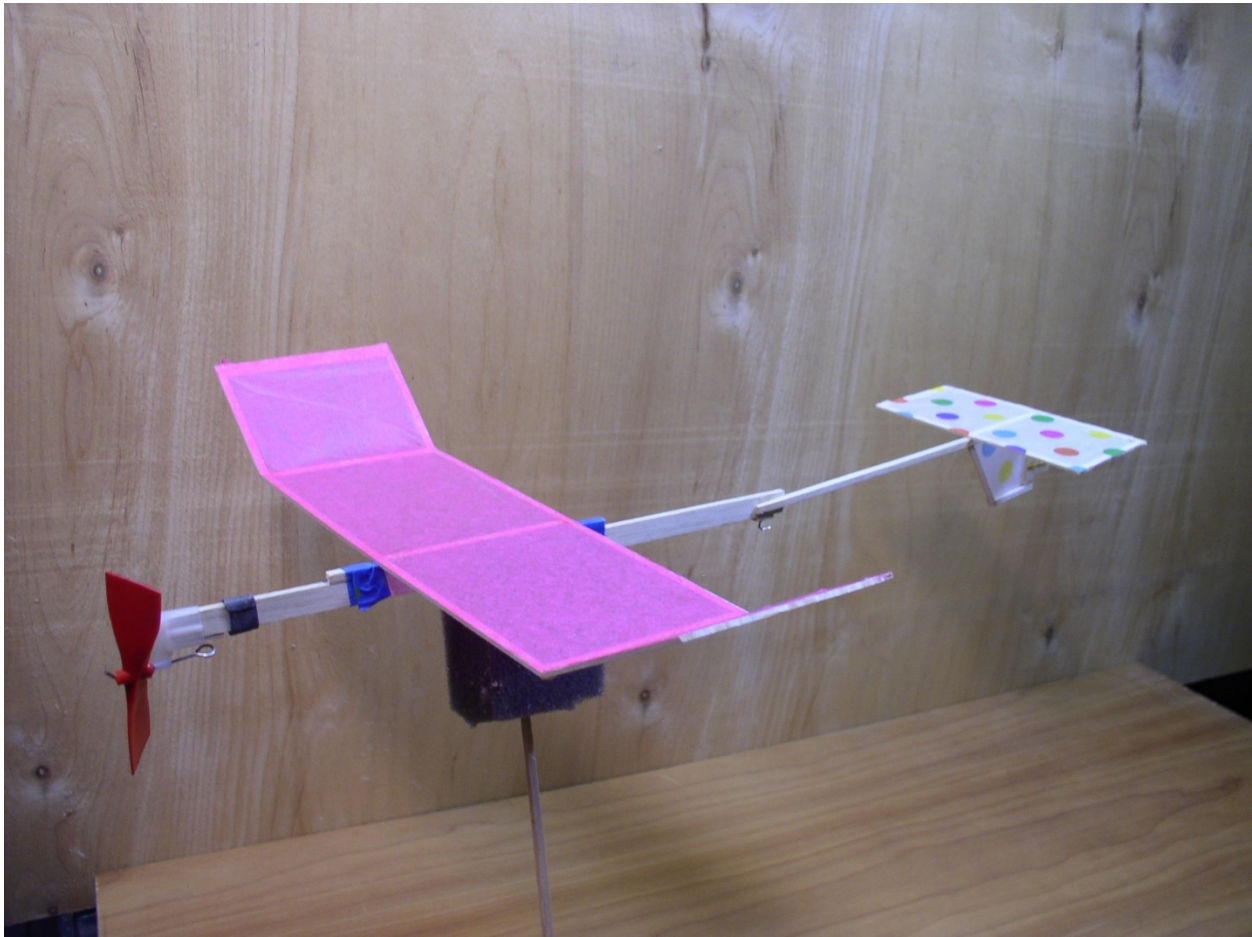


## 2019 ISO COACHES CLINIC WRIGHT STUFF BUILD

**Note: Odd page numbers on left side, even page numbers on right side.**

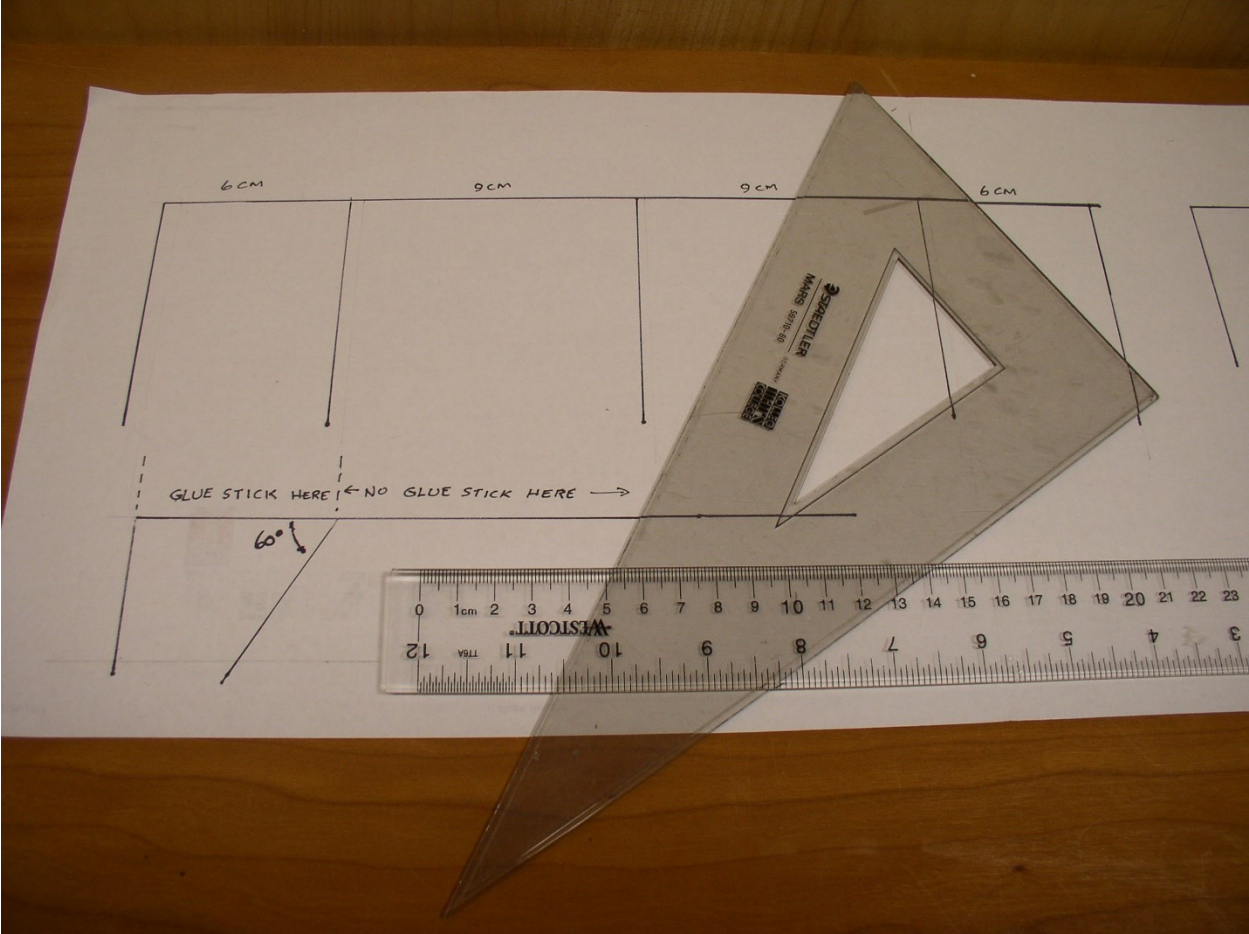


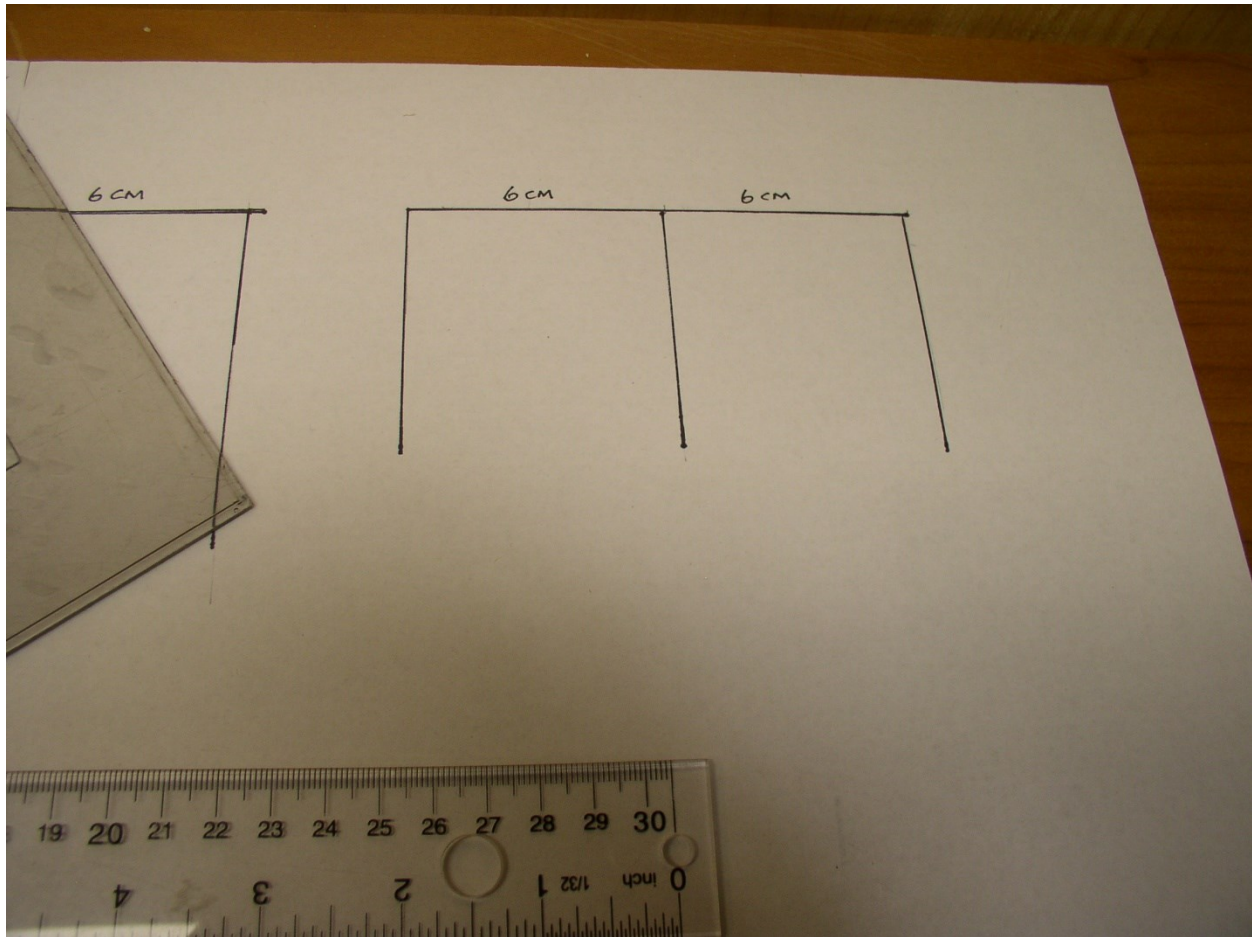
The inspiration for this airplane is the all-time favorite starting kit for many, the famous Delta Dart. Taking advice from Henry David Thoreau to “simplify, simplify” a basic change from the Delta Dart was to make most flying surfaces rectangular so that cutting balsa wood sticks at precise angles is unnecessary. Construction method is to attach balsa wood to the covering just about the same way as a Delta Dart is constructed.

