

Utah Aereon Corp. – Leslie Warner’s *Aereon SA-1*

Peter Lobner, 9 September 2023

1. Introduction

In the mid-1970s, Salt Lake City resident Leslie Warner began researching the Civil War-era *Aereon* airship designs of Dr. Solomon Andrews, which incorporated variable buoyancy control systems that enabled the airship to be propelled without an engine or motor. Instead, Andrews’ airships were propelled by aerodynamic forces arising from buoyancy-driven lift and gravity-driven descent.



Warner had worked as an engineer most of his life for Morton Thiokol during the shuttle program. He founded Utah Aereon Corporation in May 1977 to build a modern *Aereon* airship of his own design. His airship was comprised of two side-by-side cylindrical envelopes that were joined by a lightweight rigid structure that carried a suspended piloting station under the envelopes and also supported the rudder.

Leslie Warner
Source: *Salt Lake Tribune*

Warner identified potential applications for his nearly silent *Aereon*, including search and rescue in surrounding mountains, where the pilot could fly low and slow and possibly hear cries for help, and wild animal surveys.

It appears that the *Aereon* originally was being readied to fly in early 1979. However, a significant design change was implemented and the first flight didn’t occur until late 1980. Warner’s work on *Aereon* in 1979 and 1980 was the subject of several local newspaper articles. No subsequent articles on *Aereon* were found in the following years, so the first flight in 1980 may have been its only flight.

2. The original design, circa early 1979

On 8 February 1979, a Salt Lake Tribune article by Anne Wilson described the *Aereon* while it was in the “final stages of construction,” with a first flight anticipated the following month, in March 1979.

“He’s (Warner) now in the process of finishing construction of his *Aereon*’s parts, which include a number of nylon bags, a rudder, several aluminum cross-members and a basket or some other type of control seat.”

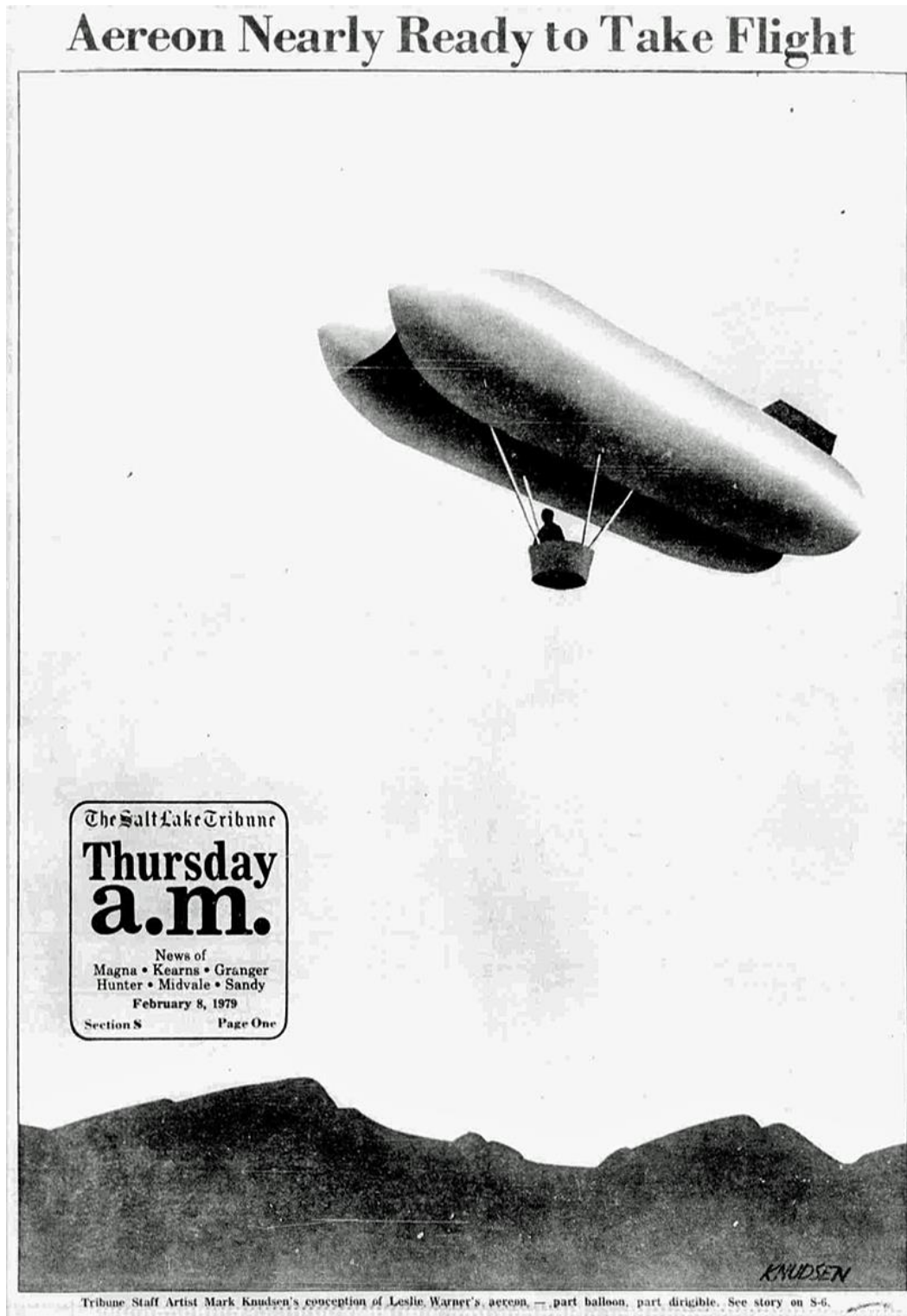
“The initial craft, he (Warner) says, will be 78 feet long and 24 feet wide, and consist of two main cylinders containing helium-filled bags. Under those bags will be an air bag, both of which comprise the craft’s (variable) ballast system.”

