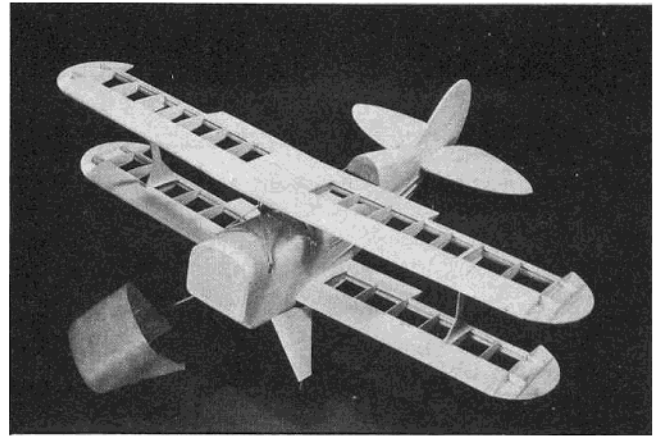
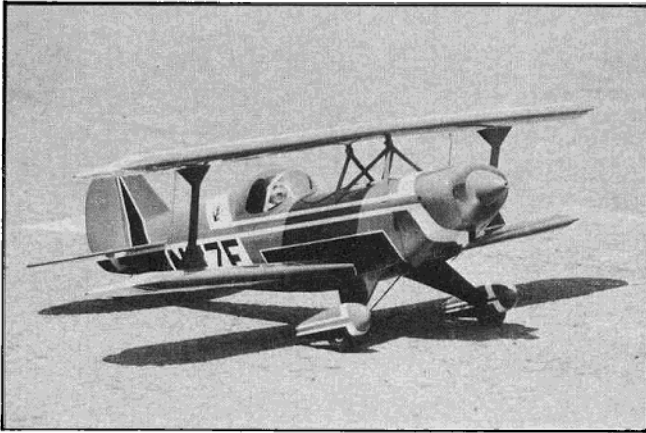


# PITTS



## S2A

### ABOUT THE AUTHOR

Robert Brantley, age 31, has been interested in modeling for the past 22 years and has built everything from free-flight to control line and radio control models. After a few years away from building models, he has re-entered the hobby with his main interest in Stand-Off Scale. The Pitts S2A is his first design but he is planning others. Robert is a member of the Radio Control Bee's in North Orange County, and is the publisher of their newsletter. He and his family reside in Brea, Calif., and he is a real estate broker in that area.

**T**he design of the Pitts S2A started some two years ago when I wanted a good looking, snappy flying .40 powered biplane. I chose a .40 powered biplane because it can be carried assembled to and from the

flying field in the trunk of a medium sized sedan. Being a real estate broker, most of my flying is done on a weekday morning, then back to the office. I can't afford to waste time at the flying field setting up to fly.

During the long wait for someone to come up with a design to fit my preferences, thoughts of designing my own kept cropping up. Why not? Nothing to lose if it doesn't fly, right? Finally I started to put thoughts on paper. This being my first, and so far, only design, why not do it right and try for something fast and easy to build? After reading and re-reading several "how to design" articles that have periodically appeared in RCM, work began.

Admittedly the design of an airplane with the name Pitts has not been one of the easier designs to accomplish. Being a short coupled airframe to begin with, combined with a small model, causes

not only ground handling problems but very, very quick control responses. The S2A was chosen over the Pitts 1A design because of the better moments which I hoped would produce a better flying airplane. That decision has paid off in an excellent flying sport aircraft and one that can be flown by anyone except a rank beginner. Control response is very smooth and predictable. The stalls, if you can call them that, are gentle with only oscillations occurring. The plane's slow speed ability makes for effortless low passes and landings. In fact, the slow inverted flying ability of the S2A has astounded everyone who has had the opportunity to fly her. If you are an experienced flyer, you might want to move the Center of Gravity rearward to facilitate spin entry. I do feel the challenge of designing a good model of a Pitts airplane was well worth the effort. The model captures all of the real

The Pitts S2A is a .29 to .45 powered Stand-Off Scale biplane that can be carried assembled to and from the field in the trunk of a medium sized sedan. And, once at the site, its aerobatic performance and low speed characteristics will put the rest of the planes in the pit area while the other flyers stand around and watch with envy.



By Robert Brantley  
Ektachrome transparency by  
Art Linaschke

plane's lines and appeal. At the flying field the model is easily identified as a Pitts. If weight is kept around the 80 ounce mark any good .29-.40 engine will give all the performance you would want.

The original plane used a standard K & B .40. In addition to the fine flying ability of the Pitts S2A, other design features were incorporated to improve overall performance and ease of construction. These included the landing gears wide stance, for great ground handling, and novel wing attachment. The aluminum cabane struts are no harder to fabricate than bending and soldering the customary wire struts. In fact, the sets made took about 15 minutes per set. Since the

windcreens, if desired. If scratch-building is not your cup of tea, a kit of the S2A should be available from the above manufacturer in early 1979.

#### Bottom Wing:

Pin 1/4" sq. x 36" balsa bottom rear spar to building board. Trim one piece of 1/16" x 2" x 36" balsa to 1 7/8" wide in order to have one straight edge. Cut four pieces 8" long to be used for the lower wing trailing edge sheeting. Pin the trailing edge sheeting to the plan and glue the forward edge to the spar. Use the ribs to locate the front spar. Pieces of 5/16" sq. balsa are used to elevate the front spar to proper height. Locate and glue ribs #2, #3, and #4 to the trailing edge and spars. Use a piece of 1/8" balsa scrap to space the distance

Install the upper 1/16" x 2" x 36" balsa leading edge sheeting with Titebond. This sheeting is glued over the front spar and against the wing ribs. Install the top center section sheeting. When dry, remove the wing from the building board. Turn over and install the front sheeting and remaining center sheeting. Trim the leading edge sheeting flush with cap, and install 1/4" x 1/2" x 36" balsa leading edge and sand to shape. Cap between rear spars with 1/16" x 3/8" balsa.

Carefully cut through the center sheeting and the spars, cutting the panels apart. Trim overhanging spars and sheeting; and sand flush to rib #1 and wing tip ribs #3.

