

#105



# The Sportsman

Harold Ruark

THE SPORTSMAN could easily be a scale model of a beautiful high-wing airplane of the '30s, with their unforgettable lines, or it could be one of the equally beautiful homebuilts of today. Actually, it is neither. The Sportsman was designed to look like a full-size airplane, with enough wing and tail to make it a pleasant flying machine.

I have been a modeler for over 40 years, and as you can see, my age is controlling my style of thinking. This airplane is the result of two previous models, is flown with trike gear, and began with a .30 engine. The .30 engine just wasn't enough. The Sportsman is powered with an OS .40, and man, what a difference! Plenty of power

Realistic and as pretty as they come, this .40-powered job is a most rewarding project in both building and flying.

for take-off, with no worries about snap rolls. A good 35 would be okay, but I consider the 40 to be just right.

A comment or two before we go to construction: Although not a beginner's airplane, it isn't difficult to build or fly. A modeler with a moderate amount of experience will have no trouble. The only two items of concern may be the fiberglass

cowl and wheel pants. The pants can be purchased from almost any model supply house. The cowl can easily be made by the method described here. The upright engine installation is just straightforward model building, and it still looks good with a Sullivan spinner. So let's get started with the enjoyable part of all this, construction and flying.

## Construction

**Fuselage:** Begin with two pieces of 1/8 x 6 x 36" medium balsa. This is enough for the sides and frames. Follow the arrow-heads on the drawing for the initial cuts. After the sides have been cut and all edges trued, glue the two 1/8 x 1/4" bottom stringers to the sides. Make sure the stringers are 1/16" below the side's bottom edge. (You will see later why this is done.) Cut out the 1/16" ply doubler and glue to the forward section, back to the forward side of F-2. Now, let the stringers and plywood doublers dry.

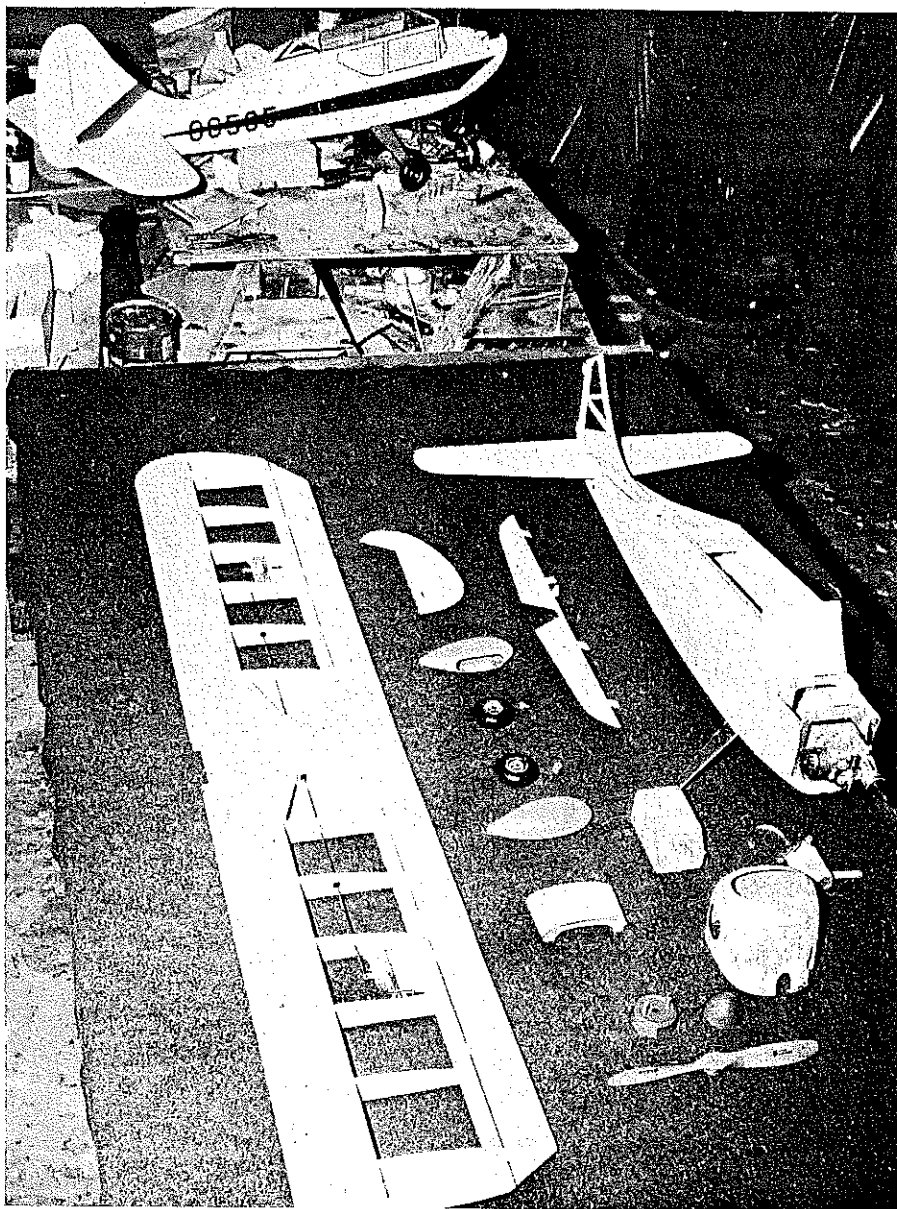
Using scrap left from the sides, make up the frames. Be careful to plan two pieces for the aft top half of the fuse, from cabin to stabilizer. There is plenty of material in the two sheets. Glue together the two halves of the frames with 5 minute epoxy—they make up quick this way. Now, cut a 1/32" ply doubler for F-2 and F-3, and glue these to balsa frames with epoxy.