“To raise and lower the *Aereon*, the airbags will be filled by the action of a gasoline-powered motor. As the volume of air increases and the helium is compressed by the pressure of the air, the increased weight of both substances will bring the craft down.”

The “airbags” in the original design fit along the bottom of the two cylindrical envelopes and functioned as a ballonet to maintain a positive pressure within the envelopes. It appears that the airbags also could take on enough air to serve as an effective air ballast system and control overall buoyancy. Higher pressure air was supplied to the ballonet by an on-board engine-driven blower, and, presumably, a vent path was available to reduce the pressure, and hence, the volume of air, in the ballonet when needed.

When the ballonet volume is relatively small, the airship would be positively buoyant. As it gained altitude, airflow over the cylindrical envelopes would generate aerodynamic lift and a net forward thrust vector. When the ballonet is filled with air, the airship would be heavier-than-air and it would descend under the influence of gravity while airflow over the cylindrical envelopes would continue to generate aerodynamic lift and a net forward thrust vector. Continuing this cycle would result in a sinusoidal flight path and continuing forward flight.

This version of the Aereon did not fly in 1979.



*Rendering of Leslie Warner's Aereon by staff artist Mark Knudsen.
Source: Salt Lake Tribune (8 Feb 1979)*

3. The flight test version, circa late 1980

Aereon made its first flight in October 1980. From local newspaper reports it was apparent that Warner had implemented a different approach to variable buoyancy control than previously described. The Lehi Free Press reported:

“Control is done by the pilot by changing the pressure of the helium in the cylinders by a system of cables, pulleys and a winch” (which changes the volume of the gas envelopes).

Warner noted that, with this system, the pilot can fly a predetermined course by varying aerostatic lift to alternately ascend and descend, using lift and gravity to propel the *Aereon* across the sky. This type of variable buoyancy propulsion was first demonstrated in 1866, when Dr. Solomon Andrews twice flew his hydrogen-filled *Aereon 2* airship over New York City. These flights were about three years after Andrews first demonstrated variable buoyancy propulsion in 1863

On Warner’s *Aereon*, four adjustable cables were placed around each gas envelope and were used to control the volume of the two envelopes. The cables would be eased to allow the envelopes to expand and displace a greater volume of air, thereby generating more aerostatic lift. As the airship gained altitude, airflow over the cylindrical envelopes would generate aerodynamic lift and a forward thrust vector for propulsion.

To descend, the cables would be drawn in with a winch to compress the envelopes, thereby reducing aerostatic lift and allowing the airship to descend under the influence of gravity. Airflow over the cylindrical envelopes would continue to generate aerodynamic lift and a forward thrust vector

