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AERO MODELLER

SHORT POBJOY SCION

1 in. to the foot

FLYING SCALE MODEL

incorporating the "MOORE DRIVE" Patent No. 514974

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Span 42 in. Length 32 in.
Wing area 255 sq. in. Weight 12 oz.
Wing loading 6¾ oz. per sq. ft.

IN order to conserve space I must cut the description of the structure to a minimum and I ask you to study the drawing on the centre pages.

The structure is fairly orthodox, the fuselage sides, wing panels, tail plane and centre-section spar, together with nacelles, are built on flat building boards.

The order of building is as follows :—

(1) Two separate halves of the centre-section main spar and top portion of nacelles, ready for drive.
(2) Shafts D.1, D.2, D.3 and propeller shafts are made and fixed and top of unit completed.
(3) Remove centre-section spars from board and join.
(4) Fuselage assembled without decking.
(5) Main spar and nacelles fixed to fuselage.
(6) Gearbox and driving shafts made and fixed.
(7) Fuselage nose and nacelle noses are cut off.

At this stage the order of building is optional.

The wheels and nose are made of papier mâché. Plasticine is modelled on the actual nose, removed carefully and a mould of Dentac plaster of paris (chemists keep it) is made. Eight layers of newspaper are pressed in, after greasing the mould, the first soaked in water and the other seven in paste. Allow to dry naturally. For further details see Jackdaw II.

The tail and rudder outlines are 1/16 in. birch and are steam bent round cardboard templates. The rubber is integral with the fuselage.

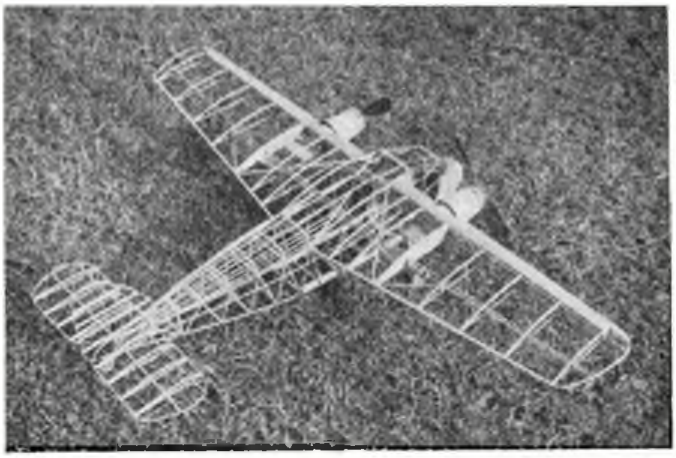
Except for the tail and rudder everything is covered with medium tissue and they are covered with lightweight. Thin cellophane is used for the windows, except the windscrew, where celluloid is used. The cellophane should be put on damp and stuck with Seccotine or Croid. The whole should be given two coats of banana oil (including the cellophane), and two *thin* coats of aluminium dope.

The Moore Drive.

Each joint of the drive is composed of two units, the "fork" and the "stirrup," and relies on the sliding of the "stirrup bar" between the parallel "fork" prongs for its angular motion. The friction is less than two gears for the whole train. When disengaged from the gearbox the whole drive freewheels by air pressure. Two types of "forks" are used, those with the prongs joined and those without the joining piece; closed and open "forks" respectively. Open "forks" are used where disengagement is required. Before making the drive burnish all wire and brass sheet with sandpaper to make sure of good soldering.

