DE HAVILLAND DHC-6 TWIN OTTER

By ROY SCOTT and BILL NORTHROP . . . A slightly different R/C scale construction article, as explained in the text. Here is twin engine sound and performance without the hazards of single engine emergencies.

A construction project of this magnitude is not aimed at the "but the spars are an inch too long" kit assembler. However, a genuine MODEL BUILDER model builder will find it to be quite basic . . . the wood bill may be a little high.

We think the best way to convince you of the Otter's recommendations is to go through its flight instructions first. It should make a believer of you. Incidentally, remember that the original model was built to fly as close to scale speed as possible. It was powered by O.S. Max 30 engines, and was not intended to be a "bi-motor bomb." Don't put larger than "sporty-forty" engines in it.

Incidentally, the following flight instructions and building suggestions are based on information from Roy Scott, who designed and built the prototype model.

1. Run in both motors *before* installation in the model. A sick or badly tuned engine can only lead to trouble.

2. When both engines are happy, through a full range of speed, they're ready to go!

3. Tune each motor for maximum power. If they don't synchronize at full power, do *not* tune down the faster revving motor, as the power loss could be critical (remember, this is in reference to .30 cu. in. engines). Instead, trim the rudder in the direction of the faster engine.

4. When motors are running at optimum power, hold the models nose-high for at least 20 seconds. If either engine slows down, it's too lean. Open the needle until the engine will hold power while pointed up.

5. As two motors cause much more vibration than one, check servos for good operation with both engines going *full bore*. The best check is to suspend the model in the air using two helpers to hold the wings by rubber bands.

6. If one engine starts to go sick during takeoff, abort and start over. *Don't try to take off with one motor acting up.*

7. On takeoff, don't yank the Otter from the ground . . . a nice gentle climb is called for. Although it is not too responsive on controls, easy stick movement is best. It likes coordinated rudder and ailerons for nice, smooth turns. It will maintain altitude on 1/4 throttle (with some flaps) and has no tendency to drop a wing. On the first flights, stall it high in the air in order to get a feel for proper flare-out. On landing, remember that the Otter is a real "floater", so it's easy to overshoot.

8. On first flights, don't use more than 30 degrees of flap. If the model flies straight and level without flaps and with neutral trim, you'll find that the more flap is added the more down trim is needed to keep the model from climbing steeply. Full flaps and full throttle is not a good idea! Flaps slow the model down and motors speed it up . . . the net result can be a very steep climb.

9. In order to fly it safely, you should practice single-engine flight with the Otter. It performs well on one engine, but don't try it close to the ground until you're familiar with the model's behavior . . . low altitude doesn't give you much room to correct for a bad turn and still make it to the runway. The Twin Otter will maintain altitude and turn either way on one motor, but 1/2 throttle on the single engine is better than full bore. Trim the model with rudder and ailerons *against* the running motor. If in doubt, cut the throttle and land as if dead-stick, and if worried about stalling, don't use flaps. The prototype has had *no* tendency to spin with *one* motor full-out and full flaps, but don't try this until you are certain that you know your ship. Should you begin to spin, *immediately* put the flaps up, cut the throttle, and treat the Otter like any other model you have spun. But remember . . . in a badly trimmed twin, flaps can cause a spin on one motor. To be safe, experiment, but start nice and high!

10. Remember, the whole point of this project is scale-like flight. The Twin Otter flies beautifully and slowly on low throttle . . . so don't fly full bore all the time! Just think . . . you can sit back and watch your own model while it flies itself . . . When properly trimmed, the Otter will fly hands off. Just don't sit there, fat and happy, and let it fly out of sight. There are no points allowed for that!

Now, if you're hot to trot, let's get into the construction. It's not very difficult to build the Otter . . . the problem is staying out of jail while raising the money for the balsawood required!

It should be noted before starting construction, that certain minor modifications have been made between the full size aircraft and the model, which simplify construction. This would only

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matter if the builder intends to use the Otter in AMA (Museum) Scale. Reference is made to the additional counterbalancing of the movable tail surfaces, relocated wing struts, and a few other minor changes. The museum scale builder is on his own in these areas. We feel the majority of modelers are more interested in the sight and sound of a scale twin at 50 feet than the microscopic details of a seldom flown static scale model at 50 millimeters.

Begin fuselage construction by cutting out parts and contact cementing the 1/32 ply doublers to the 3/16 sheet sides. Add the 1/4 square spruce locating strips. Assemble the sides with bulkheads 3 through 10, watching alignment at this critical stage. Install the 1/8 ply nose gear mount, bulkhead 2, and the 1/2 inch sheet nose sides. Now bulkhead 1, and then all the cabin area blocks.

Next, install the main landing gear plywood plate, the anti-crush strips at the bottom of bulkhead 7, and then the top sheets and upper rear block. Water-soak 1/2 inch sheet balsa for the bottom of fuselage and then clamp in place with rubber bands and tape, using white glue for adhesive. If a joint must be used, should you not be able to obtain 5-foot wood stock, we'd suggest *two* joints at bulkheads where there are less bending forces involved, such as 4, 8, or 9.

Using a razor plane, shape the upper fuselage in accordance with the cross-sections shown, and bevel the lower sides and bottom in preparation for application of the 1/2 inch sheet lower side pieces. Before gluing the latter in place, install the nose and main gears, and epoxy the 1/2 inch squares of hardwood under the landing gear plate.

Finally, soak and bend the lower 1/2 inch side plates in place, add the front and bottom nose blocks, and install the 1/4 inch hard balsa wing saddles. Shape and sand for final finish.

Build up fin, without sheeting, install a, b, and rib 7 in fuselage, and then slide fin into position. Run elevator pushrod through fin, staying to left of fin leading edge and then sheet *right* side of fin only. Build up stabilizer and elevator, sheet, and sand for final finish. Go back to fin and cut out area for stabilizer. Slide elevator through opening, hold it in proper location while sliding stab into place. Hinge elevator to stab and connect pushrod linkage to elevator control horn. Now finish fin sheeting on left side, and add fairing blocks. Build and install rudder.

The wing is standard rib and multi-spar construction, with 3/32 sheeting overall. It is best built on a hinged board with 2¼ inches dihedral in each panel at the tip rib. Most important of all is the built-in washout. You'll have an unstable aircraft without it! Position the 3/8 square jig strips as shown so that washout will exist, and be equal, in both panels. Install 3/32 webbing between upper and lower rear spars for additional rigidity. Remember, this wing carries two engines, a completely movable trailing edge, and has a high (9½ to 1) aspect ratio to boot!

Plans show the original fiberglass engine cowlings. We have also added suggested construction for those who wish to build them up from balsa sheet and blocks, and plywood. Another detail shows the outer flap/aileron section as developed by Dave Allen, of Ontario, Canada, in building his version from the originals of these plans. Incidentally, he also chose to revise the tail surface hinge lines and the wing strut locations. Since we didn't have *accurate* dimensions on these items, we felt it best not to show them on the plans.

Want to make us feel bad? Write and tell us about building and flying *your* Twin Otter . . . we'll never get to it! ●

Twin Otter model built from these plans by Dave Allen, Ontario Canada, and shown at the 1974 Toledo Trade Show. Long, skinny wing is evident in this photo, also wing fences, which are not on the Golden West aircraft seen at Orange County.

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