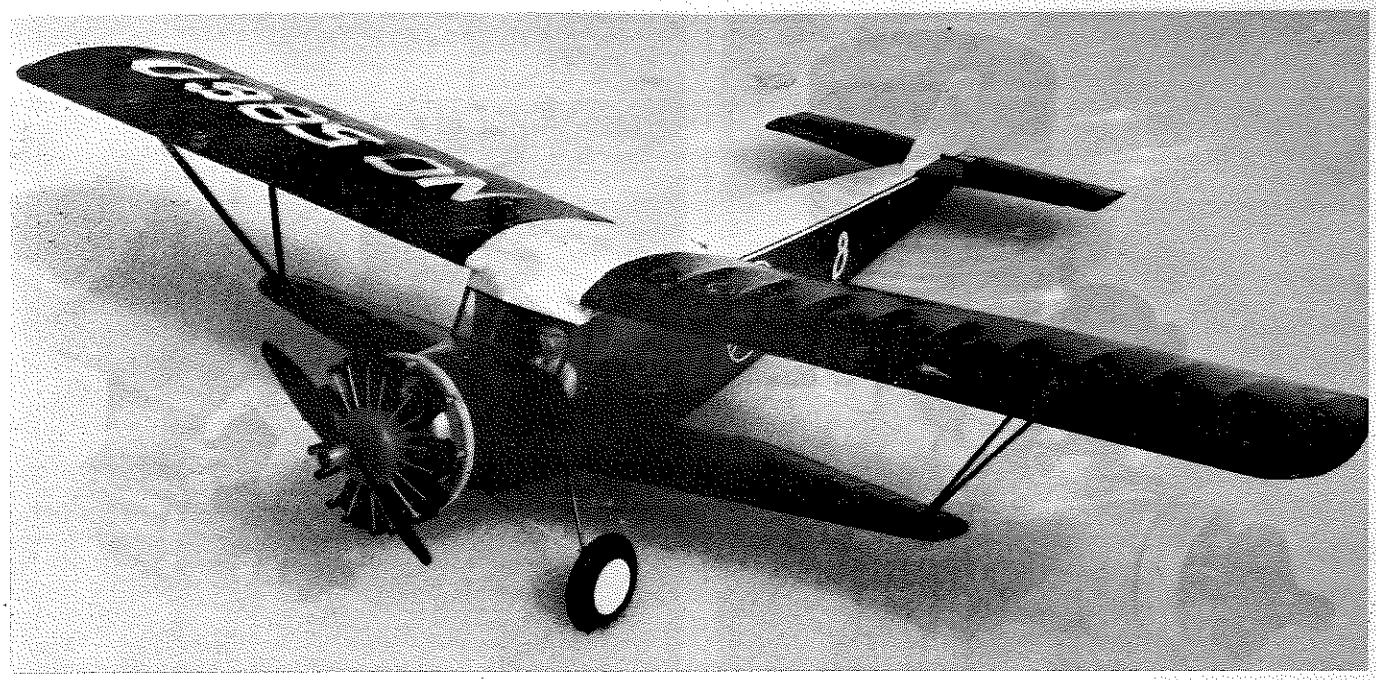


According to Webster's Seventh New Collegiate Dictionary, *sesqui-* means "one and a half times." The Buhl Airsedan you see here has not one, not two, but one and a half wings . . . therefore, it is not a monoplane, nor a biplane, but a sesquiplane!

BUHL AIRSEDAN

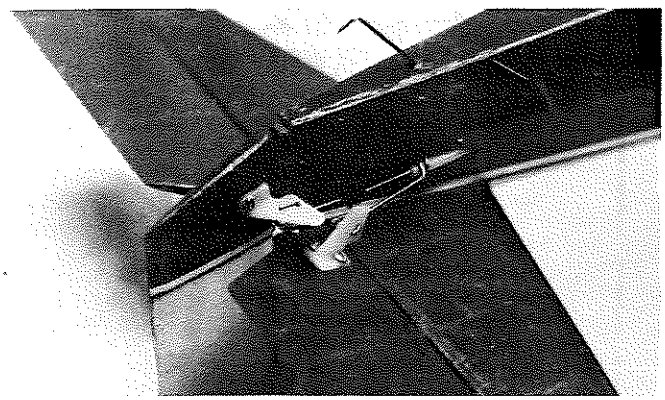
By JONATHAN McPHEE . . . Would you like to build a scale model that won't take three months to finish? How about one that you can fly after work at the local school yard? Read on bro', this is it!

