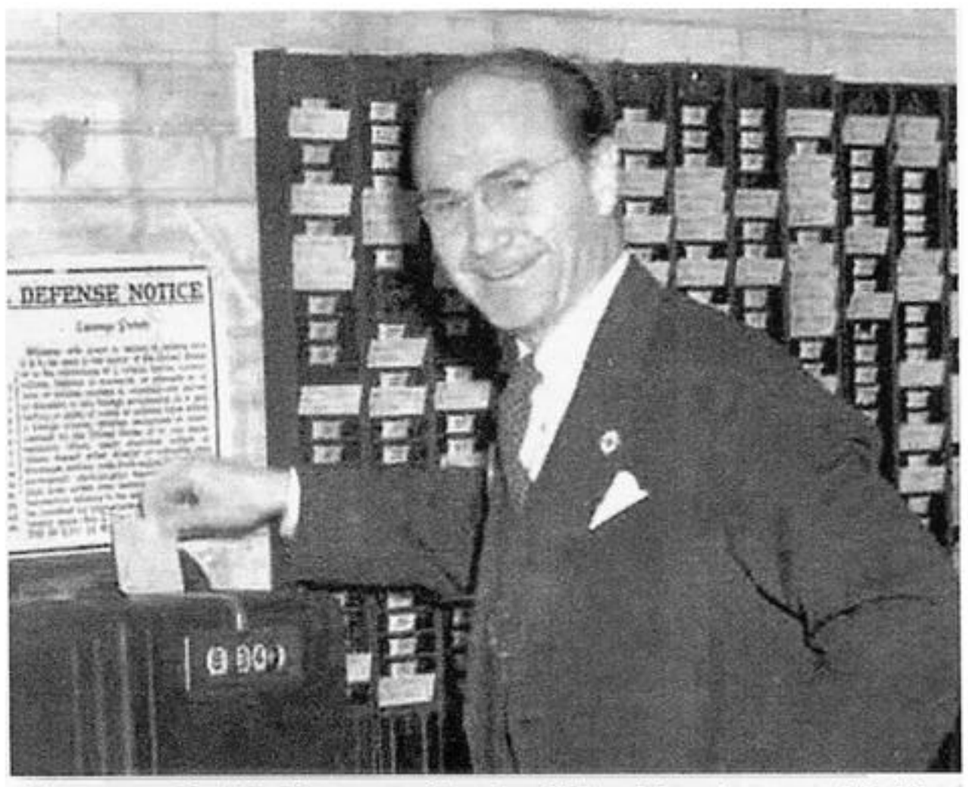
McDonnell Aircraft Helicopters: 1942 to 1960

Professor Paul A. Czysz
Emeritus Professor
Saint Louis University

The information presented here is from memories of 30 years at McDonnell and the AIAA, St. Louis Section, ***Gateway News*** for September 2006 in an article by Frederick Roos, *"Mr. Mac's Helicopter."s*

There was an article in the St. Louis Post-Dispatch in May 2001 entitled "*The Man Who Could See Changes in the Wind*." It was about "Mr. Mac" shown below clocking in. All of his employees from himself to the plant floor sweeper clocked in and out. Not counting the stock that he owned, he salary was always 16 floor sweeper. If he was to make money it would be through the value of his Company, the stock.



James S. McDonnell, Jr. (Mr. Mac), ca. 1941.

