ARIES XJW-120

Giant Size Sport Aerobatic Model

By John T. White

Introduction:

I have always been fascinated by the aerobatics performed by the model aircraft, especially those that are scale or semi-scale. I found them interesting and enjoyable to fly. Although I admire individuals who take on true scale projects, that isn't my forte. I don't have the patience, skill, or discipline to build scale. So I will leave those projects to the scale builders.

The Aries XJW-120 monoplane is very much like many of the popular semi-scale aerobatic aircraft now flying. Although similar in appearance to some models, I hope I have added a few performance enhancements. Some of the planes that have influenced the design and development of the Aries, are the Caps, Lasers, Extras, Sukhois, and the Ultimate Bi-plane. There are features in these aircraft that are of considerable interest to me. This is my attempt to duplicate these features in the Aries.

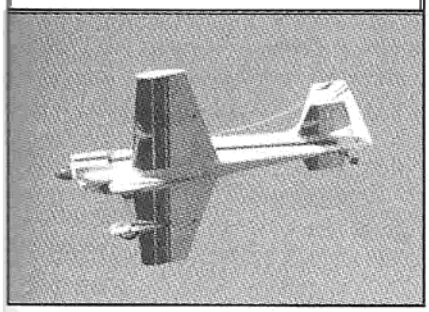
The challenge is to develop a design into an aircraft that flies well, has good aerobatic capabilities, and is a comfortable flier for a Sunday afternoon. Also, the design must come in light enough so a 4-stroke 1.20 or 2-stroke .91 engine would provide ample power to give good performance and retain the scale appearance. As you know, in most aircraft of this size that require the 1.20 4-stroke, the cylinder head protrudes through the side of the cowling. I like to hide the cylinder head inside, so the Aries fuselage was made wider and cheeks were added.

The Aries XJW-120 was developed around the O.S. FS-120 4-stroke engine and performed exceptionally well with that power. However; to further evaluate the performance of the prototype with different power installation, the O.S. FS-120 4-stroke was removed and replaced with an ASP

ARIES XJW-120
Designed by:
John T. White
TYPE AIRCRAFT
Sport Aerobatic
WINGSPAN
73 Inches
WING CHORD
12-3/4 Inches (Avg.)
TOTAL WING AREA
950 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
1-3/16 Inches
OVERALL FUSELAGE LENGTH
58-3/4 Inches
RADIO COMPARTMENT SIZE
(L) 14" x (W) 5-3/4" x (H) 2"
STABILIZER SPAN
25-5/8 Inches
STABILIZER CHORD (inc. elev.)
8-1/2 Inches (Avg.)
STABILIZER AREA
220 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
9-3/8 Inches
VERTICAL FIN WIDTH (inc. rud.)
8-1/2 Inches (Avg.)
REC. ENGINE SIZE
.90 2-Stroke, 1.20 4-Stroke
FUEL TANK SIZE
16 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.
C.G. (from L.E.)
4-1/8" to 4-3/8"
ELEVATOR THROWS
3/4" Up — 3/4" Down
AILERON THROWS
5/8" Up — 5/8" Down
RUDDER THROWS
1-1/2" Left — 1-1/2" Right
SIDETHRUST
0°
DOWNTHRUST/UPTHRUST
0°

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Ply & Fiberglass
Empennage	Balsa
Wt. Ready To Fly	160 Oz. (10 Lbs.)
Wing Loading	24-25 Oz./Sq. Ft.



ABOUT THE AUTHOR

John T. White of Norton, Ohio, is married and has two children. He was born in August, 1932 and served four years in the U.S. Air Force (Korean War) as a B-29 and B-50 flight mechanic. After service and school, he was employed by The Goodyear Tire and Rubber Company as a Senior Tire Engineer. While employed there, he became a charter member of The Corsair Model Aircraft Club, formerly known as The Goodyear Model Aircraft Club. During the many years as a club member, he served as a club officer in several positions.

During 35 years of modeling, the author has built and flown gliders, U-Control, and powered radio control type aircraft. In the early 60's, most of his modeling interest was directed towards scratch and kit building of R/C aircraft. As miniature aircraft competition became more popular, the author developed more interest in designing and building models that closely resembled full-scale aerobatic aircraft.

.91 2-stroke engine. The retrofit was completed and the performance is still excellent. Even the C.G./balance worked out okay.

To be sure that the aircraft would perform reasonably close to what was expected, design parameters were kept to known moments and proportions for good flying results in model airplanes. The wing aspect ratio is 6:1, with 14% airfoil. With this wing planform and a fairly long nose moment, the plane grooves with little tendency to tip-stall at low speeds. In looping maneuvers, the model keeps a fairly constant speed.

The empennage including the control surfaces have a slight airfoil for aesthetics and help neutralize unwanted aerodynamic forces.

The wide fuselage is for allowing room in the nose area for the cylinder head of the larger 4-stroke 120 engine and makes for easier installation of radio equipment and other internal fuselage parts. When studying the plans, you will notice the near proximity of the wing saddle to the cockpit floor. This is a narrow area so the builder must do the construction just as it is shown on the plans, to be assured of not having any structural integrity problems.

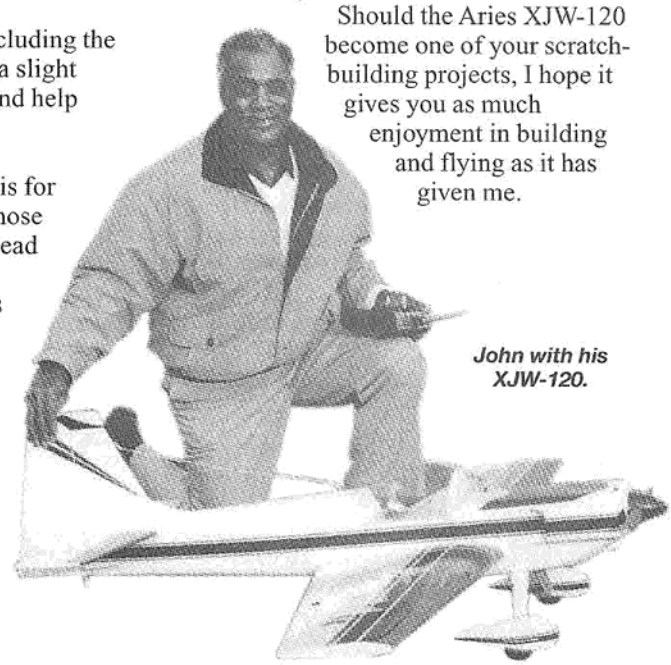
When mounting the servos in the fuselage, be aware that it may be necessary to cut relief openings in the wing so the wing will not interfere with servos when it seats in the fuselage saddle.

The wing uses the NACA 0015 type airfoil which has worked out very well for me. I took the liberty of making a few minor adjustments to the airfoil ordinates at the various camber stations. This was done to adjust the percentages of amplitude above and below the airfoil Datum Line. I believe these modifications make a more efficient wing planform. So far, I have not seen any unwanted flight instabilities while using this airfoil.

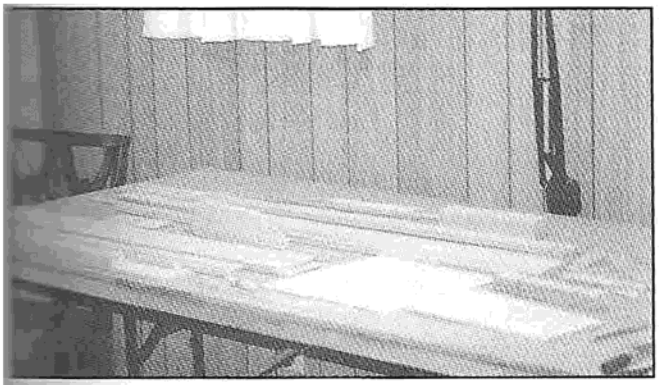
This airplane is not for the beginner builder or flier. It will require a certain amount of building and flying experience. I would recommend it to anyone who has built and flown low wing or pattern type aircraft.

Before starting construction, take the time to cut out a kit of parts, rubber band or tape them together, and put them in one of your old kit boxes. Oh ... one other thing, be sure to mark them so you will know where they fit. When I cut out a kit, I have an extra set of plans to cut up, then cement the parts with 3M Spray Mount Artist's adhesive to the wood to be cut. I find that the paper is easy to remove and it leaves very little residue on the wood. After all this ... if you are still interested, go back to the text and drawings and study them before starting construction.

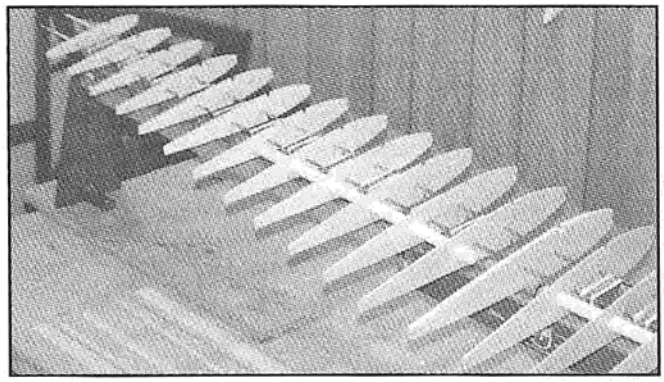
Should the Aries XJW-120 become one of your scratch-building projects, I hope it gives you as much enjoyment in building and flying as it has given me.



