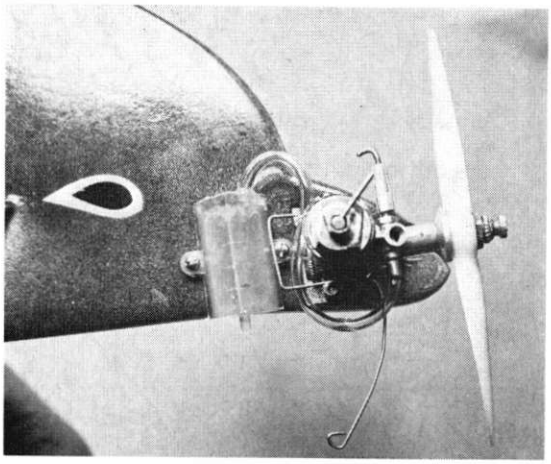


The 0.5cc diesel engine provides ample power for this craft. Designed purely for beam-mounted engines, it would however be quite a simple task to add a bulkhead and use a radial mount if necessary – but do keep the thrust line as shown on the plan.

are round the right way! F4 should be on the right, facing forwards.

Epoxy the bearers in place, checking the alignment of the engine mounting holes. When set, cut out the shaded area marked on F3 and add the scrap $\frac{1}{4}$in. blocks between the bearers; you will have to hollow out the front portion of block slightly to clear the engine crankcase. Next shape the 'chin' from scrap hardwood and glue in place, then butt the nose portion to F1 and F2 and add strengthener F5 when dry. The entire fuselage should be block sanded with P360 paper so that there are no 'stepped' joints, and all the edges are well rounded. The flexible 1mm ply sanding block will be useful here.

Wings (fins?)

Cut out the wing blanks from $\frac{3}{16}$in. medium balsa and butt the front and rear portions together. Carve and sand to the section shown using the carving lines as a guide. A tubular block of about 2in. diameter is useful for shaping the trailing edge. Recess two 1p pieces into the leading edge of the left (facing forward) wing, in the positions shown on the plan. These will counterbalance the weight of the engine cylinder head.

Tailplane and fin (flippers?)

Cut these from $\frac{1}{16}$in. medium soft sheet and join the front and rear tailplane sections. Block-sand all over and round off the edges with P600 paper.

Finishing and assembly

It is best to keep the parts separate for pre-finishing and covering. Do not use shrinking dope. Use instead clear cellulose lacquer from a car refinisher, or make your own lacquer by plasticising ordinary dope with the addition of 5% castor oil. Thin your lacquer for brushing by mixing 2 parts of lacquer with 3 parts of cellulose thinners, then give two coats to all parts. Sand after each coat with P600 paper. Cover everything with lightweight *Modelspan* tissue, using 50% thinned PVA adhesive. Brush this through the dry tissue and pull gently round the edges to remove wrinkles. Allow two hours to dry, then sand evenly with P600 paper. If any warps develop during this stage, they should disappear during subsequent lacquering.

Give a further three coats of lacquer to each component, again rubbing down well between coats with P600 grade paper and remove any remaining warps by pressing over a flat surface. The model can now be assembled. Start by cutting out the wing slot – cut in from both sides to form a shallow 'V'. Now epoxy the fin in place. Lay the fuselage on a flat surface and rest the fin on scrap $\frac{3}{32}$in. sheet to ensure a vertical joint.

Now follow with the tail. Pencil-in guide lines to show the fuselage position, then epoxy in place. Smear any excess epoxy smooth to form a fillet – speed is essential. Check continually with a 90° template that the joint is true while the epoxy is hardening.

Before fixing the wings, make the anhedral template from scrap $\frac{1}{4}$in. sheet, and pencil in positioning lines on the underside of the wings and on the fuselage. Mark guide lines $\frac{1}{8}$in. from the root of each wing and assemble 'dry' into the wing slot. Holding the template in place by hand, make sure that the fits are satisfactory.

Quickly mix a quantity of epoxy and smear the inside of the wing slot and the wing roots. Press the wings in position from either side, checking from the guidelines that they are correctly mated, and smear off any excess epoxy to form a fillet. Hold the template firmly against the underside of the wings until the epoxy is set. Finally, smear a fillet of PVA glue over the wing, fin and tail joints. The colour coat can now be added. The original was sprayed thinly with dark grey cellulose enamel to give a half-covered mist-coat. Two thin coats of fuel proofer were then added by brush. The eyes can be created by masking during application of the colour coat, or cut from coloured paper and stuck in place.

After finishing, epoxy the engine bolts in place in the bearers, and screw down the engine while the glue is soft to ensure correct alignment.

Bend the skid from 20swg wire and lock-nut it loosely over the rear engine bolts.

Fuel tank

The original was an old Mercury F/F tank, but any small transparent tank is suitable. (18in. of coiled fuel tubing is unsightly, but satisfactory.)

Engine

There is no point in using an engine more powerful than the *Allbon Dart* used in the original, as this is never run flat out. Only beam-mounted engines are, of course suitable.

Trimming and flying

The centre of gravity should be where shown on the plan in all planes. If necessary, recess lead shot into the 'chin' to bring it forward and down.

Lateral balance is critical, and if the wings do not balance evenly, add weight to the appropriate tip until they do.

Now check for warps – use steam to make the model as 'straight' as possible before test gliding over long grass. The design has a natural tendency to turn right under power, so the glide turn should be to the left to control this.

