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TWIN LIZZIE

by KEITH LAUMER

For ½**a** engines-and the little Pee Wee is just fine, a joyful free flight design for sport flying. Has character all its own-Disney character, maybe?

It's a perfect day for flying, the runway is smooth and the air is calm. Engine humming, Twin Lizzie starts her take-off run; the tail skid clears the ground, and with a tentative bounce, she's airborne, climbing steadily in a wide turn that brings her back directly overhead with 50 feet of altitude. The sun glints off her side, as she swings past to make another circle, climbing 100 feet before the engine cuts.

In the glide, the ship drifts back toward the runway rocking slightly in an occasional gust, to float in to a perfect landing, ready to go again. That's the way Twin Lizzie flies, and construction is easy, with a simple box fuselage, sheet balsa tail surfaces and constant chord wing. If you're a beginner or an old timer you'll find Twin Lizzie fun to build and fly.

Fuselage:

Let's begin by cutting out the sheet balsa fuselage parts. There are two plywood parts, two "s" sheet- balsa parts, and seven 1/16" sheet-balsa parts. Lay out the first side directly on the wax paper covered plan, cutting two of each piece as you go along. The second side is built over the first, and the two sides are allowed to dry before removing from plan, sanding and separating. While the sides are drying hard, bend the 3/32" wire main landing gear to shape as shown on plan and lace to plywood part No. 4 With No. 30 linen thread, coating lacing heavily with cement. The 1/32" piano wire tailskid is bent and sandwiched between the two parts 13. The fire- wall (plywood bulkhead No. 1) is drilled for a radial mounted engine, such as the Cox Pee Wee, and retaining nuts are cemented in place on the back, reinforced by a strip of hard balsa notched and cemented over them. The two sides can now be joined, on part No. 4 and 1/8" cross strip can be placed across the bottom in notches as indicated on the plan. The cabin roof, (part No. 3), is scored on the bottom center line, and cracked to the angle shown on the front view, after which the front wing retraining dowel, bent from 1/16" piano wire, is cemented in place and cross pieces, cut from 1/8" x 1/4 balsa as shown on front view, are added to the underside, between the notches. The cabin front posts now are cut from 1/8" sq. balsa and cemented in the front notches in part No. 3. The cabin roof assembly is cemented in position on fuselage frame.

Next, the front ends of the fuselage sides are drawn together and attached to part No. 1, being held by a rubber band until dry. The rear ends are similarly drawn in and part No. 12 is cemented in place. The cross pieces of sq. balsa are cut to length as shown on top view and placed top and bottom. The tailskid assembly should also be added now, placing crosspieces both in front of and behind the skid.

Formers 2, 8, 9, 10, and 11 are now added and 1/16" sheet stringer is added in notches from 8 to 11. The 1 /32" sheet balsa top skin is now cut to shape and cemented in place. A 1/8 x 1/4" stringer is placed between parts 1 and 2, and the cabin side posts are added.

The 1/8" balsa panels for side filling are cut to shape and placed. If a separate tank is to be installed, it should be mounted now before adding the 1/16" sheet balsa bottom cover, from station 1 to station 4. The interior of the tank compartment should be fuel proofed. The top cover, of 1/16" balsa, is cut to approximate shape using a paper pattern, soaked in water, and held in place by rubber bands to dry. When dry, the cover should be fuel proofed thoroughly and cemented in place.

The cowling sides of 1/4" soft balsa should be cut to the shape shown on the side view and cemented lightly in place. The 1/4" soft balsa cowl bottom and 1/2" top now should be placed, cementing lightly to firewall, but liberally cementing to cowl sides. The front piece of the cowl assembly now is added with plenty of cement Fired the assembly left to dry for at least two hours before shaping with a sharp knife and sanding to final contour. The soft balsa block should be cemented to the rear of the fuselage and the balsa tail fairing block cemented lightly in place. In order to shape the fairing properly, a temporary filling block of 3/32" balsa is placed under the fairing in the position the elevator will occupy. When dry the fairing block and tail block are shaped and sanded and the fairing removed.

