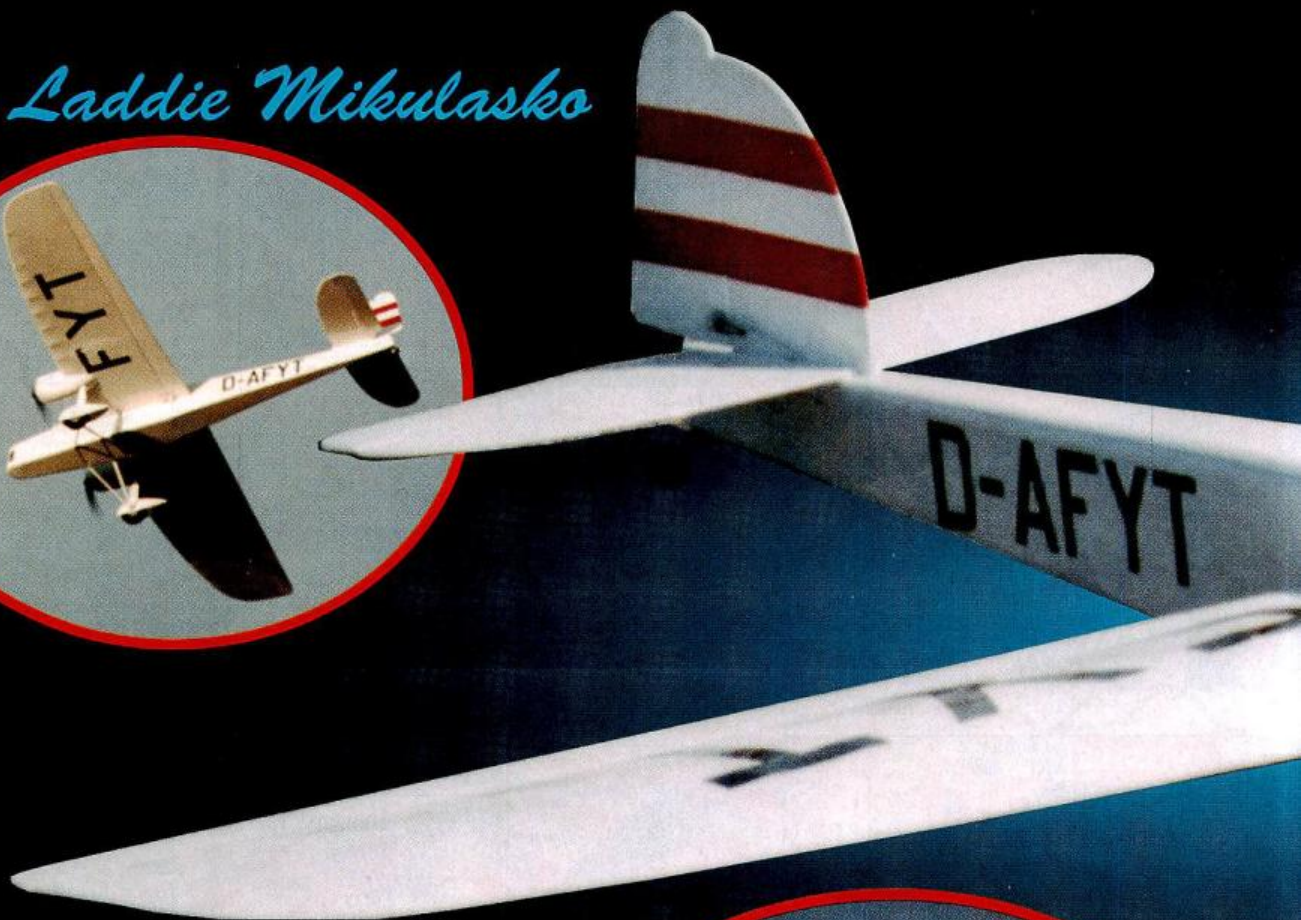


Dornier

By Laddie Mikulasko



After the first World War, Germany was prohibited from building military aircraft. To get around this stipulation, firms like Fokker and Dornier set up affiliated companies in Italy or Switzerland and several other countries. At these locations the Germans started developing so called "civilian" aircraft. In most cases the intent was to convert these aircraft for military use. Dornier had a factory in Switzerland and the twin engine Do-11 aircraft was developed to train future bomber crews. To facilitate this deception, these future bombers were given to the Ministry of Railroads to transport goods. This

