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by Wesley R. Smith, Ph.D.

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What is undoubtedly the first recorded circular aircraft was the product of the fertile imagination of an 18th Century Swedish scientist, philosopher and noted theologian named Emanuel Swedenborg (1688-1772).

Born in Stockholm on Jan. 29, 1688, he was the second son of Jesper Swedenborg. The family surname was transformed to "Swedenborg" after being enobled by the King of Sweden in 1719 and following Jesper's appointment as the Bishop of Skara. From 1710 to 1714 Emanuel Swedenborg traveled extensively throughout Europe following his education at Uppsala University; visiting England, Holland, France and Germany. An avid student of astronomy and mathematics, he is known to have met with John Flamsteed and Edmund Halley.

While he is known to have studied the works of Isaac Newton, there is no evidence to support the contention that Swedenborg ever knew him. Nevertheless, it was during this period in his life that Swedenborg developed many ideas which were as far ranging as a method to calculate longitude based on the position of the moon, to plans for a submarine and a practical design for an aeroplane.

On Sept. 8, 1714, Swedenborg first wrote of his idea for an aircraft to his brother-in-law, Erik Benzelius. This was later followed by a complete written description which appeared in the fourth edition of Sweden's first scientific journal, *Daedulus Hyperboreus*, founded by Swedenborg in the same year (1716). During this time, Charles XII of Sweden also appointed Swedenborg as Assessor Extraordinary at the Royal College of Mines, which enabled him to have significant impact on Sweden's metal-mining for the next 30 years, during which he was elevated to the position of Assessor. Moreover, his work is of great historical significance, for *Daedulus Hyperboreus* contains the first detailed technical description of a flying machine of any type.

Fortunately, the Stifts-och Landesbibliotek at Linköping (codex 14a, 1714) has Swedenborg's original manuscripts which include a sketch of Swedenborg's "Flying Saucer." The design is oval in shape; however, circular, square and rectangular planforms are also suggested in the 1716 text. The dimensions [*] of Swedenborg's aircraft are given as: 32' x 24' (603.2 sq') for an oval, 28' diameter (615.75 sq') for a circle, 25' x 25' (625 sq') for a square, and 20' x 30' (600 sq') for a rectangular surface. In all cases the central thesis of the Swedenborg ornithopter comprises of a central pilot's station measuring 6' wide, 4' long and 2' deep. Suggested materials for the pilot's basket include cork, leather and birch bark; nevertheless, both the main wing and secondary flapping wings were to be covered with sailcloth.

On both sides of the basket area are a pair of flapping wings operated by the would-be pilot. These are described as having a length of 5' and a chord of 1.5' (7.5 sq' each). A coiled spring was also to be attached to the spars of the flapping wings to enable the pilot to operate the wings with greater ease.

Furthermore, like a design suggested by Da Vinci, the flapping wings were intended to function as valves with hinges at the center of the chord, folding on the up-stroke and opening on the down-stroke. With aid of what he refers to as "the power of the wind," Swedenborg believed that the muscular weakness of the pilot would be more than compensated for by this system, and that by being able to alter the incidence angle of the flapping wings, they would also provide sufficient thrust for horizontal flight. While not entirely complete, there is at least a partial divorce of the lift and thrust components of flight, as the flapping wings are clearly not intended as the primary means of aerodynamic lift. A complete separation of these two systems would not come for another 85 years when Sir George Cayley designed his first fixed-wing aircraft in 1799. The oval wing of Swedenborg's machine is comprised of a wooden framework with eight lateral ribs. Both lateral and longitudinal camber are employed, the curvature being maintained by four beams spaced in pairs at right angles to each other. After carefully balancing the craft to ascertain its center of gravity, Swedenborg suggested that a vertical beam measuring about 8' in length be attached to the bottom of the pilot's basket. At the bottom end, a weight of 1 lispund (18.75 lbs) was to be attached to ensure pendulum stability. To support the entire machine, and presumably prevent the central beam from piercing the bottom of the basket, four diagonal beams were apparently attached to the sides of the pilot's basket. Swedenborg states that it "would do no harm" to attach wheels to the ends of the quadruped struts, but he does not specifically indicate they were necessary.