The design meets 2020 Science Olympiad specifications for the “Wright Stuff” event. It will be used for “build” sessions at a Coaches Clinic sponsored by the Illinois Science Olympiad in Nov 2019. Special goals were established for that application: Simplified structure, no special tools, no pins or building boards to accept pins, no potentially toxic spray adhesives, and no special materials. All the materials with perhaps the exception of a propeller can be found at hobby dealers, craft shops, office supplies, party stores or hardware shops. A prototype shown in the photo above was tested and found to be a stable flyer that could be made to fly in both clockwise or counter-clockwise circles that provides bonus scoring.

If not for Science Olympiad competition, the airplane does not require chopping the propeller from 14 cm (5.5 inches) diameter to 8 cm. In addition, the prototype required 1.5 grams of ballast to bring it to the 8-gram competition specification. Pay no attention to those two specifications and the airplane will be capable of 60-second (+) flights indoors as was attained from a precursor design to this one.

**Page 2**

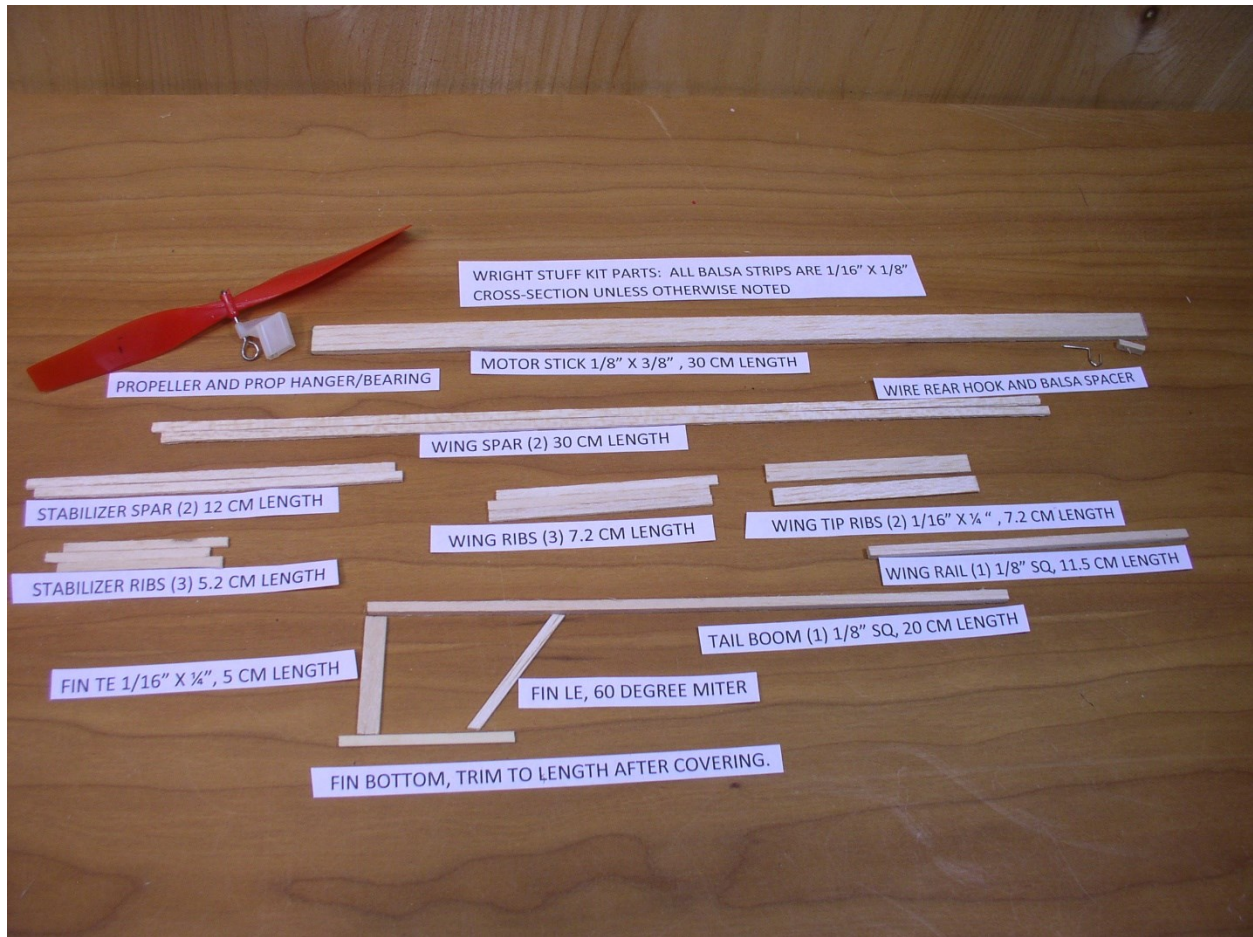




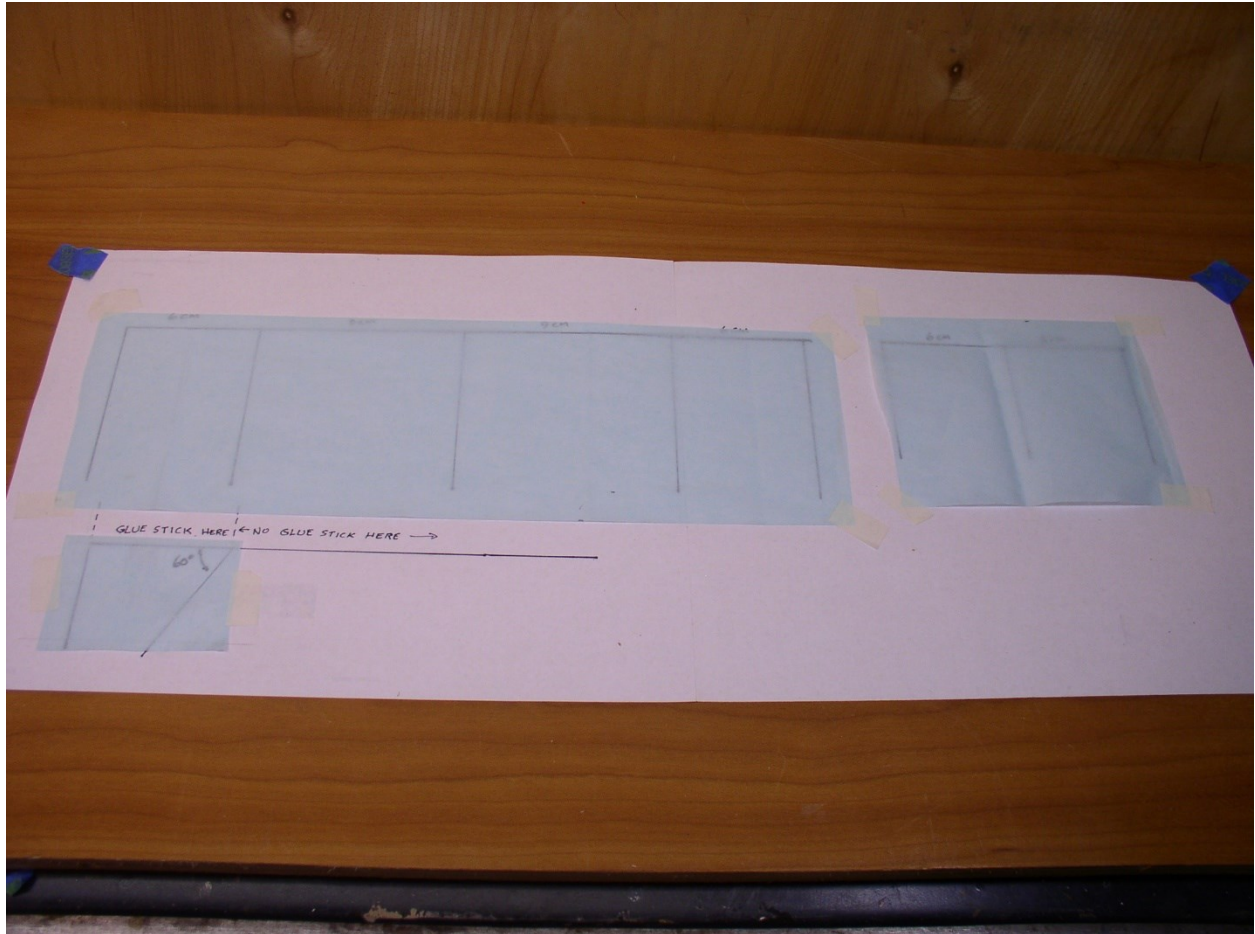
Construction starts with a simple plan. It is not a plan in the ordinary sense of the word for building a model aircraft but is a guide to make sure that prefabricated parts end up in the correct place. Two photos are shown, one for the wing and tail end of the fuselage and one for the stabilizer. A felt-tipped pen, straight edge ruler and a drafting triangle can be used. The paper for the plan is two sheets of 8.5 x 11 inch joined along the short edge to make a sheet 8.5 x 22 inches.

Wing diagram shows location of balsa wood for its leading edge and ribs, same for stabilizer. Fin diagram is a trapezoid that shows location for a tail boom as well as three balsa wood parts for

its TE, LE and bottom edge.



To speed things up at the clinic where limited time is available, all the pieces were prefabricated to correct dimensions except for the fin bottom that is trimmed to size after construction.



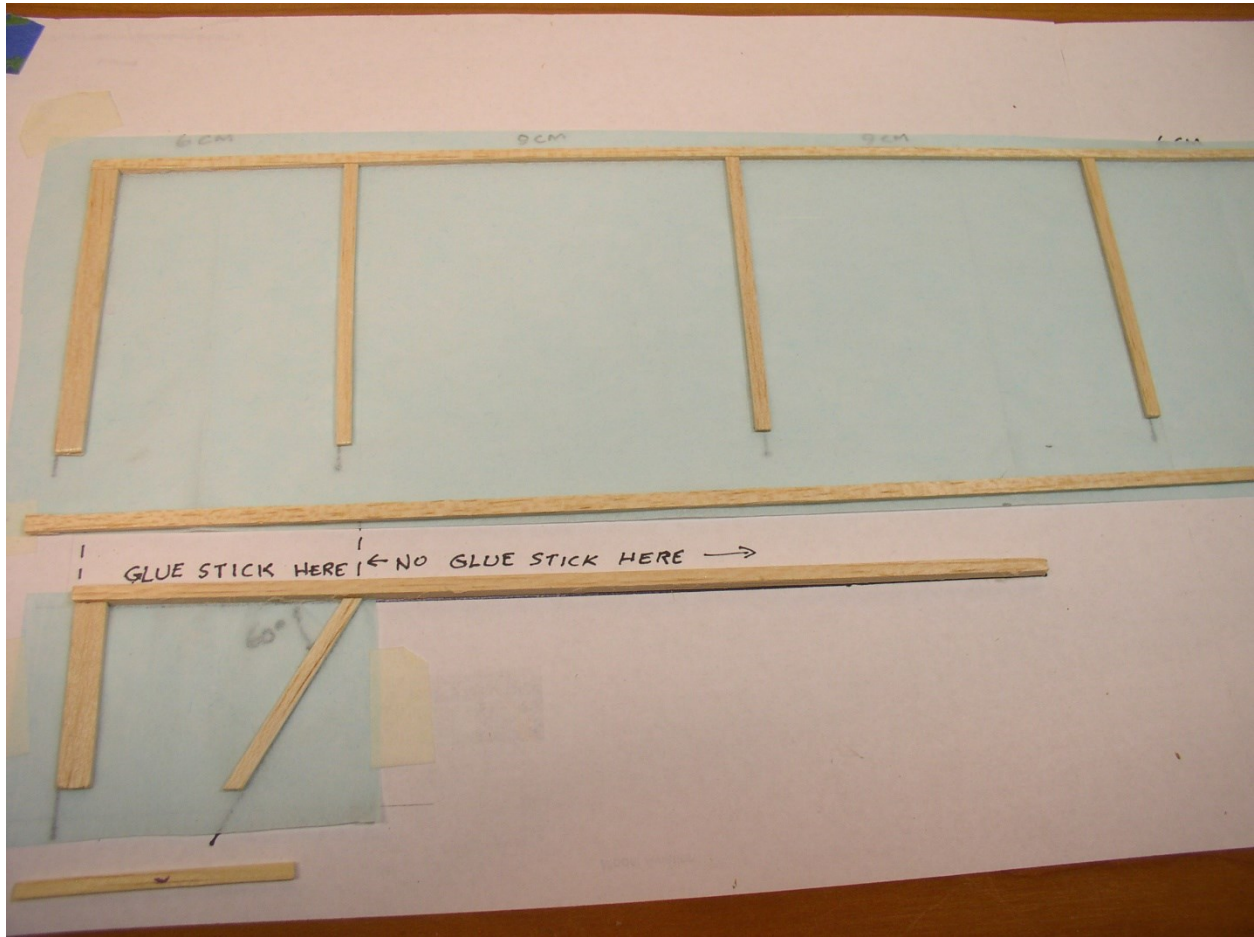
The airplane is built on its covering material. In this case it is gift-wrap tissue. Best to use a tissue color that is not so dark that the underlying diagram is not visible. Plan is taped to a flat surface at four

corners and tissue is attached to plan with masking tape so that the whole of each diagram is covered.



