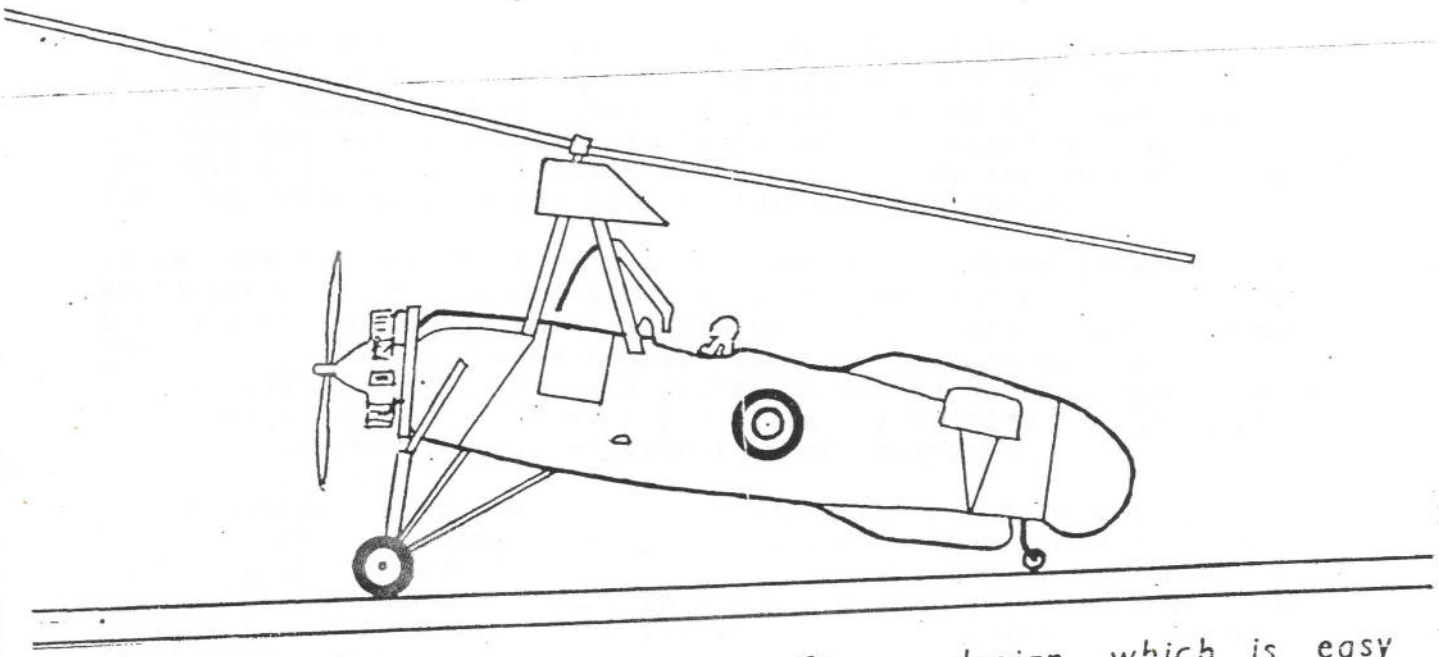
AVRO ROTA



A practical model of the famous Cierva design which is easy to fly and duplicates the full size aircraft in its ability to fly very slowly and operate from confined spaces

Specification :-	Full size	Model
Rotor dia	37 ft	53 in
Length	19 ft 8 in	39 in
Weight	1220 lbs	8 — 9 lbs
Engine	140 hp 7 cyl Radial	·60 2 stk / ·60 — ·90 4 stk
Radio	—	4 Channel

Designed & Manufactured by

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07-44

INTRODUCTION

Thank you for choosing the ROTA, you are obviously a modeller looking for something different, you won't be disappointed. We are sure you will enjoy building and flying the model, if so please tell others, if not please tell us.

The AVRO ROTA

The C.30 was the most successful and prolific of all the CIERVA designs. Built under licence in the U.K. by AVRO for the R.A.F. and named 'ROTA'. It was used for a wide variety of duties, but its main use was as a controllable target for radar calibration. The ROTA was the only aircraft which was able to remain stationary for long periods while the boffins twiddled the knobs.

