

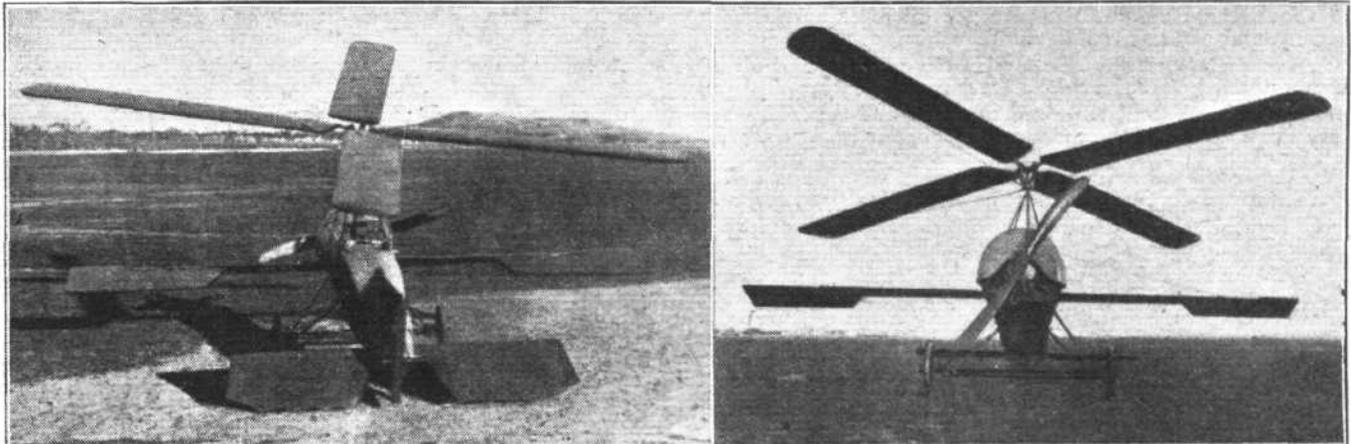
# MORE ABOUT LA CIERVA "AUTOGIRO"

In our issue for May 24 last we illustrated and made brief reference to an interesting and original Spanish machine known as the Cierva "Autogiro." We had not at the time any details bearing on the operation of this machine, and our only information was to the effect that trial flights had successfully been accomplished at Cuatro Vientos aerodrome, near Madrid. In a recent issue of our American contemporary there appeared some further particulars on the matter, which we quote herewith.

The "Autogiro" is not, strictly speaking, a helicopter, but is in fact based on principles entirely different from those followed in the construction of helicopters—and aeroplanes too, for that matter. A helicopter is sustained in flight by a lifting screw which an engine causes to rotate in a horizontal

The rest of the machine is an ordinary tractor aeroplane (without the wings), with an 80 h.p. Le Rhone engine driving a tractor airscrew, and the usual tail surfaces. The experimental model was fitted with two aileron extensions, on either side of the fuselage, in order to safeguard the pilot against unexpected occurrences, but the experiments proved that this precaution was unnecessary, for the machine did not require lateral means of control. The "Autogiro" was found to take automatically its correct bank on turns, for the hinged connection of the blades of the vane—referred to later—keeps the plane of rotation always at right angles with the bearing shaft, and this despite the gyroscopic effect.

It is well known that when a stationary airscrew is exposed to an air current, the blades being in position A, shown in the



Rear and front views of La Cierva "Autogiro."

plane, and it lifts vertically. In the "Autogiro," on the contrary, the big four-bladed screw, which is mounted on a vertical shaft fixed on the fuselage, is not actuated by any power plant, but instead is made to turn freely on its bearings. Consequently this "screw" is actually a wind vane which actuates like the small propellers of fuel pumps, *i.e.*, it is the relative wind created by the forward motion of the machine which causes it to rotate.

On the "Autogiro" the big wind vane is mounted in ball bearings and is not controlled in any manner by the pilot.

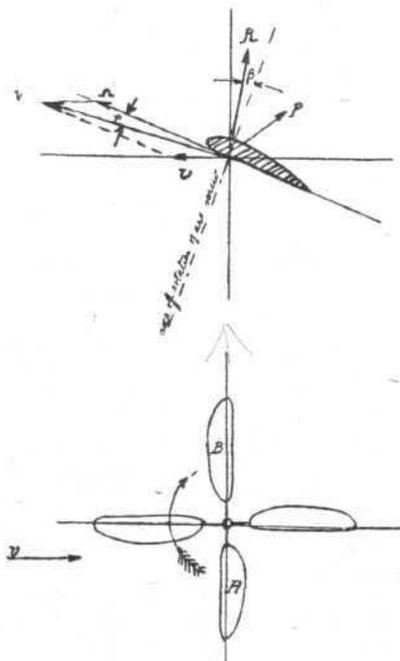


Diagram showing the forces in the lifting vanes.

The blades of the vane are set at a fixed angle of incidence relative to the axis of rotation, but they are hinged to the bearing shaft in such a way that in flight they place themselves in the resultant of their lift and centrifugal force.

accompanying diagram, have a resultant R which makes an angle with the airscrew shaft. The resultant P of the opposite blade (position B) has always a smaller angle than A or is negative. Therefore a rotation is established by the airscrew as indicated by the arrow. The speed of rotation will increase until the resultant of R and P is parallel to the axis of rotation of the airscrew. The whole lifting body does not transmit to its shaft any torque except the one produced by the friction of the bearings, which can be neglected, eliminating therefore the necessity of using two propellers.

However, the resultant velocity of the blades relative to the air in position A is greater than in B, and its lift will be greater also. Therefore, the total resultant of this airscrew will not pass through its centre, and the whole system will tend to bank. This banking effect has been overcome by fixing the blades to the shaft by means of a hinge, which permits them to set themselves automatically in the resultant position of the centrifugal force and lift. Thus the blades A will bank slightly, while blades B will remain horizontal, and the total resultant of the lifting airscrew will always pass through its centre.

If we analyse the effect of the hinged blades of the vane, we see that the shaft can freely change its angle with the plane of rotation of the blades, but that the blades have a strong tendency to return to their original position relative to the shaft. This gives an automatically perfect banking in the turns and stability in flying.

The velocity of the blades relative to the air is much greater than the translational speed of the whole machine. The angle of attack is a function of the translational speed of the machine and the angle between its direction of motion and the plane of rotation of the blades. This allows a much greater range of speeds and angles of flying to the whole machine, and will permit landings in very small spaces without horizontal motion.

The "Autogiro" weighs about 880 lbs. empty and 1,100 lbs. loaded. The horizontal speed attained is from 38 to 55 m.p.h. The rotational speed of the lifting vane is about 140 r.p.m. in horizontal flight. The descending speed in vertical landings is of about 6-10 ft. per sec.

It may be of interest to note that the inventor of this machine, Juanito Cierva, is the son of one of the most popular Spanish political figures who has been several times Minister of War, Minister of the Interior, and Minister of Finances, and is at the present time the chief of a Spanish political group.