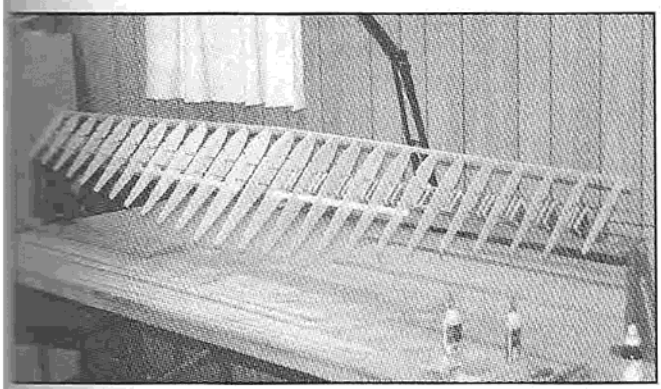
John with his XJW-120.



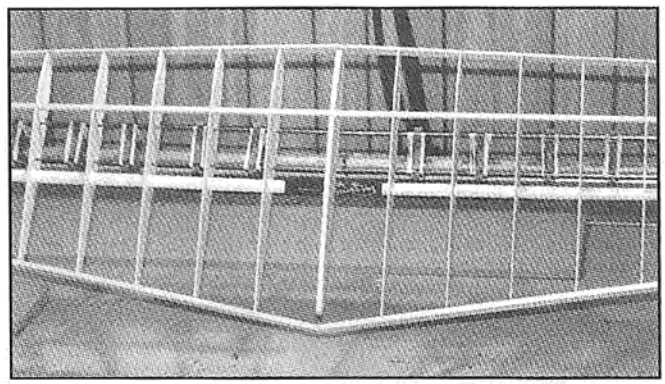
The basic kit before construction.



Ribs on jig with aileron cable tube.



Both panels with leading edge.



Both panels with trailing edge and top spars.

CONSTRUCTION

Construction is primarily built-up balsa and plywood, and a little fiberglass at the wing halves joint, aluminum landing gear, canopy, and other miscellaneous hardware. See the material list accompanying the text.

Wing:

I have a reason or two for starting with the wing. The ribs are all cut and notched, all you have to do is place them on the jig and go from there. Oh, you don't have a wing jig, okay, then just lay the plans on your flat building board. Place wax paper on the plans and build two wing halves upside down, one left and one right, or obtain the *RCM* wing jig article that was in the August 1967 issue, and build your wing on that jig. Another reason for building the wing first is to help locate the 3/8" diameter hardwood dowel hole in fuselage former F-3. Last, when the wing is framed up, it looks like you have really done something.

I have used the A-Justo Jig for many years and built this wing on it. It allowed me to build both halves at the same time and I can nearly complete the framing before removing the wing from the jig. Therefore, when describing wing construction, it will be in reference to framing on a wing jig.

Take all ribs from the storage box. Make sure holes and notches are in place as per plans, except the lightening holes, these are to be cut in after the capstrips are in place. Next, drill all holes in all ribs for the jig rods.

Set your jig up as per instructions. Slide all ribs onto rods with the largest rib in the center and working outward toward the wingtips. Roughly space ribs as shown on the print.

From 1/8" balsa sheeting, make two leading edge strips. These are tapered from center of wing to tip rib. Hold strips 3/4" wide at wing center and taper to 3/8" wide at tip by 37" long. Draw a centerline from wide end to narrow end, both pieces, both sides. This is to line up with centerlines on ribs. On one side of the leading edge, mark rib spacing as on drawing. Put leading edge pieces aside. For trailing edge, use 1/4" x 1/2" x 37" strips (two are required). Draw a line down center of strips. On same side mark spacing of trailing edge of ribs from drawing, on both strips. Put these trailing edge caps aside. Next, take four 1/4" sq. spruce spars and mark the rib spacing from the drawing on all four pieces. Lay spars aside.

Before starting the wing framing, be sure that the wing jig is set up to make the wing completely flat on the top surface from tip to tip along the spar location.

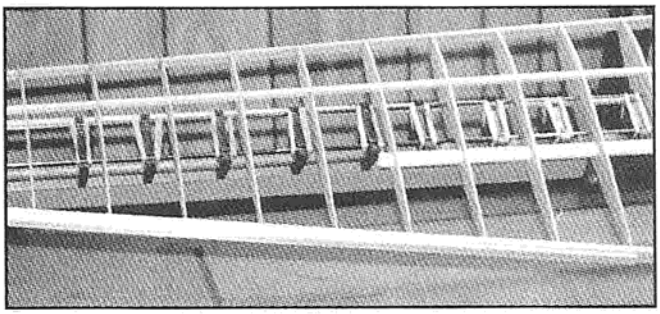
Build two 5/8" x 17" long paper tubes to be placed in the wing panels for aileron servo cables.

Begin the wing construction by inserting the paper tubing into holes previously drilled in ribs 2-3-4-5-6, and 7. Next, place the leading edge of each rib at the rib spacing and centerline mark. Using slow CA, apply to all leading edge ribs on both wing halves. Go to the trailing edge and align the trailing edge of ribs to the spacing and centerlines of trailing edge cap. Glue and pin all mating surfaces until glue sets.

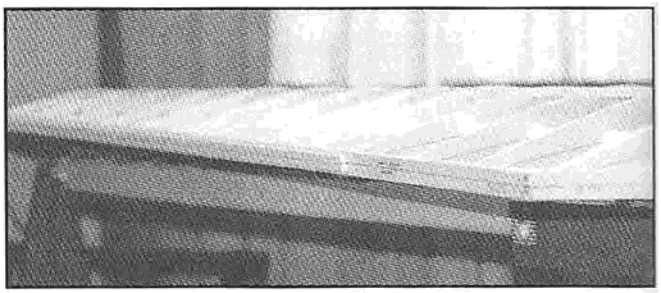
Next, place 1/4" sq. spruce spars into notches provided in top and bottom of ribs. Make sure ribs are placed 90° vertical to top spar and spaced properly. Glue all spars in place with thick CA. After glue on spars has set, place all plywood bracing and doublers in wing center section as per drawing, also add balsa fillers as shown. Use epoxy glue in this area.

Place masking tape on edges of ribs near leading and trailing edge of wing; this is to protect ribs when you are sanding leading and trailing edges to contour of ribs.

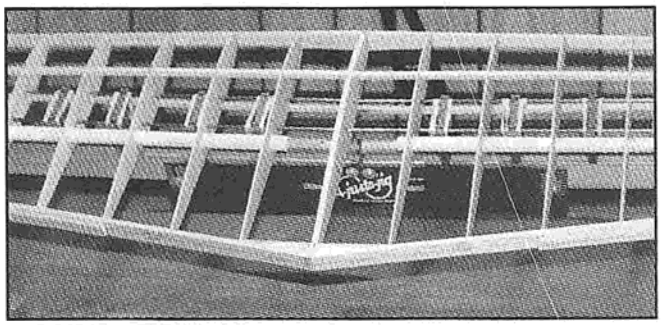
Pin 1/4" x 1/2" balsa aileron leading edge to trailing edge cap. This is to be shaped at the same time the trailing edge cap is shaped. Remove aileron leading edge after shaping and set aside. Place hinge blocks in wing



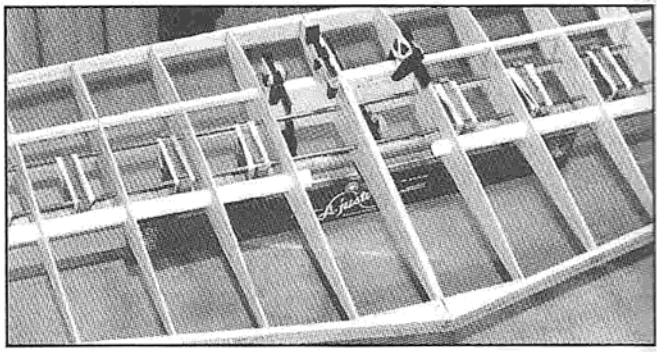
Left panel with leading edge of aileron attached for forming.



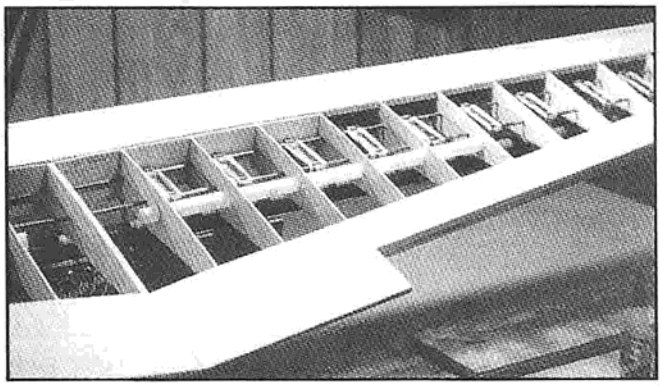
Left panel with close-up of aileron leading edge.



