

## YOUR FREE CHRISTMAS PLAN — FOR R/C

# PUSH MOTH

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FOR anyone who fancies a change from the conventional single channel rudder only model this could be your answer. This pert little pusher looks different and includes an unusual form of escapement linkage but for all that is simple to build. The aileron control makes for a smoother style of flying and, once one has become used to this type of flying, is a pleasant change from rudder. There is no reason why "kick-up" elevator should not be incorporated, providing the torque rod connection is on the bottom of the escapement, although the original was fitted with a sequential type. Remember that if elevators are used they should be in addition to the designed tail plane area.

"Push Moth" resulted from a long considered desire to design a model with a simple and functional aileron control from a standard rubber driven escapement. At the same time I had been sketching some ideas of a small pusher and it was soon obvious that the two thoughts of aircraft and form of control were going to marry together in an easy and efficient manner. The original fuselage had a shorter nose than the present design and, although ample for storing the R/C equipment, the balancing of the model at the correct point was only achieved by adding

plasticine in front of the nose. With the present model, using a 225 Deac pack as far into the nose as possible, a small amount of lead weight was still required to obtain the correct balance point. Possibly this additional weight could be avoided by increasing the sweep back on the wing. I'm sure there's room for experiment in many ways with this form of design. 'P.M.' is no lightweight and tips the scales at just over 15 oz. but try to keep the weight down where possible otherwise flying is going to be a little too fast and furious.

You should find ample room for all modern small radio gear in the deep fuselage and should you prefer it, a small motorised servo could be used for either aileron or rudder control. With the Cox Golden Bee mounted "up back" turning a Keil Kraft three bladed prop in a clockwise direction the power is just about right for normal sports flying. Any glo or diesel engines from 0.5 to 1.0 cc. (or even 1.5 cc. with inefficient silencer!) should cope according to the style of flying required, but any engine which will run in the opposite direction to normal has the advantage of allowing the use of a standard propeller and in this design it is essential to have a 3 blade to reduce the diameter.

### Construction.

Try to organise a building schedule before you start your project and keep to this programme, don't start on all the interesting parts and leave the dull items till last. Cut out *all* your sheet parts before commencing building and build the wings and tailplane first. I'm a keen "spare minute" builder, I know that by finishing in the evening by gluing one wing panel over the plan it will be ready for removing the next morning and, if I've managed to get up those few minutes earlier, glue the opposite wing panel in position before setting off to work. You should find construction straightforward with no particularly difficult parts. Choose the balsa wood carefully for lightness and evenness, especially the fuselage sides.

### Wings.

1. Wings are constructed in two sections and joined together with dihedral braces. After soaping the drawing, pin down a piece of  $\frac{3}{4} \times \frac{3}{32}$  in. trailing edge. Cut  $\frac{1}{8}$  in. square hard lower spars to length and pin in position.

2. Cut wing ribs by the blocking method, afterwards trimming the root ribs slightly due to the narrower spacing of this rib.

3. Glue  $\frac{1}{8}$  and  $\frac{1}{16}$  in. wing ribs in positions shown and check that all are vertical except for the root rib, which should be angled from the root rib template. Glue the top spar in position. Fix the top trailing edge in position and glue the leading edge in position.

4. When dry remove from the plan and sheet in the upper surface of the wing from the rear of the top spar to the leading edge and from root rib to the tip.

5. Add  $\frac{1}{2}$  in. soft balsa tips and sand paper, together with the leading edge, to smooth contour.

6. Construct the second panel in a similar manner.

7. When both panels are set cut slots in the first three ribs to receive the dihedral braces. Check these for accurate fit and then glue into position on one wing panel. When dry add the second wing panel to the projecting dihedral braces, glue thoroughly and pin down, prop up the opposite wing tip to  $2\frac{3}{4}$  in. to obtain the correct dihedral angle. Hold firmly in position until dry, pinning the two root ribs together.

8. Sand and prepare for covering and glue trailing edge stock reinforcement.

9. Cut ailerons from hard  $\frac{1}{16}$  in. quartergrain sheet and sand and prepare for painting. Ailerons should be sewn to the wings after all parts have been covered, doped and fuel proofed.

### Tailplane.

1. Construct the basic frame from  $\frac{1}{8} \times \frac{1}{8}$  in. strips  $\frac{1}{8} \times \frac{1}{2}$  in. T.E. stock as shown on plan remembering to prop up T.E. to allow for symmetrical section.

