# Aquarian Airship

Peter Lobner, 8 February 2022

## 1. Introduction

The solar-powered Aquarian Airship were conceived around 2010 by Marshal Savage and The Millennial Project 2.0 (TMP2) team as a key transportation link in a hypothetical, distributed global marine settlement known as the Aquarian Colony. A variant of these airships would be configured as the Aquarian Aerostat to serve as high altitude communications platforms linking the extended colony. You'll find the TMP2 article on these airship concepts, the colony and the associated global transportation system at the following link: https://tmp2.fandom.com/wiki/Aquarian_Airship

As envisioned by TMP2, the Aquarian Airship and Aerostat are derivatives of the solar powered, variable buoyancy, vertical takeoff and landing (VTOL), lenticular airships designed from the 1970s to the 1990s by Michael Walden for his firm Lighter Than Air Solar (LTAS) and its successor firm Walden Aerospace. Viewed from overhead, the Aquarian Airships have an elliptical profile rather than the round profile of the Aquarian Aerostat and Walden's toroidal airships.

Key features of the Aquarian Airships include:

- Rigid, composite hull with a geodesic space-frame structure
- VTOL, enabled by the variable buoyancy system based on Michael Walden's Density Controlled Buoyancy (DCB) active buoyancy control system.
- Solar powered via an integral photovoltaic skin on the top surface of the hull
- Hybrid power system combining solar electric power with supplemental power from fuel cells or micro-turbines burning hydrogen or methanol fuel and providing battery storage
- Propulsion and flight control with electric powered thrusters
- Solar-only economic cruise at 50 – 60 mph (80.5 – 96.5 kph), or higher speed operation with supplemental power

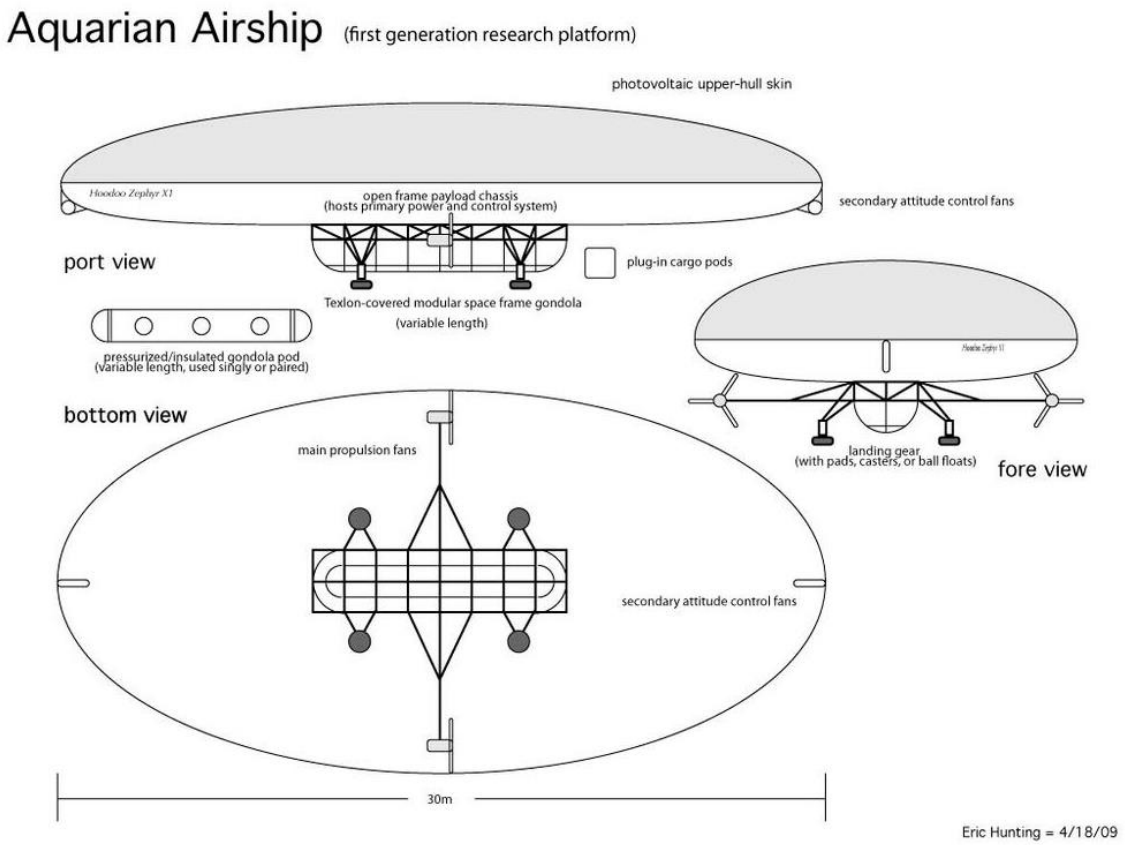
- Unlimited range at economic cruise speed, or range limits as a function of higher cruise speed
- Large central payload bay, configurable for passengers and/or cargo
- Rapid passenger / cargo loading and unloading, enabled by the variable buoyancy / DCB system. No ballast is exchanged with a ground facility.
- A trim control system manages the airship's center of gravity.