Temporarily install ailerons using two



cabane struts are not attached until after building is complete, finishing is a snap. As with any short nosed airplane, keep the tail light. Choose your balsa carefully to prevent adding excessive nose weight for balance. Before starting, if you will first pre-cut all parts and make a custom kit, your actual building time will be reduced. You can make one of three S2A versions: front cockpit covered with rear bubble canopy; front cockpit open with windscreen and rear bubble canopy; or windcreens on both cockpits. A fiberglass cowl, wheel pants, and two bubble canopies will be available from House of Balsa as a set. For prices, you can write them at 20134 State St., Cerritos, Calif. 90701. The canopies can be cut and used as

between #4 ribs. Add center rib #1 and, using a rib angle guide, glue to the spars; also glue the rib angle guide to the spar flush with the bottom. Glue the remaining #1 rib against the angle guide. Install #5 ribs centered between ribs #1. Add 1/4" sq. top spars. Glue the 1/16" x 3/8" balsa leading edge cap in place, centered on ribs.

Make up and install the torque rods at this time. Use 1/8" O.D. brass or aluminum tubing and 3/32" music wire. Epoxy to rear of spar. Make sure the torque rods are bottomed in slots and are 1/16" below the top of the spar. Glue 1/2" x 1 1/2" trailing edge stock between ribs #1 as support for wing mounting bolts. Notch the trailing edge sheeting for the torque rods and glue in place.

hinges per aileron. Glue on 1/8" balsa wing tips making sure they are centered and at 90° to rib #3. Glue 1/8" balsa wing tip ribs using aileron to center rib. Add the remaining tip pieces. Using epoxy, join panels blocking up one panel 1 1/2" under tip rib #3. Wrap center section with 1" wide glass tape, using epoxy or polyester finishing resin. Cut two pieces of 3/16" dowel and glue to the top rear spar across #4 ribs in each panel. Add 1/16" x 1/4" balsa cap strips as follows: cover the slot on the bottom of the wing between #4 ribs with one strip; glue one cap strip each side of #4 ribs on the upper side of the wing. These cap strips are used to strengthen the inter-plane strut mounting area and to give a base for the wing covering. Cap strips are not

used over any other ribs.

#### Top Wing:

Construction is basically the same as the bottom wing except it is built inverted on the building board. It also has no dihedral. After installing the bottom spars, add 1/8" plywood center rib with strut mounting tabs pointing upward. Glue a piece of 1/4" x 1/2" balsa, trimmed to size, between #1 ribs against ply rib. Install the 1/2" x 1 1/2" trailing edge stock filler between #1 ribs. Cut radius after the bottom sheeting is installed and the wing is off the building board. Cut two pieces of 1/4" dowel and glue to the bottom rear spar across #4 ribs.

Finish by adding 1/16" x 1/4" balsa cap strips as follows: cover the slot between #4 ribs on top of the wing; add one cap strip on each side of #4 ribs on the bottom.

#### Fuselage:

Mark the firewall centerlines. Drill holes and install blind nuts to suit your mount. Make a right and left hand fuselage side as follows: glue 1/16" plywood fuselage doublers to 1/8" balsa sides using contact cement. Index against bottom of sides 1/4" in from the front. Make sure you leave a 1/16" space at the top edge of the fuselage for the top crutch. Add the top 1/4" sq. longeron and the 1/8" sq. bottom longeron. Cut out the wing saddle with a #11 blade.

Using plan, mark location of bulkheads #4, #6B, #7, #8, #7A, and #8A, on the fuselage sides. Pin the top crutch on the top view of the plan. The forward edge is even with the rear edge of the firewall. Mark the location of bulkhead #2 on the crutch. Glue the fuselage sides to the crutch, indexing the front of the crutch even with the edge of the 1/16" ply doubler. Add bulkhead #2 and #3 to the crutch and the fuselage sides. Bulkhead #3 is glued to the rear edge of the crutch. Glue the rear of the sides together.

Using epoxy, glue the 3/16" ply landing gear block and the 1/4" ply wing mounting block in position. Remove the fuselage from the building board and install the firewall using epoxy. Add 1/2" triangle stock to the firewall-fuselage joint for added support.

Install top bulkheads #6B, #7 and #8; and 1/16" turtledeck sheeting; sand flush at the top and install 1/2" top block. Carve and sand to final shape.

Install bulkhead #6A against #6B. Score bulkhead #5 and glue to the cockpit floor. Glue #6C to rear of the floor. The cockpit can now be detailed if you wish with instruments and a pilot. A Williams Bros. 3" pilot will work if the shoulders and height are trimmed. The cockpit floor is glued against bulkhead #6A and top of the fuselage. Add bulkhead #4 and 1/4" sq. top longeron. Install 3/32" front sheeting by first gluing bottom edge to 1/8" side, then apply

water to the top surface of the sheeting. With this method the top sheeting can be done in two pieces. Mark and cut slots for the cabane struts using slots in ply doubler as a guide. Using template, cut out the cockpit opening.

Glue bottom former #3B to the rear of former #3A and glue to the bottom of the fuselage across former #3 at a 30° angle. Add formers #7A and #8A.

## PITTS S2A

Designed By : Robert Brantley

### TYPE AIRCRAFT

Stand-Off Scale Biplane

### WINGSPAN

Top 41" — Bottom 39"

### WING CHORD

7 1/4 Inches

### TOTAL WING AREA

580 Square Inches

### WING LOCATION

Biplane

### AIRFOIL

Semi-Symmetrical

### WING PLANFORM

Constant Chord — top wing swept

### DIHEDRAL, EACH TIP

Top 0" — Bottom 3/4"

### OVERALL FUSELAGE LENGTH

37 Inches

### RADIO COMPARTMENT AREA

(L) 7 1/4" x (W) 4 1/8" x (H) 2 1/2"

### STABILIZER SPAN

17 Inches

### STABILIZER CHORD (incl. elev.)

7 3/4 Inches

### STABILIZER AREA

85 Sq. In. (approx.)

### STABILIZER AIRFOIL SECTION

Flat

### STABILIZER LOCATION

Mid-Fuselage

### VERTICAL FIN HEIGHT

5 3/4 Inches

### VERTICAL FIN WIDTH (incl. rudder)

8" (Avg.)

