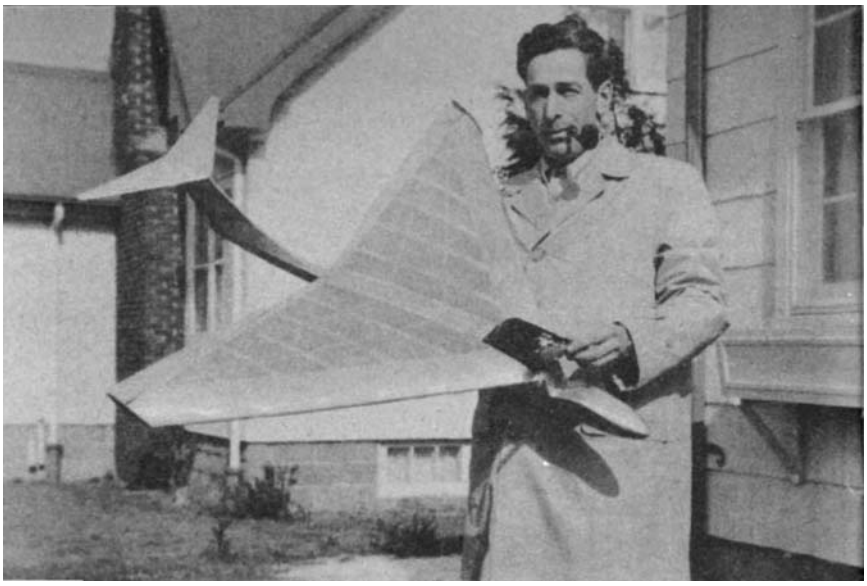
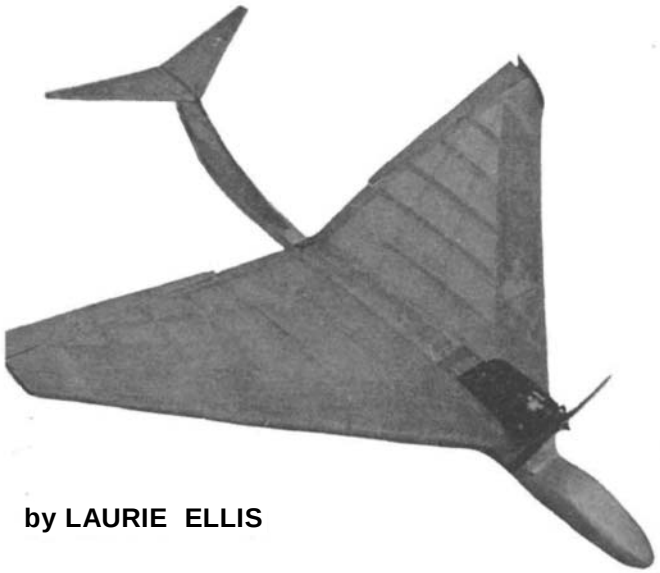
BIG D



The author with a Webra Mach 1 powered Big D. One unusual quality of the delta if its tolerance of power. Plans show a ship that will fly on an .049, and skyrocket upon the hotter .15.



by LAURIE ELLIS

A many times contributor on deltas to foreign magazines, the author-designer is a noted authority on the* subject. With *this design he shot for the highest performance.

• Big D *is my* 21st delta and is the third to use a pylon-mounted engine located at the apex of the wing. We were after contest climb and glide in the delta shape, or to match the pylon contest model. The delta is a queer bird. It has amazing stability, is more reliable than the conventional model but it is difficult to get a glide which will equal the orthodox layouts. This may be attributed to the fact that the span-loading is higher than on the ordinary model.

Hundreds of flights on all the previous designs dictated the shape of this delta. It is not pretty but performance makes up for it! It takes any engine from a good .049 to the hot .15's. Performance with an .049 will only be of the sport variety but with a .15, it comes into its own. Even with higher power, this model will not spiral in providing one does not get ham-handed on the trim. The transition from power flight to glide is very smooth and stall recovery is rapid and positive.

