



● Small Wonder is a fun airplane! You can relax, have a ball, and fly as much as you like on a minimum investment with this airplane! I have always had a soft spot in my heart for parasol airplanes. (My wife says the soft spot is in my head!) Anyway, some of my fondest memories of R/C flying go back some ten years to when I built and flew my first parasol, called the Petite Parasol. It was a Fox .07 powered job, guided by a Min-X radio and a Rand Galloping Ghost actuator. Those brand names bring tears to the eyes of us old timers and stares of puzzlement to the newcomers. Anyway, the Petite Parasol was a good flyer and gave me my first taste of true success in the form of consistent flight performance. But as the saying goes, according to Don Dewey, "A fool and his airplane are soon parted!"

Small Wonder is an effort to duplicate that fun and relaxed flying I had with the Petite Parasol, except this time a modern home-built flair has been added. Stolp Starlet, Baby Ace, and Pober Pixie are examples of modern day parasol designs that have become popular with the EAA (Experimental Aircraft Association) members everywhere. Small Won-

der is a scale-like ship that could very easily have a full-size counterpart hiding in some EAA'ers garage this very minute!

With 320 sq. in. of wing area, three channel radio, O.S. 15 R/C engine and a healthy epoxy paint finish, the flying weight is 2½ pounds. This results in a wing loading of 18 oz. per sq. ft. and is right in the ballpark. If you want a real floater, use an .09 engine, and cover with Solarfilm and it should weigh in at 2¼ pounds or less!

In the flying department, Small Wonder excels. Take-offs are effortless and requires very little rudder correction. Lift-off is smooth with no zoom and, once airborne, the ship is rock solid and goes where you point it. With an .09 engine in the nose, flight is slow and relaxed; however, a .15 provides enough zing to really tear up the sky. You may even be able to invent some aerobatic maneuvers of your own! Landings are easy with good control all the way in and, once back on the ground, you will be delighted with the ground handling. Construction is easy, quick and economical. Don't let the curved fuselage top and cabane struts throw you. Uncle George has en-

gineered out the hard part. Just follow the steps in the test and in a few evenings you too will have a parasol that will occupy a soft spot in your heart (head?). It's truly a Small Wonder!

Wing

(Note) All balsa in the wing should be medium weight wood. Do not use soft mushy wood as most airplanes fly better when the wing is in one piece!

- Build the left wing panel directly over your wax paper covered plan by pinning down the 1/16" bottom leading and trailing edge sheeting, as well as the 1/16" x 1/4" capstrips and center section sheeting. Touch each joint with a drop of Hot Stuff instant glue.
- Using yellow glue such as Hobby Shack Kwik Tak, add the 1/2" x 1/2" leading edge and the 3/16" bottom spar.
- Cut the ribs from 1/16" sheet and glue in place all except the center rib.
- Add the 3/16" top spar. When thoroughly dry, block up the outboard end of the wing panel so there is 1½" measured from your building board to the bottom of the

A Three Channel .15 Size Home-Built Type Parasol Wing Sport Ship.

BY GEORGE F. JENNINGS.

SMALL WONDER

Close-up of cockpit area and cabane struts. Easy to build, the Small Wonder returns a maximum of fun for a minimum investment.



An .09 to .15 engine and a four ounce tank provides ample flying time with a fuel bill that's hard to beat.

The wheel pants add a finishing touch to this home-built type parasol wing. Remove the pants when flying from rough fields.





SMALL WONDER

Designed By: George F. Jennings

TYPE AIRCRAFT

Sport

WINGSPAN

46 Inches

WING CHORD

7 Inches

TOTAL WING AREA

322 Square Inches

WING LOCATION

Parasol Wing

AIRFOIL

Flat Bottom

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

1.5 Inches

O.A. FUSELAGE LENGTH

28 Inches

RADIO COMPARTMENT AREA

(L) 7" X (W) 2.5" X (H) 2.5"

STABILIZER SPAN

15.75 Inches

STABILIZER CHORD (incl. elev.)

4.375"

STABILIZER AREA

65.5 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

5 Inches

VERTICAL FIN WIDTH (incl. rudder)

3.75" Average

REC. ENGINE SIZE

.09 — .15 Cu. In.

FUEL TANK SIZE

4 Ounce

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

Three

CONTROL FUNCTIONS

Rudder, Elevator & Throttle

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa
Weight Ready-To-Fly	36 — 40 oz.
Wing Loading	16 — 18 oz./sq. ft.

lower spar at the end rib.