### REC. ENGINE SIZE

29-45 Cubic Inch

### FUEL TANK SIZE

8 Ounces

### LANDING GEAR

Conventional

### REC. NO. OF CHANNELS

4 (5 with smoke)

### CONTROL FUNCTIONS

Rud., Elev., Ail., Throt.

### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa
Wt. Ready-To-Fly	72-96 Ounces
Wing Loading	18-24 Oz/Sq. Ft.

Install 1/8" x 1/4" balsa bottom stringers. Use a piece of 1/4" balsa scrap at the fuselage tail.

Mount the lower wing, mark and drill for 1/4" dowel by using a piece of 1/4" outside diameter brass tubing. Install dowel using epoxy.

Attach the wing with 6-32 socket head bolts and blind mounting nuts. Sand bevel to former #3C and glue to the wing

trailing edge. Do the same with former #2A and attach to the leading edge of the wing. Add 1/16" sheet side pieces. Remove the wing and cap the side pieces with 1/4" sheet. Sand to final shape. Back drill mounting holes through 1/4" sheet. Re-mount the bottom wing. Glue 1/4" sheet to the front of the fuselage bottom. This sheet forms a lip to hold the bottom hatch in place. Make up the hatch from 3/8" balsa block. Tack glue to the fuselage sides and blend to the belly pan and the front 1/4" sheet. I use 1/8" dowel to hold the rear of the hatch by gluing two short pieces to the hatch and putting matching holes in bulkhead #2A. You can permanently glue the hatch on after the landing gear is attached if you prefer, but the landing gear will not be removable. The removable hatch is nice when installing the fuel tank and hooking up the fuel lines.

Make up the landing gear and cabane struts from medium soft (T2-T3) .063 aluminum. Make the landing gear clips from strip brass and bend the landing gear spreader from 3/32" music wire. Mount to the landing gear block with (4) 4-40 bolts and blind nuts. You will have to relieve the bottom hatch block for clearance of the wire retainer clip.

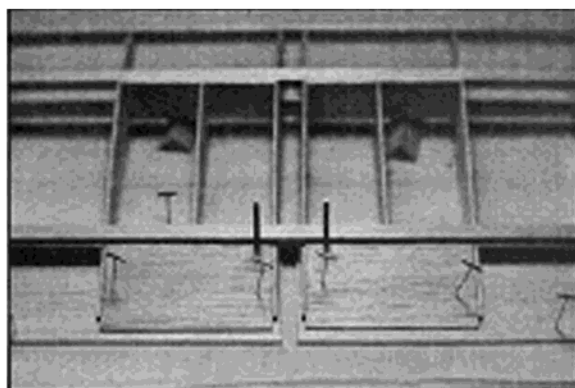
Cut the empennage from 1/4" sheet balsa. Use soft balsa blocks for the aft fairing blocks. Use scraps of 1/4" balsa as spacers for the stab and vertical fin; blend blocks to turtledeck. Add 1/8" sq. balsa side stringer and blend to the fuselage sides. Make up the landing gear fairing from 1/32" ply and 1/16" x 1/4" balsa. Use epoxy and affix to aluminum gear. Cut two inter-plane struts from 1/8" lite-ply. Complete sanding the fuselage and wings in preparation for covering and finishing.

#### Finishing:

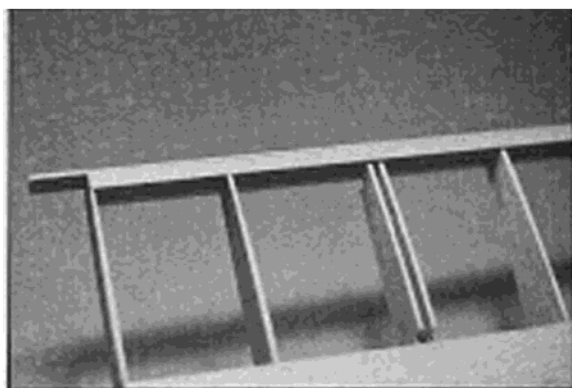
The choice of covering materials is up to the individual builder. The original prototype S2A has MonoKoted wings with Silkspun Coverite and acrylic lacquer on the fuselage.

If you plan to use MonoKote for the whole ship, it is easier to cover the fuselage and tail surfaces before final assembly.

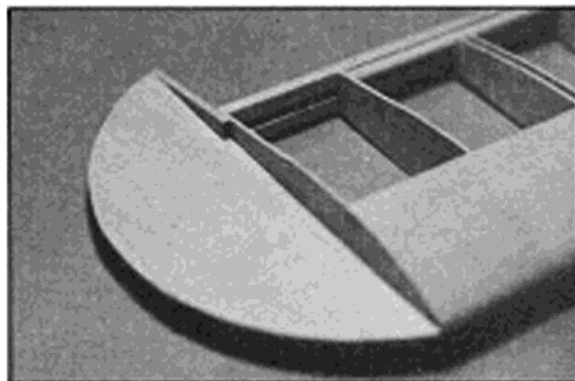
If you choose to go with the Silkspun Coverite, here is my method: Glue on the stab and the vertical fin prior to finishing. I used Coverite over the fuselage side stringers from the leading edge of the wing to the tail and from the centerline of the fuselage down and over the bottom. Coat the bare wood with a coating of polyester resin removing the excess with a paper towel. When dry, lightly sand, then spray on a coat of lacquer primer. Remove most of this first coat of primer. A second coat may be needed to fill the grain. The Coverite is usually filled by the first coat of primer. Color coats can now be added. I use Ditzlers acrylic lacquer plasticized with



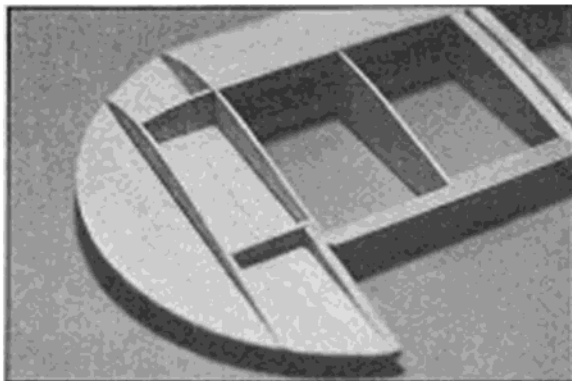
Basic wing construction showing installation of torque rods on bottom wing.



