This shot of the model captures the feeling of air racing in 1929 when the Mid-Wing flew at the Cleveland Air Races. Its great performance there resulted in its production as a kit or ready-to-fly FOB for less than $1000.

The Church Mid-Wing

Nats-winning, free-flight scale model is copy of author's own restored full-size airplane. Steady flying model on an .09 engine. And for radio control too?

WILLARD KEHR

THE first time I saw a Church Mid-Wing JC-2, it was hard to visualize it as a one-time racing plane. Gene Chase, a model builder and member of the local Antique Airplane Assoc. had the remains on exhibit at an antique plane fly-in. It was in sad shape; actually, no shape, just a rusty skeleton more resembling a pile of junk.

Gene had factory drawings and an advertisement on the tiny ship. Right away I saw the potential it had for a scale model. The cockpit was simple, easy engine to scale, lots of wing area, plus a colorful paint job. Gene, himself, started rebuilding the Church in the winter of 1965. While helping to clean up some of the parts for the fuselage, I began the scaling down of the plane. Since I helped on the full-size airplane, my work on the scale model was easier for I could see many details at close hand.

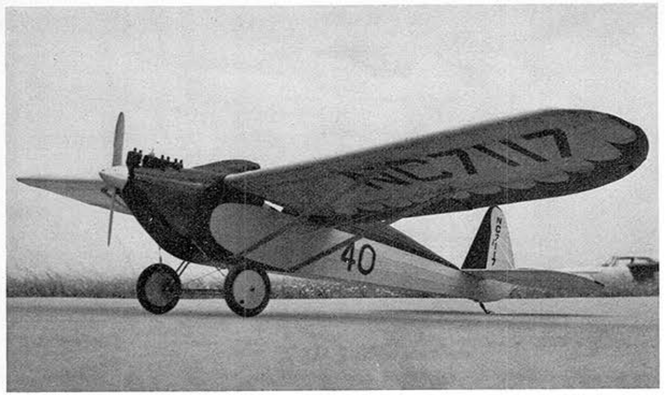
The original Church was built in 1928 and 1929, by Jim Church of Chicago. He used basic Heath Parasol parts, i.e. the wings, body and tail. His plane was powered with the famous Henderson motorcycle engine. In 1929, Jim entered the Church in the Cleveland Air Races in the 100 cu. in. class. The Church, piloted by Freddie Lund, test pilot for Waco, lead the race for five laps before a burned valve forced it from the race. The airplane performed so well, Jim started kitting his modifications for the Heath. He also sold the complete plane and parts to potential builders.

The Church could be bought complete, ready to fly, for $975 or in kit form for $200. Conversion kits to change the Heath to a Church were available; also a fully equipped tool kit which sold for $12.50. Today, you can't even buy the box at that price.

Some of the specifications of the plane were: weight, empty, 240 lbs.; top speed, 90 mph; landing speed, 28 mph; span, 27'; chord, 4' 6".

With all the information that was available and the real plane handy to measure, the Church made a very exciting subject to scale. Some difficulty was experienced in scaling and fabricating the landing gear because I wanted realism in the shock system.

Construction: it has always been my choice to build the fuselage first. The main part of the fuselage is not difficult to build but there are a few parts which will take some extra effort to make it true to scale. Build the two sides on the plans, using ¼" sq. After the sides are complete, they are then joined by cross members. Start at front and work to back, gluing in each cross member securely. Make sure fuselage is true as you glue in each piece.



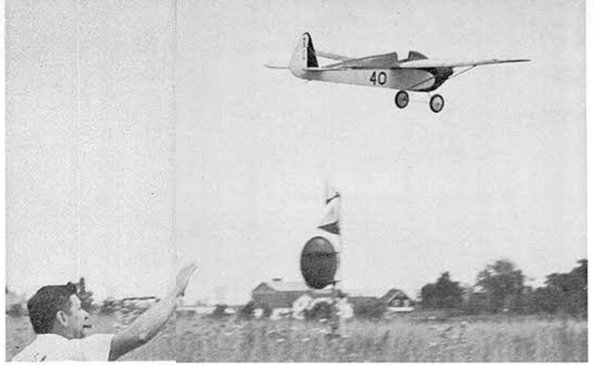
All control surfaces are hinged and adjustable. The wings are two panels which are supported by functional struts. Goes together like the real one.