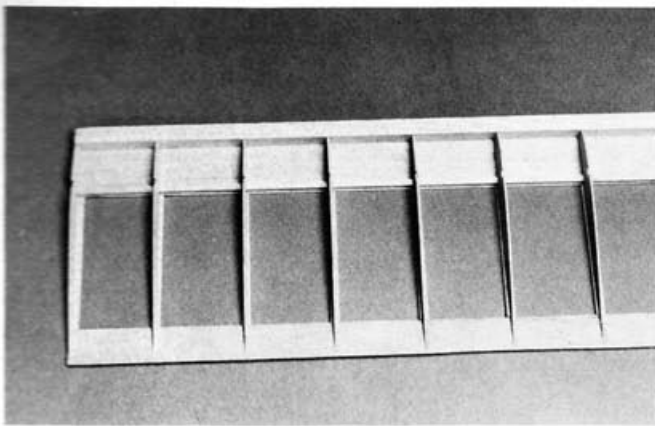
- ☐ Now glue the center rib in place using a square to set the rib at exactly 90° from your building board.
- ☐ Trim the top spar and leading edge to match your center rib angle. Also bevel the leading edge to match the front of the ribs where the top leading edge sheeting will attach.
- ☐ Add the center section balsa filler block at the trailing edge.
- ☐ Repeat the last 7 steps and build the right wing panel.
- ☐ Join the wing panels as follows: Pin down the left panel flat to the building board and block the right panel up 3" and glue together with Kwik Tak.
- ☐ When the glue dries, cut out 1/16" notches in the center ribs both in front of and in back of the main spars. Slip the 1/16" plywood dihedral braces in place after liberally coating with Kwik Tak. Clamp the braces securely to the spars with spring-type clothespins until the glue sets.
- ☐ Next add the 1/16" leading edge sheeting, trailing edge sheeting, capstrips, and center section sheeting to the pinned down panel. Use Kwik Tak glue.
- ☐ When the left panel is dry, pin down the right panel and add the top sheeting.
- ☐ Using a sharp X-Acto knife and sanding block, shape the leading edge of the wing to correspond with that shown on the plans.
- ☐ Cut out the curved portion of the trailing edge of the wing center section as shown on the plans.
- ☐ Add the 1" triangular wing tip blocks and, when the glue is dry, carve the tips to the contour of the airfoil and the tip shape will form automatically.
- ☐ Sand the entire wing lightly and wrap the center section with Celastic soaked in dope thinner or wrap with Carl Goldberg nylon tape and saturate with Kwik Tak. Do not eliminate this step, since a great deal of wing strength comes from the center section wrap!

Fuselage & Tail Surfaces

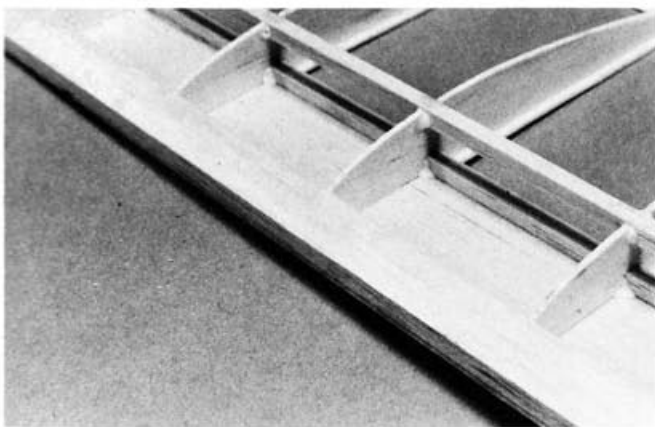
- ☐ Cut two fuselage sides from 1/8" x 3" x 36" medium balsa. Add a 3/16" square spruce strip flush with the bottom of the fuselage as shown on the plans. This will later become the framing for the radio access panel.
- ☐ Next, pin down the right fuselage side over the plan and glue the 1/8" x 3/8" plywood upright cabane struts in place on the inside of the fuselage side. Be sure that the strut position matches the plan perfectly.
- ☐ Using contact cement, add the vertical grain 1/16" balsa doublers, carefully fitting them around the struts. The doublers run from the

rear of the firewall to the front of former F2.

