



# Pietenpol 'Four'

**RCM's Pietenpol (#613) has been updated with ailerons and a .40 four-stroke engine. It's a whole new airplane and well worth building and flying.**

**By Gene Wallock**





**T**he 4-cycle craze is sweeping the civilized modeling world and why not; they're quiet and economical to operate. Several years ago, when the first Saito 30 4-cycle became available it was installed in a House of Balsa Pietenpol (RCM Plan #613) and was a real fun machine on rudder, elevator and throttle only. I decided to update the Pietenpol design to incorporate ailerons for a more realistic looking appearance and incorporate a built-up tail to simplify balancing and add to appearance. By now you must have guessed if I don't like the model's looks, I won't build it. Besides, I think it's refreshing to have an aileron trainer type model that doesn't have "ugly," "box," "lil" and "stik" in its name.

Before you start building, you'll look twice at the wing location above the fuselage and swear it has negative incidence. Well, it does, to neutralize the positive mean camber of the airfoil. In other words, the model won't balloon on you at level flight.

#### CONSTRUCTION

##### Fuselage:

The fuselage forward end is lite ply for handling durability and the aft end is built-up balsa for lightness. Pretty straightforward stuff except the built-up aft section underlaps the forward section. Now that I've got your attention, let's proceed:

1. Cut out one each left and right fuselage forward sides from lite ply. Mark the insides with an "L" (left) and "R" (right) in dark pencil or ink. No one will see it and the model will fly

#### PIETENPOL 'FOUR'

Designed By:

Gene Wallock

##### TYPE AIRCRAFT

Sport/Stand-Off Scale

Aileron Trainer

##### WINGSPAN

63 $\frac{3}{4}$  Inches

##### WING CHORD

11 Inches

##### TOTAL WING AREA

701 Sq. In.

##### WING LOCATION

High Wing Parasol

##### AIRFOIL

Semi-Symmetrical

##### WING PLANFORM

Constant Chord

##### DIHEDRAL EACH TIP

2 $\frac{1}{2}$  Inch

##### O.A. FUSELAGE LENGTH

39 Inches

##### RADIO COMPARTMENT SIZE

(L) 5" x (W) 3 $\frac{1}{2}$ " x (H) 4 $\frac{1}{4}$ "

##### STABILIZER SPAN

18 Inches

##### STABILIZER CHORD (incl. elev.)

6 Inches

##### STABILIZER AREA

103 Sq. In.

##### STAB. AIRFOIL SECTION

Flat

##### STABILIZER LOCATION

Top Of Fuselage

##### VERTICAL FIN HEIGHT

6 $\frac{3}{8}$  Inches

##### VERTICAL FIN WIDTH (inc. rud.)

5 $\frac{1}{4}$ " Avg.

##### REC. ENGINE SIZE

.40 (4-Cycle)

##### FUEL TANK SIZE

8 Oz.

##### LANDING GEAR

Conventional

##### REC. NO. OF CHANNELS

4

##### CONTROL FUNCTIONS

Rud., Elev., Ail., Throt.

##### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Plywood
Wing	Balsa & Ply
Empennage	Balsa, Ply
Wt. Ready To Fly	72-88 Oz.
Wing Loading	14.8-18.1 Oz./Sq. Ft.

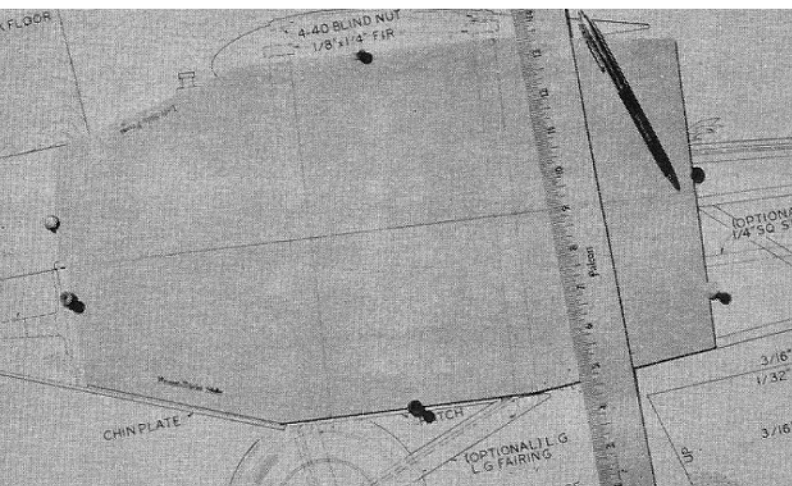
funny with left thrust and a tractor propeller (I don't mean a John Deere tractor).

2. Mark the tank floor location using the dotted lines on the pattern as a guide.

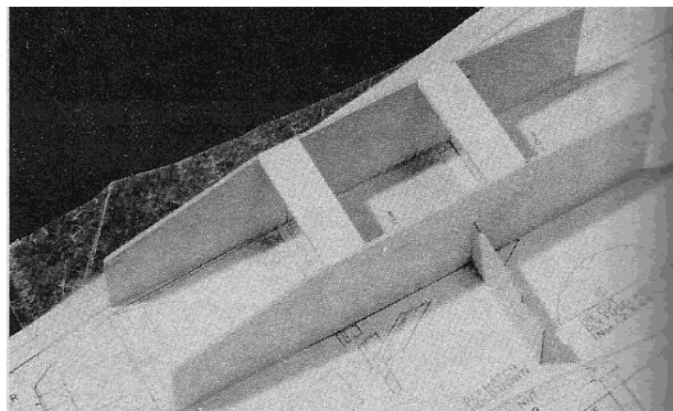
3. Place the sides on the fuselage plan with the "L" and "R" up, and mark the cabane locations. If you line up the rear edges of the sides, you'll stand a good chance of building the forward fuselage correctly. If, by some gross error, you line up the front bevel when marking the cabane locations, your wing mounting will be something to behold --- none of which is a joy!