Next, cut the two sides for the false bottom from ⅛" plywood, sand and drill the two 3/32" holes in each piece. Also, the strut holes may be drilled at this time. Use a 7/16" drill. Now, bend the two 3/32" wire main landing gear. Slide the two wires through the holes in the plywood sides. These sides will have to be forced over the bends in the wire. The plywood sides, F-10, may then be glued to the body. The three balsa and plywood turtleback bulkheads, F-6, F-7, F-8 and F-9, may be cut, sanded and glued to the body. The stringers may now be glued to the bulkheads.

Next, cut from hard balsa, two wing mount parts, F-3 and F-4. Glue F-4 to F-3. Use instrument bulkhead, F-5, and firewall bulkhead, F-2, as a guide for carving wing mount part, F-3 and F-4. Use balsa filler or body putty to make a fillet between F-3 and F-4. Cut from ¼" balsa sheet F-5 instrument panel. A mahogany wood wrapper from a 20c cigar was used as the front of the instrument panel. This is finished with several coats of dope. One-half inch Tatone instruments are then inserted in the panel, and glued to F-3 and F-4.

The 3/16" hole for the dowel wing retaining peg and the hole through which the rubber bands that hold the wing to the wing mounts pass, should be drilled before gluing wing mount to fuselage. Two base ribs are cut from ⅛" plywood. The front and back 3/16" dowel holes and the hole for the wing rubbers are drilled before gluing to wing mount, F-3 and F-4. After this is done, glue solidly to F-3 and F-4. Make sure you have about 3 degrees incidence.

The rudder bars, seat rods and floor rods can be cut and glued now while there is still room to work in the cockpit area. These parts are made from 1/16" dowel swab sticks. The stick and the control parts can also be glued in. After the cockpit area is completed, a piece of ⅛" hard balsa is glued in front, flush with the firewall. When all the cockpit is complete, mix some colored dope which looks like zinc chromate primer. Paint the entire cockpit area which can be seen. The seat and back can also be put in at this time. The elevators and rudder cables run under the seat. The aileron cables can also be put in for added details. I used small elastic cord.



Off on winning Nats flight, it reveals the generous amount of dihedral and the large rudder area. The wheels are Williams Products. Has fairly light wing loading.

Section in front of pilot served as streamliner and enclosed the fuel tank which had to be located high. No windshield was used.

Author's daughter displays the model at a windy Oklahoma contest. Flew well in spite of the gusty weather. Rugged shock-mounted landing gear helps too.

Note how well the Cox .09 engine is hidden as the second cylinder of the scale engine — which was a Henderson motorcycle four-banger. They used almost anything in those days.

The ¼" plywood firewall can now be cut and motor mount beam holes made in the firewall. Be sure to taper the sides and bottom of the firewall so it will follow the lines of the nose. Glue the motor mounts in place. Cut the nose cowl ring, F-1, from ¼" plywood and three ¼" hard balsa sides for the nose. Glue all pieces to the firewall and shape after the glue has dried. After the nose is shaped and sanded, fuel proof the entire engine compartment.

Landing gear: It is not complicated. Cut four pieces of brass 3/32" I.D. tubing. Put each piece in a vise and flatten one end. Round the ends of the flattened part and drill a hole for 2-56 machine screw. Tin the ends of the 3/32" landing gear wire and insides of brass parts. Slide the brass parts onto the ends of the gear and slip a long 2-56 machine screw through the hole. Be sure to put the brass tubing spacer between the two landing gear ends. Align the ends and sweat solder the brass ends to the landing gear wire. Do the same to the spreader-bar ends as you did for the landing gear ends. Cut the axle to the proper length and sweat solder brass tubing to each end, making sure that a small hole can be drilled through the ends for a piece of copper wire bent to the shape of the cotter pin.

