STEPHENS AKRO

A Stand-Off Scale model of the famous E.A.A. design that has added its share of the fifty plus trophies won by the author in competitive flying. A magnificent aircraft for .40 to .60 engines designed by Don Condon.

● The model in this article represents my exact thoughts for stand off scale. By this I mean the following:

(1) It must fly well and be as easy to fly as any scale model can be.

(2) It must have true scale outlines, and look as much like the real thing as possible, without a lot of frills or difficult structure which means heavy wing loading.

(3) It must be attractive and unusual and, above all get you enough static and flight points to win some hardware.

I think it does all these things pretty well, so now for a little background and history.

This model is patterned after the one owned by Leo Loudenslager of Walkil, New York. Leo is an airline pilot, and the most promising young aerobatic pilot to come along in recent years.

He very nearly made the last United States Aerobatic team for international competition, and is a sure bet to be one of the best in this country soon.

The airplane is a Stephens Akro, an E.A.A. design, somewhat modified to fit Leo's needs. Photos and three views were taken from the following magazines: Air Progress, October, 1973 and the E.A.A. publication, Sport Aviation, January, 1973.

If you're still interested, let's start like this:

Wing

I suggest building the wing first, because it helps in fitting to the fuselage later, and you must have it completed to build the canopy hatch.

Full size inside and tip patterns are given for foam cutting. The dihedral is not shown on the plans, but is cut into the foam. Using 2" thick foam, just keep the tops of both patterns near the top of your foam block.

and the dihedral will be cut in the bottom of the wing only. The top of the wing is level. The reason for all the plywood in the tip is to protect it from scuff damage, and to provide a good base for the hardware screwed to the tip for horizontal and vertical reference lines. The ailerons are foam, too. After sizing the piece you cut out of the wing blank, and sheeting to match the wing airfoil, the rest of the wing is pretty much like all foam wings, and the plans show all you need to know.

Fuselage

Start by cutting out all bulkhead frames as follows: #1 and #2 are ¼" aircraft plywood; #7 and #14 are ⅛" balsa; #13 is ⅛" plywood; all the rest are ¼" balsa.

Because of the midwing design, it is necessary to get some strength up front to hold that engine solid. Two things accomplish this: The four ¼" dowels between the firewall and #2 bulkhead, and the 1/32" ply doubler on each side that runs from #1 to #13, from the thrust line to the bottom of the fuselage. The little weight it adds is well worth the added strength.

Now lay out a center line (fuselage bottom) on your building board, and mark the spacing for all bulkheads. I found it easier to cut scrap balsa to put under all bulkheads to bring them up in height so that the thrust line on the side is perfectly straight and level, with #3 sitting flat on the board. This also assues a no-twist fuselage. Don't forget to cut clearance holes in all bulkheads for the pushrods first.

Cut the 1/16" balsa sides and 1/32" ply doubler the same size. Glue together and install against the sides of the bulkheads, the top being even with the thrust line pre-marked on the sides of all formers. The stab and rudder fin should now be shaped and installed.

Cut two #14 from ⅛" balsa. Glue one to #9 and #10 and tack glue (lightly) the other on top of it. Using a straight edge, sand the necessary bevel into both #14's to conform with the top former shapes. Remove the top #14 and save for building the canopy hatch later.

Put 1/16" scrap balsa behind all panel joints for help in gluing the top sheeting.

Install the 3/32" soft top sheeting next. Wet the top surface, bend to fit, and hold with masking tape till dry.

Install the tank floor and sides and Tatone mount now, then sheet over the tank section. Put the wing into place and finish fitting to the fuselage if necessary.

Use 1/4" x 1" hard balsa as wing saddles inside both sides and under the wing for added strength and stiffening in this section.

Now cut a piece of wax paper slightly wider than the fuselage and tape to the wing center. Next cut pieces of 1/16" sheet for the deck floor. Glue together and cut to the fuselage width from #3 to #9.

Fit formers #3-4-5-6-7 and the #14 you made before. Add glue backers along the sides between all bulkheads for gluing top sheeting later on. Drill two ⅛" holes through #2 and #3 at about the angle shown on the plan and epoxy in pieces of ⅛" music wire for the front hold down pins. Now apply the top sheeting after making sure all the framework fits tight to the wing and bulkheads #3 and #14. After sheeting and removal, drill a ¼" hole down through the rear where shown and install a piece of ⅜" dowel for strength. Now drill a hole for the rear hold-down bolt.

Canopy

I went the hard way and made a wood plug and molded my own canopy from butyrate plastic, but a little shopping around will find you a commercial canopy that you can fit to shape.

The landing gear should be bent and installed as per the plan and pictures before the fuselage bottom is sheeted. Mine was made from a piece cut from a 50' roll of sewer clean-out tape.

STEPHENS ACRO

Designed By: Don Condon

TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
57 Inches
WING CHORD
Root, 12⅝" — Tip, 6¾"
TOTAL WING AREA
542 Square Inches
WING LOCATION
Mid-Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
Flat Top (7/8" at tip)
O.A. FUSELAGE LENGTH
37⅞ Inches
41¼" (nose to rudder tip)
RADIO COMPARTMENT AREA
(L) 10" X (W) 4" X (H) 2"
STABILIZER SPAN
19¼ Inches
STABILIZER CHORD (incl. elev.)
5"" (Avg.)
STABILIZER AREA
92 Sq. In. (approx.)
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6½ Inches
VERTICAL FIN WIDTH (incl. rudder)
5" (Average)
REC. ENGINE SIZE
.45-.60 Cubic Inch
FUEL TANK SIZE
11 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Four
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa, Ply, Foam
Empennage	Balsa and Ply
Weight Ready-To-Fly	108 Ounces
Wing Loading	28.7 Oz./Sq. Ft.

