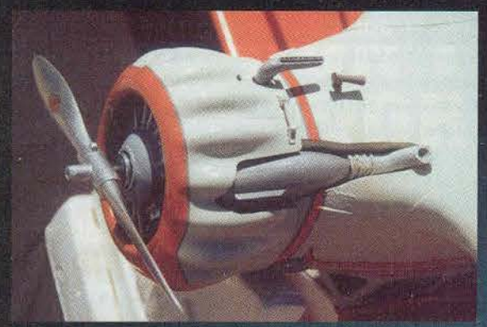
STINSON SR5-E



A 1/8 Scale Model Of A Golden Age Classic ... For .25-.32 2-Stroke Power

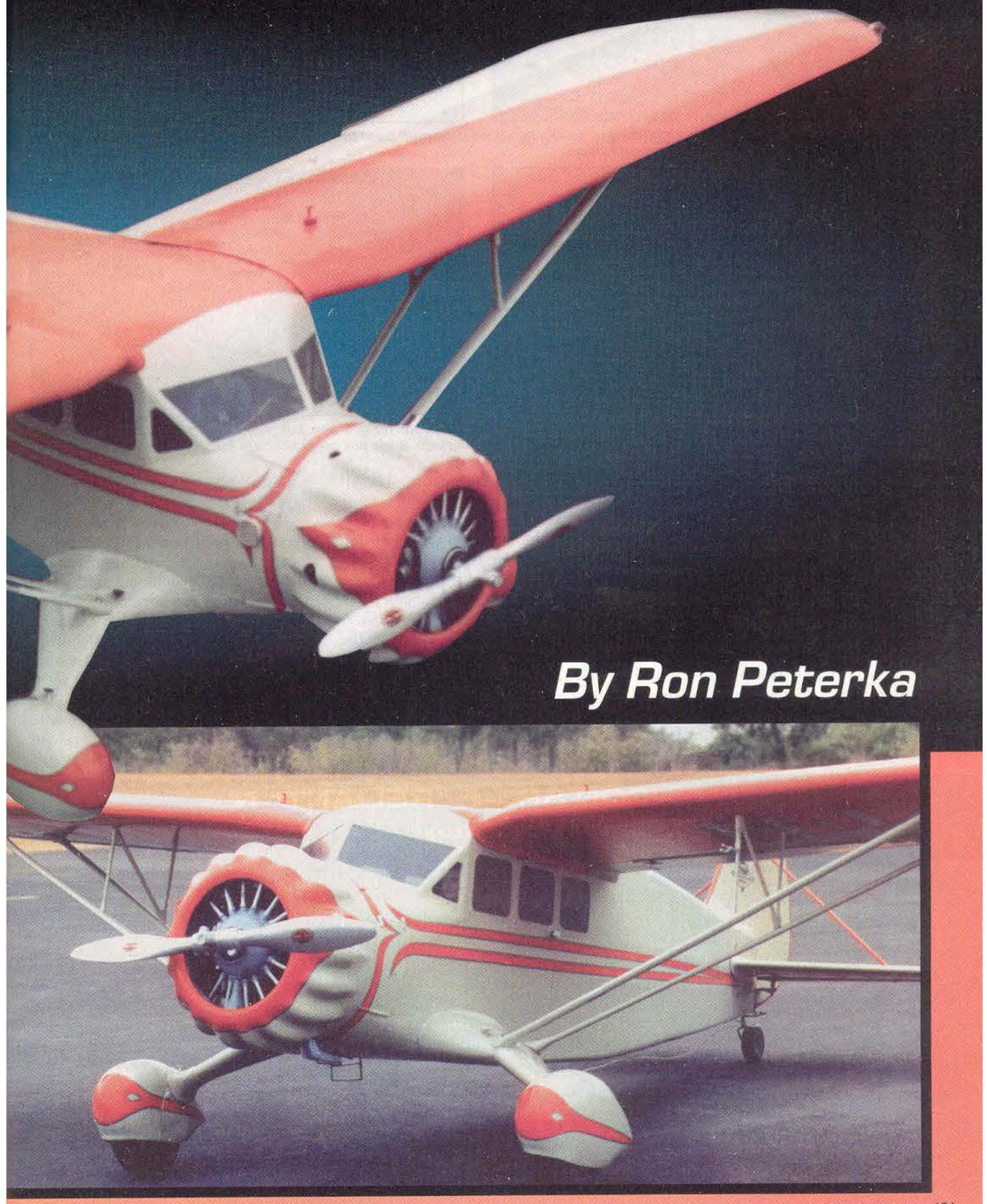
I never met Tom Laurie, he died a few years ago, but I know and respect his abilities. A lifelong modeler since the thirties, several of his free-flight designs were printed in the Frank Zaic Yearbooks, but his most outstanding project, in my eyes, is his restoration of N14187, a full scale Stinson SR5-E Reliant airplane. Even though Tom never managed to get a pilot's license, he persevered as a labor of love. When it was finished, Tom had to get a qualified pilot to fly it. He spent ten long years restoring this classic "straight wing" Stinson to such a high degree of perfection that it was awarded "1984 Grand Champion Antique" at the prestigious EAA Convention at Oshkosh against some of the finest antique aircraft ever presented for competition. This beautiful aircraft had been on display at the Gillespie Field hangar of the San Diego Aerospace Museum in San Diego, California, until recently when it was sold to a private owner. Excellent 3-views and photo paks are available from Bob Banka.

