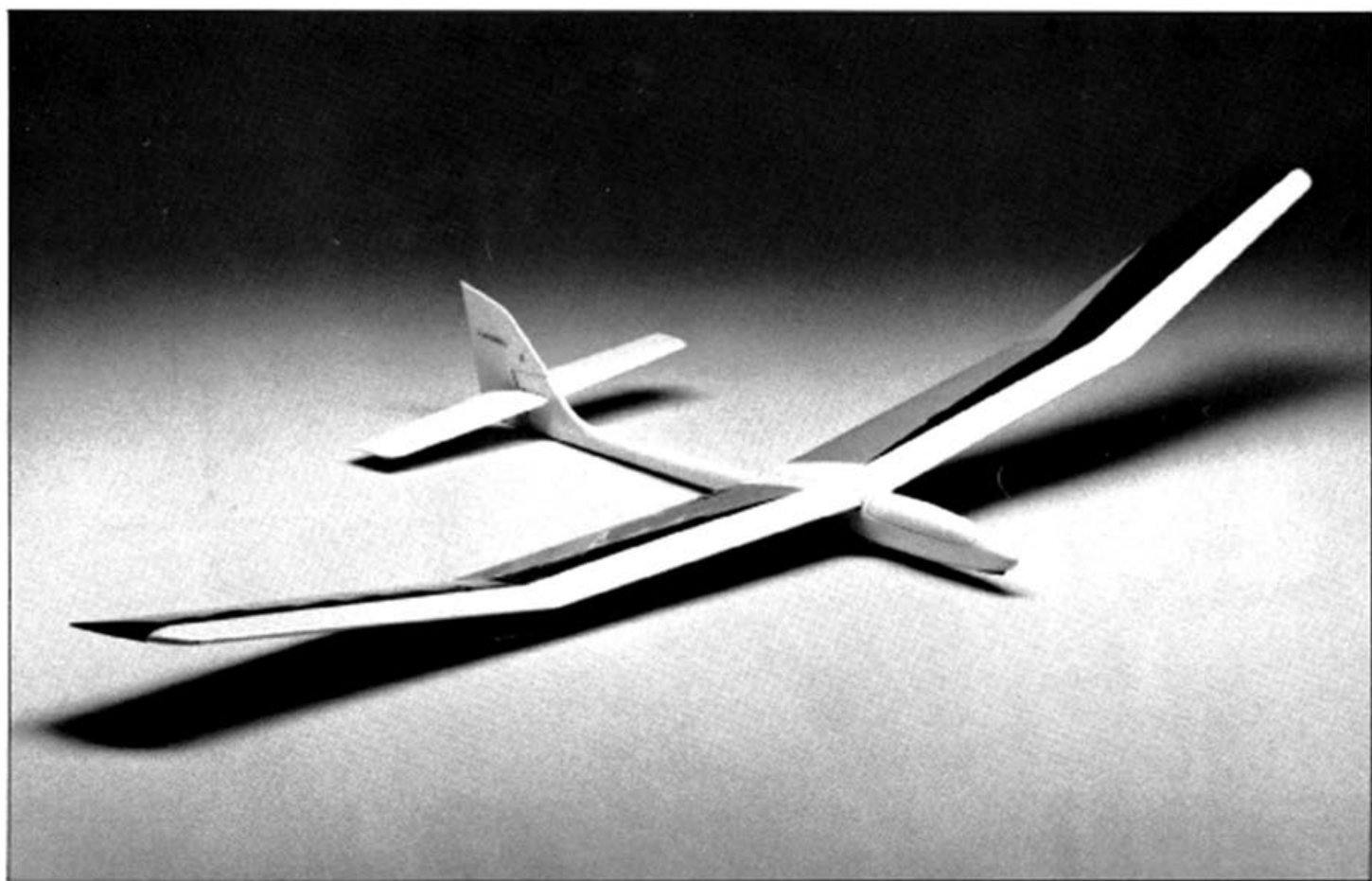




AIRTRONICS[®]

BUILDING INSTRUCTIONS



CUMIC PLUS

CUMIC PLUS

Since the introduction of the Cumic, there has been a growing demand for a larger open class version of the airplane. In response to this demand, we have introduced the Cumic Plus. This kit now contains all the materials necessary to build either a 100" span Cumic or a 117" span Cumic Plus. The fuselage, tail assembly, and tip panels are identical for the two planes, with the only difference being in the wing center sections.

The kit includes 36" long material for the center panel leading and trailing edges, wing sheeting and spars. If you are planning to build the 100" Cumic, all of these pieces should be cut off to 24". To build the 117" version simply leave the stock 36" long. The building sequence is identical for the two center sections other than the different lengths of the stock.

The choice of which version to build is up to you. With its greater span and higher aspect ratio, the Cumic Plus is the better all around performer, so it is the one we would opt for. If you want a standard class ship or don't want to deal with a six foot long center section, then the Cumic is for you. Either way you will wind up with a truly excellent sailplane.



INTRODUCTION

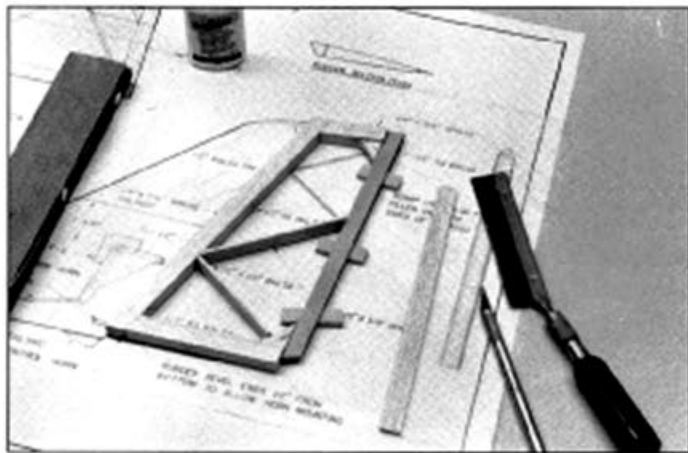
The Cumic has been designed to be the highest performing thermal sailplane on the market today. The Cumic is based on the highly successful Sagitta 900, with several improvements that were suggested as people gained more experience with their Sagittas. First, the tail moment has been increased and the stab section thickened to improve pitch response characteristics. Second, the fuselage cross-section has been increased to allow the use of larger radio components and permit them to be mounted farther forward to make balancing easier. The wing has been changed to a three piece design with a one piece, bolt-on center section for increased strength to withstand zoom launches. The spoilers have been moved outboard one rib bay to prevent them from blanking out the stab when they are deployed. Finally, the Cumic features a fiberglass fuselage to eliminate all the carving and shaping of the Sagitta's wood fuselage. These changes, combined with the proven performance of the Eppler 205 Airfoil, make the Cumic the finest flying thermal sailplane we've ever produced.



RUDDER

1. Cut the 1/2" square balsa outline pieces and fit the joints tightly. When satisfied, pin the pieces in place and apply CA to the joints.

