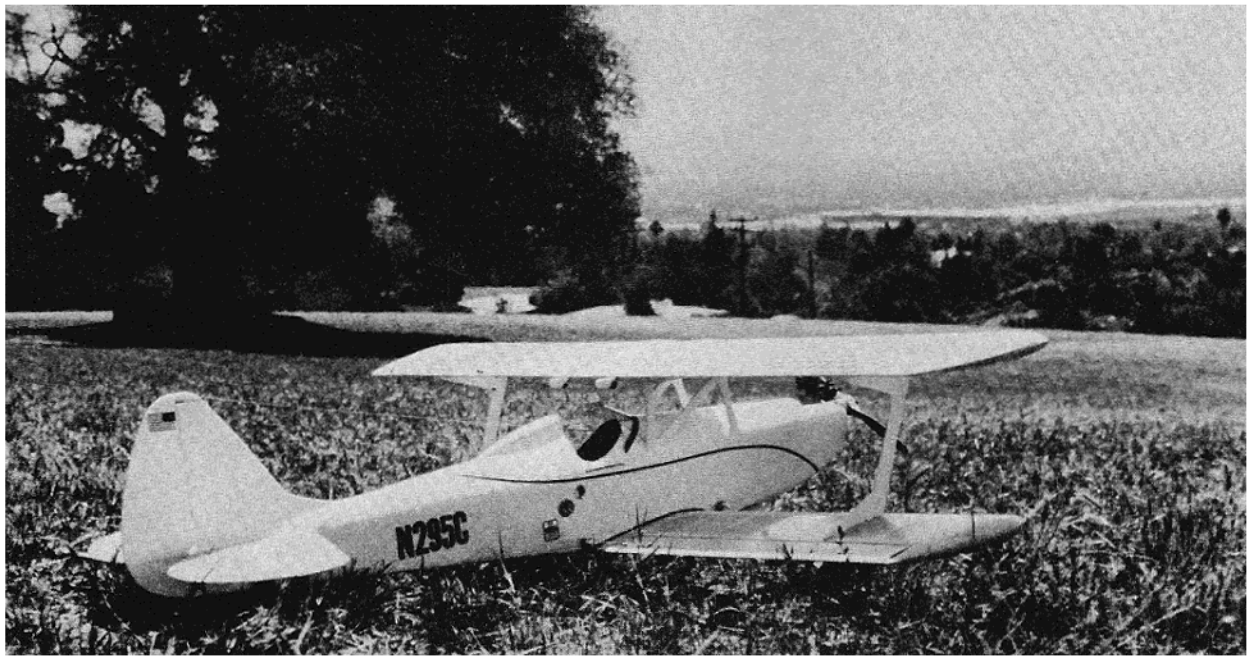


One of the finest bipe's you'll ever fly - - - performs all the maneuvers in a realistic manner. Outstanding slow speed characteristics.

WAYFARER

REALISTIC PERFORMING SPORT BIPLANE FOR .40 TO .60 ENGINES

BY DON DEWEY

During the 1965 RCM Design Contest, we received a set of plans from a Dr. D.J. Gerner for a model that was later destined to become one of the all time favorites ever presented by R/C Modeler Magazine. Before presenting it for publication in the May 1966 issue, we constructed a prototype from the author's plans and virtually "flew the pants off of it." This model was the Hobo, a quickly built and easy-to-fly sport biplane for reeds or 3 channels of the new proportional systems.

The Hobo was an almost immediate success. It was a fun-type biplane that was extremely easy to fly, yet was rugged enough to withstand any type of rough field takeoffs and landings. Its slow speed characteristics were virtually phenomenal and it could be landed at a speed far slower than the normal stalling speed of most aircraft of its type. During the next two or three years, we wore out one Hobo and built at least two more, all of which were flown for many, many hours. All of the original Hobo prototypes required no takeoff corrections at all, and after exploring the sky at your leisure with a stable and easy to fly biplane and, as the author put it, "when you got tired of chasing the wind and playing tag with the birds, you could throttle back and come in for an effortless landing that would make the hot shots envious."