Parts of each component are coated on its wide side with a glue stick and placed on a line of the tissue-covered plan. Note that a felt-tipped pen is used to help identify which side of the balsa is coated with

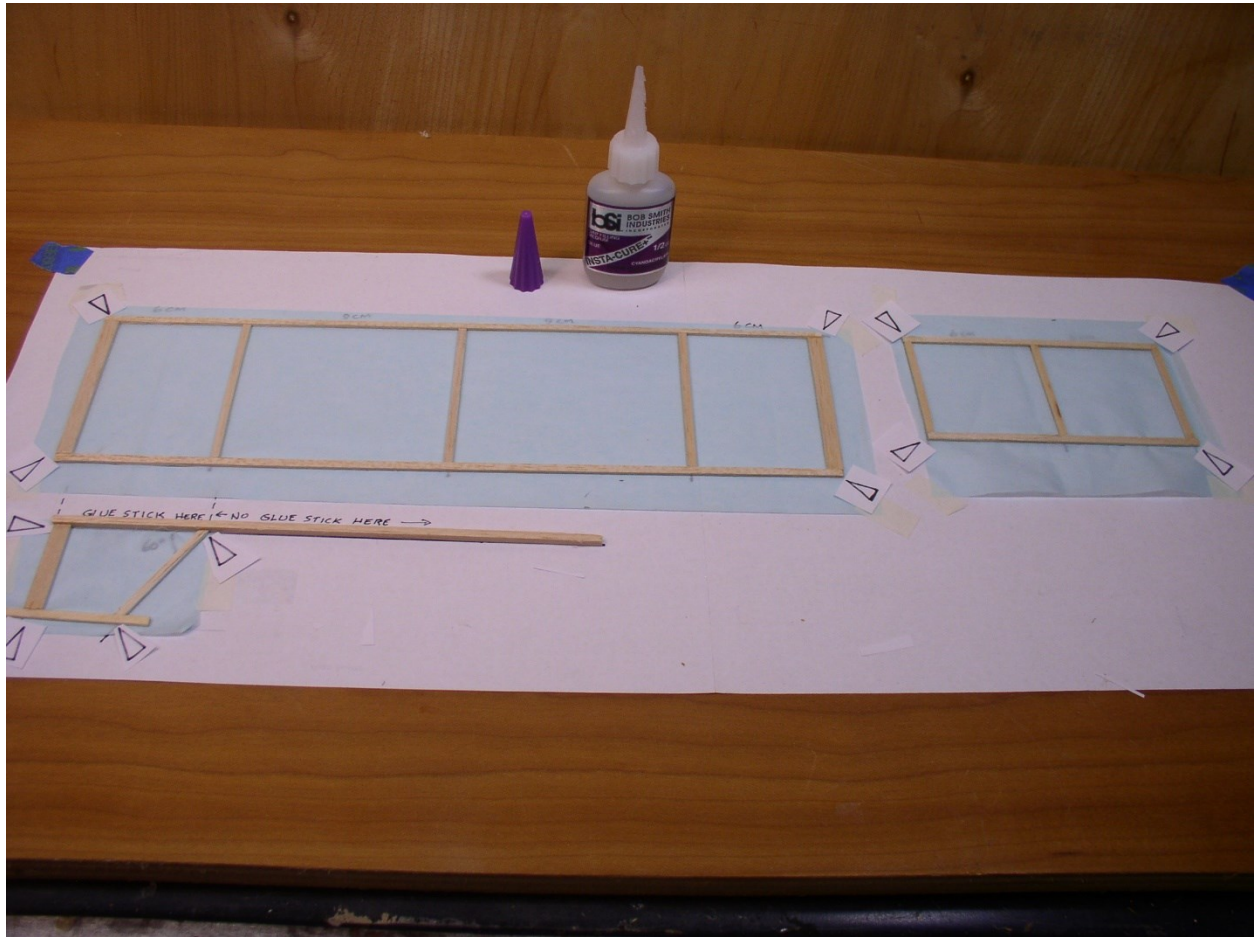
glue.



After the wing leading edge (LE) is in place, ribs are added with glue stick in the same way. The best procedure is to place a rib end against LE with no space between them. If not, a weak structure will result. I like to call this intermediate stage a “comb” configuration. For the fin/tail boom note that there

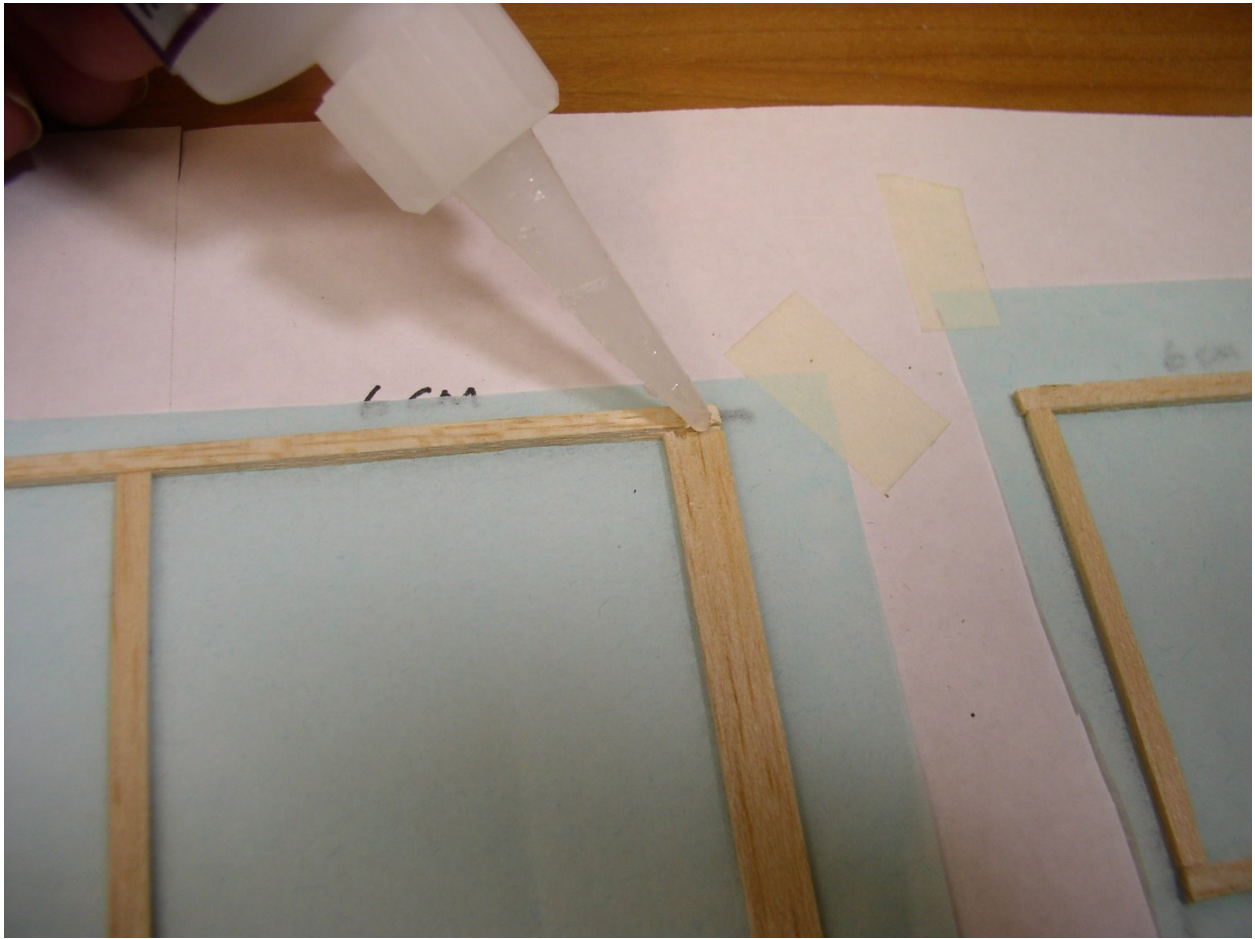


is no glue on the forward part of the tail boom.



This shows structures in "ladder" configuration after all pieces have been attached with glue stick. Note the triangles pointed at each corner. These are the locations where wood will be attached to wood with

super glue. Other locations will be glued later on.

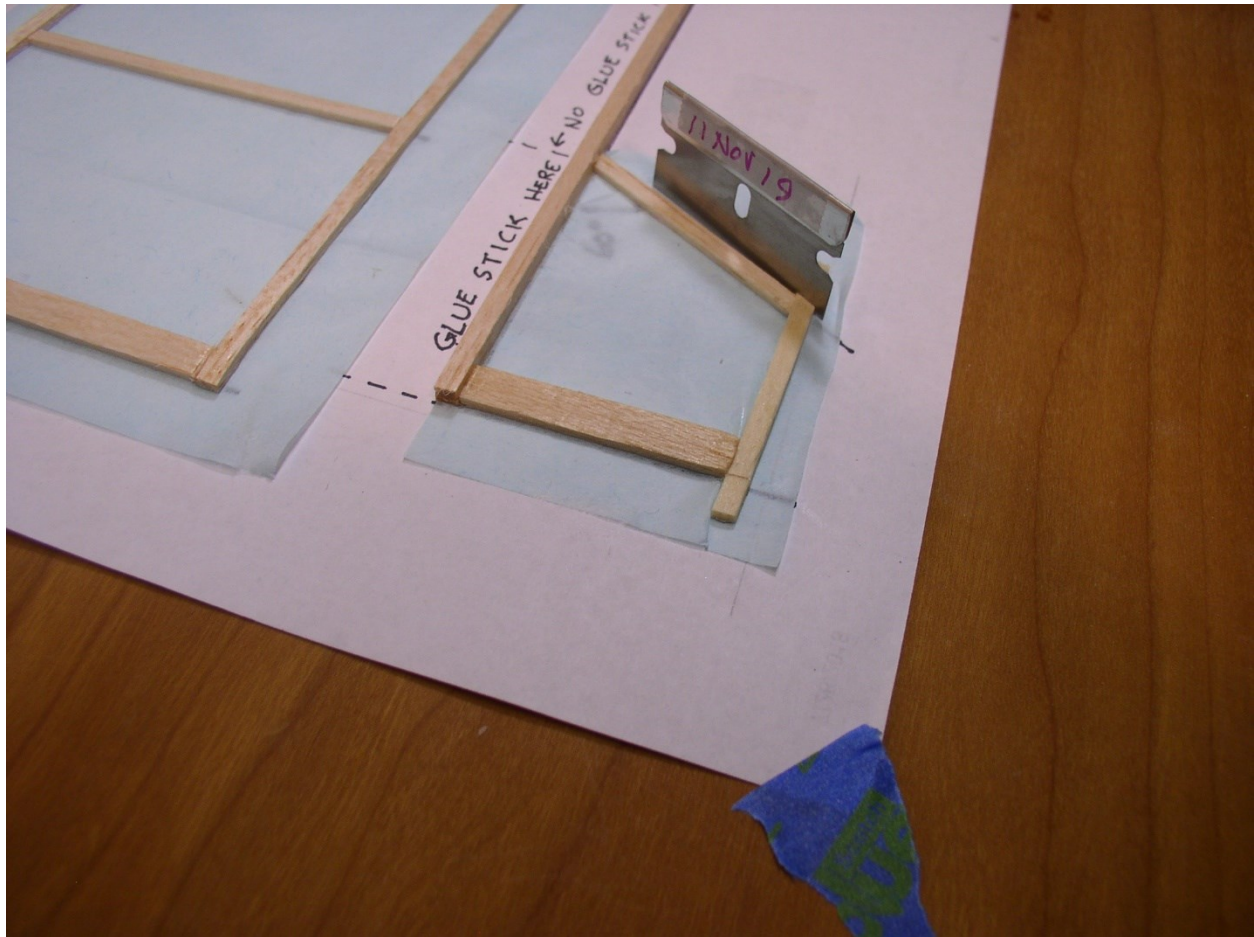


Just a small drop will do. Avoid large drops that may seep through the covering and stick your construction to the plans. Great difficulty will result. Slip a small sheet of plastic film or wax paper