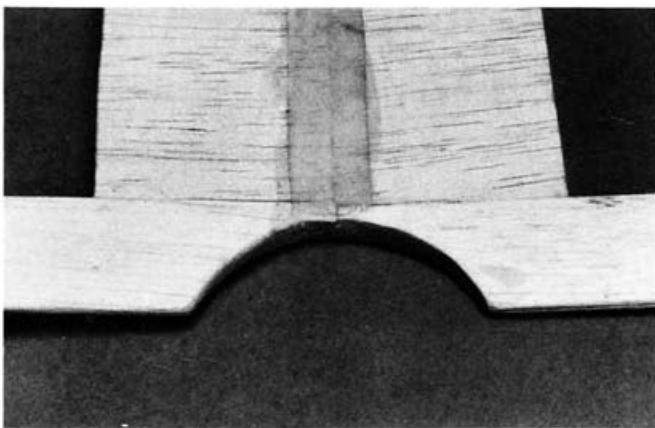
- ☐ Add the 3/8" triangular firewall braces, as well as the upright 3/16" square balsa braces at the aft end of the fuselage and then the 3/16" square balsa tank floor brace. The tank floor height on the plans is positioned for a Sullivan SS 4 four ounce tank. If you use a different tank, adjust the tank floor braces accordingly.
- ☐ Complete the left fuselage side in the same manner as the right, making sure you end up with a right and left side! Use the right side as a guide in making sure the cabane struts are positioned identically on both.
- ☐ Cut out F1 from 3/16" plywood and all other formers from 1/8" balsa.
- ☐ Mark and drill the radial engine mount on the firewall and install the 4-40 blind nuts. (A Kraft-Hayes mount was used on the original.) Grind or file the mount for about 1 1/2 to 2" of right and down thrust.
- ☐ Pin down the right fuselage side and use 5 minute epoxy to secure F1 and F2 in place. Use a square to make sure they are 90° perpendicular to the fuselage side.
- ☐ Epoxy the left side in place, making sure everything is absolutely square.
- ☐ Epoxy the 1/16" plywood forward fuselage bottom in place which runs from the front of the firewall to the front of the radio access panel.
- ☐ Bevel the fuselage sides at the tail. Mark the center of F1 and F2 and set the fuselage over the centerline on the plan and pull the tail together so that the marks on F1 and F2 and the rear of the fuselage are centered on the line. Add Kwik Tak and use a spring clamp clothespin(s) to hold until dry.
- ☐ Add the 3/16" square balsa cross braces in the rear of the fuselage, as well as the 3/16" square spruce cross braces at the front and rear of the radio access panel.
- ☐ The radio access panel hatch can now be cut from 1/16" plywood and installed using six No. 2 x 3/8" round head wood screws. Drill small pilot holes through the hatch into the spruce before adding the screws.
- ☐ Install the 1/8" balsa tank floor and drill holes for the fuel lines. Fuel-proof the inside of the tank compartment with polyurethane varnish or surfacing resin. (If you fail to do this and your tank springs a leak, you may get to see how your airplane flies without an engine and front end!)
- ☐ Sheet the front fuselage top by first installing formers F1A and F1B with Hot Stuff, as well as the 3/16" square balsa top stringer. Cut out



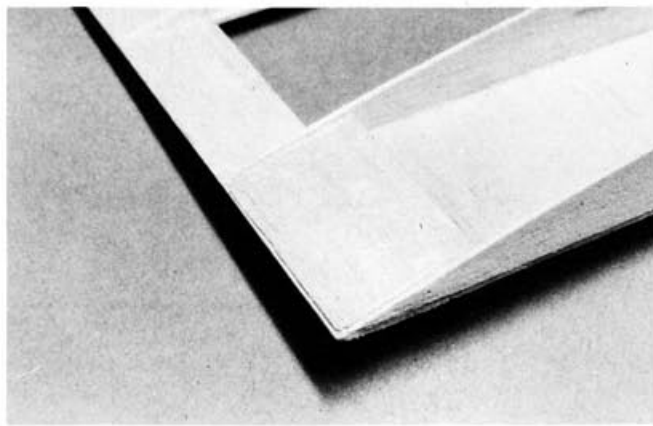
Pin down the 1/16" bottom sheeting as well as the 1/16" capstrips. Add 1/2" x 1/2" leading edge and the 3/16" bottom spar. Next add ribs and then top 3/16" spar.



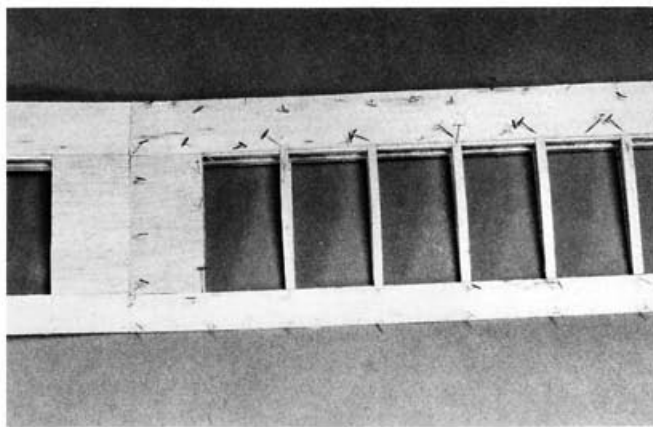
Taper the leading edge stock to match the front of the ribs in preparation for sheeting the top of the wing.