## 2. First generation prototype Aquarian Airship

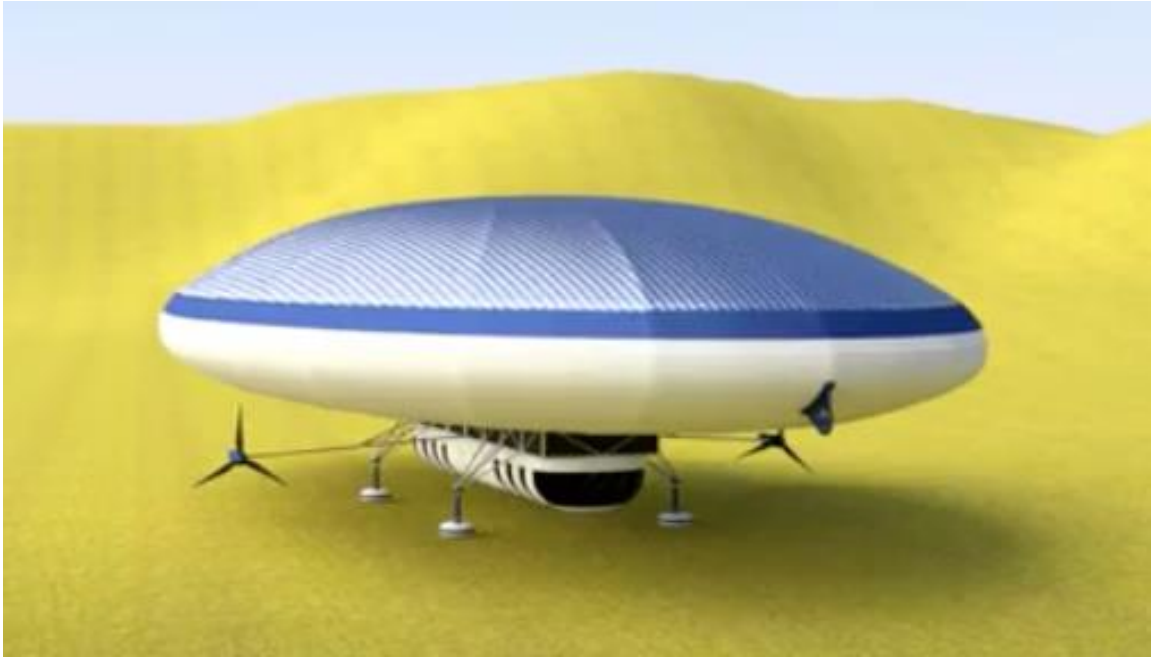
The 30-meter (98.4-ft) long first generation Aquarian Airship had a simple, large, open frame gondola under the rigid aeroshell for carrying passengers and light payloads. Two outrigger propellers supported from the gondola provide propulsion. Lateral thrusters at the nose and tail of the aeroshell provide directional control.