• A host of fascinating aircraft designs were spawned by the dozens of companies that grew up along with America's infatuation with the fledgling science of aerodynamics in the years just prior to the 1929 stock market crash. The Buhl Aircraft Company, of Maryville, Michigan, was not least in putting forward some new approaches. From 1927 to 1932 the company produced a line of aircraft bearing the designation "Airsedan," embracing at least eight distinct types that still shared a common, corporate "look." Alfred Verville, and later Etienne Dormoy (of 1924, ultralight "Bathtub" fame) were the designers.

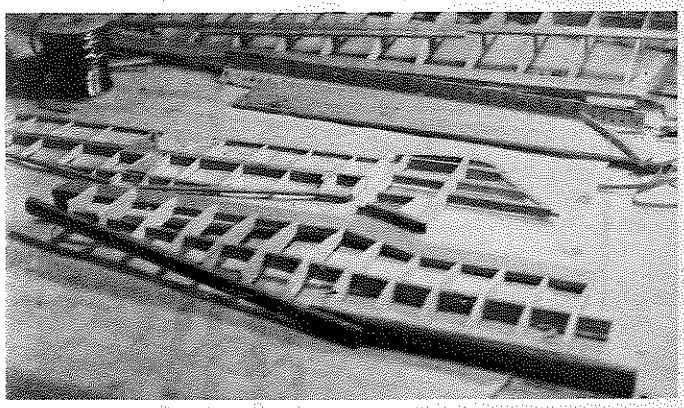
These aircraft were almost unique for their time in providing indoor accommodations for passengers *and* pilot. They were generally powered by the reliable Wright nine-cylinder "Whirlwinds," and they offered relatively high performance. Despite a lack of serious marketing, they sold well.

While the first two Airsedans were true biplanes, albeit with somewhat atrophied lower wings, later versions, including the one modeled here, were "sesquiplanes" with one and a half wings. This arrangement looked about as useful to me as udders on a bull, with the drag of a bipe and without all of its lift. But it provides for a strong wing structure, and it also works aerodynamically. One Airsedan set a shortlived in-flight duration record, with mid-air refueling, of 246 hours. Another finished sixth in the 1928 New York to Los Angeles Air Derby and 10th in the 1928 National Air Tour. Sadly, an earlier version disappeared into the Pacific during the 1927 Dole Derby race to Hawaii.

My interest in this series began with a 1965 set of British plans for the "Junior Airsedan," a sports car version of the aerial Oldsmobile modeled here. I flew this version free flight, and it was put out to pasture until resurrected six years ago to accommodate a recently completed Ace digital kit radio. It gave me a great many pleasant evening flights (albeit sometimes hairy due to its short tail moment), until its terminal snap roll when the wing spar gave up. The resulting "dead duck" descent buried the engine to the firewall, but its new



This Airsedan uses a three element push rod system based on the old stand-by, the Gold-N-Rod. The outer nlyon rod is securely fastened to the fuselage, the inner rod has a friction tight wire wrapped around it, and there is another wire inside for rudder.



The author prefers not to cut individual tip ribs for the lower half-wing, so instead, he makes them the correct length, depth, and with the correct spar notches, then, using the root ribs as templates, simply sands in the airfoil shape. Simple, effective.

#9831

Silkspun Coverite kept all the parts lined up, and Hot Stuff and baking soda soon had it all back together.

I wanted to build a similar plane, with more favorable moments, and recalled an old *Air Trails* article on the Buhl series. Inquiries at local libraries led me to the Smithsonian Institution in Washington, D.C., which has the nation's best aviation library. A phone call brought a listing of available resources and copies of useful documents, especially a three-view from Volume I of *U.S. Civil Aviation,* (Aero Publishers, 1962) and data from the *1929 Aircraft Yearbook* (Aeronautical Chamber of Commerce). Photos are also available for scale presentations at a very fair price.