The SR8 through SR10 "Gull Wing" Stinsons are perhaps better known, but the SR5-E is a pretty design and a little easier to model with the constant chord wings compared to the highly tapered wings of the SR-8 or SR-10. This 1/8 scale model is a highly detailed model of Tom's Stinson, with measurements from the real craft taken to document almost every visible feature. Wing rib spacing is scale. Wing flaps, called "speed arresters" by Stinson, were an optional feature in 1934 and are installed on N14187. It was common in those days for each airframe to be highly customized to meet the customer's requests.

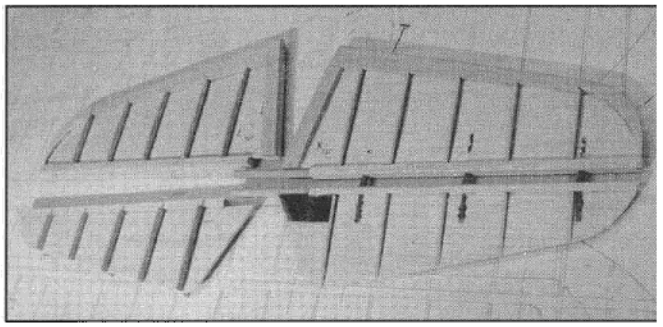
CONSTRUCTION

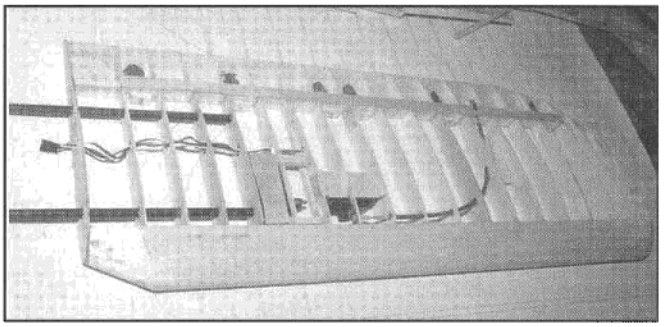
If you decide to build this model, be advised that it is a somewhat complicated effort, not at all a beginner's model, and will require some ingenuity in some areas. Any modeler who has built from plans should enjoy the challenge of this project. Please use these plans as a *suggestion* for one way to build the model, and feel free to change materials and detail design to suit yourself and your skills. At this time few applicable commercially manufactured parts are available. Fiberglass Master Inc., offers a 5-1/2" dia. Waco SRE cowl and they offer wheel pants that may fit for you. I enjoy the challenge of making my own pieces, so I built composite epoxy/glass cowl and wheel pants using foam for patterns, covering them with three layers of 3 oz. satin weave fiberglass