Cowling

I think the cowling is the strongest and easiest you can build for this shape. At least, it's easier than molding!

Temporarily, mount the engine about 3/8" to the rear of where the permanent mount will be. Cut out the front cone from ¾" soft pine. Next drill a 1" hole into the back, (center line) about ½" deep. Now drill the rest of the way through with a 5/16" drill and bolt to the crankshaft. This spacing will assure prop clearance when you permanently mount the engine.

Make the ¼" ply main former fit around the Tatone mount, and make sure the sides and top are flush with the fuselage sheeting. Screw in place where shown against the firewall.

Glue part #1 on each side of the main former with the front edge flush with the front face of the main former and the top flush with corner 'A' of the former.

Next glue the two ⅛" x ¼" spruce stringers from the notch marked 'A' in the front cowl along the top edge of #1 to the rear cowl line. Bevel slightly to follow the curve of the top front sheeting. Now glue the two #3 cheek formers ¼" from the rear edge of piece #1 on each side.

With a straight edge and sanding block, or Dremel Moto-tool, bevel the front pine cowl former, from point B all the way over the top to point B on the other side. This gives the top and side pieces a flat firm gluing surface.

Now cut and fit the top cowl sheeting and piece #2 to fit. The latter glues down the center of the ⅛" x ¼" spruce side pieces, to the front former and the top of the ¼" main former. A little wax paper on the top fuselage sheeting just behind the main cowl former will keep the glue from making the cowling a permanent part of the airplane.

Next glue the top edge only, of the 1/32" #4 pieces to the other half of the ⅛" x ¼" spruce and let dry completely. After the glue dries, wet the plywood on the outside and glue to the front former and piece #3. Hold in place with masking tape.

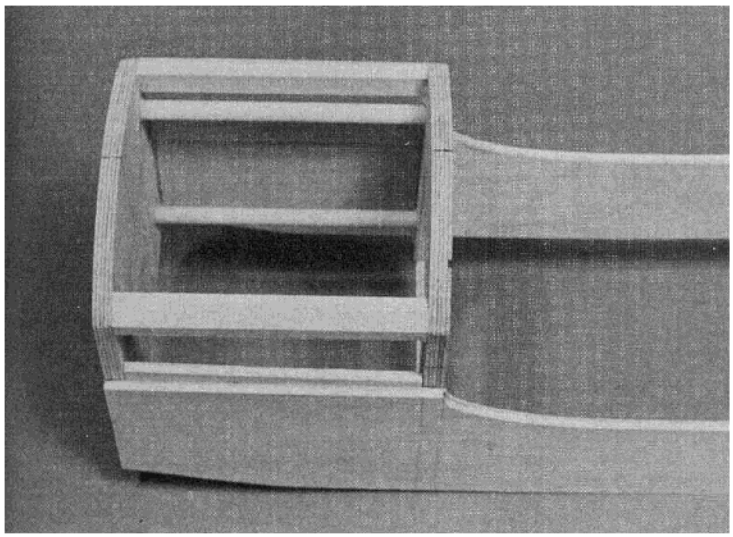
The last piece is the bottom #5, which should be cut somewhat over size first, and a slot cut for the engine head, then glued to the bottom edges of the front former, main former, and the side sheeting.

A piece of ⅛" x ⅛" can be glued inside on the bottom edge of the side sheeting for better gluing of the bottom piece if desired.

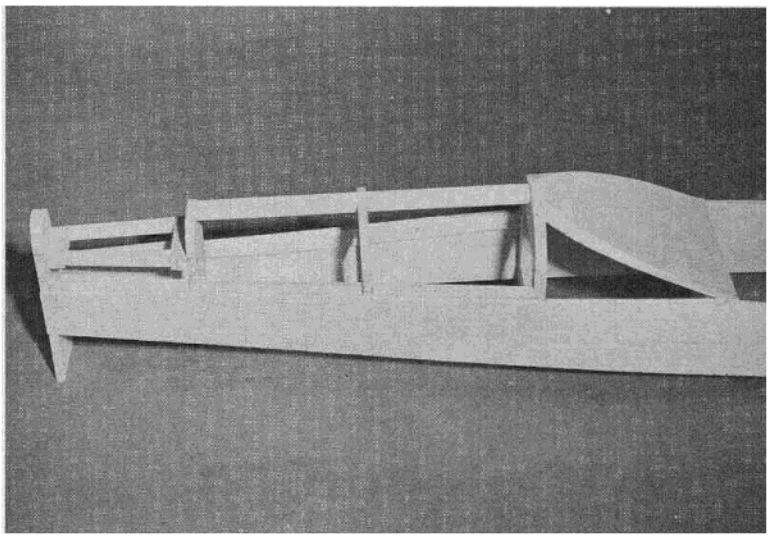
When dry, remove the two screws in the main former and the whole thing should slide off the front.

Sand the front edges to shape and cut the oval shape in the pine front. Cover the whole thing with a layer of light glass cloth and two coats of resin. The two bubbles are shaped from soft balsa block and installed on each side at this time. The finished cowl is very strong, easily repaired if needed, and no heavier than molded fibreglass or heavy ABS sheet. The photos should clear up any points in question.