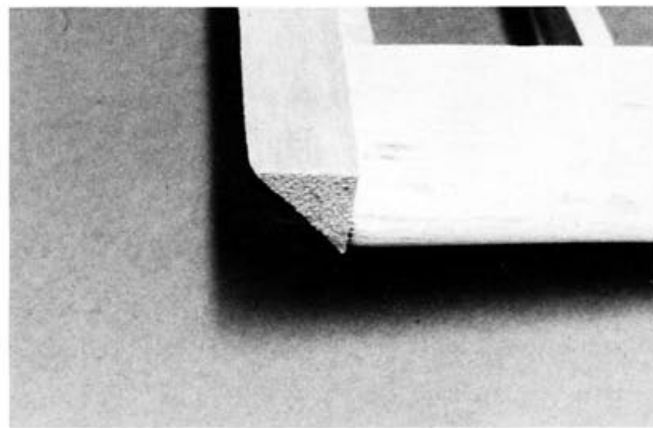
Trailing edge center section showing wing cut-out.



Add a soft balsa block at the trailing edge of the center section and shape to the contour of the wing ribs.



After wing panels are joined, pin wing panels flat to the building board and glue 1/16" top sheeting and capstrips in place.



Wing tip is 1" triangular stock glued in place and carved to shape.

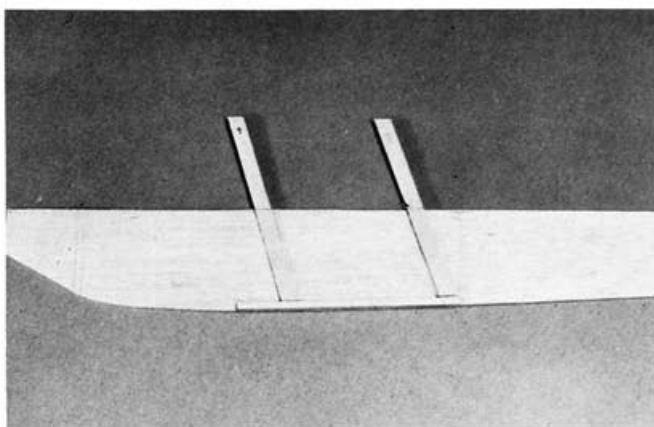
two sheeting pieces using the pattern on the plan from 1/8" soft balsa. Wet the outside of one piece and glue in place with Kwik Tak and hold in position with pins and masking tape until dry. Cover the other side with the second piece.

- Install the 1/8" balsa cockpit floor as shown on the plans.
- Cut out the 1/8" sheet balsa tail surfaces and epoxy the stab in place by applying the epoxy and pinning the

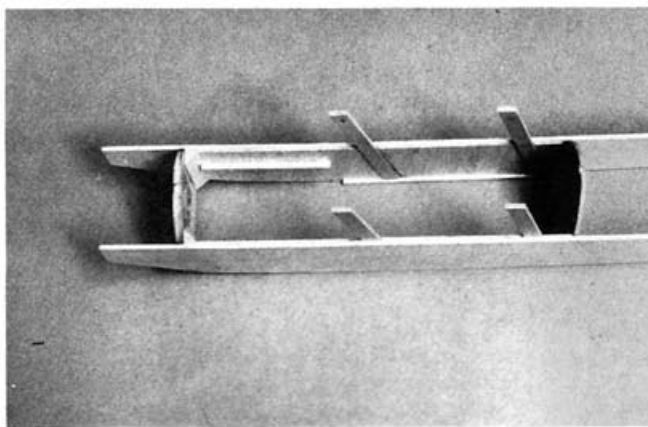
stab in place. Then, before the glue sets-up, turn the fuselage over and sit it on the cabane struts and measure the stab to be sure there is an equal distance from your building board to the trailing edge of the stab on both sides.

- Glue F3, the fin mounting plate, in position in front of the stab as shown on the plan.
- Glue the fin in place, making sure it is located squarely.

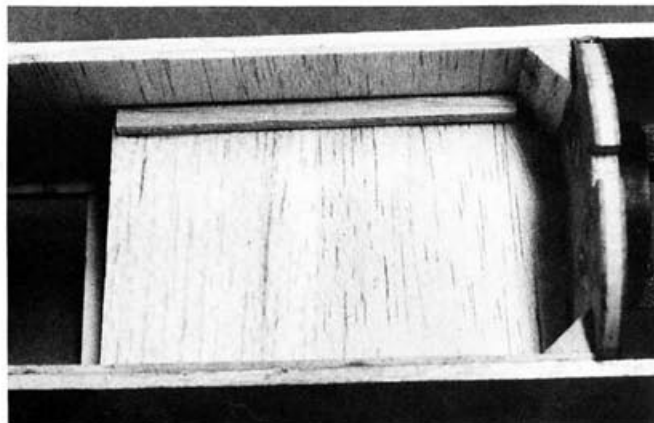
- Add the rear fuselage top sheeting by first adding formers F2A and F2B, as well as the 3/16" square balsa top stringer. Again using the pattern on the plan, make two covering pieces from soft 1/8" balsa and glue in place in the same manner as the forward sheeting.
- Add 3/4" soft balsa blocks to each side of the fin and carve and sand so as to blend them into the fuselage and tail.