"RELIANT" N

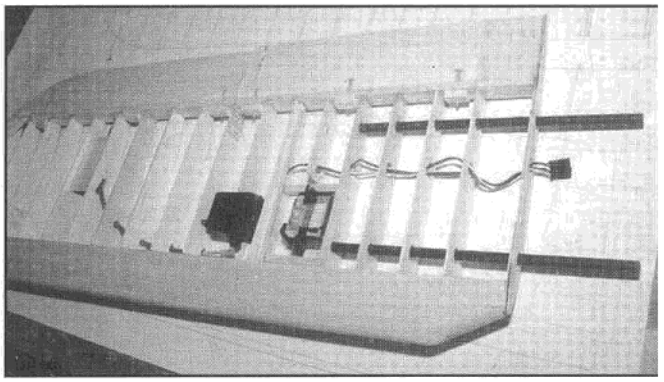


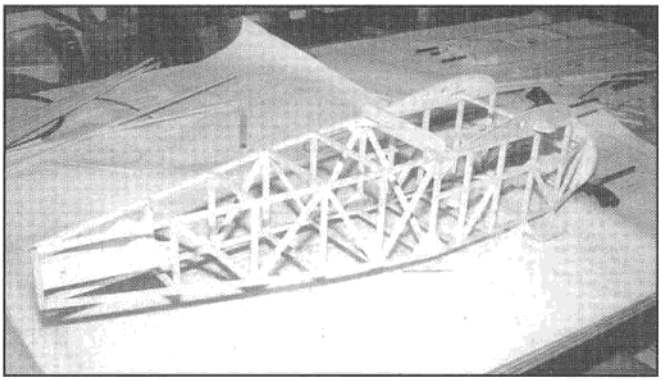
By Ron Peterka





LEFT: Horizontal stab construction. Lightening holes can be added if desired. Sand to symmetrical airfoil shape. RIGHT: Upper wing surface details. Note ply root rib and servo cable leads.





LEFT: Lower wing surface construction details. Original used flex pushrods for ailerons, but plans show pushrod and bellcrank. Separate servos could also be used. RIGHT: Construction details of fuselage. Basic box construction is light and rigid.

cloth, and using E-Z Lam epoxy resin from Aerospace Composite Structures to form a hard shell; same thing for the upper windshield and forward cockpit area. Balsa could also be used here. No curved or complex plastic canopies or windshields are required.

Easy stuff first. The vertical fin and rudder, along with the horizontal stab and elevators are simple 1/16" balsa shapes to match the plans. I cut lightening holes in some pieces just because I felt like it. The ribs are 1/16" balsa glued in place across the grain with 1/8" balsa leading edges cut from sheet on top and bottom. Install 3/8" x 1/4" balsa for the elevator leading edge and horizontal stab trailing edge. Soft balsa blocks form the transition from vertical fin to fuselage. Don't forget to put in balsa filler pieces so you will have a place to install hinges. Sheet the center section with 1/16" balsa. A 1/8" wire joiner is used to connect the elevator halves.

A very nice way to build a scale trailing edge for the rudder and elevator is to glue a length of 1/16" o.d. aluminum tubing to the 1/16" sheet center material. It is light and gives a realistic and evenly rounded trailing edge when fabric covered.

You will need a reinforcement where the stab to fin strut attaches, as well as for the control horns. Struts are bolted in place with 2-56 bolts and nuts. I have shown a one-piece horizontal stab on the plans. The prototype has a ground adjustable variable incidence stabilizer, requiring some very careful assembly and I can't recommend it. It's heavy and not as strong as the one-piece, or as trouble free. I like the Robart pin type hinges. They are almost exact scale in appearance. The full-size plane has

