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synchropter



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# Aerodynamics

Helicopter designers face several alternatives when deciding where to put two rotors. One is the synchropter.

LIKE THE COAXIAL configurations discussed last month (page 8), the synchropter has two closely placed rotors turning in opposite directions. But unlike the coaxial, which has both rotors on one shaft, the synchropter has its rotors mounted on separate shafts at the same height above the fuselage. When they rotate, the rotors intermesh like an eggbeater.

This configuration was invented by Anton Flettner in Germany just before World War II. Flettner's chief of aerodynamics and dynamics was Dr. Kurt Hohenemser, who moved to the United States after the war. Hohenemser worked for McDonnell Aircraft when it was developing helicopters and then became a professor at Washington University in St. Louis, Mo.

### World's first helicopter

Hohenemser recalls working with the German design team. He said the team members considered several other configurations before selecting the synchropter concept. They rejected both the main-rotor/tail-rotor and tandem concepts as being too complicated.

Flettner's FL-282 was the world's first production helicopter, beating Sikorsky's R-4 by several months. Its development program included the first wind-tunnel tests of a powered-rotor model and later a full-scale wind-tunnel test. A total of 24 FL-282s were built before Allied forces bombed the factory during the closing months of the war.

However, even before the FL-282, the synchropter configuration had been adopted by Kellett Aircraft Corp., in the United States. It built two experimental prototypes:

the XR-8, which first flew in 1944, and the twin-engine XR-10, which flew three years later. The XR-8 looks like a giant tadpole with rotors, while the XR-10 looks like a tadpole with rotors and an engine nacelle on each side. Neither entered production.

But, in the 1950s and 1960s, Kaman Aircraft Corp., Bloomfield, Conn. (now Kaman Aerospace) built several HTK synchropters for the U.S. Navy and about 300 HH-43 Huskie synchropters for the U.S. Air Force. In 1956, during the Navy's utility-helicopter competition, Kaman submitted two proposals, one for a synchropter and one for a main-rotor/tail-rotor configuration. The latter proposal won and became the HU2K, eventually evolving into the SH-2F Seasprite.

That effectively ended any further synchropter development. I may be wrong but I believe all synchropters have been retired from active flight status.

### Advantages

The synchropter shares with the coaxial the efficient use of engine power and compactness allowed by the absence of a tail rotor. It is even more compact than the coaxial, since the two rotors are at the same height rather than one above the other on the same shaft. Blade clearance is obtained by careful synchronizing rather than by vertical displacement.

In addition, the synchropter has an inherent design feature that improves its longitu-

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