The aircraft modeled here is the Model CA-3C "Sport Airsedan," which first flew in 1928 bearing Approved Type Certificate No. 46. This $11,000 plane seated four passengers and a pilot, and was powered by a Whirlwind J-5 of 220 hp driving a ground-adjustable metal prop. It had the following characteristics:

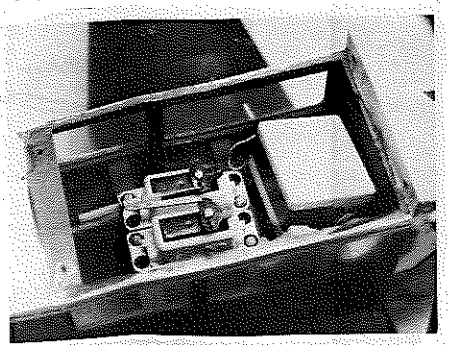
Span: Upper	36 ft.
Lower	20 ft. 10 in.
Wing area	240 sq. ft.
Length	28 ft.
Empty weight	1760 lb.
Useful load	1440 lb.
Max. level speed	134 mph
Cruise speed	112 mph

These dimensions made it ideal for a one inch equals one foot Schoolyard Scale project, and it has proved to be a delightful flyer. The long moments damp some of the 1/2A wildness, and the exotic appearance catches people's eyes. The plane flies well with exact scale outlines and areas in the tailfeathers, so change these at your own risk. The stick construction also mimics the steel tube and spruce forms of the original.

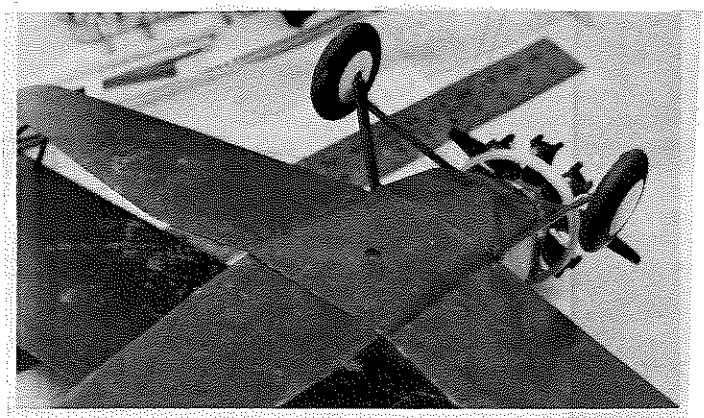
CONSTRUCTION

The construction methods detailed in this project are light, but quite strong enough. The original weighed in at 18 ounces with a heavy paint job, a tired Babe Bee, and an Ace mini-servo setup. Please don't deviate from the wood sizes or qualities shown on the plans . . . overweight and under-strength aircraft are bad for the designer's reputation, unless they're military planes.

Two preparatory items will help in construction. First, make a sanding block out of 3/4 x 2 x 12-inch straight pine stock faced with 120 and 220 grit aluminum oxide paper (use *rubber* cement so that you can replace paper as it wears). Next, make up a tool as shown on the plans, which I think you will find extremely useful for tasks like slotting trailing edges and cutting off cross-pieces and diagonals. Break a carbon-steel (Gillette Super Blue) double edge blade as shown. Hot Stuff it into the slit end of a 3/16 dowel. Use it by sighting down the blade held vertically over the part you want to cut and pushing down to cut and trim small parts "X-actly." For example, to cut fuselage crosspieces and diagonals, shape one end to fit with the sanding block. Now, place the stick over the plans or across the framework with the preshaped end in place, line up the tool's blade with the joint line, push down, and *voilá!* — the perfect joint.



The front end of the Gold-N-Rod shows the working side of the three element system. Use some Super 'T' to secure elevator rod.



Bottom view of the 1/2A Airsedan reveals the landing gear setup, and the method of mounting the lower half-wing.

TAIL SURFACES

Let's begin here. Start by supporting the 1/8 square medium-hard LE and 1/8 x 3/16 TE pieces over 1/16 scraps on the plastic covered plans (I reuse Monokote backing sheets as it helps save petrochemicals). Pin down the spars and add the 1/16 x 1/4 and 1/8 x 1/4 ribs and braces as shown. The rudder tip is laminated from four layers of 1/32 x 1/4 balsa using Titebond, over a form.