STINSON SR5-E "RELIANT" N

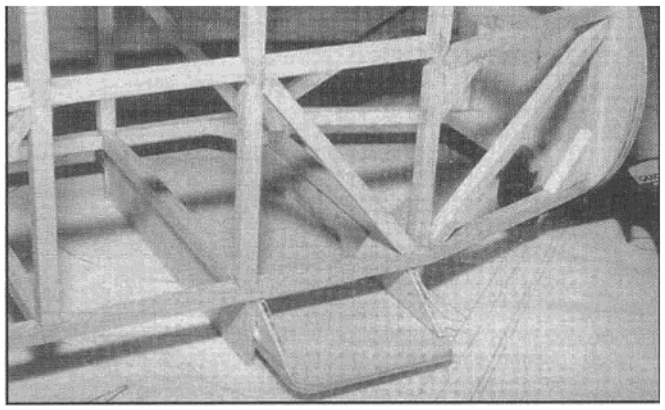
Designed by:
Ron Peterka
TYPE AIRCRAFT
Precision Scale
WINGSPAN
62.5 Inches
WING CHORD
10.25 Inches
TOTAL WING AREA
550 Sq. In.
WING LOCATION
High Wing
AIRFOIL
Clark "Y" (Scale)
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
2° or 3/4" (at W-5)
OVERALL FUSELAGE LENGTH
41 Inches
RADIO COMPARTMENT SIZE
4.5" (L) x 4.75" (W) x 3.5" (H)

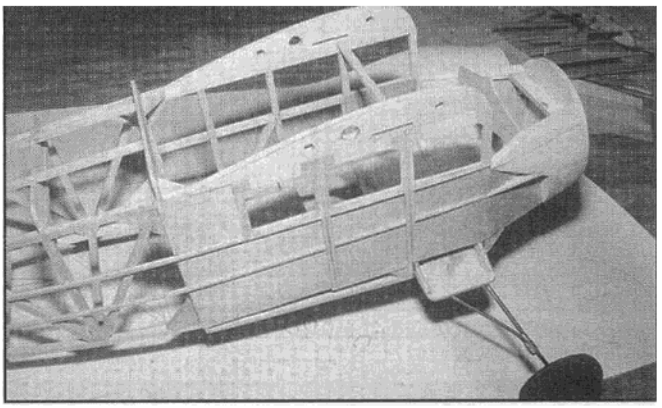
STABILIZER SPAN
20.5 Inches
STABILIZER CHORD (inc. elev.)
5.5 Inches (Avg.)
STABILIZER AREA
104 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Center of Fuselage
VERTICAL FIN HEIGHT
9.5 Inches
VERTICAL FIN WIDTH (inc. rud.)
7.25 Inches (Avg.)
REC. ENGINE SIZE
.25-.32 2-Stroke
FUEL TANK SIZE
6 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4-5

CONTROL FUNCTIONS
Rud., Elev., Throt., Ail., Flaps
C.G. (from L.E.)
3.5 Inches (at 2nd Rib)
ELEVATOR THROWS
3/4" Up — 1/2" Down
AILERON THROWS
3/8" Up — 3/8" Down
RUDDER THROWS
3/4" Left — 3/4" Right
SIDETHRUST
—
DOWNTHRUST/UPTHRUST
—

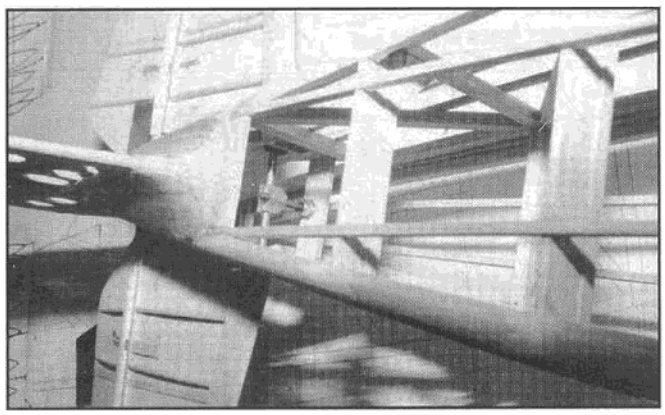
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage . Balsa, Ply, Fiberglass Cowling
Wing . . . . . Balsa, Ply, Carbon Fiber
Empennage . . . . . Balsa & Ply
Wt. Ready To Fly . 88-96 Oz. (5.5-6.0 Lbs.)
Wing Loading . . 25 (@ 6 Lbs.) Oz./Sq. Ft.