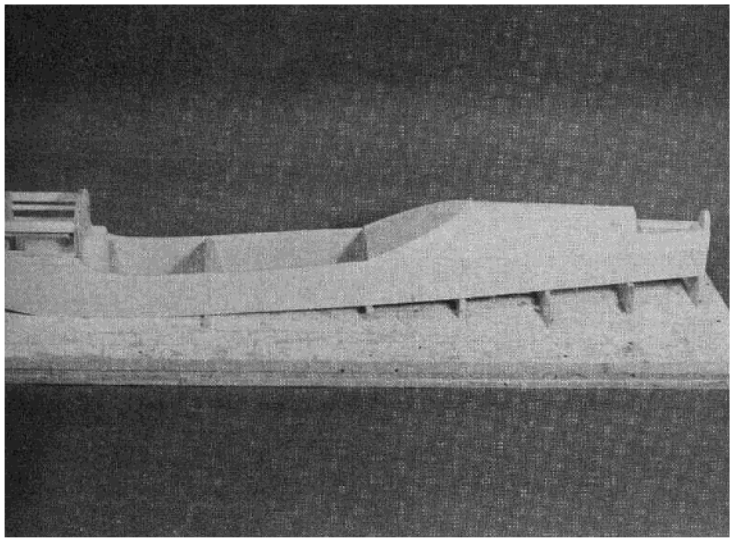
The simulated tube framing of the elevator, rudder and ailerons is done as



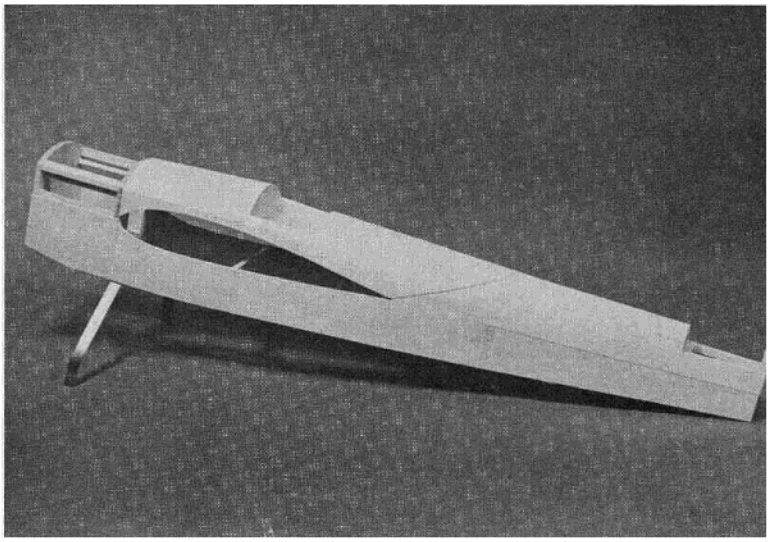
A close-up view of two plywood nose section bulkheads and partially completed fuselage.



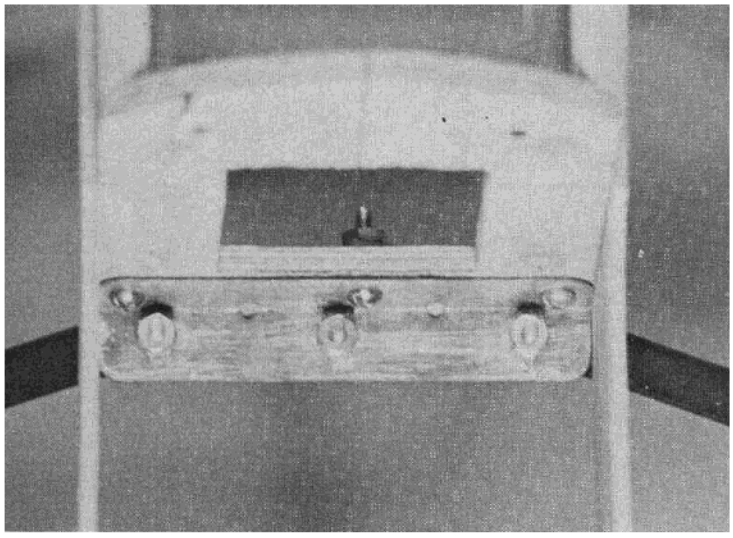
Close-up details of the basic framework in the aft section of the fuselage.



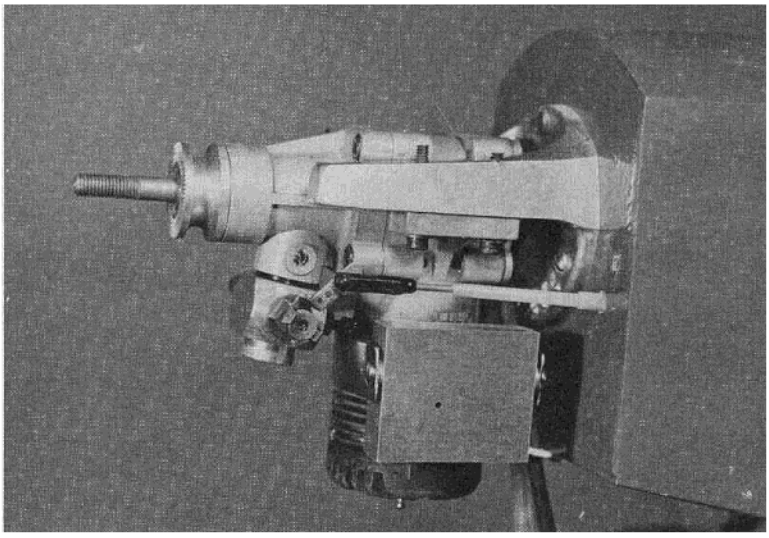
The Akro fuselage being built on a flat building board. Note shims to hold fuselage.



