



**S. Calhoun Smith builds
Radio Control
miniature of**

WITTMAN'S "TAILWIND"

One of the world's best-performing home-built planes scaled down by one of the world's best designers. Result: a radio controlled model that performs almost like the real aircraft! We give you Cal Smith's version of Steve Wittman's famous W-9L. Not only did Smitty do the model engineering, he's responsible for this "how-to" article, the plans and photographs. By far the year's best R/C scaler, this is remarkably easy to duplicate. Strong? She thrives on rough treatment! For rudder-only use 15-size mill; multi takes a 19 for real "he-man" performance

Big Jim Patmore delivers heave-ho to Smitty's R/C model Tailwind.



■ Steve Wittman's accomplishments in air racing and sport aviation make for a long and impressive record. His racers have been consistent winners and his sport aircraft which have always provided very rapid transportation are able to out-perform similar size and power factory-produced types.

Wittman Fan Club members will happily recall his "Chief Oshkosh" and his Curtiss Conqueror powered D-12 "Bonzo" of the late '30's. Champions of the Good-year Race era were "Buster" and "Bonzo." In the sport department the modern "Tailwind" had its ancestry in Steve's speedy "Buttercup," a two-place cabin design built in the late '30's.

Credit must also be given for several design innovations developed by Wittman—the Scimitar propeller, spring-leaf landing gear (now standard on Cessna aircraft) and the tapered spring steel tube gear featured on the Tailwind, first used on Buttercup.

Simplicity and high performance keynote the Tailwind design. That broad box-like fuselage may not be as handsome as some, but the smooth line from windshield to body top combine into an airfoil shape to gain lift from the fuselage. The 170-mph top speed is aided by a thin 9% wing section (NACA 4309 mod.) and single strut bracing. The single tube landing gear produces a minimum of drag.

The Tailwind design offered to homebuilders by S.W. is his W-8. Fuselage is welded steel tubing as are the tail surfaces. Wings have wood spars and ribs and plywood covering. With the exception of the cowling and aluminum covered forward cabin section, the airplane is fabric-covered including the plywood wings. The W-8 specifications are: Span, 20-ft 11-in; length 19-ft 3-in; wing area 83.5-sq ft; and gross wt. 1,250 lbs. Various engines can be utilized including the 85 or 95-hp Continental and 108 or 115-hp Lycoming. Performance varies with the different power plants . . . averages are: Maximum speed 170-mph, cruising speed 150-mph, landing speed 55-mph.

Our model is based on the most recent Tailwind, the W-9L, built by Wittman for test purposes. It is

basically the W-8 design with modifications. Wing span is shortened to 20-ft with area reduced to 80-sq ft. Wing tips utilize an aerodynamic shape designed to control tip vortices and spanwise flow which further aid performance and stability. Length is 19-ft 8-in. Most notable feature of the W-9L is its tricycle landing gear with castering nose wheel tube mounted with main gear. This gear design really absorbs the bumps while the aircraft literally floats along while taxiing. Engine in the W-9L is 160-hp Lycoming with Hartzell Constant Speed 70-in dia. prop. Performance is upped with maximum speed at 200-mph, cruising 175-mph at 75% power, landing speed 60-mph.