4. Cut two cockpit floors, two former #9s, two strut attach plates and two servo mounts. I know the word "two" was repeated too many times --- too bad! Hopefully you have a Dremel #580 table saw or access to one because all the aforementioned parts have a common dimension: the inside spacing of the forward fuselage. If all the parts are cut on the same set-up, it's very easy to build a true forward fuselage.

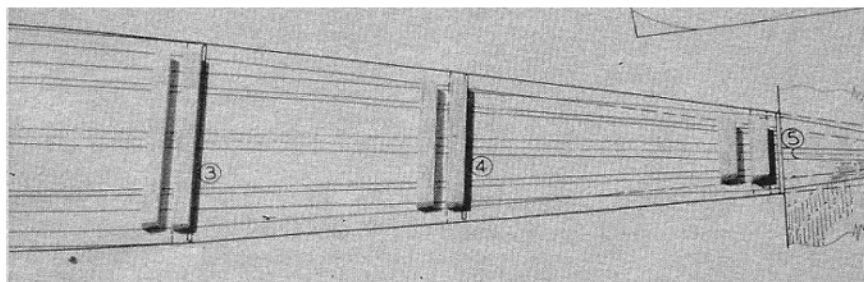
5. Well, it's time to assemble the forward fuselage. Use the top view as a guide to properly align the cockpit floors and strut attach plates. I use waxpaper over the plans to prevent the Zap from bonding to the paper and I suggest you do the same. I glue all parts with Zap CA and go over completed assemblies with Zap CA+. In the old days I double glued with Comet cement and never got out of the habit. Tape the cockpit floors and strut attach plates to the fuselage sides in



Place the forward fuselage sides on the print with the aft ends even and mark the cabane locations.



Place waxpaper over print. Glue landing gear mounts and cockpit floors to the fuselage sides using the fuselage top view as a reference.



Cut aft fuselage cross-pieces using the plan as the reference.

their correct position; the forward edge of the floors are in line with the aft end of the cabane locations and the aft edge of the strut attach plates are in line with the aft edge of the cabane locations. Use a #9 former as a 90° triangle to insure squareness. Zap the

floors and plates to the sides. Try not to make the tape a permanent part of the fuselage due to overzealous gluing (that's a bottle of Zap, not a water pistol).

6. It's all down hill from here. Build two identical aft fuselage sides

out of 1/4" square balsa. You know they're identical, because you don't have to mark them "L" and "R."

7. Place the forward fuselage section back on the fuselage top view. I assume you've removed the tape. Pin the assembly to the plan through the cockpit floors. Again, line up the aft edges on the reference line. Pre-cut the 1/4" balsa cross pieces per the top view. Plan to use a former #9 as a 1/8" shim to maintain parallelism between the top lite ply edges and the 1/4" balsa top longerons.

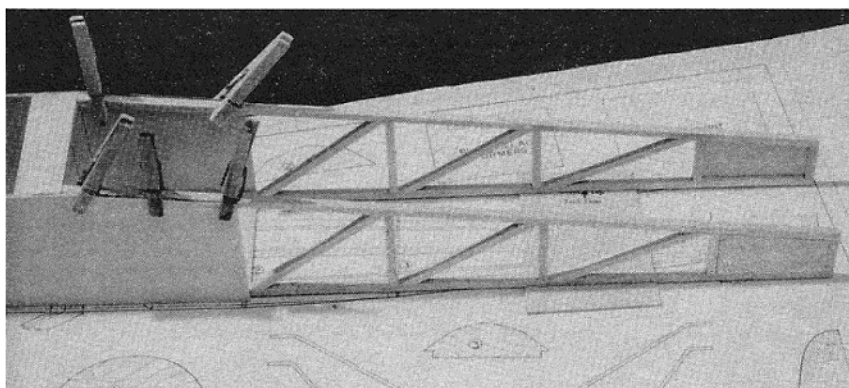
8. Glue the built-up frames to the forward lite ply section. The 1/4" top longerons end at the aft cabane rear edges and the bottom longerons butt up against the rear strut attach plate.

9. Pull the built-up frames together at the rear. Don't glue the rear post yet! Insert and Zap the upper and lower cross pieces you cut in step #7. Now glue the rear posts together.