It is hard to imagine in this modern world of turbine powered helicopters of every shape and size that there was a time when the Autogyro was the only practical and reliable rotary winged aircraft. The modern helicopter owes a great deal to the work of Juan de la Cierva (1895 - 1936), the data collected during his experiments with early autogyros was invaluable and certainly speeded the development of the helicopter into a reliable form of transport.

The enthusiasm of the men who designed, built and flew autogyros in their heyday is obvious from their writings. They had visions of huge autogyro transports flying between city centres, the autogyro was to replace the motor car, people would commute to work in their private one man autogyros. A fighter was even mooted, not as daft as it sounds perhaps, the autogyro can perform manoeuvres which would have made it a difficult target to hit.

It was not to be, the helicopter grew up and the autogyro was pushed almost to the point of extinction, which is a pity because the autogyro could even today fill a gap between relatively cheap fixed wing aircraft and the horrendously expensive helicopter and would be quite capable of performing some of the duties of both types of aircraft. Using modern lightweight materials and more efficient engines the autogyro could be a useful and versatile flying machine. Who knows the autogyro may yet make a comeback, after all who thought a few years ago that we would again see airships over London.

Construction

The first step is to establish the position of F.1 to suit your engine, measure the distance between the prop driver and the back of the engine mount and mark the position of F.1 on the plan.

Join the $\frac{1}{8}$"fuselage sides and when set place the sides on the plan and mark the position of all formers, also the pylon struts and the $\frac{1}{2}$" x $\frac{1}{4}$" balsa lower bearing support. Glue the two $\frac{1}{8}$" ply pieces to F.3 to suit your servos and drill to take servo mounting screws. Glue $\frac{1}{4}$sq. balsa to inside of fuselage sides between F.2 and F.4 and when set cut away for the struts.

Fix formers F.1, 2, 3 and 4 in position ensuring they are 'square', allow to dry. Add other side and when set join the fuselage sides at the tail and add the tail block. Fix all other formers in place, also the $\frac{1}{8}$" ply U/C plate. Glue the triangular reinforcements to rear of F.1 and U/C plate, also the $\frac{1}{2}$" block to front of F.1.

but without any play, take your time with this as a tight or sloppy swashplate will adversely affect the performance of your model.

Rotor Head

Bolt the hub to the teeterplate (NOTE: the holes in the hub are not the same size, the hub should be fitted so that the steel pin is parallel to the long axis of the teeter plate), also bolt reinforcement strips to underside of plate.

Screw ball joints to flybar ring and assemble flybar as shown, not forgetting the locknuts. The flybar must rotate freely and have a small amount of endfloat. Assemble the paddles as shown and sand to aerofoil section (note position of hole). Screw on the paddles holding flybar in a vice and ensure the paddles are equidistant from the ring.

Glue plywood reinforcing strips to both sides of rotor blade at the root approx. 5 mm back from the leading edge. Place the steel blade holders on the underside of the blade with 30 mm projecting, now mark the bolt holes and mark the position of the rear edge. Drill two 3 mm holes in the blade for the bolts and two 2 mm holes for the S/T screws in position shown (see drawing).

Important, the underside of the blade holder and the top of the teeter plate should be scored with coarse sandpaper, this helps prevent the blade moving relative to the plate but will still swing back if necessary, avoiding damage to the blades. Note the 4 mm bolts should be tight.

Engine

Using a suitable former (a milk bottle is about right) make the crankcase from 1/64th ply, hold in place with rubber bands or tape until set. Make the cone and glue to the crankcase. Mark the centre of each cylinder on crankcase, and drill small holes for pushrods also drill holes to rear of crankcase for inlet manifolds. Wrap wire round each cylinder to simulate fins and fix with cyano. Glue cylinders in position and add cylinder heads, rocker covers and pushrods (16 SWG wire). Drill holes in heads for inlet and exhaust manifolds. The manifolds can now be bent and fitted, cut the plastic tube into 2" lengths, immerse in boiling water and while holding bent dip in cold water. Make a hole about $\frac{1}{2}$" from the end of collector ring (use a drill between fingers) and using cyano fix to first exhaust pipe drill and glue to next cylinder and so on. The engine is fixed to F.1 using the aluminium brackets, adjust the length of these to suit your installation. A coat of matt black paint will produce a convincing radial engine.