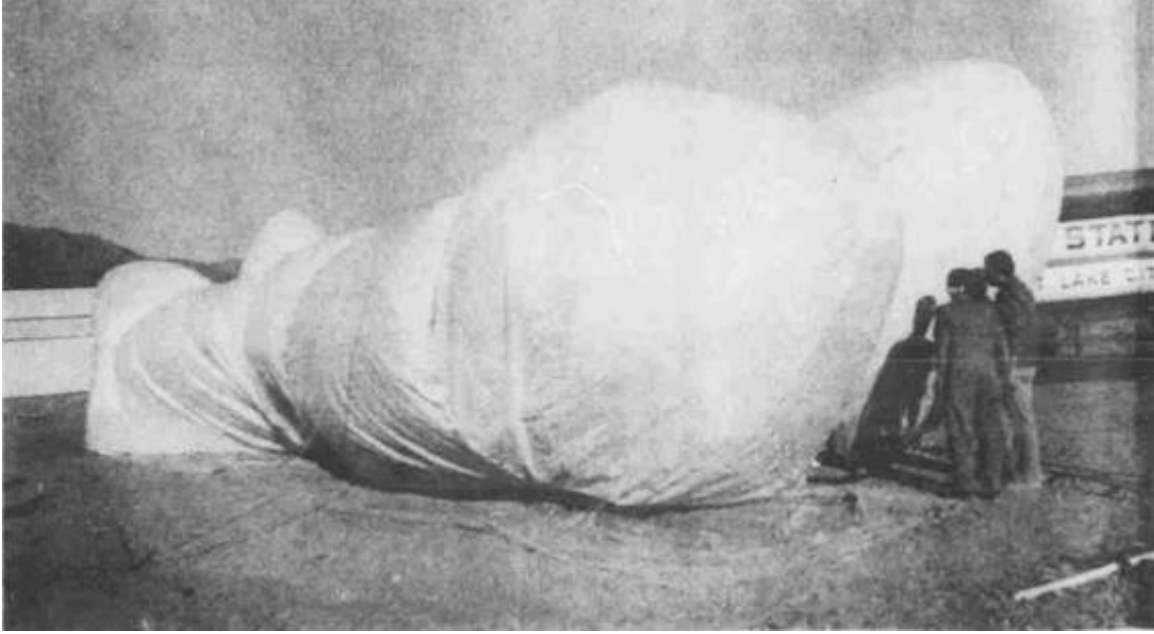
The *Aereon*’s flight instrumentation included an altimeter, an air speed indicator, a compass and a variometer, which indicates rate of ascent / descent.

General characteristics of the Aereon SA-1

Parameter	Aereon SA-1
Type	Non-rigid, twin cylinder hull, variable volume, variable buoyancy airship
FAA registration	N8038Q
Lifting gas	Helium
Envelope	<ul style="list-style-type: none"> • Two cylindrical, ripstop nylon, pressure-stabilized, non-rigid shells with conical nose and tail cones & metalized mylar lining. • Each cylindrical gas envelope contains five helium gas cells.
Rigid keel	A centerline aluminum keel & cross-members secure the two cylindrical gas envelopes, the buoyancy control system hardware (cables, pulleys & winch) & also support the suspended pilot & ventral rudder.
Volume, variable	396 to 481 m ³ (14,000 to 17,000 ft ³)
Length, each cylinder	23.8 m (78 ft)
Width, each cylinder	3.7 m (12 ft)
Height, each cylinder	1.8 m (6 ft)
Width, overall	7.3 m (24 ft)
Aerodynamic controls	Single rudder under the gas envelopes
Buoyancy control	Pilot adjusts the volumes of the two cylindrical gas envelopes with a system of cables, pulleys and a winch.
Payload	> 181 kg (400 lb)
Accommodations	<ul style="list-style-type: none"> • Pilot sits beneath the twin-cylinder gas envelope in a hang glider seat. • Other seats could be added for passengers, but this was not implemented
Altitude, demonstrated	About 15.2 m (50 ft) AGL
Altitude, max (est.)	3,505 m (11,500 ft)

Sources: Abstracted from several newspaper sources, circa 1979 – 1980.

The *Aereon* was ready for its first flight in October 1980. Warner reported that the cost to build the craft, not including labor, was about \$14,000, which was raised from his own investment and the investment of shareholders in Utah Aereon Corp



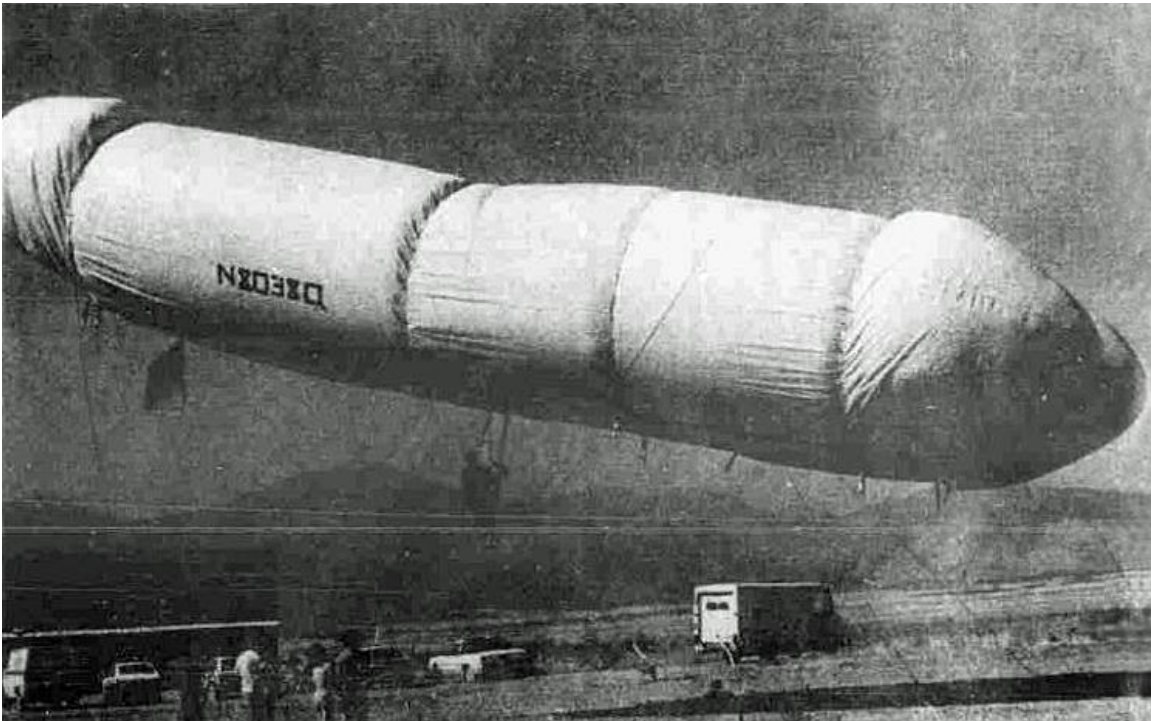
*Starting inflation of Aereon's twin gas envelopes.
Source: Lehi Free Press (16 October 1980)*