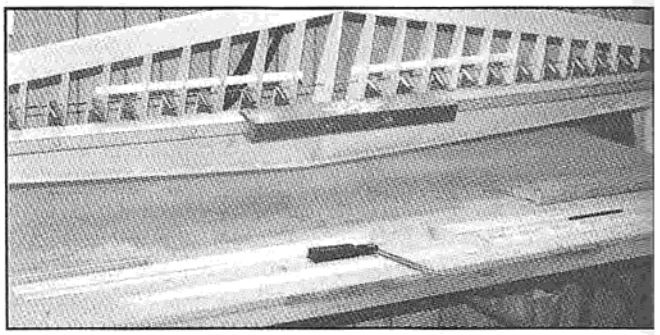
Both panels with front and rear braces and fillers.



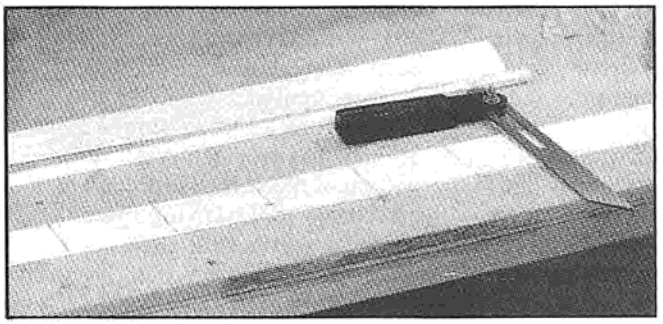
Center wing bracing.



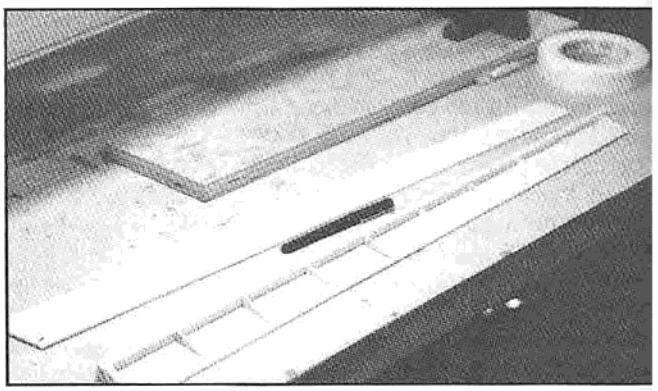
Wing with aileron and center section, aft section sheeted, trailing edge added.



Aileron parts ready for assembly.



Lay-out lines for aileron ribs.



Ribs in place on aileron lower half with leading edge.

as shown on drawing.

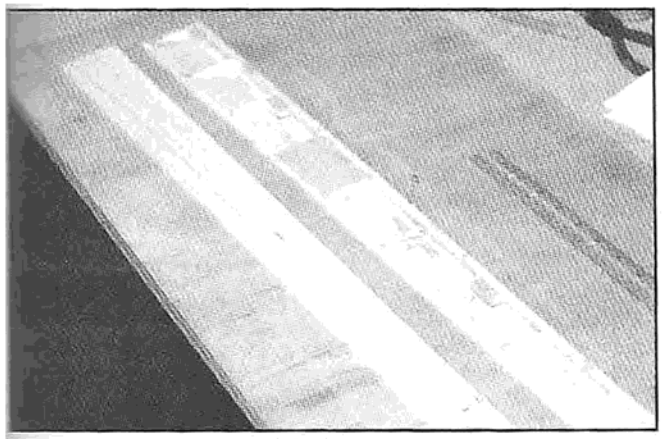
After all shaping is complete, remove masking tape from rib edges. All of the ribs must be flush with the leading and trailing edge members, use a long sanding block with fine sandpaper to finish the contours.

Add 3/32" balsa leading and trailing edge sheeting. When installing sheeting, I like to use aliphatic glue as the base glue and thin CA to tack while the aliphatic resin cures. Add 1/4" leading edge cap to both wing halves. Glue paper tubes in place.

Install center section 3/32" balsa sheeting on top and bottom. The jig may not allow the bottom to be completely finished; this can be done after the wing is removed from the jig. Add 3/4" x 3" balsa sheeting for trailing edge from rib W-1 to W-4, and sand both halves to shape. Cut the wing sheer webs from 3/32" balsa sheet, fit snugly between ribs, and flush with both bottom and top spars, glue in place with slow CA, be sure webbing is installed with the grain perpendicular to spar. Aileron servo mounting rails can be added now. Use 3/32" light plywood for support brackets (four are required). Add the 3/32" x 1/4" capstrips to both bottom and top. Wing can now be removed from jig. Complete center section sheeting and prepare tip blocks and 1/32" plywood tip caps for installation when ailerons are built. Rough-sand the leading and trailing edges of the wing.

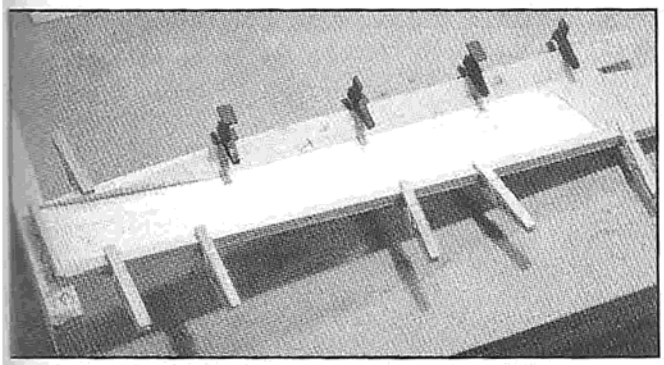
Aileron:

Place plans on a flat surface, cover the aileron area with wax paper, then

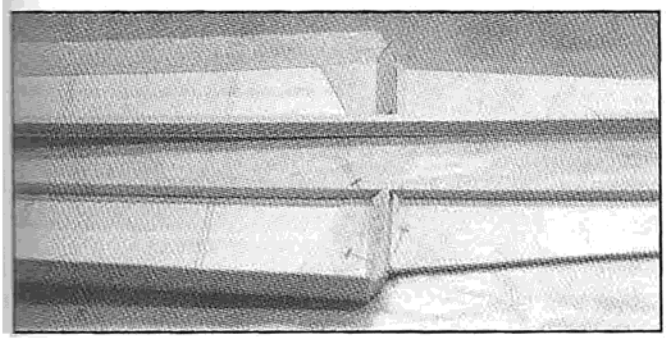


Aileron with hinge support block.

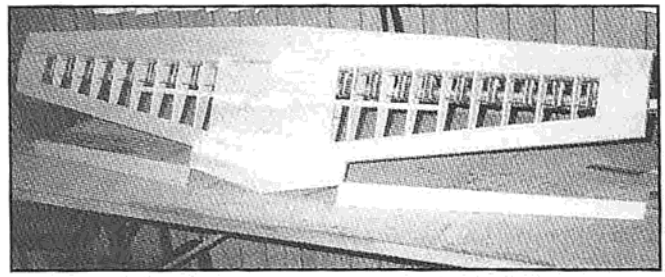
Pieces and parts to construct fuselage.



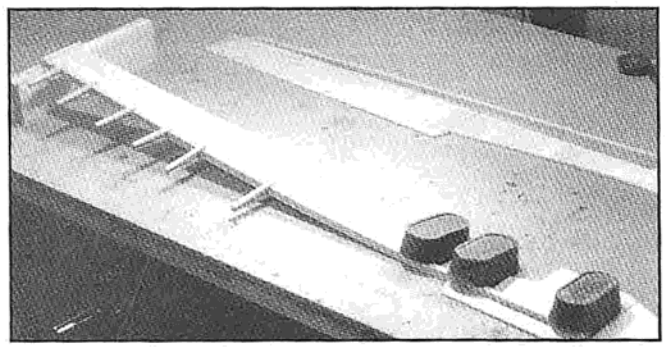
Fuselage side with 3/4" triangular stock added still in pre-stress position.



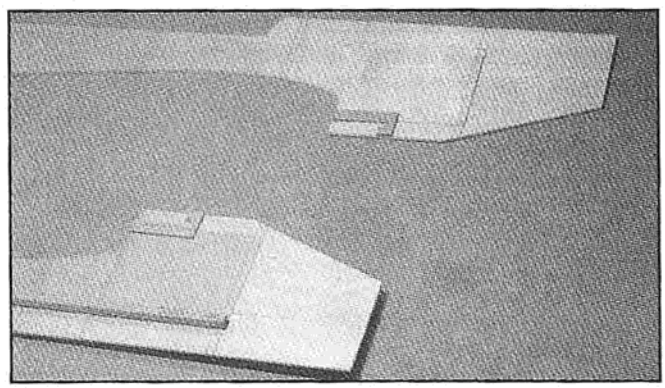
Both sides with aft wing vertical members shown.



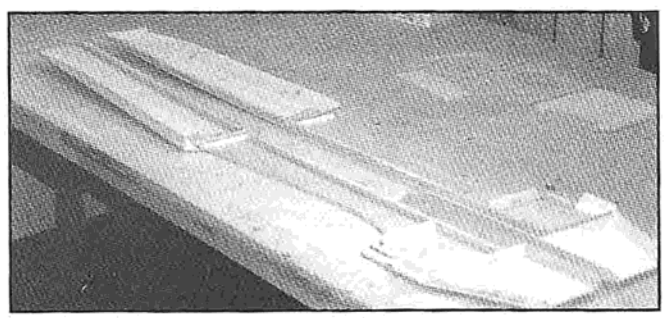
Wing completely sheeted shown with constructed ailerons.



Fuselage sides held in place with weights and assembled in pre-stress position.



Fuselage sides with landing gear support bracket.



