

The Spirit of St. Louis ⁶⁹⁵

With its nice proportions and wealth of optional detail, this clean-lined rendition of a universally loved aircraft makes an ideal first Scale project. ■ Dave and Michael Haught

FOR AVIATION aficionados, the Spirit of St. Louis is one of those airplanes that seems to embody the wonders of flight. Whatever the source of our interest in

aviation—erospace, jets, aircraft of World War I or II, to name a few—nearly all of us have been touched at one time or another by the Lindbergh legend. Almost

everyone has been attracted to the tall, quiet Lindbergh and his clean, high-wing monoplane, marveling over the man and then the machine. Many of us were fascinated enough to read the book *We*, maybe even to build a plastic model of the Spirit of St. Louis.

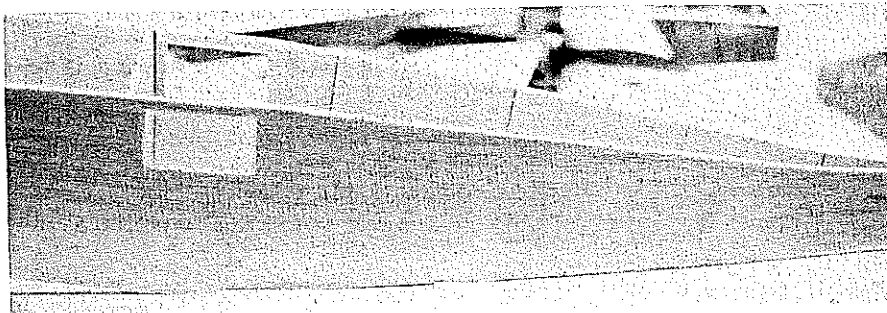
The Lindbergh legend is timeless. The elements of conquest, adventure, and success against great odds bring it alive for each new generation. I fell into the snares of the spirit of *We* at the ripe old age of 10, and it's never let go of me since. Now my 10-year-old son Michael has been visited by the same spirit. Like his father, and his father's father, he was smitten by airplanes at a very young age.

When Michael was required to read a nonfiction book of his choice recently for school, it was the perfect opportunity to mix learning and fun. Of course he picked *We*. After he'd read it, we held onto the magic by renting a video of "The Spirit of St. Louis," with Jimmy Stewart as Charles Lindbergh. It brought the book so completely to life that by the time we'd finished watching it we were both excited about a possible building project.

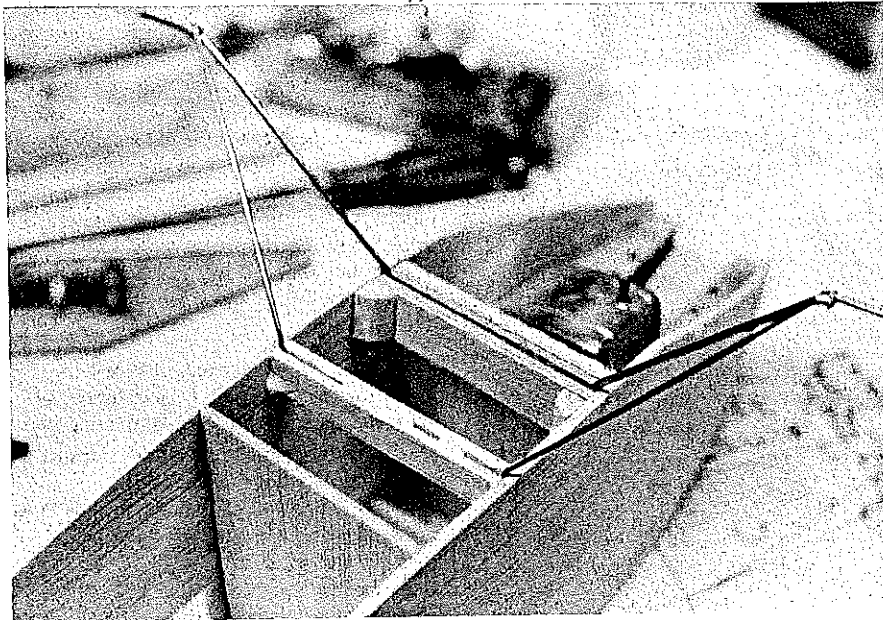
Not long afterward we dug out the needed three-view drawings of the airplane that Lindbergh made famous. The Spirit would make a good transition for Michael from ½A models to medium-size Scale