between covering paper and plan paper to catch any glue.

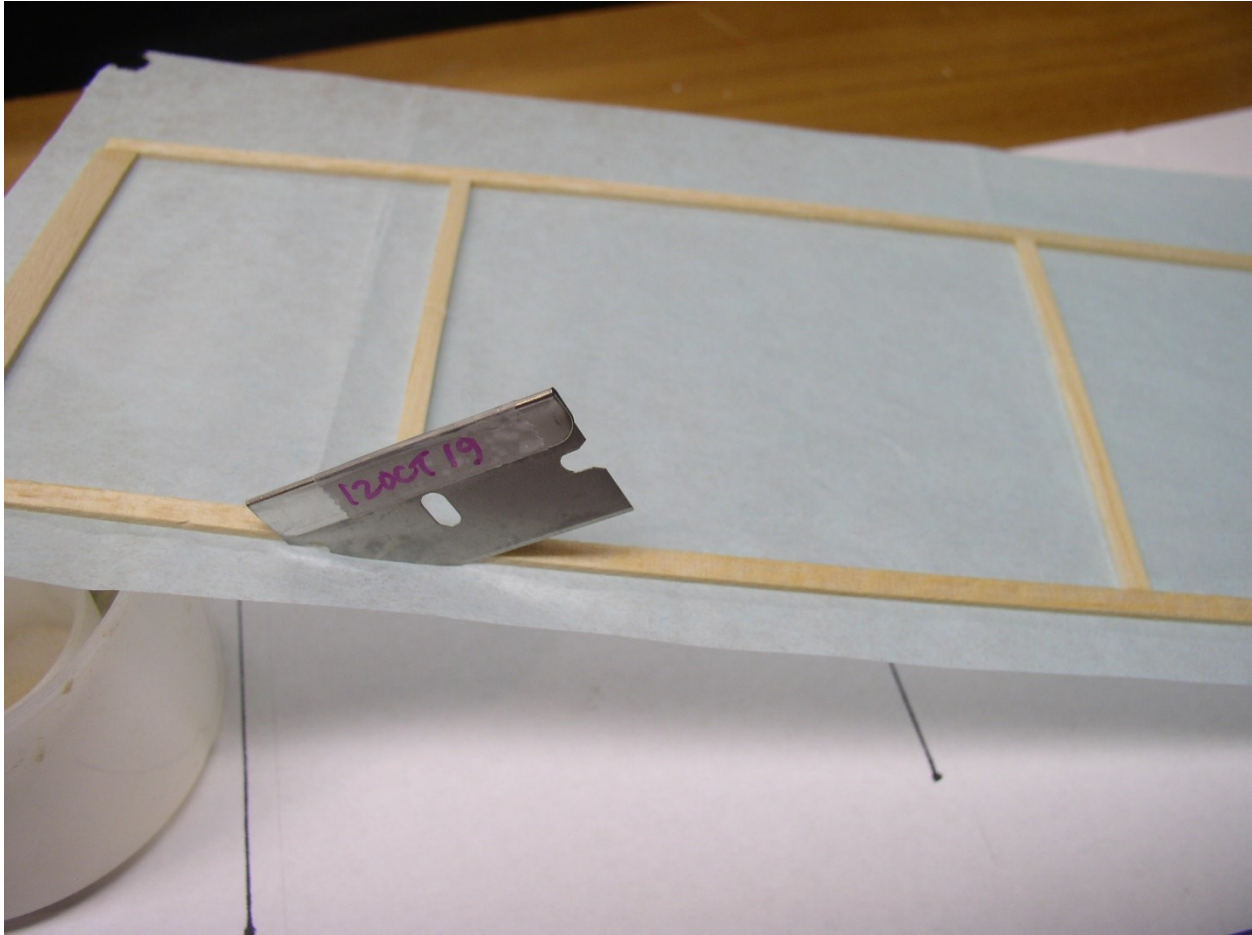


Use a scrap of balsa wood to help force super glue into the joint **immediately** after the drop is placed. Waiting will allow the glue to set before it is spread.



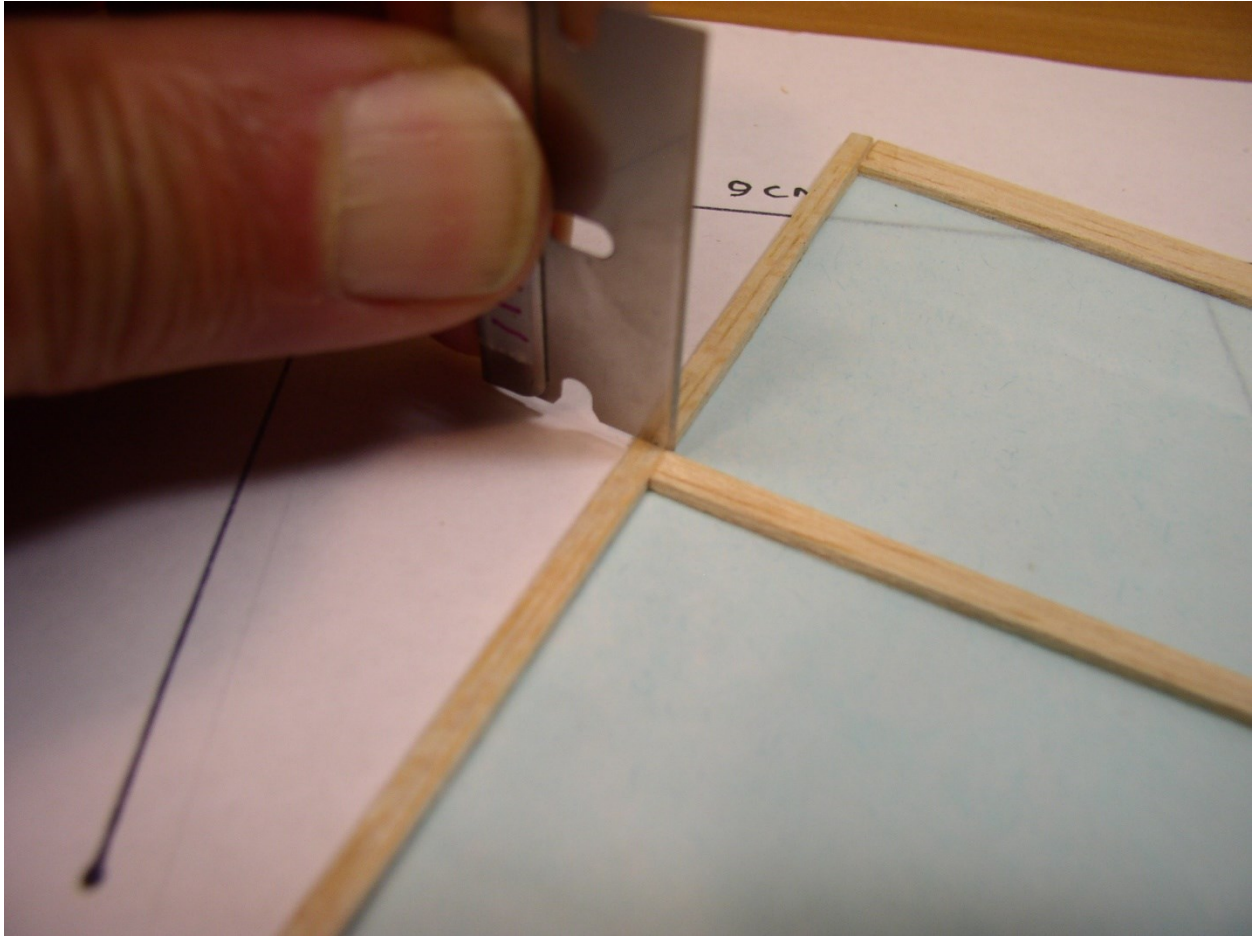
Cut away excess balsa from fin tip. Try very hard to not cut into the work surface. A partial cut followed by breaking off the un-needed part is ok. Hold balsa structures down as tape from corners of tissue is removed. Remove all three structures from the plan very carefully because unwanted adhesions may have occurred. Cut away excess tissue with a very sharp new razor blade while holding

the structure away from work surface.