Radio Installation

The throttle and rudder servos are screwed to the $\frac{3}{8}$" x $\frac{1}{2}$" servo bearers and make up the rudder pushrod from $\frac{3}{8}$" sq. balsa and threaded rods, the throttle linkage from nylon tube and 18 SWG piano wire. The 'aileron' and 'elevator' servos are fitted to F3 as shown, one facing forwards and one aft.

The RX and Nicad are fitted in a suitable foam packing between the two pairs of servos. Mount the switch in cockpit floor, the aerial should not go to the top of fin as there is a danger of it becoming

entangled with the rotor, rather along the fuselage side under the tailplane, any excess allowed to trail.

Final Assembly Setting Up

Fit the pulley to the shaft (be sure the grubscrews locate in the hole through shaft) and fit the assembly in the model not forgetting the short brass sleeve between pulley and bottom bearing. Now fit the long brass sleeve, swashplate and swashplate driver, ensuring no endfloat in shaft, tighten the screw in the driver, note the driver is in line with the hole through top of shaft.

Fit the rotor head using the steel pin (note the two rubber dampers). The 4mm bolt should be very tight (use Loctite). Connect the two links between swashplate and flybar ring (equal length), also connect the swashplate to servos and adjust to get swashplate square at neutral. The swashplate replaces aileron and elevator controls and tilts right for right 'aileron' and tilts forward for down "elevator". Swashplate travel should be approx. 10 mm total measured at the ball joints.

The pitch is set as follows:- fix the gauge to the underside of the blade at the tip with a small rubber band (thin end to leading edge) and sight along the blade. The underside of the gauge and the flybar should be parallel. Screw in the self tapping screws to adjust the pitch (tightening the screws will reduce the pitch angle). The coning angle is set as follows:- stretch a thread between the blade tips, it should pass approximately 30 mm above the hub, adjust as necessary. Also ensure static tracking is correct by measuring the height of each blade above the fin. Bend the blade holders as necessary. The C G is not critical, approximately ½" to 1½" forward of the shaft, suspend the model by the flybar and the shaft should lean slightly forward.

The blades and paddles should be treated with a coat of varnish or cover with Fablon and when dry balance the rotor head as follows:- ensure that the blades are in line and square to the flybar, disconnect all linkages to the swashplate so that the whole swashplate can revolve freely. Now stand the model on its nose so that the shaft is horizontal, add tape, Fablon etc. to blade and/or paddle so that the rotor will remain stationary in any position. The balance can be checked by spinning the rotor fast by hand, the model should not rock and the top of the shaft should run true.

Flying

Make certain that the radio and engine are 100%, hold the model vertical with the engine running, also it is important for an autogyro to have a quick and reliable throttle response.

Fix the wire fork at the take off point, wind the cord onto the pulley passing it through the guide, a light rubber band hooked over a rotor blade will keep everything tidy. With the engine running place the model with the fork hooked over the tailplane. Now have an assistant spin up the rotor with a firm steady pull on the cord, the engine should be opened up to full throttle during the spin up. The model should accelerate rapidly once the cord has released and a little back pressure on the stick will have it off the ground in about 40 ft., less in windy weather. The climb out angle is dependant on the power available but should be kept fairly shallow until speed has increased. Once airbourne the Rota can be flown very much like

a fixed wing model but it needs co-ordinated use of cyclic pitch ('aileron') and rudder.

The Rota can fly very slowly, the technique is to raise the nose and control the height with the throttle, controlling the attitude with cyclic pitch ('elevator'). Autogyros cannot stall but you can reach a point where the nose is very high, the throttle wide open and the model is slowly sinking, you've overdone it! The solution is to force the nose down slightly and allow the airspeed to increase and then climb away. Landing is very simple, you can wheel it on at normal speed but for very short landings, approach slowly as above controlling the sink rate with throttle, it is quite normal to end up with full power just before landing. As soon as the tailwheel touches chop the power.