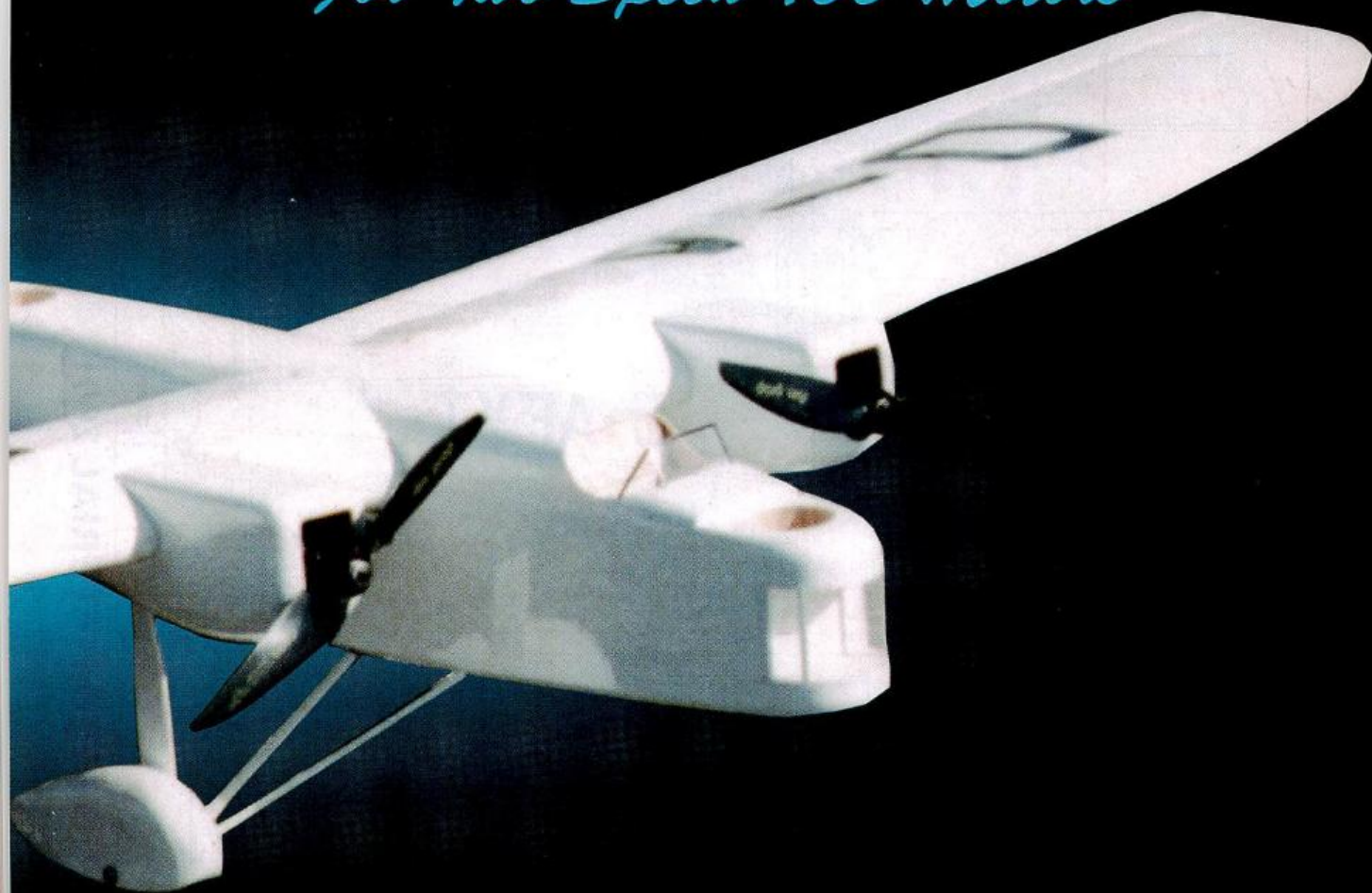
may have been the first railroad to operate, using bombers! This scheme allowed the flight crews to train extensively in long distance night flying operations.

The Do-11 had several aerodynamic shortcomings and the pilots did not like them, thus the new version Do-13 was produced. In a short time span, several of them crashed due to construction defects. More changes were made and for psychological reasons, the designation was changed from Do-13 to Do-23. As a result, in 1935 more than 200 Do-23's were built.

I elected to build a model of this plane because it has a generous wing area and simple fuselage shape. I kept the outline accurate to the 3-view drawings. For simplicity, I changed the airfoil of the stabilizer/elevator and the fin/rudder from symmetrical to flat. The wing and fuselage on the full-size plane were plywood covered. Photos of some planes show a different shape on the

Do-23

*Sport Scale Electric
For Two Speed 400 Motors*



Dornier Do-23

Designed by:

Laddie Mikulasko

TYPE AIRCRAFT

Sport Scale

WINGSPAN

60 Inches

WING CHORD

9-1/4 Inches (Avg.)

TOTAL WING AREA

550 Sq. In. (Approx.)

WING LOCATION

High Wing

AIRFOIL

Flat Bottom

WING PLANFORM

Semi-Elliptical

DIHEDRAL, EACH TIP

1-3/4 Inches

OVERALL FUSELAGE LENGTH

43 Inches

RADIO COMPARTMENT SIZE

17" (L) x 2-1/2" (W) x 2-1/4" (H)

STABILIZER SPAN

19 Inches

STABILIZER CHORD (inc. elev.)

5-3/8 Inches

STABILIZER AREA

95 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

6-1/2 Inches

VERTICAL FIN WIDTH (inc. rud.)

7-1/2 Inches

REC. MOTOR SIZE

Two Speed 400 Geared 2:1

BATTERY SIZE

8-10 1400 mAh

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.

C.G. (from L.E.)