Both fuselage sides pre-stressed and complete ready for former modules.

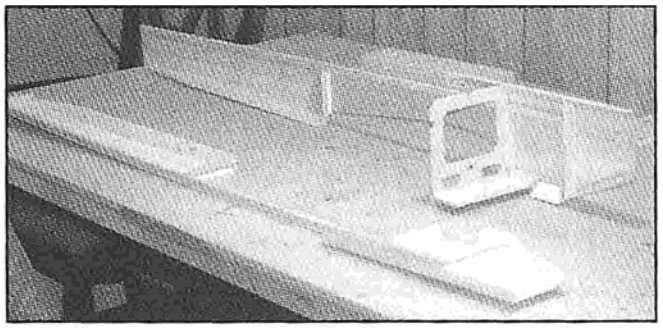
cut 3/32" sheeting to aileron shape as per drawing (four are required). Pin one sheet to drawing, then locate rib centerlines as per drawing. Place the 1/4" preshaped aileron leading edge on drawing and pin in place. Place all aileron ribs on 3/32" sheet and glue in place using medium CA. Using a long sanding block with fine sandpaper gently sand a slope on the sheeting at the trailing edge of both halves, these two are to mate when the top is in place. Before the top is glued in place, install all balsa hinge blocks as shown on drawing. With slow CA, glue top pieces to ribs, leading and trailing edges, now build the other aileron.

Once both ailerons have been built, see that they are straight and warp-free. Now, temporarily attach ailerons to wing and install tip blocks to both wing and ailerons. Remove ailerons and make any adjustments, then sand both ailerons and wing. Control horn reinforcement and plywood plates can be installed at this point.

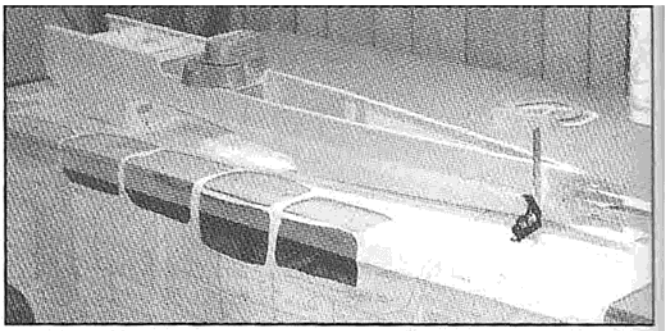
Apply 4" fiberglass reinforcement tape to wing center section using epoxy glue. After the epoxy has cured, cut the access opening for the servo wire harness.

Fuselage:

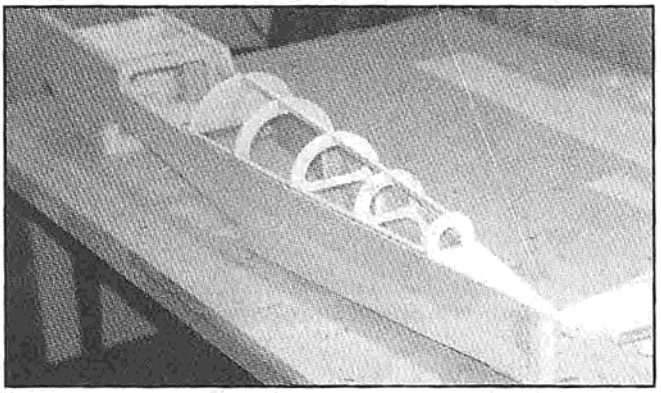
Lay out and cut fuselage sides from 1/8" x 6" x 48" balsa sheeting. The two sides should be cut together so they are identical in shape. Draw the engine thrust centerline on the inside surface of each fuselage side. Also, be sure the top edge of fuselage is straight and parallel to the engine thrust centerline. Lay out and cut two doublers of 1/32" plywood to the shape shown on



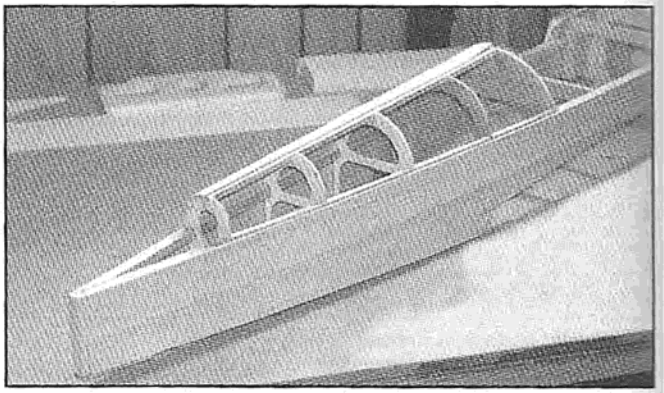
View of side and former pre-stressed modular assembly system.



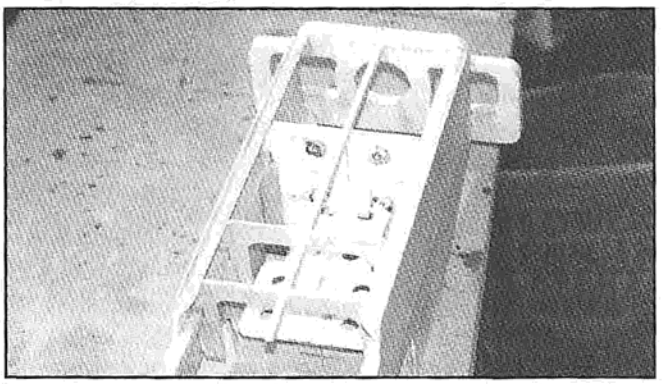
Use weights to hold fuselage in place when pulling tail together.



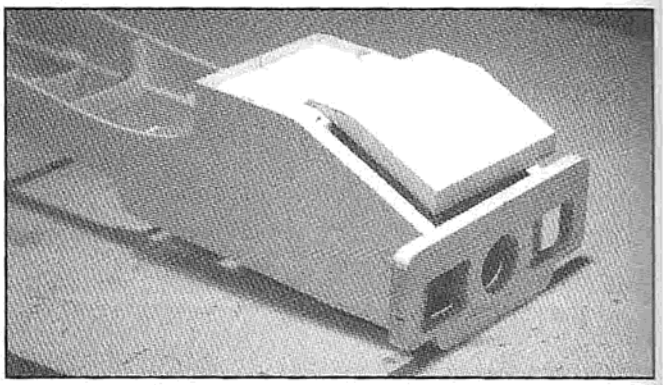
Fuselage with top stringer and deck supports added.



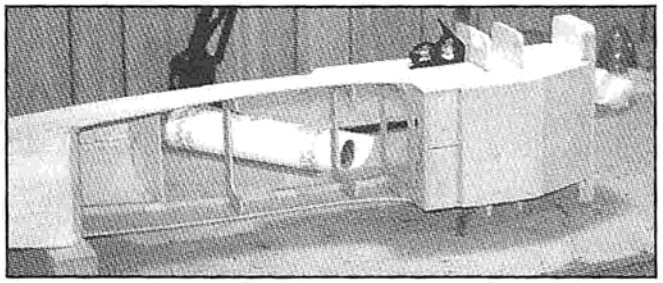
Deck partially assembled.



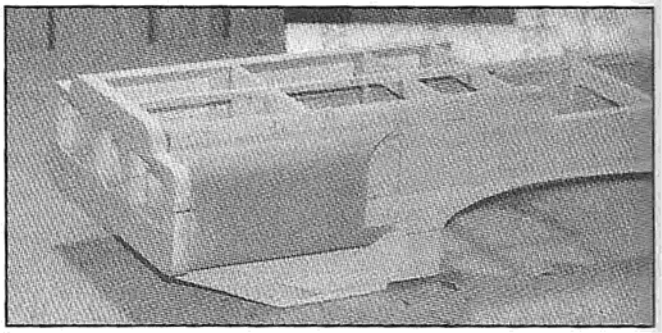
Top view front end assembled with fuel tank floor shown. Tank floor is removable.



Chin block ready for placement.



Chin block in place and cheek formers in place, use square for accuracy.



Front end ready for top cowl and engine hatch.

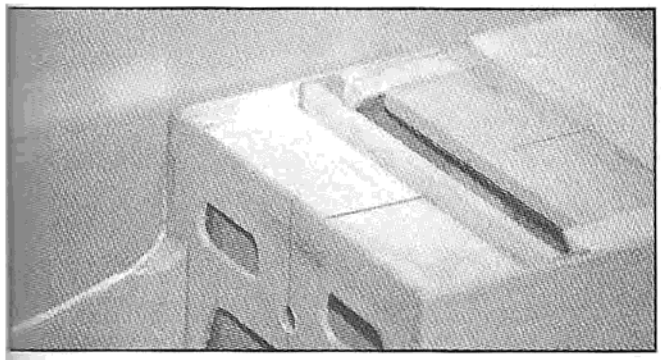
drawing. You are making two side subassemblies, one right and one left from these parts.

Outline the location of doublers on the inside of fuselage sides. Apply a thin coat of epoxy glue to interface of doubler and side. Carefully place the doubler in the outlined area and clamp until cured. It's very important that the top edge of the fuselage sides be straight and parallel to the engine thrust centerline, because all formers' vertical locations will be taken with reference to the sides' horizontal top edge.