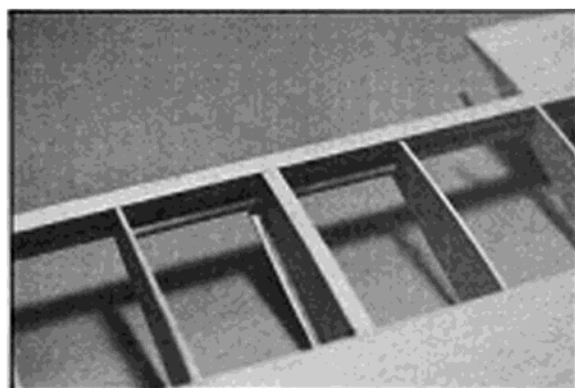
1/16" x 3/8" balsa end cap fits against bottom rear spar to fill gap.



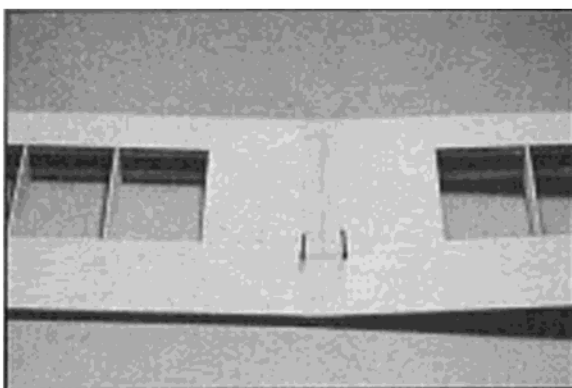
Wing tip prior to adding tip pieces.



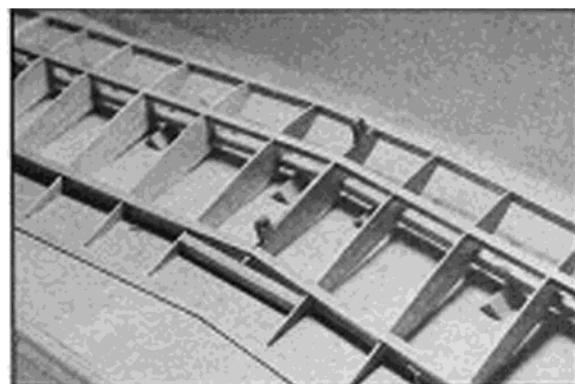
Wing tip pieces added to finish tip.



Cap strip on bottom to cover slot between #4 ribs.



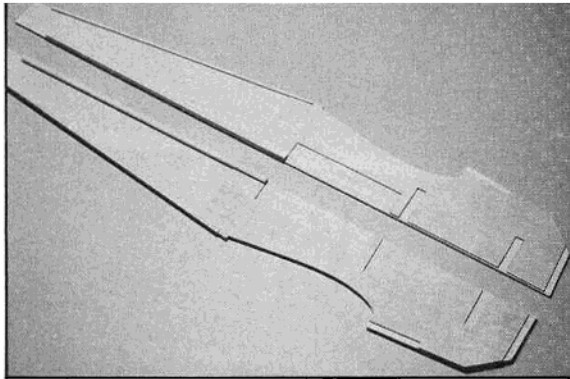
Panels joined and 1" wide nylon tape applied to center joint.



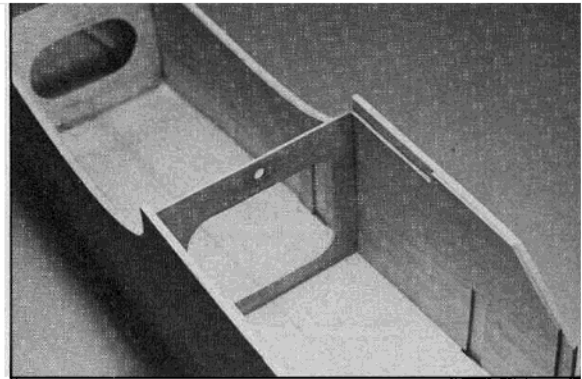
Top wing showing that it is built inverted and position of center plywood rib.



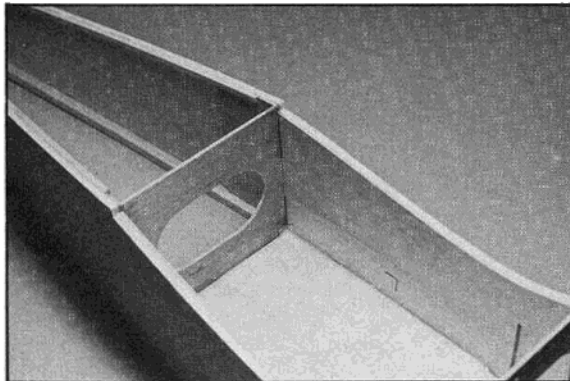
Bottom of top wing showing center section sheeting and wing mounting tabs. Also 1/4" x 5/8" balsa center leading edge cap applied over the 1/4" x 1/2" top wing leading edge.