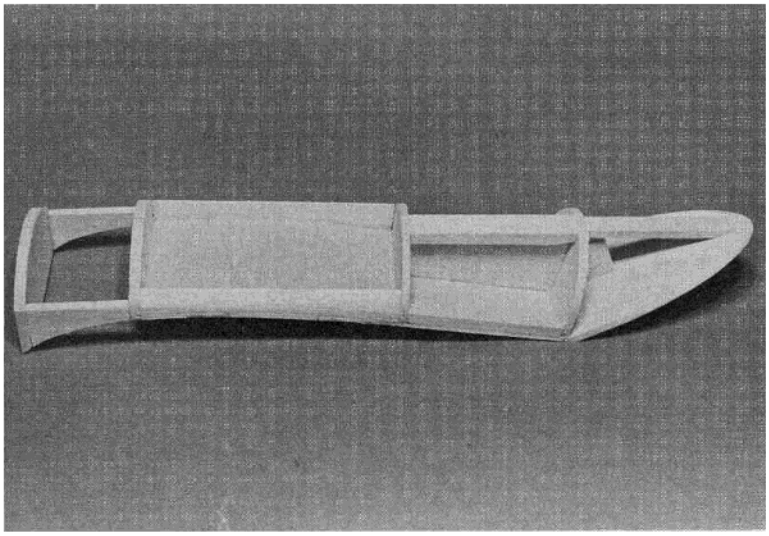
The fuselage with landing gear attached and the center section fitted in place.



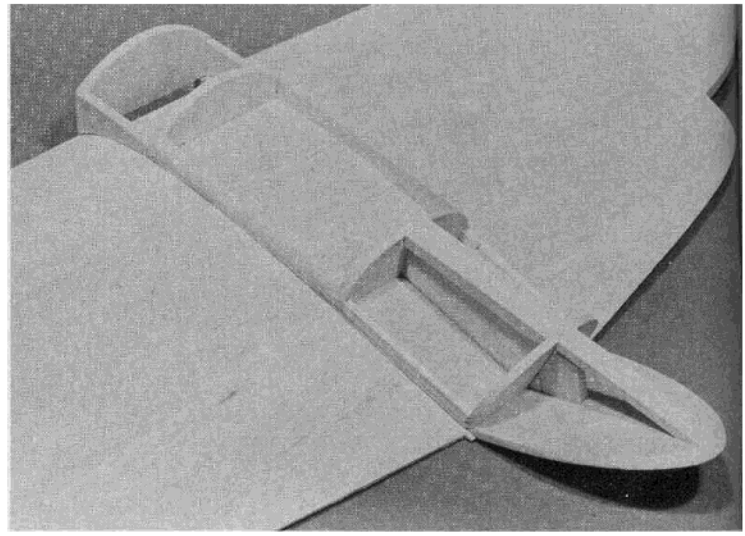
View of metal landing gear bracket bolted to ply former and dural gear.



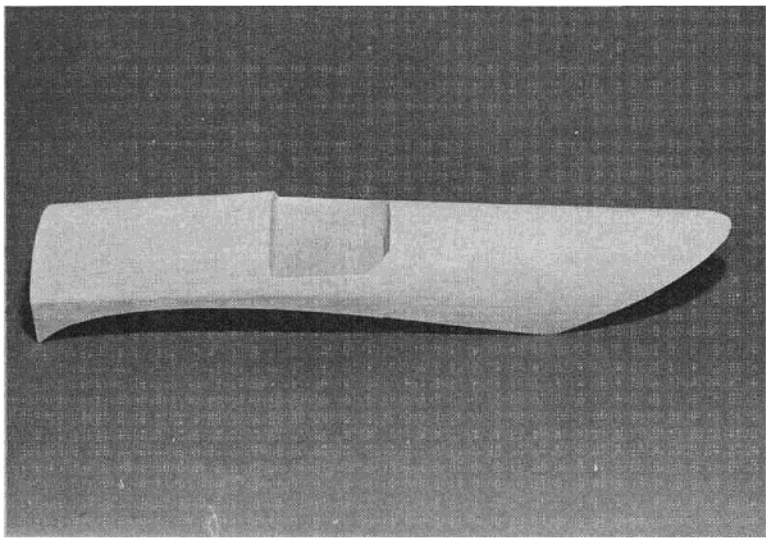
The .60 mounted inverted on a Tatone long mount. Note muffler and throttle pushrod.



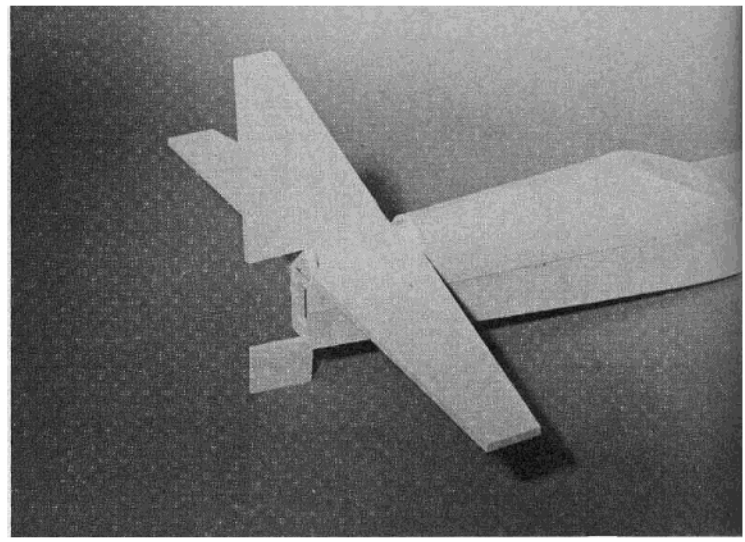
Basic construction of fuselage top deck prior to sheeting.