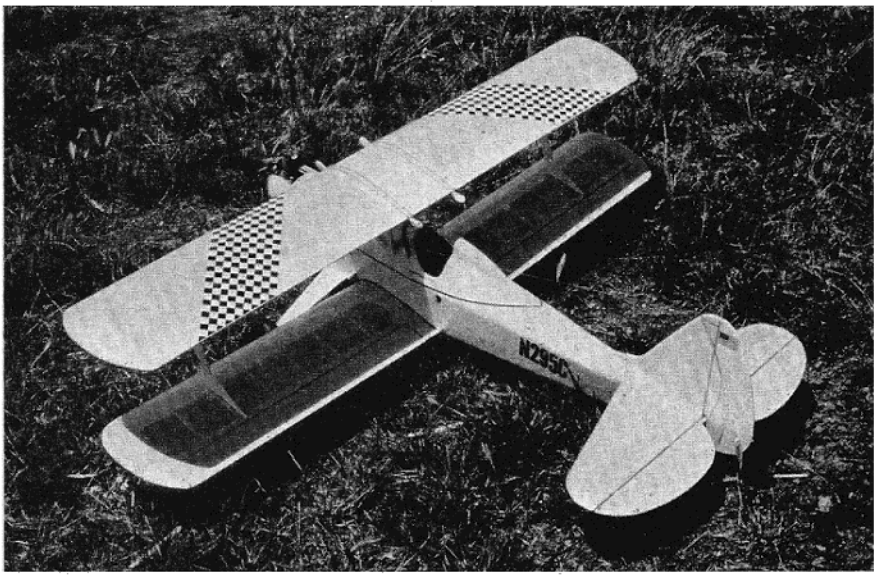
As proportional systems became more and more reliable, not to mention smaller and lighter in weight, we used the Hobo as a test bed for each of the new systems that came our way. The original prototype by the author weighed six pounds plus with the older and larger systems and, as the micro miniature proportional system became available to us, the weight of the plane lessened and we noticed an even greater increase in its performance characteristics. After a couple of years of flying with various radio systems, I decided to use the original Hobo's unique construction features in a new design that would retain its excellent handling capabilities and low speed characteristics while increasing its performance with the addition of ailerons and a reduction in the overall weight.

Thus, the Wayfarer was born. This model proved to be even more than we had anticipated when I started sketching the plans. In fact, the prototype is one of the best flying sport biplanes that we have seen at RCM. With 800 sq. inches of wing area and an all-up weight of five pounds with the Kraft Series Seventy-One proportional system, it excels in the performance category with anything from a .40 to .60 engine. We used an OS Max H.40P engine on the prototype and found the airplane capable of all standard maneuvers while retaining the original and exceptional slow speed characteristics. The overall wing loading is in the 15 to 16 ounce per square foot range which added considerably to those slow speed characteristics. Yet, under full power, the Wayfarer will climb out with the best of them and perform virtually all of the vertical maneuvers

with ease.

While I, personally, have a particular affinity for biplanes, there is something about this particular model that gives you a thrill every time you see it in flight. It is extremely easy to fly, and anyone with a few hours of proportional time on an intermediate or advanced trainer will have no difficulty in handling the Wayfarer. Don't hesitate to fly it from small, rough fields since it can be slowed down to a virtual walk for a landing and can take almost any type of punishment a rough field can hand out. With a .40 it flies at almost scale-like speeds and is quite responsive to controls. It has been flown in standard configuration with rudder, elevator, throttle and ailerons, and has also utilized a coupled aileron and rudder system using a "jumper" servo cable that operates two servos from one channel simultaneously. Most manufacturers will make one of these jumper harnesses for you.

One of the biggest drawbacks to a biplane in the past has been the "birdcage" and this is one of the problems the original Hobo overcame with the use of one piece sawn plywood cabanes. This feature has been retained on the Wayfarer and reduces the problem to one of simply cutting out the two plywood cabane struts on a Dremel Moto Shop. To be sure, the extra wing will take a little more time than the conventional monoplane, but not much, since both wings are virtually identical with the exception of the ailerons in the lower wing.



Three quarters view shows ailerons in lower wing. May be coupled with rudder for sport flying.

