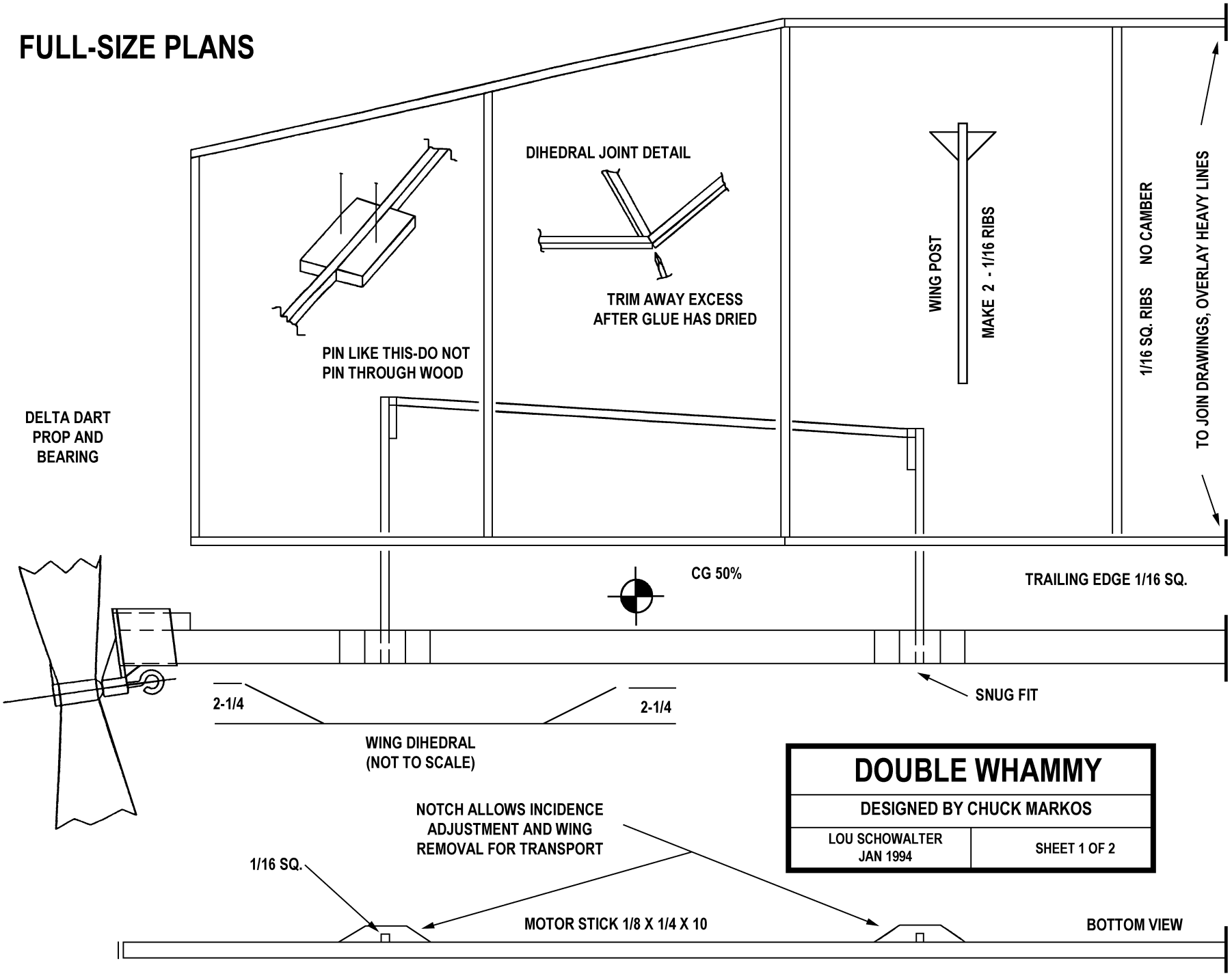
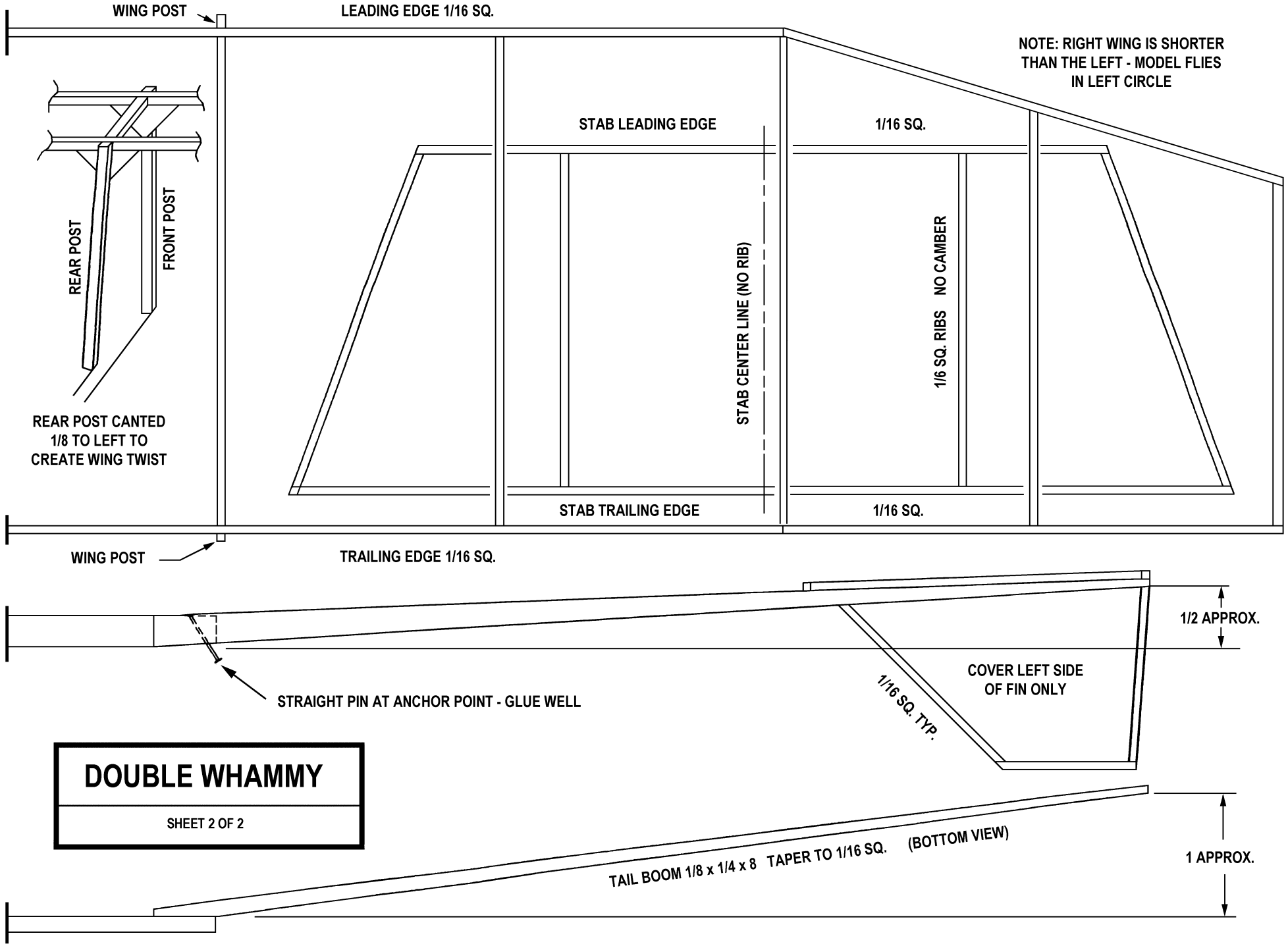
FULL-SIZE PLANS



DOUBLE WHAMMY	
DESIGNED BY CHUCK MARKOS	
LOU SCHOWALTER JAN 1994	SHEET 1 OF 2



DOUBLE WHAMMY

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