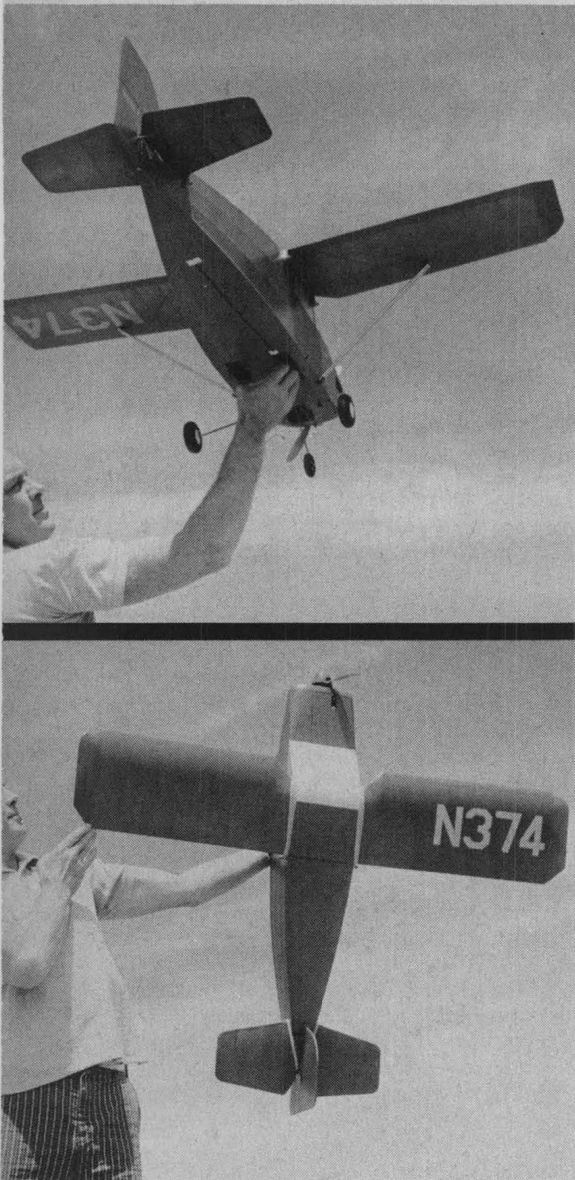
THE MODEL TAILWIND

Few models we have built have turned in such smooth flying performance as has this one. This is because many of the big plane's good characteristics show up in the model. An unexpected bonus resulted from the airfoil fuselage shape. Exhaust oil is carried well up and over the top, leaving the model clean. We found the only concentration of oil on the fin top.

The model is very stable, turns smoothly, recovers to level flight quickly; climb is flat and glide is fast. With modest .15 power and rudder-only radio control it is an excellent up, around and down sport flyer. It is not a contest busting screamer. Nor is it a super-detailed Nats' winning scale job. Some compromises were necessary in favor of flying performance. Our miniature retains all the outward appearance of the big Tailwind but it is constructed with the idea that it is to do a lot of flying. Concessions include a one-piece wing. Dihedral is 4° instead of zero as on the prototype. Airfoil thickness was increased to 12% (scale is 9%) to gain depth for spar strength. Wing is also partially openwork with fabric-covering, rather than being completely planked. Fuselage structure is openwork, fabric-covered with members close to scale locations. Cabin area and nose are planked to simulate metal covering of original. Windshield and cabin win-

Would you call this a wee plane or a mammoth model? Note cooling air duct in side of nose, necessary for sidewinder-mounted powerplant.





Top photo: Finger slots (not scale!) have been added to fuselage bottom for handling ease.

dows are doped on over planking rather than utilizing open scale-like structure which in this area would be too flimsy in miniature. Horizontal tail area is increased over scale size. Vertical tail is scale size and full scale rudder is used.

One added feature found necessary for ease of handling: finger slots built into the fuselage bottom for no-sweat hand-launching! With the fuselage $6\frac{3}{4}$ -in wide, it can be quite an awkward handful otherwise. The receiver switch can also be conveniently hidden inside one of these belly slots.

Our original miniature exhibited some ground-loving tendencies during its first flights. About 4° downthrust had been built in. This was removed and she now flies fine with 0° thrust line. Some right thrust is needed, however. Slightly more than a usual amount of negative stab incidence was needed to hold proper fore and aft trim.

Model is scaled at $2\frac{1}{4}$ inch to the foot, giving a wing span of 45-in, length 44-in and wing area of 397-sq in. Power on our original is an old K&B .15 Torpedo swinging a 9D-4P prop. With five pen cells or a medium battery load, a single channel receiver and an S-N escapement all-up weight is close to 3-lb. This weight and area is about right for a sport flyer, but if snappier performance is desired, you could go to a .19 engine. However, more controls will be needed to handle such power. There is ample room in the fuselage for additional R/C gear, but don't go overboard. Remember that wing area is under 400-sq in.

As is, this model Tailwind looks like a real airplane. And we ain't just whistlin' Dixie when we say her flight performance is a joy to behold.

FUSELAGE CONSTRUCTION

Begin by building complete side frames over the fuselage side view. Note marks above and below longerons showing upright positions when frame is built flat. Assemble one side frame