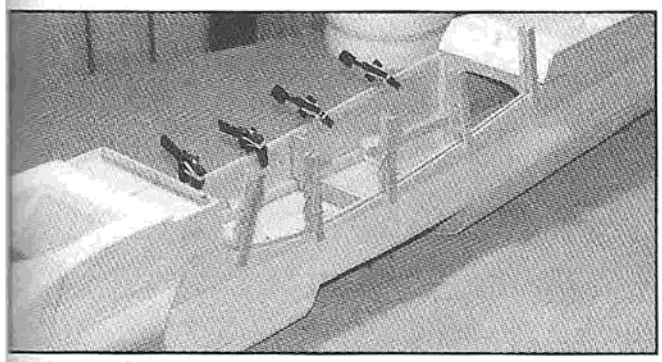
After the doublers have been glued in place, locate and mark vertical positions of all formers on inside surface of right fuselage side. Show the actual thickness of the formers at these positions. I have found that the Try Square placed on the top edge of the sides to mark former locations is very useful. Now go to the left fuselage side and draw in the same location lines on the inside surface.

Take two 3/8" sq. x 48" spruce longerons, cut to length and shape one end of each piece as shown in top view of fuselage. Lay them aside. Next, mark the fuselage sides on the inside with a pen where the 3/8" sq. longerons are to be placed.

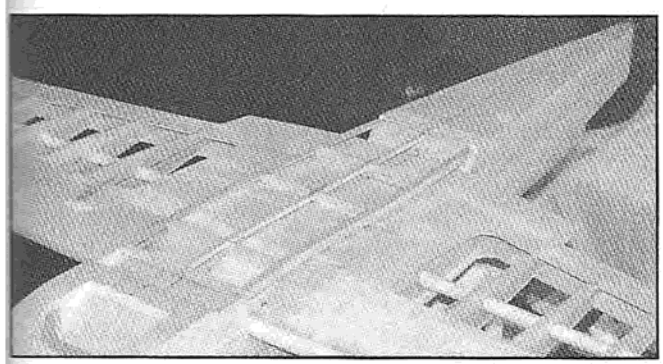
Using epoxy, put a thin coat of glue on the side from location F-2 to F-5. With the shaped end pointed in the



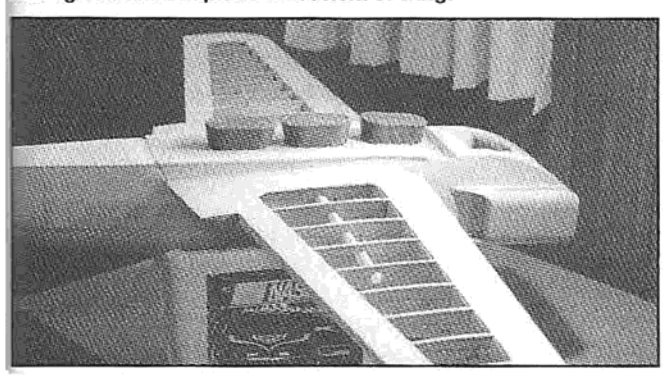
Wing seat landing gear plate.



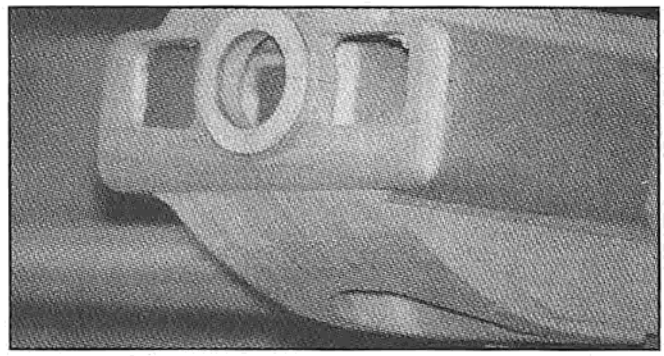
Saddle reinforcement in place.



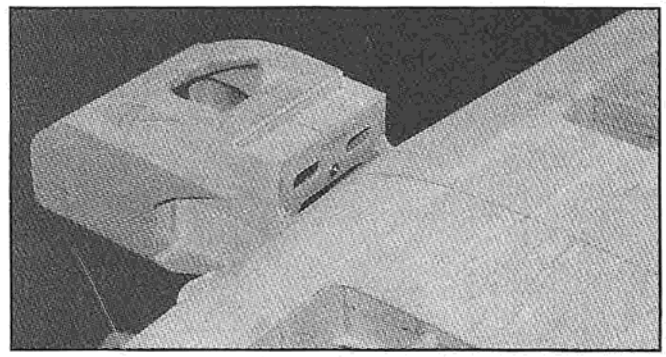
Fairing structure in place on bottom of wing.



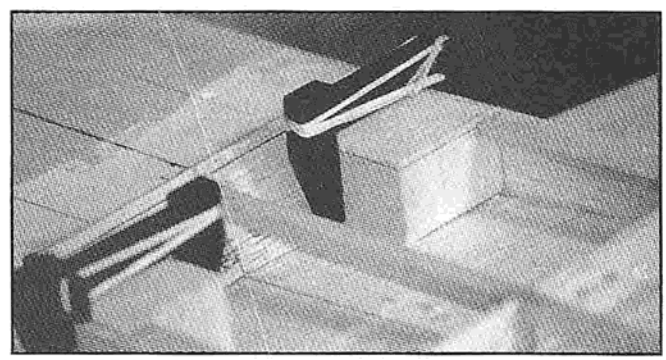
Wing in saddle with fairing structure covered ready for sanding.



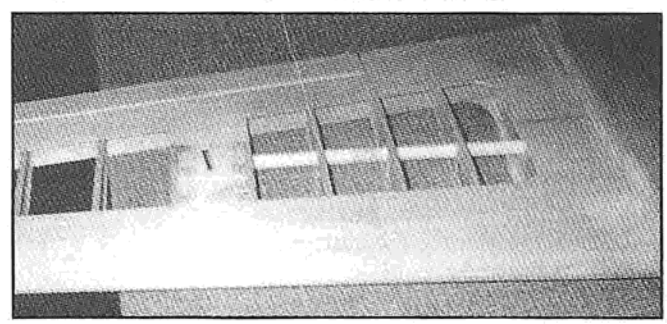
Close-up of nose section. Note: air intake and air exit in bottom of cowl.



Wing in saddle ready to mark wing dowel location. Note: doweling center.



Wing bolt balsa blocks in place ready for sanding.

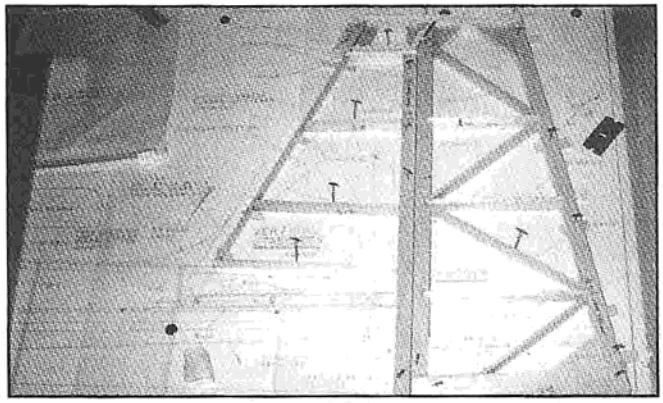


Aileron servo access hatch with slot for pushrod.

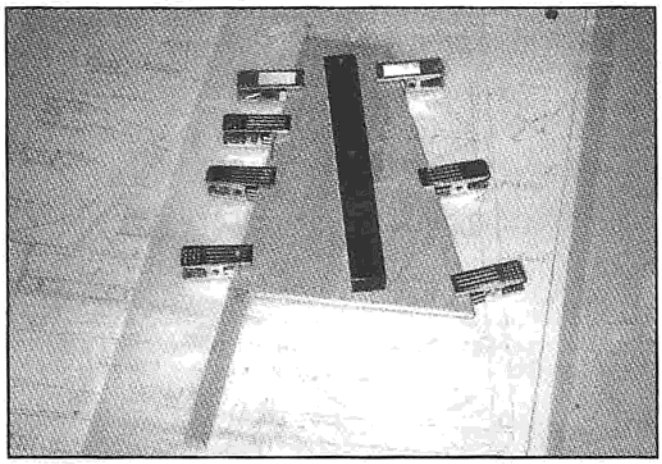
correct direction, clamp the longeron into position. After the glue sets, use weights to hold the front portion of the side down. Block up the aft area with a 3" block; then glue and clamp the remaining portion of the longeron. Repeat this process on the other fuselage side. Now both inside surfaces have longerons applied.

While sides are still blocked up, now would be a good time to glue in place the 3/4" triangular stock on bottom edge of sides.