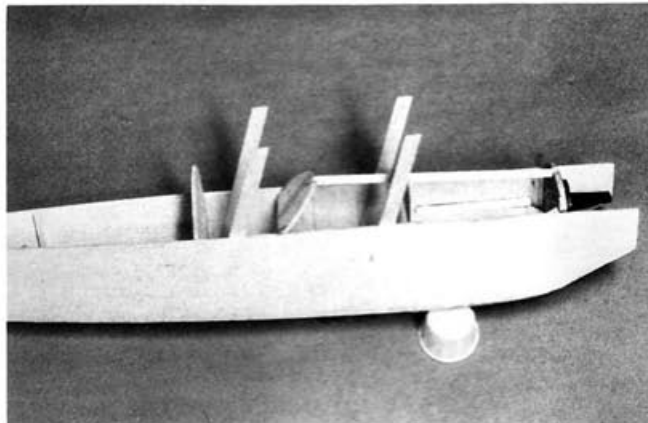
Right fuselage side showing 3/16" spruce strip and 1/8" by 3/8" plywood cabane struts glued in place.



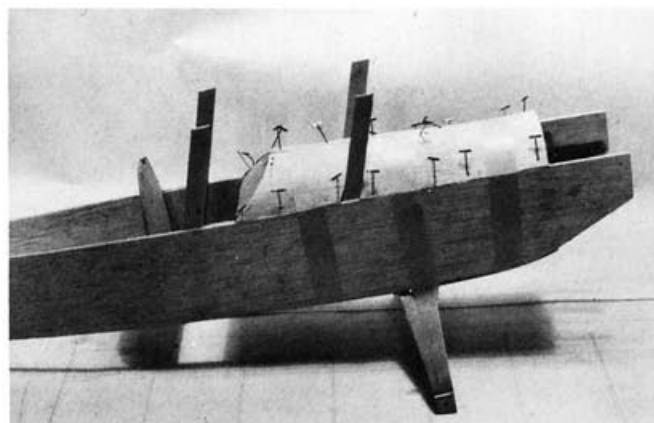
After fuselage doublers, tank floor braces, and 3/8" triangular firewall back-up braces are added; fuselage sides are joined using F1 and F2.



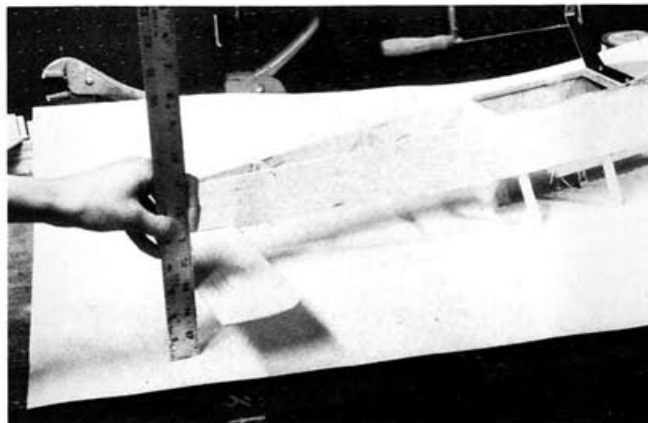
Tank floor is made from 1/18" balsa. Be sure to fuel proof inside of tank and engine compartment.



Instrument panel, F1A and 3/16" stringer are glued in place in preparation for sheeting of front top fuselage.



Wet the 1/8" soft balsa sheeting on the outside, glue in place and hold with masking tape and pins.



Stabilizer is epoxied in place with 5-minute epoxy. To insure correct alignment, place fuselage upside down on cabane struts and measure both sides of the stab to be sure of equal distance from your work table.