2. Cut the 1/8" x 3/8" spruce rudder T.E. and install it, making sure it is shimmed 3/16" above the work surface. Cut the gussets from 1/2" square balsa and install them.



3. Cut the rudder ribs from 3/32" x 1/2" balsa and fit them in place. Work carefully to get tight fitting joints.

4. Glue the 1/4" x 3/8" spruce rudder top in place, shimming it 1/16" above the work surface. Remove the rudder from the board. Carve and sand the rudder to the section shown on the plans.

5. Use a razor plane to bevel the front edge of the rudder. Note that the bevel stops 1/2" from the bottom of the rudder to allow the control horn to mount securely.

6. Mark the locations of the rudder horn screws and drill two holes in the rudder. Mount the control horn using two #2-56 x 5/8" machine screws. This completes the rudder assembly.



STABILATOR

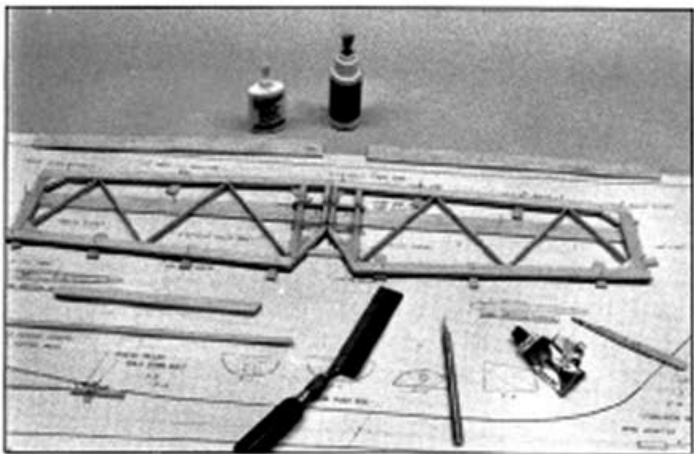
1. Cut the four stabilator spars from 1/8" balsa sheet. Pin two of them in location over the plans.

2. Cut the stab L.E., T.E., and tip from 1/4" x 1/2" balsa and install, shimming them 1/8" above the work surface.

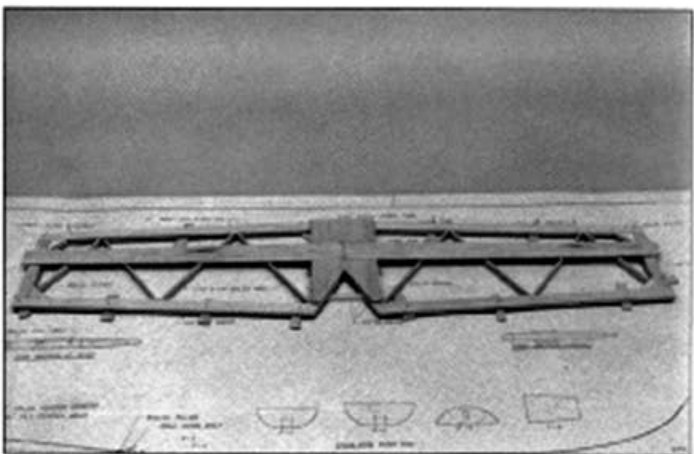
3. Cut the stab roots and center ribs from 1/4" square balsa. Glue in place, again shimming 1/8" above building board.

4. Notch the center ribs for the brass joiner tubes. Take care to ensure that the tubes are square to the stab center line and properly spaced to match the stabilator horn. When satisfied epoxy the tubes in position.

5. Cut the gussets and fillers from 1/4" x 1/2" balsa and install. Make the stab ribs from 3/32" x 1/4" balsa and glue in position, fitting the joints tightly.

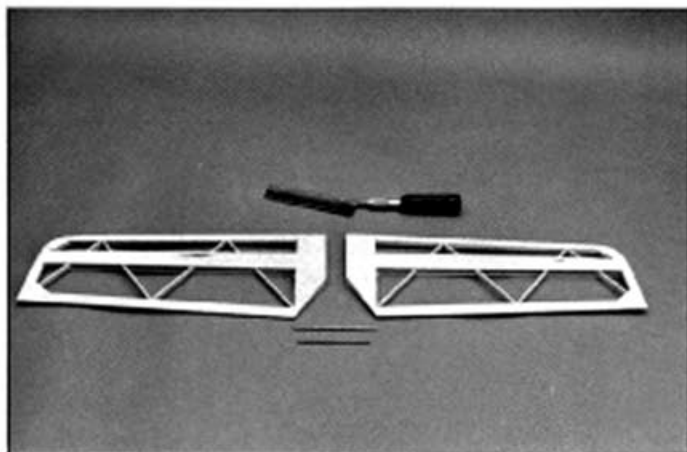


6. Install the 1/8" balsa sheet spars on the top of the stab. Cut and install the 1/8" balsa center sheet.



7. Remove the stab from the building board and turn over. Using 5-minute epoxy, build up a fillet between the stab joiner tubes and the balsa sheeting.

8. Install the lower center sheeting. Carve and sand the stab to the cross-sections shown on the plan, then use a razor saw to cut the joiner tubes and separate the two stab halves.



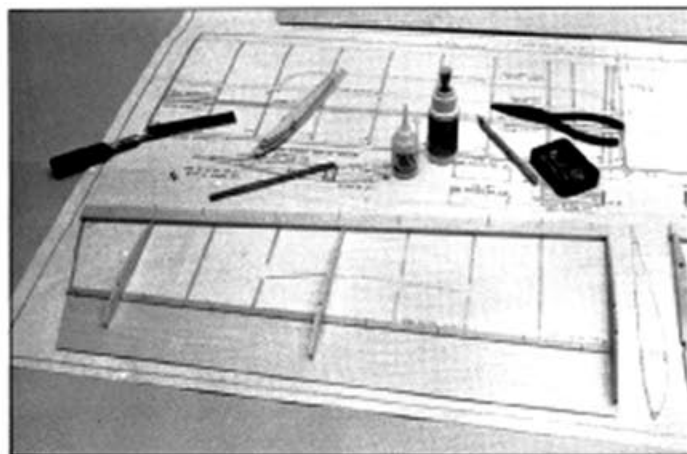
9. Chamfer the ends of the joiner tubes so that the stab joiners will slip into them easily. This completes the stab assembly.