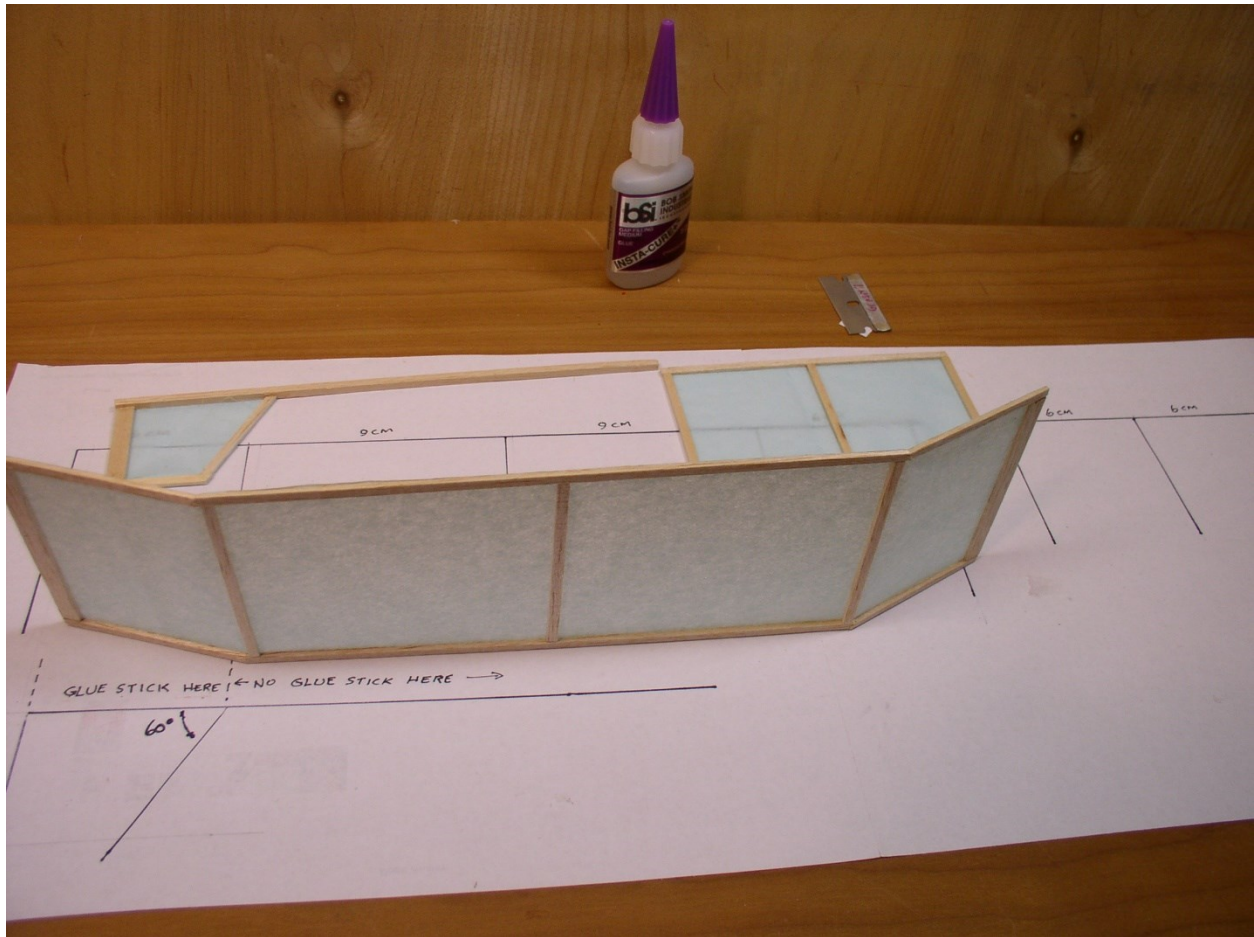


Start trimming away tissue in the middle of a section. Never at one end. Hold the structure with one hand on the member from which excess tissue will be removed. Insert a corner of a blade into the tissue where it meets balsa wood. Hold the blade at an angle of approximately 45 degrees as it is drawn immediately adjacent to the balsa wood member to trim away tissue. If resistance is felt it means that the blade is cutting into wood.....not wanted. STOP BEFORE YOU GO TOO FAR. After the blade travels to the end put it aside. The structure is turned over. Re-insert blade at the location where the previous cut started and draw to the other end.

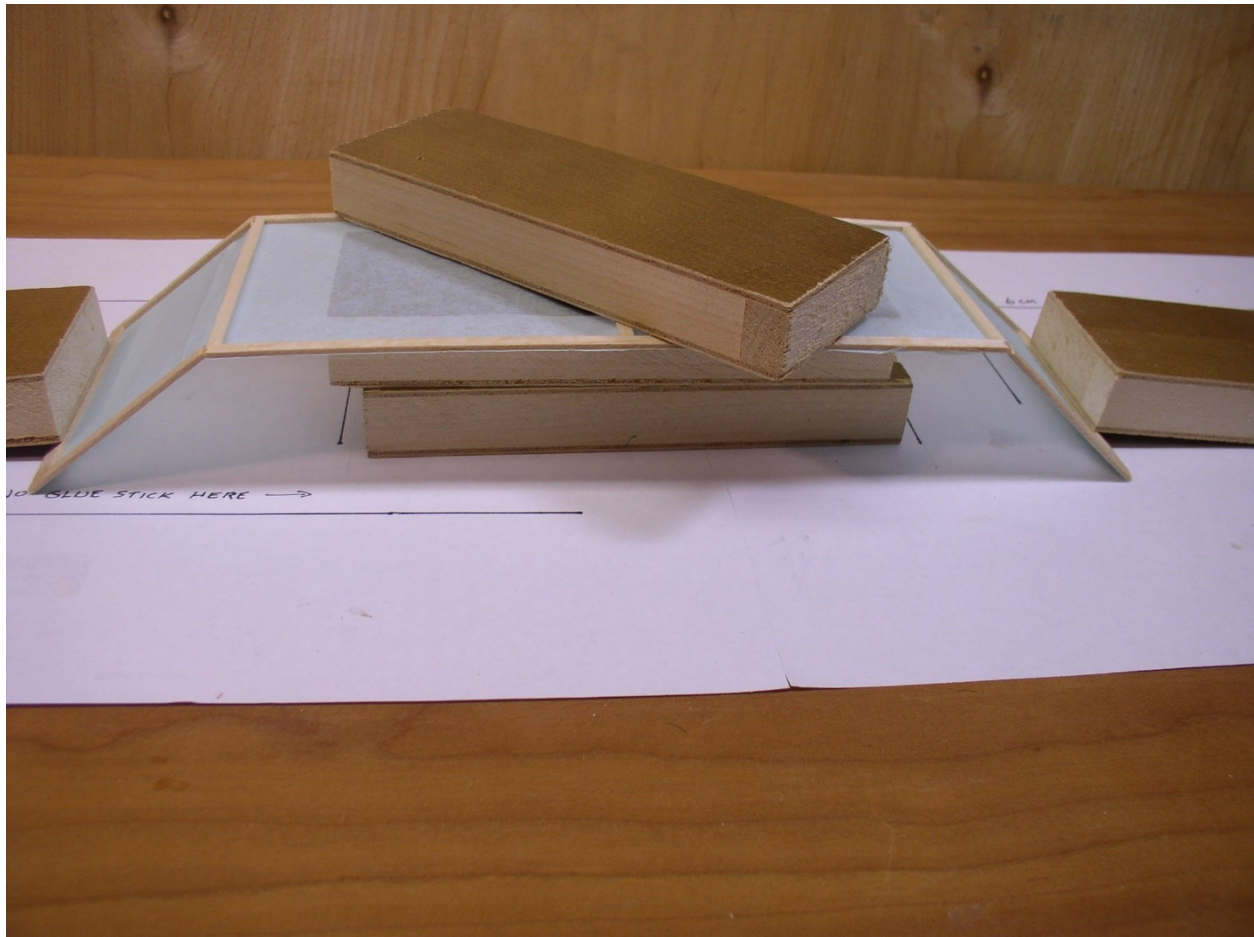
All paper has a "grain" direction that can be demonstrated by observing how it tears. That is, it will tear in a reasonably straight direction with the grain but will travel sideways when tearing against its grain. Tissue for this project is supplied so that its grain travels in the long direction of each part. Razor trimming of tissue also is easier with the grain than it is when going across the grain. When going across it is best to impart a sawing motion to the blade when moving it through tissue.



Use the dull edge of a razor blade to crush a dent at 4 places into the wing edge at the location shown. That is, adjacent to a rib at its outer side (closest to wing tip).



Bend the tips up by gently breaking the LE and TE at the crushed locations. Hold with finger and thumb from both hands on either side of each dent while bending. Note that the covering will finally be on top. Up to now all the work has been done on the bottom side of the wing.

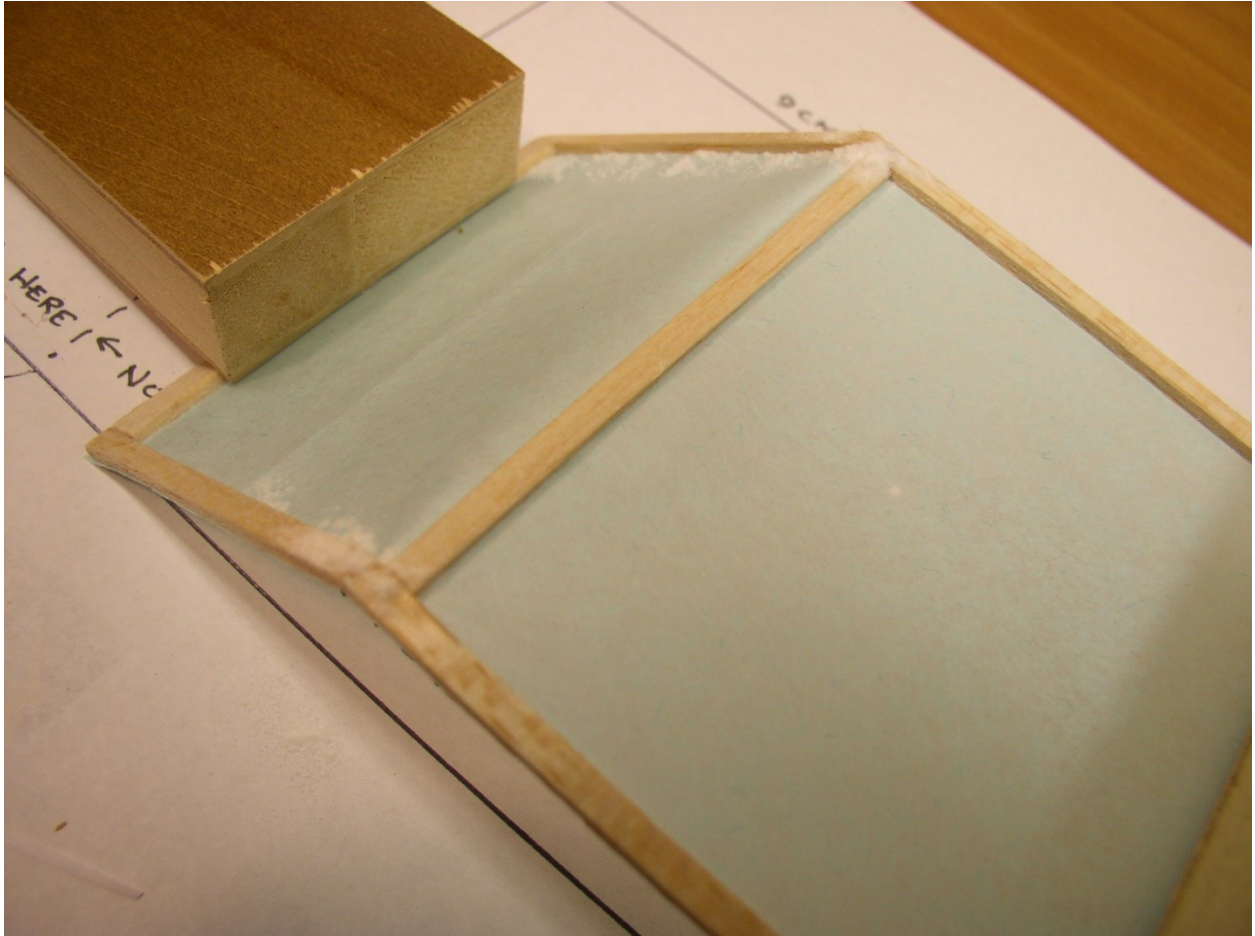


Support the wing center with two thicknesses of 3/4-inch plywood. Use another piece to hold it on the two plywood pieces. Wing tips are held down flat on work surface with two more plywood pieces, one at each tip.