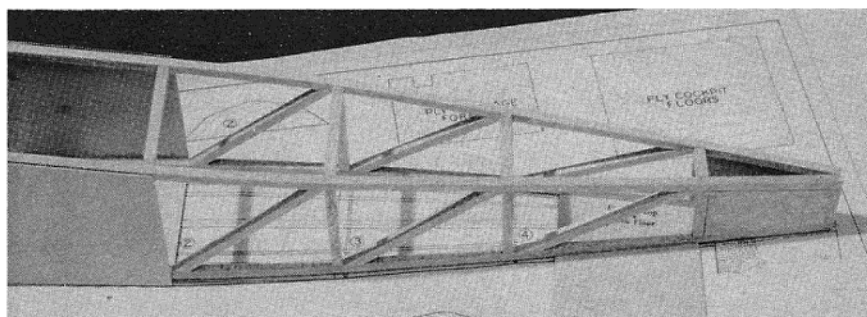
10. Before you go any further, verify the straightness of the fuselage. If you've built it crooked, twisted or angled, straighten it out now.

11. Fabricate all the remaining parts for the fuselage; tank floor, firewall, chin plate, radio hatch, nose block and ring, cowl sides, tank access cover and cleats and the landing gear components. In addition, make four equal length cabane struts.

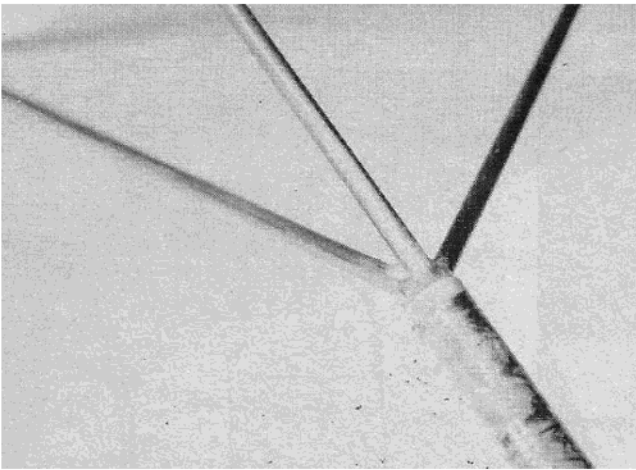
12. Clamp the forward and aft landing gear wires to the fuselage as shown using standard landing gear clips and #4 x 3/8" sheet metal screws. Bundle with the 3/32" diameter spreader axle and slide each end into a 1/4" O.D. brass tube. Tack together with Zap. Slip on the wheels and tail wheel and do some preliminary taxi testing on your driveway or garage floor. If the model veers left or right, twist the wire bundle (a little at a time) within the brass tubes which will effectively turn



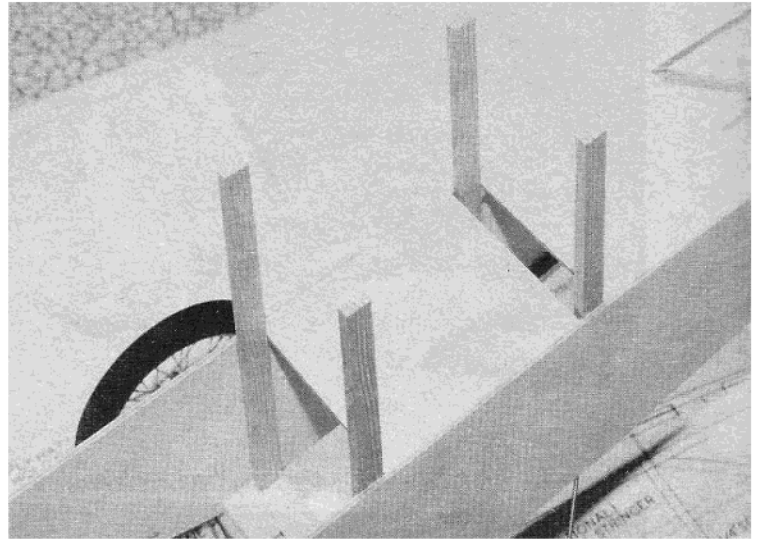
Using the tank floor as a shim, Zap the aft and forward fuselage sections together.



Zap the bottom cross-pieces in. Lift assembly and Zap in the top cross-pieces.



**ABOVE:** Silver solder the 3/32" landing gear components into the 1/4" O.D. brass tube. Be sure model tracks before soldering. **RIGHT:** Zap cabanes to fuselage sides and landing gear mounts. Be sure cabanes are equal height above the fuselage.

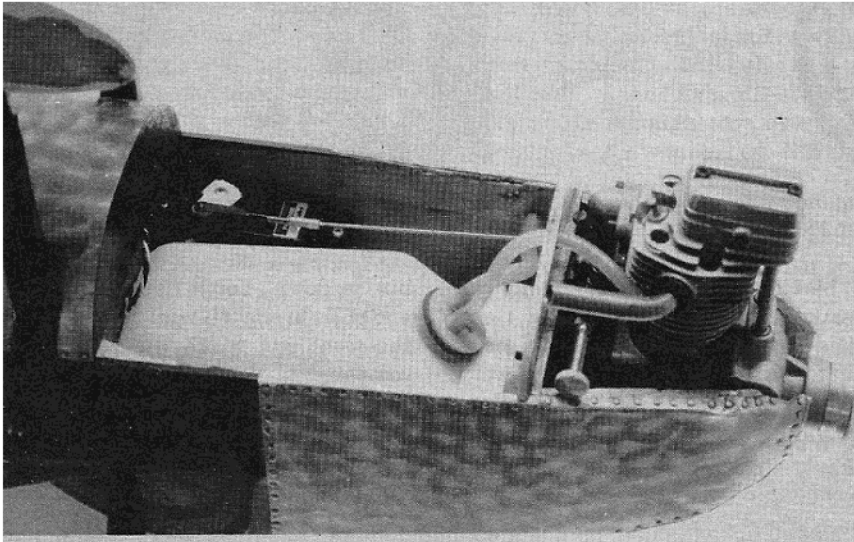


the wheels left or right. Be sure to Zap the wire bundle each time you twist or you will be running taxi tests for weeks. When the model rolls straight, silver solder the wires into the tubes.