1. Build the wing tip panels first. Pin the 1/4" x 1" balsa T.E. in place over the plan.

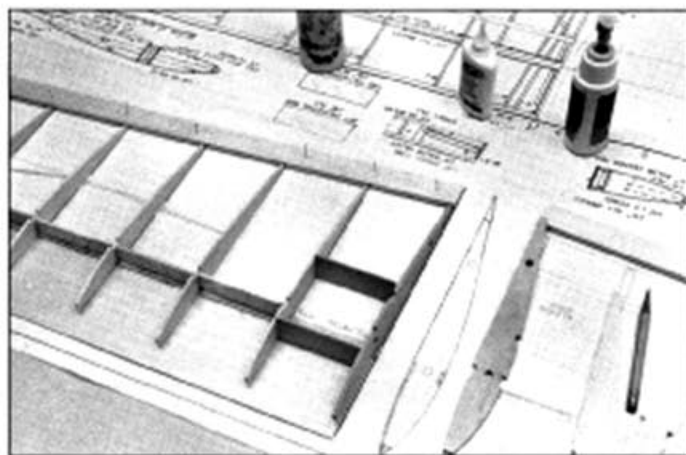
2. Trim the aft edge of a piece of 1/16" L.E. sheeting straight with a straightedge. Glue the trimmed edge of the sheeting to the forward edge of a piece of 1/8" x 3/8" spruce spar stock. Make sure the bottom edge of the spruce is flush with the bottom edge of the balsa.

3. Using W-3, W-7 and W-10 as spacers, pin the spar/sheet assembly in position.



4. Install ribs W-4 through W-11. Trim the 3/32" balsa shear webs to match the taper of the wing and install in the rib bays between W-4, W-5, W-6 and W-7.

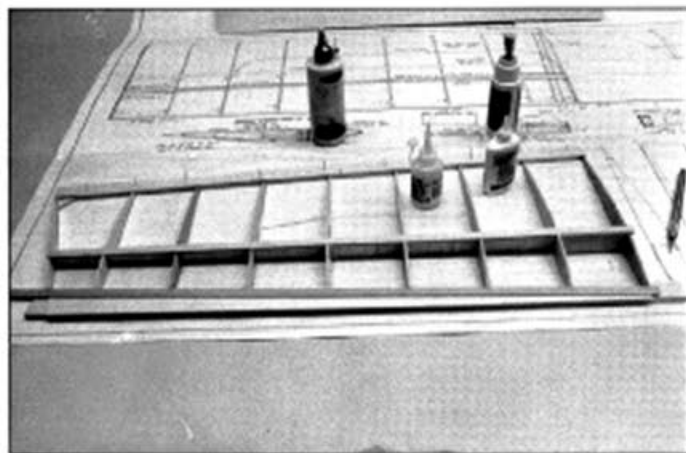
5. Using the forward and aft polyhedral webs as spacers and to set the angle of the rib, install W-3. Do not glue the ply webs in place yet.



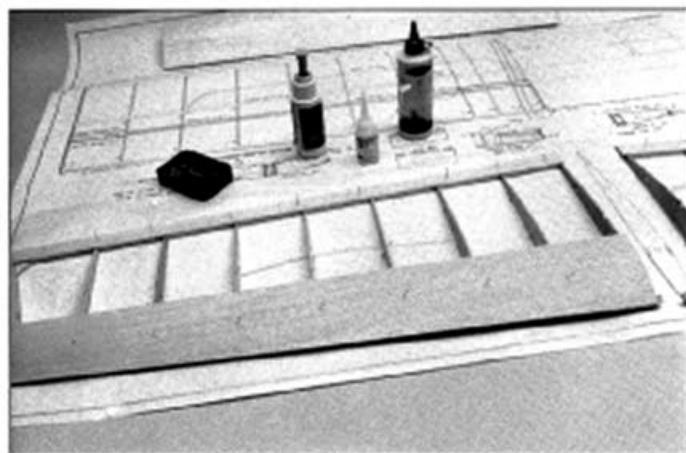
6. Apply glue to the tops of the shear webs and all the spar notches and install the 1/8" x 3/8" spruce top spar. Cut and install the 1/8" balsa gussets.

7. Slip a piece of T.E. stock under the bottom sheeting to force it into contact with the lower edge of the ribs. Glue the sheeting to the ribs.

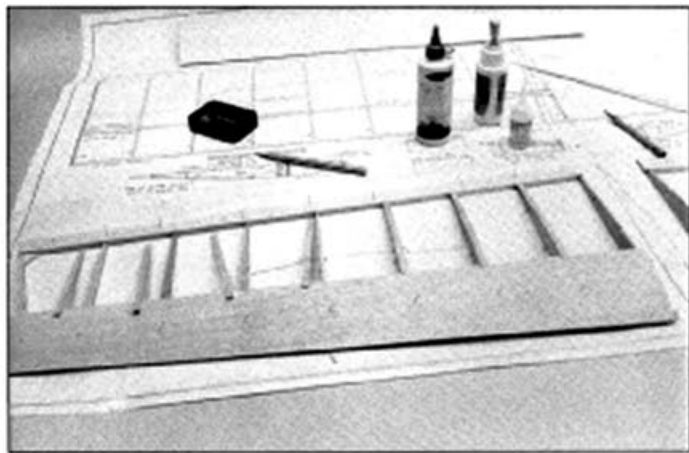
8. Install the pre-shaped spruce L.E. glue securely to the L.E. sheet and all of the ribs. Epoxy the forward polyhedral web in place.



9. Install the 1/16" top L.E. sheeting using either contact cement, slow setting CA, or aliphatic resin.



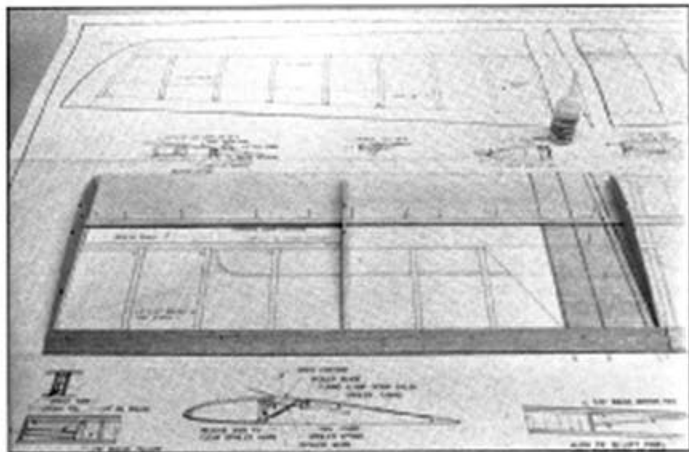
10. Install the 1/16" x 1/4" balsa cap strips. A little extra care here to keep the cap strips flush with the upper wing surface will add greatly to the finished appearance of the plane.



11. Remove the tip panel from the board and trim the L.E., T.E. and spars flush with the W-11 and W-3 ribs. This completes the basic tip panel. Complete the other tip to this point before continuing.