Portions D.1, D.2, and D.3 are the first to be made, by bending the wire to shape on the plan. Small round and pointed nosed pliers are essential. The bearing plates are next cut from 22 s.w.g. brass strip and drilled in the centre, two plates to each shaft. Thin 1/64 in. hardwood (spills) is cemented to the back of the brass bearing plates, cut to the same size and drilled. Thin silk is bound tightly round them thus making it possible to cement the brass to the balsa structure. Cement bearings to 1/8 in. by 1/16 in. by 2 in. bearing spars and drill for the shaft. Slide these complete bearings round the stirrups and forks on to the shafts with the brass outwards. Link forks and stirrups together and bind the short end of forks and stirrups to the shafts with copper fuse wire and solder. Make the two plates for each open "fork" together by folding brass strip, drilling and cutting to length. Cut the propeller shaft 1 in. too long, tin one end and push on these plates. Bind between them with fuse wire and 1/16 in. up the shaft to form a collar. Tin the 18 s.w.g. prongs at one end and push in position. Solder thoroughly and shake off surplus solder while hot. Make bearings as before but stick one to the "radiator" instead of bearing spar. The section of drive through the wing is now complete.

Build the centre-section spar in two halves flat on a board, then, again on a board, erect the spar, L—E, engine bearers, front of cowling and formers C.2 and C.3. The bottom segments of the latter are cut off in line with the board. *B.2 and B.3 are not cemented in place.* The shaft D.2 with closed "stirrups" is first to be fixed. Cement the bottom edges of the two bearings and stick to top *edges* of B.2 and B.3. Cement two vertical battens on either side of the shaft at the back and allow to set. Cement B.2 and B.3 in place and while unstuck cut and wedge fairly tightly, distance pieces which are parallel to the shaft. These distance pieces force the bearing plates apart and thus prevent end slap. The rear bearing of the propeller shaft is mounted and battened to the edge of its bearing spar, but in this case the spar is very wide in order that the *propeller shaft is parallel to the building board.* Put shaft in place and pin bearing temporarily. Engage stirrup of D.3 with open fork on propeller shaft. Cut bearing spar at opposite and lower end until it fits at 45 degrees to L.E. and engine bearer. Hold stirrup in open fork with a spring clip in a horizontal position, and line up the opposite stirrup with the closed fork. The bearing spar at the front will be higher than both L.E. and bearing spar. Cut 1/16 in. sheet to fit between this space, cement on



edge and batten. Pin these bearings in place, remove the spring clip and test by turning. *When the "forks" and "stirrups" are aligned, their shafts, if produced, would intersect on a point in the centre of the stirrup bar in every position.* I might add that considerable inaccuracy in line up does not seem to have the result one might expect, but don't do it on purpose! Pack or cut until satisfied, then cement and fix distance pieces. All top riblets are cemented in place and the two halves removed from the board. Stand half units on the spar with nacelles vertical, bring ends together and cement. Add L.E. between units and allow to set. Turn over on its back and align and fit the two shafts D.1, which go below the L.E. Except for the lower central portion, cover L.E. of spar with 1/32 in. sheet, top and bottom. Banana oil both sides and cement while wet.

The gearbox.

The gearbox is orthodox in construction. The balsa bulkhead is reinforced with two kite-shaped pieces of 1/16 in. ply (celluloid or even tin) and a similar shaped piece of 1/8 in. sheet balsa. These are drilled to take six screwed bushes. One of these bushes is long to support the winding spindle. Owing to the small radius the four hooks are made from 18 s.w.g. and bound and soldered to the 1/16 in. shafts. The shafts are fixed in place with a few turns of fuse wire and solder. The winding square is a screwed bush soldered along its whole internal length to the shaft and then filed to a parallel square. Make from 22 s.w.g. brass a box to fit this (a loose fit), bind along its whole length with fuse wire, plug with balsa and solder solid and then lay it aside. A suitable clock key can be used. Before soldering fill gear teeth with dope and fit paper washers on shafts to stop solder from sticking. The bearing spar is drilled to fit shafts and threaded on and the two bearing plates after, but don't stick them together till aligned. The open forks are now made and fixed.

The distance horizontally between the two top gears must be the same as the centres of the stirrup bars at the first joint. Turn these stirrups horizontally, mark the centres of their bars, measure between, turn them over, measure again, and take the average.

The shafts are slid up the fuselage and the whole unit held by pins and clips until aligned. Pack where necessary and cement.