2-7/8 Inches

ELEVATOR THROWS

3/8" Up — 3/8" Down

AILERON THROWS

1/2" Up — 1/2" Down

RUDDER THROWS

1" Left — 1" Right

SIDETHRUST

—

DOWNTHRUST/UPTHRUST

—

BASIC MATERIALS USED IN CONSTRUCTION

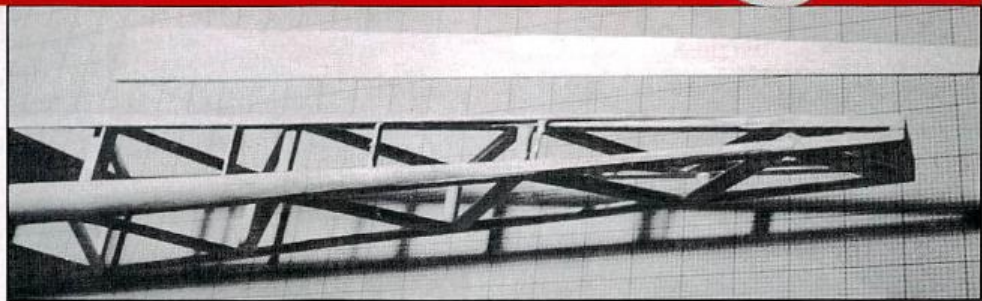
Fuselage Balsa & Ply

Wing Balsa

Empennage Balsa

Wt. Ready To Fly 64 Oz. (4 Lbs.)

Wing Loading 16.6 Oz./Sq. Ft.



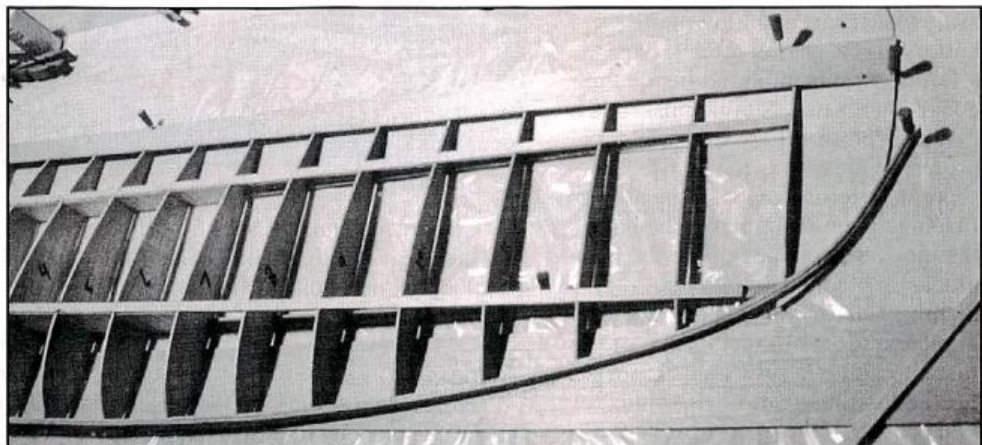
The top sheeting is being glued on.

underside of the fuselage behind the wing. Most Do-23's had a machine gun station in that location. The full-size plane had ailerons hinged beneath the trailing edge in typical "Junkers" fashion. For simplicity, I elected to hinge the ailerons directly to the trailing edge. The color scheme on my model is the one used on the "civilian" version. The model is of all balsa construction using very light sheets only. There is a minimum amount of plywood and hardwood used. Two Speed 400 size motors with 2:1 gearboxes were used for power, and a BEC speed controller also helps contribute to its light flying weight. Small servos easily cope with the light flight loads.

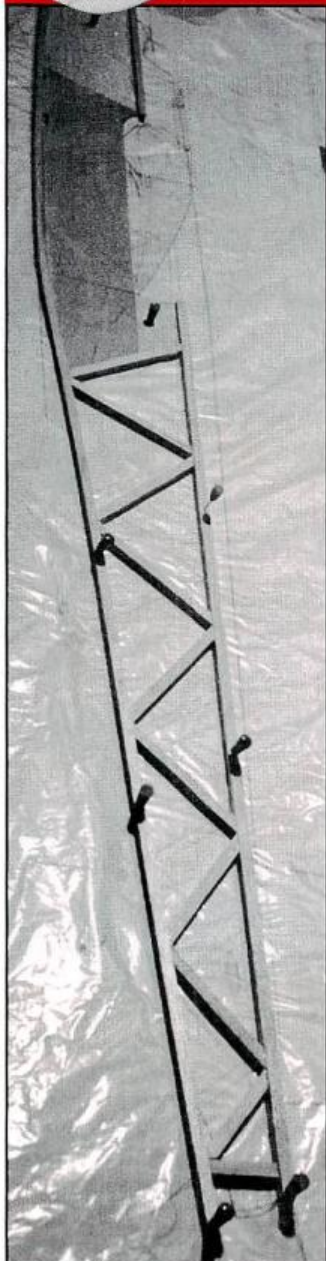
Before building the model, study the plans carefully. Cut out as many parts as possible before starting the building sequence as this will speed up construction. Build the model directly over the plan.