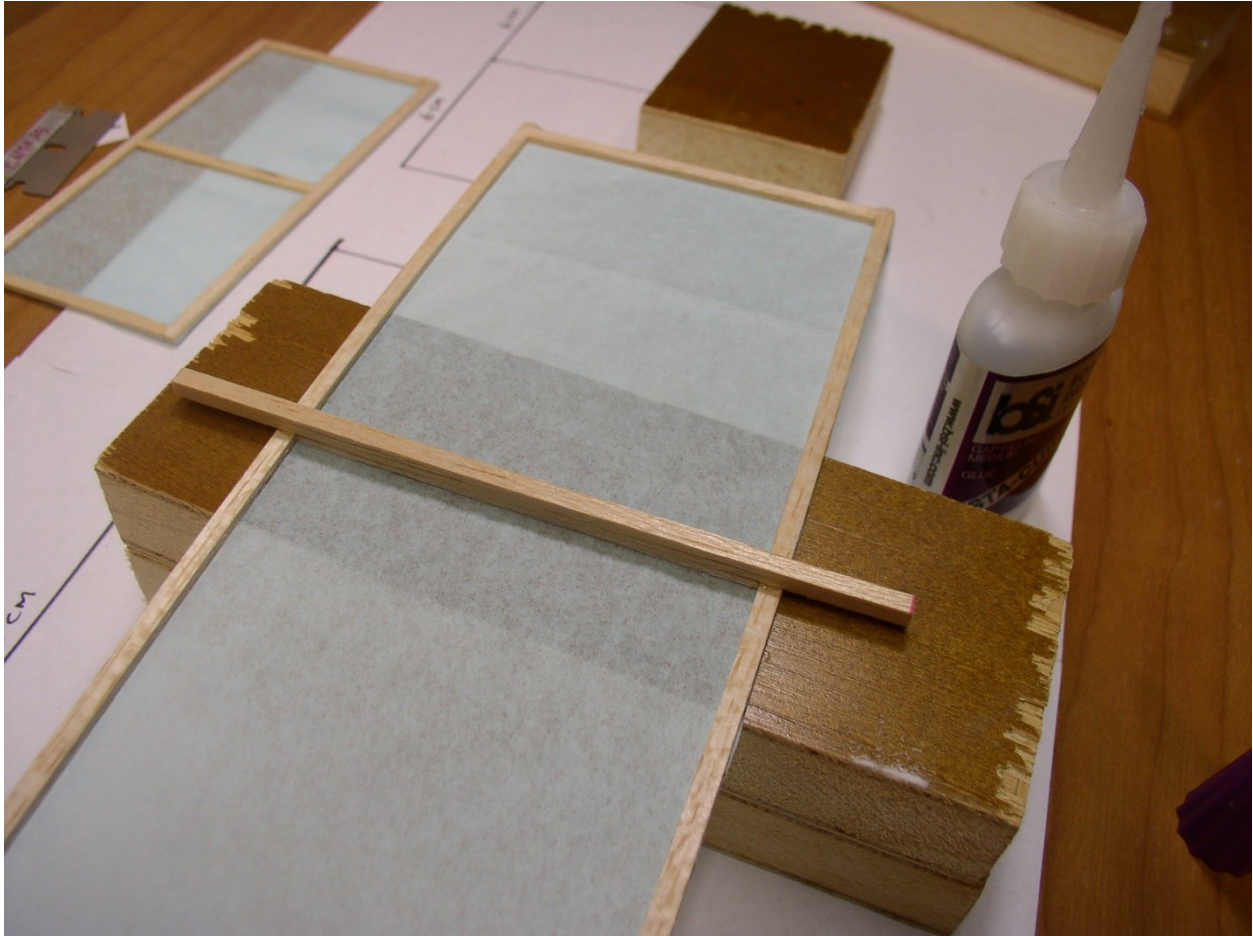




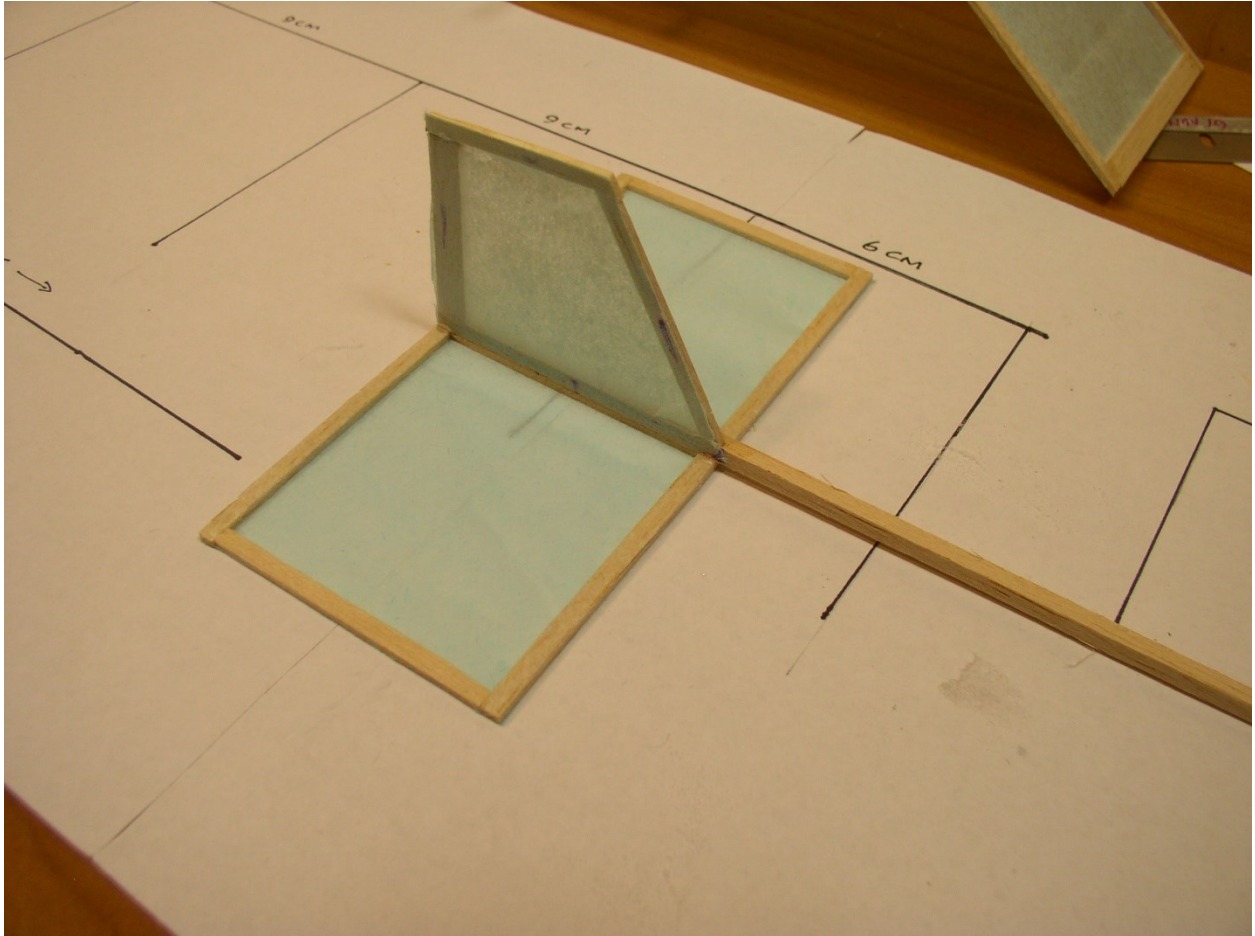
Glue the broken joint and rib next to it with super glue. Use a dusting of baking soda to accelerate glue cure.



Excess baking soda may be blown away.

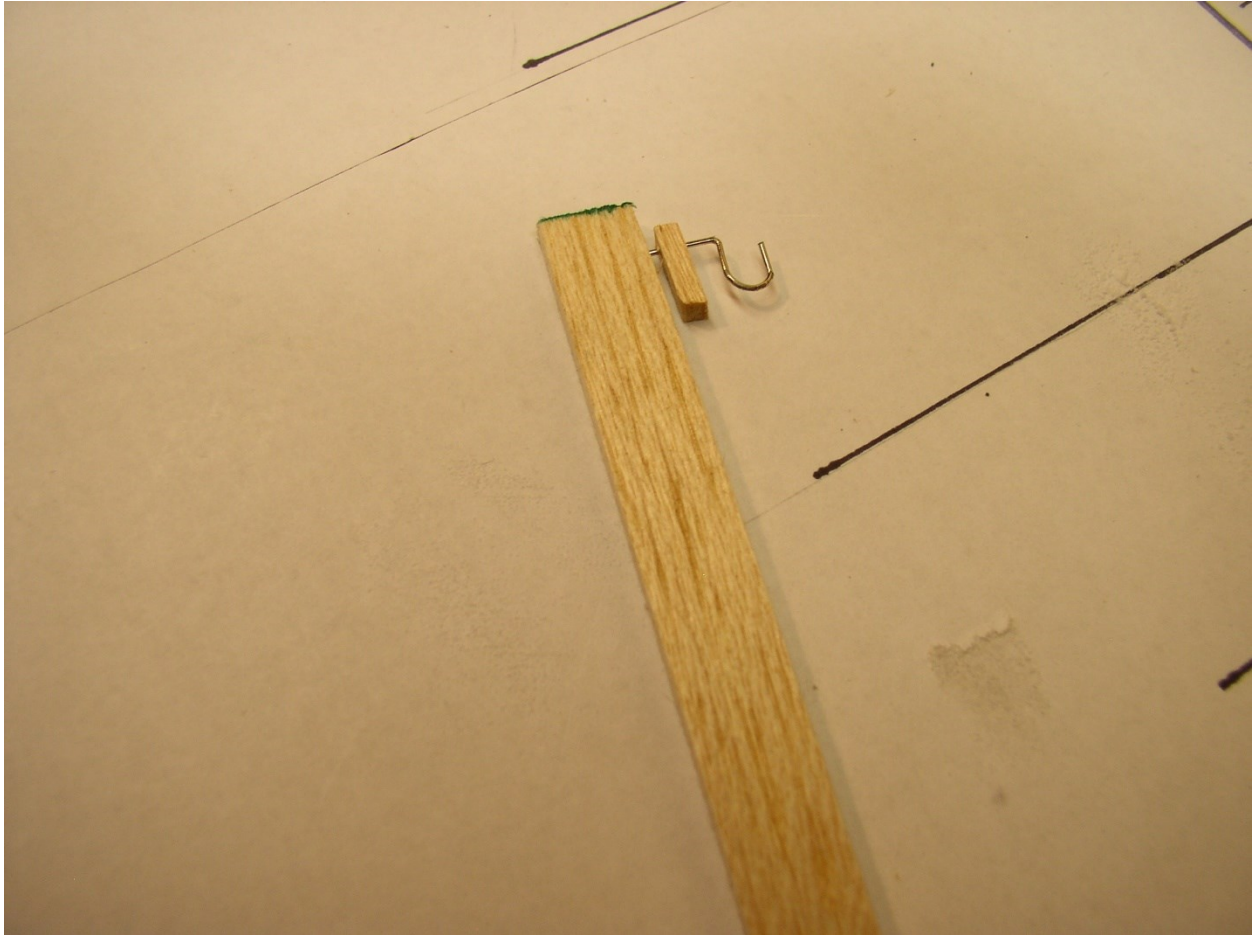


Wing rail is glued to center of wing only at the juncture of rib to LE and TE. Make sure the overlapping rail is about equal for both sides. It will be used to hold the wing to fuselage with masking tape.



