No torque troubles with this Canadian twin-rotor egg beater

LAURIE ELLIS'S

CONTRA-GYRO

"CONTRA-GYRO" is the result of curiosity rather than design research! Having built a couple of normal autogiros, Laurie Ellis was prompted to see what would happen using contra-rotating blades, for it had been noticed that with the normal autogiro one could experience difficulties with certain trim conditions. It was thought that, with one rotor cancelling the torque of the other, it should be possible to trim for left or right turn, or to have straight ahead flight—also the fuselage should not counter-rotate on descent.

The model resulting has come well up to expectations, for one can fly it in calm conditions from an area smaller than a football pitch, and it answers trim in a docile manner with no apparent vices.

This model is not recommended for beginners. All components employ ordinary construction, but accuracy must be assured for the rotor shaft and hub. The whole secret of successful autogiro flying rests on the correct angles of rotor shaft and blades.

Rotorhub Assembly.—Hubs are shown full size, and the specified 14 s.w.g. wire should be adhered to. Cut tinplate discs to size and drill to accommodate copper or brass tube bearings. Tin the surface of tubes where they will contact the discs; surfaces of the discs; and the root end of the rotor arms. Jig the hub assembly by using a piece of board about 8 in. square, drilling a $\frac{1}{4}$ in. deep hole to accommodate the bearing.

Mark out position of the rotor arms and insert hub in jig, making sure it is vertical. Slide on one disc and locate rotor arms in their proper location, holding in place with pins. (*Note.*—Dihedral angles, etc., are bent into the arms AFTER the hub is assembled.) Firmly solder the arms in position, using plenty of solder to ensure firm holding. Now slide other disc in position and sweat into place.

The second hub is made in similar manner, with blade connectors pointing in the same direction, bearing in mind that, when mounted on the shaft it will be inverted to allow opposite rotation. Once the hubs are completed bend in 3 degrees dihedral in the lower hub arms, and 4 degrees in the upper. Bend the blade connectors to give minus 5 degrees angle of attack.

Fuselage is a straightforward box construction, but it is important that Former 2, which has the rotor shaft sewn to it, is set so that the backward slope of 5 degrees is incorporated. Engine bearers must be positioned to accommodate motor employed.

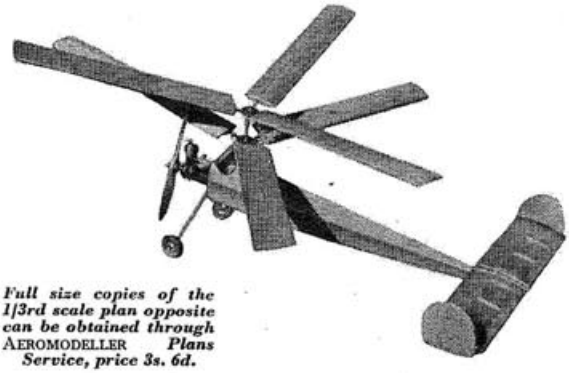
Tail and fins are of normal construction, as are the **Rotor Blades.** Note that the blades are completed before the hub attachments are cemented in place. The simple method of attachment allows the blades to be simply dismantled for repair or transportation, the rubber bands holding the blades firmly by passing from the hook under the arm and back to the hook. The rotor shaft should be rubbed with graphite to ensure smooth operation, and the retention of hubs on the shaft can be by means of a soldered washer, or the shaft threaded to take a small nut, thus making for ease of transport.

The engine is mounted with 5 degrees downthrust and 3 degrees right sidethrust.

Trimming and Flying.—Test glide by holding the model at arm's length overhead, walk into the wind to get the blades spinning, and then—with the nose level—release the model with no forward thrust. If the C/G is where shown on plan, the model should slowly descend in a slightly nose-down attitude.

Carry out initial power flights over long grass for safety, with engine running at half speed for about 15 seconds. Walk into wind until the blades are spinning rapidly, holding the nose pointing upwards at about 30 degrees. When blades are spinning fast, stop forward movement, lower nose to level attitude and release the model. If model stalls, pack up leading edge of tail by $\frac{1}{8}$ in., or if model dives place similar packing under trailing edge. Compensate any tendency to slide to the side with rudder trim tabs.

"Contra-gyro" is very robust and can take a lot of punishment, and will give hours of fun. It is by no means a contest flyer, but is ideal for sport flying and will give hours of fun. Vertical rate of descent is very slow, so look out for thermals, for this model can take advantage of such lift as well as any winged machine.



Full size copies of the 1/3rd scale plan opposite can be obtained through AEROMODELLER *Plans Service, price 3s. 6d.*