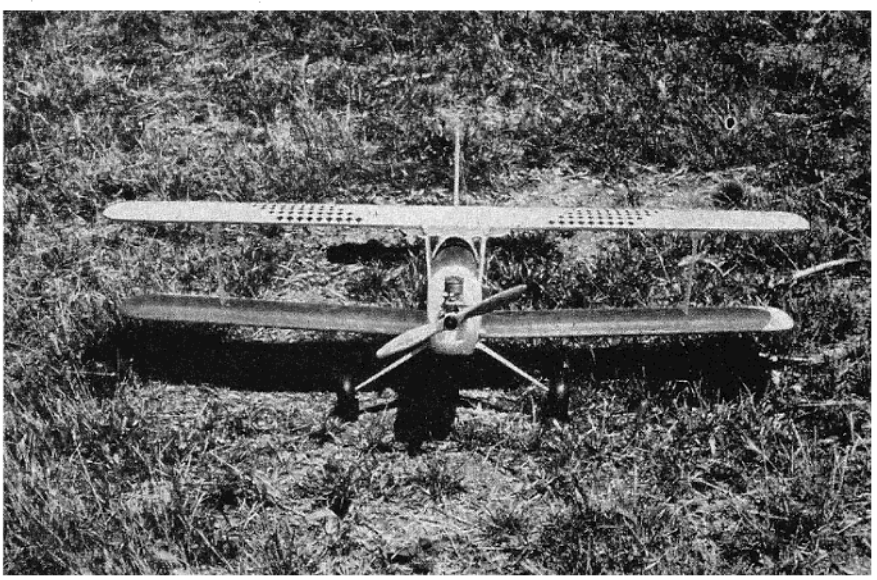
CONSTRUCTION

Wings: The easiest way to construct the two wings is by using a wing jig. Both wings for the Wayfarer are built in the "Eggcrate" construction method. The top wing is built flat with no dihedral while the bottom wing has 3/4" dihedral under each tip. Both wings are identical in span and chord. If you use 48" stock for the upper wing, it can be built in one piece and no dihedral braces will be necessary. Since, however, 48" balsa sheet and strip stock is quite expensive, the plans show the use of standard 36" length of material. Begin construction of the wings by using a metal T-square and cutting out the hard 3/16" sheet balsa spars. Be sure that the notches for the wing ribs are cut exactly 3/32" wide and 1¼" deep on the front spar and 5/16" deep on the rear spars. Join the spars together by epoxying the 1/16" plywood dihedral braces in place over the spar center sections. Hobbypoxy Formula 4 quick drying epoxy was used throughout construction of the Wayfarer wherever epoxy is specified. While you're cutting out the plywood dihedral braces, cut out the leading edge and trailing edge dihedral braces for both the upper and lower wings.

All ribs are cut from 3/32" balsa sheet with the exception of the ¼" rib (UW-1) used in the center of the upper wing. It is suggested that you make plywood templates so that all ribs may be cut accurately and sanded smooth between the two plywood end templates. The 3/16" x 1/2" balsa leading edges are cut to proper lengths as are the 1/16" balsa leading and trailing edge sheeting.

Slip the ribs on to the front and rear eggcrate spars and make sure the spars are flush with the top and bottom of the ribs. When these are lined up properly over the plans, use a toothpick and add a fillet of Hobbypoxy 4 at all rib-spar junctions. Add the 3/16" x 1/2" balsa leading edge and the 1/8" x 1/2" tapered trailing edge stock. Make sure that the latter is lined up properly and retains the proper airfoil as shown on the plans. Hold the trailing edge and leading edge stock in place with masking tape until the Hobbypoxy 4 or Titebond glue dries. Following this, add the leading edge and trailing edge sheeting on the top wing panels followed by the top and bottom cap stripping. Make sure to taper the trailing edge of the top

Front view shows straight top wing, dihedral in lower wing only.



and bottom trailing edge sheeting so that it fairs neatly together just beyond the extremity of the tapered trailing edge stock. When the top wing panels have dried, join them together using the plywood dihedral braces at the front and rear spars and at the leading and trailing edges. Remember that there is no dihedral in the top wing.