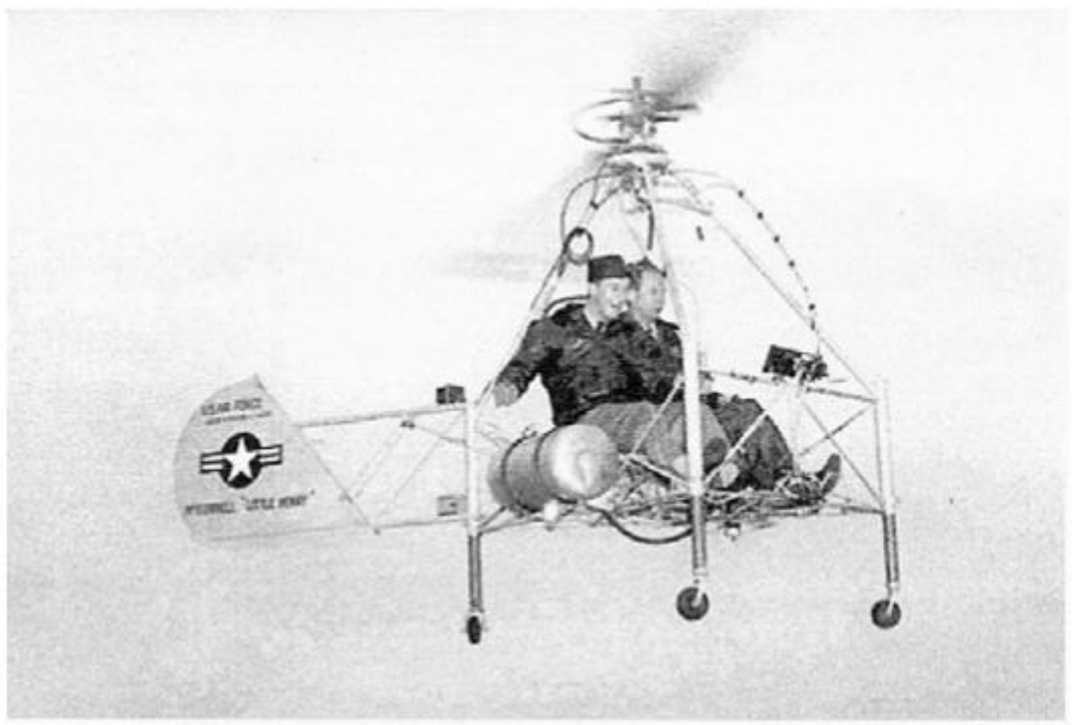
In 1932 when still at the Martin Company, he published a detailed analysis of trans-Atlantic passenger traffic and came to the conclusion that Air Ships could not compete with aircraft for safety and speed. It is on file in the archive section of the Saint Louis City Library. Mr. Mac founded the McDonnell Aircraft Company in July of 1939. He thought the future was in jet propulsion and helicopters. So by mid-1942 he had invested substantially in the Platt-LePage Aircraft Corporation, builders of the U.S. Army's first helicopter. The XR-1A.



McDonnell XHJD-1 Whirlaway

The XR-1 had a strong resemblance to twin-rotor configuration of the Focke-Achgelis Fa-61 that flew in 1938. So by May 1944 the U.S. Navy funded the XHJD-1 research helicopter. It was the largest helicopters of its time and the first with two engines. Ground testing was in 1946 and first flight in 1947. It had a 2 ½ year flight test program. Mr. Mac always liked simplicity, and although the XHJD-1 program gained a wealth of operational and technical design data, it was a complicated mechanical and power transfer system.

So while this was going on, another group of McDonnell engineers were busy at the other end of the design spectrum. A young engineer with a bent for design and hardware, Harold Ostroff, noted that the tip speed of the rotor was nearly sonic and certainly in the range of ramjet



XH-20 *Little Henry* **ramjet helicopter**

operation. So by 1946 a tethered version of a rotor system powered by ramjets at the tips was in test. That evolved into the USAF XH-20 (*Little Henry*) a gasoline fueled research helicopter. First flight was in August 1947 and testing continued to 1951.

About the same time in 1947, *Operation Paperclip* brought two German helicopter engineers to McDonnell's Helicopter Division. These were Fiedrich von Doblhoff, an Austrian of noble ancestry from Wiener-Neustaedter Flugzeugwerke and Dr. Kurt Hohennemser, a Berliner who had taught at Goettingen. Doblehoff had led in the development of jet-rotor helicopters, and the first, WNF-342 was flown beginning in 1940.



Fred Doblhoff (left) showing Model 79 *Big Henry* controls to J.S. McDonnell.

Fred Doblhoff with Mr. Mac in *Big Henry*. Doublhoff's concept was for a "pressure jet rotor system" where high pressure air was piped through the rotor to a tip burner to provide thrust. So the rotor did not have to be sped up first to permit the ramjets to function. Another of Doublhoff's concepts was an "unloaded rotor principle" where conventional wings were used to generate lift for forward flight, unloading the rotor. Both of these concepts were to shape the helicopter efforts pf the McDonnell Aircraft Company. Both concepts eliminate the need of a complicated and mechanically limiting transmission and a tail rotor.

The first effort that began in 1951 was for the XHRH-1 twin engine, compound helicopter with carrying 30 fully equipped combat troops at 220 knots. However the effort was terminated in 1953 because of the unconventional nature of the configuration. The next effort was a joint Army/Air Force competition for a high speed liason/observation aircraft. The rsult was the McDonnell XV-1 "*Contvertiplane*". This was very similar to Doublhoff's WNF-342 concept.