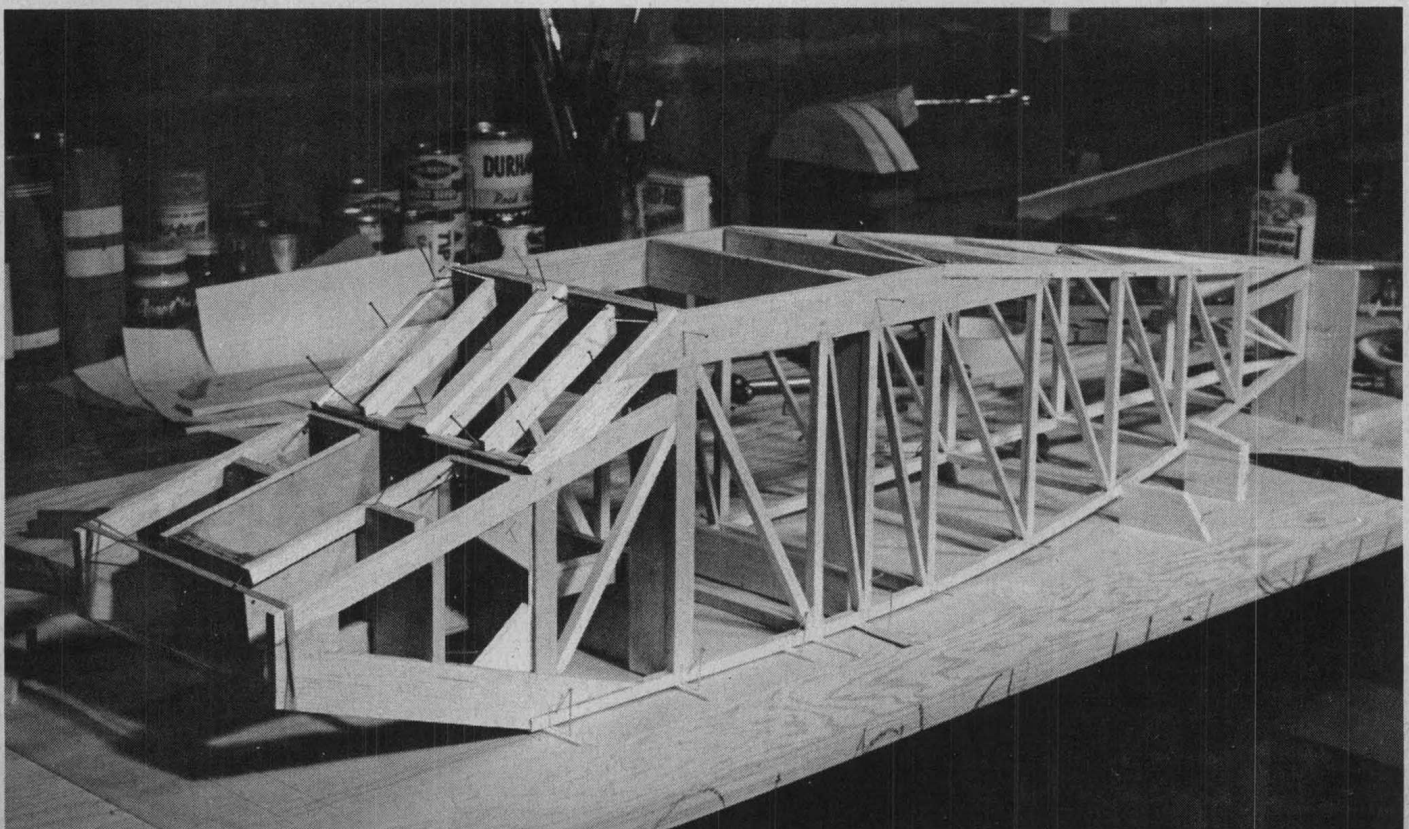
and let dry thoroughly, then build second side directly over the first to insure identical sides. To prevent cementing the two together during building put patches of thin tracing paper (not waxed paper) over joints of first side before pinning down second side parts. Next, assemble the fuselage formers over section drawings. Build formers 5, 7, 8, 9, 10 and 11. Note slight outward slant of side members.

That engine-landing gear mount should be built as a separate assembly now. This is a plywood box structure with pine or bass corner braces. Use white glue or Weldwood for this unit. Small brads will aid assembly. Cut out plywood bulkhead for Sta. 4 and glue the engine-mount box to this—align carefully.

Fuselage sides can now be assembled to formers over a smooth flat work surface. Note horizontal reference line on plan side view. This corresponds to work surface. Fuselage is level on bottom from Sta. 4 to 6, so these edges should lay flat on work surface. Install Formers 5 and 7 first and let dry. Fuselage sides are parallel in this area. Add Formers 8, 9, 10 and 11 in that order, working from cabin to tail. Block up tail to proper height from horizontal reference square and align carefully. Put Sta. 4 bulkhead with engine mount attached in place between sides and cement, drawing sides together to fit bulkhead. Further draw nose section of side frames together and cement to Firewall A, also add bulkhead halves a Sta. 3. While fuselage basic structure is still down on work surface, add diagonal braces in fuselage top rear section. Also add $\frac{1}{4}$ x $\frac{1}{2}$ " doublers inside cabin top edge, cross pieces behind Sta. 4 and windshield supports between Sta. 4 and top of 5. When dry, fuselage structure can be taken up from work surface. Add diagonal braces in lower fuselage rear and add $\frac{1}{4}$ x 1" crosspiece at Sta. 6 bottom.