Big picture: There's no mistaking that huge barn door wing, the earth-inductor compass and all-silver coloring. The Spirit of St. Louis owes at least some of its popularity to the fun of vicariously recreating a landmark event in aviation history. Above: Easy to build and with nice proportions, the Spirit is a good choice for the flier making the transition from ½A to Scale. The earth-inductor compass, fashioned from model-kit plastic sprue and gelatin capsules, actually spins in the slipstream. The decorations are made with black trim sheet and chart tape.



Joining the sheet balsa fuselage sides. Note that the former locations have been marked on the inside surface of each side to help maintain accurate alignment.



The wire landing gear receives ample gusseting. That way it won't fold when you touch down in Paris in front of all those people. The gear is sandwiched between ply and balsa formers.



Making the large faired landing gear strut from a section of TE stock saves a bit of carving. The wire gear struts are soldered just at the axle for a strong, unified arrangement.

projects. Nostalgically, I pulled the old Fox .15 from my first Scale model, cleaned off 24 years of grime, oiled it, and handed it over to Michael. It was time for the big move from 1/2A engines to larger ones.

We began the Spirit of St. Louis in January, and it took to the air the following spring. The spirit of *We* flew

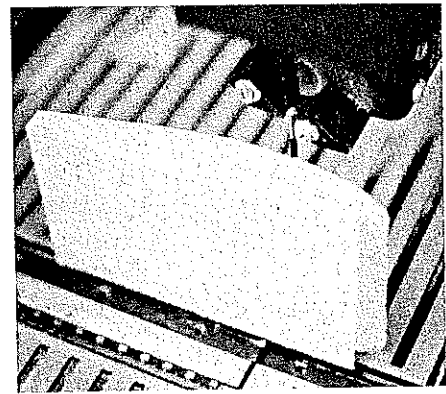
again.

The simple, clean lines and nice proportions of the Spirit of St. Louis make it ideal for a first Scale project; it challenges the novice builder just enough to keep him (or her) motivated. With the abundance of information available for scale detailing, you can add to the basic airplane to your heart's content. The model is close to scale in outline. As a concession to stability, we fudged the nose moment arm and the tail surface size a bit, but the difference isn't obvious in the finished design.

Construction. This airplane is simple and straightforward to build. Begin by kitting all the sheet wood parts. Once that's done, it's easiest to build the wing first.

Wing. The ribs are identical, except that the center section ones must be trimmed to accept the sheeting in that area.

Cut the trailing edge strips to length, and notch them for the ribs. Pin the trailing edges to the waxed paper-covered plans, then pin the ribs in place. Fit the wing spar, and pin on the leading edge. Seal each joint with a drop of CyA (cyanoacrylate glue). If any of the joints haven't set securely, add microballoons



All 23 wing ribs have been cut and are ready to be incised with an identical spar notch. Make sure the blade is perpendicular to the saw table before cutting the notch.



Notching the wing trailing edge is an important step, and easy to do if you know how. Here two strips of trailing edge stock have been pinned together and then pinned to a third strip. The TEs can then be notched simultaneously and at matching intervals.

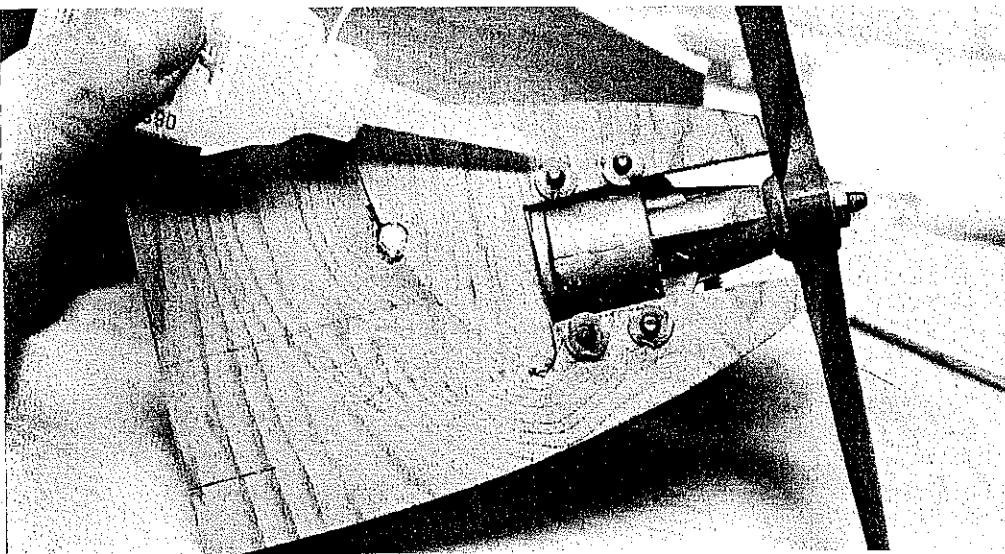
and then reglue them.