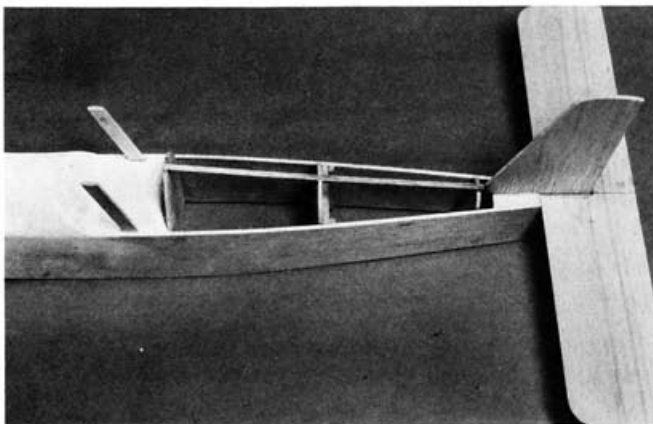
- ☐ Install the 1/16" plywood tail piece at the rear of the fuselage — drill a 1/16" hole at the location shown on the plan.
- ☐ Make up 6 control surface hinges from strip nylon hinge material as detailed on the plan. Using a sharp X-Acto knife, make slots in the tail surfaces for the rudder and elevator. Temporarily hinge the surfaces to be sure they function properly.
- ☐ Taking 1/16" music wire for the tail,

bend a 90° angle and drill a 1/16" hole into the rudder at the location shown on the plans.

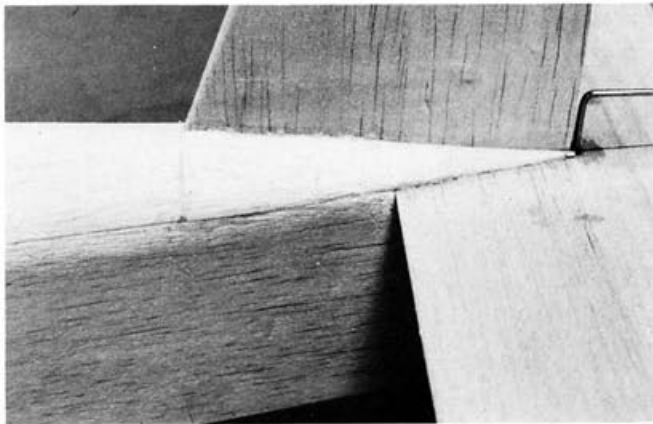
- ☐ Carefully poke the wire down through, and out, the 1/16" hole in the plywood tailpiece on the bottom of the fuselage. Bend the wire to accept the tail wheel.
- ☐ Temporarily re-install the rudder with hinges and plug the wire into the rudder. When adjusted for easy movement, solder a small washer

to the wire at the bottom of the fuselage. A soldered washer takes the strain from the rudder. The rudder control horn straddles the wire plugged into the rudder for strength in this area.

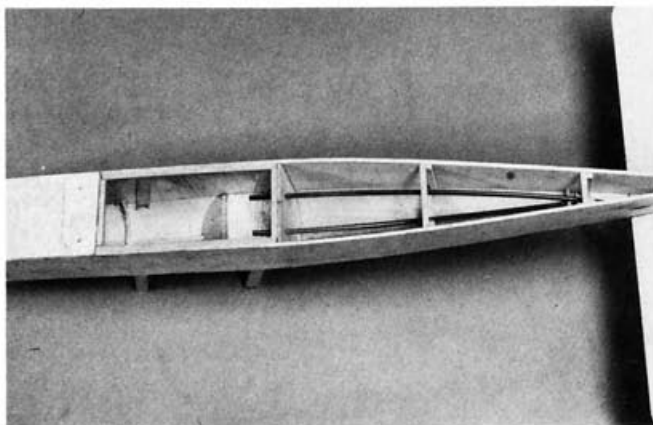
- ☐ Solder the tail wheel in place. You now have a steerable tail wheel.
- ☐ Plan your servo installation but don't install them yet. Install the outer pushrod cases by drilling 3/16" holes through F2 and out the



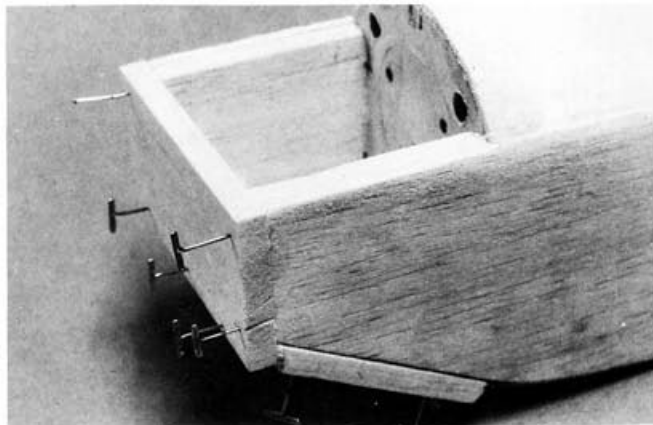
Rear top fuselage sheeting is installed in the same manner as the front top sheeting.