2. When dry remove from plan and add  $\frac{1}{8}$  in. square to rib position and  $\frac{1}{8}$  in. sheet to centre section on aerofoil section.

### Fin and Rudder.

This is straightforward construction of  $\frac{3}{32}$  in. sheet sanded to slightly tapering T.E. and rounded L.E. A trim tab may be fitted if desired.

### Fuselage.

1. Mark on the handed fuselage sides the positions of formers and strengthening longerons and uprights. Glue the  $\frac{1}{8}$  in. sq. and  $\frac{3}{16}$  in. sq. longerons and uprights and  $\frac{1}{2} \times \frac{1}{8}$  in. top and bottom doublers in position. When the sides are dry glue the formers F.1, 2, 3 and 4 in position ensuring that they are square with the sides.

2. Add the  $\frac{3}{8}$  in. soft balsa sheet to the lower nose area. Glue internally to the battery compartment to the rear of F.1, the  $\frac{1}{8}$  in. bottom sheet and the side framework  $\frac{1}{8}$  in. sheet latex or synthetic rubber sheet to act as shock absorption to the DEAC cells. Note: Plastic foam is not sufficiently resilient for lining purposes but ideal for holding the batteries loosely in position within the battery compartment.

3. Add top  $\frac{3}{8}$  in. nose sheeting and nose block consisting of three layers of  $\frac{3}{8}$  in. sheet.

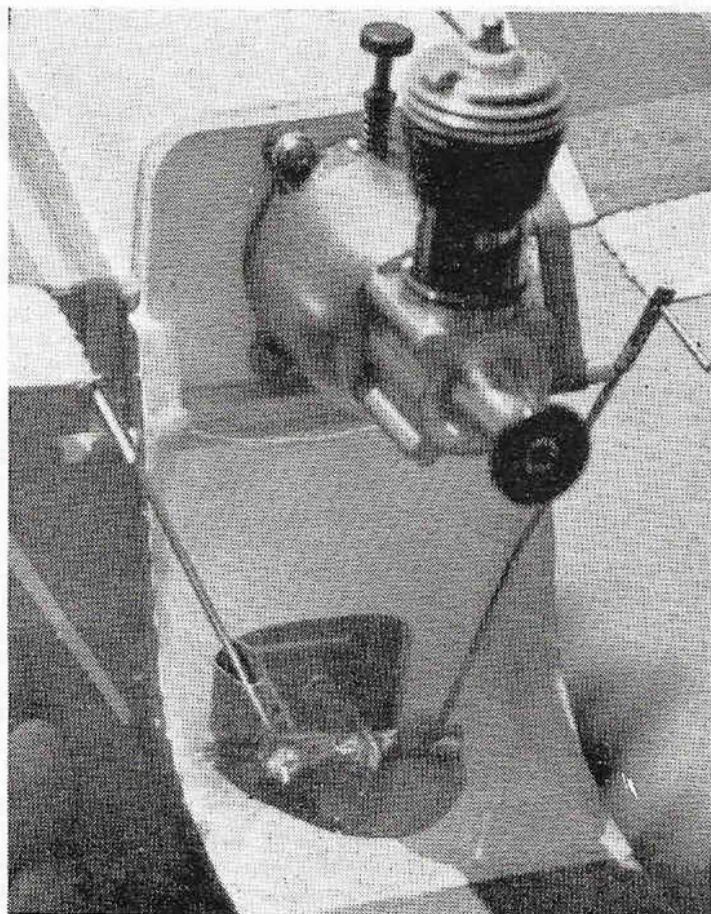
4. Draw in the fuselage ends and glue in position formers F.5, F.6, and the tailblock with  $\frac{1}{16}$  in. ply plate end, and  $\frac{1}{8}$  in. sq. cross members. When all is set top and bottom  $\frac{1}{16}$  in. sheeting can be added, including the  $\frac{1}{16}$  in. ply for the main undercarriage and the 16 gauge piano wire tail skid bound to  $\frac{1}{16}$  in. ply.

5. The escapement rubber winder consists of a plastic nose bush with a slot cut in the rounded end for the winding hook to engage. The nose bush is prevented from rotating by filing a flat onto the side of the nose bush shank conforming with a similar shape hole in the fuselage and plate.