Attach a set of cable lead-outs to a metal three-inch bellcrank; follow the directions supplied with the lead-outs. Install the bellcrank on the plywood mounting plate, and fit the pushrod. Carefully trim the center ribs to allow full movement of the bellcrank unobstructed by any ribs or spars. When the clearance looks good, epoxy the bellcrank mount in place.

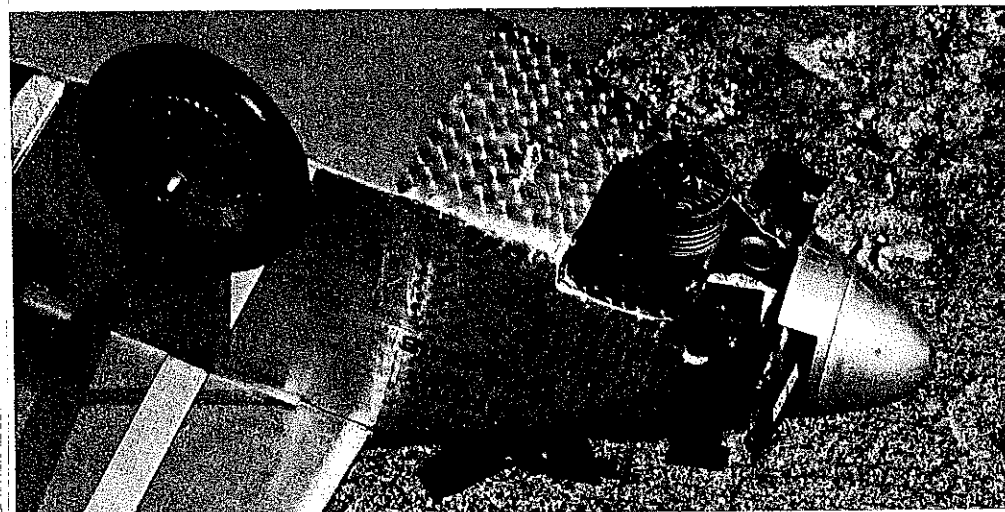
While the epoxy sets, cut and fit the 1/16 sheeting to the top of the leading edge, then sheet the center section. Add the 1/8 x 1/2-in. sheet strut mounts under each wing. Rough cut the wing tip blocks, and glue them in place.

Drill the left tip for the lead-out wire guides. Cut them out of brass tubing just large enough in diameter to fit the lead-outs. Glue in the lead-out tubes with epoxy, and finish off the control loops on each lead. Add tip weight to the right wing tip, securing it with a method that will ensure it stays put.