12. Pin the 1/4" x 1" balsa T.E. for one of the center panels in place over the plans.

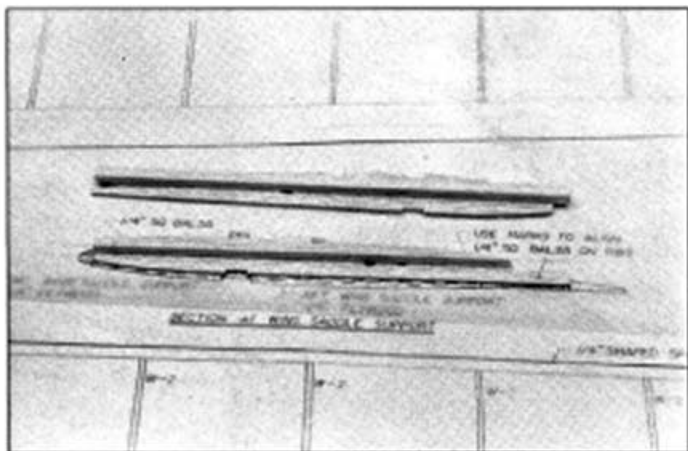
13. Make up a sheet/spar assembly like you did in step 2. Using several ribs as spacers, pin the sheet spar assembly in position.



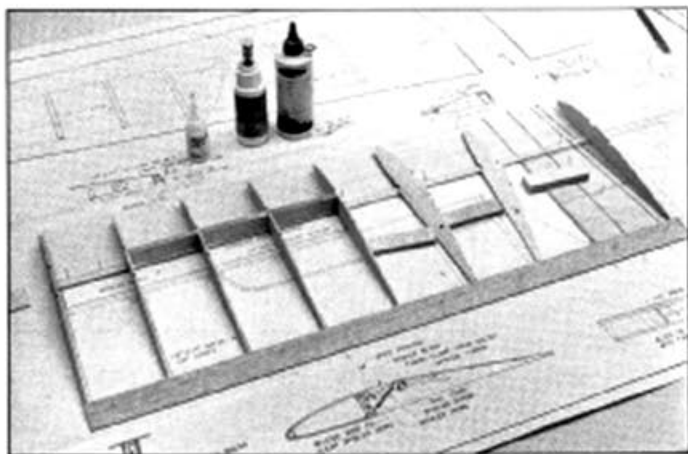
14. Cut the 1/16" balsa lower center sheeting and install between the spar and the T.E. Using the reference marks on the plans, mark the location of the W-1 ribs on the sheeting.

15. Drill the W-1 and W-2 ribs for the 1/8" spoiler tubing.

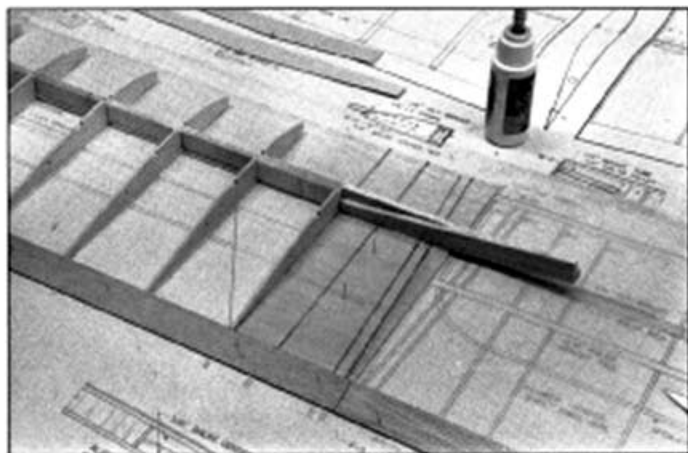
16. Take 2 of the W-1 ribs and install 1/4" square balsa on them as shown in the view marked "Section at Wing Saddle Support". Then cut all the W-1 ribs apart at the forward edge of the spar notches, leaving 1/16" clearance for the forward ply center web.



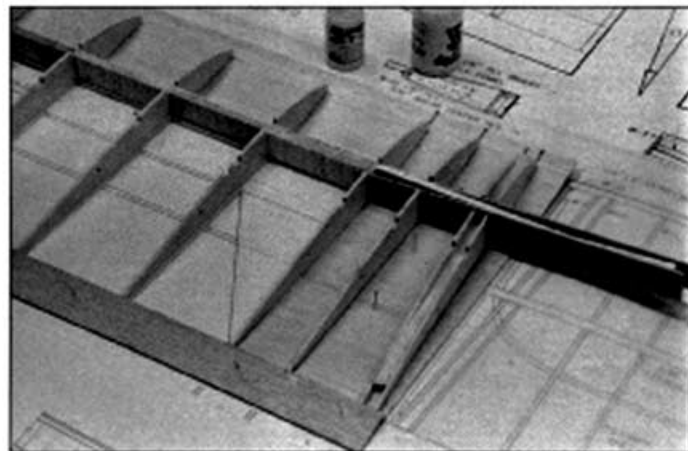
17. Starting at the outermost W-2 rib, start installing the ribs and 3/8" balsa shear webs. Use aliphatic resin on the end grain of the webs to ensure a good bond to the spar.



18. Glue the aft half of the outboard W-1 rib in place. Drill two 1/8" holes in the 3/8" ply center joiner for the spoiler tubing to pass through, then glue the joiner in positions on the lower spar.

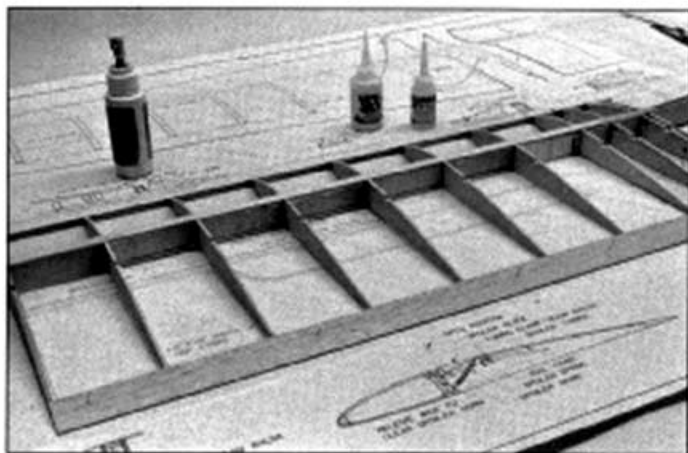


19. Drill two 1/8" holes through the ply center webs for the spoiler tubing to pass through. Glue the webs in position. You will have to notch the W-1 rib installed in step #18 to clear the aft web. Fit and install the remaining W-1 ribs.

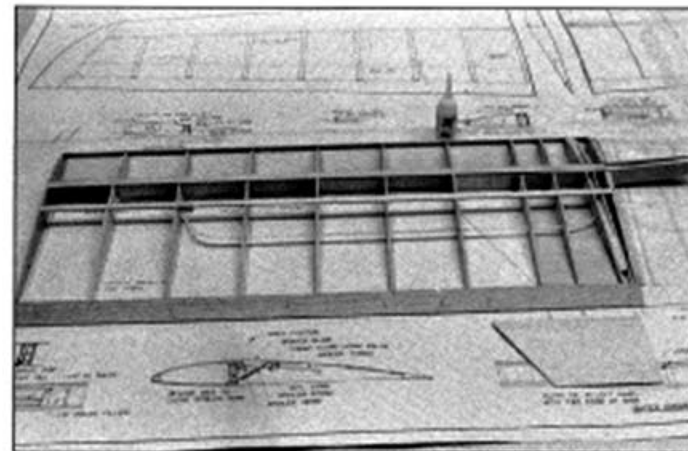


20. Using the plywood polyhedral webs as spacers and guides to tilt the rib, install W-3. Shim the L.E. sheet against the bottom of the ribs and glue.