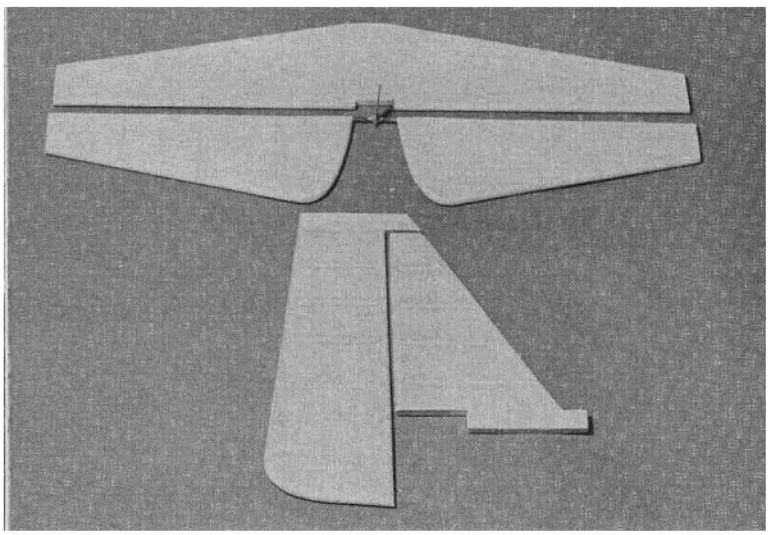
Fuselage top deck resting on balsa covered foam wing to check for proper fit.



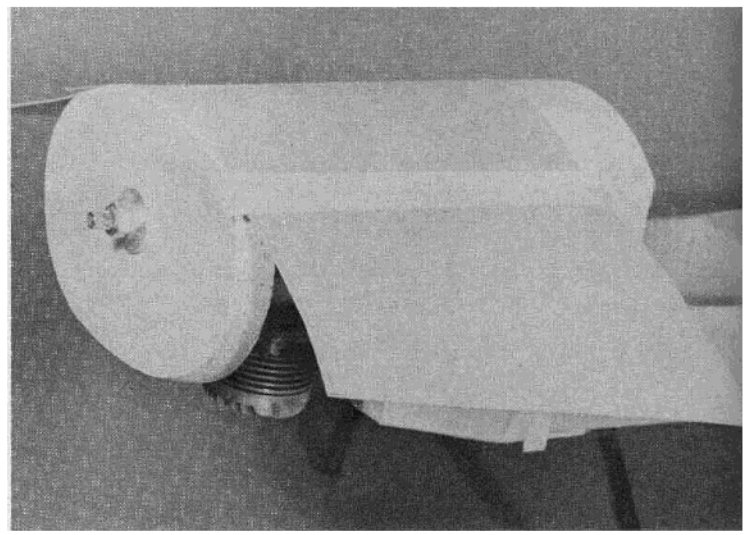
Fully sheeted top deck with cockpit area cut out.



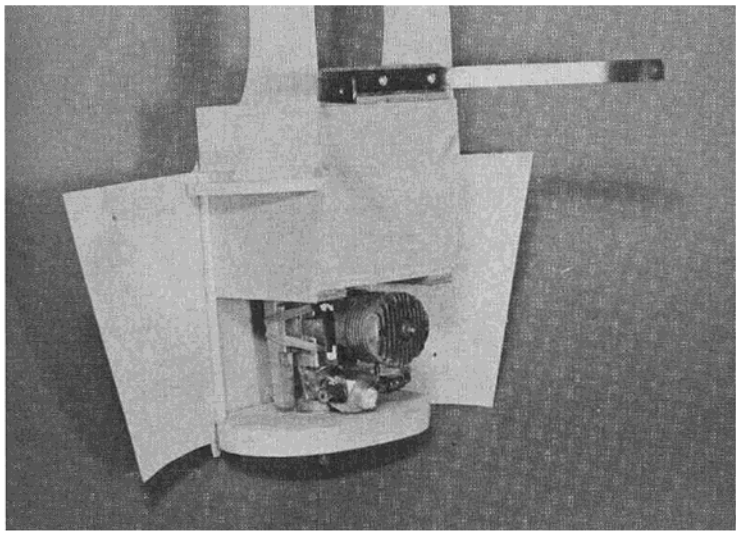
Rough-cut sheet balsa vertical and horizontal stabilizers set in place to check fit and alignment.