This would be a good time to plan your cabin interior and R/C installa-

Basic fuselage structure of Cal's original model shown on the jig board (below); plans incorporate changes made to simplify building.



tion. In the original model we bridged the $\frac{1}{4} \times 1$ " bottom crosspieces from Sta. 4 to 7 with $\frac{1}{8}$ " sheet, having grain running fore and aft. We also planked the insides of the side frames in this area. This forms a strong box for battery packs and your foam-wrapped receiver. Inside planking is not absolutely necessary, but the floor is useful or can be raised about 1" or 2" for R/C unit mounting. If floor is not desired, hardwood rails can extend fore and aft bridging additional $\frac{1}{4} \times 1$ " crosspieces at Sta. 5, 6 and 7. In original model we simply bolted a 2" wide piece of $\frac{1}{8}$ " plywood across Former 7 to serve as an escapement mount plate. The plans show a typical servo mounting in phantom line utilizing $\frac{1}{4} \times 1$ " crosspieces and $\frac{3}{8}$ " square pine bearers between Formers 7 and 8. Precise R/C installation details are not detailed since equipment varies so much and R/C choice is up to the individual builder anyhow. Locate the parts where indicated on plans, however. CG location can be shifted by moving batteries ahead of or behind Sta. 4 bulkhead. There is ample room for any battery and R/C combination desired. And we do mean "any".

Outside of fuselage is finished next. Add $\frac{1}{16}$ " x $\frac{1}{4}$ " strips over aft longeron sides, then cap top and bottom of longerons, see detail at Sta. 10 on plan side view. Add $\frac{1}{16}$ " sheet planking to forward fuselage sides from Sta. 1 back to Sta. 7. Trim flush with longerons at cowl and windshield. Plank windshield area with grain running cross-ships. Add $\frac{1}{4}$ " sheet bottom between 4 and 5. Side and top bottom stringers should be added now. Note that they taper in width toward tail. Use a modeler's plane to reduce taper after pieces are cemented in place.

Landing gear plywood mount E should be shaped and fitted now. Bend gear wire to shape, attach with "J" bolts then glue mount in place. Put No. 2 x $\frac{1}{2}$ " wood screws through mount into engine mount beams and bulkhead 4 to strengthen joints. Cement upper and lower cowl blocks in place and carve to shape. Note removable section in top center for tank and battery access.

Finish tail section of fuselage by adding $\frac{1}{16}$ " plywood strips to sides for fin post mounting. Plans show vertical tail mounted with bolts and wood screws. This was done on original model in case modifications were needed or horizontal tail required extensive incidence changes. The removal tail mounting proved unnecessary so this feature can be omitted if desired. Once the stab trim is established after test flights, tails can be cemented permanently in place. Wing and tail hold-down dowels are added after fuselage is covered.

TAILS

These surfaces are simple flat structures. Fin and rudder can be assembled flat over the plan outlines. Round off leading edge and tip and taper trailing edge. Add rudder hinge before covering. Horizontal tail is also built flat over plan as with fin and rudder. Cap rib pieces top and bottom with $\frac{3}{16}$ " sq. strips, then carve or plane down to form an airfoil section as shown on typical section and tip profile.

AMERICAN MODELER ANNUAL 1964



Author SCS opens access hatch to get at fuel tank and batteries; model has ample space for just about any type of equipment you want to stuff inside.

BILL OF MATERIALS (Balsa unless otherwise specified)