21. Install the pre-shaped spruce leading edge and the 1/8" x 3/8" spruce top spar. After the spar is in position install the forward polyhedral web. Do not install the aft web yet.

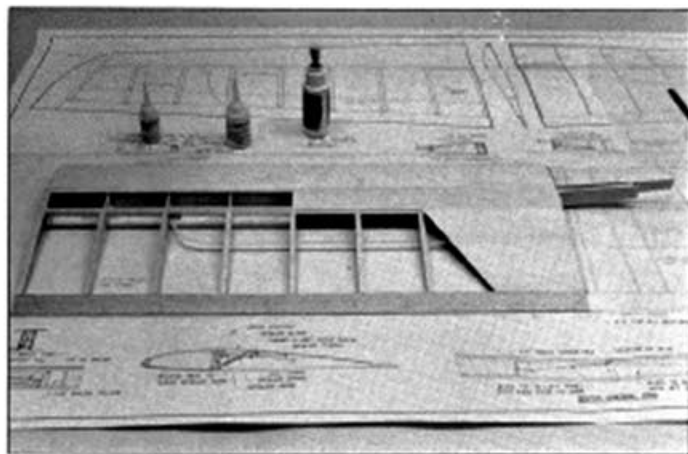


22. Install the 1/8" spoiler tubing and the 1/8" x 1/4" spruce spoiler spar. Cut the 1/4" balsa W-1B rib in half and install it. Install the W-1A ribs.

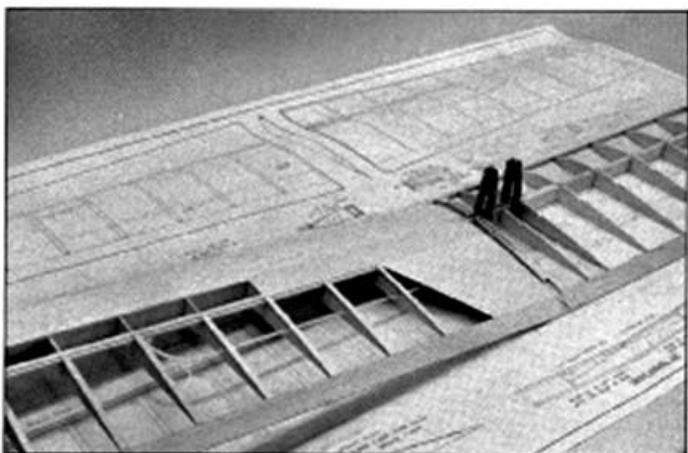


23. Install the 1/16" balsa top L.E. sheeting. Cut and install the top center sheeting, and install the 1/8" gussets.

24. Install the 1/16" x 1/4" balsa cap strip on W-3. Glue the 1/16" x 1/4" spoiler framing in place, then finish installing the remainder of the cap strips. This completes the basic center panel assembly.



25. The second center panel is built onto the first panel. Build the second panel just as you did the first panel through step #17. Then glue the first panel in position, blocking it up for the proper dihedral. Complete the second panel to the same point as the first one.



26. Trim the L.E., T.E. spars and sheet flush with the outboard face of the W-3 ribs. This completes the basic center panel assembly.



POLYHEDRAL JOINTS

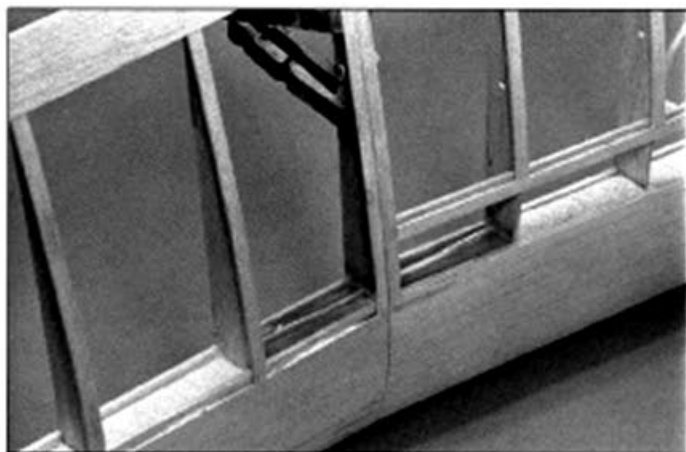
1. Cut and install the 1/8" balsa fillers against the forward polyhedral webs in both center panels and both tip panels. Also install the 1/4" square balsa fillers as shown in the views on the plans.

2. Cut two 1/2" long pieces of 1/4" dowel. Round one end of each slightly, then glue the square end of each dowel into one of the tip panels.

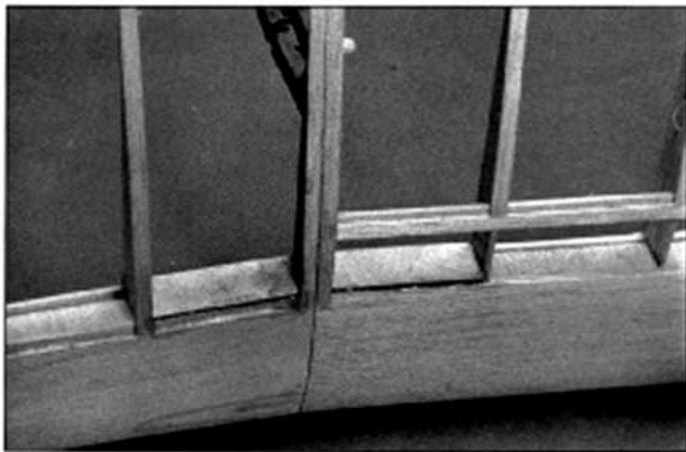
3. Plug one end of each of the four 1/4" brass joiner tubes with scrap 1/16" balsa. Roughen the outside of the tubes with coarse sandpaper and clean the tubes with acetone.

4. Slide two of the brass tubes onto one of the 7/32" wire joiners. Slip the joiner/tube assembly into one of the center panels and one of the tip panels and slide the two panels together.

5. With the center panel flat on the board, block up the tip for the proper dihedral. Check the fit of the two W-3 ribs and correct any misalignment now. When satisfied, use two or three dabs of 5-minute epoxy to spot glue the two brass tubes in place.



6. Mix up a generous batch of slow drying epoxy and micro-balloons. Stand the wing on the leading edge and completely fill the cavity surrounding the brass tubes with epoxy. Add the aft polyhedral webs and let the epoxy set. Repeat steps #4 through #6 for the other polyhedral joint.



