Meyers OTW-160

By DARRELL ROHRBECK. . .A desire to recreate in model form a favorite biplane once owned by the author led to this stunning model. Designed for a Saito 4-cycle, it performs flawlessly in the air.

• In 1946 I owned a full-size Meyers OTW-160 biplane. The license number of my plane was NC 26490. It was designed and built by Al Meyers at the Meyers Aircraft Company in Tecumseh, Michigan, in 1941. It was originally fitted with a 120 hp Ken Royce radial engine and was flown in the Civilian Pilot Training Program. This program was created by President Roosevelt in 1938 to train 20,000 college students to fly each year. The C.P.T.P. was instrumental in developing a cadre of pilots who would be needed in the coming war years. One hundred and two Meyers OTW biplanes were built for this program from 1938 to 1942. OTW stood for "Out To Win." After the war, the Meyers biplanes were sold to civilian flying schools, bought for crop dusting, and fitted with 225 hp engines. Some were used for glider towing and sport flying. Presently 55 of these aircraft are airworthy, and they have become expensive collectors' items. After the war NC 26490 was purchased by Doctor Hammel of Tecumseh, Michigan, who was a close friend of Al Meyers. The plane was taken back to the factory, fitted with a 160 hp R-5 Kinner five-cylinder engine, aluminum ailerons, landing gear fairings, and a new paint job. I purchased the plane in 1946, and it was sold in 1949. It was a beautiful-flying plane that cruised at 105 mph and landed at 45 mph. It could loop from straight and level and slow-fly with idle throttle without dropping a wing.

On July 4, 1986, I was asked to display my R/C scale model of the Meyers at a Meyers Fly-In in Tecumseh, Michigan. There were eight OTW biplanes there, and one of them was NC 26490—the plane I once owned but had not seen in 40 years!

My modeling career started at age 10 with rubber-powered free flight and continued into gas-powered free flight and gliders. I recall losing a Comet Zipper at an AMA-sanctioned Nationals contest at Ford Airport in Ypsilanti, Michigan, in 1943, when it thermalled out of sight. After a

Lifting off with the sun glinting on its chrome MonoKote surface, the Meyers OTW certainly must bring back memories for its owner/builder.

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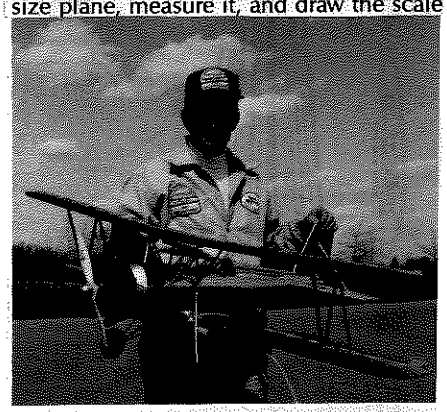
hitch in the Army Air Corps, I continued to build and fly gas models. During that period of time, I had bought the Meyers OTW. On a few occasions, my models were strapped inside the fuselage of the Meyers, and I flew to out-of-state contests to compete. That was the best of both worlds.

I sold the Meyers and gave up modeling to go to college, race sailboats, ice boats, and hydroplanes. Also took time to get married, raise a family, and have a career with General Motors that lasted 33 years. When I retired in 1981, I decided to get back into model airplanes, and the state-of-the-art was radio control. I joined the Fraser R.C. Flying Club, built a Sig Cadet, and learned to fly it. The next project was a scratchbuilt Seamaster 40 designed by Ken Willard, followed by Carl Goldberg's Gentle Lady glider.

Now was the time to make a longtime dream come true—design and build an R/C model of my old Meyers OTW.

My efforts to obtain plans, three-view drawings, or accurate dimensions from various model magazines, model plans catalogs, the Smithsonian Institution, and Meyers Aircraft Company were mostly in vain. However, Walt Mooney had the plans published in a 1968 model magazine for a 15-inch, rubber-powered, almost-scale Meyers OTW. This enabled me to trace his three-view drawing that would be used to record dimensions later. It became apparent that this classic airplane has been virtually obscure to the modeling world, and the only way to obtain plans was to find a full-size plane, measure it, and draw the scale plans myself.



The author today, with his recreation of the full-size Meyers OTW-160.

About fifteen years ago, I became acquainted with Everette Payette. Everette is the historian for Meyers Aircraft, an OTW pilot, and freelance photographer. He made it possible to measure and photograph an OTW-160 that was hangared near his home in Monroe, Michigan. With all dimensions and pictures I needed, I decided to make a .40-size scale drawing using a Saito .45 four-cycle engine. It looked more like a full-size Kinner engine cylinder than any of the other engines, and with a slight revision to four Williams scale model cylinders, I could make a neat five-cylinder look-alike. After some calculations and guesstimates, the wing span turned out to be 50-3/4 inches.