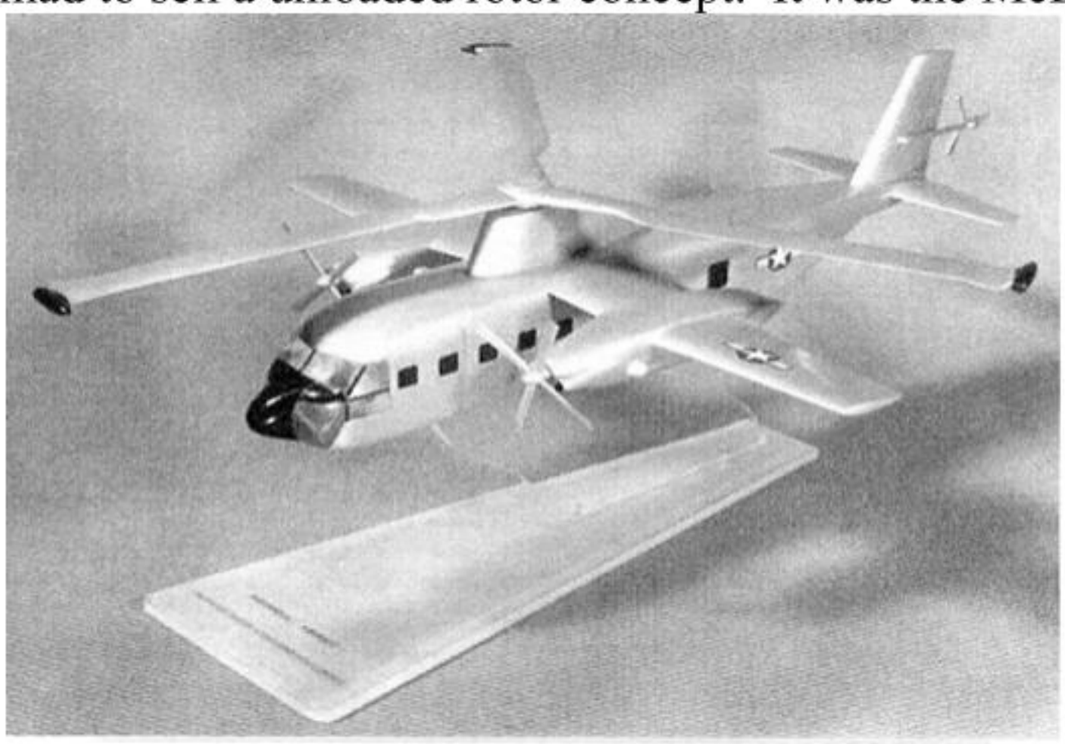
XV-1 in full flight.

The complete aircraft began flight testing in February 1954. The XV-1 achieved several firsts, including the first successful conversion from helicopter takeoff to conventional wing-borne flight, and the first rotorcraft to exceed 200 mph (not officially recognized). Despite the company's efforts to sell the production version the project was canceled in 1957 and the award

went to the Bell XV-3 twin tile-rotor the eventually led to the NASA/Bell XV-15 and ultimately to the V-22 Osprey.

In the writer's opinion the Key West Agreement between the USAF and US Army the President Truman signed in 1947 was always the down fall of any US Army aircraft that was not force to land and takeoff vertically. And we see where that has gotten us in the last 60 years.