*Leslie Warner tries out the pilot's seat on the Aereon
(based on a hang glider pilot seat).
Source: The Salt Lake Tribune (13 October 1980)*

The first tethered flight was conducted on Friday, 10 October 1980. The Lehi Free Press reported:

“The craft was tested at the Cedar Valley Airport, with (Mick) Elkins (a Lehi balloon pilot) doing the tests. He said he flew the Aereon to a height of 50 feet or so on a tether line, making it turn right, and left, and go up and down as well as forward into the wind. ...It was great. ‘We proved the theory will work,’ he said.”



*The Aereon on its first flight. Note the four constrictions around the starboard envelope, showing the locations of the volume-adjusting cables.
Source: The Lehi Free Press (16 October 1980)*

A subsequent free-flight on Saturday, 11 October 1980 was cancelled because of windy conditions and leaks in the balloons. The Salt Lake Tribune reported, “Future flights of an experimental helium powered Aereon will be scheduled pending approval by the Federal Aviation Administration and further adjustment on the craft.” Warner remarked, “We won’t try to fly it anymore this year. We have taken it apart and will take the lessons we have learned and go from there. Maybe next year.”

I have not been able to find any published reports of Aereon flights after 10 October 1980. However, the following two photos with hand marked captions and the date "1981" were [posted on Quora](#) by a Warner family member and re-posted on [The Aerodrome website](#). It isn't known if these photos actually show a flight in 1981 with Leslie Warner piloting, or, perhaps, they show the 1980 flight and were incorrectly captioned years later.



Aereon being inflated at Cedar Valley Airport, 1981



Aereon being flown by Leslie Warner at Cedar Valley Airport, 1981

The fate of the Leslie Warner's *Aereon* airship is not known. Its FAA registration number, N8038Q, was later abandoned and reassigned in 2002 to the first of multiple aircraft to reuse that registration. Leslie Warner passed away in 1998.

4. For more information

- Anne Wilson, "Aereon Nearly Ready to Take Flight," *The Salt Lake Tribune*, pp. 98, 103 & 108, 8 February 1979:
 - <https://newspapers.lib.utah.edu/details?id=28752580>
 - <https://newspapers.lib.utah.edu/details?id=28752585>
 - <https://newspapers.lib.utah.edu/details?id=28752590>
- "Aereon Flights Awaiting FAA," *The Salt Lake Tribune*, p. 32, 13 October 1980:
<https://newspapers.lib.utah.edu/details?id=27626256>
- Sharon Morrey, "New Aircraft Flies in Cedar Valley," *Lehi Free Press*, pp. 1 & 2, 16 October 1980:
 - <https://newspapers.lib.utah.edu/details?id=23383733>
 - <https://newspapers.lib.utah.edu/details?id=23383734>
- Alfred Montestruc, "What should be the minimum size of a zeppelin to carry one person?" Quora, updated circa 2020:
<https://www.quora.com/search?q=alfred%20Montestruc%2C%20airship>
- "Pioneer Aviation," *The Aerodrome*, posted by Aerohydro, circa September - October 2020:
<http://www.theaerodrome.com/forum/showthread.php?t=71784&page=4>

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
 - Voliris – variable volume airships
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
 - David Bimbat & Ural OKBD - variable volume airships
 - Hunt Aviation – Gravity plane
 - New Mexico State University – AHAB
 - Phoenix - VB propelled airship

- Solomon Andrews - *Aereon* & *Aereon 2*
 - Walden LTAS - VB propelled airships
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>