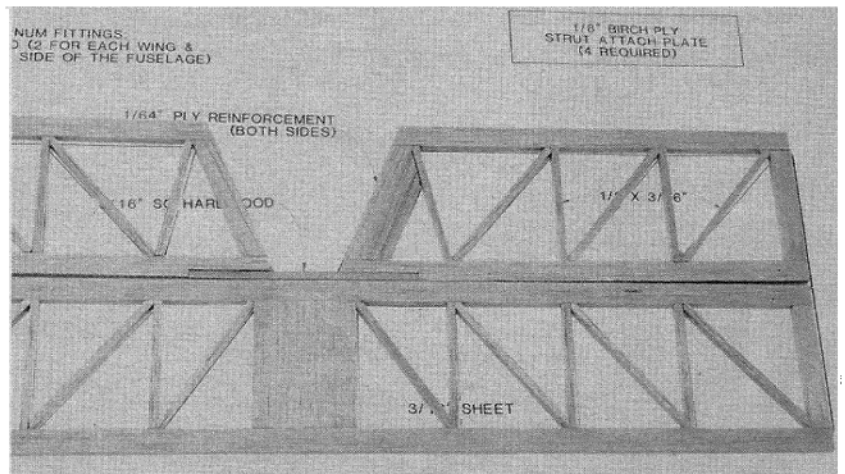
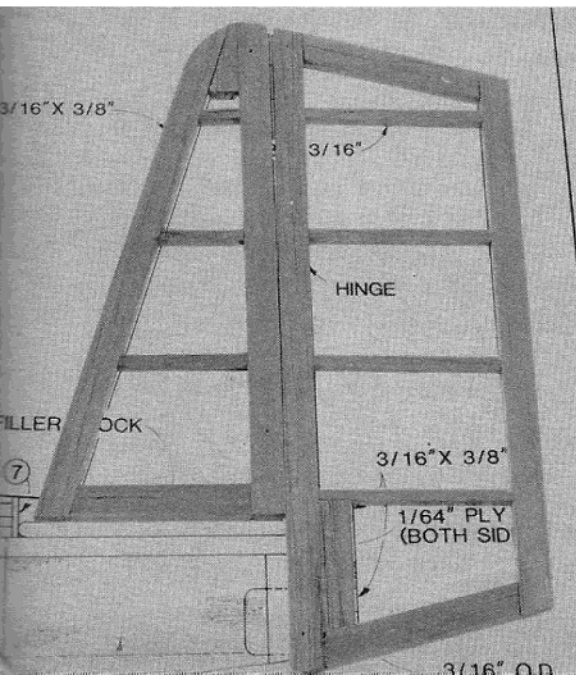
Silver solder a 1/4" I.D. washer on the inboard end of each tube for a wheel stop. Slip the wheels back on the tubes with another 1/4" I.D. washer on the outside edge of the wheels. Drill a

1/16" hole through the tube for a cotter pin. Locate the hole so that if you're off location, the wheels will have a little side-play. If the holes are too close to the wheel you'll have a non-turning wheel when you install the cotter pin. In the event you really don't like cotter pins, buy a big wheel collar and stick it on the end of the tube. This of course will look like a wart on the end of a witch's nose, but I don't like to comment on people's taste.

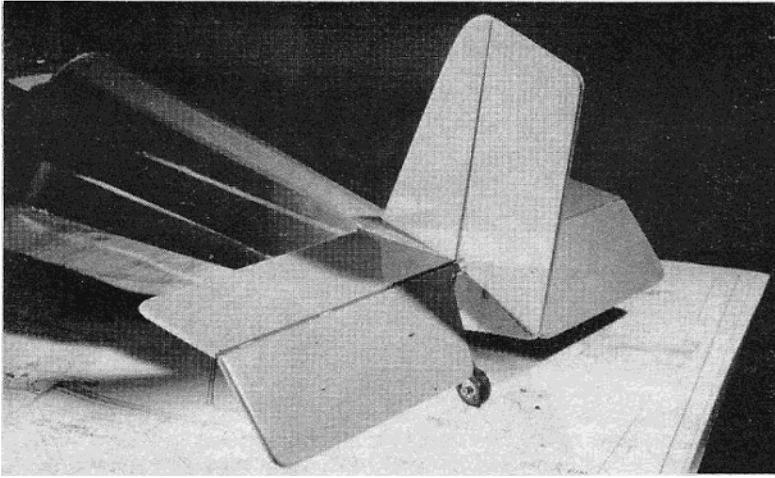
13. Shape the balsa cockpit blocks and notch for the cabane struts. Don't glue the blocks in yet; it's just a lot easier to shape them without the cabanes in place. Now Zap the cabanes to the inside of the lite ply forward fuselage sides, using the guidelines you put in at step #3. If you made the cabanes at different lengths, equalize the lengths right now or your wing



