CONSTRUCTION

• Type: Stand-off scale • Wingspan: 38 inches • Engine: TD .051

by Walter Musciano

I KNOW BIG IS beautiful, but I think tiny is terrific too. This ½-inch to the foot stand-off scale R/C model of the Vickers Wellesley bomber can be flown with an .049 cubic inch engine and it performs beautifully on three channels. It can be built on the kitchen table and it doesn't require a trailer to bring it to the flying field. In fact, I often fly it in the local supermarket parking lot.

The fascinating story of the full-size Vickers Wellesley and its long-distance record-breaking flight appears alongside this article.

I used lightweight materials to attain a light, strong model. Many of the new super finishes are great but a bit heavy for my purposes so I used the lightest coverings and finishes I could find. Some modelers may want to substitute foam in some areas of this model.

The model has a multi-spar wing, with sheet balsa trailing edges and

For an out-of-the-ordinary scale project that looks real, flies well, and won't break the bank, try a

VICKERS WELLESLEY

Top: The model shows off in the air. She's smooth and stable. Above: Strange, unique, and—well, really interesting. The model has a thick airfoil and wide-track landing gear, both of which contribute to its handling, whether in the air or on the ground.

capstripped, lightweight ribs. The capstripping gives the ribs an I-beam cross section and an excellent strength-to-weight ratio. In addition, capstripping reduces the covering sag between ribs, which preserves the true airfoil and considerably improves lift.

The oval section fuselage could be stringered and silk or Silkspan covered. I decided to plank the model, however, because the fuselage is relatively small so the added weight was no big problem. Besides, fuselages do take a beating.

The wide, track-mounted landing gear called for added wing reinforcement. I used plywood spar joiners and spar webs from the center line to the landing gear attachment. I attached the wing firmly to a large fuselage bottom hatch, which can be removed to reveal the radio equipment.

My model used three channels of a Cannon Super-Micro System for speed, elevators, and ailerons. The small size and light weight of this equipment made the three-channel installation easier. If you want to use large R/C components, cut down to two channels for engine and rudder.

Most parts of the model are 1/20-inch balsa. If you can't find this size, take 1/16-inch sheet balsa and sand it to the proper thickness. I cut all the 1/20-inch strips from sheet balsa rather than use already-cut strips.

WING. Complete the wing structure first. Trace and cut the spar joiners accurately and cement them firmly to each side of the spars, then cut the ribs to shape. Be sure to cut space in the centerline of rib number 1 for the aileron servo. Pin one-half of the lower spar to the workboard with the other half extending above the board. Cement all the ribs to the lower spar, then cement the upper main spar into the rib notches, followed by the leading edge, upper auxiliary spar, and the trailing edge spar. Do the same procedure for the other half of the wing.

Check both sides for alignment. They will still be flexible enough to twist slightly if there is any warping. Add the lower auxiliary spar and pin it to the workboard so the trailing edges of the ribs are aligned by the flat surface of the table.

Make the trailing edges of two 1/20x1 inch balsa sheets cemented to the top and bottom of the ribs. Note that the trailing edge pieces overhang the end of the ribs about 3/16 inch. Cement the upper trailing edge piece in place, and do the same for the other half. Before cementing the lower trailing edge sheet, bevel the edge of the upper trailing edge sheet so it will follow the contour of the rib lower camber. Now, add the lower trailing edge, being sure to cement it to the upper trailing edge bevelled area as well as to the ribs and trailing edge spar.

Cover the forward area of the wing from the leading edge to the auxiliary spar with 1/20x1-inch balsa strips. Notice that these pieces only extend over the forward half of the auxiliary spar. The rear half of the auxiliary spar must be left uncovered in order to provide space for the capstrips. Cement this balsa sheet cover to all ribs as well as the auxiliary spar and leading edge.