Fuselage:

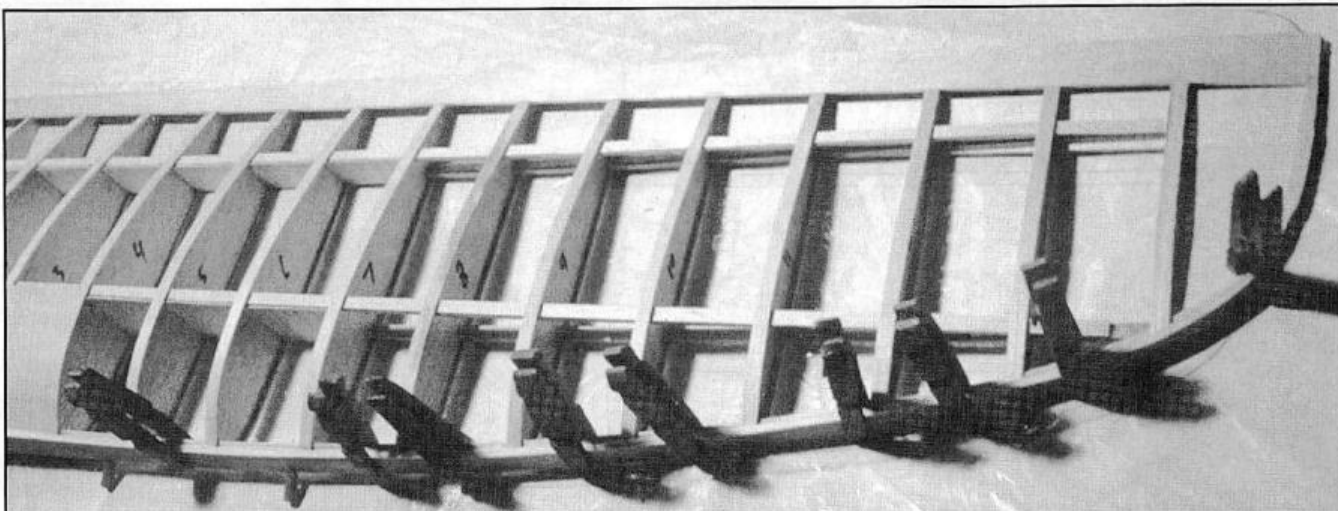
Build left and right fuselage sides, then glue the 1/16" plywood doublers to the balsa sides. Next, pin and glue the top and bottom longerons to the balsa sides.



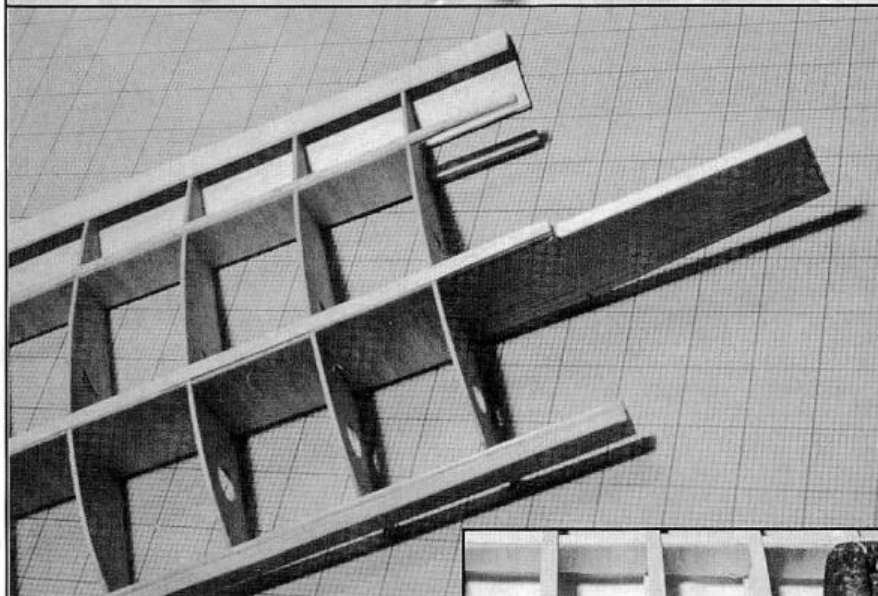
Half of the wing showing all the ribs and the spars in place. Place the shim under main spar while top capstrips are glued on.



The fuselage side being built. Notice plywood doubler.



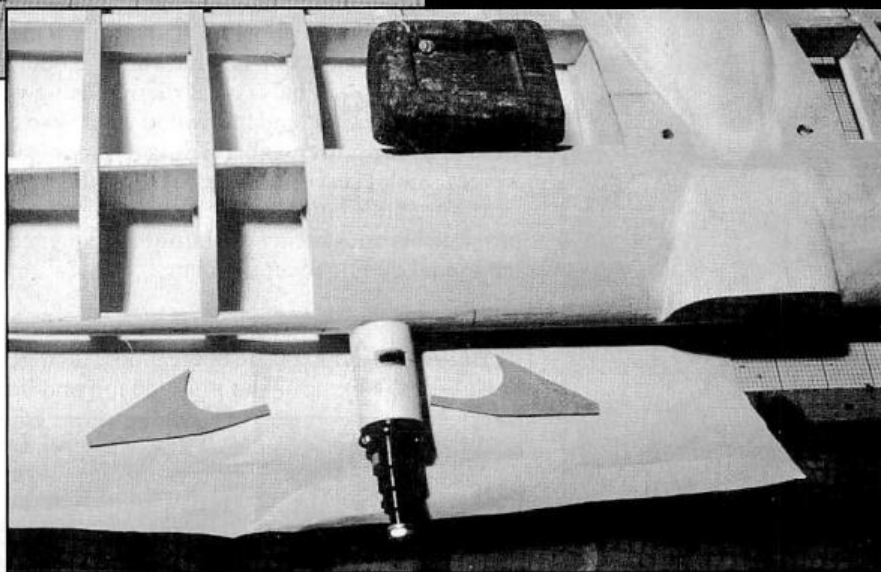
ABOVE: The capstrips were added to the ribs and to the leading edge.