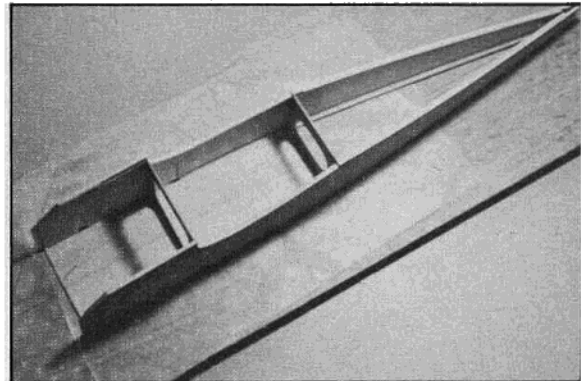
*Right and left hand fuselage sides.*



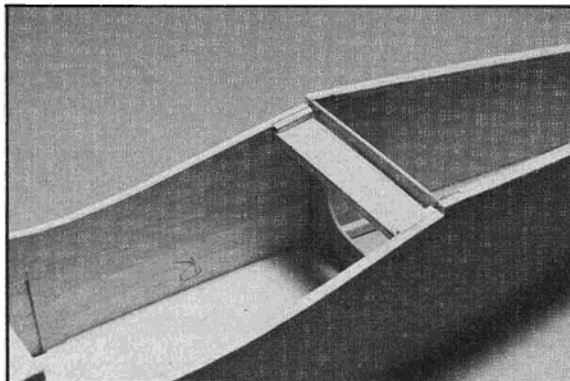
*Formers #2 and #3 installed between fuselage sides.*



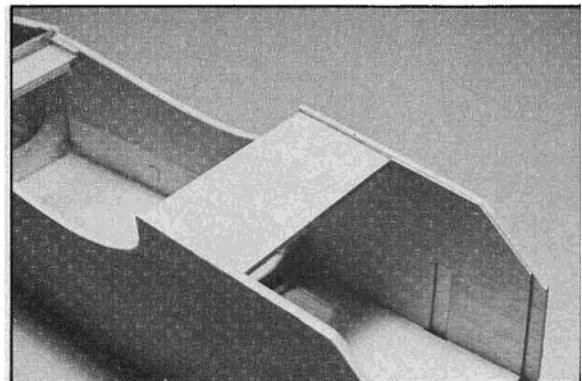
*View of former #3 showing position at aft end of wing cutout.*



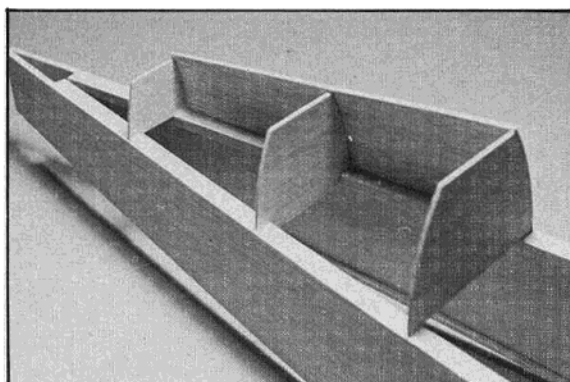
*Fuselage pinned to building board and using top crutch as a building aid.*



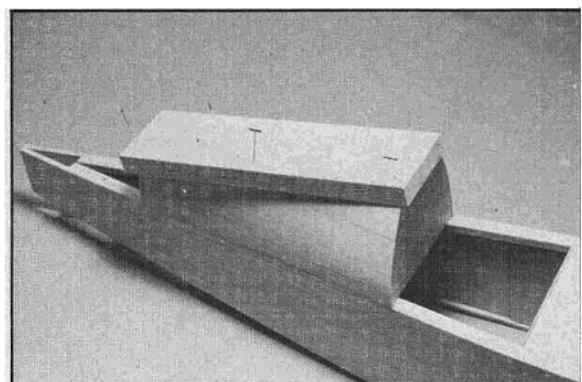
*Wing mounting block shown installed between fuselage sides.*



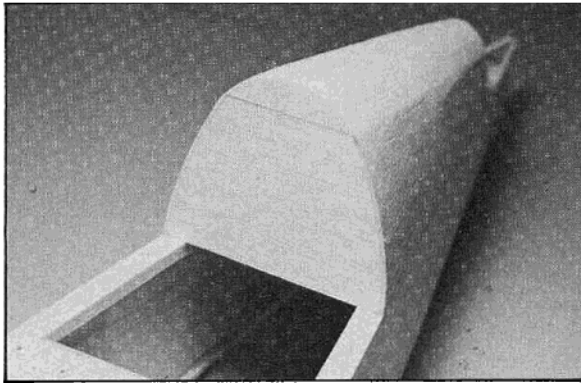
*Landing gear block installed.*



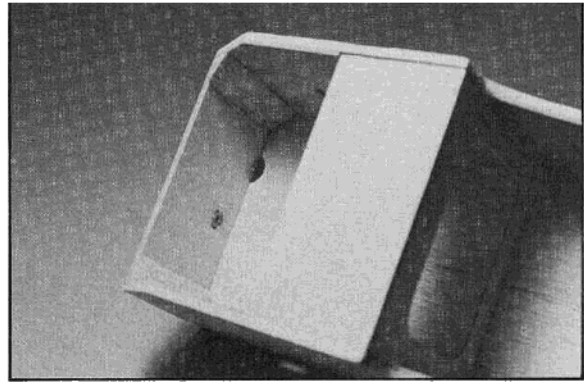
*Turtledeck construction showing formers #6B, #7, and #8 with 1/16" balsa sheeting.*



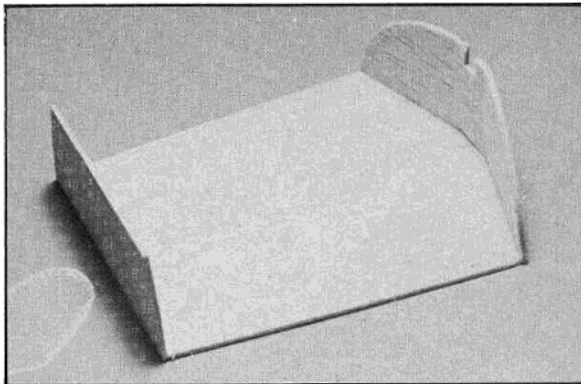
*1/2" balsa top block installed to top of turtledeck.*