The bottom wing is identical to the top wing with the exception that it has ailerons, as well as 3/4" dihedral under each wing tip. Instead of a single 1/4" rib in the center section, two standard LW-1 ribs of 3/32" sheet are used at the junction of the two lower wing panels. The aileron servo compartment can be any width you desire to fit your particular proportional servo. When the wing is assembled, the shaded area shown on ribs UW-1 are removed with an X-Acto knife and false ribs LW-2 are installed between the front and rear spars. The bottom of the servo compartment is floored with 1/8" Lite-Ply which is a new lightweight plywood available direct from Sig Mfg. Co., or from any Sig dealer. This material is used throughout the construction of the Wayfarer and saves considerably in the weight department. This particular type of plywood is extremely easy to cut and work, is less expensive than balsa, and far less expensive and lighter than conventional plywood while retaining a tremendous strength-to-weight ratio. The lower wing panels are built as one piece with the ailerons being cut out with a razor saw after construction is completed. Draw lines with a ball point pen or pencil on the top and bottom sheeting so that you know where to make your cuts with the razor saw. When construction is completed, the ailerons are simply sawn away from the wing and the leading edge of the ailerons capped with 1/16" balsa sheet while the exposed portion of the rear spar and the butt end of the ribs and the wing panel, itself, are also sheeted with 1/16" sheet balsa. A conventional nylon aileron bellcrank is epoxied between two false aileron ribs (LW-6) or, alternately, a 1/8" plywood plate can be epoxied into place inside the bottom sheeting of the aileron in the proper location and a conventional long control horn can be secured to the bottom surface with two sheet metal screws. The method of aileron horn attachment is up to you. Be sure that you have drilled the proper holes through ribs LW-4 and LW-5 to allow passage of your 1/16" wire aileron pushrod to the Goldberg aileron bellcranks. The latter are mounted on aileron platforms cut from 1/8" Lite-Ply and cemented into the two LW-5 ribs.

After joining the wing panels together, cut the wing tips from 2" x 1¼" x 8" soft balsa block and Next, add the 1/4" spruce stringer in the front and the rear at the top of the bulkheads. Do not substitute balsa for the spruce since the pressure of the sheeting, when applied, will cause a bowing in the turtledeck.

At this time, install the 1/8" Lite-Ply tank floor and your Pylon Brand RST-8 tank. Since there is no fuel compartment hatch, this tank is mounted permanently in place and must be tested for any leaks prior to installation. Make sure that the tank is completely surrounded with foam rubber or G-Pad to keep it from moving. We recommend the use of the new Sullivan Foam inside the Pylon Brand tank to prevent any foaming due to vibration. Drill the proper holes in the firewall for the passage of the brass pick-up tubes and then brace the tank so that it cannot slip backwards against bulkhead F-2. When this has been completed, sheet the fore and aft top sections of the fuselage with soft 3/32" sheet. The easiest method is to cut your sheeting to exact size to go from the fuselage top to the center of the top stringer using two pieces, one for each side of the fuselage in the front and in the rear. The front sheeting extends from former F-1 to the center of former F-4. The rear sheeting extends from the corner of former F-4 to the end of former F-6. Be sure to wet the sheeting thoroughly on the outside to allow the proper curvature. Sheet one side of the fuselage at a time, using masking tape to hold it in place until the glue has dried and until all moisture has evaporated from the sheeting. Then, proceed with the other side, making sure that you have a neat joint line in the center of the spruce stringers. When your sheeting is thoroughly dried, cut out the cockpit area and sheet the floor with 1/8" Lite-Ply. At this time it would be advisable to cut the switch and charging jack holes in former F-3. Next, add the 3/4" sheet balsa cowl pieces and epoxy in place to the firewall. Finally, add the 3/4" x 4" x 8" balsa nose block and the 1/2" hard balsa filler block between the cheek pieces. (We hope, that before you sealed up the top of the fuselage you installed the blind mounting nuts for your Kraft-Hayes Motor Mount!) The belly block is cut away at the point where the landing gear is installed and the Hallco B-105-5 aluminum landing gear is bolted in place with short 6-32 nuts and bolts. The remaining piece of belly block is sanded to final shape and installed over the Hallco gear as a smooth fairing piece. Finally, sheet the bottom rear of the fuselage with 3/32" sheet balsa applied cross-grain. Install the wing dowels but do not install the 1/8" Lite-Ply cabane strut cross braces until the airplane is completed in order to facilitate reaching otherwise inaccessible areas of the fuselage around the cockpit. Before going on to the tail surfaces, cut yourself a plywood shim to fit behind your Kraft-Hayes or Tatone motor mount to provide 2 degrees of downthrust and 3 degrees of right thrust.

Tail Surfaces: The stabilizer is built on a flat board and consists of a structure of 1/4" x 1/2" balsa strips, 1/4" sheet balsa center section, 1/4" x 1/4" cross pieces, and 1/8" x 1/4" diagonals. This is an open structure and is completely strong and rigid when completed. Be sure to double glue all butt joints of the balsa wood pieces to assure permanence of your glue joints. The elevators are cut from 1/4" balsa sheet and can be joined with a 1/8" wire joiner or a 1/4" spruce dowel. The vertical fin and rudder are also cut from 1/4" sheet balsa and sanded to a smooth airfoil section. When the stabilizer has completely dried, glue the 1/4" sheet balsa vertical fin in place, checking it with a triangle to insure proper alignment. Sand the entire tail assembly to final shape and install the stabilizer and vertical fin in position on the fuselage, checking at all times for proper alignment. Form the tail wheel strut from 3/32" and 1/16" music wire, wire together and solder, and install in the vertical fin. The fuselage fairing blocks can now be cut to shape,

rounded, and installed in position on the stabilizer and against the 1/4" sheet balsa vertical fin. Add the small 1/4" fairing piece to fill the gap between the vertical fin and the space between the two fairing blocks.