LEFT: The dihedral piece in place.

BELOW: The tube holding the motor is being glued to the leading edge. The plywood pieces are going to support the tube.

Between the longerons, glue all diagonal pieces and 3/32" balsa sheet at the rear. Once both sides are built, pin the sides upside-down to the building board. Glue in all formers and all cross members. Make sure that the sides are square to the building board. Attach the 1/16" I.D. aluminum tubing to the last former, then glue on the balsa tail cone. Insert and glue in the battery floor. On my model, one aileron servo is mounted inside the cockpit with two flexible pushrods exiting from fuselage sides. The preferred method is to use two separate aileron servos. Glue all top fuselage formers in place, then add the top sheeting. Next, glue the nose blocks in place. Cut out two openings in the top sheeting for the gunner stations. In the bottom of the fuselage, glue in plywood supports for the landing gear. At this time, you can make the openings for the pushrods to the elevator and the rudder and sand the fuselage.



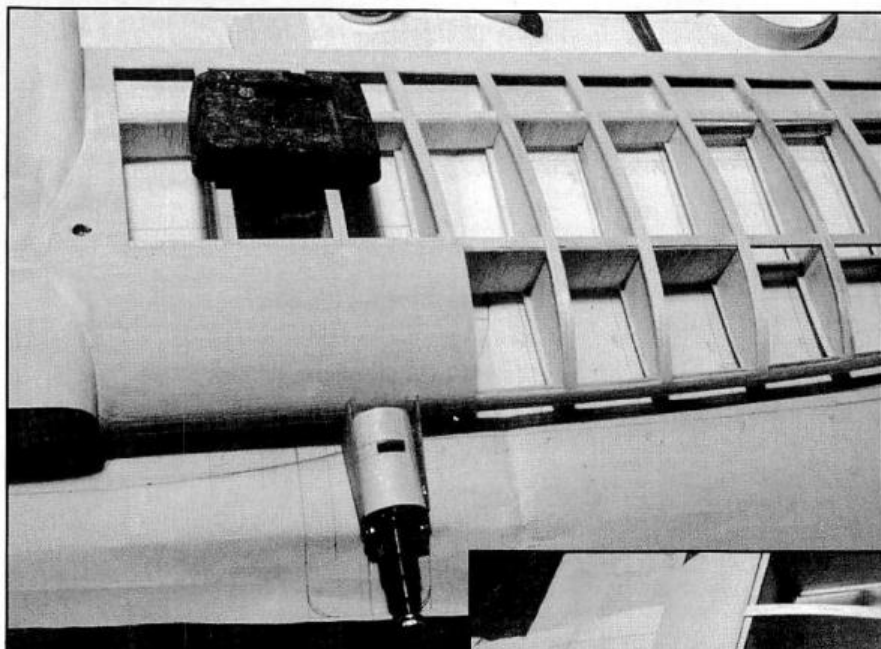
Tail:

Construct all tail surfaces from 1/8" balsa sheet. Glue the stabilizer and fin in place on the fuselage, then set the fuselage aside for now.

Wing:

To speed up cutting out the ribs, make a photocopy of the rib templates, then use a glue stick to attach these templates to 1/16" balsa sheet. Place a

second sheet under this sheet such that left and right rib sets are cut at the same time. W1, W2, and W3 have holes in them for feeding the motor wires through. W1 and W2 are split to accommodate the solid dihedral brace joining the top and bottom spars. If you are planning to use two aileron servos, bore holes in the appropriate ribs for the aileron servos' extension wires. The wing is built in two halves.



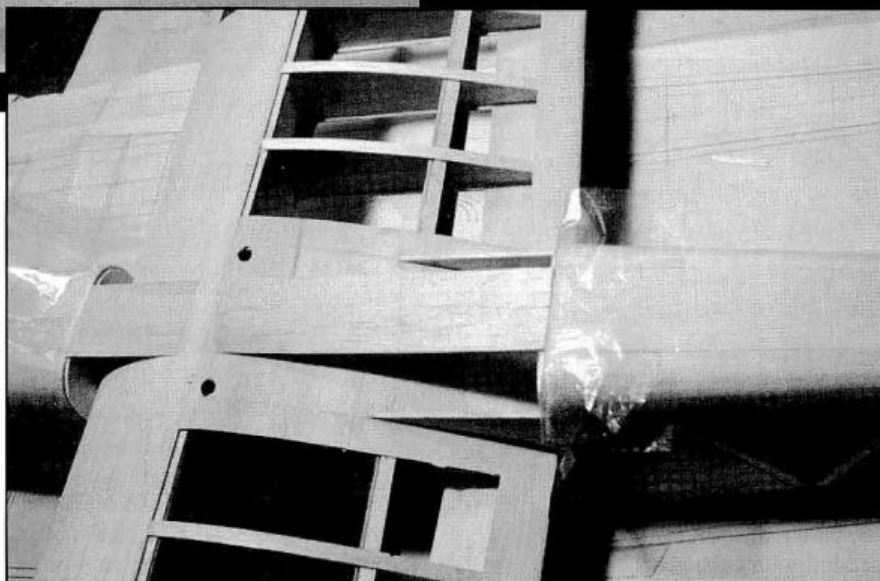
LEFT: The motor in place. Notice opening in tube for hot air to escape.