At this stage, you must decide if you will build the model with a fiberglass cowl, or use an upright engine on hardwood mounts. If a firewall-mounted engine is used with a glass cowl, make the firewall F-1 from 1/4" plywood. If a balsa nose, upright engine is contemplated, then F-1 is cut from 3/16" plywood. The fiberglass cowl makes a very pretty airplane and isn't that much trouble. I'll explain my method shortly.

By this time, all the components cut out and glued should be dry and ready for assembling on all frames. Mark the vertical centerline. This will help with true alignment of the fuselage. Mark the frame lines on fuse sides by laying over drawings and spotting the proper locations. These markings can easily be made with a fine-point, nylon-tip pen. Everyone has a favorite method of assembly. If you have a factory-made jig, fine; if not, here's the way I do it. Using a flat board, approximately 38" long and 6" wide, draw a centerline. For F-2 and F-3, four notched pieces sawed from soft pine—two for the top and two for the bottom. Width of the notches should equal the width of the frame, plus 1/4" for the two sides. Make the notches a snug fit. Use 15 min. epoxy to glue these two frames to the sides, with the notched pine clamps to hold it together.

Make sure the centerlines are over the line on the building board, and be certain the firewall ends are square across your building board. This is a simple and easy way to get a true fuselage. After these two frames have dried, add the firewall and frames, F-4 and F-5, jointing the tail together with a scrap piece of balsa. If you have kept the centerlines of the frames over the centerline on your building board, construction will be true. Using white glue or glue of your choice, add the rear side panels and the rear top center, curved, 1/4" stringer back to F-5.

When you've allowed all this to dry overnight, notch out and add the piece of 1/8" ply for landing gear and glue in place.



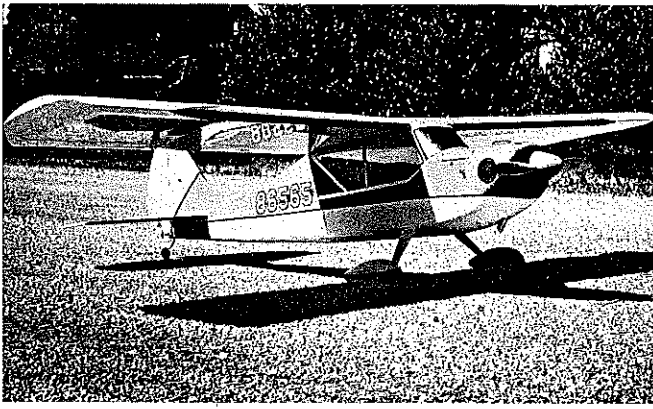
Opposite: The designer with the ready to fly Sportsman—it's easy to see why so many people have a yen for cabin jobs. Above: All the parts—displayed just before covering—show many things to augment drawings, Mylar hinges on elevators and fin, barndoor aileron set-up, etc.