Cover the center section with 1/20-inch sheet balsa, top and bottom. This should be well cemented to the four number 1 ribs, the auxiliary spar, and the trailing edge. Note that it overhangs the outboard number 1 rib by about 1/8 inch and also that the grain runs spanwise to facilitate bending and to provide greater strength. When the cement is dry, cut an access hole in the center section upper covering for the aileron servo as shown on the plans.

Wing tips are laminated with 1/8-inch balsa. I cut the core piece as shown on the plans, so the completed tip will be hollow. For added strength, cement the core piece to the tip rib, leading edge, trailing edge, and the main spars between which it fits. The remaining laminations are made in two sections, one forward and one aft of the main spars, and are cemented to the ribs, spars, and the core piece. Extending the spars through the tips adds considerable strength to the installation.

Bend the right and left landing gear

The author uses some old-fashioned body english to bring model in close for a photo.

struts to shape. Bind and solder the auxiliary strut wire to the main strut wire. Cut the landing gear mounts, number 17, from plywood and drill holes as shown in the drawings. Using a strong needle and thread, sew the wire struts to the plywood. Use as much thread as the holes will admit, then smear a few coats of cement over the installation. Epoxy the landing gear mounts to the forward side of the spar joiners, numbers 15 and 16. The mounts should also be glued to the adjacent ribs. When they're dry, remove the clamps and apply more glue to insure a firm installation. Notice that the auxiliary spar strut is not attached to the wing structure.

The struts penetrate the wing through the covering so cement 1/20-inch balsa across the penetration points. These balsa fairleads must have holes to admit the wire.

Make the spar webbing of 1/20-inch sheet balsa pieces and install them with the grain running vertically. Cement the webs to the spar joiners and ribs on both the forward and rear sides of the spar.

The simplicity of a small model makes it a joy to build and finish.

They must touch the ribs but not extend above or below the spars.

Cement the capstrips to the ribs, spars, and trailing edge. Measure each strip individually by placing it on the rib to be capped, then cut it to length. Hold the strips in place with small pins or tape until the cement dries. When the capstripping is completed, carve the wing tips to shape and sand the entire wing structure.

Cut the ailerons from the trailing edge, then cement the ribs and aileron spar in place between the sheet balsa pieces. Using a block, sand the wing aileron opening as well as the aileron so the mating edges are straight. Be sure to allow a gap between the aileron and the wing along all three edges. Round off the hinged edge of the aileron wing. I used pushrods, bellcranks, and aileron horns on the prototype model instead of torque rods, but you can use torque rods if you want.

Attach the horns to the bottom of the ailerons, then hinge the ailerons to the wing with epoxy. Be sure the hinges are firmly installed in the ailerons and wings. Carefully sand the wing structure and re-cement the joints. Bolt the bellcrank

(plans on next page, text continued on p. 76)

Left: The Tornado 3-bladed prop was painted dull black with silver tips and hub. Three-channel micro equipment operates throttle, ailerons, and elevator. Right: The 170 square-inch wing and 14-ounce all-up weight brings the wing loading to a light 12 oz/sq ft.

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to the plywood mount and cement the mount to the ribs and spar. Temporarily install the servo and add the pushrods. Check the system and when operation is satisfactory, remove the servo.

The wing covering can be lightweight Silkspan or silk, or ¾-ounce Micafilm. You can cover the left and right wing panels in one piece if you cut slits for the landing gear wire. I suggest you give the trailing edges, wing tips, and center section covering a coat of dope before starting covering with Silkspan or silk. This will allow the dope to fill the grain so the adhesive won't be lost by seeping into the wood. Remember, the grain of Silkspan must run spanwise.

Begin by doping the edge of the covering material to the trailing edge of one wing panel. Apply dope to the top and bottom of the center section and wing tip as well as the other side of the trailing edge. Quickly pull the covering taut across the wing, around the leading edge, and onto the other side of the trailing edge. At the same time draw the covering tightly over the tip and center section. Complete by doping the slit covering to the sheet balsa fairleads. When it's all dry, trim the excess covering from the wing.