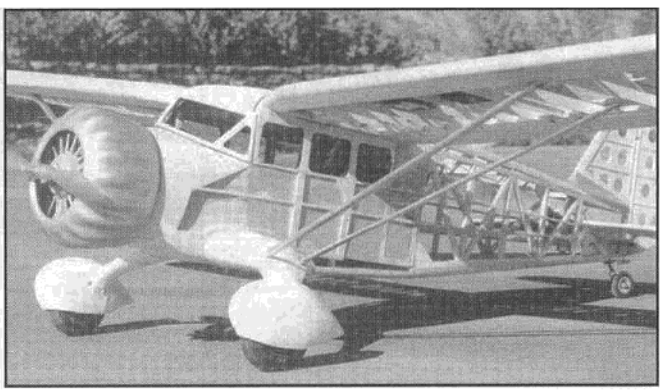




LEFT: Landing gear and firewall mount details. Wing strut mount lugs attach to top of ply plate. RIGHT: Landing gear and forward fuselage details. Landing gear mounts on plywood plate.



Adjustable horizontal stabilizer incidence on prototype model. It works, but is too heavy for a small model.

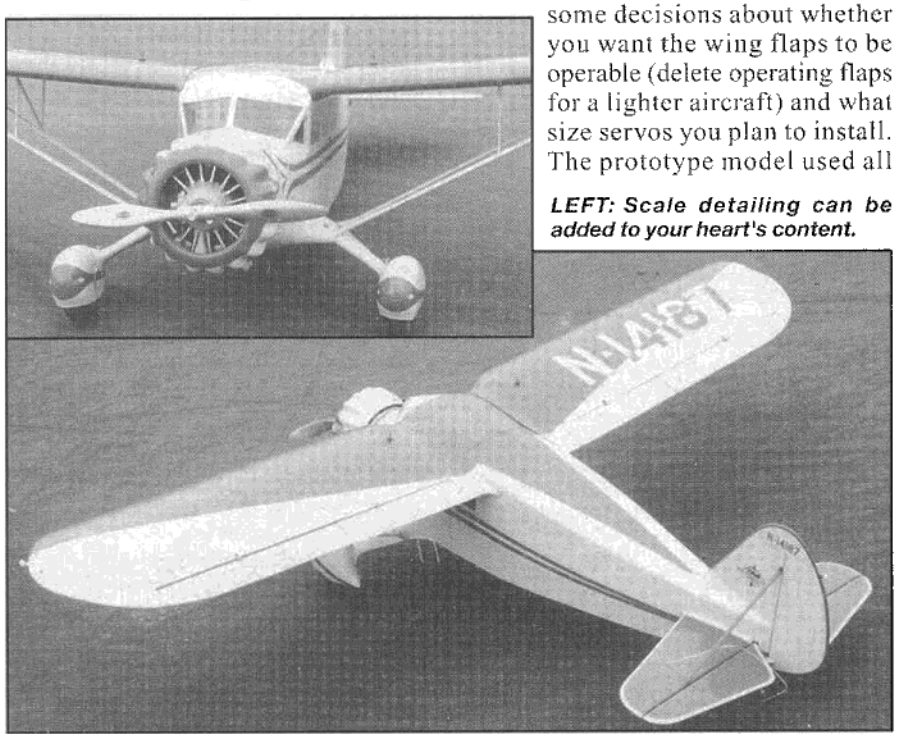


Ready for covering. Entire model, including side windows, will be covered with clear MonoKote and painted. Mask the windows to keep them clear.

pull-pull rudder cables and an internal elevator pushrod assembly. You might like the pull-pull rudder set. I chose an external elevator horn for ease of trimming. Same thing with the external tail wheel steering. The full-size craft uses a free swiveling tail wheel and differential brakes to steer. Remember, keep the tail as light as possible.