8— $\frac{1}{16}$ x $\frac{1}{4}$ x 36": longeron, rib capstrips	3— $\frac{3}{32}$ x 3 x 36": wing ribs
4— $\frac{1}{8}$ x $\frac{1}{4}$ x 36": fuselage stringers	1— $\frac{1}{8}$ x 3 x 36": floor
1— $\frac{3}{16}$ x $\frac{3}{16}$ x 36": stab ribs	1— $\frac{3}{8}$ x 3 x 36": wing T.E.
3— $\frac{3}{16}$ x $\frac{3}{8}$ x 36": stab L.E., spar, wing L.E.	1— $\frac{3}{4}$ x 4 x 20": top cowl blocks
1— $\frac{3}{16}$ x 1 x 18": stab T.E.	1—1 x 4 x 12": bottom cowl blocks
12— $\frac{1}{4}$ x $\frac{1}{4}$ x 36": spars, fin, fuselage	1—1 x 2 x 18": tip blocks
6— $\frac{1}{4}$ x $\frac{1}{2}$ x 36": fin, fuselage	1—6 x 12 x $\frac{1}{16}$ ": plywood
5— $\frac{1}{4}$ x 1 x 36": fuselage, formers	2—6 x 12 x $\frac{1}{8}$ ": plywood
2— $\frac{1}{8}$ x 1 x 36": fuselage, formers	1— $\frac{3}{8}$ sq. hardwood x 18"
2— $\frac{1}{2}$ x $\frac{1}{2}$ x 36": wing L.E., spar	1— $\frac{1}{4}$ " dia. dowel x 18"
5— $\frac{1}{16}$ x 3 x 36": fuselage, wing planking	1— $\frac{1}{8}$ " dia. dowel x 6"
	2— $\frac{1}{8}$ " dia. x 36": steel wire
	1— $\frac{1}{16}$ dia. x 36": steel wire

Misc. hardware: Eight "J" bolts; 2-56 nuts; bolts; No. 2 x $\frac{1}{2}$ " woodscrews; pr. $2\frac{1}{2}$ " dia. Banner wheels; one 2" dia. wheel; $2\frac{1}{4}$ " dia. Merco spinner; Fuel Tank Perfect No. 7; two sq. yds. nylon; cement; glue; clear and colored dope. R/C gear and fittings as desired.



Actual size working drawings for Smith's version of the W-9L are available as part of Hobby Helpers' Group Plan # 640; scaled 2.25 inches to the foot, model spans 45 inches.

Structure here is conventional with over-and-under spar, planked leading edge and rib capstrips. The wing is not scale-like except for the rib spacing. Steve's big Tailwind has a two spar wing, but for the model a single spar was used for strength near maximum thickness point. Build the wing in three parts—right and left panels and center section. Only fussy part is the leading edge cut-out at the fuselage side junction. Cut the required number of ribs; all are 3/32" sheet. Note that centersection ribs W1 and W2, W3 are reduced in height for 1/16" sheet top and bottom planking.

Build an outer wing panel directly over the plan. Lay trailing edge and lower 1/4"-sq spar flat on plan while blocking up leading edge 5/32". Cement ribs in place, then add upper 1/4"-sq spar. Add 1/16" sheet planking to leading edge and rib capstrips before taking up panel from work surface. Assemble other outer panel in same manner.

Build flat centersection over plan as with outer panels. Note 1/2"-sq at leading edge and plywood spar joiners extend beyond centersection sides. Block up centersection ribs with 1/16" thick scraps to allow for bottom planking. Do not cover centersection with sheet until after it is joined to outer panels.

Join outer panels to center section by cementing at 1/2"-sq plywood joiners and trailing edge. Let dry thoroughly, then take up from board and complete leading edge at cut out. Add 1/2" sheet at centersection leading edge to form upper windshield wedge. Add planking to top and bottom of centersection and carve or plane leading and trailing edges to shape. Carve tip blocks before attaching to wings. Study photos and plan details correctly. Since the tip is somewhat difficult to form, work carefully. Cement in place when completed. Add such details as strut end mounts and 1/16" dia. wire to trailing edge to complete wing. Sand all exposed wood smooth, apply two coats of clear butyrate dope before covering.

Treat rest of model in same manner. Cover with Nylon. Apply at least four coats of clear dope, sand lightly between each. Four coats of colored dope will give an ample finish. Color scheme is all red, with light gray numerals, wing struts and gear legs. Cabin windows can be finished silver. Door and cowling lines are drawn on with black ball-point pen.

These final details remain: Wing struts, strictly decoration, need not be used for flying. But if they are, lower end attachment is flexible enough so wing can shift in a hard landing. Lower strut end should have a patch of inner tube rubber attached with Pliobond or Contact Cement. Pierce rubber with knife point so it will slip over wood screw in lower fuselage longeron. Under load the rubber can twist off screw head, but will hold during flight.

The scale-like landing gear should work well for R.O.G. take-offs from a smooth runway. We haven't had the opportunity to find out since our local flying site is rough ground with stubble. The nose gear does tend to deform and trip up our model when landing in this mess, so if your flying site is rough we recommend an additional brace from mount plywood to