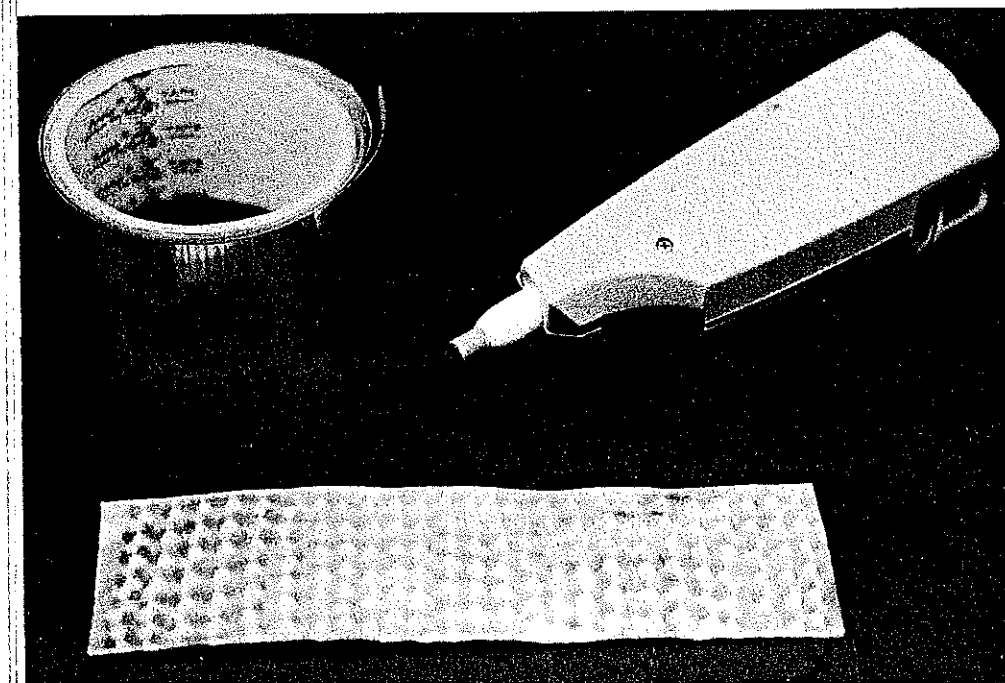
Give the wing a good sanding. Put a new sheet of No. 220 paper on your



The fuselage builds around the $\frac{3}{8}$ -in. plywood engine mount plate. Here the blind nuts are given a drop of CyA to keep them in place. After formers F-2 and F-3 have been epoxied to the mount plate, the assembly is attached to the fuselage with a slow-drying glue.



You can cram the engine in and out without a cowl if you're determined! Note the fuel tank overfill tube and the clearance for the air intake. Also note the signature swirls on the burnished aluminum sheet panels. The operating engine takes the place of two scale cylinders.



The aluminum nose panels were made up in sheets and added to the finished model after painting. The electric eraser was used to burnish the panels in the distinctive swirl pattern. (See the January 1991 Issue of *Model Aviation* for more burnishing how-to's.)

sanding block, and keep at it until it's perfect. Blend the leading edge and top sheeting nicely together, and blend in the wing tip blocks.

Finish the wing with three coats of clear dope, sanding well between each. Cover the structure with light weight silkspan. Shrink the silkspan with water, and add four coats of thinned clear dope to fill the pores. Sand the wing lightly between coats with No. 600 paper, and set it aside.

Empennage. Make the tail feathers from medium-stiff $\frac{1}{8}$ -in. sheet balsa. Sand all the edges to a round cross section. Glue the rudder and fin together with $\frac{3}{8}$ in. of rudder offset to keep the Spirit at the end of its lines in flight.

Strengthen the elevator with a plywood sandwich at the center. When the glue has set, hinge the elevator to the stabilizer with your favorite hinges. Lay the stabilizer over the plans, transfer the centerline to its upper surface, and glue on the rudder. Make sure it's congruent with the centerline, and also that it's perpendicular with the stabilizer when viewed from the front.

Fuselage. The two sheets of $\frac{1}{8}$ x 4-in. balsa for the sides may be purchased, or they can be made by edge-laminating two smaller sheets together. Cut the sides to shape, and cut out the windows.

If you haven't already done so, this is a good time to cut out all the fuselage formers and parts.

Assembly begins with the $\frac{3}{8}$ -in. plywood engine mount plate. Drill it to match your engine, and install four blind nuts for mounting. Attach formers F-2 and F-3 to the plate with epoxy, making certain they're well aligned and true.