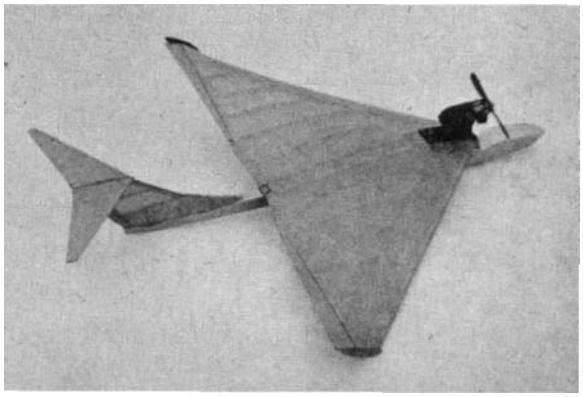
A" trike" landing gear is shown for those who want to ROG—not be used for contest flight. This model, because of its high thrustline, takes a long run to "unstick."

For those who wish to get away from the conventional, this design is a good start. Experimenters, with ideas of their own will have a proven design to modify.

CONSTRUCTION: Trace all full sized parts on stiff paper for templates, making it easier to trace parts on balsa sheets. Rub the plans with wax or soap so that cemented parts will not adhere.

WING: The fuselage cannot be completed before the wing. All rib patterns are given. Slots for the 1/8 sq. spars are shown but remember, slots are slanted one direction for one side of the wing and the opposite direction on the other side. The slots shown on the plan are drawn as if there were no slant involved, therefore, it will be necessary to bevel each slot in the correct direction.

We found it best to cut out the rib shape but not put in the slots. When the ribs are assembled and cemented in place, we then lay the 1/8 sq. spars in place, one at a time, mark the position of the spar *(Continued on page* 52)



Shown in the pictures ai the hand-launched version, model can be fitted with landing gear for ROG's, at is shown on the drawings.

Big D

(Continued from page 28)

slot, remove the spar and cut the slot — then cement the spar in place. This assures absolute accuracy in the alignment.

Pin the 1/4 sq. leading edge and 1/4 x 1 trailing edge center section pieces on the plan; also the 1/8 sq. bottom center section spars. Cement ribs W.1. in place but do not put in the top center section spars until the dihedral is built into the wing. Cement the 1/4 sq. main wing leading edge pieces with a butt joint to the leading edge of the center section, and pin flat on the plan. Cement with a butt joint the 1/4 x 1 trailing edge piece and pin flat on the plan. Note that the under surface of this part is beveled up. The remainder of the trailing edge, 1/2 x 1/4, is now located. These pieces are cemented with a butt joint to the first part of the trailing edge, and then raised 3/8 in. at the tip and held in place with a small piece of balsa under the tip during construction. Small wedges of balsa placed underneath at about 2" intervals will hold these pieces rigid while the ribs are installed. This is done to build in the necessary washout for this type of wing.

All ribs are now installed. Note that the leading edge of each rib must be beveled to fit. The lower 1/8 sq. spars are not put in until the wing is lifted from the plan. When all ribs are set, install all upper 1/8 sq. spars except for those across the center section. The sheeting on the lower part of the center section is cemented in. This goes between the ribs, as indicated on the sketch on the plan. While the wing on the plan, the leading edge sheeting and cap strips are cemented on. Do not cover across the center section yet. When dry, take out pins holding the construction to the building board, except those at the center section. Raise the wing tips 1" and place a piece of balsa under the leading edge of the tip to hold the tip at this height. This gives the required dihedral.

Now, the center section top is completed. Cement in the 1/8 sq. spars, install, and cement in place the 1/8 plywood engine-mounting supports (or inserts). Cement on the 1/16" sheet upper surface. Cement on gauze strips over all places where there has been a butt-joint —these locations are shown on the plan. When dry, remove the wing from the plan and cement in the lower 1/8 sq. spars. These spars are not really spars but a stiffener to hold the ribs in position, and to prevent shock-tearing of the covering.

