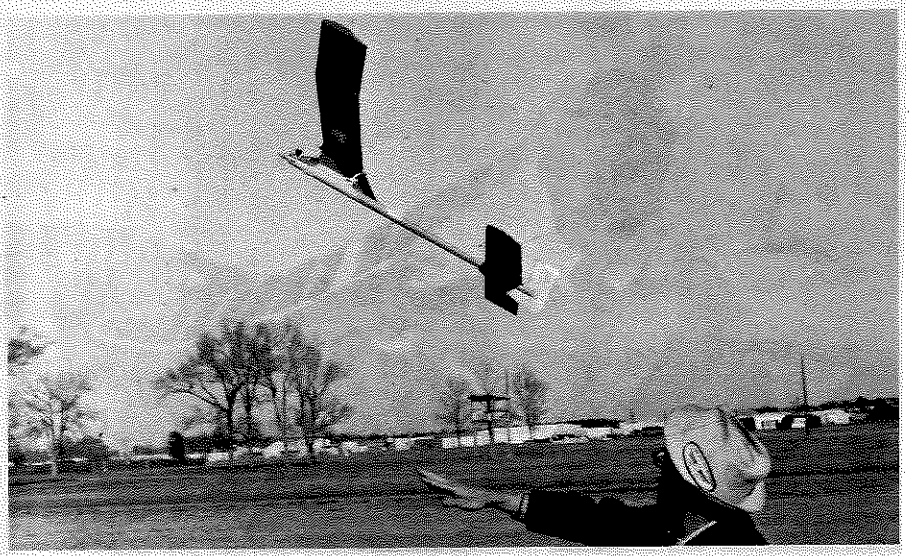
LARA

By REID HULL . . . Not just another 1/2A free flight, this design has some innovative features and a very efficient airfoil. Get one or two together for late summer or fall contests.



• Just another 1/2A? Not quite, especially if you have a scientific bent of an aerodynamic nature. And if past performance means anything, it will better than hold its own at any free flight competition.

The wing airfoil was indirectly suggested by an associate professor from Massachusetts Institute of Technology (M.I.T.) by the name of Eugene Larrabee. I became acquainted with him while he was on leave to Langley Research Center of N.A.S.A. It seems he had tested the near primitive, Joukousky airfoil section at approximately model plane-flying Reynolds numbers and found it to be quite efficient in that regime, providing it was turbulated a bit. It seemed to me that the desired turbulation as well as an obvious structural advantage might be had by placing numerous diagonal ribs in front of the main spar, as with no sheeting there, they would create an uneven wing upper surface. This hoped-for effect seemed to have been realized to a degree beyond that which my fondest imagination had presupposed. . .a beautiful low sink rate glide with very good penetration. No doubt a little attention paid to details, such as positioning the D.T. fuse for lower drag and partially burying the wing platform inside the wing contour also served to enhance the glide. (Incidentally, if you choose to use it elsewhere, percent airfoil coordinates for a 9.2% thick Joukousky airfoil are given on the plan.)

LARA.'s designer, Reid Hull, needles the Cox TD prior to a test flight.

As for a contest record, this plane has won two Brainbuster 1/2A events, plus several other lesser places. No doubt it would have won more had it been flown more, but I compete mostly in rubber-power events. I won the Coupe d'Hiver event at the 1984 Eastern U.S. Free Flight Championships and was presented a handsome plaque, a P-30 kit, and a subscription to *Model Builder*.

If you've somehow been sold this design and feel the urge to build something, this is it. . .and as a bonus you can sniff glue at the same time!!

Before construction, the few pointers which are to follow will smooth the way for the newcomer as well as the old hand. The fuselage is probably the most difficult and should be started by locating a three-inch wide 1/16 sheet of best quality flexible balsa, certainliy not quarter-grain stock, which is stiff and will crack easily if you try to form it into a tube. Quarter-grain has small shiny flecks visible in the grain. Having found a suitable sheet, trim it so there will be very little excess at the small end of the eventually conical tube desired. You'll find that no trimming will be needed forward of a point 14 inches from the small end of the tube to be. Now form the sheet around a broom handle or similar item of about 3/4-inch diameter. Of course, a tapered form will be best if you can locate something, or you can build up a small diameter item to the correct taper. In any case, form the tube by first soaking the blank in water, then gradually bending it around the form, starting near one end and working your way to the other. Make several passes, bending the sheet a bit more with each succeeding pass, till you get it bent to where it will form a closed tube. When bent around the form, wrap the tube with string or tape and lay it aside till it is thoroughly dry.