*A preliminary rendering of the 1st-generation airship, without the bow (and stern) lateral thruster(s). Source: TMP2*

A short (0:33 minute) 2012 animation showing the first generation airship can be viewed here:
https://www.youtube.com/watch?v=ZBfmvBGbh-Q




*1st-generation Aquarian Airship. Source: TMP2*



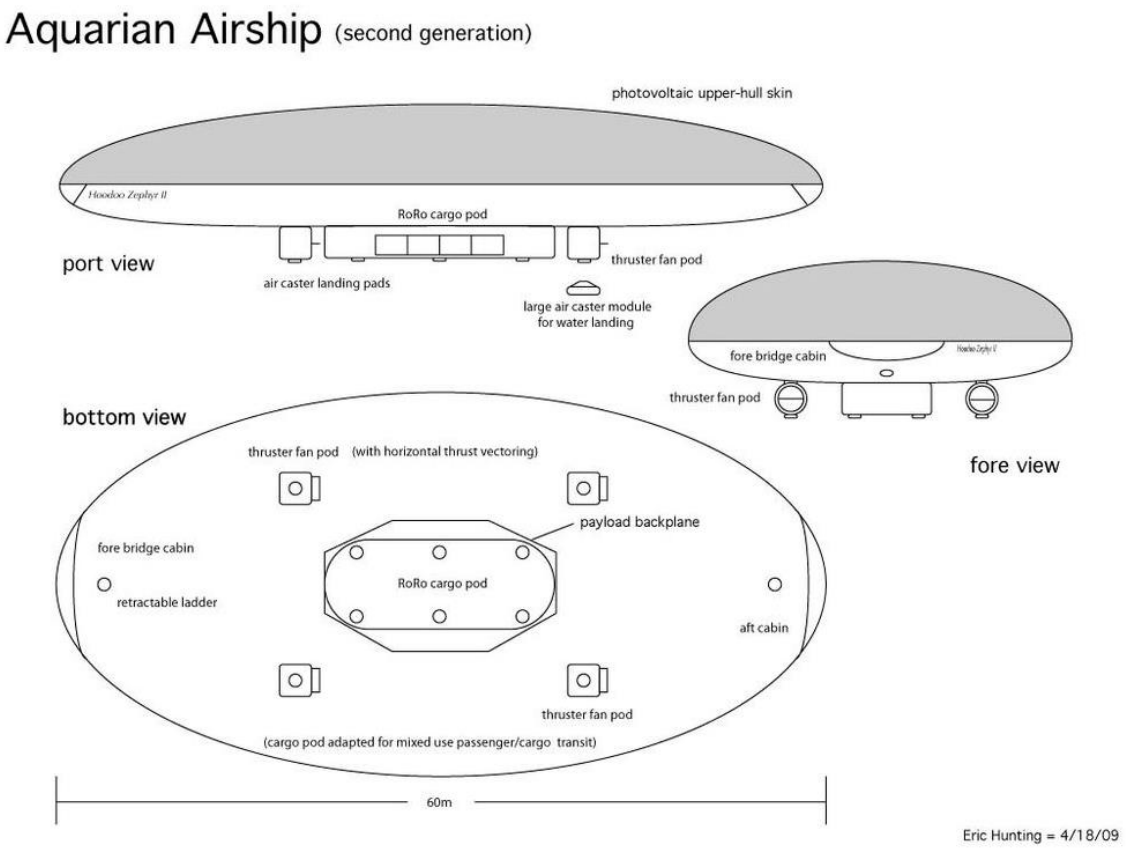
*1st-generation airship.*
*Source: Screenshot from TMP2 video*

*Rendering of a 1st-generation Aquarian Airship. Note the cantilevered main propellers and the nose lateral thruster. Source: Screenshot from TMP2 video*

## 3. Second generation Aquarian Airship

The 60 to 102-meter (196.8 to 393.6-ft) long second-generation airship was designed as a “workhorse” carrier in which heavy cargo and passengers were loaded via ISO-sized modules that were suspended from overhead rails to distribute the heavy loads into the rigid aeroshell structure. The floor of the payload bay did not carry the heavy load of the payload. Using standardized modules, loading and unloading could be accomplished quickly. Similar cargo handling features have been employed by Aereon Corporation for their Dynairships and Ohio Airships for their Dynalifters.