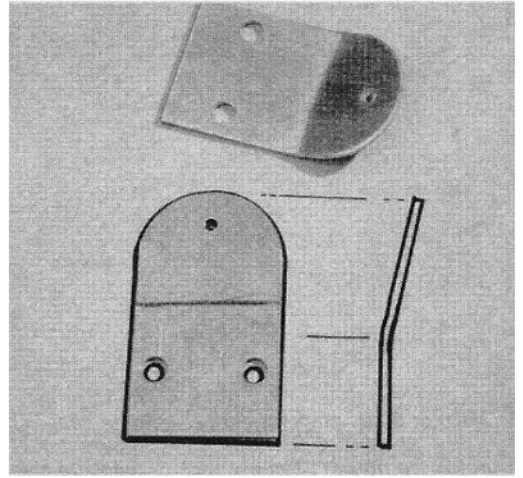
**Fuselage front end showing the tank and throttle servo installation.**



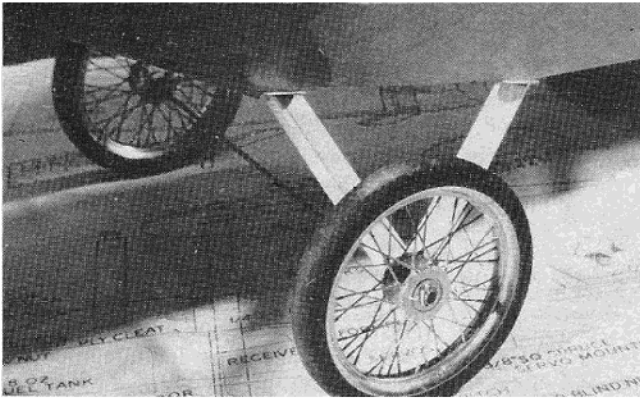
**Built-up fin/rudder and stab/elev.**



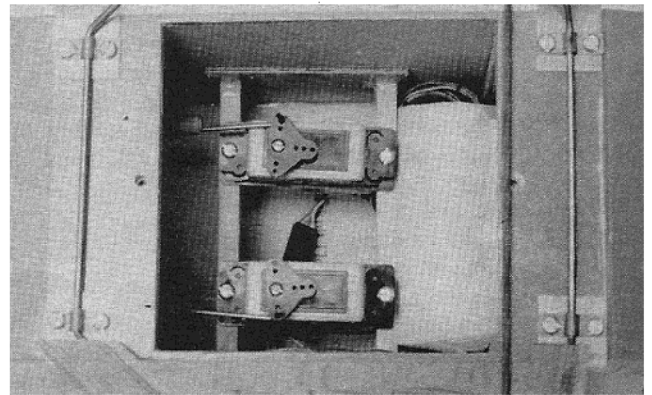
Tail group in place. Would look clunky without the filler blocks!



Fabricate eight strut attach clips. Bend the angles on a table edge (not your mother's or wife's) to agree with the strut installed position.



A set of House of Balsa wire wheels dresses up the model. Be sure the cotter pin retainer is bent over or your wheels will go trucking on their own.



Typical radio installation. You'll notice I never throw anything away, even old radios.

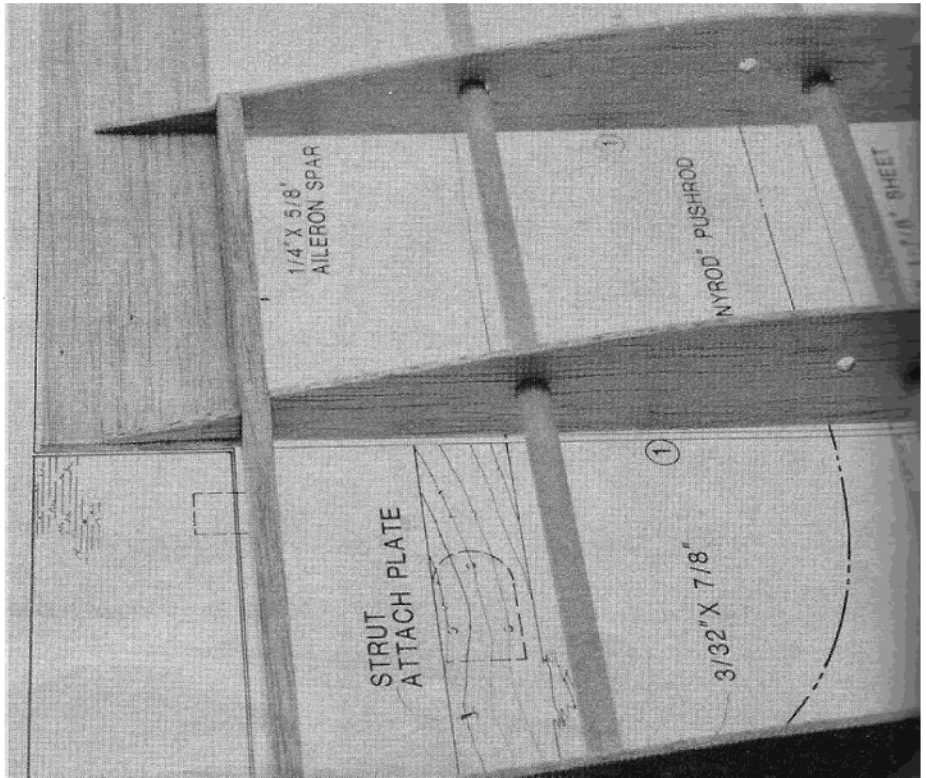
installation will be tilted. Remember the guy who tried to level a four legged table by cutting a little off each leg at a time; the Pietenpol is a parasol not a shoulder wing airplane.