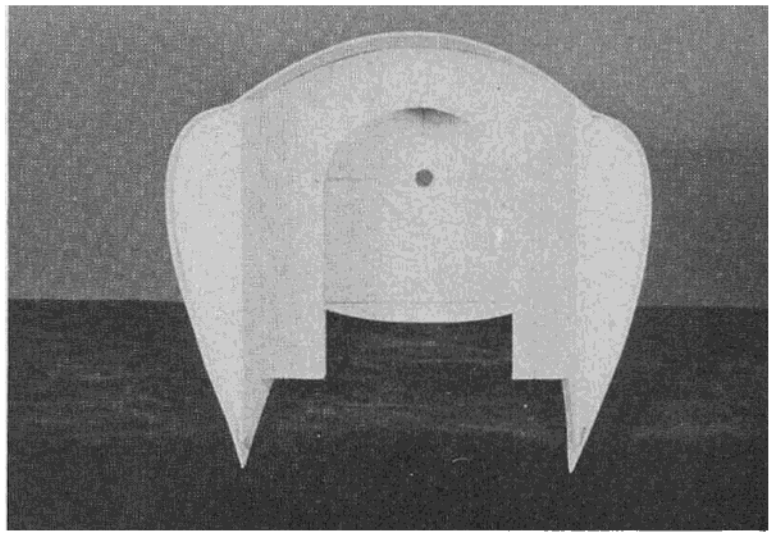
Finished stabilizer, elevators, vertical, and rudder, with simulated ribs.



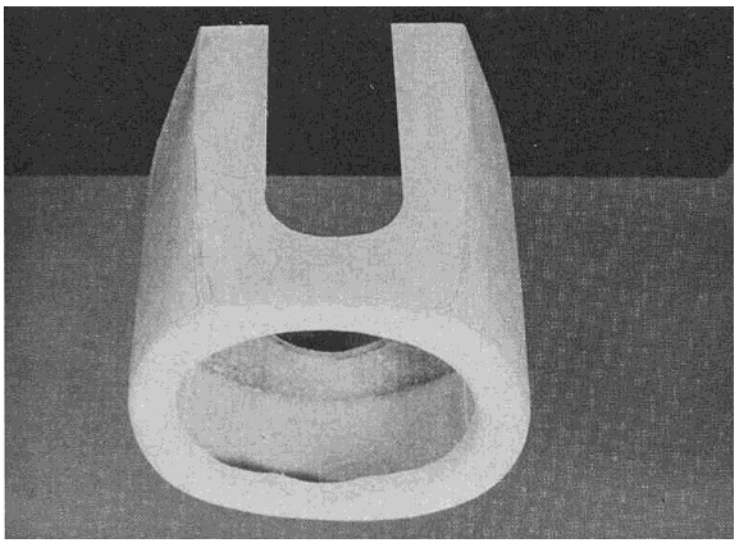
Front nose block held in place with prop nut and washer as cowl sheeting is applied.



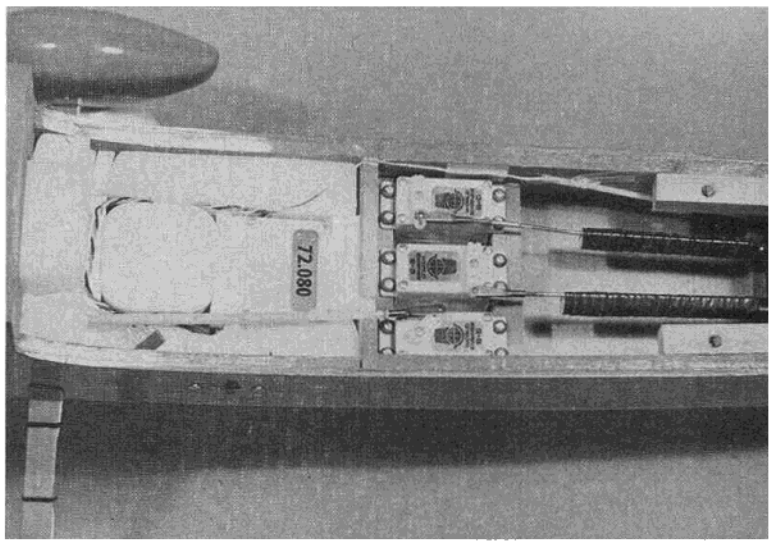
The sheeting laid back to show temporary mounting of engine. Note stuffing in carb and exhaust.



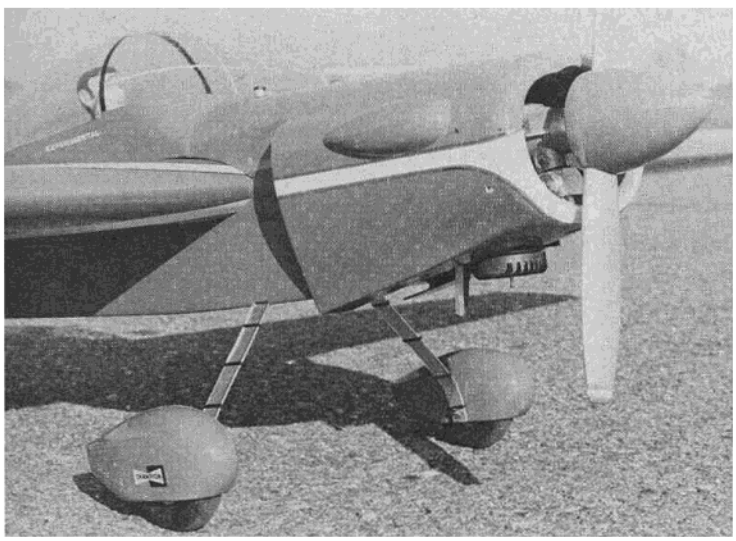
Rear view of cowl prior to cutting out front block and final sanding.



