= De Lackner HZ @-@ 1 Aerocycle =

The HZ @-@ 1 Aerocycle , also known as the YHO @-@ 2 and by the manufacturer 's designation DH @-@ 4 Heli @-@ Vector , was an American one @-@ man " personal helicopter " developed by de Lackner Helicopters in the mid @-@ 1950s . Intended to be operated by inexperienced pilots with a minimum of 20 minutes of instruction , the HZ @-@ 1 was expected to become a standard reconnaissance machine with the United States Army . Although early testing showed that the craft had promise for providing mobility on the atomic battlefield , more extensive evaluation proved that the aircraft was in fact too difficult to control for operation by untrained infantrymen , and after a pair of crashes the project was abandoned . A single model of the craft was put on display .

= = Design and development = =

During the early 1950s , Charles H. Zimmerman of the National Advisory Committee for Aeronautics (NACA) developed a system for control of a rotorcraft in which , with the rotors mounted on the underside of the aircraft , the machine could be steered by the pilot through the simple shifting of his weight , and kept stable through the actions of his natural reflexes . Known as kinesthetic control , and similar in principle to the mechanics of riding a bicycle or a surfboard , it was hoped that the concept would allow for pilots to operate an aircraft with little to no training time . NACA testing proved that the idea had merit , and several companies , including Bensen Aircraft , Hiller Aircraft , and de Lackner Helicopters , began development of rotorcraft using the concept .

The concept proposed by de Lackner Helicopters was a one @-@ man flying platform , and it received the company designation " DH @-@ 4 " . The DH @-@ 4 was expected to be able to carry up to 120 pounds (54 kg) of cargo or an auxiliary 5 @-@ US @-@ gallon (19 l ; 4 @.@ 2 imp gal) fuel tank to extend its range up to 50 miles (80 km) in addition to its pilot ; in addition , a cargo lifting line could be threaded through the rotor shaft for the carrying of slung loads underneath the craft .

The machine was a simple , cross @-@ shaped frame , with the pilot standing on a platform , secured by a safety harness . The harness also secured the aircraft 's engine , which was an outboard motor manufactured by Mercury Marine . The engine was controlled by a twist @-@ grip motorcycle @-@ style throttle and transferred power to the 15 @-@ foot (4 @.@ 6 m) diameter , contra @-@ rotating rotors via belt drive with a chain reduction unit . The aircraft 's landing gear consisted of airbags at the end of each arm of the frame along with a large rubber float in the middle , allowing for amphibious capability , although this arrangement was later replaced by a pair of conventional helicopter @-@ type skids .

= = Testing = =

Originally designated YHO @-@ 2 by the U.S. Army , then later re @-@ designated HZ @-@ 1 and named " Aerocycle " , the prototype made its first tethered flight on 22 November 1954 , with its first free flight taking place in January 1955 at the Brooklyn Army Terminal . Over 160 flights totaling more than 15 hours of flight time were conducted , and the results of this early test flight program were considered promising enough that a dozen examples of the type were ordered (serial numbers 56 @-@ 6928 to 56 @-@ 6939) . Predictions were made that the craft could provide transport to a modern version of the old horse cavalry , providing airborne " eyes and ears " for the Army .

In 1956 , the test program was transferred to Fort Eustis , Virginia , where Captain Selmer Sundby took over test @-@ flying duties . The HZ @-@ 1 had been designed to be very easy to fly , and early testing indicated that untrained soldiers could learn to operate the craft in less than 20 minutes , and some claiming that only five minutes of instruction were required . In addition , the HZ @-@ 1 proved to be faster than other flying platform designs evaluated by the Army . Sundby , however , quickly determined that the craft was much more difficult to fly than had been expected , and would not be safe in the hands of an inexperienced pilot . In addition , the low @-@ mounted rotors proved

to be prone to kicking up small rocks and other debris .

Over a series of tethered and free @-@ flying test flights lasting up to 43 minutes , the HZ @-@ 1 suffered a pair of accidents . Both crashes occurred under similar conditions ? the contra @-@ rotating rotors intermeshed and collided , the blades shattering , causing an immediate loss of control resulting in a crash . Aerodynamic testing was conducted in the full @-@ scale wind tunnel at the Langley Research Center , and it was discovered that the Aerocycle 's forwards speed was limited by an uncontrollable pitching motion , but rotor @-@ tip clearance was always sufficient . The inability to determine the precise cause of the intermeshing , combined with the fact that the " personal lifting device " concept was failing to live up to its expectations , led to the decision to terminate the project .

Sundby was awarded the Distinguished Flying Cross for his test @-@ flying work with the HZ @-@ 1 , going on to test @-@ fly the H @-@ 21 and H @-@ 34 helicopters , as well as seeing combat in the Vietnam War before retiring with the rank of colonel .

= = = Parachute development = = =

An entirely new type of parachute with extremely fast opening characteristics , the " Ultra @-@ Fast Opening Personnel Parachute Type XMP @-@ 2 " , was developed for use in testing of the HZ @-@ 1 and Hiller VZ @-@ 1 flying platforms . Designed for use from 0 to 50 miles per hour (0 ? 80 km / h) and at altitudes as low as 25 feet (7 @.@ 6 m) , the XMP @-@ 2 proved to have insufficient reliability for use as a personnel parachute .

= = Aircraft on display = =

Of the dozen examples of the type ordered by the U.S. Army , only a single example of the HZ @-@ 1 has survived , and this aircraft is currently on display in the U.S. Army Transportation Museum at Fort Eustis , Newport News , Virginia .

= = Specifications = =

Data from
General characteristics
Crew : 1 (pilot)
Height : 7 ft (2 @.@ 1 m) from air bags to handle bars
Empty weight : 172 lb (78 kg)
Gross weight : 454 lb (206 kg)
Fuel capacity : 1 US gallon (3 @.@ 8 l ; 0 @.@ 83 imp gal)
Powerplant : 1 × Mercury Marine 20H outboard motor , 40 hp (30 kW)
Main rotor diameter : 2 × 15 ft (4 @.@ 6 m)
Performance
Maximum speed : 75 mph (121 km / h ; 65 kn)
Cruise speed : 55 mph (48 kn ; 89 km / h)
Range : 15 mi (13 nmi ; 24 km)
Endurance : 45 minutes
Service ceiling : 5 @,@ 000 ft (1 @,@ 524 m)