There are three methods of spinning up the rotor prior to take off.

1. By pulling the cord against the restraining fork as described above, use this in light or no wind conditions.

2. By hand, in a good breeze spin the rotor as fast as possible by hand, with sufficient wind the rotor will accelerate, if not use a different method.

3. The third method is to stand on the cord and allow the engine to spin up the rotor. With this method it has been found best to have the throttle fully open during the spin up but as soon as the model releases throttle back to a fast walking speed to allow the rotor time to accelerate, after about 40 ft. open the throttle and take off, use this method in light winds.

Remember that whatever method is used, what is needed is rotor speed not airspeed. Allow the model time for the rotor to accelerate.

A Few Tips

1. Avoid very high airspeeds; if you want to come down, close the throttle. Screaming full throttle dives are not recommended!

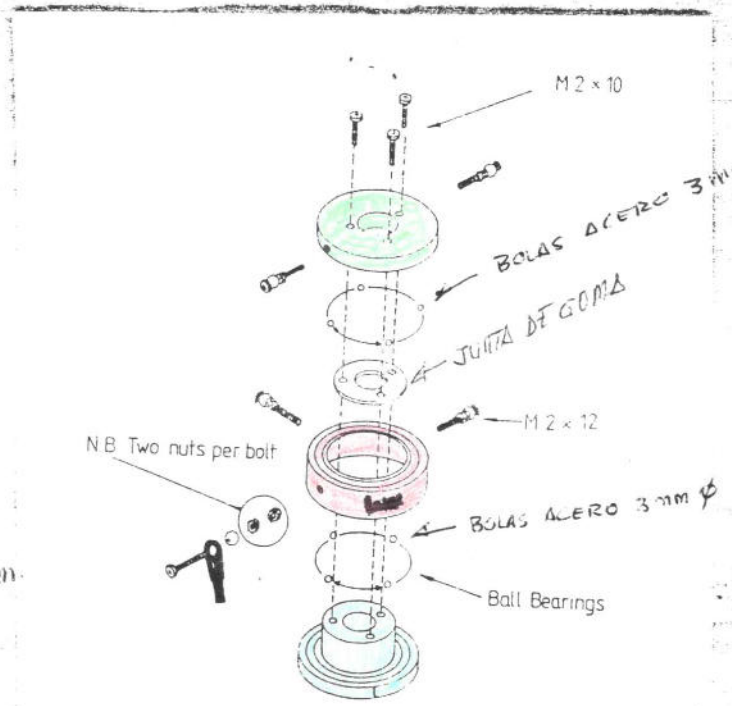
2. Use the rudder and swashplate together, the rudder is very effective and co-ordinated turns look much more tidy, at very low airspeeds the use of rudder is essential.

3. In windy conditions take off slightly to the left of the wind i.e. with the wind at about one o'clock.

4. After landing in windy conditions turn the model immediately slightly to the left. To stop the rotor either turn the model downwind or lift the tail to present the top of the disc to the wind.

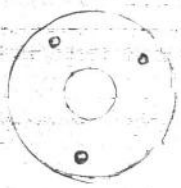
5. In windy conditions, when having a cup of tea and a chat, tie the rotor down or point the model downwind or your ROTA may go flying without you.

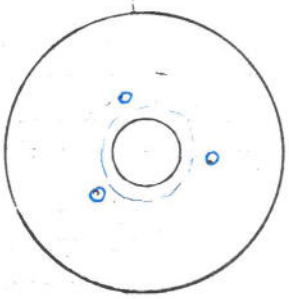
6. Don't leave the fork on the field.

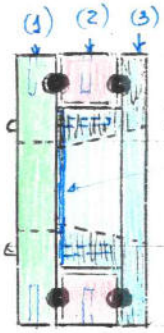


Swasplate assembly

JUNTA GOMA 1 mm







ARANDELA GOMA
(MEDIDAS EN MM)

ESCALA 1/1