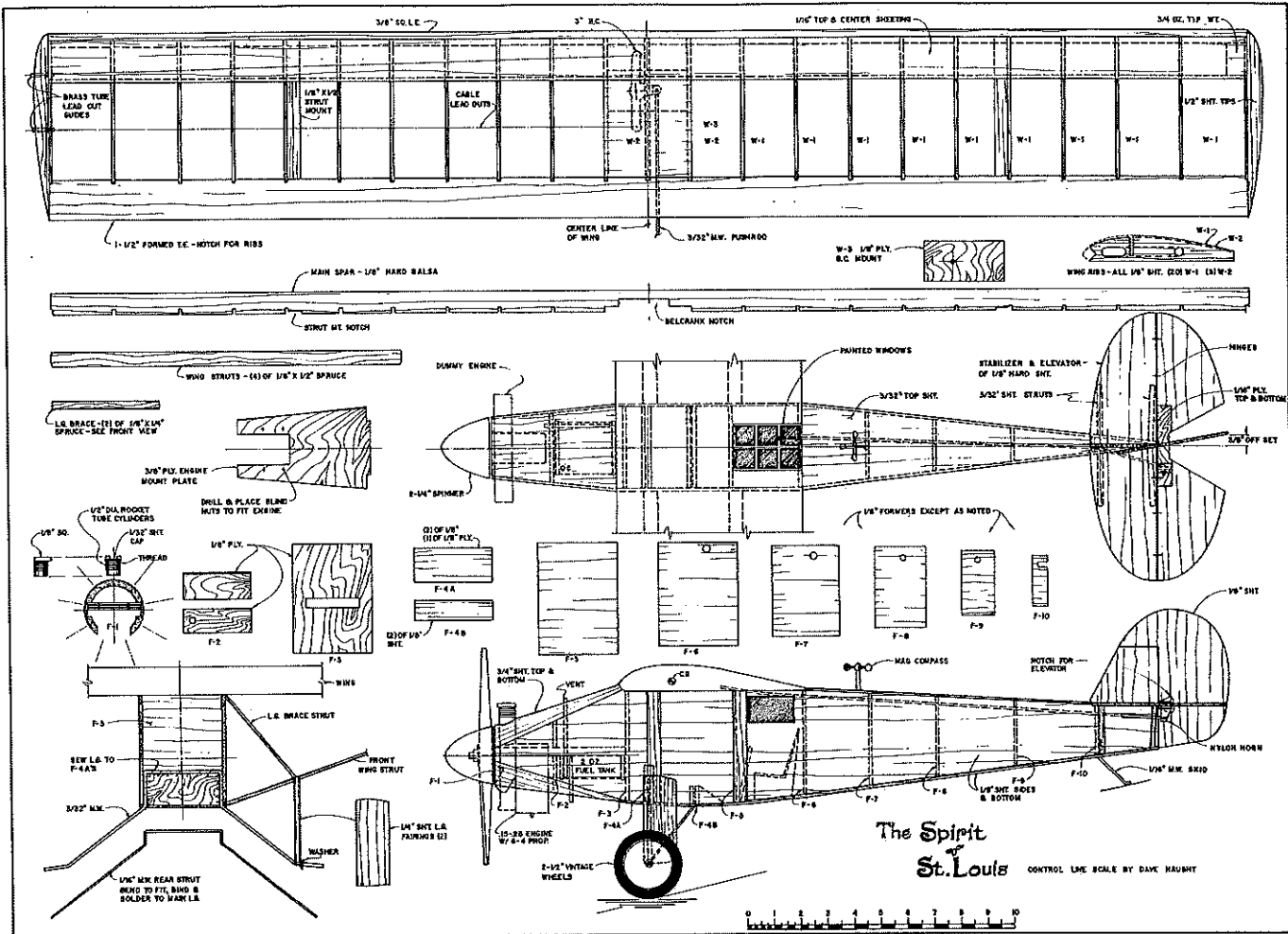
Bend up the landing gear and tail skid wires while the epoxy sets. Bind them to the appropriate formers, and set them aside.

Attach the engine mount plate assembly to the fuselage sides with a slow-drying glue. A white glue such as Elmer's carpenter's glue works well. Glue and pin the assembly to the first side, then glue on the second side. Pin this in place, and add a few rubberbands around the nose to hold the front together. Carefully pull the sides together, and install former F-5.

Draw the tail together, holding it with pins or a clamp. Before the glue has set, lay the entire assembly over the plan fuselage top view to check for proper alignment. Adjust, if necessary, by moving the formers or sides. Allow everything to dry thoroughly before proceeding.

Add the remaining formers. Give F-4A and F-4B, the sandwich formers that hold the landing gear struts, a generous gusseting to ensure that they stay in place later.