When completed, the drawing was exactly 9/64 scale, or 1-11/16 inches to the foot, with a lot of detail. First came the detailed dummy engine, then flying wires, followed by fairings, rib stitching, navigation lights, fairings, exact color scheme, etc. To date, the model has won four first- place trophies in sport scale class, and I chickened out about flying it.

Back to the drawing board! I revised the drawing by eliminating some detail and designing a lighter structure—strictly a flying model! A few months later the second model was completed, and off to the flying field we went. The first takeoff was a ten float roll, and it flew just like the full-scale Meyers: just great, with all trims centered.

FUSELAGE CONSTRUCTION

Making the bulkheads is the most time-consuming job in building the fuselage. To make this chore much easier, take the plans to a local print shop where they have a Xerox copy machine. By folding the plans in the right place, you can make copies of the bulkheads, wing ribs, dihedral braces, wing, elevator, and rudder tips. Make a couple extra copies from the first Xerox and you will save a lot of time tracing shapes from the original plan. The #1 bulkhead is 3/16 plywood, #2 and #3 bulkhead is 1/8 plywood, and #4 through 9 are 3/32 balsa plys, cross-laminated. Cut out the Xerox bulkheads and cement them to 3/32 balsa sheet with the grain either vertical or horizontal to the bulkhead vertical center line. Use a low-contact spray adhesive, and the paper template can be peeled off later. Cut out the balsa bulkheads leaving 1/16 inch outside the line. Do not cut out the notches for the stringers at this time. Lay the bulkheads on 3/32-inch balsa sheet with the grain running in the opposite direction and draw a line around them.

Cut out the second laminates and cement them together except for F-5. Leave F-5 in two separate laminates. Drill two small bolt holes on the center lines of F-1 through F-5, stack and bolt them together, and sand to the line. This will insure straight line surfaces from F-1 to F-5.

Cut out and file the stringer notches, lightening holes, and wiring tube holes, then drill the control cable holes. Fit a six-ounce Sullivan fuel tank in bulkheads F-2 and F-3 and cement 1/8-inch foam all around the edge of the openings for a vibration-free mounting.

The next step is to silver solder 1/8-inch I.D. brass tubes to 1/32-inch brass plates, bond and bolt them to F-2 and F-3 to accept the cabane struts and the landing gear. Allow the tubes to extend 3/32 inch outside of the bulkhead line for sheeting thickness.

The fuselage is built as a front and rear assembly, and then the assemblies are bonded together. Let's build the rear half first. My method of construction was to cut the bulkheads F-6 through F-9 on the vertical center line, cut only one laminate of F-5. Pin the top and bottom longeron in place on the side view of the plans, allow extra length forward. Cement the left half bulkheads to the stringers in a vertical position. Cement the remaining stringers in place. Remove the partial assembly from the drawing and cement the right bulkhead halves to their respective "F" numbers, then cement the remaining stringers in place. Leave extra length forward on the top three stringers.

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Now set the rear assembly aside, pin the right-hand center stringer to the plan, and position F-1, F-2, F-3, F-4 and the single F-5 laminate *vertically* in place with pins or square blocks. Position the opposite left side stringer and cement all the stringers to the bulkheads *except* F-1. The drawing shows two degrees downthrust and one degree right thrust. This can be done by positioning F-1 at the correct angle now or shimming the motor mount later. Your choice! Cement the top and bottom longerons in place. At this point, wet a piece of 1/16 balsa, roll it around the 1/2-inch diameter dowel to form a tube that is cemented in the holes between F-2 and F-3. This tube will carry the wires from the servos and switch to the receiver and batteries in the front compartment. Complete the front half of the fuselage by cementing the remaining stringers. Now comes the important part, bonding the front half of the fuselage to the rear half. Position the two assemblies on the drawing over the top view. Use a combination square or triangle to align the vertical center line on F-1 and F-9. Make a gage block 3/4 inch thick to elevate the rear half at F-9. When the stringers have been trimmed and matched, bond the two halves together with a long-setting, void-filling epoxy. Complete the structure by installing all the reinforcement angles and sand the structure to a true elliptical shape.