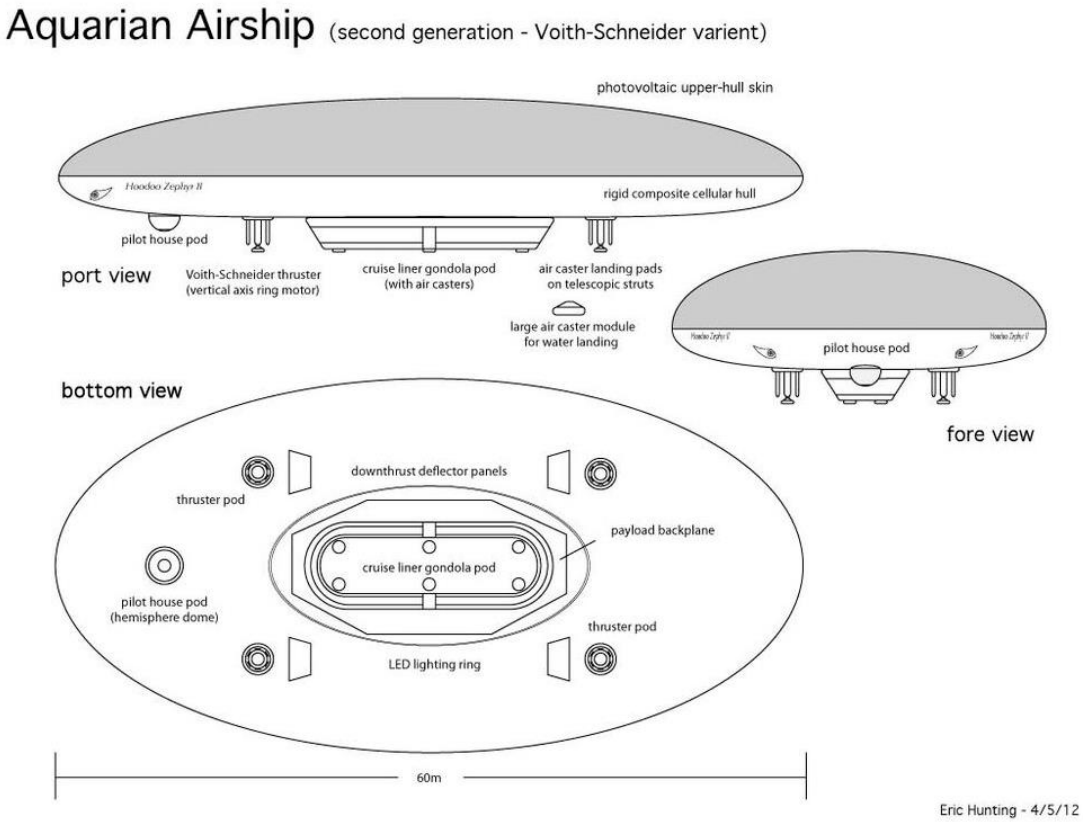
In the early version, propulsion and directional control were provided by four 360º vectorable ducted fan thrusters flanking the gondola under the aeroshell.



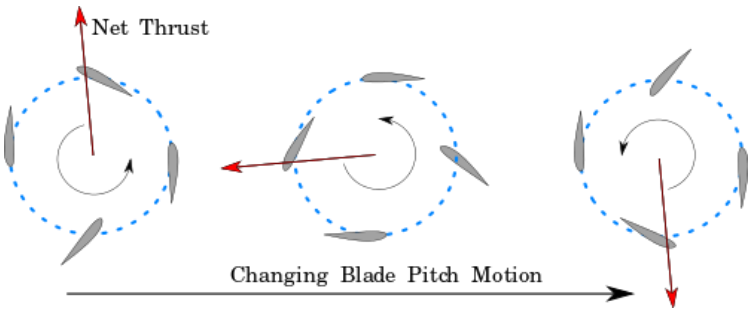

*Early 2nd-generation Aquarian Airship with ducted fan vectoring thrusters. Source: TMP2*

This airship would have an air cushion landing system to provide mobility on the ground. This system would likely be functionally similar to the systems installed and tested in the mid-1990s on the Lockheed-Martin P-791 and the Aeros *Dragon Dream* airships.