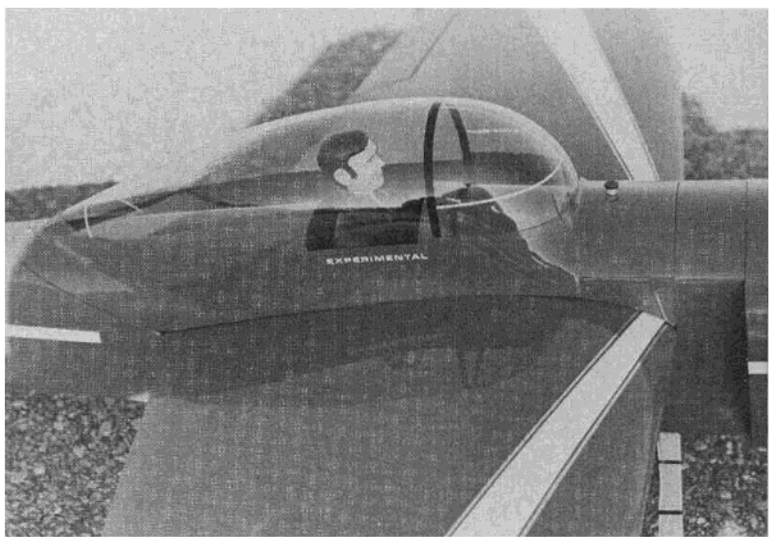
Completely formed cowl, ready for final sanding and finishing details.



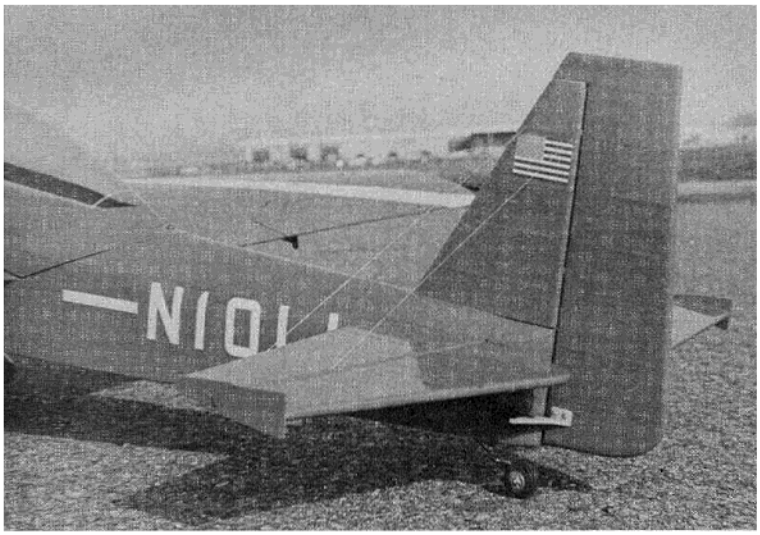
With wing and top deck removed, there is easy access to all of the radio equipment.



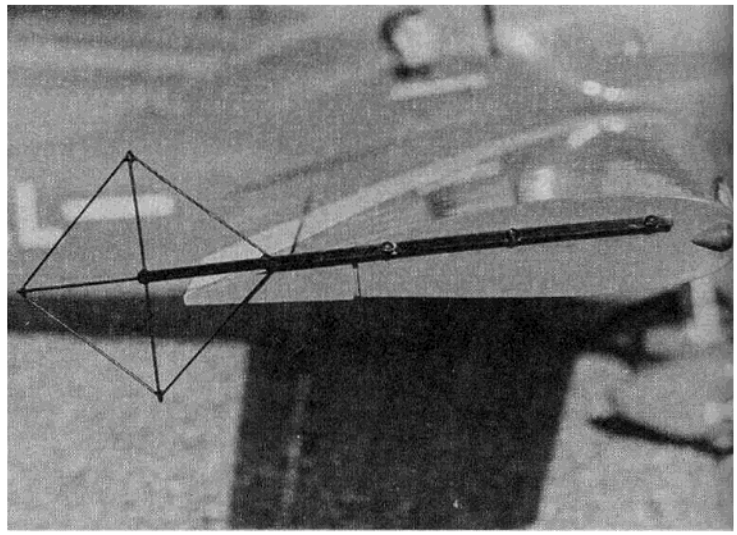
Close-up of cowl, spinner, and landing gear on the finished Stephens Akro.



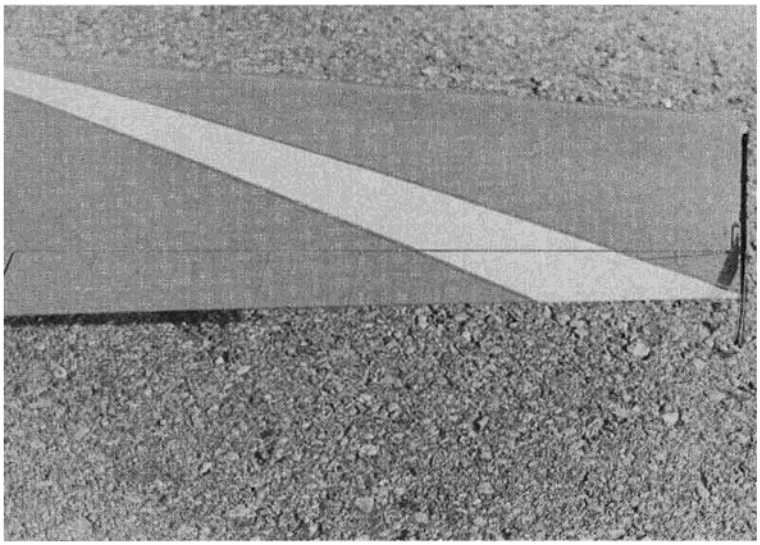
Note smooth fairing of canopy into fuselage. How's that for a mirror finish?