BELOW: The wing in the saddle. Notice holes for wing bolts.

Pin the bottom spars to the building board over the plan. Position all the ribs and pin them to the building board. Insert the top spars into top slots in the ribs. Glue all the ribs to the spars. Keep all the ribs square to the building board. Slide the bottom trailing edge sheeting under the ribs and glue the ribs to it. Glue on top trailing edge sheeting and glue the 1/4" sq. strip to the trailing edge. Next, glue on the wing tip sheet, and add the sub-leading edge to the ribs and sand the edges to the contour of the ribs. Glue on top and bottom leading edge sheeting. Glue all top capstrips in place, then turn the wing over and glue on the bottom capstrips. Between the top and bottom of main and rear spars, glue in the dihedral braces to one half of the wing only.

Construct other half of the wing in the same manner.

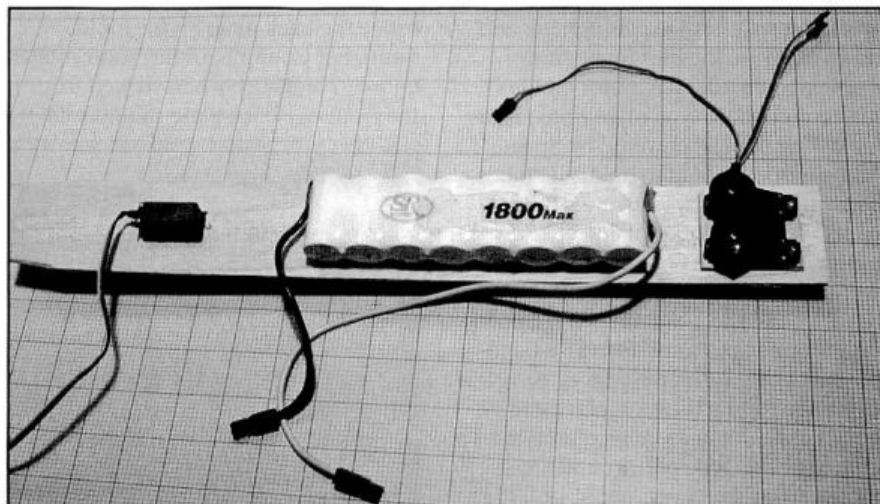
Join both halves of the wing together gluing and sliding the dihedral braces into the space between the spars in the other half of the wing. Glue the plywood doubler to the back of the main spar between ribs W1. Glue the two spruce wing bolt blocks to the doubler. Next, pull in all motor wires, then glue on top and bottom sheeting over W1 and W2 ribs. Sand the entire wing. Place the wing onto the fuselage and align it carefully, then drill the holes in the mounting blocks in the wing and the fuselage. Use self-tapping screws to fasten the wing to the fuselage. Glue the front and back fuselage formers to the top of the wing. Glue sheeting to the wing and to these formers.



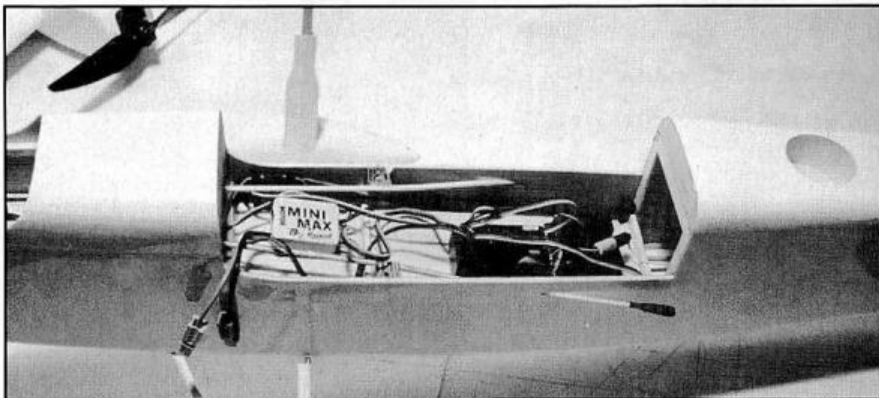
Nacelles:

The nacelles are made in two halves. The top half is very simple, just be sure that you have one left and one right nacelle. The cutout for leading edge outline is different on the inboard and outboard side. The cutouts are dictated by the leading edge taper. The bottom

half of the nacelle is cut from balsa blocks. Stick two blocks together using double-sided tape. Transfer the outlines of the left and right sides of the nacelle to the block and cut. Refer to the nacelle drawing on the plans for the sequence of building. Shape the nacelle blocks using sandpaper. The inside of

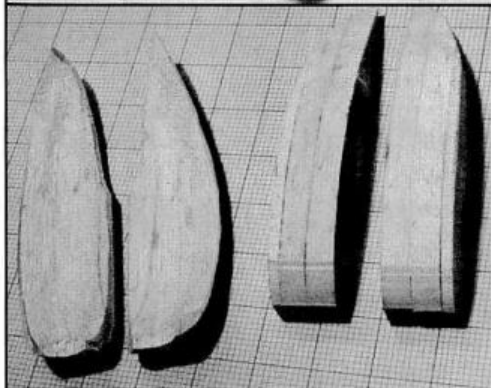
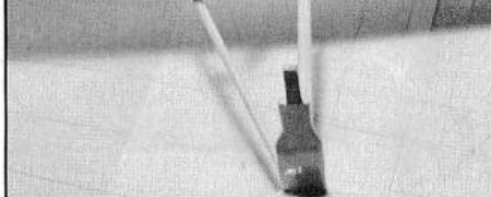


The balsa sub-floor to hold all the servos and the battery.