With medium, 1/8 x 1/2" balsa, add the reinforcement over the landing gear area and at the top for the wing saddle; also, put in place the vertical struts to stiffen the cabin sides. When dry, add the balsa triangle stock up the sides of F-2 and across the plywood landing gear mount, as shown on the plans. The next step is to complete forward of F-2. Add the 1/4 x 1/2" balsa stock to the bottom edge. Carve the bottom block to shape (as shown on plans) out of two pieces of 1/2" stock (or from 1" stock if you're lucky enough to have some). Hollow to lighten, following dotted lines on plans. This gives tremendous strength to the forward section. If an upright engine is to be used, carry these blocks out to the nose, add 1/2" thick cheek blocks over to the hardwood rails, and add nose block.

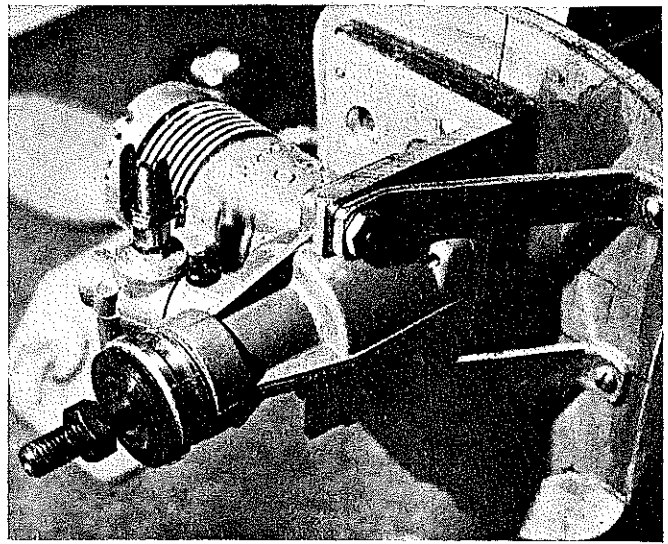
Carve the entire unit together, cutting out the nose to suit engine used. The fuel tank location shown works alright with

either side-mounted or upright engine installation. Build the hatch as shown on plans. The hatch and nose planking can be covered with one piece of 1/16" sheet balsa. Wet a little on top and glue on with white glue. If firewall mount and fiberglass cowl are to be used, all wood construction stops at F-1. With everything finished to this point, lay the whole works aside and forget it for a while.

**Tail Surfaces:** I always build the tail surfaces next. As the drawings show, everything is straightforward construction. The open framework of the fin should be medium grade, 1/4" balsa, and all other balsa of tail surfaces should be light. Build up the stab frame of 1/8 x 3/8" balsa over plans on flat board, gluing the 1/16" sheet on both sides. Clamp between two pieces of 3/4" straight pine or plywood and let dry. This gives a perfectly straight, no-warp stabilizer. Build the movable rudder and stab sections from



Almost too pretty to fly, the covered and painted Sportsman shows reflections on its finish—note bottom of the wing, for instance. Snug and clean, cowl all but hides the side-mounted .40 engine, detailed on right. Many plans leave it up to builder to select and install "commercial" type mount. Judging by angle braces author really got the vibrations out. Designer also provides information for built-up nose.



## Sportsman

$\frac{1}{4}$ " balsa. Insert a piece of  $\frac{1}{4}$  x  $\frac{1}{4}$ " hardwood between the two halves of the elevator. Taper and round off the edges as shown on plans. Use nylon hinges where indicated.