Add all the gussets and braces as shown. Spot glue the spars and the aerodynamic balance areas of the tips together. Please note that the rudder-fin assembly can only be glued on *after* the stab-elevator is covered and installed on the fuselage. The rudder spar is an important strength member, so don't just cut it off to clear the stab spar and then butt-glue the fin to the top of the stab.

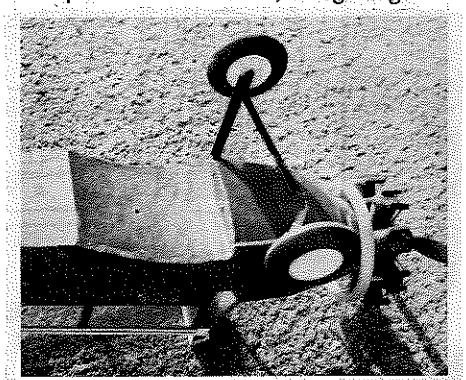
Lift the surfaces off the plans, and with a ballpoint pen, draw centerlines on the LE, TE, and tips. Using the sanding block, shape the surfaces to conform to the plan cross-sections, leaving a little "fat" (1/32 or 3/64) on the extreme TE to avoid breaking it during handling and covering. Cut the surfaces apart and sand the bevels on the rudder and elevator spars to allow free movement of the hinged surfaces with a minimum gap. Drill 3/32 holes for the Robart Mini-Hinge Points, and cut recesses for the hinge joint, *but do not glue yet.* This nicely simulates scale hinging.

Set these surfaces aside.

LOWER WING

Don't complain, guys, there's only a half-wing to build here, and besides, the funky configuration is half the appeal of this bird. I never have figured out how to lay out tapered wing ribs, especially for a *double,* double-taper wing like this one, so the lower wing is largely finished up with the sanding block, like the tail surfaces.

Cut the center and tip ribs, and the rib at the TE "break," out of 1/16 medium-hard sheet per the plans. Carefully cut the spar slots. Cut rectangular blanks to the length of the other ribs over the plans, with a little extra on the front edge to allow shaping the LE bevel. Mark and cut the spar slots using a divider to transfer the tapered spar depth at each rib station. Cut the LE pieces, and epoxy the TE pieces at the break joint together (don't glue the dihedral joints yet) over the plan. Notch the TE. It helps to roughly preshape the TE pieces before going further. Cut the sheet tip pieces, noting grain direction. Note that the center section LE piece forms its own dihedral brace: it is deeper than necessary to begin with, and runs without breaks across the dihedral joint area. Be sure to sand in the bevel on its forward face very carefully, to insure a good, strong joint. Fit and glue all the ribs *except* the dihedral ribs, not gluing ribs



No, it didn't crash, it was turned on its back to show you some fuselage details

This 3/4 rear view graphically depicts the long tail moment of the Airsedan which aids stability in a 1/2A-size model.

The dummy Whirlwind engine really "makes" this model. Take the time to do it right; it's worth it!

to the spar where the dihedral brace will pass through. Glue in the tip pieces.

After sanding the joint faces at the dihedral break to a good fit, pack up the tips the indicated amount and glue the panels together using epoxy sparingly. Add the rest of the ribs, again *not* gluing where the dihedral brace goes. The brace is most easily made using this method: the ribs are slotted for the brace, a blank of plywood (cut to length) is slid into the rib slots, and the spar is used as a template to mark the top edge of the finished brace. The top edge is cut with a jigsaw, the blank is slid in again, the bottom edge is marked as before, and the blank pulled out so the final cut can be made. Glue into place using spare amounts of epoxy.

Lift the wing off the plans.

Add the 1/16 x 1/4 strips outboard of the dihedral rib bottoms. These form a base for the covering to adhere to. Add the block bracing for the mounting bolt hole but *do not drill* yet. Tack-glue and rough-shape the fairing block.

Now put a thin strip of vinyl electrician's tape across the tops of the preshaped ribs only. Sand the LE and TE roughly to shape, and then shape the wing ribs using your sanding block laid spanwise but pushed chordwise to shape the rib blanks to blend with the taped-over ribs. Sand the whole structure smooth, except the bottom fairing block, and set aside.