Finish bending the landing gear wire, and solder the struts together at the axles. Do this carefully, so that the finished gear is level from the front and straight from the top view. Add the bottom sheeting, and



trial fit the wing and pushrod.

Add optional detail in the cockpit area. The cockpit isn't easily viewed from the small side windows, so there's little point in spending a lot of time on it.

Give the interior a coat of silver dope. The black instrument panel is well documented, and a few minutes with a copier-enlarger will produce a good full-size pattern. Make the instrument panel, and glue it to F-5.

Make the seat from balsa, paint it a wicker color, and install it. Install the control column.

Pin the wing to the top of the fuselage, and route the pushrod through the windows in the formers. Cut the pushrod exit slot just under the stabilizer location on the left side. Check that the pushrod makes a free passage through the fuselage, then pin the stabilizer assembly onto the fuselage rear, bend the pushrod, and install the elevator horn. Once you're sure the entire control system works well, align and glue the wing and stabilizer.

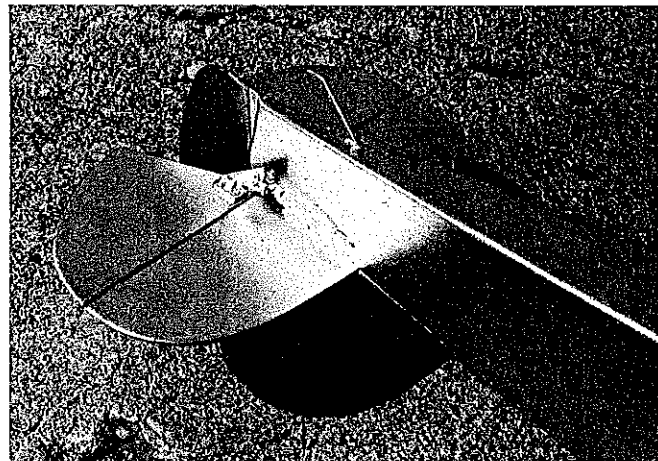
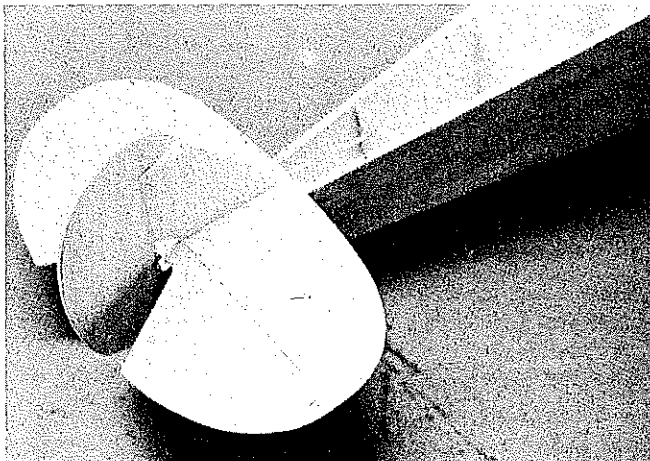
Add the fuselage top sheeting and the top front nose block. Carve out any necessary clearance around the engine

before gluing on the top block.

Install the fuel tank. Add extensions to the filler and vent tubes, and attach the tank with glue. Temporarily glue on the bottom nose block. Carve it to shape, remove it for hollowing and fitting around the engine, and then install it permanently. I was able to carve away enough of the block that the engine can be put on and taken off without a removable cowl.

Give the nose a good sanding to bring the cross section from the spinner circle to the rectangle section at former F-3. Add

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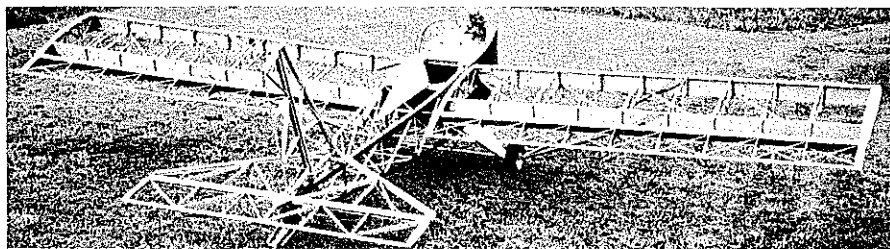


Left: Trial fitting the control linkage before assembling the model makes the job a lot easier. Here the pushrod is in place and the rudder/stabilizer assembly has been pinned to the rear of the fuselage. Right: Control hookups don't come much simpler than this. Keep the pushrod exit as small as possible and neatly tucked out of sight. The tail skid is also simple and scale—tail wheels were not yet of age in 1927.