Alas, Swedenborg's flying saucer was never to be built. He did, however, wisely suggest that the aircraft first be tested as a ballasted glider, and that it be launched from a high place. Looking across the chasm of 280 years we can see the practical, as well as the impractical, aspects of his design. His work apparently influenced no one and is all but forgotten by most aerospace historians; but since his day, a number of successful circular planform aircraft have been built and flown.

Although the idea was not to be taken up again for many years, it is worth noting that there were at least a dozen circular, elliptical or annular shaped aircraft designed and/or built in the United States and Canada prior to the First World War. Among them, Dr. Bell's Ring Rite of 1908, Ringert Jongewaard's flying disc of the 1880s, Robert B. Taylor's 1842 design for a convertiplane, George Francis Myers' 1904 annular quadruplane, and the interesting McCormick-Romme "Umbrella Plane" tested at Cicero Field near Chicago from 1912 to 1914. Last year a disc-shaped airship was displayed at Washington, D.C., by a team of Russians for the first time, so it would seem that the idea is far from permanently disappearing from the polymorphic annals of aerospace despite the high aerodynamic drag penalty of circular planforms, particularly at transonic speeds.

The flying saucer, like the "flying house" stories of the late 19th Century and the "Great Airship Flap" of 1896-1897, is based on historical fact which has evolved into distorted cultural mythology. Yes, there are flying saucers, and I for one, am open minded enough to admit that it is entirely possible for life to have arisen on a planet orbiting a distant star. But of all the flying saucers that can be positively identified, they are definitely the products of imaginative human beings, and among those humans is one by the name of Emanuel Swedenborg, an 18th Century man who designed the progenitor of what has become a 20th Century icon.

Notes

* According to *The Prehistory of Flight*, p. 233, footnote 5, Sweedenborg's unit of measurement, the ell, is about 2' (24n). However, *Webster's Third New International Dictionary*, p. 736, states that an ell is 2.25' (27"). Based on the latter, the overall dimensions and areas would be as follows: Oval, 36' * 27', 763.4 sq'; circle, 31.5' dia, 779.3 sq'; square, 28.125', 791 sq'; rectangle, 22.5' * 33.75', 791 sq'. Additionally, the dimensions of the pilot's basket would be 6.75' * 4.5' * 2.25'. The wings would measure 5.625' * 1.6875', 9.5 sq' (ea), and the rod for the pendulum weight would be 9' in length.

Bibliography

Books

- Encyclopedia Britannica, Volume 21 (Spelman-Timmins). Chicago, etc.; William Benton, 1968. pp 503-504.
- Gibbs-Smith, Charles Harvard. Sir George Cayley's Aeronautics 1796 - 1855. London; Her Majesty's Stationary Office, 1962. pp 7-10.
- Hart, Clive, Ph.D. The Dream of Flight: Aeronautics From Classical Times to the Renaissance. London, 1972.
- ibid. The Prehistory of Flight. Berkeley, California; University of California Press, 1985. pp 146-151, 223.
- Swift, E. Swedenborg, The Man and his Works. 1932.
- Sigstedt, C.S. The Swedenborg Epic. 1953.
- Tafel, R.L. Documents Concerning the Life and Character of Emanuel Swedenborg, 3 Vol. 1875-1877.
- Trobrigdge, G. Swedenborg, Life and Teaching. 1944.
- Webster's Third New International Dictionary. Chicago, London, Toronto, Geneva, Sydney, Tokyo, Manila; Encyclopedia Britannica, Inc., 1966. p 736.

Periodicals

- Acton, Alfred. "The Mechanical Inventions of Emanuel Swedenborg." Philadelphia, 1939. pp 20-26.
- "Machine att Flyga i Wardet Enlight Utkast av Emanuel Swedenborg." Stockholm, 1960.
- Odhner, Carl Th. "Swedenborg's Flying Machine." New Church Life, October 1909, pp 582-591.
- Odhner, Carl Th. and Hugo Lj. Odhner. "Suggestions for a Flying Machine." Aeronautical Journal, July 1910, pp 118-122.
- Swedenborg, Emanuel. "Utkast til en Machine at Flyga i Wadret." Daedulus Hyperboreus. 4, October-December 1716, pp 80-83.
- Transactions of the International Svedenborg Congress. London, 1910, pp 45-46.