Lightly sand the wing. It is covered with nylon, silk or heavy-weight Silkspan. Cover the wing with your choice of covering material but, before the first coat of dope, cover the elevons with light-weight paper and install on the wing. Bend the elevons to the full "up" position and then give the wing the first coat of dope. The elevons in the "up" position prevent a warp from developing on the trailing edge of the wing. When the first coat of dope is dry, the "droop snoot" pieces are cemented to the under side of the leading edge of the wing. Cover these with light-weight paper and give one coat of dope. Apply the remaining coats of dope. If a glow plug engine is used, use fuel proof dope.

Color the wing to suit your taste, cement on the elevon adjusting blocks and the tip fins. Put the wing aside. The aerodynamic value of the tip fins is open to debate. The model will fly just as well without, but they protect the elevons. **FUSELAGE:** The outline is made up of 3/16" x 1" balsa. Pin down on plan, cement in spacers. Bend at front is accomplished by cutting slots in the balsa and steaming lightly. Cover one side of the fuselage with 1/16" sheet with the grain running diagonally. Remove from plan when dry and cover other side with grain running in opposite direction. Cement on the 1/4" soft balsa sheet sides at forward end and, when dry, carve and sand to shape. Cement in the 1/16" ply wing rest pieces—note these are countersunk into body. Cement on and carve to shape the nose block. If you are going to use an undercarriage, cement in 1/8" ply insert for attaching main gear. Cement on 1/16" ply front wing brace. This keeps the wing from moving forward. Reinforce this area with gauze so ply brace cannot be pushed forward in a nose-low landing. Cover fuselage with light-weight paper, dope, color to suit. Two ballast boxes are shown, one in nose, one in tail. If a very light .049 engine is used then a nose weight will be needed. If a heavy .15 engine is used, it may be necessary to use a bit of weight in the tail to get the CG in the correct location.

FIN: It is a flat plate section with a streamlined portion on its lower part. Make up the flat portion of the fin on the plan and while the cement is drying, cement on the lower half rib, and cover with 1/32" sheet. Remove from plan, add half rib to other side, and cover with 1/32" sheet. Sand lightly, cover with Silkspan. Dope and color to suit. Install trim tab (after it has been covered and doped) and cement fin in position on rear of fuselage. Make sure that the fin is aligned correctly fore and aft.

TAILPLANE: Is made out of 3/16" medium balsa sheet. Cement parts together, sand to airfoil shape, cover with lightweight paper, dope and color.

ENGINE NACELLE: Cement base pieces (1/16" ply & 3/32" sheet) together using a contact cement such as Pliobond. The curve is obtained by holding the pieces over the center section leading edge while joining. Cement and tack the 5/16" sq. engine bearers to the 1/8" ply core piece. Insert the core in the slots in the base piece and thoroughly cement. The remainder of the nacelle is built up, using 3/8" medium balsa for the sides of the pylon and soft balsa for the top part of the nacelle. Shape and sand all over and give several coats of dope. Tank and timer installation positions are shown on the plan. For a radial mount engine use a 1/8" ply face at the rear of the engine and build up the nacelle in the same way.

ASSEMBLY: Locate wing on fuselage. It will center itself at the front end because the "droop snoot" sections fit down over the sides of the 1/16" ply front wing rest. Secure trailing edge with elastic bands. Place engine nacelle in position, line it up fore and aft, and screw down at the rear end. Secure front end of wing and nacelle with elastic bands. Tail-plane is held with elastic bands, over top of fin.

FLYING: Using a Cub .15, weight should be around 18 ounces. One has leeway as the model will carry quite a weight. However, if contest performance is desired, it is best to keep the weight down initially and then use ballast to bring it up to the required weight for the rules under which you fly.

Be sure the model balances where indicated. A bit of leeway is permissible here and slight nose heaviness is preferable to any tail heaviness. A tail-heavy free-flight delta will show the stunt lads some tricks they can't do on the end of wires.