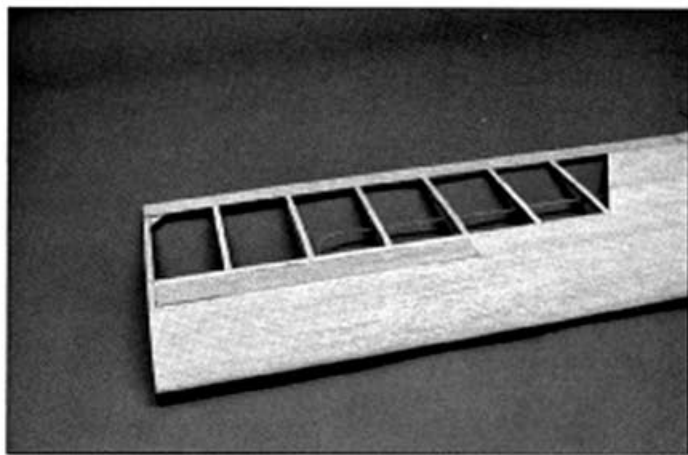
7. Glue the tip blocks in position and carve to the cross sections shown on the plans. Use a razor plane and coarse sanding block to shape the leading edge, then give the whole wing a good going over with the sanding block to smooth all the joints and remove any high spots.

SPOILER FITTING

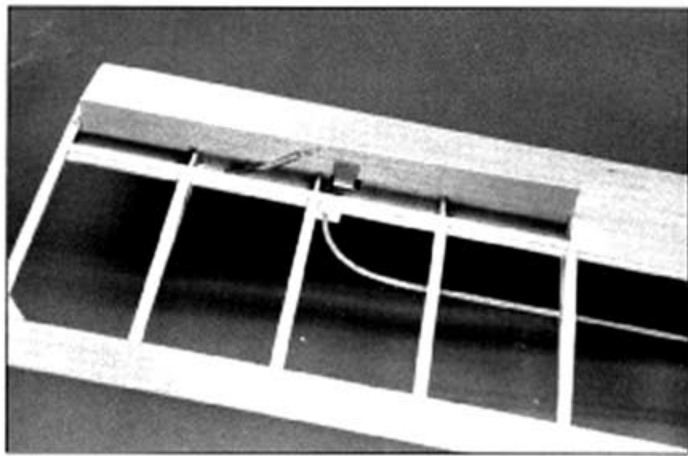
1. Make the spoilers from 1/4" x 1" T.E. stock. Mark the location of the spoiler horn on the underside of each blade and install the horns.

2. Cut out the three ribs in the spoiler bay as shown on the plans to clear the spoiler. Drop the spoiler in the bay and relieve the 1/4" shear web as necessary to clear the spoiler horn.

3. Using scrap 1/4" square balsa, install a spoiler rest at each end of the spoiler bay. The rests should be positioned on the ribs so that they support the spoiler just flush with the top surface of the wing.



4. Temporarily hinge the spoiler with masking tape. Feed the dial cord through the tubing and through the spoiler horn. Use the end of a round toothpick as a wedge to trap the cord in the spoiler horn. Pull on the cord to check the spoiler action.

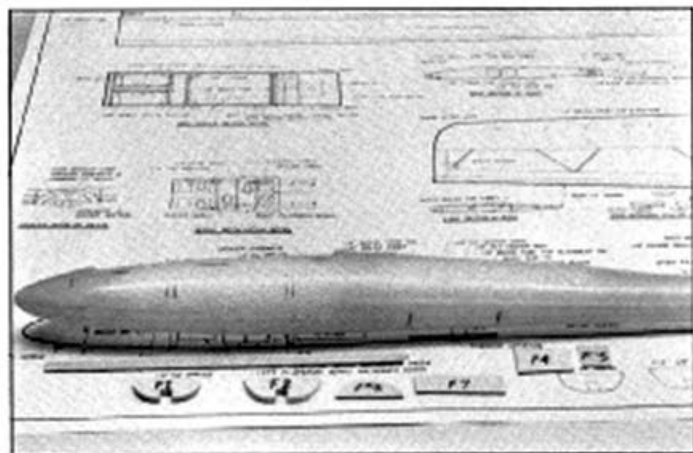


5. Bend two small hooks from straight pins. Glue one into the spoiler blade in the center near the aft edge. Push the other into the shear web near the bottom spar. Hook the spoiler spring to these hooks and check the action. Move the hook in the shear web until you have enough tension to pull the spoiler closed. Glue the lower hook in position.

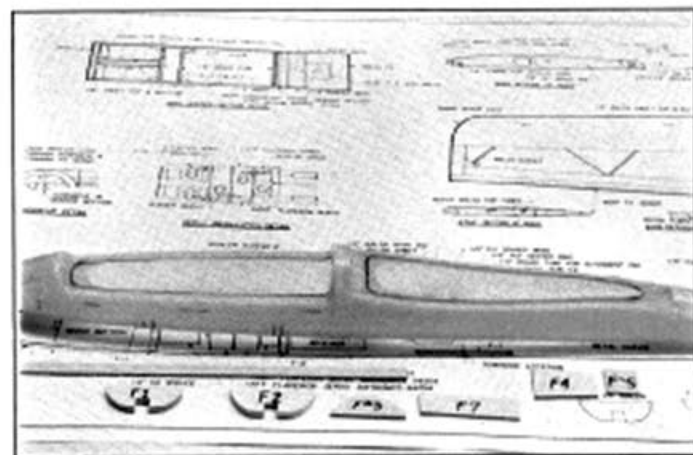
FUSELAGE

The fuselage supplied for your Cumic is laid up with epoxy, so only epoxy should be used during construction. Before construction the entire inside of the fuselage should be wiped down with acetone to remove any mold release, oil, or residue which would cause poor glue joints.

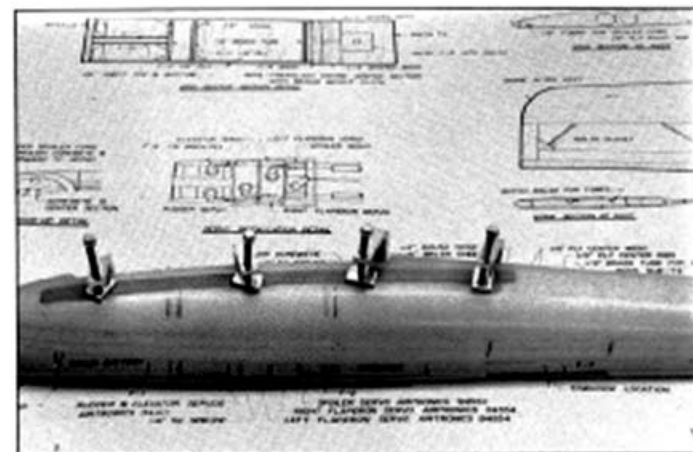
1. Using the plans as a reference, mark the location of the spruce side rails, F-1 and F-2 on the outside of the fuselage. Note that the spruce runs parallel to the canopy opening 1/4" below it.