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assembly employing rather large gold-plated contacts in a compact plastic housing. I'll have more details next month including photos and data.

Here's wishing you all a happy, quiet safe Electric-flyin' Summer!

Spirit/Haught

Continued from page 45

filler—epoxy-and-microballoons works well—for a smooth transition at the wing leading edge-fuselage joint. Give the fuselage-and-tail assembly a good sanding, and prepare it for finishing.

Covering and finishing. Apply three coats of thinned clear dope to all wood surfaces. Cover them with lightweight silkspan to help fill the grain and strengthen the wood. Dope the newly covered areas with four more coats of clear dope, sanding well between each.

While the dope is drying, cut out and fit the wing, landing gear, and stabilizer struts. The struts—and there's a bunch of them—all need to be sanded, doped, and glued in place.

Naturally, you have no color scheme

decisions to make with this airplane. As all you aviation buffs know, it's silver all over.

If your sanding or filling was less than perfect, you'll know it after spraying or brushing on the color dope. Silver shows all your mistakes. Correct any flaws you find before adding the last coat of color.

The markings, all black, are cut out of trim sheet and pressed in place. The top window can be cut from the same sheet and carefully positioned on the top of the wing.

Reproducing the signature swirl pattern in the burnished aluminum sheet panels at the front of the fuselage presented a bit of a challenge. Looking around the workshop, I found a roll of aluminum tape used to repair furnace ducts. Available at most hardware stores, it's basically a thin strip of aluminum with a strong adhesive coat on one side and a waxed paper backing. Just peel off the backing, and presto! Aluminum panels.

I used an electric eraser fitted with a hard rubber eraser to make the swirls. Place the spinning eraser directly on the aluminum tape. Press lightly, lift up, and there's the swirl. Experiment until you get

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the right effect, then make up several long sections of burnished aluminum tape. A short piece of eraser mounted in a variable-speed drill can also be used to create the swirl.

Apply the tape panels to the nose, carefully rubbing out any wrinkles. Wrap the excess over the nose, and trim it off out of sight.

The Williams Bros. World War I wheels look about right on the Spirit. Paint the hubs silver before mounting them. Add the engine and spinner, and balance the model.

Dummy engine and detailing. The dummy engine is less difficult to make than it looks. Find a 1/2-in. cardboard rocket body tube or other tubing of similar size. Wrap the tube with heavy thread to simulate the engine cooling fins. Cap it with a disc of 1/32 sheet balsa, and add the 1/8-in.-sq. balsa rocker covers. Repeat the process seven times. The plan shows the radial centering for all nine cylinders, but since the real engine takes up some of the available room you need only make seven.

Trimming the cylinders to sit correctly on the cowl is the tricky part. Take the time to get this right. Paint each cylinder,

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and epoxy it in place. Push a straight pin through the centerline of each cylinder and into the cowl to keep it from shifting until the glue sets.

You can lavish a lot of time on detailing your Spirit. The earth inductor compass, the fuel tank vents on top of the wing, the door handle, steps, and so on can all be added to suit your fancy. When you're done, check that all your pretty decorations will stay on.

Flying. Test run the engine before you go to the flying field. Adjust the needle valve, and make any necessary adjustments to the engine and fuel tank access. Then hook up a set of 55-foot steel control lines, and get ready to cross the Atlantic yourself.

Before you venture out for that first big contest, keep in mind that the full-scale Spirit of St. Louis had logged over 100 hours by the time it crossed the ocean. Get to know your model in all flying conditions, from calm air to mild winds. Confidence comes from practice. □

CL Scale/Boss

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that the nine cylinder Lycoming R-680-17 220 HP radial engine is all there. A good portion of that challenge is in finding or selecting materials that can be used for the successful and easy simulation of engine parts without the need of a fully equipped machine shop.