A later version of the second generation Aquarian Airship used four vertically-oriented cycloidal propellers that can adjusts their blade pitch to provide almost instant vectored thrust in any direction perpendicular to its axis of rotation.




*2nd-generation airship with cycloidal propellers. Source: TMP2*




*Cycloidal propeller delivering vectored thrust by changing blade pitch angle. Source: Wikipedia*

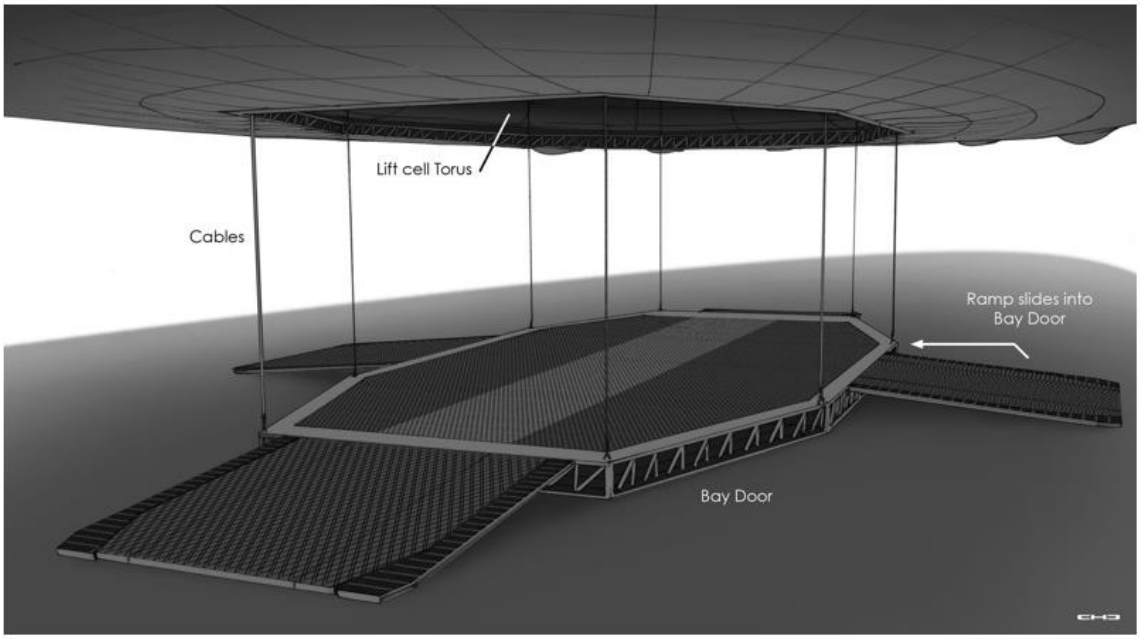
## 4. Third generation Aquarian Airship

The third-generation airship was designed to be scalable to many sizes and applications, from small ‘yachts’ to very large passenger and/or cargo carrying vessels. This airship would have an advanced nanofiber composite hull with integral, electrically-powered fans for propulsion and compressed air jet thrusters for directional control.