Finishing: Sand the entire airplane using progressively finer sandpaper until you are pleased with the final results. For any fillets, such as at the juncture between the rear fairing blocks and the vertical fin and stabilizer, we use micro-balloons and epoxy glue, or corn starch and epoxy. This can be smoothed on with the finger, wetted slightly, and faired out nicely with almost no sanding required. The prototype in the photographs used yellow silk on the wings with clear dope applied to fill the grain structure of the silk. Finally, the wings were allowed to cure for seventy-two hours and two coats of clear Hobbypoxy were applied overall for an excellent gloss. Either MonoKote or Solarfilm could be used on either wing with an overall reduction in weight. The fuselage and vertical tail surfaces were not silked at all but used a filler followed by white Hobbypoxy color, sprayed on. If you prefer, use Francis Surfacing Resin followed by K & B Super Poxy. We would not recommend the use of silk on the fuselage since it is more than adequate in the strength department and the additional weight would only detract from the performance of the aircraft. We would also not recommend the use of one of the plastic covering materials since getting in and around the cabane struts is quite a job. If you feel up to tackling it, be our guest!

The cockpit coaming is made from black fuel tubing which has been split lengthwise and cemented in place with Walthers Goo. The headrest is simply a piece of soft balsa block which has been carved and sanded to shape and cemented in place. Paint the cockpit floor a dull black or simply stick a piece of dull black Contact shelf paper in place. Mount a pilot's head of your choice using a sheet metal screw from underneath and drilling a hole in the bottom of the William Bros. pilot and pouring epoxy into the hole. Put the pilot in place over the screw and the epoxy will hold it permanently in place. Since this is a fairly large biplane, several dolls heads available at local toy and department stores will also fit in the cockpit area. The switch and charging jack are easily accessible by mounting them on the instrument panel (former F-3). If you prefer, a piece of wood grained Contact shelf paper can be cemented in place and IM scale instruments available from local hobby shops, or from Hobby Lobby International in Nashville, Tennessee, can be used to dress up the cockpit area.

Finally, hinge all control surfaces using your favorite hinge. We used Du-Bro hinges throughout. 3½" Du-Bro regular wheels were used for the main gear and a 1¼" Veco wheel was used for the tail wheel. An O.S. .40 front rotor engine with muffler was used and provided more than adequate power swinging an 11-6 prop. Anything from a .40 to a .60 engine can be used while the .40 provides more scale-like speeds for this vintage-type biplane. A powerful .60 will pull this airplane straight up and out of sight almost faster than you can blink your eye! With regards to the installation of radio equipment, the space available to you is immense and any of the older and larger systems will fit, not to mention the newer micro miniature radios. This airplane may be flown in the conventional manner or, as mentioned, can use coupled ailerons and rudder. Finally, when all finishing has been completed, glue the cabane strut cross braces permanently in place.

FLYING

I couldn't begin to describe to you the flying characteristics of the Wayfarer, since it is one of the most interesting and unusual aircraft that you will ever fly. I can only say that it flies more like a full scale biplane than it does a model. This is not an airplane that you bang around with full deflections of the ailerons since it requires the use of rudder in the turns for smooth coordinated turns. As the Wayfarer climbs out or makes a slow fly by, it is, in my opinion, as close to flying the "real thing" as you can obtain with a model. It requires virtually no correction on takeoff and tracks straight and true with no ground looping tendencies. The climb out is straight and, if you don't feel a certain thrill watching the old biplane flying into the sunset, then you'd better go back to that low wing, jet-like over powered monster that can be found at any flying field. Make sure that the center of gravity on your Wayfarer is no further aft than that shown on the plans. It can be up to 1/2" forward of that point, but not rearward.

Good luck with your Wayfarer and I hope you'll send me a picture of it c/o R/C Modeler Magazine. This has been one of the most enjoyable aircraft that we have flown and we think that you'll like your version equally as much.

Good Flying. □

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