While waiting for the tube to dry, locate maple, oak, or similar 5/16 sq. wood for the engine mounts and cut the tapers required at both ends. With this done you can cut the firewall from plywood and the other bulkheads, that lie between the engine mounts, from sheet balsa. Epoxy the engine mounts to the plywood firewall and bulkheads, making a separate unit. Add to this unit the wing pylon of hard, 1/8-sheet balsa.

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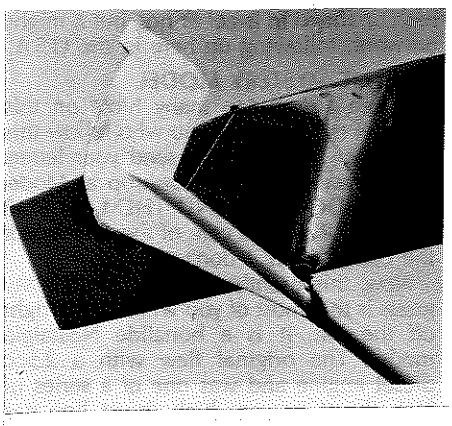
Next cut out all the remaining fuselage bulkheads, which are circular. Starting at the small end of the fuselage, position them inside the sheet balsa tube in the manner indicated on the drawing. (The formed sheet is presumed thoroughly dry by now.) Make sure the cement isn't wiped off the disc-like bulkheads as you position them. Tape tube edges together as they are installed, or use an instant glue such as Hot Stuff to close the tube. You will probably need to wet the outside of the sheet tube in order to get it to lay snugly around the smaller bulkheads near the tail.

It will become evident that the three-inch wide sheet isn't quite enough as you get close to the pylon T.E. while installing bulkheads. To fill in this wedge-shaped opening, it will be necessary to add some small pieces of preferably *hard* balsa. Also it will be best to use narrow strips of hard 1/16 sheet balsa to sheet the fuselage from the plywood firewall to a convenient bulkhead near the aft end of the balsa pylon. Don't forget the sheet balsa doublers in the area near where the front edge of the horizontal tail is strapped down.

A word about the fuel tank shown. It is a pressure tank, and the pressure fitting Cox provides is put into use. Drilling a 1/32-inch hole through the fitting on the side of the shaft housing after removing the crankshaft. Sure, a pen bladder will accomplish the same thing, but it also dangles here and there. I thought the name of the game was aerodynamic efficiency. . .cleanliness. If you can't find a metal tank near the size shown, one can be made from a tin can if you're handy with a soldering iron. The sheet metal in a food can works fine, in fact it's probably the best you can get. Be sure no residue is left in the tank when you seal it up, and soldering in the 3/32 inch O.D. brass pressure and fuel feed tubing, as the drawing indicates.

After you have finished the construction of the fuselage, having been guided by details shown on the drawing, you should sand it well. Then apply wood filler and insert tiny pieces of balsa where crude surfaces indicate the need. Following a coat of clear dope and another sanding with extra fine sandpaper, cover the whole fuselage with silk and finish it with colored dope or Hobbypoxy, or whatever. Just be sure the finish is fuel-proof in the area around the engine. Also see that the wood cowl and the area close to the engine mounting get a couple of extra finish coats, so engine oil has no chance to soak in. You don't need any added weight; the plane weighs nearly 10 ounces now.



Stab in D.T. position. Stop thread sets angle.

Mount the engine with number 2 or 3 machine screws. In doing so, you will find that you need to notch one of the wood engine bearers to clear the pressure fitting on the .049 (Cox TD) and allow silicone tubing to be epoxied to it. When epoxying the pressure tubing (1/16 silicone), first roughen the fitting on the side of the crankshaft housing. Also, the tubing may be cemented in the notched engine bearer with a shrinking cement such as Ambroid. The fuel line tubing will have to be 1/16 I.D. surgical tubing, so a pinch-off timer will effectively do the job. Silicone tubing is just too stiff. Mount the pinch-off timer with some tiny wood screws in the area the plan indicates.