**Wing:** Select your balsa properly for different components. The  $\frac{1}{16}$ " sheet should be light-medium grade; the  $\frac{3}{32}$ " ribs should be soft and light; the spars should be medium-hard. Begin by making two plywood patterns for wing ribs. Cut out ribs in the rough and clamp, or bolt, between the two plywood patterns. Carve, then sand to shape with a long, flat sanding block. A wing jig is great, but my method for building flat-bottom wings is to use two pieces of flat, straight boards,  $\frac{3}{4}$  x 12 x 36". Nail these boards at the center joint to your workbench. Using wing drawing, law off the wing rib lines and outside leading edge line on boards. Take two strips,  $\frac{7}{8}$  high x 12" long, raise the ends of the boards, and place strips in position, as shown on drawing. Nail strips and wing board securely to bench. This produces  $\frac{7}{8}$ " dihedral. Make eight triangular, wing tip jig blocks, as shown on plans. Nail two pine strips, approximately  $\frac{1}{4}$  x  $\frac{3}{4}$ ", along outside LE line on wing boards: Cover the entire board with wax paper. Next, tack, glue or nail wing tip jig blocks in place. Using a piece of  $\frac{1}{16}$  x 2 x 11" sheet balsa, pin in place on the blocks.

Cut proper angle on balsa LE and glue to tip sheet, pinning or nailing firm to strip and building board. Select the bottom  $\frac{1}{16}$ " sheet, glue to LE and tip sheeting, and pin to board. Cut and glue forward, bottom wing spars in place, using several wing ribs to place spars in proper position. Repeat for trailing edge bottom sheeting and spar. Glue in wing ribs, except the two W-2 ribs on each side of the center of wing. Build up spar at aileron section, added the angled,  $\frac{1}{4}$ " stock for aileron frame, then add A-1 ribs. Make sure  $\frac{1}{16}$ " space is provided between the

end of A-1 rib and W-2 wing rib. This is for aileron cutout clearance. Epoxy on the plywood W-4 LE brace and the wing spare plywood braces, W-5 and W-7. Cut off  $\frac{1}{16}$ " from the remaining two W-2 wing ribs and glue in place. Add the  $\frac{1}{2}$  x  $\frac{3}{4}$ " balsa block to the  $\frac{1}{16}$ " plywood W-4 LE brace.

This block fits tight between the two W-2 wing ribs. Install  $\frac{1}{8}$ " W-6 balsa frame between the W-2 wing ribs, and glue in the  $\frac{1}{4}$ " W-1 wing rib. (Note that the center section of the wing is approximately  $\frac{1}{8}$ " thick at the TE. This will fair out straight across the finished fuselage.) Add soft pine, tapered blocks to TE section for wing hold-down bolt. Install top wing spars and fair up with sanding block for covering with  $\frac{1}{16}$ " sheet.

After all the wing framing is completed, add top sheeting. The two  $\frac{1}{16}$ " LE sheets stop at W-2 ribs, where wing LE stops. Dihedral of the top of wing stops at fuselage sides. The wing top is straight across, so as to fair into the windshield block. The TE top sheeting edge is beveled to fit on top of bottom sheeting. The TE sheet can continue across to center of wing and half on W-1 rib. When the TE sheet is fitted and all has been glued, lay a piece of wax paper over the joint. Take two pine strips, about  $\frac{1}{4}$  x  $\frac{3}{4}$  (or two yardsticks), and nail them through the TE with  $\frac{3}{4}$ ", No. 16 nails (available at any hardware store) to the building board. Keep about one half the stick on the board and the other half on the wing edge. After wing has dried, this makes a true, no-warp edge. With scrape ends, fill in the section across top of wing.

At this point, the wing is almost completed. Let everything dry for a day and night, then remove from jig and finish planing the bottom center section. Install the servo box and aileron mounting platform. Glue on wing tip blocks, but do not carve yet. Saw out and dress ailerons, and clean up the aileron section for clearance in the wing. Now is the time to carve wing tips to fair in with

ailerons. Cap all wing ribs with  $\frac{1}{16}$  x  $\frac{1}{4}$ " balsa and sand everything smooth with a long block. Install wing dowels. Install wing to fuse and mark position for your windshield block. Carve the windshield block to almost its proper shape, leaving some to fair into top of wing. Glue this block in place with the  $\frac{1}{16}$ " plywood plate to F-2 of the fuselage. This is to catch the wing dowels. Remove wing, install wing bellcranks and all other aileron hardware. Use three hinges to each aileron. Pin the hinges (for a little peace of mind) after gluing with epoxy. Use Carl Goldberg's short mini-horns and links, or any of your own favorite systems. Hook everything up to the servo, but test before covering, to be sure all is working correctly and free.