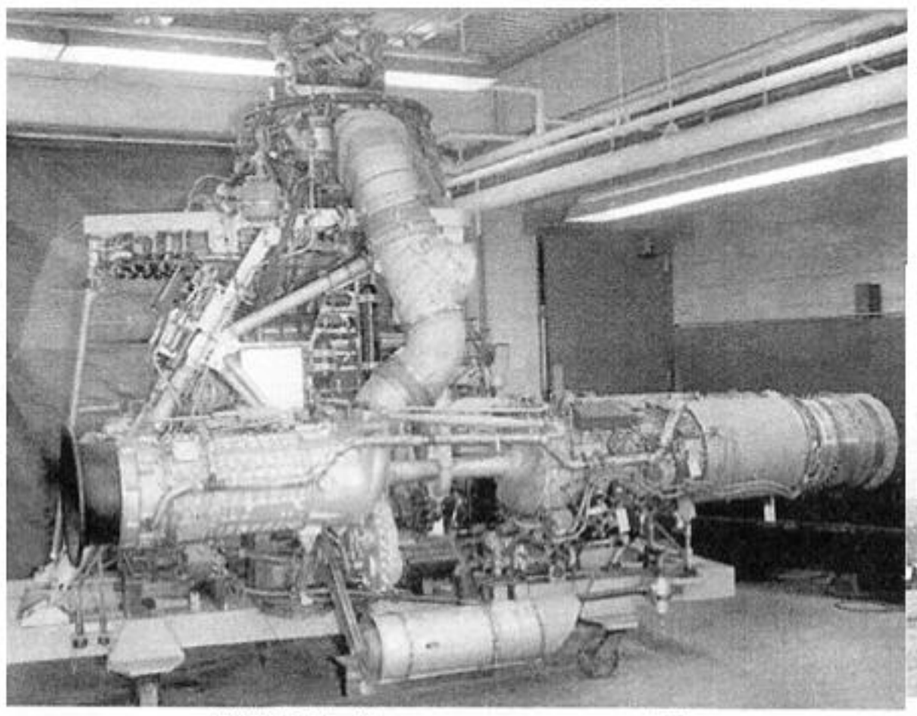
One last attempt was mad to sell a unloaded rotor concept. It was the McDonnell Model 113P.



Proposed Model 113P (desktop model).

Many think the Fairey "Rotordyne" was the first of its kind (it was to fly) but the concept also existed here in St. Louis, although only in model form, as like the XV-1 it was not to succeed.

The USN selected McDonnell as the winner of a cargo-unloading helicopter, the XHCH-1 based on the McDonnell pressure jet concept. In the spring of 1952 the complete 75 ft diameter rotor, engines, clutches and rotor-air compressors for the system was build and hot whirled.