If the natural glide turn is to the right, add increments of weight to the left tip until a gentle left turn is achieved. A violent left turn should be cured by a little weight on the right tip.

An under elevated glide should be cured by a slight twist of the tail tips.

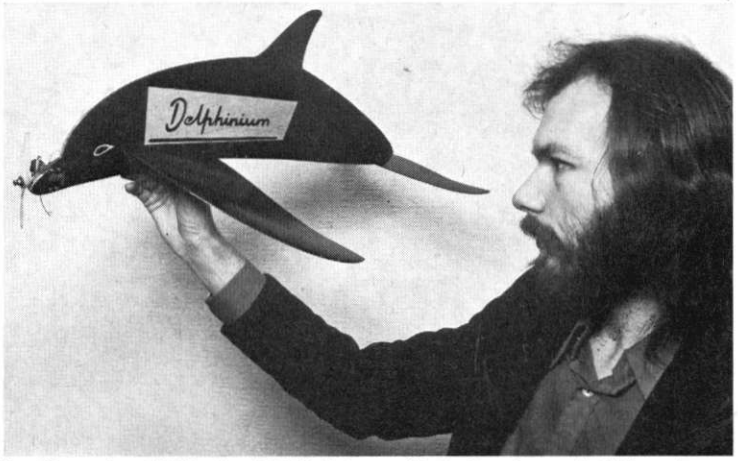
When a gentle left glide has been established, try a low-power flight. A right power turn will almost certainly result. This turn was perfectly safe on the original, but if it gets out of hand try tightening the left-hand glide turn a little before resorting to sidethrust, which I have not found necessary.

In calm conditions, and calm early mornings and evenings are really quite common, you can reduce the power until *Delphinium* maintains height without climbing. This is very pretty, but you must be careful of spectators, who will certainly gather.

No it's nothing 'fishy', just a mini-mammal!

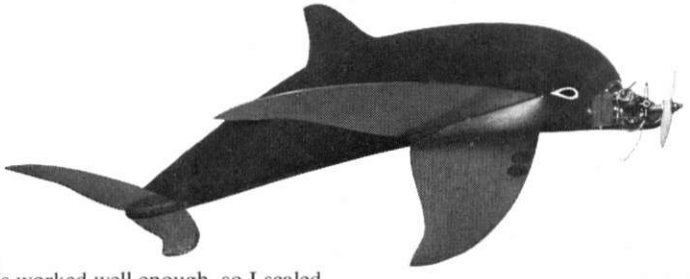
DELPHINIUM

an all-sheet free flight sportster for 0.5cc engines by Robert Dulake



DELPHINIUM is the second model of its type in a series designed for fun, but also to investigate some aspects of stability. Experimenting with paper aeroplanes showed me that dihedral is not necessary provided that (*a*) there is sufficient decalage, and (*b*) the centre of gravity is well forward of, and below, the centre of side area. I also found that if these principles are combined, a considerable amount of anhedral can be tolerated.

The dolphin shape lends itself attractively to these ideas, so I made a small dolphin model from card.



This worked well enough, so I scaled it up to produce *Propelorus Jack*, a model of similar dimensions to *Delphinium* but 'wrong' in detail. It had too little decalege, the CG was too far back, and the centre of side area was too low.

This meant that it was unstable, and would not fly for more than a few seconds before rolling and sideslipping into the ground. A hefty twist to the tail, some noseweight and enlarged dorsal fin put matters right, and thus modified *Propelorus Jack* made many successful flights. I discovered that the layout is sensitive to lateral CG shift, but this is not a problem if the balancing is carefully done. Indeed, it provides a convenient method of directional trimming. A 'sea-gee', as described in the December 1960 *AeroMADeller* would probably be the answer here!

Delphinium incorporates the lessons learned from *Propelorus Jack*, plus a small safety margin. The anhedral is reduced from 3 to 2 inches, and decalege is increased by placing the wing at a large positive angle. This allows the CG to be slightly further forward, and encourages a 'tail-up' attitude in flight, which raises the centre of side area. This all adds up to a docile sports model that looks like a fish, and that's just what you've always wanted to build, isn't it?

HALF FULL SIZE PLANS DRAWN OVERLEAF

Study the plan well. Although construction is straightforward, do not try to rush. A little care will pay dividends. All joints on the original were made with '5-minute' epoxy which is ideal for butt-jointing sheet balsa. To keep your butt-joints true, sandwich them between polythene sheets over a flat surface while they set, using soft bound books as weights.

Wet or dry paper is best for finishing – I use three grades, P180 (coarse), P360 (medium) and P600 (fine) with a rigid block for sheet surfaces and a flexible block from 1mm ply for curves.

Fuselage (body?)

Cut F1 and F2 from medium soft $\frac{1}{4}$in. balsa (note grain) and butt joint – do not cut out the wing slot at this stage. Shape the engine bearers and strengthener F5 from $\frac{1}{4}$in. × $\frac{5}{16}$in. beech. Cut out the rough shapes with a saw and finish to the accurate outline with a sharp knife and P180 wet or dry paper. Remember the horizontal taper on the bearers.

The 20swg aluminium facing plates are to give the engine a firm seating; scuff them and the bearers well before epoxying in place and drilling the engine mounting holes.

F3 and F4 are made from $\frac{1}{8}$in. medium hard balsa, make sure that the grain runs as on the plan. Glue the two together, checking that they