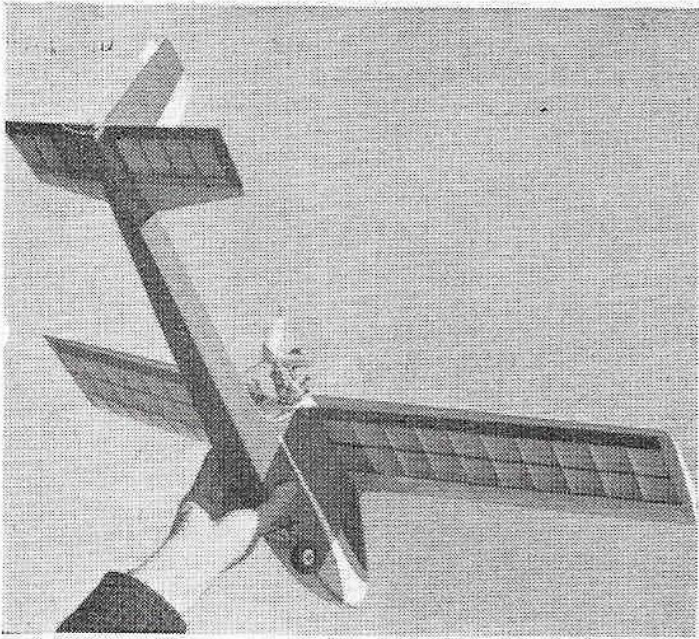
6. Thoroughly sandpaper the fuselage, grain film and sand again.

### Covering and Finish.

The model should be covered in heavyweight tissue. Pin down all flying surfaces when dopping to prevent warps. Colour dope should be kept to minimum as



Heading: the pleasantly refreshing shape of David Boddington's prototype "Push Moth" is bound to capture the interest of single channel R/C sport enthusiasts. Original model uses a Cox .049 Golden Bee motor and carries a MacGregor Minimac Rx to drive an Elmic Conquest escapement. Right: Close-up of the designer's clever method of actuating the strip ailerons from the Elmic Conquest escapement.



this represents wasted weight but the model should be thoroughly fuel proofed to avoid seepage of fuel into the structure, particularly beneath the engine.

#### Escapement Installation.

1. The escapement is mounted on a  $\frac{1}{16}$  in. ply former in the normal way although the former must be glued to the fuselage, there is not room to slide the escapement in and out. Cut a piece of 12 or 14 g. brass tubing  $1\frac{1}{8}$  in. long and flatten the ends in a vice. Drill 2 No. holes each side approximately  $\frac{9}{16}$  in. and  $\frac{1}{16}$  in. from centre to centre. Solder this rocker arm onto the drive hook of the escapement. With the wings in position cut 2 No 18 g. piano wire pushrods to length, bend one end at  $90^\circ$  and soldering to the rocker arm with cup washers. Cut small lengths of 16 g. tubing, flatten the ends and drill to receive 18 g. aileron horns, and solder them to the pushrod arms so that the ailerons are level.

2. Test linkage for freedom of movement. The amount of "throw" will depend on which hole on the rocker arm is used.

3. When satisfied with the action cover the area below the engine, following the fuselage curve to the horizontal top of the rear fuselage with the heavy gauge celluloid. Two small holes must be cut in the celluloid for the pushrods to project through, and the rear of it must be well fuel proofed before fixing in position, and externally after fixing. An impact adhesive is the best for fixing this screen in position, the purpose of the screen being to protect the escapement area from the excess fuel from the engine.

#### Radio Installation.

Due to the variety of radio control equipment presently available, no specific instructions are given for installation, but the use of DEACs is strongly recommended for the reasons of nose weight and reliability.

#### Test Flying.

Check the functioning of the radio gear and check again, now wait for the right weather conditions. If you are sure there are *no* warps and that the C. of G. is correctly located then test glide in the most suitable area you can find, the launch should be fast and straight. Correct any turn with opposite rudder and dive or climb by adjusting tailplane incidences  $1/64$  in. at a time. When the glide appears O.K. test with engine running and radio *on*, have the engine running at near full power and get somebody to launch for you. If power stalling occurs adjust with downthrust on the engine, i.e. washers between engine *top* bolts and bulkhead, note turn under power and if this is the same on the glide adjust with rudder, if under power only adjust with opposite side thrust.

Remember ailerons can take a little longer to become effective than rudder so try to anticipate signals and stop transmitting in good time too. The proportions of this aeroplane would, I feel sure, make it easily adaptable to a flying boat so why not splay out the lower half of the fuselage with a step underneath, add wing or tail tip floats and get waterborne. Let's have a bit of variety in single channel models.