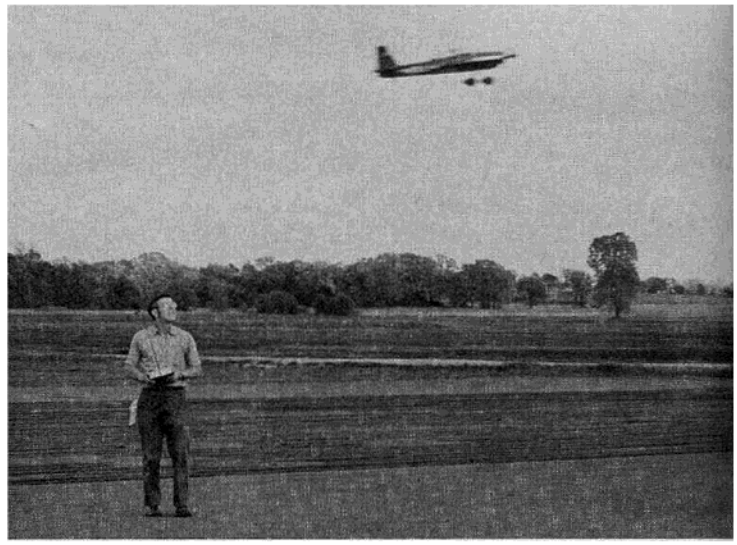
Tail details, including fin braces, stab tips, and simulated ribs are evident in this photo.



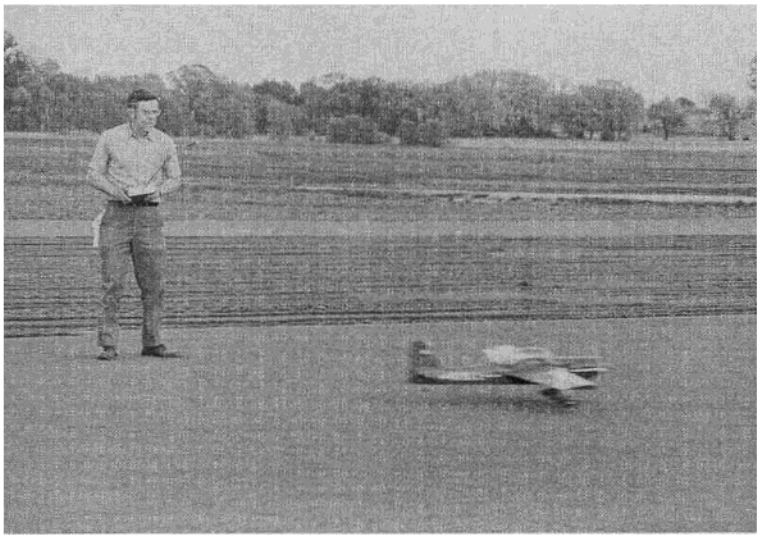
An added touch of realism – scale details include maneuver reference diamonds on wing tips.



Note simulated ribbing used on ailerons as well as tail surfaces.



The author makes a low pass with the fast and highly maneuverable Akro.



A touch-and-go looks like this – ground handling is excellent, even from grass fields.

Don Condon and his pride and joy. Latest trophy was from the 1975 Sig Manufacturing Co. Contest.

follows:

Cut 3/32" wide pieces of masking tape, press on as shown on plan, and silk right over the whole thing. Care must be taken when sanding, not to go through the silk. The finished result looks very much like tubing outlines on the original plane.

The brace wires on the tail assembly are silver metallic thread. With a needle of the correct size, come through the correct spot in the fuselage side below the stab. Go up through the stab, through the vertical fin and down through the stab on the other side, then through the fuselage side opposite the first hole.

Now connect both sets of thread with a short spring. This helps keep them tight and also helps if you hook one accidently. A small access plate under the fuselage bottom at the tail makes this an easy installation and also simplifies hooking the control rods to the rudder, elevator, and tail wheel.

Finish

I am an all-dope-and-talc man for filling, but you should use whatever method you like. Everything is silk covered except the wing, which is covered with medium silkspan. The finish is Hobbypoxy. Mix dark blue and white for the correct shade. The gold shadow strip is 1/16" Pro-Stripe.

Flying

The full sized airplane has its C.G. at 25%. The model started out that way, and never changed. Experiment if you wish, but it flew right off the board like it is. The all-up weight, minus fuel, is 6 pounds 12 ounces. With a .60 size engine, it really streaks, so is best flown at about half throttle in the air.

I am sure the model would fly on a good .40, but I fly off grass all the time, and if I have to pull it off a bit early some time, I want it to be flying when it gets in the air. If you have power to spare, you can cut back at any time, but if you are marginal, you don't have that option. Most scale models can use the extra weight up front anyway.

That's about all there is to it. I can supply the foam cores, wheel pants and canopy for anyone who doesn't want to make his own. (Don Condon, 1117 Woodman Rd., Janesville, Wisconsin, 53545.)

Happy flying, and I hope I don't have to fly against you at a scale contest — you would probably beat me, it flies that well! □

From RCModeler Jan. 1976