Cut and shape the axle limit part. Assemble all landing gear parts. Cut two backstay cables from control lead-out wire. Cut and make two front stay cables from the same material. Put a small turnbuckle in each front stay wire. Lash the axle to the bushing between the gears after all other parts have been assembled. I used elastic cord about ¼" in diameter. Fasten back stay wires to false bottom and other end to 2-56 machine screw. Now fasten front stay cable to firewall and other end to 2-56 machine screw. Take up turnbuckle until drum tight. Two Williams vintage wheels were used. Slip on axle and retain with washer and cotter pin.

Trace the cowl pattern off the plans onto a piece of paper and fit this paper to the plane before a metal cowl is made. I used .020 aluminum pie pan. After the cowl fits snug and proper, cut a hole for the cylinder and needle valve. A piece of 1/16" plywood is glued to form a back-up to which to screw the cowl.

Make three dummy cylinders. I turned mine from aluminum. They could be made from layers of cardboard and balsa. Paint these parts black. Glue on the valve covers and exhaust. Epoxy glue the dummy cylinders to the cowl.

The tail skid is made of laminations of brass. Hold together with a brass clip.

Rudder, elevator and wing: Not very much explanation is needed for the rudder. It's just conventional construction. The elevator needs a little more explaining. I think by following the plans, the construction will be easy. The first elevator I made for the Church warped badly. The elevator has been enlarged for stability.

The wing is straight forward and just a few points must be given. Cut all ribs and sub-ribs. Also cut out the base ribs No. 1 of 3/8" ply and cut one rib from 1/16" ply. Lay the ½" x ½" spars and trailing edge out on the plans. Glue the ribs in place. Glue the leading edge in place. Be sure to glue the base rib *after* the dihedral angle is set. The wing tip is made of laminations of 1/16" balsa built up to make 3/16" thickness.

Copper wire is used to hold the ailerons to the other part of the wing after all the parts are glued in. The wing can be blocked up for the dihedral and the ⅛" base rib glued on. The 1/16" rubber retaining wires can now be put in place and epoxied to base rib and No. 2 rib. These joints must be strong. Notch and glue a piece of 1/16" plywood to each ½" x ½" spar for the strut attachment points.

Covering and painting: Sand the entire body, wing, rudder and elevator making sure there aren't any sharp corners or bumps. I clear doped the outside of body with two coats and then lightly sanded again. Cover the body with lightweight silk. After it's covered, give the body three or four coats of color. The fuselage is canary yellow and black. The nose is also covered with silk.

The wings were also covered with silk. The ailerons were covered separately. Three or four coats of clear dope and two or three coats of color are applied. The wings are also canary yellow and black scalloped.

The rudder and elevator were covered with Jap tissue to eliminate warping. Cover and dope with three coats of clear and two coats of color. The tail surfaces are also scalloped. All numbers are painted by hand.

The wing struts are made from ⅛" x ½" spruce, sanded to a streamlined shape. A 1/32" wire hook is glued and thread wrapped to the bottom of each strut. A 1/16" wire is bent to a 90 degrees to strut, glued and thread wrapped to upper end of strut. Rubber bands are passed through false bottom and hooked to bottom of struts. The upper ends fit into surgical tubing which is held to the wing with aluminum clamp screwed to plywood piece inserted into wing spars.

Align the elevator and rudder, glue to the fuselage. Attach wing to fuselage by slipping dowel into wing holes and hook rubber bands to hooks through fuselage.

Test flying: After the plane is assembled, check balance which should be about one-third of the chord back from leading edge. Wait for a calm day and look for some tall grass. Glide plane until you get a straight, not too steep glide. Be sure it doesn't stall. I fly my Church slightly to the left.

When you are satisfied with the glide, put on a 7-6 prop. Don't rev the engine full — just enough to get the plane airborne. Run into the wind until she gets airborne and then let her fly out of your hand. Don't be afraid to ROG the model. It will run straight as an arrow.