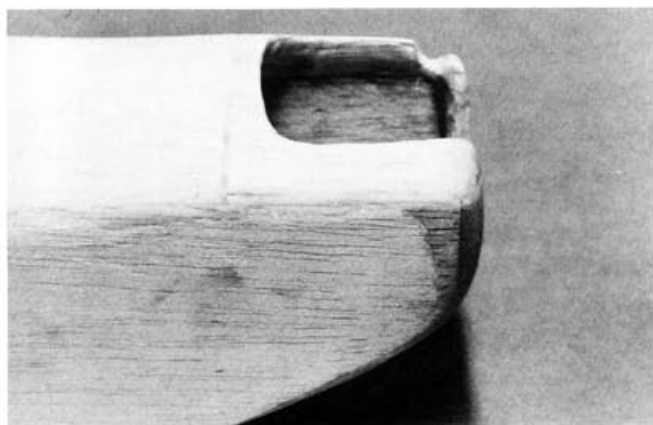
Add 3/4" soft blocks to each side of the fin and carve and sand to blend into the fuselage.



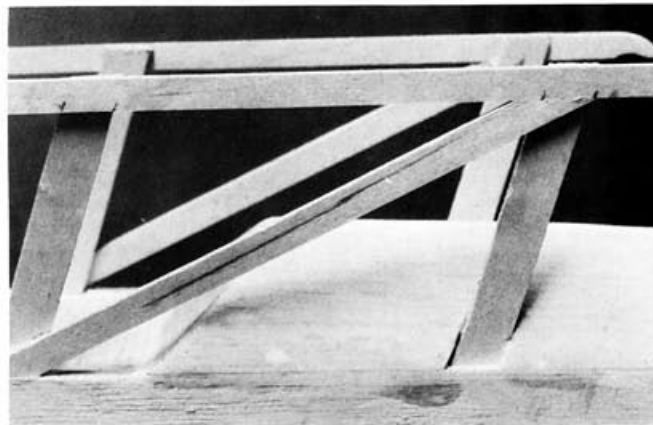
Sullivan pushrods are installed before bottom of fuselage is sheeted.



Soft 1/4" balsa blocks are installed at the nose for easy carving and shaping.



The 3/4" top nose block has been added and the nose has been carved and sanded to shape.



1/8" plywood wing saddles and diagonal braces are shown glued in place.

rear of the fuselage at the appropriate locations. Taking coarse sandpaper, rough up the pushrod cases where they go through former F2 and fuselage rear and epoxy at both ends. Bevel the pushrod cases where they exit the fuselage at the tail so that they are flush with the fuselage.

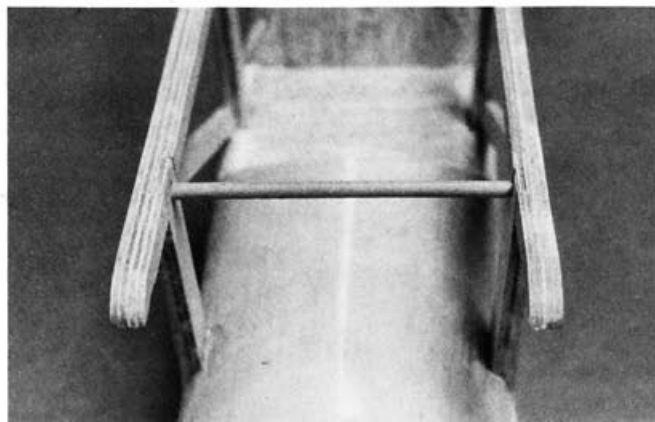
- Now install the 1/16" balsa bottom fuselage sheeting from the radio access panel on the back. Make

sure this is installed crossgrain.

- Add the 1/4" soft balsa noseblocks as shown on the plans and carve to a pleasing well-rounded shape.
- Tack glue the 3/4" soft balsa block in place and carve to blend in with the rest of the nose. Remove and, using coping saw or jig saw, cut out top of block to accommodate engine. When a good fit is achieved, permanently glue in place.
- Add the 1/8" plywood wing saddles

to the outside of the cabane struts using Kwik Tak (see plan).

- Add the 1/8" plywood diagonal cabane struts.
- Fill in the outside of the upright struts with 1/8" balsa and, using sandpaper, round the edges. Also add 1/8" plywood fill-in to the wing saddle on the inside (see plan).
- Drill 1/8" holes through the wing saddles at the location shown on the plan and insert pieces of 1/8"



1/8" dowel cross braces are added to cabane structure.



Small Wonder completely framed up ready for covering.