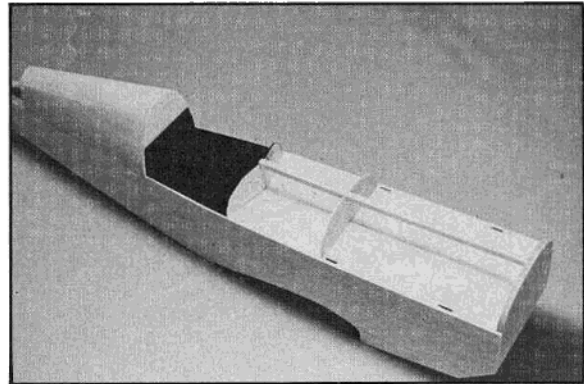
*Shaped top block.*



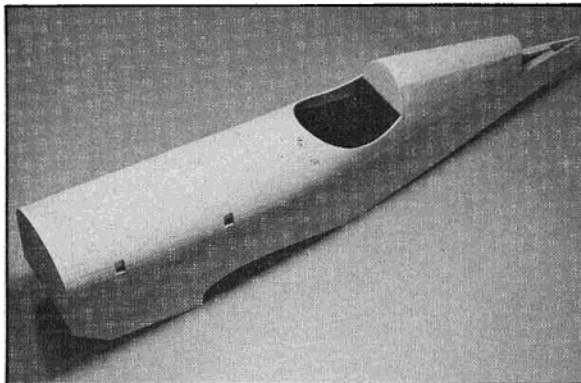
*Rear of firewall showing 1/2" triangle stock for added support.*



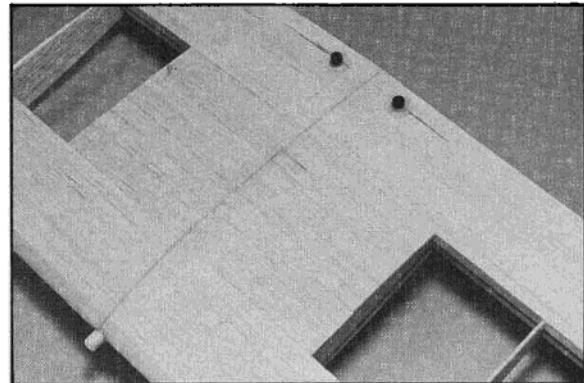
*Assembled cockpit section with instrument panel prior to installation.*



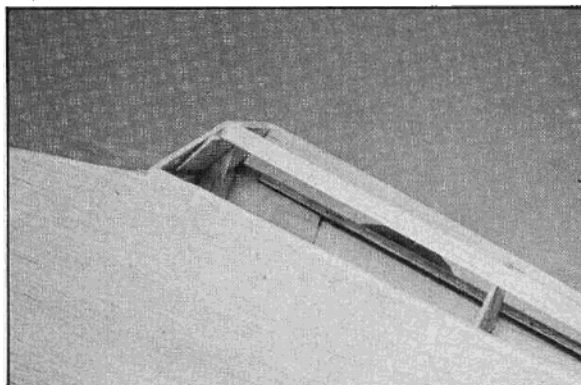
*Cockpit section installed with former #4 and 1/4" square top longeron. Note that cockpit section is painted black.*



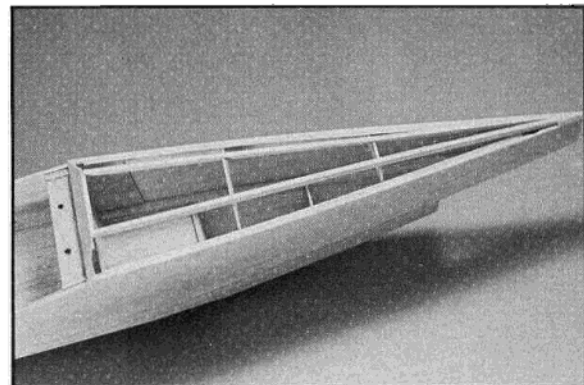
*Top 3/32" balsa sheeting installed to forward fuselage.*



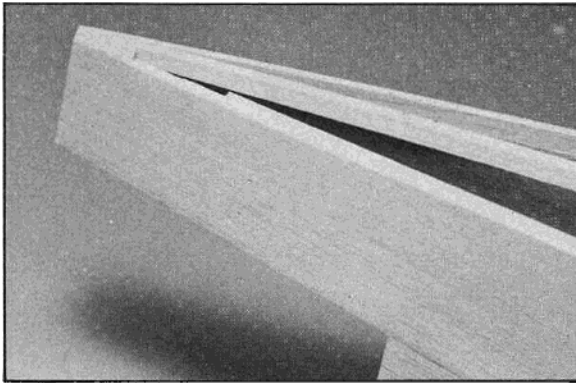
*Bottom wing drilled for mounting bolts. Note nylon washer to protect wing.*



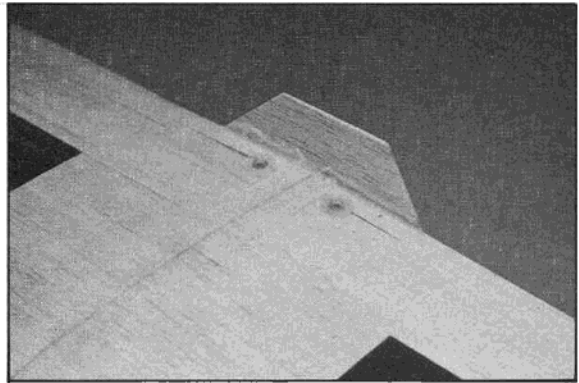
*Former #3A and #3B glued to fuselage bottom across former #3 at a 30° angle.*



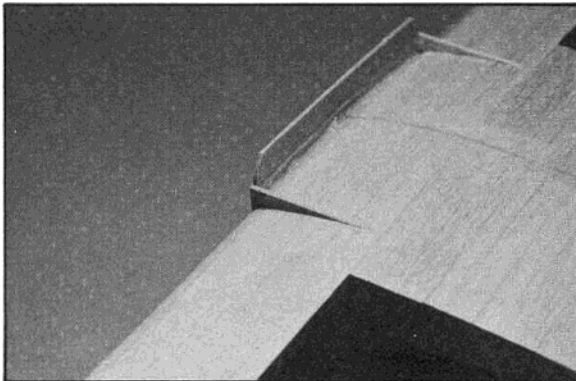
*Formers 7A and 8A installed along with 1/8" x 1/4" balsa stringers.*