Elevons serve a dual purpose. They act as elevators and ailerons. They will make

the model climb or descend and also make it turn. If one elevon is higher than the other, then the model will turn in the direction of the higher elevon.

Keeping the above in mind, let's start the glide testing. Screw the elevons in la slightly "up" position. (See sketch of wing tip detail on plan.) Pick a reasonably calm day and a field with long grass or soft ground. Make sure that the fin trim tab is neutral. Hold the model at arm's length over head and run along into the wind and, by means of an overhand throw, send the model into a glide in a very slightly nose-down attitude. It will take a bit of practice to determine the correct gliding speed of a delta. Too hard a throw will make the model nose up and too slow a throw will cause it to mush. If the glide is too steep, screw up the elevons a shade at a time. If the model wants to stall, unscrew the vernier screws and the elevons will depress themselves through the action of the elastic bands on the adjusting blocks.

Continue glide testing until you have obtained a flat fast glide in a straight line. When you are satisfied that the glide is correct, raise the left elevon just a shade and lower the right elevon the same amount. Glide the model and watch for a slight turn to the left. Continue this until a medium turn to the left is obtained. Now start playing with the trim tab on the fin. Give it about 1/8" turn to the right and glide test again. This will make the model glide straight again or show slight turn to the right. The idea is to get a slow turn to the right by means of the tab which is counteracting the elevons which you have already adjusted to give a turn to the left. Confusing isn't it? The reason is that under high speed with power the elevons will hold the left wing down and cause a left turn but the trim tab is trying to turn the model to the right with the result that the nose is held up in a left turn under power and the model will not develop a spiral dive.

For first power flights it is best to hand launch the model—if you have installed an undercarriage. Run the engine rich and hand launch the model with a fair heave in a slightly nose-up attitude. This must be done because the model has a high thrust line and the model must get away at near flying speed or it will be taken over by the thrust of the engine and head for the ground. Watch the low-speed power flights to determine if any adjustments are necessary, then increase the power until you have it wide open. Once you get used to your model you will, no doubt, play around to find the flight path you like best. Once the model is trimmed,

ROG is just a matter of putting the model on the ground, starting her up and letting her go. It will not ground loop but because of its high thrust line it will take rather a long run before it suddenly lifts off and goes into a howling climb.

For the benefit of those who are used to the conventional model with its large tail-plane, the tail-plane on this model will appear to be small. The tail-plane on this model is a true stabilizer and its only function is to stabilize the reaction of the wing which already has its stabilizer built in in the form of washout and elevens. A word of caution, do not decrease the minus 2-1/2 degrees incidence on the tail-plane as this will upset the stall recovery of the model.

BILL OF MATERIALS

12	1/8 x 1/8 x 36-Wing spars.
1	1/4 x 1/4 x 36—Wing leading edge.
1	3/16 x 1 x 36—Fuselage outline or cut these from 3" stock.
1	1/32 x 3 x 36—Fin covering.
5	1/16 x 3 x 36—L. E. sheeting, capstrips, fuselage sheeting and center section sheeting.
4	3/32 x3x36-Wing ribs.
2	1/8 x 3 x 36-Wing ribs, nacelle.
4	3/16 x 3 x 36—Elevons, fin outline, tail-plane and 'droop snoot' pieces.
2	1/4 x 3 x 36-Fuselage sides.
1	3/8 x 3 x 18-nacelle.
1	5/16 x 5/16 x 8 hardwood—engine bearers.
1	Piece 4 x 6 x 1/16 ply
1	Piece 4 x 6 x 1/8 ply 18" of 3/32 piano wire.
3	sheets heavy weight Silkspan or equal area of silk or nylon.
3	sheets light weight Silkspan.
4	large tubes cement.

1-1/2 pints clear dope.
Color dope as required.
One 1" wheel and two 2-1/2" wheels.
Fuel tank, timer, engine, prop 7-1/2 x 3, fuel and a nice place to fly.