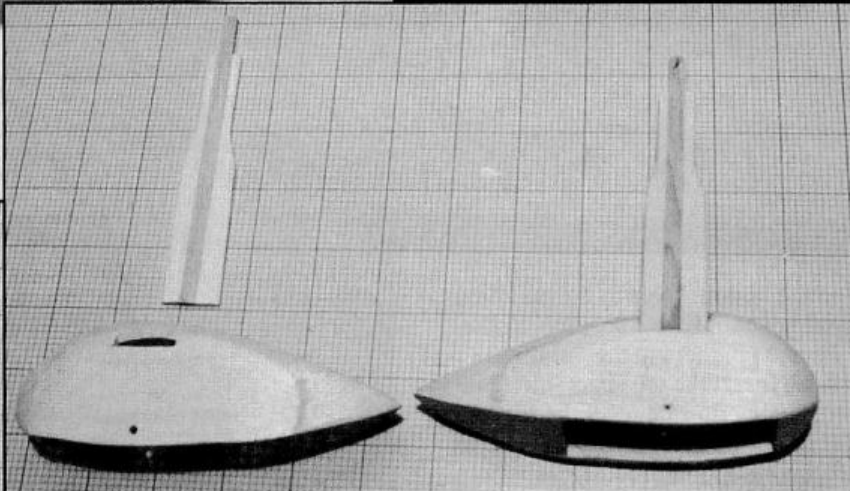


LEFT: Inside of the fuselage showing radio equipment. Notice that the aileron servo is located inside the cockpit on author's prototype.

BELOW: Wheel pants and vertical legs.



Motor nacelle pieces.



the block must be hollowed out to accommodate the gearbox. Once complete, glue the top half of the nacelle to the bottom half. Cut the radiator opening in front and sand the nacelles. At the bottom of the nacelle, cut a vertical slot for the landing gear leg. This leg must ride up and down freely. Build the second nacelle in the same fashion. Make a trial-fit of both nacelles onto the wing. With both tips propped up equally to keep the wing level, the nacelles face straight up and down at 90° to the building board.

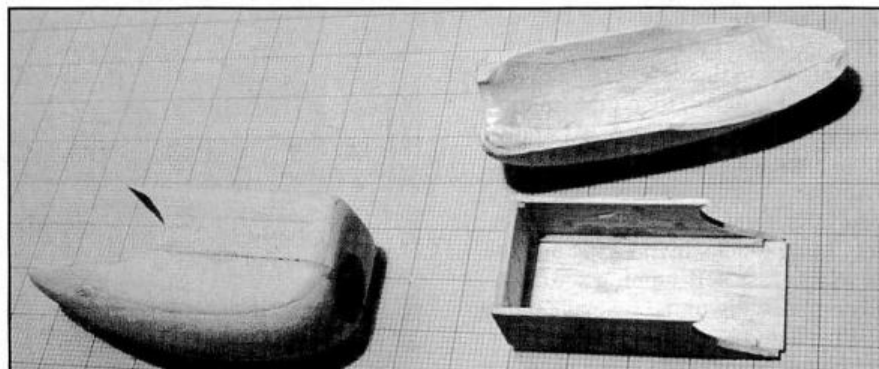
Next, construct the motor mounts to accommodate type of gearbox used. On all my models powered by Speed 400 motors, I mount them inside tubes constructed from typing or drafting paper. Wrap the motor using clear plastic food wrap. On top of the workbench, place the motor on an 8-1/2" x 11" sheet of paper. Wrap one turn around the motor and run a bead of thick CA glue on the paper. Continue rolling the motor along the bench and adding more glue until the entire sheet is wrapped around the motor. After the glue is cured, pull the motor out, and cut the tube to the

required length. Cut cooling holes to match those on the motor.