Sam started the project by using the 2 inch scale crankcase outline drawing that comes with the William Brothers 2 inch scale J-5 Whirlwind cylinders. The crankcase outline was laid out on an appropriate thickness of balsa and rough cut to shape on a jig saw. The cylinder angles were then accurately finished on a belt sander. While Sam made the cylinder mounting holes in a Bridgeport milling machine, you can do the same with an X-Acto knife—with care and loads of patience.

Photo No. 1 at right shows the completed balsa crankcase with the front cover and rear air-induction cylinder shaped and glued into place. Holes for valve pushrods and air induction tubes were made by using an appropriate size of sharpened K & S brass tubing and turning it into the balsa. The light colored ring around the crankcase is a piece of formed aluminum tubing simulating the engine's wiring harness. Note the holes in the ring for the acceptance of the spark plug wiring.

Photo No. 2 shows the rear of the engine with cylinders mounted (Williams Brothers Wright J-5 cylinders were modified/adapted to represent the Lycoming engine cylinders), rear spark plugs wired, oil lines between rocker covers (electric copper wire) and air induction tubes made from Du-Bro large fuel tubing. The cylinder modification was to the exhaust and intake ports for the

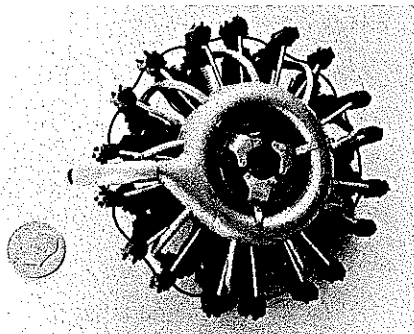
acceptance of the air-induction and exhaust tubes as used on the Lycoming engine. The blind nut in the center of the engine is used as a support for the engine's propeller shaft.

The completed engine with a scale Sensenich propeller is shown in Photo No. 3. In this photo we see that all oil lines between valve rocker covers have been installed, that valve pushrods made of aluminum tubing are in place, and that the exhaust collector ring and cylinder exhaust

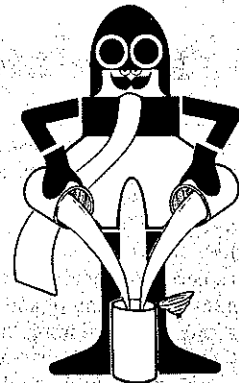
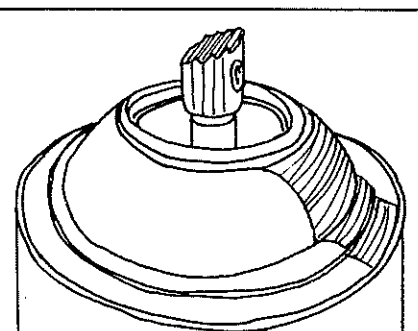
tubes are also in place. The exhaust collector ring was made of 1/2 in. balsa mounted on a 3/32 in. plywood base, carved, and sanded to shape. A piece of 1/2 in. aluminum tubing serves as the exhaust stack. The exhaust tubes between cylinders and collector ring are made from a small size automotive rubber vacuum hose easily bent to shape and painted silver using Formula-U polyurethane paint. The flexibility of the urethane paint will make paint cracking from the rubber hose less likely.

The very scale-looking propeller is a model of the Sensenich prop that was used on many planes from the Golden Era of Aviation. Planes such as Cessna, Piper, Taylorcraft, Waco, Rearwin and Ryan were among those using this great wooden propeller. Abdo made his model prop by following data found in the April 1990 issue of *AOPA Pilot* magazine. The scale 16 in. prop is made from a lamination of 10 layers of yellow birch and hand carved to shape. The dark area near the blade tips is fabric covering (Sam ironed on Coverite) which served as a blade tip stiffener on the real prop to prevent tip flutter.

Next, the prop leading edge and tip is covered with brass shim stock to simulate the real props' "tipping." Sam photographed the Sensenich logo on a real prop with a 35MM camera, had the logo photo enlarged to the proper size for his model, cut out the logo and applied it to the prop. The prop was then finished with several coats of clear dope. While Sam machined the prop hub from aluminum stock, it also can be simulated by soldering



Engine is just about complete in this photo. Oil lines have been completed between rocker covers, pushrods installed, exhaust collector ring and exhaust tubes and stack added. Next, the propeller shaft and hub.



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