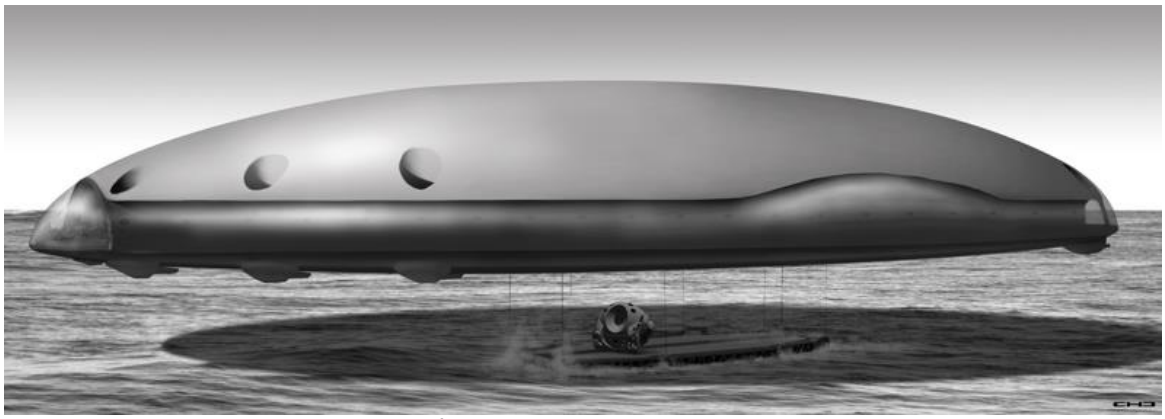
The TMP2 team speculated, “With the advent of nanofiber membranes, this may lead to the use of vacuum lift technology based on tensegrity membrane cells that can tolerate evacuation at sea level and thus serve as an even more efficient form of lighter-than-air system than any gas.” If it were developed, this vacuum lift system would replace the DCB system in the first & second generation airship designs.

The third-generation airship has a long, open, internal bay along the centerline of the hull, with a large skylight above the bay. This multi-purpose space would enable the airship to be configured for a variety of missions. For example:

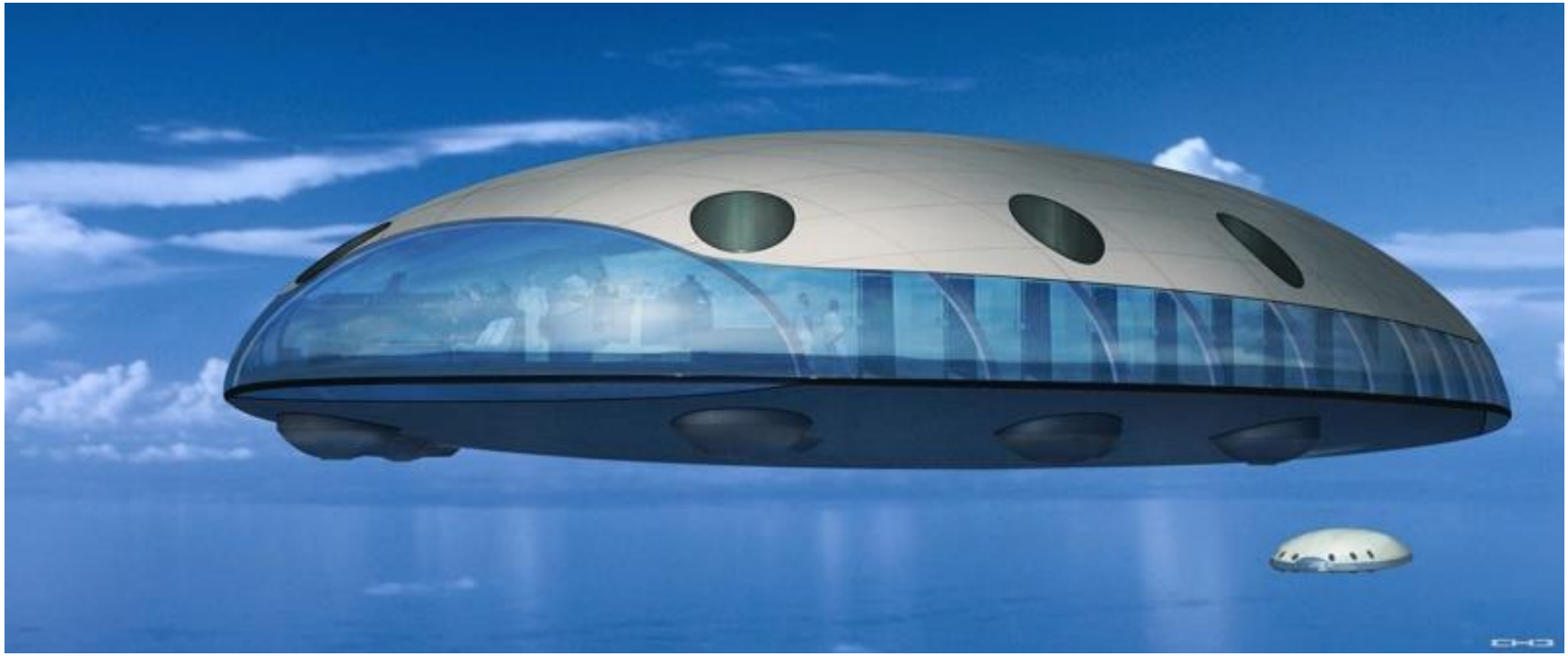
- An overhead crane, supported from an overhead space frame structure, would lift modular cargo containers with top-mounted attachment points and large, indivisible cargo items into the payload bay, where the cargo will be supported from the overhead space frame and secured for flight. Operation as a sky-crane and lifting or delivering cargo from a hover would be possible.
- A flush-mounted cargo deck could be used for roll-on / roll-off (Ro-Ro) cargo handling. The deck would be lowered on telescoping pylons or cables and deploy ramps for cargo transfer, and then lifted back up into the hull and locked rigidly in place.
- A “cruising” passenger module could be installed under the bay like a large, conventional airship gondola. The internal bay space could be converted into an atrium like that in a hotel or cruise liner with a large skylight on top and space for restaurants and lounges, supplementing the passenger space in the gondola.



