



# MUSEUM PIECE

## THE VS-300

The Vought-Sikorsky VS-300 wasn't the first helicopter to fly, but it was the first simplified, practical helicopter. And it served as the model for the first mass produced helicopter – the Sikorsky R-4.

The VS-300, Sikorsky's third helicopter design, was significant because it was the first helicopter to use a single main rotor and a single tail rotor. The tail rotor provided both yaw control and anti-torque compensation. The advantage of this Main and Tail Rotor (MTR) design over previous ones was that it was much less complex mechanically. The MTR design became the model on which most modern helicopters are based.

The earliest flying helicopter to carry a man was the Breguet-Richet 1, which made its historic flight on 9/29/07 while tethered to earth by ropes. It remained aloft for one minute, and reached an altitude of 2 feet.

The first helicopter to achieve unrestrained free flight was the Cornu tandem-rotor machine, on 11/13/07. It flew for 30 seconds.

In 1924, a quadruple-rotor machine designed by Oemichen achieved a flight covering a dis-

tance of 1640 feet. This record was then surpassed by Pescara-designed helicopter which went 2640 feet.

During the mid twenties and early thirties, Juan de la Cierva successfully developed the autogyro. Hundreds of his C-30 autogyros were manufactured. This machine, weighing 1900 pounds, could cruise at 80mph for two hours.

The C-30 was evaluated by several countries as a military reconnaissance aircraft. It was also used to calibrate ground radar installations.

The outbreak of World War II heightened military interest in a practical aircraft which could take off vertically, and hover. While some autogyros could take off vertically, none of them could hover.

Sikorsky was aware of Cierva's work on the autogyro as were designers in England (James Weir) and Germany (Heinrich Focke). All three of these men developed prototype helicopters for the military in their respective countries. Sikorsky's VS-300 was the simplest and most successful of the three, and by 1945, the Sikorsky Main the Tail Rotor (MTR) design became the model

## *The VS-300 about to land – photo by Gail Fischer*

on which most subsequent designs were based.

The VS-300 made its first free flight 5/13/40. It was flown until 1943 when it was donated to the Ford Museum. The aircraft carried 1 pilot; it was powered by a Franklin radial piston engine with 90hp. The VS-300 weighed 1150 pounds. Its length was 28 feet; height was 10 feet; rotor diameter was 30 feet.

The VS-300 set a world helicopter endurance record on May 6, 1941, after it flew for 1 hour, 32 minutes. Its distance range was 75 miles.

My interest in the VS-300 began in 1980, when I stumbled upon a book about the aircraft written by Sikorsky's test-pilot. The book contained many excellent photos which I copied and enlarged. In studying the photos, I noticed many similarities between the VS-300 and the model helicopter which I fly, the Kavan Allouette II.

Both helicopters use an open tail boom; the VS-300 was flown with either 2 or 3 blades on the main rotor – the Allouette has a 2-bladed main rotor. Also, the VS-300 was flown with either pon-

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by Sam Newhouse

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toons or wheels, and the pontoons which are available for the Allouette looked very similar to the VS-300 pontoons. Finally, I was attracted to the VS-300 as a construction project because the real VS-300 was constructed of metal tubing framework covered by fabric.

I proceeded to attempt to obtain 3-views of the VS-300 from Sikorsky Aircraft, which is now part of United Technologies. I called and wrote the corporate archivist for more than 2 years before giving up on obtaining these plans. At this point, I started to construct a model based on the photographs which I had obtained. In addition to the half-tone photos from the test-pilot's book, I got some excellent black and white photos from the Edison Museum in Dearborn, Michigan, where the VS-300 is now located.

The primary difficulty at first was in squeezing in the radio equipment, since the VS-300 is much narrower than an Allouette. Using Futaba S-20 servos, with a Futaba Gyro and receiver, I managed to package everything into a very small space. The tail boom at this point was not upswept, as is the VS-300, since I lacked confidence in my ability to reshape the Allouette tail boom. The resulting model flew reasonably well, but because of the straight tail boom, the tail rotor blades had no more than 1 inch ground clearance. This made landings and takeoffs very hairy, and also, did not look scale-like. Nevertheless, the model looked good enough to come in first in the 1983 WRAM static competition.

At this time, I renewed my efforts to obtain a 3-view. Eventually, the archivist determined that, in fact, there was no 3-view of the helicopter in existence. Luckily for me, however, a project developed internally at Sikorsky which required a 3-view of the VS-300. A team was sent to the Edison Museum to photograph and measure the VS-300, and an excellent 4-view was produced. I got my plans shortly before the AMA nats.

Study of these plans revealed a practical way to reshape the tail boom. In order to make it work, it was necessary to cut the tail rotor drive shaft and install a universal joint between the two halves of the shaft. I used Dumas boat fittings for this purpose. Amazingly, this fitting works very well.

This upswept tail boom smoothed out tail rotor response, improved landings and takeoffs, and was more scale-like.

The helicopter, probably because of its very narrow and



streamlined shape, seems to move more cleanly in forward flight than an Allouette, which has a large canopy. Tail rotor response is also more smooth than with a standard Allouette.

The model is powered by a Webra 40 Speed engine, with Perry carb and air filter, as well as a Webra baffled muffler. The fuel tank is an 8-ounce Kavan unit, and the amount of fuel remaining can be seen by the pilot very clearly while flying. The model will fly from 8 to 10 minutes on a tank. It weighs 7 pounds.

Tips of both main and tail rotor blades have been rounded to match the appearance of the original. This does not seem to have altered its flight performance. Also, the main blades have simulated ribs, to match the appearance of the original main blades, which were fabric-covered wings built up using spars and ribs.

In its first flying competition, the model took first place in scale at the 1983 Greenville, Pa competition.

There are many scale details on

*By Jeff Huntley – Shot of author flying Allouette II. This is the helicopter from which the VS-300 was built. This particular model has collective pitch, and is totally unmodified; i.e. it is built according to Kavan instructions with standard parts. This photo, was taken at Liberty State Park in Jersey City, NJ; a wonderful site overlooking the Statue of Liberty and the World Trade Center.*

the original which I have not incorporated on the model. These include a scale exhaust, zippers for access, and the nose-mounted carrying basket which Sikorsky used to demonstrate the stability of the aircraft. Also, the existing model is a fixed pitch helicopter. I am planning to build a collective VS-300 which will have fabric covering over a frame made of metal tubing, just like the original.

Notes on the Author: Sam Newhouse lives in downtown Manhattan, in New York City. He has been flying model helicopters for 5 years. He learned to hover on the roof of his apartment house, using a non-collective Allouette with pontoons.