**Fiberglass Cowl:** Now that all the woodwork is nearly completed, we will get back to the glass cowl. Using the side elevation of the fuselage, trace the outline of the nose back to  $\frac{1}{4}$ " beyond F-1; likewise, trace the cowl lines from the top view. From the nose section, A-A, of the airplane at F-1, make a template of the nose shape at that point. Using a piece of foam (you may have to glue two pieces together), draw the outlines you have made from the drawings onto one side, top and rear end of block. Saw out this block, following the outlines.

With a sharp knife, this block can easily be carved. Finish by sanding to the same size as the nose, so that when the block is placed up to F-1, it all fairs out with the lines of the airplane. The sides should protrude from the fuselage about  $\frac{3}{8}$ " to let out air that will enter the nose. After all carving and sanding is finished, epoxy a piece of scrap wood about 2 x 3 x 3", with the 2" side to the center of the back of the carved block. This is to hold the block firm in a vise (or clamp it to anything that will hold it free), so the fiberglass cloth can be laid up without touching anything, except the foam block. Coat the foam heavily with

*continued on page 70*



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three to four coats of Johnson's Paste Wax, filling all little holes and voids completely.

Before you start to lay up the cowl, get everything ready, cutting the 6 oz. glass cloth into approximately 3" strips. These will lay over the block without wrinkling. Mix the resin hot enough so that it will start to jell in 20-30 minutes. This will give you plenty of time to lay on two coats of cloth and fill the weave full. At this stage, forget it until it has hardened enough to handle.

Sand everything as smooth as possible on the foam block. By this time, the block will have shrunk away from the cowl, and should come out easily. If you have any holes or voids, fill them with an epoxy-type, automotive body putty, which can be purchased at any auto body repair shop. Apply this putty-filler with a small, thin rubber squeegee, or any flexible material that will put on a thin coat and follow the curves. Use a rough file to knock off the high places, then sand smooth with wet paper—220 first, then 400. This will give you a cowl as smooth as a bottle and very light. Cut out the nose air inlet to the contour shown on the drawing. Holes for the cylinder head exhaust and needle valve will be cut after installation of the engine. Don't be afraid to try this cowl—it's simple to build and the results are gratifying.

**Landing Gear:** Make your main landing gear strut from 3/32" tempered aluminum. Using the lines on the drawing, and bending to the same profile, will produce a springy little gear. Any type of commercial wheel pants in the 5"—5 1/2" range, to cover a 2-1/4"—2-1/2" wheel, will work out fine. If the wheel pants aren't used, Bonner 2-1/2" wheels with unexposed axles, make an attractive arrangement, and are a little better for grass and rough fields. The tail wheel is a 1" Williams wheel. The wire leg was made from the scrap end cut off a mini-snap-link rod. This rod bends easily, yet has plenty of strength. The tail bushing is a piece of 3/16" dowel, with a close-fit hole for the wire. Bend the wire to shape, leaving the top section straight. Solder a small, flat washer in position, as shown in the drawing. Insert the tail wheel wire through the dowel bushing. Bend the leg 90 degrees to fit into pine block in the rudder. Tail wheel assembly will be fitted into the fuselage after bottom fuselage sheeting has been installed.

**Assembly:** Make sure the tail platform is level, then glue the stab to the fuselage. Glue the fin into stab slot and onto center top stringer of fuselage. Be certain the hinge post of the fin is 90 degrees to the stab. I use two light cardboard triangles, one on each side, to hold it straight until the glue dries. Next, install the mounting for the wing. Cut the wing hold-down plate from 1/4" birch plywood. Glue

in place with epoxy, and brace with soft pine or hard balsa blocks, as shown. After boring forward wing dowel holes and wing is centered, bore the nylon screw hole through wing, where the pine insert blocks are. Mark this on plywood wing-plate, bore and tap for 1/4"-20 nylon bolt. At this stage, carve your windshield block to the shape shown on drawings, and fair into top of wing.