Miscellaneous Information

- Illinois State Library. Patent Classification Index.
- Stifts-Och Landesbiblioteck. Linkoping, codex 14a, 1714.
- Swedenborg, Emanuel. Opera quaedam aut inedita aut obsoleta de rebus naturalibus I, ed. Alfred H. Stroh (Holmiae 1907), p 226.

Listing of Circular, Annular, Elliptical, Square, Rectangular or Otherwise Oddly Shaped Aircraft Which Have Relevance to the UFO Phenomenon

Name	Configuration	Country	Year
Emanuel Swedenborg	elliptical, etc. h-t-a	Sweden	1714
Robert B. Taylor	circular, h-t-a convertiplane design	US/Britain	1842
Muzio Muzzi	circular (upright) l-t-a propelled balloon	US/Italy	1844
Leteur	circular, h-t-a controllable parachute	France	1852
John Wooton	annular, h-t-a flying machine patent	US, New Jersey	1866
Ringert Jongewaard	elliptical, h-t-a flying machine patent	US, Dakota Territory	1883
F.R. Geshyenda	elliptical, h-t-a "Proekt Paraleta"	Tsarist Russia	1887
John Buegger	circular, l-t-a airship	US?	1888
William Augustus Fyers	annular, l-t-a balloon	US?	1891
William N. Riddle	circular (domed) l-t-a propelled balloon	US, Texas	1892
William Eddy	circular, h-t-a kite	US	1892
Laurence Hargrave	annular (upright) h-t-a tandem kite	Australia	1893
Estanislao Caballero de Los Olivos	elliptical, h-t-a flying machine patent	US, New York	1895
George F. Myers	circular, h-t-a multiplane and patent	US, Ohio	1897-1904
Percy Pilcher	circular, h-t-a "Umbrella Boat/cyclone sail"	Britain	1897
Rev. Burrell Cannon	semi-elliptical, h-t-a "Ezekiel Airships"	US, Texas	1880s, 1902, 1913?
A.G. Bell	annular, h-t-a "Ring Rite"	Canada	1908
D'Equivilley	annular, (upright) h-t-a	France	1908
Givaudan	annular, (upright) h-t-a tandem ring	France	1908
Vermorel	annular, (upright) h-t-a "Givaudan II n hybrid tandem ring triplane	France	1908
Cappazza	elliptical, l-t-a airship	France	1909
Unknown	annular, h-t-a "Safety" annular biplane	Britain	1909
Lt. J.W. Seddon, RN and A.G Hackett Seddon "Mayfly"	elliptical, h-t-a Steel hoops used in construction of tandem biplane	Britain	1909
A.G. Ufnmstev	annular, h-t-a "Sfyeroplan No.1 & Sfyeroplan No.2"	Tsarist Russia	1909-1910
William P. Gary	annular (upright) h-t-a "Flying Barbell n	US, New Jersey	1910
Butler Ames	annular wings h-t-a, magnus effect	US	1910
Amos Wyckoff	circular, l-t-a/h-t-a hybrid flying machine. Two patents, one built. Destroyed by fire.	US	1910-1914
Lee-Richards	annular, h-t-a biplane	Britain	1911