UPPER WING

Use your favorite method to "prekit" from 1/16 medium-hard balsa, 20 regular ribs, three center section ribs, 20 nose ribs, and two dihedral ribs from 1/8 sheet. Round off the rear, upper portion of the nose ribs to produce a better covering job.

Pin down the spars, the preshaped and notched TE, and the LE over 1/64 shims. Add the ribs, gluing LE and TE with Super 'T' Hot Stuff, and the rib-to-spar joints with Titebond, using for the latter purpose a pointed, 1/4-inch round brush. *Don't glue* where the dihedral brace will go, and don't add the 1/8 ribs until the dihedral joint is complete.

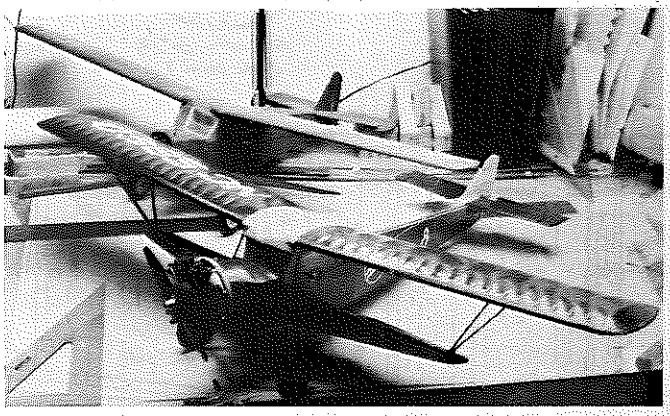
Glue in the 1/16 x 3/16 hard interplane strut braces and scrap strut mounts, drilled out to 1/16 where indicated. Add the tips, noting the cross-section and upsweep on the plan. Lift the outboard panels, and sand the joints to match the dihedral angle. Prop up the tips the indicated amount, and glue LE, TE, and spar dihedral joints using a Sig trick: drill several small holes, 1/32 or 1/16 diameter by 3/32 deep, into the spar, the LE, and the TE *inside* their final cross-section. Work epoxy into the holes and over the mating faces, bring together and pin, effectively "nailing" the parts together. Add the gussets and block reinforcements shown, and the center-section sheet fill (note grain direction). Cut and fit the TE fairing block roughly to shape but *do not glue* until the fuselage is available for final fitting.

FUSELAGE

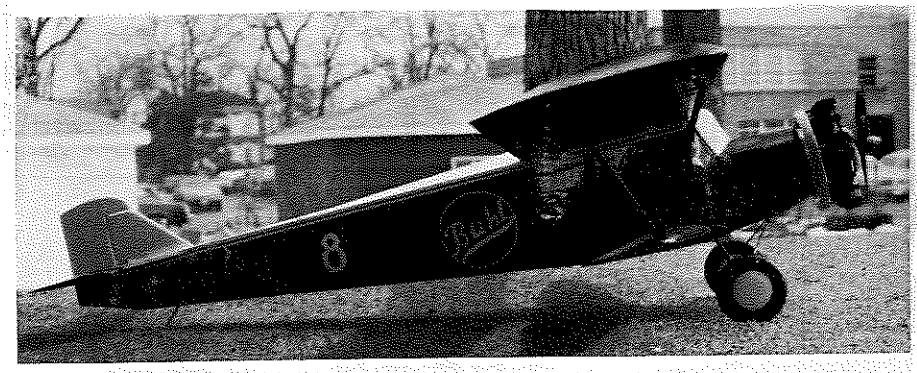
Build the side frames (one left, one right) out of hard, stringy 1/8 square balsa as well as the other sizes of balsa and spruce where indicated. Take special care to get the lower wing saddles right as they control its incidence. Note that the side view of the fuselage is a true *projection* of the top view, so the tail post will end up over the centerline and over the spot shown on the plans. Glue the 1/16 hard diagonal on the outboard edges of each frame so they will contact, and can be glued to, aft fairing strips. Use Titebond here sparingly, but preglue each joint and you will gain significant strength. *Do not* add the 1/32 sheet sides yet. Cut out the bulkhead parts and cabin crosspieces, but don't glue the ply pieces to B-B yet. Glue cabin bulkheads and sides together upside-down over the plans, taking care to get a square, true structure. Crack the longerons behind C-C and bring the side frames together at the tail directly over the fuselage centerline, and glue. Add the gussets behind C-C, and the top and bottom crosspieces and diagonals. Fill in the lower wing mount area with cross-grain 1/16 sheet. Lift the structure off the plan and epoxy the ply pieces to B-B with epoxy, but *do not drill* for the wing bolts, and don't cut away the frames in the window areas yet.