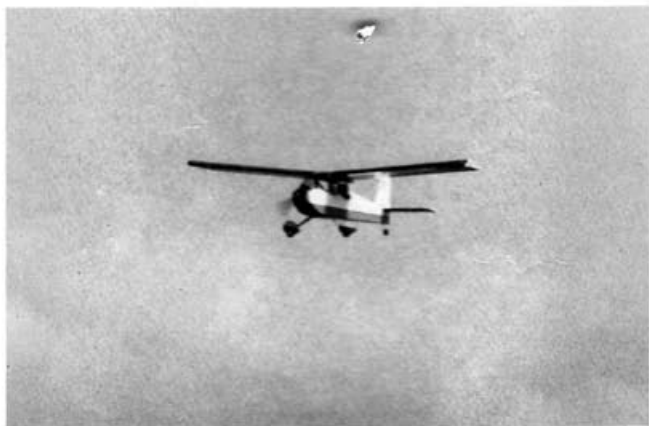
The finished product.



Son, Doug Jennings, fires up Small Wonder while Ken Sucharski holds.



The Small Wonder looks like an EAA home-built in the air.



A three channel sport ship, the Small Wonder is easy and fun to fly.

dowel.

- Install 8"-10" tread dural landing gear by epoxying the 1/8" plywood landing gear plate in the fuselage as shown on the plan. Drill two 1/8" holes through the gear. Line the gear up so that the wheel axle is in line with the leading edge of the wing. Mark the location on the fuselage and drill 1/8" holes through the fuselage bottom. Install 4-40 blind nuts and bolts, cutting off the ex-

cess length of the bolts. (Note: Wheel pants are not recommended if you fly from grass.)

Finishing

- It is recommended that one of the plastic heat shrink covering materials be used such as Solarfilm or MonoKote; however, the traditional silk and dope method is acceptable on this aircraft. The main thing to remember is that extra weight detracts from good flying perfor-

mance. Surfacing resin and epoxy paint can be used; however, this method will result in a weight gain of about 4 ounces (on the airplane!). One trick you might try if you cover with Solarfilm is, once the aircraft is covered, mask off trim areas and spray with K & B Superpoxy directly on the Solarfilm. Don't be alarmed if the covering loosens up. When the Superpoxy is cured, gently re-

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shrink the covering with your heat gun. It will be necessary to install D.J. stripe tape on the trim line to keep the paint from chipping. Since trying to cover the cabane structure would give you nightmares, it is best to paint this area. Don't forget to fuel proof the inside of the engine compartment and provide an oil drain at the bottom.

- ☐ Install the windscreen, trim, pilot, and any other finishing touches you care to make.
- ☐ Permanently install the rudder and elevator by epoxying the hinges in place.
- ☐ Attach the control horns.

Radio Installation & Flying

- ☐ Install the engine, muffler, prop, wheels, and tank. Trial fit the battery under the tank, receiver, and servos in the main compartment. Put the radio access panel temporarily in place and attach the wing with rubberbands. Shift the servos and battery forward or back until the correct balance is achieved. The balance point should be in the range of 2¼" to 2¾" back from the leading edge of the wing and *no further back!* When correctly balanced, the plane hangs slightly nose-down when suspended on the tips of your index fingers placed under the wing on each side of the wing saddle.

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- ☐ When the position of the servos is found for correct balance, epoxy two pieces of 3/8" square hardwood (not balsa) across the fuselage to support the servo tray.
- ☐ Wrap the battery and receiver (loosely) in foam and put in Baggies for fuel proofing.
- ☐ Install the inner pushrods as follows: Cut off the threaded end of a clevis rod and screw into the pushrod at least 1/8". Next, insert in the pushrod case and attach the clevis to the outer hole in the control horn.
- ☐ At the servo end of the pushrod, screw a section of threaded rod into the pushrod at least 1/8". Make a Z-bend in the rod and put in the servo arm. Make all initial adjustments at the servo end by screwing the threaded rod in or out to achieve a neutral condition at the control surfaces.
- ☐ A 1/32" music wire is recommended for throttle pushrod as it is easy to bend and yet rigid enough to actuate the throttle. Be sure the throttle linkage is adjusted accurately so that the throttle servo isn't in a stalled position either at high or low position which can drain your battery pack and damage your radio. Be sure to use a no-noise connector where the wire attaches to the throttle.
- ☐ Set up the throw on the elevators so you get no more than 5/16" in either direction. Set the rudder throw for no more than 3/8" throw in either direction.
- ☐ If this is your first radio installation, get an experienced flyer to check over your work before attempting to fly.
- ☐ Small Wonder is easy to fly. Re-check your balance with an empty tank. Be sure there are no warps in your wing and tail surfaces. Double check to make sure the control surfaces move in the right direction and the throw is the same as specified earlier. Check your radio range both with the engine stopped and running. Be sure to balance your prop — propeller balance is an area commonly overlooked and can be the cause of radio malfunction and failure because of excessive vibration.
- ☐ If you are a rank beginner, get the help of an experienced flyer to help you trim out the plane. Once trimmed out, you will be amazed at the flight characteristics and, when you get her back on the ground and taxi back in, you too will say "It's a Small Wonder." ☐