Wings:

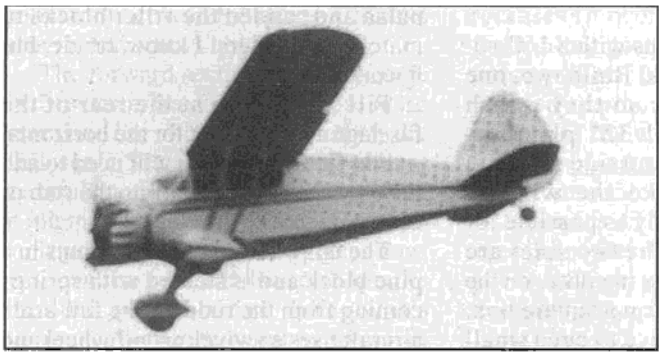
The wings are a logical next step as they will be needed to complete the fuselage. Cut the myriad ribs and make some decisions about whether you want the wing flaps to be operable (delete operating flaps for a lighter aircraft) and what size servos you plan to install. The prototype model used all standard size servos, leaving room for weight savings. W-1, 2 ea. W-3, and 2 ea. W-4 are 1/16" ply while remaining ribs are 1/16" balsa. The control link exiting at the top of the aileron is in a scale location as is the flap horn. Aileron and flap hinges are scale and close to the bottom of the surface with the pivot point behind the surface leading edge. The ailerons are Friese type and when up aileron control is given, a portion of the aileron juts out into the airflow below the wing to equalize drag from the other wing's "down" aileron.

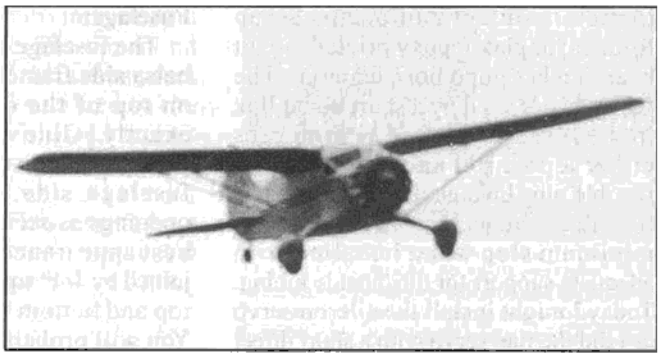


LEFT: Scale detailing can be added to your heart's content.

N14187 paint details. Each color, including pin-striping, is masked separately.

Be sure to cut 1/2" dia. wiring access holes in all the ribs inboard of the servos. Start assembly by laying out the leading edge bottom sheeting and glue the 1/4" sq. bottom spar to the trailing edge of the sheeting. The wing ribs are added, tack glued, and then the upper 1/4" sq. spar is tacked in place. The Clark "Y" airfoil builds flat on the board, but the leading edge sheeting will need to be lifted at the front of the wing to glue to the ribs. Add the trailing edge spar cut from 1/4" x 3/4" balsa. A 3/32" x 3/8" balsa sub leading edge provides a gluing surface for the 1/16" leading edge sheeting. The 1/4" x 1/2" leading edge is added after all sheeting is in place. The wingtips are shown





laminated from four layers of 1/16 x 1/2" balsa wet-formed around a scrap balsa, cardboard, or ply pattern. You should be able to cut both bows from the one lay-up. A water-soluble glue like Titebond works well here and the bow sands easily when cured. Some builders thin the glue with ammonia for quicker drying and easy handling.

Before you install the upper leading edge sheeting, place a 3/16" spacer under the rear edge of the outboard end of the rear spar to provide some wing wash-out. The upper surface leading edge sheeting is then glued in place while the wing panel is still pinned on the building board.

Add the 1/2" x 1/32" ply aileron/flap fairing on the top edge of the trailing edge spar to form the pocket for the Friese type ailerons and the flap upper surface seal area.