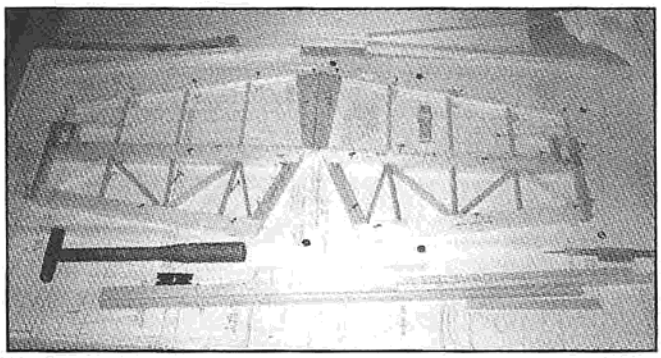
Remove fuselage sides from blocks and add 1/2" triangular stock to each side of where F-2 and F-3 are to be located, also 1/4" and 1/2" stock at F-7T position. Place 1/2" triangular stock around the perimeter of front section as shown on print. Add 1/4" x 3/8" balsa tail post to right side on inside surface. Glue 1/8" plywood landing gear reinforcement plate on the inside surface of both fuselage sides. Lay plans on a large flat surface. Lay one of these sides down with the inside facing up, place F-2 in position between the 1/2" triangular stock verticals and glue in place with epoxy. Be sure F-2 is set 90° to sides' surface. I use small drafting triangles to check squareness. Install 1/4" plywood landing gear anchor plate between fuselage sides at the same time F-3 is installed. The plate is a mortise and tenon-fit and must be done at this



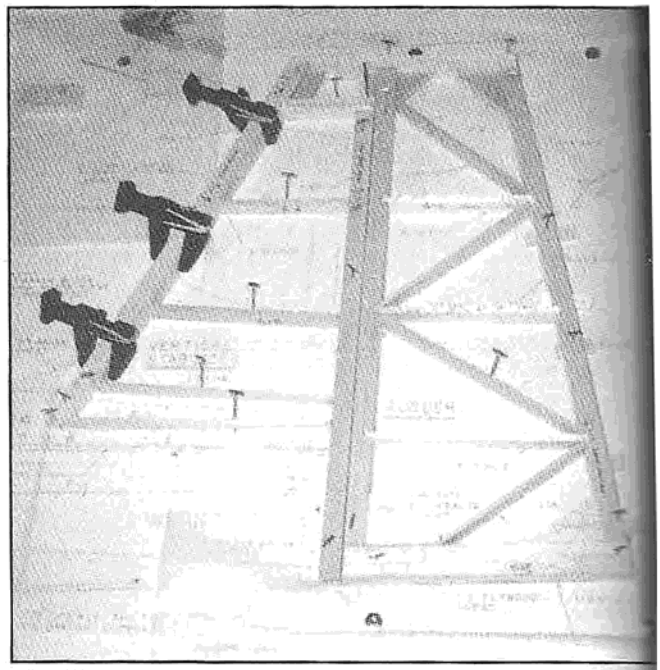
Fin partially finished with blocks in place for contour rib sanding.



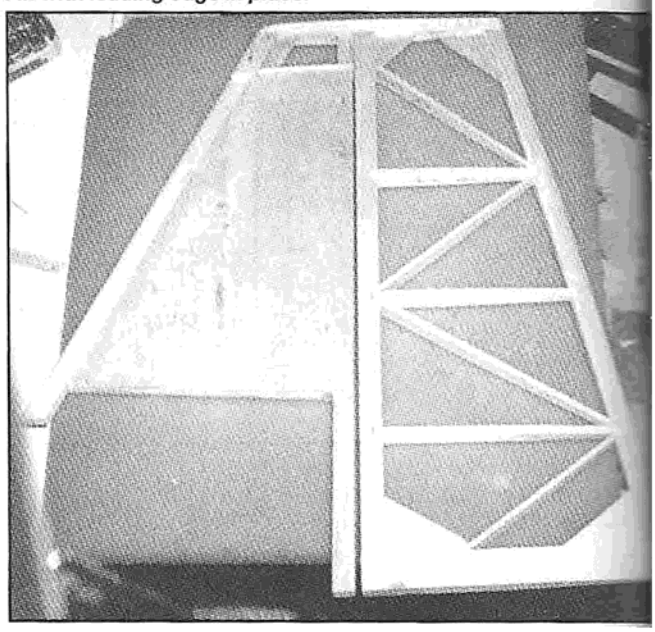
Sheeting being applied to the fin.



Horizontal stabilizer and elevators completed with blocks for sanding rib contour.



Fin with leading edge in place.



Both sides of fin shown sheeted, matched with rudder.

time. Add F-3 in the same manner as F-2. After glue sets, stand fuselage up on bottom and glue the remaining side to formers F-2 and F-3. Make sure everything is square. Now place fuselage over the top view centerline on print. Pull the two sides together at the tail post. Be sure sides are square and there is no twist showing, then glue together with thick CA and let sit until cured. Still using the top view centerline as reference, add formers F-4T and F-5T, (Note: These formers are laminated with 1/32" plywood), continue and add formers F-7T, F-8T, F-9T, and F-10. Pay attention in placing the formers on the vertical lines, then glue in place with thick CA. Glue tail cap in place and sand.

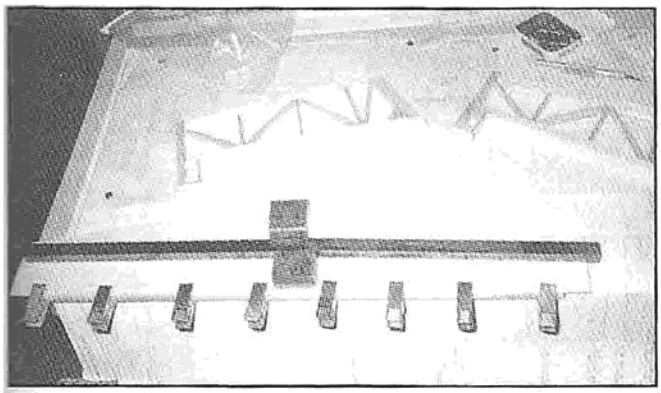
If the holes for the engine radial mount and throttle cable have not been drilled, do so now. Also, install blind nuts for engine mount. Install aft top 1/4" sq. balsa stringer, formers I-P, F-6T, F-7B (Note: make a square hole in F-7B for bottom aft stringer). Add 1/4" sq. bottom aft stringer. Go to top and add cockpit floor.

Glue 1/16" plywood F-1 former to 1/2" balsa sheet with a thin coat of epoxy, then cut to shape. Draw vertical and horizontal centerlines on both sides of F-1 former. The engine crankshaft center is the intersecting point as shown in front view of F-1 on the print. Put F-1 aside.

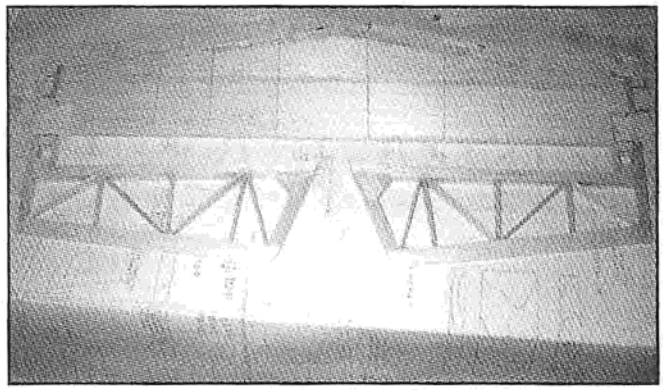
Locate the wing datum line, which is the center for the wing dowel. Transfer that line to the outside surface of both fuselage sides. These lines are to be parallel to top of fuselage sides and extend about 1" past leading and trailing edge of wing saddle.

Go to the aft section, add 1/8" balsa horizontal stabilizer plate F-11. Use thick CA glue. Add hardwood wing mounting blocks and 1/8" x 3/16" wing saddle pieces. Use epoxy for the mounting blocks and CA for saddle. Install 1/8" x 1/4" balsa deck supports between formers.

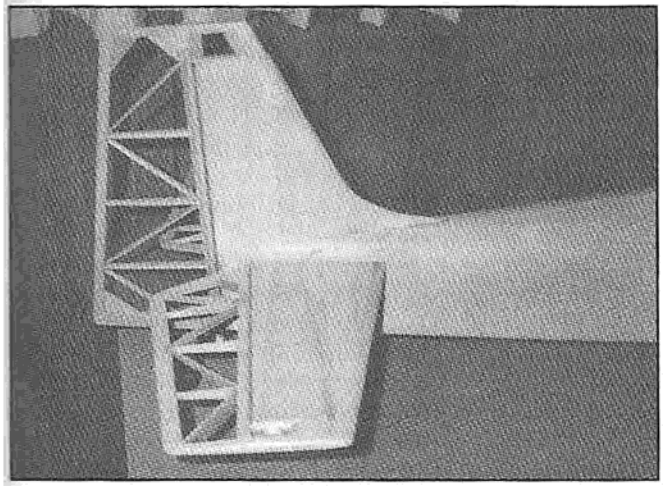
Turn fuselage upside down on the workbench and block up until level in the lateral direction using a masonry line level across longitudinal members in the aft section, also use level on the



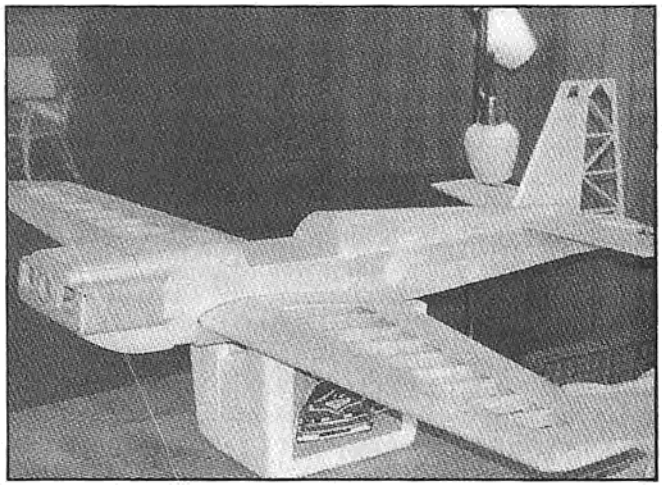
Horizontal stabilizer with sheeting held in place.