Invert the wing and pin the trailing edge of one half of the wing to the workboard, with the other panel off the board. Sprinkle it with warm water. Pinning the trailing edge to the workboard will prevent the wing from warping as the watered covering shrinks. When the covering is thoroughly dry, brush one coat of undiluted clear dope on the panel, then water and dope the upper covering.

TAIL. Construct the tail surfaces next by pinning the various components directly over the plan into the workboard and cementing all joints. When dry, remove from the workboard and re-cement all joints. Round off the leading edge and tips with a sanding block, and sand the trailing edge to a slight streamline shape as shown in the profile view. Install the hinges and cover the framework. Pin the assembly to the workboard during the covering and shrinking operation and during the first application of dope. Epoxy and sew the horn to the elevator. The fin and rudder are constructed separately and individually covered. They are joined later.

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FUSELAGE. Begin the fuselage by cutting all formers, bulkheads, and keel pieces to shape. Join the two halves of the keel P at the rear while resting them directly over the fuselage top view to insure proper alignment. Mark the former and bulkhead locations before lifting the structure off the plan. Cement the formers and bulkheads to assembled P, making sure they are perpendicular to the keel. Take care with the removable lower fuselage section. Very lightly tack-cement piece O to keel P and forward piece N to rear piece N. Also, bulkhead F must be lightly cemented to bulkhead E after the dowel peg and 1/8-inch balsa doubler have been epoxied to bulkhead F. The pieces will be separated later so be sure they are only tack-glued. It is important that piece F and forward piece N be firmly cemented to piece O. Cement the 1/8x1/4 inch fuselage spine to the bulkheads now.

Next cement the stabilizer to the underside of keel P and cement the fin to bulkhead M, the keel, and stabilizer. Then firmly cement the lower section of bulkhead K to forward N and the middle section of J to piece O. Cut two pine blocks to shape to fit above and below pieces N at bulkhead K. Drill the lower block slightly larger than the nylon wing bolt and the upper block slightly smaller than the bolt. Grip the upper block gently but firmly in a vise or pliers and screw the bolt into the hole using firm pressure with a screwdriver. The objective is to make the nylon bolt cut its own threads into the upper pine block. You might have to repeat this a few times to be certain the screw will grip the block firmly, but without excessive friction.

Trial-fit the blocks and epoxy them to bulkheads K and N. Before the glue sets, insert the nylon screw through the lower block and screw it into the upper block to assure perfect alignment. Do not remove the screw until the epoxy has dried overnight, and be sure not to get any epoxy on the screw.

Install the engine and elevator servos and connect the elevator pushrod. Temporarily install the engine, mount, and tank, then connect the speed control pushrod. Make provisions for battery and receiver stowage at this time so they can be removed from the fuselage when necessary. Remove the engine, tank, and mount, and apply several coats of sanding sealer to bulkhead D.

Fit the wing into the fuselage touching piece O and bulkheads J and K. This should automatically set the proper incidence angle. The wing will become a part of the fuselage bottom hatch, which is held in place with the dowel peg and the nylon screw. Check the incidence to be sure it agrees with the plans and cement the wing in place to pieces O, J, and K.

Before starting the planking, bend the tail-wheel strut to shape and epoxy it firmly to bulkhead M. I used the Cox engine, mount, and tank combination and this should be bolted to the bulkhead now. Apply cement or epoxy over the nuts so they won't loosen later. Add lengths of fuel line tubing to the three tank connections, making each longer than is required.

Make the planking from 1/20-inch balsa, 3/16 and 1/8 inch wide. The wider strips are for the fuselage sides and the narrow pieces are for the sharper curvature of the top and bottom.

Cement the first planking strips to the fuselage sides, top and bottom. Alternate planking installation among the four sides. If too many strips are cemented to one side at a time, the fuselage can become deformed. Cement the strips to the bulkheads, keel, spine, wing, and to each other. Each strip must be fitted in place, marked for proper taper, trimmed as required, and well cemented in place. Hold strips to the structure with straight pins until the cement is dry. As planking progresses the strips must be tapered and custom fitted. It's important that as each strip crosses the hatch separation line, it must be marked with a ball point pen to define the separation line so the hatch can be accurately separated from the fuselage.