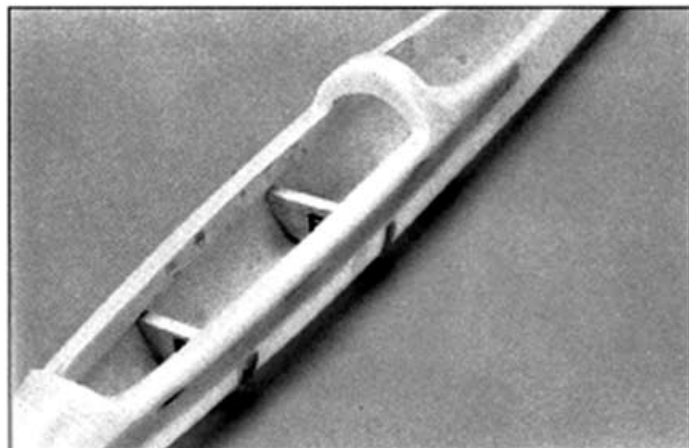
2. Mark trim lines around the canopy and wing openings so that a 1/4" of flange will remain after trimming. Radius all the corners 1/4". Use a Dremel tool to cut away the excess material and finish the edges with coarse sandpaper.



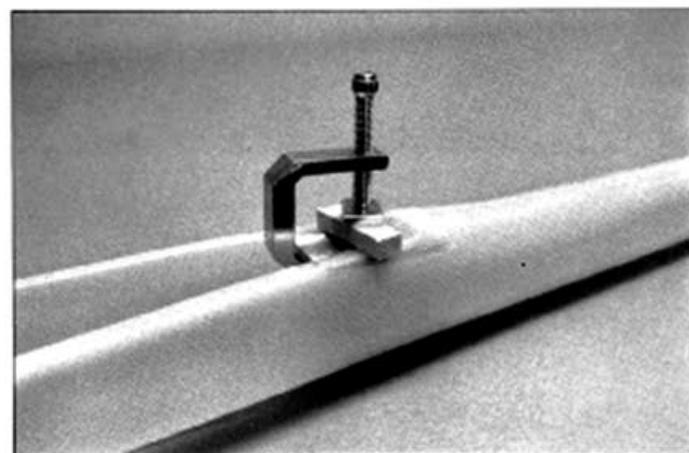
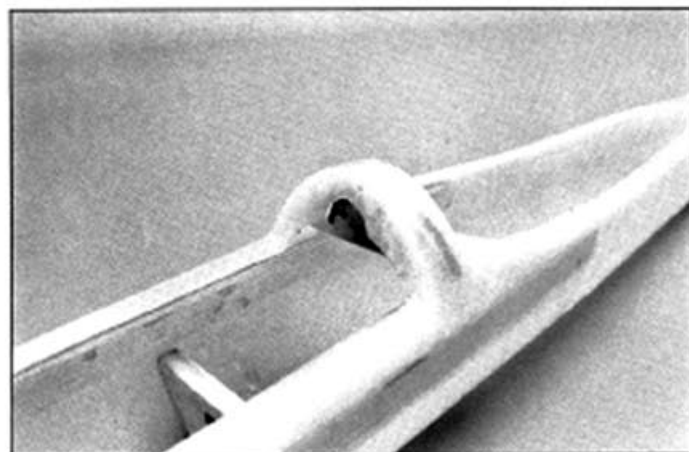
3. Cut the two spruce side rails to length. Epoxy them in place, using clamps to hold them until the epoxy sets.



4. Cut out the notches in the bottom of F-1 and F-2 as shown on the plans. After notching, epoxy both in place using the marks on the fuselage as a guide.



5. Install F-3 and F-4 using epoxy. After both are in place, mix up a batch of micro-balloons and epoxy and use it to generously fillet both F-3 and F-4 to the fuselage. Leave the fuselage upside down as the epoxy/micro-balloon mixture sets.



6. Epoxy F-7 in place to serve as a towhook mount. Install the 1/4" square spruce on top of F-1.

7. Mark the servo locations on the plywood servo tray and make the cut outs for the servos. Slip the tray into the fuselage through the wing opening and slide it forward into position and glue in place. Add the 1/4" square spruce under the tray and between the side rails above F-2.

8. Use a sanding block to square up the aft end of the fuselage. Epoxy the 1/8" ply stab reinforcements to the inside of the fin.

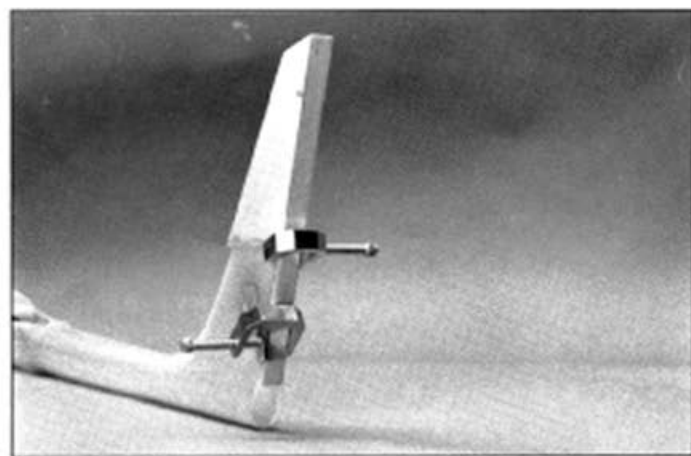
9. Use the 1/8" ply drilling template to drill the holes for the stab pivot tube in the fin. Start with a 1/8" drill, then check to be sure a 1/8" wire passed through the fin is square to the fin in all planes. Then enlarge the holes to 5/32" with a small file, correcting any misalignment as you go.

10. Using the stabilator horn as a spacing guide, make an arc shaped cut out in each side of the fin to clear the rear stab joiner. The slot should be long enough to allow 10° of travel in each direction.

11. Make up the elevator push rod from 1/4" dowel, a 4" wire adapter and a 12" threaded rod as shown on the plan. Secure the stabilator horn to the push rod with a Snap-R-Keeper.

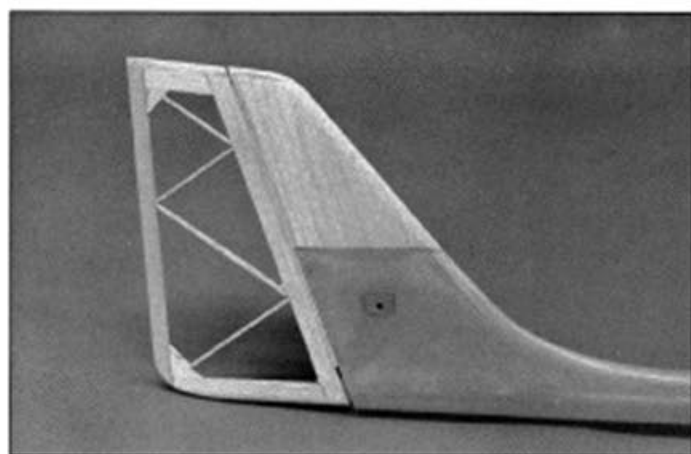
12. Locate the 1/2" section left from the 3-1/2" long piece of 5/32" brass tubing. Slide the elevator push rod into proper position. Slip the 5/32" x 1/2" pivot tube through the fin and stabilator horn. Carefully epoxy the tube in place, making sure not to glue the stabilator horn to the tube.