Make a pattern from paper for the windshield, and from 1/16" or 3/32" sheet balsa, cut and glue the windshield in one piece. Make sure you rabbet the thickness of the windshield balsa out of the block before trying to glue in place. Remove the wing and install the servo mounting arrangement of your choice, with servos in approximate location shown on plans. Use pushrods of your choice. Mine are mini-snap-links, with rod running through a piece of 1-1/2" long, 1/8" dia., nylon tubing, using balsa pushrods and Z-bent, 1/16" wire hookup to the servo arms. Hinge the rudder and elevator, but don't glue hinges yet.

Install horns and linkage to make sure everything is in order and working. Install the engine temporarily on mount, and hook up throttle linkage to servo. When all controls are moving freely, remove radio and pushrods. Now is the time to fair up bottom edges of fuselage. Install landing gear strut with two 6-32 bolts and nuts. Install bottom frame B-1, according to plans, and glue 1/4 x 1/4" stringer through bottom frames. Cut and glue bottom, 1/16" balsa sheeting, with grain running lengthwise. The notch for the tail wheel assembly is cut, and the unit glued in place with epoxy. Be careful not to glue wire to wood. The airplane is now ready for finishing.

**Covering and Finishing:** First, sand the entire woodwork with 120 paper to cut down all sharp, or rough, edges. With ready-mix spackling compound (available at any paint or hardware store) fill all holes and voids, and smooth over all steams. The spackling dries quickly and sands easily. When satisfied that everything is filled, sand the entire woodwork with 400 paper.

Covering materials and methods are many, and every modeler has a favorite. My system starts with the fuselage. Apply two coats of dope, with light sanding between coats. Using medium-weight Silkspan, cover the open top section and fin first. Cut a piece of medium-weight Silkspan approximately 1" larger than each half to be covered. Wet the Silkspan in warm water, squeeze out most of the water, and stretch it over the open

structure. Using dope to stick the Silkspan, apply to the forward edge of fin, and start stretching and gluing to outside edges only. You don't want it to stick to the fin cross-framing. This takes a little time, but is easily done. Repeat the procedure on the other side. Anyone who has covered a stick-and-tissue model knows the technique.

I have not tried MonoKote on fuselage, but I expect it could be shrunk properly to follow the contour. When dry, the top of fuselage and fin blend into one piece. Cover the solid woodwork of the fuselage the same way. Doping is the next step. Use an Aerosol can to spray the open-frame covered section with light coats, so as not to stick the Silkspan to the framing in the fin. It is only to be stuck to the outside edges of frame and the last cross-frame from the top. About four or five coats will stiffen this area enough. The rest of the covering should be brushed with two coats of dope (to stick the Silkspan to the wood). Do not try to fill the paper solid with dope. Lay the airplane aside for a couple of days, so that all oils dry out of the dope. Cover the wing while dope is drying. I use MonoKote on the entire wing, and haven't found anything better.

Using the spackling compound again, smooth off all fuselage seams and overlaps. Let dry, and sand everything with 400 paper. This leaves everything a little fuzzy. Spray on four or five coats of a lacquer, automotive-type, gray primer, until surface is smooth, sanding lightly between the last two coats. Make sure structure is dust-free. Use epoxy paint to spray or brush on two base coats. I always use white for the base coat. When dry, tape off the windows and windshield, and trim. The windows can be painted on, or use chrome-trim MonoKote. Outline the windows with 1/16" black trim tape. From 6 feet away, it is hard to tell the difference from real glass. As every modeler knows, the few extra hours spent in finishing is time well-spent, so take pride in your work and the results will be gratifying. When everything has dried, and all trim and decals added, assemble the entire ship. Install the 10 oz. Sullivan tank, engine and all radio gear. Balance just a little nose heavy at CG shown on drawing. This balance shouldn't be a problem. Mine balanced out with the battery positioned as shown.

**Flying:** This is the best part of the whole project. If all surfaces are straight, with radio checked out and engine running properly, ease on the gas and up comes the tail. With an OS 40, the ground roll is short and it will rotate itself. Ease in a little up elevator—and you're off and winging. When some altitude is gained, throttle back to half-throttle, and fly forever on that 10 oz. tank. I know that you will soon realize this is one of the best Sunday-flying airplanes you've ever had. And, with an expert at the controls, it isn't bad at aerobatics. Enjoy your Sportsman. It's a fine airplane.

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