Experimental Helicopter Demonstrated Successfully by Vought-Sikorsky

SUCCESSFUL flight demonstrations of a helicopter built by the Vought-Sikorsky Aircraft Division of United Aircraft Corporation were made on May 20th at the Vought-Sikorsky factory in Stratford, Connecticut. Piloted by Igor I. Sikorsky, the helicopter rose vertically approximately 30 feet, hovered motionless over one spot, and then flew approximately 200 feet across the field before descending vertically to the ground. Several additional short flights were made to demonstrate the craft's ability to rise, hover, travel in any direction and turn in flight under complete control by the pilot.

Mr. Sikorsky, who is Engineering Manager of Vought-Sikorsky Aircraft, stressed the fact that the helicopter as flown recently is still in an experimental stage, but said that the flights had clearly demonstrated that the problems which have balked helicopter designers for years had been successfully solved. He said that based on the information that has already been learned from this experimental model, it would be readily possible to produce a two-seater helicopter powered with an engine of approximately 200 horsepower. Such a craft would be able to take-off and land in small spaces between buildings or trees, and would be able to travel forward at any speed between zero and slightly above 100 m.p.h., which would be its normal cruising speed. It could move sideways or backward at velocities up to 25 m.p.h., and it would have a ceiling of more than 12,000 feet and an initial rate of climb in excess of 1,000 feet per minute. An aircraft of this type, he said, could be considered as a training or light scouting machine for military purposes, as well as being adapted for use by the private owner.

The helicopter which was flown on May 20th was the third to be built by Mr. Sikorsky, but the first of the three to fly successfully. The other two were built in Russia some thirty years ago and were the first aircraft of any type designed by Mr. Sikorsky. Despite the fact that they failed to fly, Mr. Sikorsky during his entire career as a successful airplane designer has been keenly interested in the wide field of possibilities offered by the helicopter type.

As stated earlier, the Vought-Sikorsky helicopter was created purely as an experimental flying test model. Its power available, the transmission system, and rotor locations, were all selected with a view to testing certain basic principles. In spite of its highly experimental character, the VS-300 has established that definitely and without a doubt, all fundamental characteristics necessary to a successful helicopter have been achieved. The problem of vertical take-off, vertical climb, and hovering characteristics, combined with the ability to move in all directions, forward, backward, and sideways, etc., finds its solution in the VS-300. All these maneuvers create no abnormal conditions nor do they call for any special skill from the pilot.

The VS-300 has no fixed surfaces. All its lift, stability, and control characteristics are based on aerodynamic forces applied to its clean, sturdy and fast-rotating main and auxiliary rotors. This being the case, forward velocity is completely excluded as a factor necessary to the control characteristics of the machine. The rotor blades at their most effective position travel at a speed of from 250 to 300 m.p.h. This velocity is present whether the machine is hovering or moving forward, thus giving a perfect basis for a powerful and effective control under all conditions.

The design of the VS-300 is based on very simple and sound mechanisms which are easily adaptable for mass production and which can be designed and built in a way insuring practical reliability and easy maintenance of the aircraft. The most important design feature of the machine concerns the novel and very successful control arrangement.

As seen from the photograph, the lifting and control members of the machine consist of one single lifting rotor and three small auxiliary rotors or airscrews, supported by an outrigger and placed beyond the disc of rotation of the main rotor.

The main rotor furnishes most of the lift that supports the machine in flight. The change of the pitch of the main rotor forms the basis of the control of the machine for up and down motion.

Two of the three auxiliary rotors which are situated on vertical shafts on both sides of the outrigger furnish means for longitudinal and lateral control. The variation of the pitches of both of these propellers in the same direction produces longitudinal control, while the variation in opposite direction gives lateral control. These control motions are connected to a pilot's stick, giving a control system similar in effect to that of the conventional airplane.

The third propeller, situated on a horizontal axle placed transverse to the normal motion of the aircraft, furnishes a force that compensates the torque of the main lifting rotor. Besides that, a mechanism which varies the pitch of the rear propeller is connected with foot pedals and furnishes means for directional control of the aircraft.

All controls are completely independent of the motion of the craft and are effective whether the machine is on the ground or in the air, with the power full on or only part of the power, or finally, with no power at all. In the latter case, the main rotor and the two auxiliary rotors on the vertical shafts would operate in auto-rotation. The system of the main and all auxiliary rotors, being mechanically connected, will, therefore, continue in operation and the controls of the aircraft would remain as in power flight. The transition

from power flight to the autorotation position is automatic in the case of a sudden engine failure.

One of the most important features that contribute to the very practical and successful control system on the VS-300 is the synchronization system.

While it is possible at any time to operate the longitudinal control of the machine and to adjust the throttle of the engine, yet when the pilot moves the main pitch control stick, he automatically adjusts, together with the main rotor pitch, the pitches of the auxiliary rear propellers and the power of the engine. This being the case, all maneuvers can be made without any need for touching the adjustment of the longitudinal stability or of the engine throttle.

With the main control stick and pedals the pilot can control the direction of the flight in the air, the position of the machine in hovering, while with the main pitch stick in his left hand, he can control the altitude of flight of the machine with remarkable precision.

For best results when maneuvering in tight places, the right procedure is to over-rev the machine some 10 or 15%, in which case, by operating the main pitch control, the pilot is able to hold it at a given altitude or cause it to descend, or cause it to momentarily jump up. All these maneuvers can be repeated and there is no time limitation for the pilot, who is able to ascend or land exactly when he sees the right moment. These characteristics, combined with the ability of the aircraft to hover motionless or to move forward, or backward, or sideways, widen immensely the sphere of usefulness of the machine. There is not the slightest doubt that aircraft with such control characteristics can be operated from narrow spaces from which no other type of aircraft, heavier or lighter-than-air, can be taken off or landed.

The above mentioned characteristics offer an immensely important field of usefulness for the proposed aircraft for both military and peaceful purposes.

The motion in any direction other than hovering or vertical ascent or descent, is caused by slightly tilting the main shaft in the direction desired. Naturally, in a streamline version of the helicopter, the most convenient and fastest direction would be forward. However, flying at slow speeds up to 10 or 20 miles per hour would be possible in any direction, namely, sideways or backwards.

An interesting operating characteristic is the fact that the aircraft can be stopped within an extremely short distance in the air, even if it is moving at full speed. To execute this maneuver, the pilot need only pull the main stick, which increases the incidence of the machine, and then adjust the desired altitude by the main pitch control. This being the case, he is able to either gain altitude during the maneuver or he can remain at the same height.

This ability to control motions makes it possible to stop the machine in a much shorter distance than would be possible with an automobile having the most powerful brakes.

An unusual and very important characteristic of an aircraft of this type is that the pilot, even if he sits in the open, is well protected from the rush of air by the powerful downward slipstream of the main rotor. Therefore, comfortable flights may be made with the cockpit opened. The control characteristics with power off remain substantially the same because the machine would be gliding down and the motion of the lifting and control airscrews would, in this case, be obtained by autorotation as in the case of the autogiro.

Igor Sikorsky receiving Helicopter Pilot's License No. 1 from Connecticut Commissioner of Aeronautics C. L. Morris on the occasion of the demonstration flights of the VS-300 Helicopter. The craft is powered with a 75 H. P. Lycoming engine.