LANDING GEAR

The landing gear is made from 1/8-inch music wire. Use the actual length dimensions shown on the drawing. Insert the bent gear parts in the brass tubes in the fuselage, wrap the joints with copper wire and solder them. When complete, remove the gear until final assembly. I used Ace three-inch wheels; they are super light weight. The dummy shock absorber strut is made from two diameters of slip-fit aluminum tubing.

ELECTRICAL

This is the time to install the servo tray, which is made of 1/8-inch plywood, mounted with bolts as shown on the plan. The control cables, switch, fuel tank, and fuel lines should also be installed now.

Now let's complete the fuselage by sheeting it with 3/32-inch balsa. But first obtain a three-foot length of 4-inch diameter and galvanized furnace flue pipe. With a little squeezing, the thin sheetmetal tube can be shaped to match the elliptical shape of the fuselage and used as a form to pre-bond the balsa sheeting. Soak the patterned balsa sheets in hot water, swab with ammonia to promote bending, wrap around the flue pipe, and secure with rubber bands. Applying the sheeting to one side with cyano glue and the second side with white glue and pins works really well.

When the sheeting is completed, cut out the headrest bulkheads H-5 to H-9 and pin them to the fuselage top view on the drawing. Apply the sheeting to the sides first and then the top. Fit and cement the completed headrest to the fuselage.

Draw the cockpit openings on the sheeted surface and cut them out. Slit 3/16 black rubber tubing and slip over the cock-

pit opening for a combing. The windshields are made from 1/32 acetate and 1/8 electrical tape to simulate the frames. Bond the combing and the windshields with RC-56 Wilhold on final assembly; it dries clear. Cut out and make the doors for the battery and receiver compartment access. The engine cowl ring, tailwheel installation, instrument panels, etc. will just about complete the fuselage, except for the lower wing fillets, but that comes later.

WING CONSTRUCTION

The top and bottom wings are structurally the same, except that the center section of the top wing is shorter (chord) than the bottom wing and ailerons are on the bottom wing only. If you have made zerox copies of the four size wing ribs, it will be a simple matter to make 1/16 plywood or aluminum master templates. Make all the ribs to the W-4 size, stack, and sand them together. W-1, W-2, and W-3 can be cut shorter as required, and the notches for the dihedral reinforcements can be notched larger. Make sure to measure the wood used for spars and dihedral braces so that the notches in the ribs will be correct for a good fit. Select hard, straight balsa for the spars and leading edges. Pre-shape the leading edge and cut the spars to length; always leave a little extra length for final trim. Don't be like the guy who said, "I cut it twice and its still too short!"

The airfoil is a modified RAF-15 and is scaled down from the master template of the full-size aircraft, courtesy of Mr. Pard Diver who has been the chief mechanic for Meyers Aircraft Corporation since the first Meyers was built. It is a high lift airfoil with considerable under camber. So when the ribs are set in place on the spars, make sure the bottom of the ribs and the spars are flush. I use cyanoacrylate glue to build the whole wing except for the epoxy dihedral joints. The construction of the wings is quite conventional. Build the outer panels, then the center section. The lower wing battery box and ailerons, cabane and "N" strut fittings are fabricated to finish the wings.

RUDDER AND FIN

Construction is conventional. Taper the rudder at the trailing edge as shown. Sheet both parts with 1/16 balsa. Bond the fin to the fuselage on final assembly.

STABILIZER AND ELEVATOR

This is conventional flat construction. Groove the two halves of the elevators and epoxy 3/32 music wire to join them. Allow clearance at the center bend to clear the tail wheel bearing tube in the up and down position. Bond to the fuselage on final assembly taking note of the two degrees incidence angle. Support the rudder and stabilizer with struts as shown. Shape a balsa tail cone to F-9.

FINAL ASSEMBLY

Install the hardwood block and "T" nuts in the fuselage to accept the rear bottom wing bolts. Shape a hard balsa front mount for the lower wing, but leave the hard wood dowels out until the wing is accurately positioned parallel to the horizontal datum line.

Construct the wing-to-fuselage fillets by the method of your choice. I covered the fillet area with masking tape and clay modeled the fillet shapes. With a coat of shellac and wax on the clay, two layers of medium weight fiberglass were laid up over the clay. The fiberglass and clay were removed, and the fiberglass was trimmed to fit. The part was then bonded to the fuselage. The cavity between the fuselage and fillet is filled with scrap balsa and seated to the wing with a lightweight filler like Model Magic, allowing 1/32 inch for a silicone rubber final seat. Use Saran Wrap taped to the center section of the wing as a separator.