The entire fuselage should be sanded carefully with fine sandpaper using a sanding block, after which the cowling is removed and openings are cut to fit the engine used. The cowling and front portion of the fuselage receive a thorough fuel proofing. The fuselage, including planked and filled surfaces, is covered with lightweight silkspan. The paper can be applied most easily using modest amounts of liquid mucilage. When the mucilage has dried, the tissue should be dampened with water, using a very soft brush or spray, preferably the latter. When dry, give the fuselage a coat of clear fuel proof dope, and sand lightly. The 1/16" wire wing mounting dowel and 1/32" tail mounting dowels are cemented in place as shown on plan.

Wing:

Select a straight piece of 1/8"' by 1/4" hard balsa and lay out the spar as shown on the front view of the wing. The leading edge, of medium 1/4" sq. balsa, is laid out on the same pattern. Note that when adding the tip portions of the leading edge, they should be swept back 1/4". The trailing edge is built up from hard 1/16" balsa. The bottom half is beveled as shown on side view before being cracked to the proper dihedral angles as shown on front view. These cracks should be liberally coated with cement.

Next, cut out the wing ribs. Ribs A can be simply made by first cutting 20 blanks 1/2' x 4 1/2" from a sheet of hard 1/32" balsa. These blanks should be stacked with one edge and one end aligned and two straight pins inserted to hold the stack together. The block of blanks should be rubbed over a sheet of sandpaper to create a perfectly flush bottom edge. The rib pattern is now marked on both outside ribs. With a sharp knife, trim the entire stack to shape as a unit, finishing the shaping with a sanding block. The notches should be cut carefully, using a short length of hacksaw blade or a, sharp razor. The ribs now can be carefully separated and the tip ribs, B, C, and D, cut out separately.

The wing is assembled one panel at a time, starting with the left main panel. The leading and trailing edges are pinned to the wax paper-protected plan and ribs added, allowing one half hour to dry. The pins then are removed and the assembly shifted so that the right main panel is now on the plan. The remaining ribs are now added, including tip ribs B, C, and D. The top portion of the trailing edge now can be placed. Notice that it will be necessary to crack this assembly very carefully to proper dihedral angle to coincide with the bottom portion of the trailing edge. The spar can be placed and the soft balsa tip balsa blocks added. The wing is removed from the plan and 1/16" balsa filler panels added to the bottom of the center section. All irregularities in joints should be sanded smooth before adding the 1/32" x 3/32" cap strips and 1/32" center section top covering.

Next, the leading edge is shaped with a sharp knife and sanding block to the cross section shown in the side view, and the entire assembly carefully sanded. All joints in the structure are daubed thoroughly with a 50-50 mixture of cement and thinner; this will double the strength of the wing.

The wing is ready for covering. Cut Silkspan to approximate size for covering one panel at a time. The bottom is covered with two pieces, the top with four. Start with the bottom, trimming the edges before covering the top. Use smooth paper to avoid wrinkles. Slow-drying mucilage gives you plenty of time to draw the paper up tight and even before setting. The paper next should be wet and doped, as was the fuselage. It is advisable to pin the wing down while the topside is drying to avoid warps.

Part number 7 can be added, and part No. 6 placed to match the angle of part No. 8 on the top of the fuselage. Thee 1/32" cover is cut to size and cemented down, being held in place with pins while drying. The wing should be held in place on the fuselage while this fairing is sanded to match the fuselage perfectly. The fairing is doped and covered with paper. Tail assembly: The elevator is cut from medium-bard straight-grained 3/32" balsa, and sanded smooth. The leading and trailing edges are rounded as shown on side view. The rudders are cut from medium 1/16" balsa, and lightly sanded and rounded. All tail surfaces receive a coat of clear dope, and a sanding with light sand- paper before rudders are cemented to ends of elevator, keyed in place by notches. The previously made tail fairing block now is added, with the elevator held in place on the fuselage for proper fit. The 1/16" balsa keys are added to the bottom of the elevator, with care exercised to get them in the right position as shown on plan. Cut rudder tab free and mount with soft copper wire.

Finishing:

Before painting the model, the inner wheel retainer washers are soldered in place. All parts of the model should be checked over to be sure that you are satisfied with your sanding job before proceeding to paint. If you have access to a spray gun, this method is preferable. However, a careful job using a soft, half inch, square- cut brush will be quite satisfactory. The wing, fuselage and tail assembly are given one light coat of white fuel proof dope, followed by a final sanding with grade 00 sandpaper. Then put on another coat of white, giving the interior of the cabin and cowling adequate covering. Next, paint the instrument panel black and add white discs for dials.