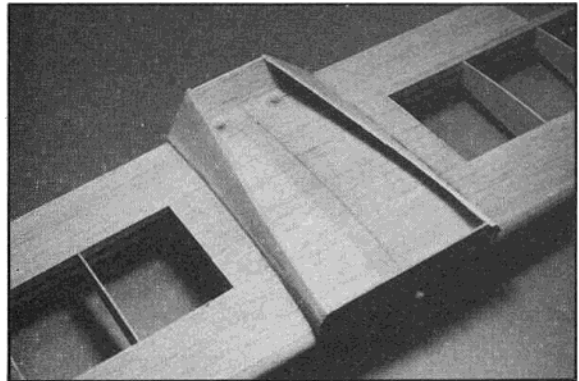
*Piece of 1/4" balsa scrap used at tail.*



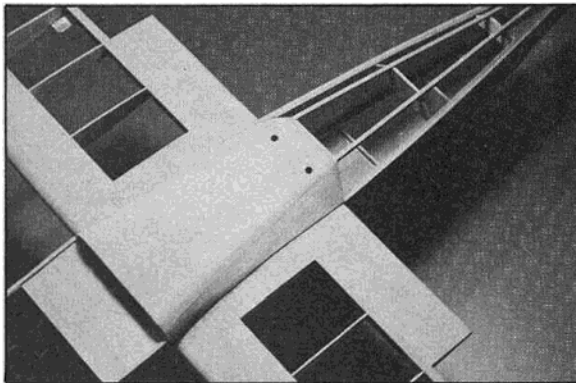
*Former #3C glued to T.E. of wing. This can be done with wing installed to fuselage and using wax paper to prevent former #3C from sticking to #3A.*



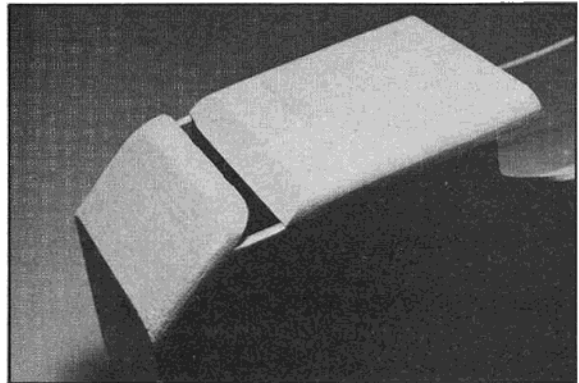
*Former #2A installed along with #2B side pieces to leading edge of wing.*



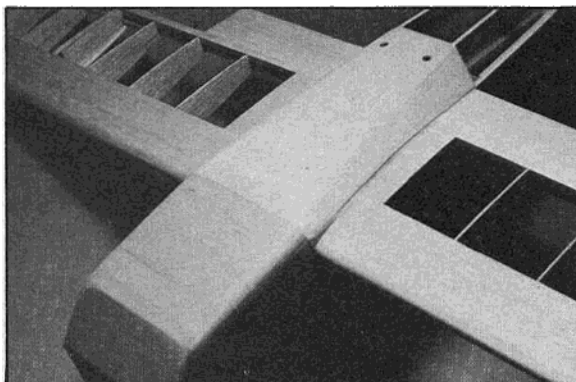
*Under wing fuselage side pieces installed to bottom of bottom wing.*



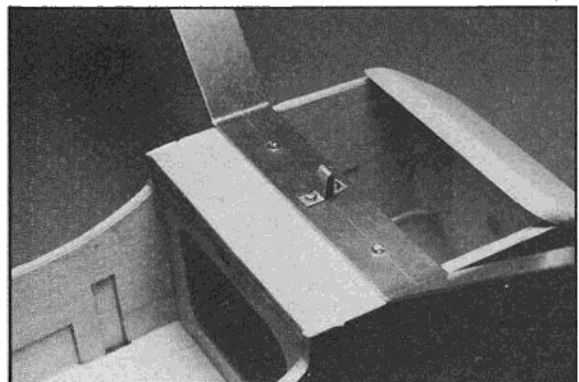
*1/4" balsa sheet installed over side pieces and shaped to match fuselage bottom.*



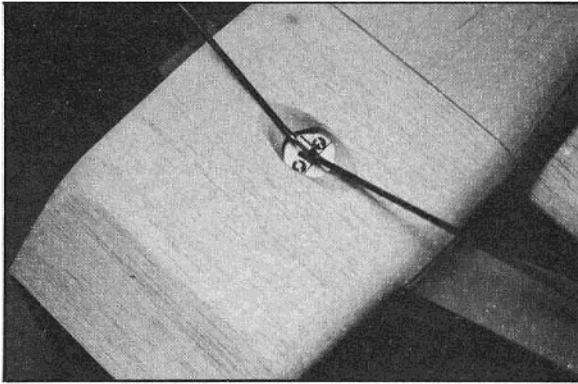
*1/4" balsa sheet used for front of fuselage and 3/8" balsa hatch block.*



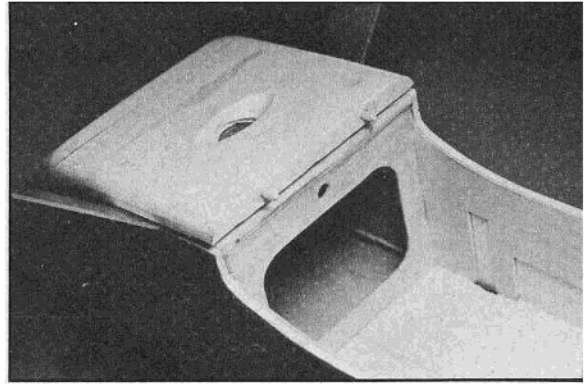
*Hatch block installed and contoured to match belly pan.*



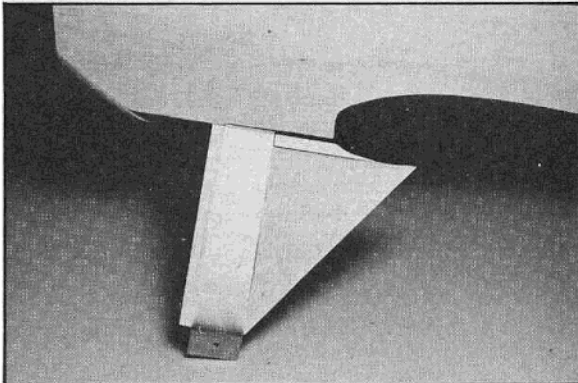
*Landing gear installed with brass retaining clip.*