When all strips are in place, wipe cement into all spaces and cracks between the planking strips. This will help fill the spaces and adds considerable strength. Mark off and cut the planking to form the cockpits. I covered the cockpit openings, however, you can install a seat and instruments if you want. Sandpaper the fuselage carefully,

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especially around the tail and near the hatch line.

Take care not to obliterate the ball pen marks at the hatch line by refreshing the marks as they become faint due to sanding. Wipe Plastic Balsa or a similar lightweight compound into any remaining cracks or spaces. Sand again when dry, and apply one coat of lightweight Sanding Sealer, then sand again.

Use a sharp knife and carefully cut along the hatch line to separate the hatch from the fuselage. Sand the hatch contact surfaces of the fuselage and hatch with a block. Apply three coats of sealer to these surfaces and sand lightly. Replace the hatch and protect the wing bolt with plastic wrap or masking tape.

Cement the rudder to the fin and fuselage. Note the bottom of the rudder extends under the fuselage for about one inch. Add the 1/8-inch balsa tail wheel strut brace.

Make the cowl from 1/8-inch balsa and 3/32-inch plywood rings covered with 1/8-inch balsa. The balsa covering should be cut into eight 1/8x1 5/16x1 inch segments with the grain running along the greatest dimension or longitudinally. Balsa rings A and B should be laminated, cross-grained, forming a 1/8x1/8 step.

The aftermost B is cut in one piece from 3/32-inch plywood. Soak the cowl segments in hot water and about ten percent ammonia, then tape the segments to a glass of slightly smaller size than the cowl diameter. When dry, liberally cement four segments into the A to B step, 90 degrees apart.

Hold them in place with pins until the cement is dry, then cement plywood ring B to the inner surface of the after end of the segments. Adjust as necessary so the segments are at right angles to the rings. Continue adding the segments by cementing them to the rings as well as to each other. It will be necessary to custom-fit the last segment by trimming it slightly.

Re-cement all joints from the cowl interior and when dry, sand the exterior with a block, rounding off rings A to form the cowl front. Apply a coat of sealer to the entire cowl, including the interior, and sand when dry. Apply two layers of Silkspan or silk to the cowl using clear dope as the adhesive.

If you want, you can carve a cowl and take it to a vacuum-forming shop. The engine cylinder opening in the cowl bottom should run from 1/8 inch forward of the cylinder to plywood ring B.

Start sealing and painting now. Apply three or four coats of clear dope to the covered wing and tail. The dope should be thinned with about 15 percent thinner. Coat the fuselage, cowl, and all other exposed wood parts with a lightweight grain filler. Four coats with light sanding between applications should produce a nice finish. Thin the final coat with 20 percent thinner. It is important that the cowl and fuselage nose interiors be well sealed with several coats of sealer to protect the wood from fuel.

Make a 1/8-inch hole in the bottom of the fuselage just forward of bulkhead D to drain off any fuel that might collect there. Be sure the sealer and paint don't close off this hole. A final light sanding with fine finishing paper will prepare the model for painting.

The engine exhaust pipe is on the lower right or starboard side of the cowl and can be simulated on the model with 3/16-inch dowel or aluminum tubing.

Cut the aluminum wheel covers to shape with an old pair of scissors or tin snips and clean off any sharp edges with used sandpaper. Install the wheel and epoxy the wheel covers to the landing gear struts at top and bottom. Epoxy the inboard wheel covers in place at the junction of the fuselage and wing. Cut the radio antenna mast from hardwood and sand it to a steamlined shape. Apply a few coats of sealer, then sand and cement it into a slot in the fuselage spine.

The upper and side surfaces of the Wellesleys were colored in the standard RAF "sand and spinach" earth brown and olive green. The undersurfaces, however, were flat black. Very few Wellesleys sported the more conventional sky-blue undersides.