Now add the 1/32 sheet sides, cut from hard, stringy, A-grain stock, but *don't glue* forward of B-B yet. You complete this area by weighing one side at a time down on the building board and bending up the front frame 3/16ths of an inch. Small kerfs half-through the front frame pieces, made with a razor saw, will ease the bend. Make sure sheet and frame contact evenly, and use Super 'T' to glue them together. Add the front cross-members and all the indicated gussets and reinforcements. Cut out the window areas.

Now build up the rear turtledeck framework and stringers, the side fairing stringers, and the 1/16 sheet at the pushrod exit point (left side only . . . this ship uses one pushrod for both control functions). The forward fuselage top changes from oval to triangular cross-section, but 1/64 plywood, dampened, bridges this nicely and is a lot lighter than blocks. First add the partial bulkhead A-A, the "dash panel," and the 1/8 scrap brace between them. Add the gluing pieces along the top longerons. Cut a piece of 1/64 ply roughly to fit. Put a bead of Titebond along the top of the brace and the dash panel, mate up and clamp or hold until the glue sets up. Now trim and glue the side seams and forward edge down, using lots of rubber bands or rubber strip to clamp.



An early free flight Airsedan, a "Junior Airsedan", was built by the author from British plans back in 1965. It rests in background.



From this angle, the Buhl Airsedan resembles a Curtiss Robin. Vertical tail size is adequate for control and stability.

Cut and glue the 1/4-inch sheet forward side pieces and top and bottom blocks. Add the 1/4 x 3/8 spruce lower wing "hold-up" brace and spruce gear leg crossbrace. Bend the LG wires and drill B-B as shown. Bind the legs to the fuse with epoxy and copper wire, and bind and solder the lower legs together. Add the bottom fuse sheet, grain fore and aft, and sand the fuse front to contour. Sand the side (2°) and downthrust (3°) shown into the nose. If you are using an engine longer than a Babe Bee, the firewall will have to be moved back to keep the prop plane in scale position. A new firewall can be made by marking around the sanded-back nose onto a piece of ply held against it.

Add the servo rails and reinforcements, spaced to suit your servos (plans set for Ace mini servos). If you plan to use a throttle, think out and do the installation now. I originally used a "clunk" tank made from a one-ounce Hot Stuff bottle, and ran the fuel line to one fill tube on the Babe Bee backplate (the other was plugged). (Fifteen minutes is a long time to try to stay in front of a 1/2A plane.) Coat the inner nose area with heat-thinned epoxy, glue 3-48 blind nuts for the engine bolts to the firewall, and epoxy them to the fuselage nose.

Now add the 1/16 ply piece to the top of B-B, using epoxy. When this has set, place the top wing on the fuse, align it carefully to avoid lateral or longitudinal twist, and spot glue in place. Drill the wing dowel holes straight through B-B into the wing spar, and drill the TE and 1/8 ply wing mount with a 3/32 or No. 64 drill. Remove the wing and tap the mount holes 4-40 or install 4-40 blind nuts. Add, and final-sand, the top fairing block to the wing, and drill and recess as shown for the bolts. Add the wing dowels.

Shaping the forward cabin roof block is an exercise in sculpture . . . just remove all the wood that doesn't look like the finished piece. Study the photos before beginning to have the shape firmly in mind. Begin by fitting the block exactly to width, and mark and sand the side profile. Use 180 grit paper glued to scrap 1/8 x 3/8 spruce, and 220 grit glued to six inches of 1/4-inch dowel, to finish the shaping. It helps to mark around the wing LE and to mark the shape of the block at the fuse side. Sand the bevel across the top of the windshield, being usre not to sand into the wing LE shape that projects cross the cabin top. Finish up with the wing installed, and with tape over finish-sanded wing areas like the LE and inboard rib tops. Rabbet the block to take the windshield material using a fresh single-edge razor blade. Recess for, and add, the spruce windshield posts with epoxy.