William P. Gary	annular (upright) h-t-a tractor triplane hybrid	US, New Jersey	1911
Edwards	diamond-shaped h-t-a "Rhomboidal" pusher biplane	Britain	1911
Lee-Richards	annular, h-t-a biplane glider	Britain	1912
McCormick-Romme	annular (hexagonal) h-t-a "Umbrella Plane"	US, Illinois	1912-1914
Lee-Richards	annular, h-t-a tractor monoplane	Britain	1913
J. Robertson Porter	annular, h-t-a "Gyropachute" air cushion vehicle	Britain	1913
Paul Malwurm	annular fuselage, h-t-a "Flyworm"	US	1929
L.C. Popper and John B. Guest	annular lift rotors using magnus effect, h-t-a	US	1932
Snyder	square, 1-t-a/h-t-a hybrid	US	1932
Unknown	circular, l-t-a "Whirling Gasbag n	Italy	1932?
Nicholson	square, h-t-a	US	1932
Carl N. Hall	annular, h-t-a propeller enclosed in a huge ring	US	1933
Jonathan E. Caldwell	rectangular blades rotating laterally, h-t-a	US	1933
Luigi Stipa-Caproni	annular fuselage enclosing buried engine, h-t-a	Italy	1933
Nemeth	circular, h-t-a	US	1930s
Lamer	circular, h-t-a	US	1930s
Aarup	semi-elliptical, h-t-a tractor monoplane	US	1935
Moskalyev	semi-elliptical, SAM-9 "Strela", h-t-a tractor monoplane	USSR	1936-1937
Flettner	annular wings using magnus effect, h-t-a	Germany	late 1930s
Vought	semi-elliptical V-173, h-t-a "Flying Pancake"	US	1942
Vought	semi-elliptical XF5U-I, h-t-a tractor monoplane	US	1947-1948
Miles	annular fuselage M-52, h-t-a	Britain	1947-1948
Leduc	annular fuselage, 0.10/0.16, h-t-a	France	1949
Leduc	annular fuselage 0.21/0.22, h-t-a	France	1953
Hiller	annular rotor duct XONR-I flying platform, h-t-a	US	1955
Convair	circular wing design studies, h-t-a	US	1950s
Doak	annular propeller ducts VZ-4DA, h-t-a	US	1958
SNECMA	annular fuselage Coleopetre C.450-01, h-t-a	France	1959
Avro (Canada)	annular, h-t-a VZ~9Z "Avrocar n	Canada/US	1960
Piasecki	semi-annular, h-t-a VZ-8P n Airgeep II n	US	1962
Aero Rinetics	annular, h-t-a	US	1963
Northrop	elongated cone HL-10 lifting body, h-t-a	US	1966
Northrop	elongated cone M2-F1/2 lifting body, h-t-a	US	1965-1966
Bell	annular rotor ducts X-22A, h-t-a	US	1966

NORD	annular rotor ducts 500, h-t-a	France	1968
Boeing/Grumman	circular radome AWACS, h-t-a	US	mid-1960s - current
Martin Marietta	elongated cone X-24A lifting body, h-t-a	US	1970
Martin Marietta	elongated cone X-24B lifting body, h-t-a	US	1973
Skyship Enterprises	circular, l-t-a airship	Britain	1974
Lockheed	annular wing design for an airliner	US	late-1970s
Mr. Six?	annular, h-t-a Model seen at Oshkosh n Flymart n	US?	1980?
Unknown	circular, l-t-a Displayed in Washington, DC	Russia/CIS	1994
Howard Menger	circular UFO model HMX-I-1951 designed by 1950s alien "contactee" Howard Menger	US	1951?

Addenda

Cayley	"Governable Parachute"	1852-1853
Convair	circular, n-t-a GEM Ground Effect Machine	1960
Avro	circular, h-t-a WSGOGA	1960
NC Price 1	U.S. Patent #3,103,324	1963
Lockheed	09-10-63, Circular High Altitude, High Velocity VTOL Aircraft	
Sikorsky	annular, "cypher" h-t-a	1988-present
Paul Moller	multiple annular "skycar" u200x	1980s-present
Jesse A. Bird?	elliptical reconstruction of Swedenborg's original design	1897
Lockheed	modified elliptical GTD-21B hypersonic rpv	Mid-1960s

[Wesley Smith is a Springfield native with a Ph.D. in American History from George Washington University. He is an aerospace historian who has received two fellowships at the National Air and Space Museum, is the Chief Archivist for the Wright Brothers Foundation, and was recently appointed to the Congressional Committee for the 2003 Wright Brothers Centennial. Smith is currently doing research for a forthcoming book cataloging early American heavier-than-air flying machines.]