With the fuselage nearly finished, turn your attention to the wing and tail. Though the drawing is pretty explicit, a few words need to be said concerning them. The twist built into the wing panels should be blocked into them about 30 minutes after cementing all structural joints in any one panel, and the twisted panel allowed to set overnight. *Don't use any instant glue in panels.* Be sure to take extra care in making an accurate fit between spars, and leading and trailing edges, when cementing in the dihedral joints. Be sure and get that inset built into the wing lower surface to receive the wing pylon platform. This inset will align the front of the wing as well as affect increased aerodynamic cleanliness.

You may choose to tissue cover the wing and tail, but I have long since gone to covering with Mylar because it is more durable and will not continue to warp the structure it covers. To color Mylar before applying it, spray or brush on a light coat of thinned Magic Marker ink, Hobbypoxy without the hardener, or would you believe, acrylic latex house paint seems to adhere as well as anything. Turn the lightly-painted surface to the inside when applying the Mylar so the coloring won't be rubbed off eventually in places, and to ensure the exposed surface will be a glossy one.

If you do choose to cover with Mylar, cover the wing with 1/2-mil Mylar and the tail with 1/4-mil if you can get it. Use fresh contact cement to adhere the Mylar to the wood structure, which should have been doped and sanded previously at all points where the Mylar is to be bounded. Use a sealing iron to bond the Mylar to the wood as you would other iron-on coverings, and then shrink it with heat from the iron. Be sure the edges of the Mylar are always bonded to the edge of the structure with heat before doing any heat shrinking (no accidents permitted).

After you have added all the details and taken pictures of your pride and joy, see if you can find a calm spell to do a little test flying. (Here on the east coast the wind blows all the time. . .except at night.)

Before glide testing, get the center of gravity (C.G.) close to where the plan indicates (the original was a bit tail light), then hand glide the plane into the oncoming breeze. Add a shim under the front or rear of the horizontal tail depending on whether or not the plane shows a stalling or diving tendency. Though a left glide is desired, you should be able to detect only a slight left turn at this point.

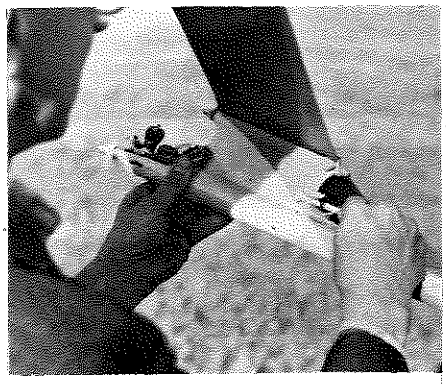
Before any test flying with power, be sure the dethermalizing system (D.T.) is working flawlessly when the D.T. fuse burns the tail restraint rubber band in two. (A number 8 band will be fine.) The first flight should be made with about 75% power and a motor run of three or four seconds duration. Launch the plane with about a 20° inclination and some 30° to the right of any oncoming breeze, and watch it closely. Under power you should see a right circle about 100 feet in diameter, followed by a gentle left glide. If the power circle seems OK, but with no subsequent left glide, try skewing the wing two or three degrees so the left tip is further aft. If this doesn't yield a left glide, tilt the wing by cementing a 1/32 shim on the right side of the wing platform. This accomplishes about the same thing as shimming to raise the left end of the horizontal tail.

Add rudder tab only when the power pattern needs adjusting, or when the glide pattern is grossly undersirable.

When all seems to be working first rate, increase the engine power to maximum, keeping the engine runs short and launching at about 45°, making minute adjustments after each flight. When the plane's performance seems flawless, increase to the maximum permitted length of engine run.

A final comment; modelers will never win any competition unless they use all of their smarts, intuition, et cetera, in seeking out and launching into balmy (Emmett calls it buoyant) air on each official flight. The more serious competition will whether you do or not.

Build this plane painstakingly and you can be proud of it, even if it is only a 1/2A free flight. The structure has been proven over several years. ●



Unique location of D.T. makes it more convenient to light, and lowers drag too.

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