I used strips of 1/16 x 1/32 to form ledges in the window and windshield openings to glue the acetate to, but don't add these until most of the covering/finishing is done. Now fit and carefully align the lower wing and fairing block, and drill, tap, and recess the wing bolt hole and mount as shown. All the wing bolt holes and recesses should get a good shot of Hot Stuff for reinforcement and fuelproofing.

COVERING AND FINISHING

I used a rather heavy combination of Silkspun Coverite and three coats of sprayed Pactra Formula U in red and white to approach the cream and maroon scheme of the original. Solarfilm, Monokote, or even Super or Permagloss Coverite would no doubt be lighter and produce a better finish than I managed. Make sure you remove the covering from areas that get glued on the stab, fin and fuselage. The trim was painfully cut from Trim Monokote, using tracing and carbon paper to transfer the shapes and lots of new, No. 11 blades, cutting on a sheet of glass.

The dummy Whirlwind cylinders were made from lengths of cardboard coathanger tube wrapped with two stepped layers of 1/32 sheet balsa and carpet thread to simulate fins. Rocker boxes and heads are 1/8 scrap, pushrod tubes are 1/16 aluminum tube, the exhaust collector ring is four wraps of 1/16 x 1/4, Titebonded around a form, and the crankcase is from one-inch block, razor-sawn to shape. An easier, but more expensive approach is to buy the Williams Brothers cylinder kits . . . and if the Williamses are listening, I bet you guys could sell a zillion one-inch scale, full-engine kits to the schoolyard set. The dummy was cut away with a drum sander and Dremel tool to fit around the engine, and a "crankcase" nose and rear transition piece was made of 5/8 sheet with slots and holes for the engine parts. Wood screws in small hardwood blocks epoxied to the firewall hold it on.

Don't forget that the wheels, the interplane struts, the LG fairings, and the dummy exhaust add a lot to appearance. I leave the dummy engine off for flying. You could leave it on and add flying wires too, but at this scale, and for this kind of fun-fly project, it didn't make sense to me.

RADIO INSTALLATION AND FLYING

The pushrod installation looks impossible, but it works well. A 3/64 wire inside the inner Gold-N-Rod with Z-bends on both ends works the rudder, and the inner plastic tube is connected through 3/64 wire fittings that wrap snugly twice around the tube (but not so tightly as to bind the inner wire and thus increase servo loads) also terminated in Z-bends. The outer tube is only a guide, but rough it up and epoxy it in place at both ends.

I have used both Ace Mini and Cox/Sanwa (micro servos) sets with success. The latter is a bit heavier, but the plane with either system is so light that it has thermalled for 10 minutes with either system aboard. Set the control throws to give about 1/4 inch up and down elevator and 3/8 inch of rudder each way for test flights. The plane is easily capable of snaps, spins, loops, barrel rolls, split-S's and similar maneuvers . . . although, of course, negative Gs quickly starve the Babe Bee. Make sure your installation is properly secured, that servos travel the right way with their arms on tight, and no wires are being strained, and generally follow all the good practices you read about every month on these pages.

Balance the plane at or forward of the indicated point for initial flights, and remove all warps and misalignments before flying (about 1/8 inch of washout is OK in the upper wings). I test-glided the plane over a grassy baseball outfield, with the radio on. Once the glide is trimmed to this CG, all other adjustments to counteract diving, stalling, or turning under power should be made with washers under the engine lugs to adjust the thrustline. The plane glided nicely at this CG with the trims on both flying surfaces set at zero . . . a desirable condition, as changes in speed have less affect on flight attitude. While this is not really a plane for beginning pilots, it has a free-flight heritage and, if trimmed right and left to itself with enough altitude, will recover from most unusual attitudes into straight-and-level flight.

Try your first flight on a day with no more than five to seven mph of wind. After the first trimming flight, mine flew great, and has over 75 flights on it to date. I have increased the control throws gradually, and the plane is capable of some very wild, decidedly non-scale aerobatics. It's a great plane to have around for those late summer evenings when you want to fool around but don't want to pack up the toolbox for a trip to that distant flying field.

Good luck, and FLY SAFELY! •