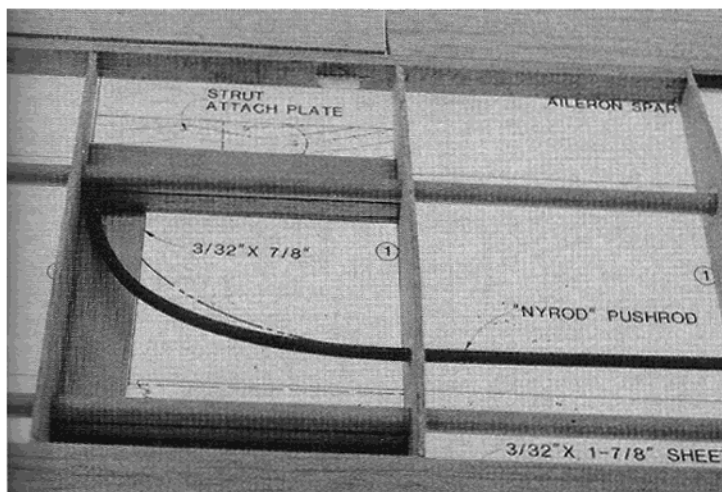
14. Glue in the former #9s and the tank floor. Remember the floor guidelines from step #2. The floor is cut for right thrust so you'll know very quickly if you're installing the floor

upside down. You'll notice the front end pulls in slightly; its supposed to or the front end width will look huge compared to the prop diameter. The notch in former #9 is to clear the

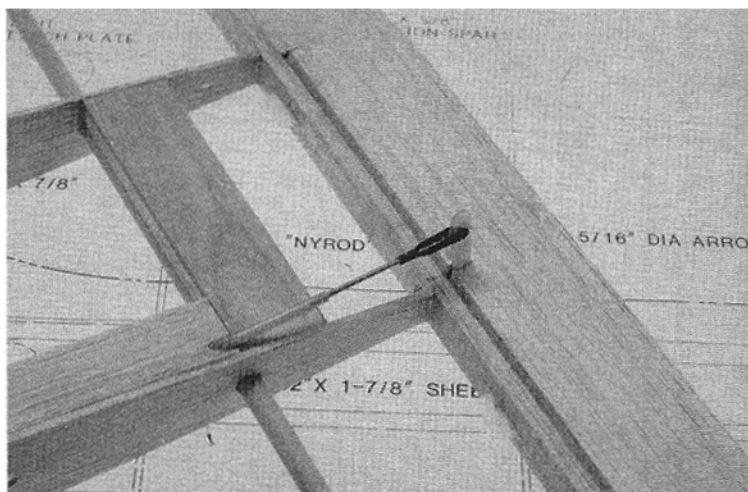
Bottom planking layed out and end ribs Zapped in place. Dihedral angle gussets and a House of Balsa "upright" make the job a lot easier.

Wing spars, ribs and aileron mount spar in place.





**Aileron pushrod guide. Note smooth, natural curve.**



**Check the aileron linkage for smooth action and correct throw capability before covering.**

throttle linkage, so verify your linkage orientation before Zaping in #9.

15. Obviously, you've selected an engine for your model. Hopefully it's not a Quadra but something that will fit in the engine space envelope. If you were thinking, you also bought the engine mount you'll need. I do not recommend Zaping in the engine. The side thrust is built into the fuselage as well as the down thrust; therefore, center the mount on the firewall between the sides and position the thrust line of the mount to match the plan. Most .40 4-cycles are about the same physical size, but verify the drive washer face location to the plan before you drill any mounting holes in the engine mount. Now, drill the mounting holes in the firewall to match the location and size of the mount holes. Undersize mounting hardware loosens up very fast and you'll look ridiculous trying to catch an engine that fell out at 500 feet. Install blind nuts on the backside of the firewall and Zap them in.

16. Glue the firewall in place. I usually Slo Zap them in but if you need your epoxy security blanket, use the 4-hour type not 5-minute. The glue must soak into the wood for a strong joint. The Slo Zap soaks in very fast while epoxy takes a lot longer.

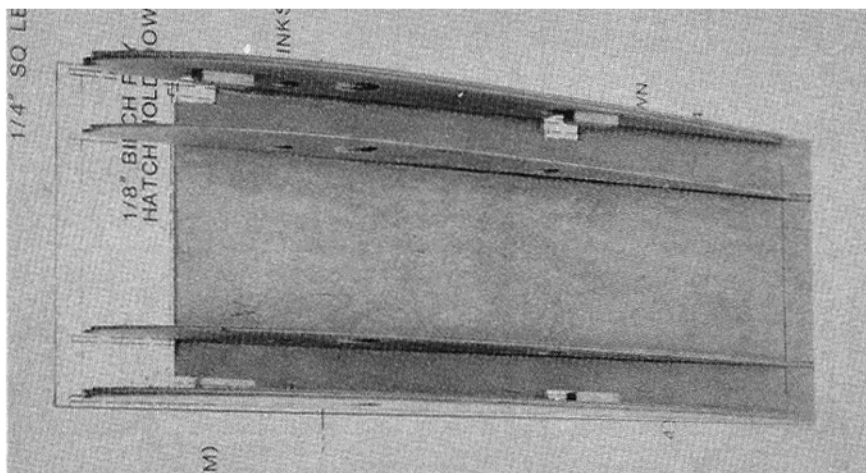
17. Temporarily install the engine mount using all the hardware (size and length) that will be used on final installation. The back of the firewall will look like a four quilled porcupine. If the mounting screws don't come through, you haven't got enough thread engagement in the blind nut. If they're exactly flush with the nut, drop everything and head for Las Vegas; you're on a roll. Plan on using a