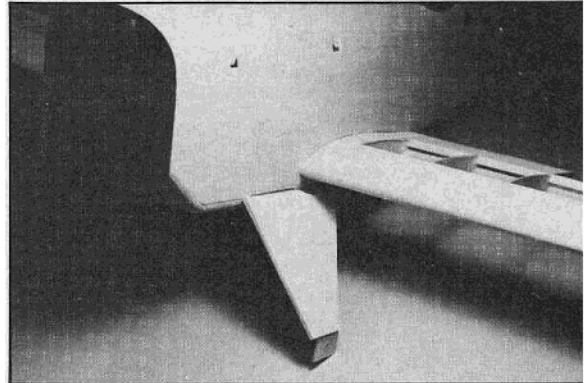
*3/32" music wire spreader and axle wire installed; note hole in hatch block for clearance.*



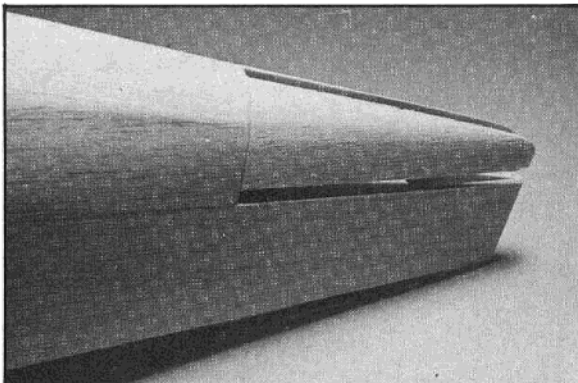
*1/8" dowel used for retaining hatch block.*



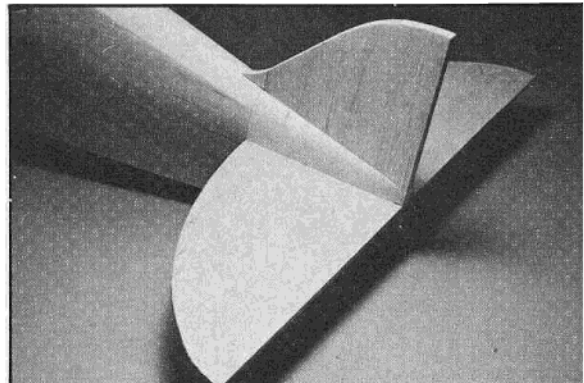
*Landing gear flaring using 1/32" plywood and 1/16" x 1/4" balsa.*



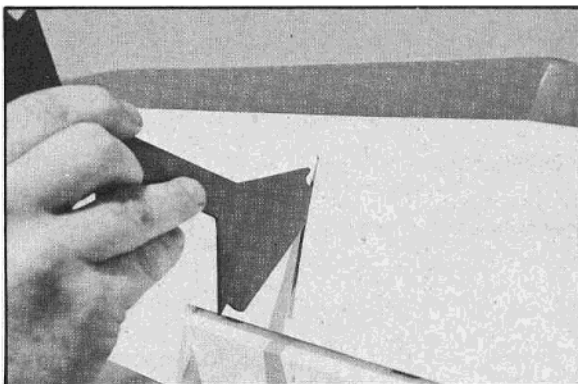
*Top 1/32" plywood flaring installed.*



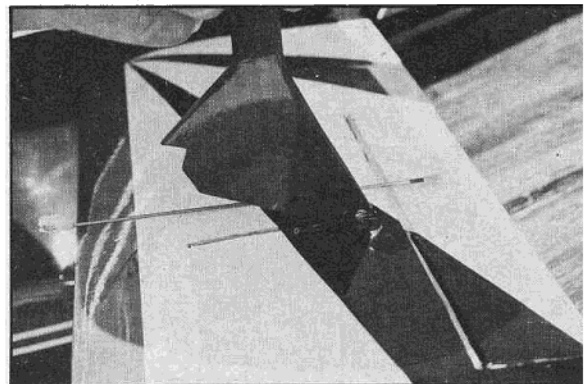
*Tail blocks installed and shaped.*



*1/4" balsa empennage installed.*



*Installing inter-plane strut to top wing.*



*Installing inter-plane strut to bottom wing.*

Southern R.C. Products Flex-all. Normal sport fuel, up to 25% nitro, will not affect this type of finish. Whatever method you use, try to keep it light.

#### **Final Assembly:**

Make up and install the tail wheel. Hinge and mount the control surfaces. Add the control horns. Using epoxy, glue in the cabane struts making sure they are bottomed in slots. Glue the strut mounting plates over the struts inside of the fuselage sides.

Before mounting the fuel tank, remove that portion of the building crutch between the firewall and former #2. This allows you to mount the tank at the proper height. Install equipment, engine, etc.

Position the servos to balance the model as shown on the plans.

To install the top wing, a certain procedure must be followed: mount the inter-plane struts to the bottom of the top wing. Notches in struts fit around the dowel in the wing. They will fit only one way. Holding one strut in each hand, and with the leading edge of the wing facing you, place the bottom end of the struts in the slots of the bottom wing at a slight angle. Engage dowels with struts and rotate the whole assembly forward until the holes in the tabs are aligned with the holes in the struts. I use 6-32 nylon bolts to mount the top wing.

#### **Flying:**

Caution! The recommended control surface throws are as follows: Aileron 3/16" each direction; Rudder 1/2" each direction; Elevator 1/2" each direction. Do not attempt to fly until these are adjusted. We know from experience.

Make sure that the C.G. is still correct. If you have wheel pants, make sure the wheels cannot rub the pant when the wheel flattens, causing it to bind. I feel that this is one of the greatest causes of ground loops. You might want to make the first flight with the pants removed.

One last check - - - everything tight, engine running correctly, range check okay? Increase power slowly. Add a small amount of right rudder and release after the tail lifts. Once the tail has lifted, the Pitts will track straight for as long as you want her to. Break ground by feeding in a little up. Once airborne, gain altitude for trim changes - - - it's safer up there.

Good flying and I hope you enjoy your Pitts S2A as much as we do.

## **From RCModeler Dec. 1978**