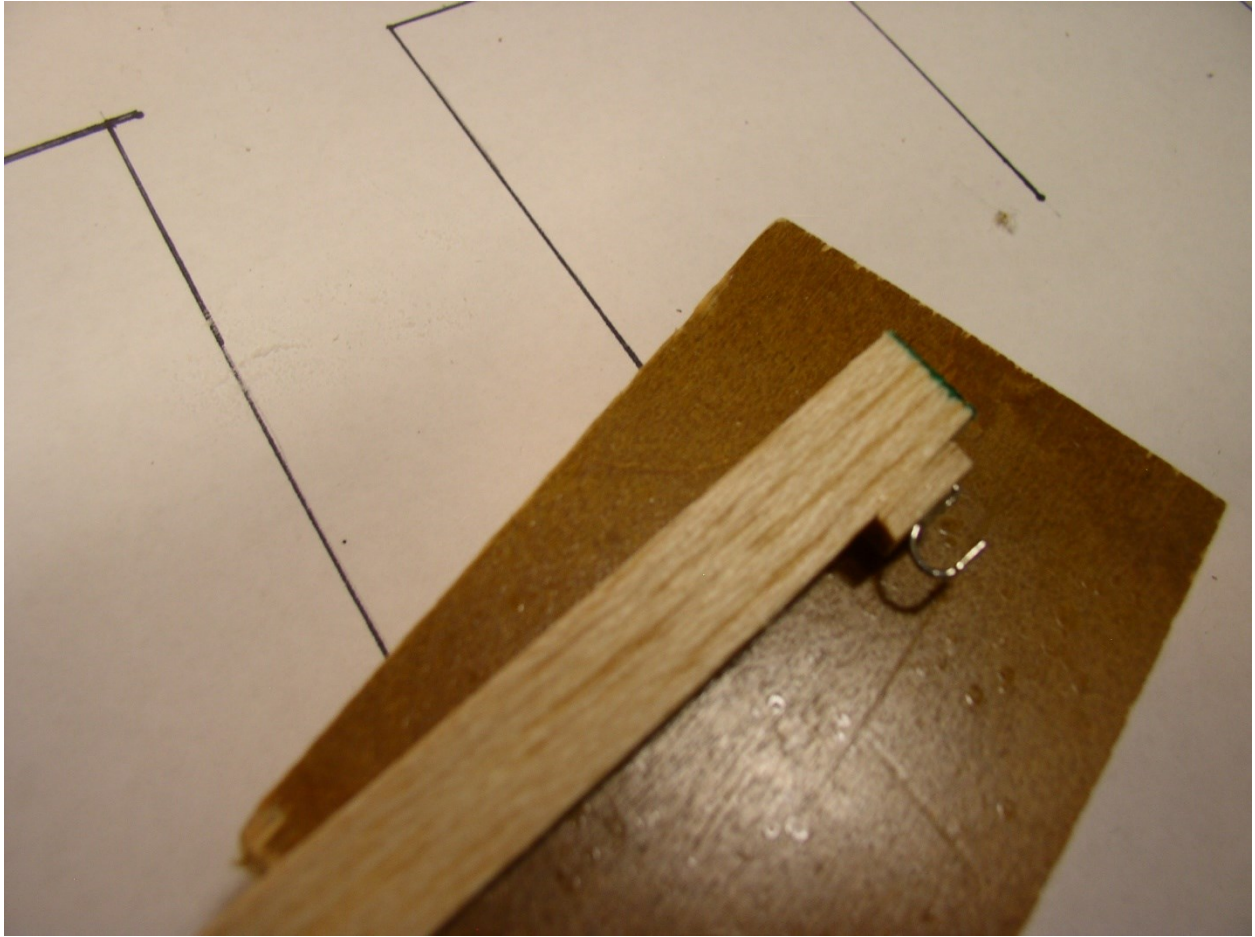
Glue tail boom and fin to bottom side of stabilizer at only the junctures of stab center rib with LE and TE.

Finally all the junctures of ribs and edges have been glued together!

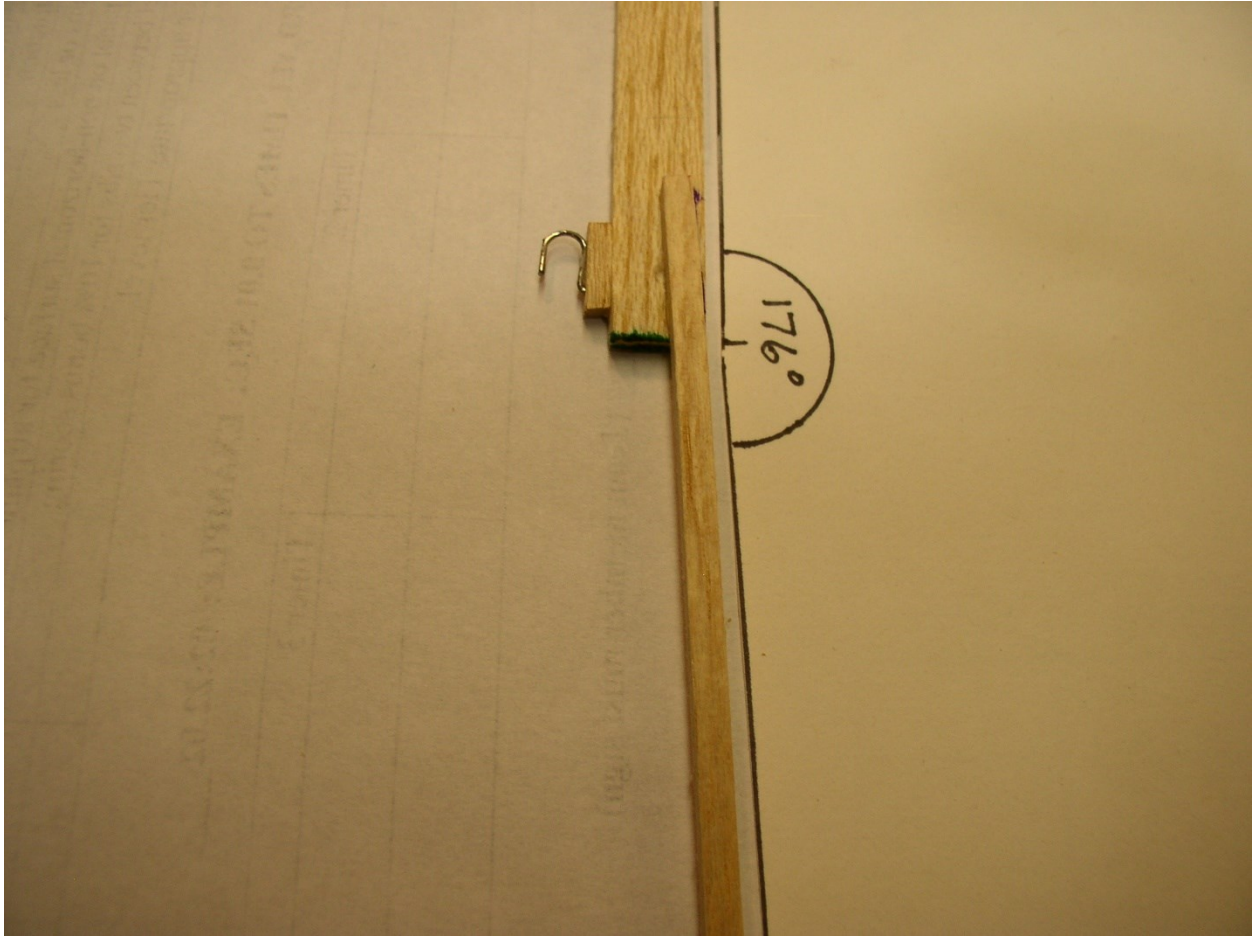


Rear hook and spacer block are assembled on fuselage as shown. There are tiny holes in both the spacer block and rear of fuselage to accept hook wire (it's made from a straight pin). The end of

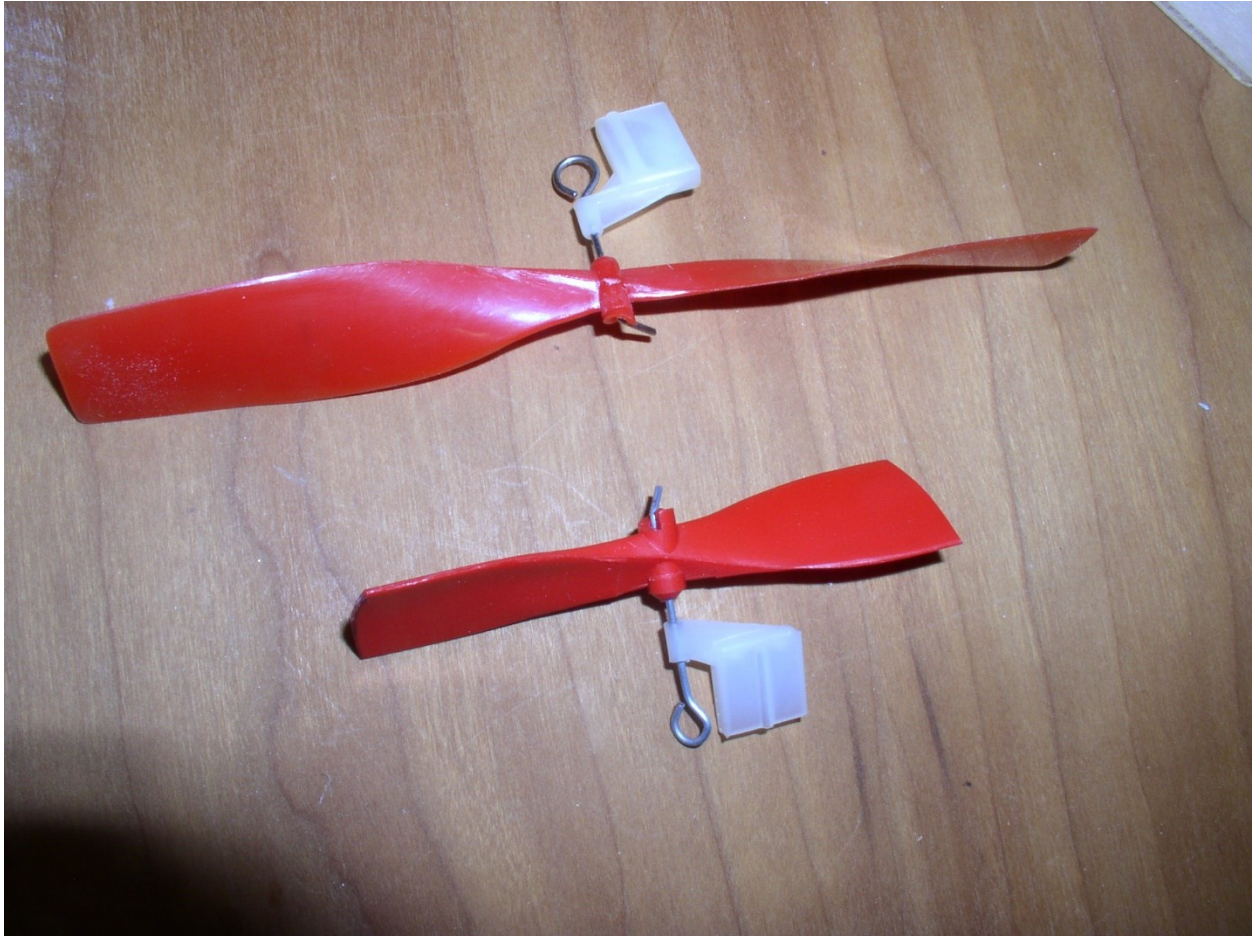
fuselage with a hole has been marked.



Put some glue into gaps shown in the previous photo and quickly push the assembly together before the glue cures. Put more glue wherever wire meets wood.