foam cushion between the tank and firewall just in case. Plot your fuel and filler line holes through the firewall, as well as your throttle linkage. I didn't say drill them yet. Make sure the tank is replaceable with the installation you've planned. You destroy the structural integrity of the mount if you had to drill holes in it to clear fuel lines and linkage; that's why we're going through this exercise. When the path is established, drill the holes and remove the mount.

18. Zap the formers and aft stringers on, as well as the cockpit blocks you shaped in step #13. Zap the 1/8" x 1/2" ply tank access cover cleats in place. Tape the 1/32" ply access cover in place and pilot drill the 4-40 screw holes. Remove the cover and install 4-40 blind nuts in the cleats. Remember, we're in the tank compartment so plan on a foam bumper on the tank sides. Zap on the cowl sides, chin plate, nose block, nose ring and the 1/4" x 1/4" balsa spacers in the cockpit openings. Install the

radio hatch and blind nuts. Fill in the rear side fuselage bays with 3/32" sheet for control rod guide exit mounting. Big long slots are nice if you're digging a wall footing, but are really tacky for pushrod exits. Trial fit the radio and install the pushrod guides. The tail group control horn locations are shown on the plan (that's what that 1/32" plywood is for), so exit locations shouldn't be a problem.

19. Remove the landing gear, radio, hatch covers and anything else that isn't part of the fuselage permanent structure. We are about to venture into the 4th dimension; it's called sanding! I sand initially with 120 grit garnet paper. Anything coarser than that and you put in gouges that require a trowel and pallet of spackle to fill. I finish with 400 grit dry. I also cover everything with MonoKote. I found it to be the lightest way to finish a model, and the fastest. I don't have to prepare the structure like I did for silk or paper covering. The only real work



**Center section initial assembly. Straightness counts for wing alignment and uniform dihedral.**

you have to do is sanding the cowl from a rectangle at the firewall to a circle at the nose ring. An X-Acto carving blade makes short work of the roughing cuts. The transition from the lite ply front to the 1/4" aft framework leaves a 1/8" step. Four pieces of 1/8" x 1/4" balsa Zapped to the 1/4" x 1/4" longerons between formers #5 and #6 and sanded to the natural contour of the aft fuselage will make you look like a pro. If you leave the 1/8" step the whole world will know you're a hacker! When you've finished sanding the fuselage, gently rub it with your hand. You're not getting involved with it, you're just checking for lumps and bumps you may have missed. Get rid of them now or you'll be looking at them in the covering.

#### **Tail Group:**

20. The tail group is so simple it's really a waste of paper to go into great depth on how to cut sticks. Two items, however, are worth considering:

A. Be sure all the 3/16" stock is the same thickness or you'll end up sanding the tail 5/32" thick. That will make it pretty weak.

B. Be sure the hinges are in the same plane (straight line) or you'll have an oil-can effect at 0° throw. The servo will need steroids to hold a surface at 0° and the flight battery will think it's lighting Pasadena. Obviously flight time per charge will suffer greatly if you allow this condition.

#### **Wing:**

21. Fabricate all parts required to build the wing center section and outer panels. A brass tube, sharpened on the inside makes a dandy hole cutter for the spar and pushrod guide holes.

22. Build the center section first by pinning down the lite ply cabane plate. Make a left and right hand rib #3 and #4 assembly and Zap to the cabane plate edge. A House of Balsa upright comes in handy about now to insure the ribs are perpendicular to the plate. Zap the remaining #4 ribs onto the plate. Use the lineup marks on the plan for side spacing and the arrowshafts for temporary fore and aft locating tooling. Add the hatch hold-downs and set the assembly aside. The notches in rib #3 establish the incidence so cut them accurately. When you Zap in the 1/8" x 1/4" fir stops on top of the notch, line them up carefully.

23. Both wing halves are shown so there shouldn't be any problem building two left hand panels. As a

precaution, cross the plan off when the panel is done. Construction is straightforward sheet trailing edge and sheeted top leading edge. Ribs #2 are planked completely top and bottom, so either pre-glue the 3/32" sheet or raise the ribs during construction. The wing spars are 5/16" diameter **arrow shafts**, not birch dowels. The arrow shafts have no grain runout while birch dowels have never heard the term "straight grain."

24. After the three basic wing sections have been built, it's time for the one critical operation on the wing. The outer panels are held to the center section with 1/16" dowels that go through the arrow shafts. To perform the drilling operation, slide the outer panels into the center section. Block up the end ribs 1/4" to eliminate a flat wing drooped look. Now, let's think for a minute. The arrow shaft isn't a steel rod so it's not going to offer too much resistance to drilling. An electric drill is cumbersome and makes holes fast — not necessarily where you want them. I use a pin-vise which X-Acto, among others, sells. Locate the hole position and start the hole with a pinpoint dent. This keeps the drill from leaping off the shaft as you begin drilling. The inner rib #4s provide vertical reference for the drill. The only visual requirement on my part is to drill through the shaft centerline which is 5/32" from either edge of the shaft. If you're still a little unsure about this operation, practice on the spar just inside the tip rib. Be sure to Zap the practice holes shut when you're done.