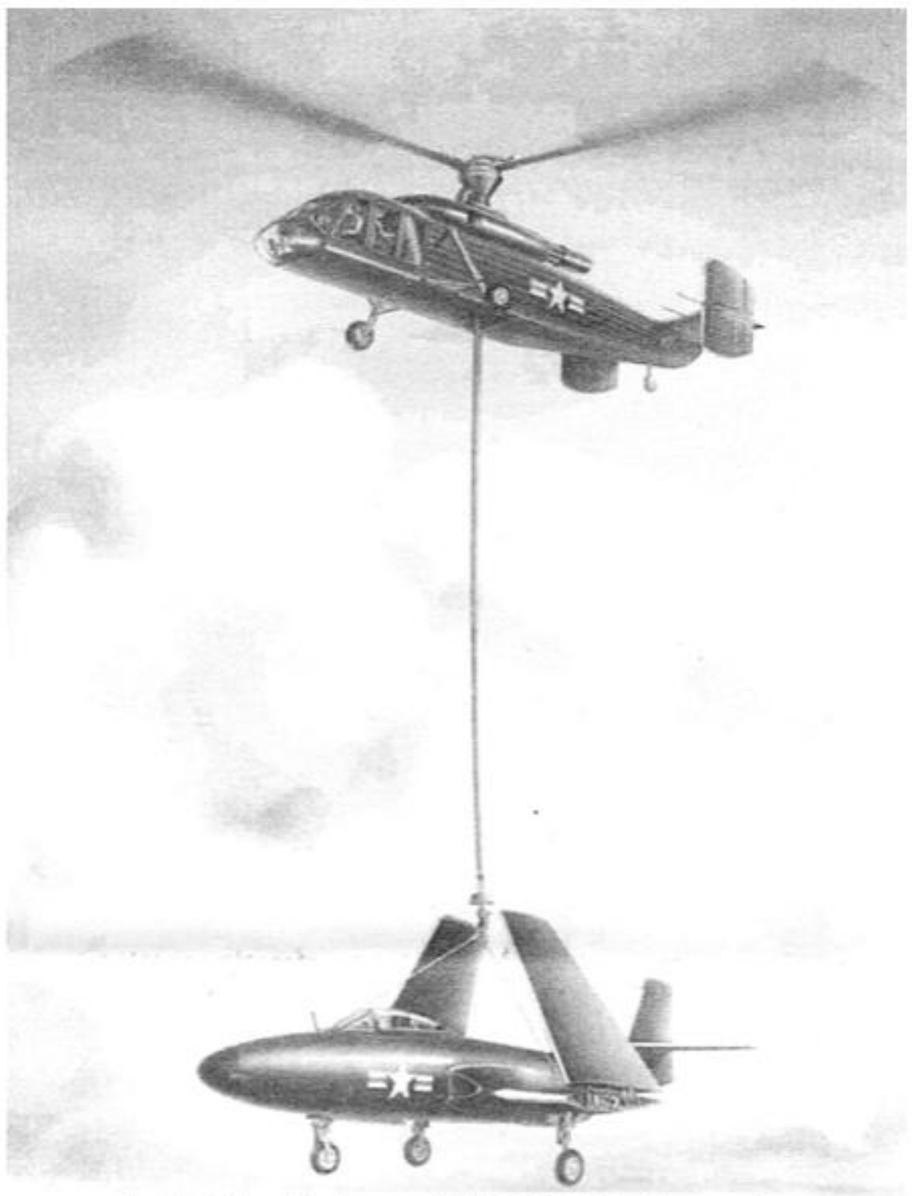


XHCH-1 power assembly.



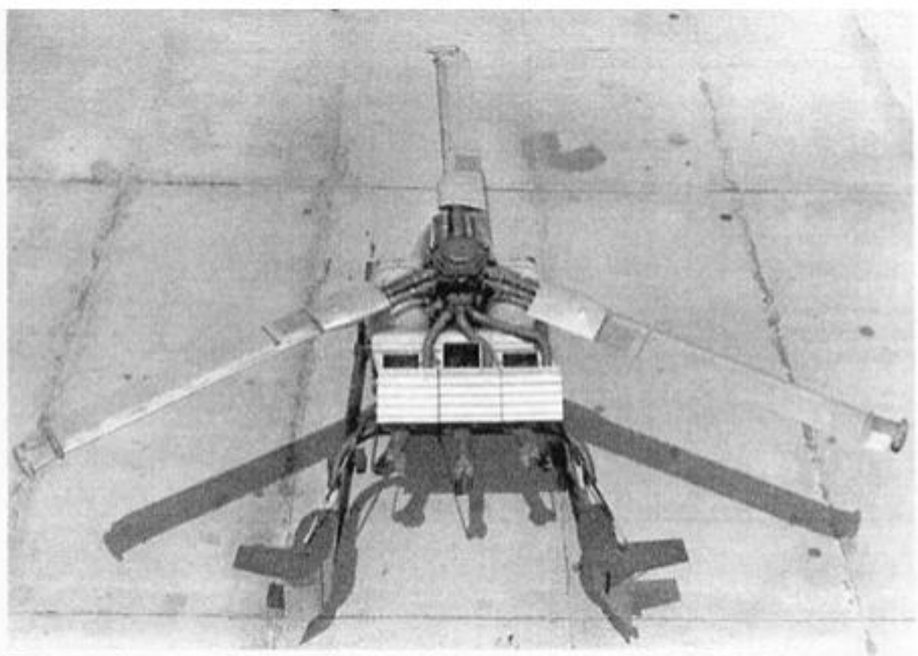
Full-scale XHCH-1 rotor hot-whirl rig.

In the mid 1950's the program was seriously cut back to imit the program ot only hot testing the power plant and rotor system. In 19549 the program was cancled with none of the three intended prototypes ever having been built. An artist concept follows on the next page.



Artist's vision of XHCH-1 at work.

There was one last effort in the McDonnell helicopter saga; it was the privately funded Model 120. Originally begun as a US Army utility vehicle, the Model 120 used the 31 ft pressure jet rotor of the XV-1. It was first flown in November 1957 (almost 50 years ago).



Top view of Model 120 rotor and power systems.



Model 120 in flight with personnel pod.

As you can see in the picture on the left the Model 120 was a bare minimum helicopter. It was designed a carry a pod of different configurations or a sling load. The Model went on to demonstrate, for the first time, that a helicopter could carry a payload greater than is own weight. In fact it achieved a payload of 62% of its gross weight. Nevertheless it went the way of all McDonnell Helicopters, failing to win either military or civilian orders. These simple, and reliable systems without either transmissions or tail rotors seemed not able to compete against transmissions and tail rotors in the hollowed halls (whoops, its hallowed halls) of Washington.

By Feruary1960 the indigenous helicopter work at McDonnell came to an end. Mr. Mac passed away in August 1980. So he did not live to see McDonnell Douglas purchase Hughes Helicopters in 1984 and develop the OH-6A *Loach*, Hughes 500 and AH-6 *Apache* attack helicopters.



I left McDonnell in April of 1958 to join the USAF at the invitation of the President. I returned in September 1963.

Paul Czysz