Before starting to paint, cover the wheel with masking tape. Ideally, the sand and spinach should be sprayed on the model with an airbrush. However, I brushed the colors on and the results were satisfactory.

Thin the colored dope about ten percent so it flows well. The olive green should be fairly light but not as light as willow green. The proper color can be attained by adding a slight amount of yellow to forest green. Add a few drops at a time and mix well after each addition to check the color. All colors should be flat, but you can use conventional dope and treat it to become flat after it is dry.

Paint the entire model with the olive green. Two coats should cover well. When it's dry, carefully and lightly mark off the color lines for the earth brown, using a china marking pencil. The brown color should be applied along the color lines first and then filled in between them. The brown I used covered in one coat.

When this is done, apply masking tape along the color separation line of the black undersides. This line is straight and not wavy as between the green and brown. The tape should be applied to the fuselage sides, wing leading edge, and stabilizer leading edge.

All undersurfaces and wheel covers are painted black, one coat was enough for my model. The cowl is brown with an aluminum or silver front. Be sure to paint the cowl interior as well as the

fuselage nose interior back to bulkhead D. The easiest way to give the model that dull military finish is to apply a coat of Sig Flat-Coat Dope.

Cut canopies from larger size standard-type canopies and cement them in place.

Install the engine, then tack-cement the cowl to the fuselage, and you're ready for the miscellaneous details and markings. I prefer solid color decal sheets to the adhesive-type plastic sheets because of their light weight. Notice that the cockade insignia only appears on the upper surface of the wing and the numbers only on the lower surface.

Trace the markings onto the reverse side of the decals and cut to shape with sharp scissors and a single-edge razor blade. Make the insignia by cutting red, white, blue, and yellow discs of the proper diameter. Apply the discs one on top of the other. Wait for the previous disc to dry before applying the next.

Decal numbers and letters of the size and type needed for the service numbers on the tail are often available at hobby shops. I used white decals for the wheel wells so they would be visible on the black wing.

The fine lines that represent the cockpit door, trim tabs, flaps, and cowl engine cooling shutters are made with white Goldberg Color Stripe cut to 1/64-inch strips. The best method of doing this is to stick the tape on clean glass, a window will do, and using a metal straightedge as a guide, run a razor blade along it to cut the tape. The canopy frames are 1/16-inch Black Goldberg Color Stripe.

The record-breaking Wellesleys featured the RAF badge on the fuselage sides between the pilot's cockpit and the cowl. It requires a bit of patience to reproduce this in the size required, but it can be done. The easiest method is to trace the badge from the full-size plan in black ink and take it to a reproduction center to be reproduced. The final copy should be touched up if necessary and the gold or yellow color carefully applied. I suggest that before applying any dope, check the results of a test run on a piece of scrap.

When it's complete, carefully cut the badge out, smear a thin layer of glue on the reverse side, and press it on the fuselage. After the glue is dry, brush a light coat of Flat-Coat Dope to the badge being sure to seal the edges of the paper. Apply two or three coats.

Rig the antenna to the mast, fuselage, rudder, and rear cockpit canopy, and you are ready to fly.

FLYING. Don't try to fly an out-of-balance model. Field-check the R/C equipment and be sure the 100 mAh batteries have a full charge.

Flying with engine, elevator, and aileron control is far more fun than with engine, elevator, and rudder, or elevator, rudder, and aileron control when restricted to three channels. Negotiate gentle turns by banking in the direction of the turn, and sharper turns with slight up-elevator while in the bank.

The Wellesley should always be flown from paved surfaces because of the small model size and small wheel size. Hand-launching can cause problems so it's best to ROG every flight. The wing generates plenty of lift, despite its only 170 square inches, because of the deep airfoil. The tail moment arm is a bit short and, although the elevator is relatively small, the controls are very responsive, but not so sensitive as to make the model tiring or dangerous to fly. ■