25. Make the ailerons from light 5/8" x 1/8" sheet. It's more important that they weigh the same than lightness. Remember the servo still has to move them so keep the hinges lined up or the oil-can effect will raise its ugly head again. It's now time to trial check the aileron servo direction. Place the servo in the center section and actuate. Set the trim at 0° so that you don't have a clocking problem later on. Feed in right aileron and watch the servo output wheel. The right ball link should move towards the right tip. If the direction is reversed your servo may be left-handed, your transmitter servo reverse switch in the wrong position, or the ball links are mounted on the wrong side of the wheel (rotate the wheel 180°). In any case, fix it now; you are building a crash!

26. Install the nyrod pushrods and guides and check for smoothness of

operation. Drag cuts down battery flight life.

27. Remove the pushrods and Plasti-Zap the guides in. Finish planking the wing, add the tips, sand and check for lumps and bumps. Make them go away!

28. The wing struts are functional so we better build some to hold the outer wing panels up. They're made from straight grained fir or spruce. A simple 1/16" Z-bent wire will do nicely at the fuselage fitting while an adjustable steel snap link is used at the wing panel fitting. If you don't need to adjust the strut lengths your building is superb and you probably lie like a rug. I've alluded to fittings; you'll need eight for the model. Fabricate them from .032 aluminum sheet per the pattern on the plan. The mounting holes are on standard 1/2" centers to match the landing gear clamps. A 1/16" diameter hole will accept the wire and snap link.

#### **Trial Assembly:**

30. You have a golden opportunity to shine & impress your buddies with your building prowess. Trial fit the entire model. Check dihedral, incidence, servo direction, the antenna wrapped around the receiver. Wait a minute! You plan on letting the antenna hang out the bottom through a notch in the radio hatch — right? Is it okay if I watch you give the engine full throttle while you're standing on the antenna? Your act is classier than that. You prefer the WW II installation where the antenna magically rises out of a top hole or mast and heads directly for the fin where it's terminated with a rubber band and a bent pin! How about a plastic tube inside the fuselage that the antenna slides through? It makes a much cleaner installation and nobody asks you what that string is for. Make the tail filler blocks while you've got it assembled. One item we haven't taken care of is the strut fitting attachment to the outer panels. Turn the model upside down on the floor and slip a 1/4" shim under the center section. This will duplicate the incidence you built in — in step #24. Center the steel snap links on the threaded strut rods, attach the mounting clips and install the clips to the outer panels using #4 sheet metal screws.

#### **Finish:**

31. Fuelproof the tank and engine compartments. If the cabanes and cockpit floors aren't going to be covered, fuelproof them too.

32. Select your favorite covering material and prepare the framework as required for that specific material. I cover in the following sequence:

- A. Fuselage
- B. Tail Group
- C. Wing Center Section
- D. Wing Outer Panels
- E. Tail Filler Blocks

**Assembly:**

33. Install the landing gear assembly, strut clips, wheels, engine, tank, radio and pushrods into and onto the fuselage. The trial fit at step #30 now pays off because there's no surprises. Zap on the tail group and tail wheel assembly. It goes on straight because you insured that at step #30!

34. Zap in the filler blocks by the fin and stabilizer. The fillers are only for aesthetics, but why have the model look like the box your motor oil came in?

35. Mount the wing center section to the cabanes using Zap CA - . If epoxy still blows your skirts up, use 4-hour curing time. Make sure it doesn't run down the cabanes while it's drying.

36. Install the strut clips in the outer wing panels. Insert the outer panels into the center section and hook up the struts. Connect the aileron pushrods to the servo ball links and the aileron horns.

37. Before you install the aileron servo hatch and radio hatch, check the following:

A. The 1/16" dowels are through the 5/16" arrow shafts so that the wing panels won't fall off in flight.

B. The aileron servo does have servo mounting tape holding it down to keep it from moving instead of the ailerons.

C. The pushrod connections are solid and all steel snaplinks have keepers.

D. The antenna is not wrapped around the receiver; it's in its tube.

E. The wheel cotter pins are in and bent over.

**Control Throw,**

**Balance and Flying:**

38. The control throws are as follows:

Rudder: 3/4" left and right.

Elevator: 1/2" up and down.

Aileron: 1/2" up; 1/2" down.

39. Balance where shown on the plan — no exceptions.

40. Before you attempt flying, check your fuel consumption, so that you'll know your approximate flying time. Then back off two minutes for safety. The model will dead stick in but it's a little tricky trying to taxi back to your pit area.

41. If you're an experienced pilot this aileron Pietenpol is a pussycat to fly. It has no bad habits unless you've washed in the wing tips. They should be straight or you'll tip stall. Actually, this applies to any model. A Robart Incidence Meter is a must tool for checking surface trueness. If you're a novice pilot, I can't tell you on paper how to fly. Beg, borrow or steal the services of a competent instructor to help you solo. □

**From  
RCModeler  
Dec. 1 1984**