Helicopter Models Perform Well

Aviation

But Full Size Craft Present Greater Difficulties

IF a full-sized, vertically rising aircraft worked as well as its small-sized models, airplanes and airships would be readily discarded while many types of the new craft would carry thousands through the air.

The new Curtiss-Bleecker helicopter, somewhat different from old machines, is now subject to test. The Cierva autogiro, of which scores have been built, has been said to be "suffering from growing pains" by Pitcairn engineers who are conducting research on it. All are experimental machines and must change and develop greatly, but their engineers have the success of models to encourage them.

The inspiring performance of models only a few feet in diameter have enabled struggling inventors to impress financiers and get money with which to carry on their experiments. But when such craft are made large enough to lift real people instead of miniature humans, there arise many unforseen difficulties of construction which do not affect the building of models.

Lifting ratios greater than 100 pounds per horsepower are frequently achieved in models, Dr. H. L. Dryden, authority on aerodynamics of the U. S. Bureau of Standards, told a Science Service representative, but only a fraction of a horse-power is applied and very little weight is lifted. The energy usually comes from a twisted rubber band.

If such ratios held for man-sized craft, a wonder world of air transportation would be opened up. However, difficulties of mechanical construction multiply and laws of aerodynamics become more severe as the size of vertically rising craft is increased.

The rotating surfaces of models can be made very light and do not require the structural bracing necessary in real machines, Dr. Dryden pointed out. It is very difficult to design this bracing to combine strength and light weight.

The rotating wings of models can be turned much faster than those of the big machines because ability to rise depends more on circumferential speed at the wing tip than on revolutions per minute. Hence to attain the same circumferential speed a small propeller must make more revolutions than a large one. This speed is easily reached in models by elastics or clockwork, but is very difficult to gear high-speed gasoline aircraft motors down to about 130 revolutions per minute for the big machines. A heavy, clumsy system of gearing is necessary and much power is lost.

This difficulty has been partially overcome in the Curtiss-Bleecker helicopter by propellers on each rotating wing.

In spite of the fact that the large rotating wings seem awkward and clumsy, they have been found the only solution to the problem of how to rise vertically, Dr. Dryden said.

As propeller speed is increased the power required rises much faster than the force pulling upward. Expressed by the aerodynamic law, power is proportional to the cube of the speed and thrust to the square of the speed.

The rotating surfaces must be large because they take the place of wings of the usual airplane, he continued. Their linear speed must compare with airplane speed and yet is limited by fast increasing power.

"A vertically rising machine is after all an airplane with rotating wings," Dr. Dryden explained. "In fact, an engineer once designed one which consisted of two airplanes attached to opposite ends of a beam and facing in opposite directions. The affair was supposed to rise by revolving about the middle of the beam, and once in the air the two machines were to face in the same direction and travel like airplanes. Though I never heard of an actual trial, it well illustrates the principle of vertically rising aircraft."

The autogiro is unlike the helicopter in that its rotating wings which exert vertical lift are driven indirectly by the backwash from an ordinary airplane propeller. It has an airplane fuselage. The helicopter has no airplane fuselage or propeller and its rotating wings are powered directly.

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The latest helicopter with its 27-year-old inventor, Maitland B. Bleecker in the front cockpit. The world will soon know whether it can fly. Curtiss-Wright is reported to have spent $200,000 developing it.