The windshield is added before trimming. It is cut from medium weight celluloid (approximately 1/64") using the pattern on the plan. It is best to check the fit first with a paper pattern since no two models will be absolutely identical. The fitted windshield is placed over the front wing mounting dowel and cemented down on one side of the cabin only. Do not use excessive cement and glue around outer edge only. When this side is set (about 10 minutes), cement down the other side. It is better to hold the windshield in place by hand while drying rather than using pins, which leaves unsightly holes. If you are spray painting, mask off the windshield following the outline shown on plan and spray another coat of white on the fuselage. A mask can be made easily by tracing window outlines on heavy tracing paper, applying masking tape to paper, cutting along line, and then stripping off the paper backing. After spraying, the tape should be removed carefully to avoid peeling paint. If brush painting, paint the window outline first, then fill. The 1-5/16" wheels are added, retaining washers soldered in place, and painted.

Select a trim color of your choice and paint the areas shown on plan. These are: upper portion of front end of fuselage, leading edge of wing and tips of rudders. The trim job is fished off by adding the stripes below the solid color areas as shown. If you have sheet decal colors to match your trim color, the stripes can be cut from these. Then place decal numerals on fuselage sides and top of wing. Suitable black and gold numerals can be purchased at most paint and glass stores.

Flying:

The wing and tail surfaces are held in place by four 2" rubber bands each, approximately 1/32" x 3/32". Fewer rubber bands would permit the wing surfaces to wobble under pressure; more would prevent the surfaces from popping off in a crackup. Check the model's balance and the alignment of flying surfaces before all flights are made. The model should be glide tested for proper trim by hand launching over grass. The ship is very buoyant and should be launched gently into a light breeze with the nose pointed slightly down. The proper glide should be a long smooth curve, flattening out before touching down. If the model drops heavily, adjust by placing a 1/32" block under the trailing edge of the elevator. A stall should be corrected by placing the block under the front edge of the elevator. It is important to distinguish the difference between a slight stall and a slight dive as the model ends up on its nose in both cases. In a stall, the model will hesitate with its nose slightly high before diving into the ground. If the model shows a tendency to swerve sharply in these short glides, check the wing for warp. Needless to say, all flying surfaces must be absolutely true.

When you have achieved a straight, flat glide, try a short flight under low power. A hand launch in calm air is best. If there is a breeze blowing, be sure it is coming from the left front. Stalling or diving tendencies under power can be adjusted by inserting a hardwood wedge behind the engine at the top to correct the stall, at the bottom to correct a dive. The torque of the engine will cause the model to circle to the left under power. The rudder tab should be offset 1/16" to the right in order to obtain a slight right circle in the glide.

Do not attempt to fly Twin Lizzie in strong or gusty breezes until you have become thoroughly familiar with its flight characteristics.

BILL OF MATERIALS

Balsa Wood

1 Pc. 1/32" x 3" x 36" hard balsa
1 Pc. 1/16" x 2" x 36" medium balsa
1 Pc. 3/32" x 3" x 12" medium balsa
1 Pc. 1/8" x 2" x 18"medium balsa
3 PCs. 1/8" sq. x 36" hard balsa
2 PCs. 1/8" 1/4" x 36" hard balsa
1 Pc.1/4" x 3" x 3" soft balsa
1 Pc. 1/2" x 3" x 3" soft balsa.

Dope

4 oz. clear fuel proof
8 oz. white fuel proof
1 oz. color fuel proof.

Music Wire

1 PC. 3/32" x 8"
1 PC. 1/32" x 6"
1 PC. 1 / 16" x 6"

Miscellaneous

1 PC. 1/8" x 3" x 4" mahogany plywood
1 PC. 1/64" x 12" x 5" celluloid
I pr. 1-5/16" rubber wheels
4 3/16" washers
3 ft. No. 30 linen thread
large tube fuel proof cement
engine mounting bolts (to suit engine)
8 1/32" x 3/32" x 2" rubber bands
decal numerals.