The wings mount to the fuselage with four 0.375" I.D. carbon graphite tubes from Aerospace Composite Products. Each tube must be absolutely parallel with its mate in each wing. Dihedral requires separate tubes for each wing panel. Bond each tube to the ply root rib and both 1/16" ply wing ribs (W-1 & W-3). The tubing I used for the sockets was made up on a 12" piece of the wing tubing by wrapping two layers of Saran wrap around the waxed tubing and then laying up two layers of 3 oz. fiberglass with E-Z Lam epoxy resin. The resulting tube will slide off the wing tubes used for a form and will fit perfectly and is cut into four pieces. You can cut them to size prior to installation. The four socket tubes will be epoxied in place in the fuselage center section between two ply formers when the wings are fitted to the fuselage.

Control surfaces are built separately using a 1/16" or 3/32" sheet bottom surface glued to a 1/4" x 1/2" leading edge with 1/16" ribs roughed in and sanded to shape after assembly. Lower surface ribs can be simulated with strips of bond paper glued to the bottom suface to match the rib positions. Hinge pivot points for the flaps and ailerons are very close to the bottom surface, so cut slots and epoxy the Robart hinges in place flush with the bottom surface. The Friese type ailerons give natural differential aileron action. Flaps and aileron leading edges are slotted to allow the control surface to move. Handmade 1/16" fiberglass control horns were installed at the top surface in pretty much scale positions. Be careful about flap servo alignment to get proper motions. It's not too good to have one flap up and one flap down for landing! I use a programmable Tx to mix the aileron movement using two channels to provide aileron differential.

Don't forget the mount plates for the semi-functional wing struts and strut supports. 4-40 blind nuts are installed for mounting the wing struts to the wing. The mid-strut supports will simply pin into the wing and each strut during assembly for flight.

The servos are installed on plywood plates after cutting away the appropriate rib areas. If you don't have a computer radio you will need to plan the pushrod installation to get the proper movement. The pushrod exits the wing at the upper surface and it is more scale-like to build a control horn from composite material. I prefer non-metallic horns so no metal to metal contact can occur. Scrap formica, or glass/epoxy printed circuit board makes good horn material. The flaps are operated by a short direct link to the servo, while the aileron uses either a pushrod and bellcrank, or flexible tube linkage. I originally chose the flex tube as simple and having minimum slop when installed with adequate support for the outside tubing. Today I might install the aileron servo as I did the flap servo with a short direct pushrod. Servo connector plugs need to be routed to the wing root. They will be fed through matching holes in the fuselage wing root ribs.

Fuselage:

The fuselage begins with a 1/4" sq. balsa side framework. Build two, one on top of the other so they match exactly. Glue the 1/32" ply reinforcement on the outside of each fuselage side. Make the window openings as accurately as possible for best appearances. The two sides are joined by 1/4" sq. cross members on the top and bottom to form a square box. You will probably have to cut a small "V" in the side panel near the front to bend the sides to meet the ply firewall. The firewall is 1/4" aircraft ply, not lite ply, and should have the edge rounded prior to installation.

Install the various top and bottom formers and add the ply landing gear mount plate below the two F-2B formers. A little epoxy is good here. The 5/32" and 1/8" dia. wire landing gear legs will be strapped to the mount and an aluminum mount plate for the two wing struts on each side will be screwed or bolted to the ply mount.

The full scale SR5 used aluminum sheet wrapped around each fuselage corner to get a nice round edge. Darned if I could come up with a good way to re-create that effect, so I just filled between the former corners with soft balsa and sanded the filler blocks to match the formers. I know, crude, but it worked.

Fill in the area at the rear of the fuselage and cut a slot for the horizontal stab to fit through. You will need to add the elevators after installing the stab or cut the tail post.

The tail wheel assembly mounts in a pine block and is steered with springs coming from the rudder. The full-scale aircraft uses a swiveling tail wheel and differential braking to steer on the ground. Maybe on a 1/4 scale?

To simulate the full-scale construction you will need to add 1/8 sq. balsa fuselage stringers to the fuselage sides where shown. The fuselage covering was formed this way to give a more pleasing appearance as well as minimize fabric "drumming" in flight.