Horizontal stabilizer with sheeting and shaped elevators.



Tail fillet blocks glued in place and sanded to shape.



Trial fit of all major parts.

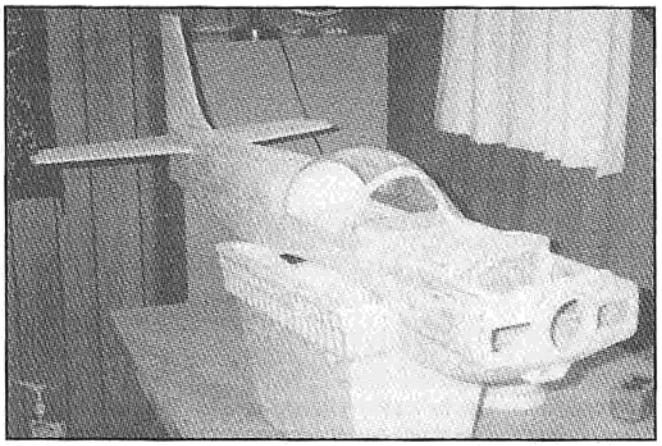
bottom of former F-3 to verify levelness. To level in the forward and aft direction, use the top edge of the fuselage sides. After you have established that the fuselage is as level as possible, draw a centerline on the bottom of the wing. Next, make the leading edge flat between wing ribs W-2 left and W-2 right; be careful here, this must be trial fit ... so don't take too much off at a time. When you are satisfied with the front fit, go to the trailing edge and trial-fit by removing small amounts of wood until wing drops into place.

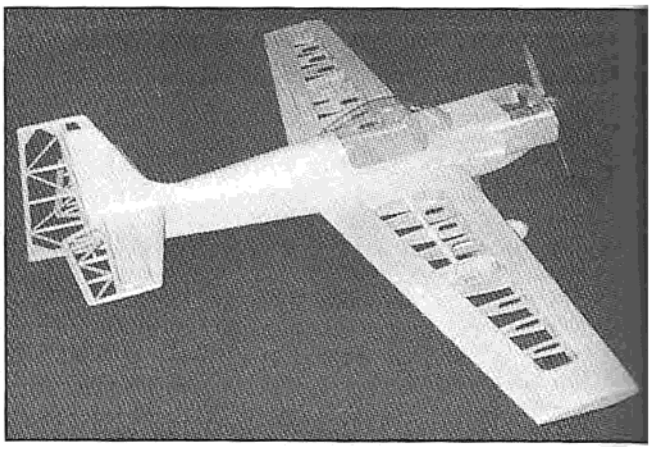
Draw a centerline on the leading edge of the wing on the flat area that was sanded earlier. Make sure the line extends past the fuselage sides. Place the wing in the saddle and then align with centerlines on fuselage sides. Use a Model Incidence Meter placed on the wing to verify that it is set at 0°. The lines on the leading edge of the wing and the lines on the fuselage sides should match as well. If all is not well, make shim adjustments to wing saddle so wing will cause Model Incidence Meter to read 0°. Place Incidence Meter spanwise on wing over the fuselage area that should also read 0°. Again, check wing to saddle for contour match, make necessary adjustments, then check the alignment again to see if the shim dimensions are still the same.

When the wing is level using reference lines and incidence meter reading, place a heavy duty pin (Push Pin) or something similar at the center of the tail post. Measure from the pin to the forward corner of the aileron on each side. While holding the leading edge centered, make adjustments to the trailing edge to assure that the alignment of the wing reflects 90° to centerline of the fuselage. Now, take a soft lead pencil and draw a line on top of the wing along both sides of the fuselage for later reference. Remove the wing from the fuselage saddle.

Place a 3/8" doweling center in the 3/8" hole in F-3, place wing in fuselage saddle, align wing with reference lines drawn on top of the wing and sides of the fuselage. Carefully push the wing forward to contact the doweling center and wing saddle. Remove the wing and drill a 3/8" dia. hole where the doweling center mark is. Drill from leading edge through dihedral brace and spar joiners. Place a 3/8" diameter dowel in the hole, do not glue yet. Place the wing in the wing saddle, align wing again, then drill holes for 1/4"-20 nylon wing bolts through the trailing edge of wing and wing mount plates. Remove the wing. Tap the holes in the wing mount plate for 1/4"-20 nylon bolts. Build bottom fairing as shown on print then drill the necessary holes. Now glue the 3/8" dowel in the leading edge of wing. Make sure the wing still has the proper incidence.

Install former F-1, 1/4" top stringer, and top nose block. Add chin block and bottom front sheeting. Install 3/32" sheeting to turtledeck formers. Note: Make two halves, use ammonia and water on the outer surface to help bend sheeting around the formers. Use aliphatic glue as the base adhesive and thin CA as a tack to hold until glue sets. Add instrument panel former I-P and 1/8" aft bottom sheet. Rough-cut two balsa filler blocks and tack-glue 1/8" balsa spacer to bottom of each filler block. Now, tack-glue a 3/8" balsa spacer in the vertical stabilizer position between the filler blocks, and 1/2" balsa spacer between F-11 and filler blocks. Using a long sanding block, sand to contour of the fuselage. When you are satisfied, very carefully take fillers and spacers off the fuselage. Dismantle spacers and fillers, discard spacers; now you have two fillers to fit





between the horizontal and vertical stabilizers with the correct contour.

Tail Assembly:

The tail parts are assembled over the top view of the tail section. Construct the horizontal stabilizer and vertical fin as indicated on the print. Note that some 1/4" balsa parts are laminated to form 1/2" members. Draw centerlines on outside surface of periphery construction pieces. After stabilizers are glued together, lay them on a flat surface and sand the airfoil on one side, with reference to the centerlines. After completing airfoil shape on one side, flip the stabilizers over, block the edges up and sand airfoil shape to the up side. Be sure to pay close attention to the centerlines on the edges while sanding the airfoil shape; try to hold edges equidistant from the centerline marks. Cover both horizontal stabilizer and vertical fin with 1/16" balsa sheeting. Add leading edge and tip facia. Set aside. Build the rudder and elevators in the same manner except these control surfaces are to be covered with Goldberg UltraCoat or similar covering. There are two elevator halves for a split elevator system.

Stabilizer Installation:

Place the fuselage on the workbench in an upright position. Draw a centerline on the F-11 horizontal plate and on the rear side of F-10. These lines will help center both stabilizer positions. Attach the wing to fuselage. Block the fuselage and wing in place then check that the wing and fuselage are both horizontal spanwise and nose to tail. Draw a centerline on top of the horizontal stabilizer. Glue the horizontal stabilizer to the fuselage, making sure the stabilizer is level and centered. The elevator hinge line must be 90° to the fuselage centerline. Glue the 1/2" filler block in place behind the stabilizer. Glue the vertical fin in place. Be sure it is centered and its center is parallel to fuselage centerline. Use a triangle to check that the fin is 90° to the top surface of the horizontal stabilizer. The entire stabilizer installation requires epoxy glue ... but use it sparingly, it adds weight. Add the filler blocks in the tail area between the vertical fin and horizontal stabilizer. These were shaped earlier. Use CA glue. You will need to fill some cracks and sand. Add 1/8" light ply tail tie and tail wheel assembly support.

Cowl Cheek:

Add the cowl cheek formers to sides of the fuselage. Now make a template using a piece of heavy paper or file folder material. Wrap the material around the outer edge of the cheek formers to establish the length required. Cut the approximate shape at the rear exit of the cheek. Lay the template on a piece of 1/32" plywood and cut it to the template shape. Use a mixture of ammonia and water on the outside surface of the cheek cover to let it bend smoothly into place.

Use thick CA and aliphatic resin to glue into place. Add cheek fillets. Sand the cowl area. Build the engine hatch. Add the air intake and hollow out air exit area. Now cowl cheek formers can be hollowed as shown on print and fit to engine and muffler.

Landing Gear:

Fit landing gear, drill four holes through gear and anchor plate and add blind nuts. Make balsa or aluminum landing gear cuffs as shown on print.

Hatches:

Finish building the engine cowl hatch by reinforcing the edges with 1/32" plywood to prevent warping. Build two access hatches for the servo compartments in the underside of the wing. These aileron servo compartment hatches will need openings for the servo wheels. Build a small framework around the inner edge of the openings and make the hatch itself out of 3/32" sheet balsa.

Cockpit:

For the cockpit detail, all I added was an instrument panel. You may want to go into more detail than I did.