13. Use a file to notch the top of the fuselage for the tailpost. When the notch is complete, epoxy the 1/8" x 7/16" spruce tailpost in place.



14. Glue the 1/2" balsa fin in position and trim the tailpost flush with the top of the fin. Complete the fin by gluing the 1/4" x 3/8" spruce in place. Add the 1/16" scrap fillers to either side of tailpost and shape the fin assembly to match the fuselage.

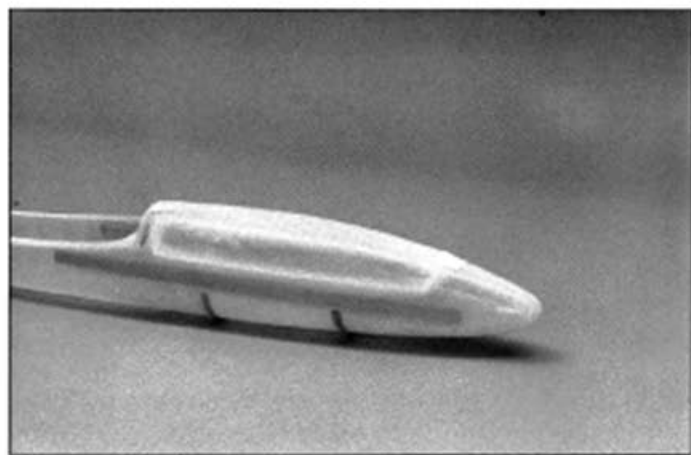
15. Notch the fuselage as shown for the rudder push rod exit and make up the rudder push rod from a 1/4" dowel, a 4" wire adapter and a 12" threaded rod.



16. Slip the rudder push rod into the fuselage and temporarily hinge the rudder with masking tape. Hook up the rudder push rod and check both the rudder and elevator action to be sure there is no binding and that the push rods don't interfere with each other.

17. Clean up the seam on both the canopy and fuselage using a file and coarse sandpaper. Once smooth, drop the canopy in place and make sure it fits properly. Remove the canopy.

18. Mark the location of the canopy hold down dowel on the fuselage and drill a 1/8" hole for the dowel.



19. Drill a matching 1/8" hole in the canopy and temporarily insert the hold down dowel. Put the canopy on the fuselage and check for proper alignment. Use a small file to correct any problems. Epoxy the hold down dowel into the canopy.

20. Lightly sand the outside of the fuselage and fill any pin holes with automotive body putty. This completes the basic fuselage assembly.



WING SADDLE

1. Carefully measure and mark the location of the W-1 ribs which are spaced 1/4" apart. Cut through and remove a 1/4" wide strip of the lower sheeting from between the ribs. Do not cut through the spar, L.E. or T.E.; remove only the sheeting between the ribs.

2. Trial fit the forward and aft 1/4" plywood wing saddle fillers. Make sure the fillers seat firmly against the 1/4" square balsa strips installed between the ribs. Using a generous amount of epoxy, install the fillers. Let epoxy set.

3. Put the wing center section in place on the wing saddle. Make sure the wing is centered and square to the fuselage centerline. Drill through F-3 into the wing for the 1/4" L.E. dowel.

4. Remove the wing and epoxy the dowel in position. Reinstall the wing, check the alignment, and drill the wing and plywood hold down plate for the nylon bolt. Remove the wing, tap the plywood, install F-5 and drill out the wing to clear the wing bolt.

5. Install the wing one more time and fit the balsa L.E. fairing blocks. Carve and sand the blocks to match the fuselage.



FINISHING

The stabs, rudder, and wings of your Cumic are best covered in Monokote. There is no better way to get a strong, light good looking finish. Sand the wings and tail surfaces with sanding blocks using 180, 220, 320 and finally 400 grits. Any nicks or dents should be filled with spackling compound. After the sanding is completed, cover the airframe following the instructions provided with the Monokote.

The fuselage should be painted. Sand the seam of the fuselage smooth and fill any pin holes with automotive body filler. Sand the entire fuselage smooth and paint using either K and B Superpoxy or acrylic enamel.



FINAL ASSEMBLY

1. Hinge the rudder and spoilers using the clear tape provided. Install the dial cord to the spoilers and the rudder pushrod.

2. Install the servos and hook up the linkages. Attach the spoilers to the servo by slipping loops tied in the end of the dial cord over a screw in the servo arm.

3. Install the receiver and battery pack, padding each with foam. Run the receiver antenna down the inside of the fuselage.

4. Install the nose and tail skids, and the towhook. Assemble the model and add weight as necessary to balance your Cumic as shown on the plans.

5. With the model still together, operate all the controls. Make sure they move in the proper directions and return to neutral correctly. Be sure the push rods don't bind and that the spoilers close completely.



OPTIONAL AILERONS

The structure of the Cumic is basically the same if you choose to build the Aileron version. The following are the changes necessary to build it with ailerons rather than polyhedral.

1. Install the W-3 ribs 90° to the building board and have both the tip and center panels flat on the board when installing the joiner tubes.

2. The tip ribs will have to be cut off at the aileron hinge line and notched for the two 1/8" x 1/4" spruce sub-spars. After basic assembly face the back edge of the panel with 1/16" balsa and install a 1/16" x 1/4" balsa cap on the upper sub-spar before installing the remaining cap strips.

3. Install a 1/16" x 1/2" balsa cap strip on W-4 as shown. The extra width will support the covering around the aileron push rod exit.

4. Install the aileron servos on a 1/16" plywood plate mounted between W-3 and W-4. Run extension cables to the receiver in the fuselage.

5. Make the aileron from solid balsa. Temporarily install the aileron and linkage and adjust until you have 20° travel up and 15° travel down. When satisfied cover the wing and hinge the aileron with Monokote.



FLYING

The Cumic will surprise you with how easily it handles. With the larger, thicker stabs turns are much smoother and more forgiving than the Sagitta. The speed envelope and ground covering ability of the airplane are superb, and once you learn to take advantage of the Cumic's ability to search out and get to lift you'll find your flight times getting longer and longer. The Cumic has a definite "step", and you should spend your first few practice flights alternating between slow flight and this "step" so you can get the plane moving when necessary to get to lift or out of sink in a contest situation without losing altitude. The spoilers are very effective in losing altitude, so practice with them at altitude for the first few times until you're used to them. We hope you'll enjoy your Cumic and wish you success with it.



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