The original uses wooden stringers over the steel tube basic fuselage. The stringers are installed by notching the formers so stringers lay in straight lines and are flush with the former surface. After they are installed, you will "scallop" the formers between the stringers so the covering will not adhere to the formers. Don't forget to outline the windows and doors. The access hatch for the radio was installed on the cabin roof between F-2 and F-3. Simple sheet metal screws hold it in place.

The forward section of the fuselage is block balsa and sheet balsa to simulate the sheet metal used on the full-scale SR. Since you will almost certainly need to add some nose weight, it might as well be put to some purpose.

If you install the landing gear now, you can use block balsa to shape the landing gear fairings. I know, it's tedious. You could cheat by using an epoxy filler material and sanding to final shape, but that is time consuming too.

This might be a good time to make and install the instrument panel. Mine was made of a sandwich of aluminum, clear butyrate, and a 1/64" ply panel with the instrument faces glued in place. I painted the whole panel medium brown and scratched the outlines of the "glove boxes" and floating instrument panel into the paint so the aluminum showed. A few simulated switches and a placard finished the panel.

It's about time for servo mounting and planning pushrod installation. For a scale look, you should use a pull-pull rudder cable system and a non-scale elevator pushrod.

The throttle pushrod can be run later. Tank and engine installation is straightforward. The engine is mounted on its side, and the stock muffler will require a small cut-out in the firewall with a scrap balsa tunnel just behind the firewall. The muffler just about disappears this way. I mounted a remote access glow plug fitting at the bottom of the firewall as well. The fuel filler was added in a bracket on the firewall and is accessed through a very small hole in the top of the cowl. The needle valve is accessed through a small hole in the cowl using a ball hex drive in a screw head soldered to the needle valve.

To install the wings, jig them in place with 3/4" dihedral in each wing panel at W-5. Visually check that the leading edges are in line. Slide the wing mount tubing in place on the carbon fiber rods between the top fuselage formers. When the wings are set, tack the mount tubes in place with epoxy and let set up. Be careful not to glue the wing tubes in place. Remove the wings and finish epoxying the mount tubes in place.

The wing struts are functional on my model. They are made of aerodynamically shaped aluminum tubing with epoxy filled ends. I milled a recess in one end, drilled the end, and tapped the remaining material 4-40. The recesses fit over the tabs mounted on the landing gear plate. The upper end uses a piece of 0.025" thick aluminum bonded in place and screwed to the bottom of the wing with 4-40 screws into the blind nuts installed during wing construction.

Streamlined fairings at the ends of each strut are built up of epoxy and micro-balloons, sanded to shape when the epoxy sets up.

Finishing:

My model is covered entirely with clear MonoKote. This has a couple of advantages. Paint sticks very well to the clear material. The side windows are merely masked, the model painted, and the windows are complete. It was also impossible to get pre-colored MonoKote in the scale colors I needed, so painting was the only choice. I used F&M Stits paint for my model with great results. There are still several SR5s flying and photo paks are available for at least two simpler trim designs than that of N14187. If you choose N14187, be prepared to mask and paint all of the pin striping (brown/orange). Add scale details like door knobs, antennas, and pitot tubes as you feel inclined.

Flying:

Be certain that the model is balanced no further back than shown on the plans. Further forward is definitely okay and safer for first flights. Check control movements and throttle setting. Remember, this was no aerobatic champion, so fly it realistically. Plan gentle turns at realistic airspeeds and mild maneuvers. A chandelle is a personal favorite of mine. A shallow dive to build speed, and then a 180 degree climbing turn looks very realistic.

Another good maneuver, and harder than it sounds, is a descending 360 degree turn at idle power setting. Pull the power back and begin a nice big circle until the original heading is resumed. Only practice will tell you how high you have to start so you don't run out of altitude before completing the circle.

While this model is a little small for all-out scale competition, it can be competitive. It is important to keep it as light as possible for good performance with an engine that can be completely hidden in the cowl.

If you have any questions or comments, please feel free to contact me at:

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Editors Note: *Please See Scratch-Building A Stinson Cowl, on page 108-109.*

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