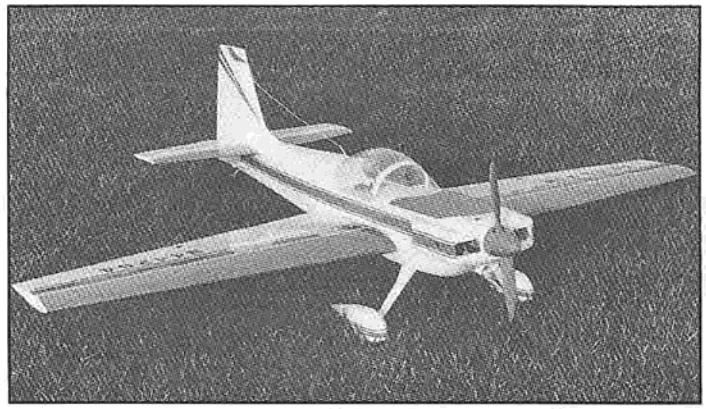
Canopy:

The canopy for the prototype was fit from the Garmhausen Cap-20 and 21 canopy, available from Fiberglass Specialties. Fill holes, cracks, and dents in fuselage, then shape and sand the fuselage to what you like. Finish the interior of cockpit, include painting, instrumentation, or other cockpit enhancements.

When painting the cockpit, be sure to extend the painted area out and around the cockpit past where the canopy outline will be. When all of this is finished, trim the canopy to fit as on the drawing. If all is well, place the canopy in position and draw around it with a pen. Remove the canopy and cut a "V" groove in the mark you made with the pen, across the front and rear deck. Trial-fit the canopy, when satisfied, carefully rough up the edges of the canopy, then place it on the fuselage and tape it down. Carefully apply thick CA in the "V" groove with the canopy. Do not allow the glue to go under the tape. Hold sides of canopy in place with pins until glue sets. When the glue has set, mask the entire canopy down to within 1/16" above the canopy contact with the fuselage. This area will need some filler to be faired and blended to shape.

Covering:

I used Goldberg UltraCoat for covering on the wing and all the control surfaces. It gave me an excellent finish with a minimum work time. The fuselage and empennage was covered with .75 oz. lightweight fiberglass cloth, and West System Epoxy Resin was used as a bonding agent. K&B Epoxy primer and paint



as used to finish. The canopy was ted with Rit Dye.

To cover the fuselage with berglass, I used the playing card and let paper method.

First, fill all cracks and dents. ape and sand the fuselage until you e satisfied with the surface. Place e fiberglass cloth on the fuselage d add the epoxy resin. Spread and queegee with a playing card until the oth is saturated. Remove all surface sin with the card. Then use toilet per or paper towels to remove ough resin so the surface feels most dry to touch. Be sure there are wrinkles left. Let the fuselage dry ernight. Do not add another coat of sin. Using 320 and 400 wet/dry ndpaper, sand the surface until it is ooth. Be careful not to cut through e fiberglass cloth.

I used K&B Epoxy primer next. ix the primer as per label on the can, en, add 50% thinner. Spray on a total four coats of primer. After each oat, sand most of the primer off down the fiberglass cloth using wet/dry ndpaper.

Now use K&B Epoxy paint for the ext coat. Mix the paint according to e label (50-50) and thin the mixture ith 50% thinner. Spray on a light/fog oat; let it set overnight. Next, use 400 et/dry sandpaper to take off dust articles. Still using 50% inner/paint, spray light coats on until e finish is completely covered.

Editor's Note: K&B now has a new Epoxy paint called "Ultrapoxy" that replaces their earlier product. Check it out at your hobby dealers.)

The trim on the fuselage was all one with K&B Epoxy paint. Trim on e wing was done using regular Goldberg UltraCoat. For all of the aint trimming, I used vinyl type tape or masking.

Engine:

I used a well broken in O.S. FS 1.20 4-stroke engine, O.S. radial mount and homemade pipe muffler with a Zinger 15 x 8 wooden propeller with a standard 3" Tru-Turn spinner.

Radio:

For control, I used my old Futaba FP-T 5UAP PCM/PPM radio with S5101 servos. You will need servos with fairly decent authority for the ailerons.

Flying:

Make certain the balance point is as shown on the plans. I used a 1200 mAh battery pack up front, which helped with the balance. The servos were moved a bit more forward than what is shown on the plans and everything balanced well. You will need to add weight to the wingtip opposite the cylinder head of the engine for lateral balancing, because of the horizontal engine mounting. The flying weight came out at 10 pounds.

For the first flight, set the control surface throws to these numbers as a starting point: ailerons 5/8" up and

Material List for ARIES XJW-120

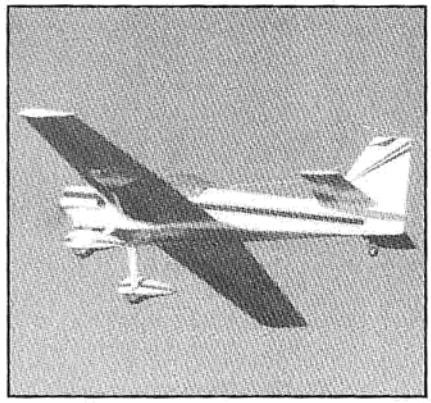
Balsa
14 — 3/32" x 4" x 36"
3 — 3/32" x 3 " x 36"
2 — 1/4" x 1" x 36"
2 — 1/8" x 3/4" x 36"
11 — 1/4" x 1/2" x 36"
1 — 1/4" x 4" x 36"
1 — 3/4" x 3" x 36"
4 — 1/8" x 1/2" x 36"
2 — 1/4" x 3/4" x 36"
3 — 3/8" x 1/2" x 36"
3 — 1/8" x 1/4" x 36"
1 — 3/8" x 3" x 36"
2 — 1/8" x 3/8" x 36"
4 — 1/16" x 3" x 36"
1 — 3/16" x 3/8" x 36"
1 — 1/16" x 4" x 36"
1 — 3/16" x 1/2" x 36"
1 — 1/2" x 6" x 12"
1 — 1/4" x 6" x 12"
4 — 1/8" x 4" x 36"
1 — 1" x 3" x 12"
3 — 1/4" x 1/4" x 36"
1 — 3/16" x 4" x 36"
2 — 1/2" x 36" triangle stock
2 — 3/8" x 36" triangle stock
1 — 1/4" x 36" triangle stock
2 — 3/4" x 36" triangle stock
2 — 1/8" x 6 " x 48"
2 — 3/32" x 4" x 48"

Hardwood
1 — 3/8" dia. x 5" long dowel stock
5 — 1/4" x 1/4" x 36" spruce
2 — 3/8" x 3/8" x 36" spruce

Aircraft Ply
1 — 1/8" x 6" x 12"
1 — 3/32" x 24" x 36"
1 — 1/16" x 6" x 12"
1 — 1/4" x 6" x 12"
2 — 1/8" x 6" x 12"

Lite Ply
1 — 1/8" x 12" x 24"
1 — 1/8" x 6" x 12"

Miscellaneous
1 — steerable tail wheel, Sullivan Products #859-861
1 — main landing gear, Ace R/C Extra 230 MPLG25
1 — canopy, Fiberglass Specialties-Garmhausen Cap 20 & 21 (RG-1C)
1 — pair wheel pants, Fiberglass Specialties #72 (10")
1 — spinner, Tru Turn 3" spinner
1 — pair wheels, 3-1/2" lite main gear
1 — tail wheel, 1" dia.
1 — 2 oz. extra thick CA glue
1 — 2 oz. thin CA glue
1 — 8 oz. aliphatic resin
1 — 9 oz. epoxy glue



down, elevators 3/4" up and down, and rudder 1-1/2" left and right or as much as you can get.

Taxi the ship around for a while to become accustomed to its ground handling characteristics. Ground handling should be smooth, responsive, and positive. There is no tendency of the plane to nose over when power is applied.

Head into the wind and increase the power slowly. The plane should track straight with little rudder correction. Continue to advance the power slowly. The tail will come up by itself when flying speed is reached. Gently pull back on the elevator stick (the elevator is large, be gentle); it will break ground into a shallow climb.

You will probably not need any right rudder application. Also, notice the plane has taken off and is climbing while at about 2/3 throttle setting. Gain some altitude (two mistakes high), while still in a shallow climb. Bring the plane around into the wind, throttle back to a very slow flight, to establish what happens when the plane stalls. I have found that it wobbled some, but did nothing violent before it nosed forward and started to fall. Recover and make any straight and level flight trim adjustments. Now set up for landing. Make a couple of passes at 1/3 power setting into the wind over the landing strip at altitude to get a feel for the altitude and size of the airplane. Set up for the approach. Do the downwind, baseleg, and final while in a shallow descent. Be aware that the airspeed will drop in the final leg, so keep some power on until you reach the beginning of the runway. Reduce the power setting to idle, continue descent to about a foot above the runway, bring the nose up gently, and watch it settle in on a nice three-point landing. I have made many landings after the model was slowed down to a point at which the tail wheel will drag the ground first while you maintain directional control with ailerons or rudder. You will like the landings as well as the flying.

ACKNOWLEDGMENTS:

Before this project was completed, I managed to do a "dead stick" three-point landing in the top of a 40' high tree with the Aries. The result was some serious damage to the front end of the model. I consulted with my good friend and fellow modeler, John Attinello, about what could be done to repair the Aries in a short time. He said, "Do not worry, be happy, it can be done." So John went about doing the repairs with great enthusiasm and the repairs were finished in a very short time with outstanding results.

The Aries XJW-120's initial flight was in May 1996 with the O.S. FS-1.20 4-stroke engine.

I am indebted to Tom Hansen for his technical advice and to John Attinello for his photography and repairing skills which helped complete this project. And thanks to my very understanding wife, Ella, for holding those late suppers for me and assistance with this project.

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