Complete the whole of the fuselage and then cut off nose at former A and nacelles between C.2 and C.3. Celluloid was used only for windscreen, cellophane being used for other windows. This was damped and stuck with Croid or Seccotine. Structure is completed, covered and doped with two coats banana oil. Banana oil cellophane as well. Two thin coats of aluminium, vermilion lettering, and black lining, completes the decoration.

The free wheels are fitted last. These are automatic and consist of double L-shaped pawls in tin hinge plates which are soldered to the airscrew bushes and pinned into the bosses. At the end of each shaft is a brass leg. A square is filed on the shaft and an undersized hole is drilled in the brass and the square is forced into the hole. Bind with fuse wire and solder. One point—make the pawls a very loose fit in the hinge plates.

The starter.

The starter is a wood disc fixed to a brass tube spindle by a tin plate which is bound with fuse wire to make a collar and soldered. In the front end is a wood plug into which is fixed a tin swivel. Attached to this swivel is a 6 in. loop of string. At the opposite end and inside is soldered the brass square. Two holes are drilled in the disc, the diameter of the heads of two round-headed screws. These screws form a clutch for the "starter bar," which is a piece of wood 10 in. by 1 in. by 1/4 in. with a 3/8 in. hole bored in centre to fit over swivel.

Motors.

Four motors of 48 in. long of five strands 3/16 in. by 1/30 in. rubber (or equivalent) are made, given 120 turns, doubled and allowed to twist into ropes. When done they should be 1 in. too short. This gives four ten-strand roped motors. Half inch of 1/4 in. tape motor ends are made and *stitched very firmly*. Make sure all gears, joints and shafts are oiled, take off nose and insert motor in nose. Make only one "tail shackle" of soft wire and hook all motors on to it and fix motors in place. Hang model with string from the marked C.G. and put wings on. Lengthen or shorten wire "tail shackle" until model balances with decking level. Remove motors and make 18 s.w.g. piano wire "tail shackles" (four) the length indicated. Assemble model and cover open panel under the fuselage.

Rigging.

Check tail setting by the plan and try a glide; it should be good and flat. The balsa box packed with loose 1/32 in. sheet like a pack of cards gives delicate adjustment necessary for such a small tail. Make sure the glide is right.

Please don't try power flights until proficient with the starter. Practice this art on the ground. Push the spindle of the starter into the nose, thread the string loop through the hole in the "starter bar" and push screws through the disc. Wind "starter bar" as an ordinary airscrew. When wound, thread *left wrist through the string loop* and grasp the disc. With the right

The completed model is a faithful replica of one of the machines employed by Plymouth Airport airlines, as will be seen from the accompanying photographs. The uncovered photo on the opposite page is of the first of the models and differs in certain details

hand remove the "starter bar." Hold the model with the right hand near the C.G. as usual for launching. Slowly relax the grasp on the disc and allow the power to engage gently. *Leave go of the disc altogether.* The revolving disc is pulled from the nose by throwing the left arm forward when the string loop on the wrist pulls it out. Don't try to get her away too quickly at first.

Always make sure that the open fork prongs are on opposite sides of stirrup bars before launching.

Adjustment.

Left hand airscrews were used, but right hand can be, but remember adjustments will be reversed. Torque though slight, tended to turn the model to starboard. This was cured by 1/16 in. packing on the outside of the starboard nacelle. Upthrust in one and downthrust in the other can be used or a mixture of both. Rather than use downthrust, temporarily weight the nose and add neg. incidence to tail and move motors by lengthening "tail shackles" when you get home.

This is the second Scion, the first was entirely hardwoods and had a wing loading of 13 oz. per sq. ft.! In spite of this she did 25 secs. If you cannot get balsa sheet, build wings and ribs as Jackdaw II. Double number of riblets and double cover the centre-section spar with heavy tissue. Make engine "radiators" of papier mâché (four layers) and use balsa for tail.

(SEE ALSO CENTRE PAGES FOR CUT-AWAY DRAWING)