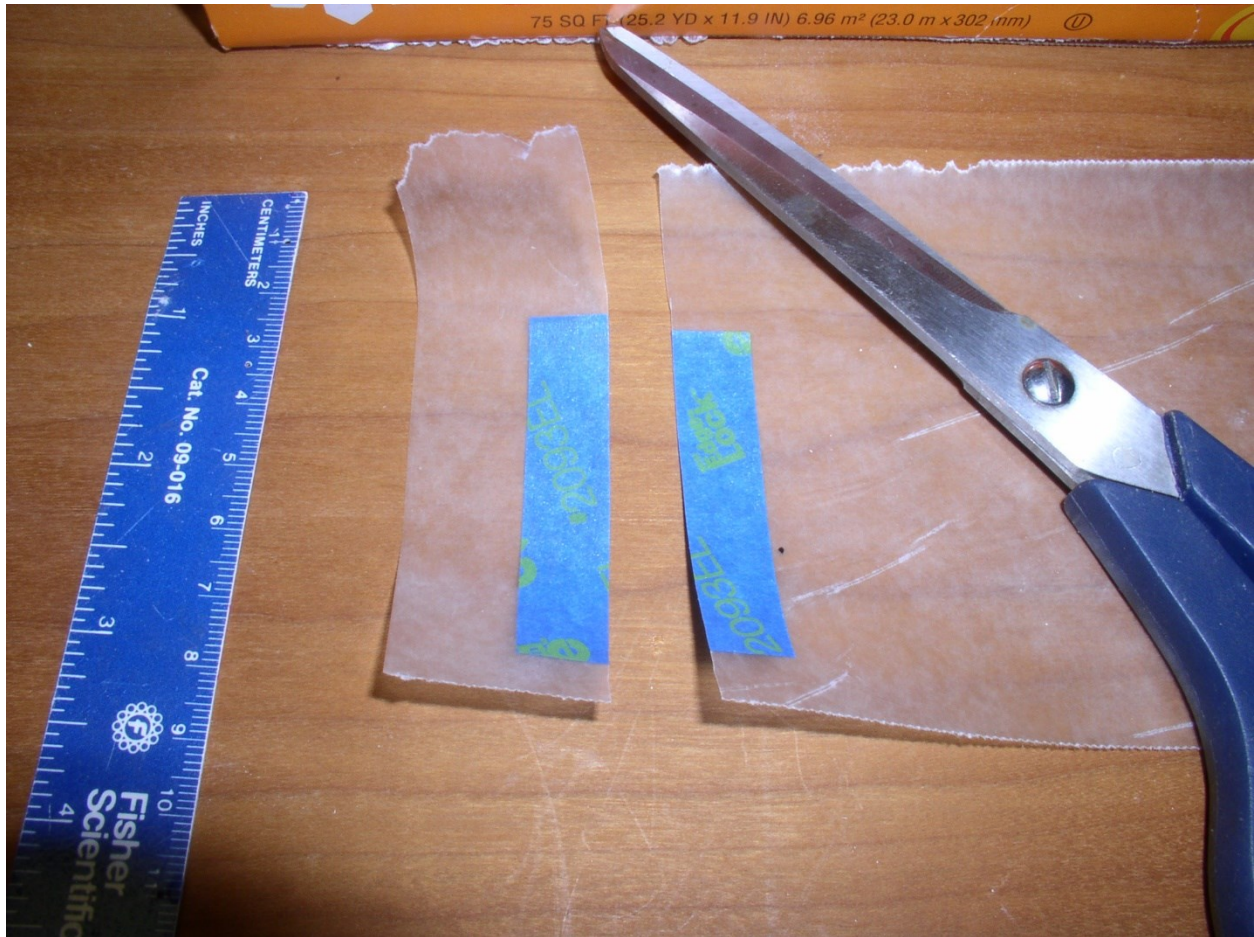


Tail boom containing fin and stab are glued onto the fuselage as shown.

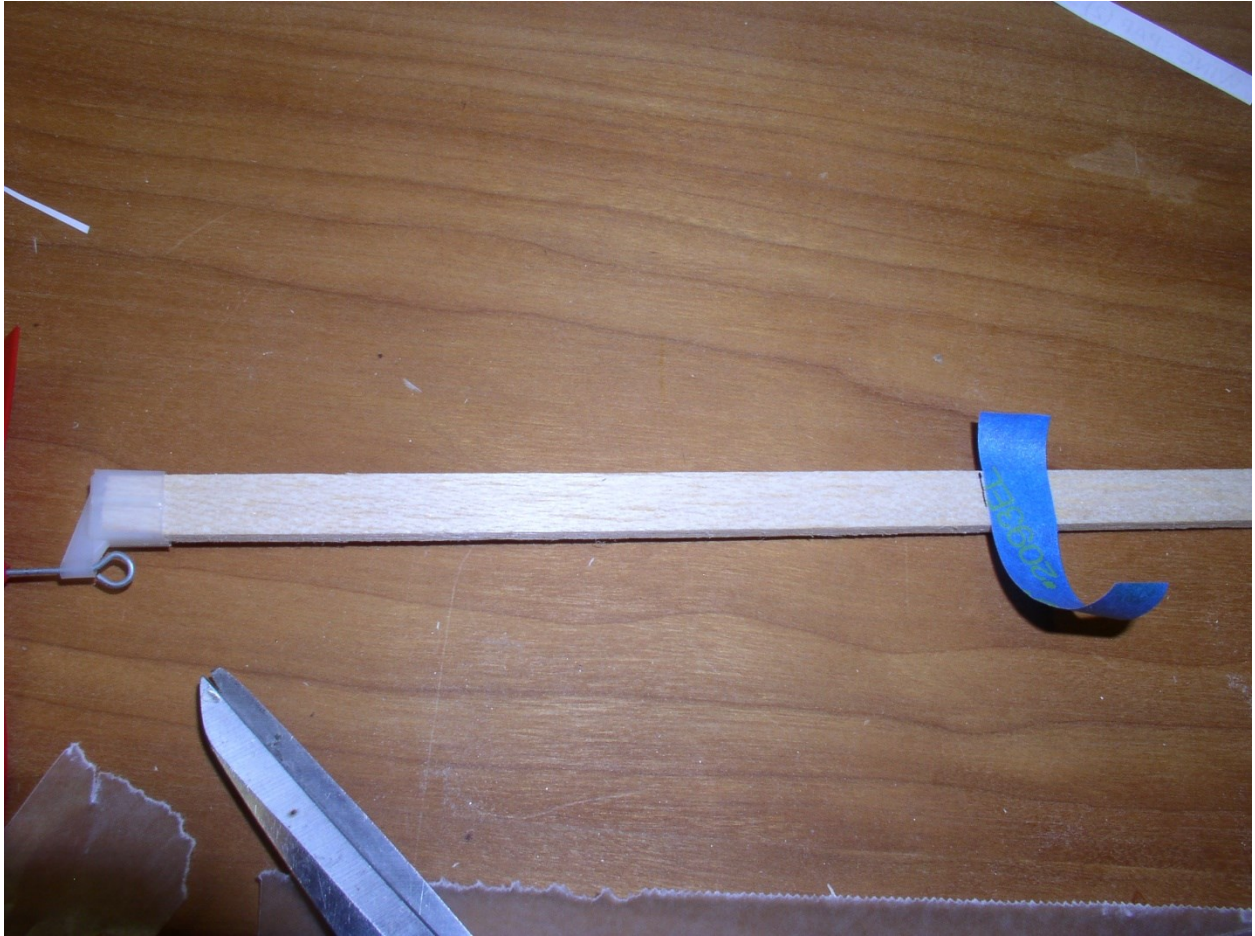


Full-sized propeller must be cut to 8-cm diameter. There are marks on propeller blade to show where to cut. A scissors may be used.

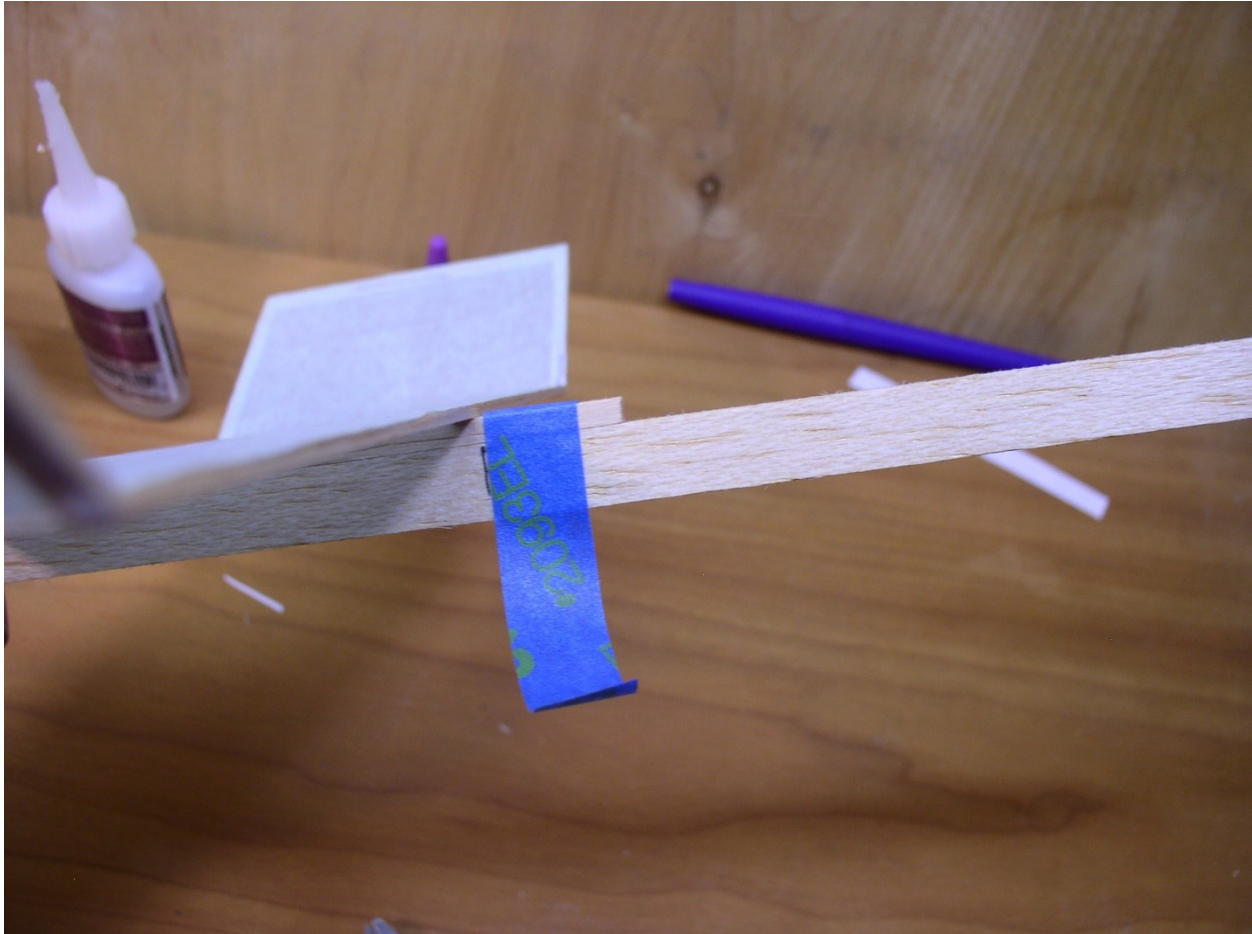




To attach wing, two lengths of masking tape are used. Put tape on wax paper to split in half. Lengths should be 5 – 6 cm.



Start tape on fuselage as shown.



Place wing rail on fuselage next to tape. Wrap tape tightly around rail and fuselage. Repeat for front of wing. To adjust wing incidence remove tape from either end to insert a shim between wing rail and fuselage. Use fresh tape for a re-wrap. If the airplane dives or does not gain altitude, shim goes in front. To correct a stall, shim goes in back. Shims can be made from various thicknesses of cardboard.

To fly this airplane, a room that is about the size of a school gym is best. Make sure the HVAC fans are turned off. Power is obtained from rubber strip tied into a loop. For an 8-cm diameter propeller use FAI Supply rubber strip size 1/16", for an unchanged propeller use 3/32". It's always best to lube the motor before winding. Use a bag into which a bit of silicon oil has been sprayed so your hands stay clean. There are many brands that can be found in most big box stores (Home Depot, Menards, Lowes). A very good winder is available in the "Alpha" kit sold by the Academy of Model Aeronautics.

Bill of materials and tools:

Balsa wood strips (usually comes in 36-inch lengths)

1/16 x 1/8 (2)

1/16 x 1/4 (1)

1/8 x 3/8 (1)

1/8 x 1/8 (1)

Gift wrap tissue (1)

Super Glue

Glue Stick

Straight pin

Modeling Clay (for ballast and CG adjustment)

Masking Tape, Wax Paper

Propeller and hanger assembly

Single-edge razor blades

1/16-inch wide rubber strip (FAI Model Supply)

Scissors