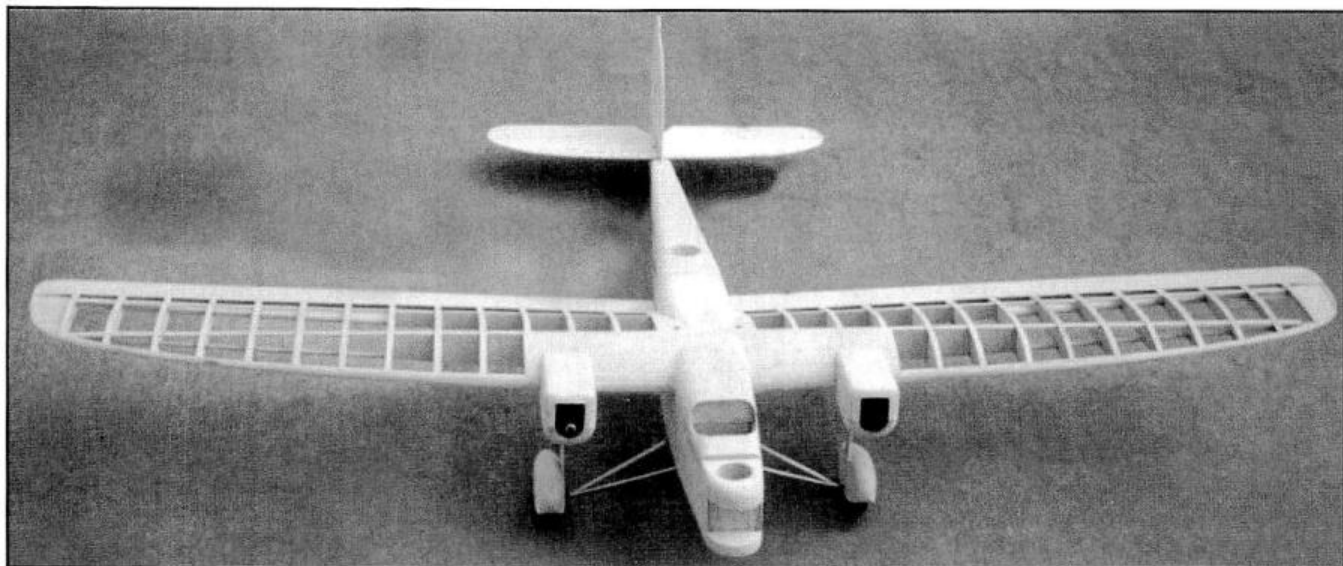
Mount the gearbox to the motor, and slide the motor into the tube. Between motor cooling slots drill a 1/16" hole through the tube and into the motor case, take care that the drill does not hit the commutator. The metal filings from drilling will cling to the drill bit. If you are concerned about filings, force air into the motor opening. Use a small 1/4" self-tapping Allen head screw to secure the motor to the tube.

To obtain optimum performance from a Speed 400 motor, it should be re-timed. The simplest method is to rotate the back plate on the motor 5mm. For example, if the motor rotates counterclockwise when viewed from the front, the back plate should rotate

counterclockwise when looking at the motor from the rear. To rotate the back plate, you must obtain a commercially available tool or make one of your own. To construct this tool, as I did, take a piece of flat steel and drill two 1/16" holes in it spaced apart such that they align with the two holes on the back plate. Insert two 1/16" steel pins in the holes of this handle. Make reference marks that line up on the back plate and the motor case. Make a second mark on the case 5mm apart from first. Wrap the motor with sandpaper and firmly grasp the case using one hand. Insert the tool into holes in the back of the motor and rotate the back plate until it's aligned with the second mark on the motor case that is 5mm advanced. Install the motor with gearbox into the tube.



Two halves of nacelles.



The next step is to glue the tubes with motors to the leading edge of the wing. To obtain the proper zero-zero angles of the motor/gearbox trust line, place the wing on the building drawing. Place a weight on top of the wing so it does not move, and position a 1/2" shim under the tube. Use thick CA glue to tack the tube to the leading edge. Take two plywood gussets and tack them to the sides of the tube. This is done so that the tubes can be re-positioned if necessary. Lift the wing and slide the nacelle over the motor to check fit and alignment. When satisfied, glue the motor tube and gussets to the leading edge permanently. Repeat the same procedure for the other motor mount. The nacelles are not glued to the leading edge at this time.

Landing Gear:

Bend the landing gear wires as shown on the drawing. Position them inside the grooves on the bottom of the fuselage. Wrap the joint points with copper wire and solder. Glue a balsa fairing to each leg and sand the fairings to an airfoil shape.

Cut out the parts for the wheel pants. Glue the outside pieces to main body and sand them to shape. Construct the vertical leg and glue it to the wheel pant. Make certain that you construct one left and one right side landing gear. The wheel pants are free to rotate on axle until the wing is installed. At that time the top of the vertical leg will slide into the slot in the bottom of the nacelles.

Finishing:

Cover the model using a white iron-on material. All the letters are black. After covering, install the two struts that brace the stabilizer. Next, install all the hinges. I use the CA type hinges cut in half. Bend 1/16" piano

wire to the indicated shape for the tail wheel. Slide the end of the tail wheel gear into the aluminum tube at the rear of the fuselage. Bend 90° as shown on the drawing. Insert a small cotter pin in the bottom of the rudder to actuate the tail wheel. When installing the rudder, slide the eye of the cotter pin onto the tail wheel arm. Install all control surfaces. Install all the horns and servos. Connect the servos to the control surfaces and check operation. Insert the wing into the fuselage opening. Caution: While lowering the wing, guide the landing gear vertical struts into holes in the bottom of the nacelles. The wing is held

to the fuselage using two self-tapping screws. On my model, the motors are wired in parallel. If you are using 6V motors, eight 1400 mA batteries can be used or ten cells for 7.2V motors.

Flying:

This model is a copy of an early bomber, so it really should be flown in a scale-like manner. The model is a docile flier with no bad habits. It will loop, but my preference is to "step back in time" and gently cruise around for ten minutes of pure relaxation.

Good luck.