Positioning the top wing accurately is very important but not too difficult if support jig templates are used. Cut out two 1/4-inch plywood templates from the side view of the wings. Cut them so that the leading and trailing edges rest on the templates, but extend the templates inside the ribs so that the templates can be clamped to a rib. Also extend the template forward of the leading edge and aft of the trailing edge to keep the wing from moving back and forth. Double check the top wing attitude to the bottom wing with a height gage. Both wings are at zero degrees incidence.

With the top wing held in position, bend and fit the 1/8-inch music wire cabane struts. It is not necessary to cement the struts into the fuselage tubes. The electrical terminals used for the top strut wing mounting can be purchased at Radio Shack stores. With a fine-toothed modeler's saw, slit the trailing edge of streamlined aluminum tubing, purchased at your local hobby store, and slip it over the 1/8-inch music wire. Bond the tubing back together with epoxy. It's easy to do and looks good.

The outer "N" struts are made by first making a side view cardboard template of the upper to lower wing strut fitting hole pattern. Check the template right to left wing. Cut and fit the streamline tubing over the template. Bend a piece of 5/32 music wire and epoxy it into the tubing joints. Epoxy the clevis in the tubes with the "N" struts in place between the wings. The "N" struts use a structural requirement to distribute the wing loading. (See Figure 10.)

ENGINE

A Saito .45 was used with excellent results. The carburetor choke assembly was removed to enable the engine to be moved rearward 1/4 inch. This brought the balance point right on the center of gravity as shown on the plans. Choking the engine with a finger works as well.

If you decide to build the dummy engine, I suggest shaping a styrofoam model of the crankcase from the drawing. Lay up 1/16-inch fiberglass thickness over the model and melt the styrofoam from the fiberglass with lacquer thinner or gasoline. Purchase four #205 Williams Bros. dummy cylinder kits. Assemble them and cut them off at the bottom to match the length of the real cylinder. Lay out and cut holes in the crankcase to accept the cylinders after the crankcase has been trimmed to fit the real engine and screwed to the motor mount. After sanding and painting the crankcase, the dummy cylinders as well as the real engine can be sprayed with a flat black high temperature paint (800 degrees F) that is fuel proof and available at K-Mart stores. The real engine actually dissipates heat better when painted black. However, if you add the dummy engine, which will weigh about 2-3/4 ounces, it will be necessary to mount the battery pack against the #5 bulkhead under the floor of the rear cockpit to maintain the correct CG balance point. The CG is accurate and critical.

COVERING

The full-size Meyers had an aluminum fuselage, rudder, and fin. I used chrome Super MonoKote to simulate the aluminum surfaces. Chrome is not the easiest of the MonoKote coverings to use because the amount of stretch or shrink is very minimal. However, this fuselage and rudder has all straight line surfaces and a beautiful job can be done. The covering will look only as good as the surface it is applied to, so sand the sheeted surfaces true and finish sanding with 180- or 240-grit sandpaper.

By using a cotton sock on the iron and starting in the center of a panel and working outward, the film went on fine. The most important part of covering with chrome MonoKote seems to be the correct heat range. Adjust the iron temperature on a scrap sample first and apply just enough heat to obtain good adhesion without bubbles. As the iron is worked to the outer edges of the panel, insulate the already adhered part from the iron heat by use of a 3-x 5-inch index card held between the back of the iron and the MonoKote.

The simulated panel lines were indented with a very dull knife and a flexible plastic ruler. The rivets were indented with a dull pencil. The brightness of the chrome can be slightly dulled to make it look more like polished aluminum by lightly rubbing the surface with white rubbing compound—easy does it!

The wings and stabilizer were covered with silver and black MonoKote using the same color scheme and NC numbers as the full-size plane I used to own.

FLYING

The initial flight was a sheer delight and made the whole project worth while. This was my first experience flying a R/C biplane, and none of my planes before sported a four-cycle engine. My preflight jitters and dry tongue were unfounded because it taxied with excellent control. When I headed her into a slight breeze and advanced the throttle, she rolled about ten feet and was flying before I had given her full throttle. She climbed out smartly, gained altitude, and when I leveled her out, she flew straight and level—hands off—with all trims in neutral. She does loops, rolls, and hammerhead stalls just like the full-size plane did. She practically lands herself. The only adjustment required was to increase the aileron movement to 5/8-inch deflection for a faster roll rate.

While the plans are very detailed, this is not a beginner's building project; however, a beginner could easily fly it. The plane weighs 5 lbs., 4 ozs. with the dummy engine. The wing loading is 15.5 ozs./sq. ft. If you decided to build it, *keep it light!* The effort will pay off in performance. Few models at the flying field have commanded so much attention for its classic design and realism on the ground and in the air. •