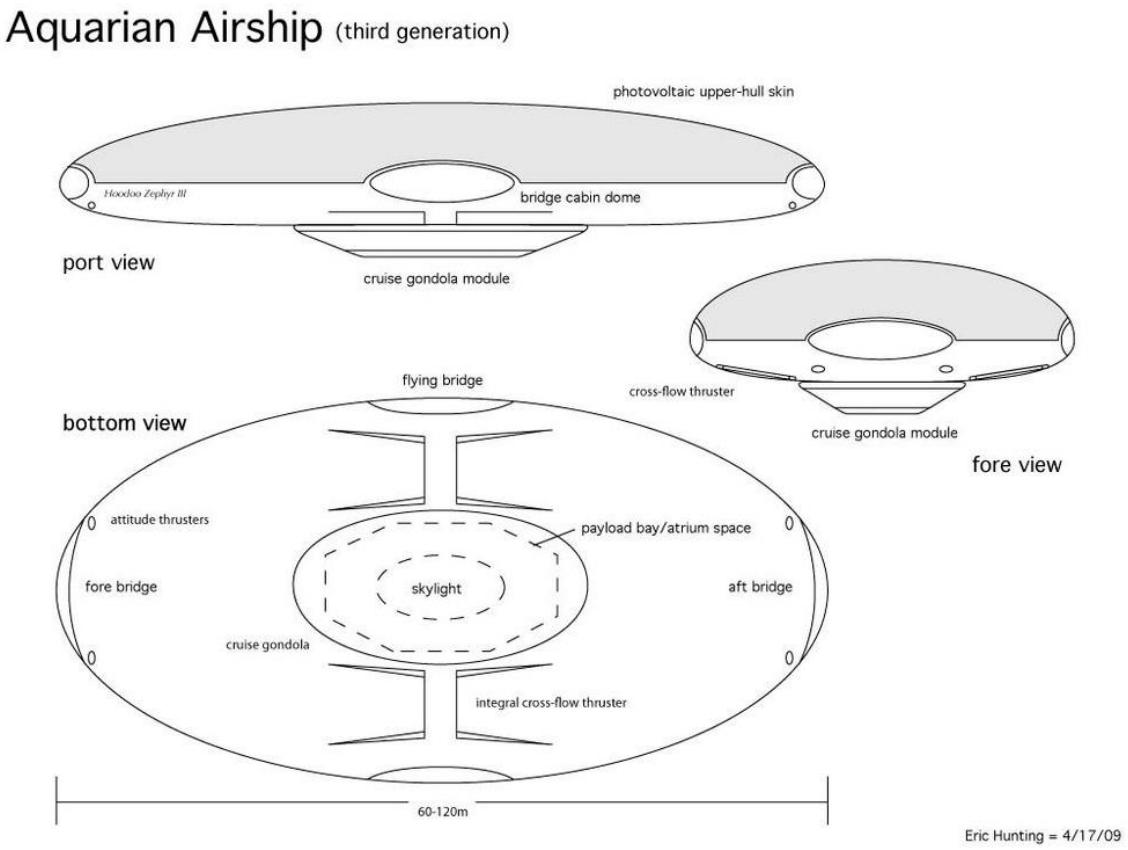

*3rd-generation Aquarian Airship can be equipped with a retractable Ro-Ro cargo deck. Source: TMP2*



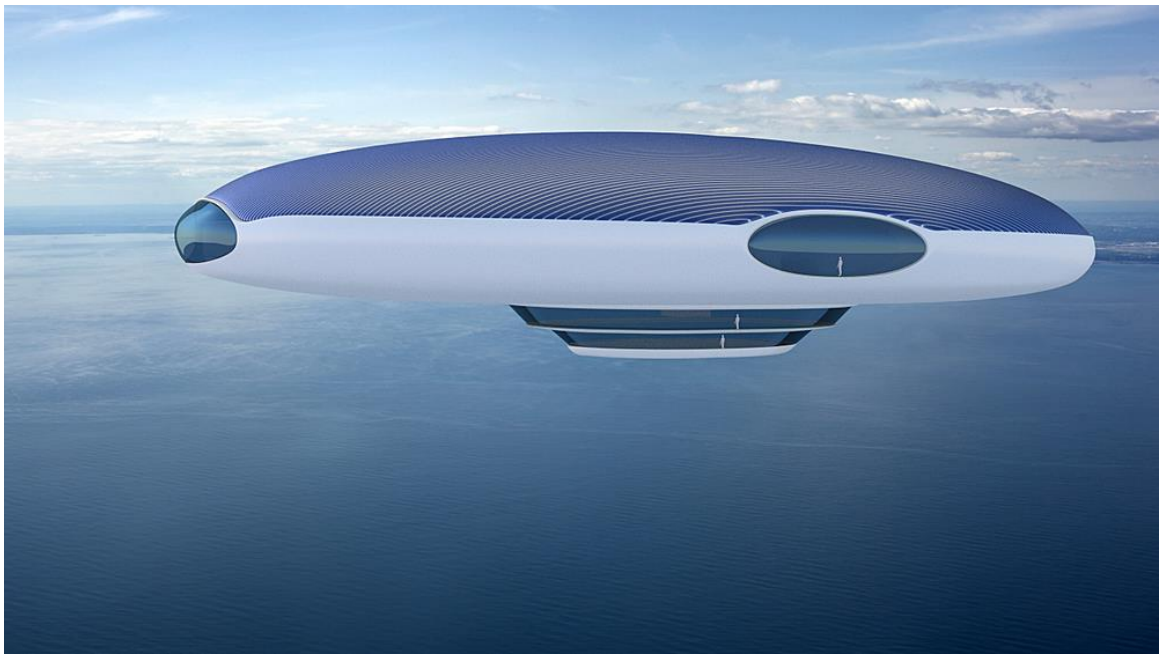
*An early version of the 3rd-generation Aquarian Airship hovering and conducting an at-sea rescue with its retractable Ro-Ro cargo deck. Source: TMP2*



*The early version of the 3rd-generation Aquarian Airship is recognizable by its vertical ducted turret thrusters. It is shown here in its "enclosed bay flight mode," without a "cruising" passenger module installed under that aeroshell. This configuration primarily carries freight, but also includes a few modest cabins for passengers. The hull features a "window ribbon" along the perimeter edge corridors linking the fore and after bridge cabins. Source: TMP2*

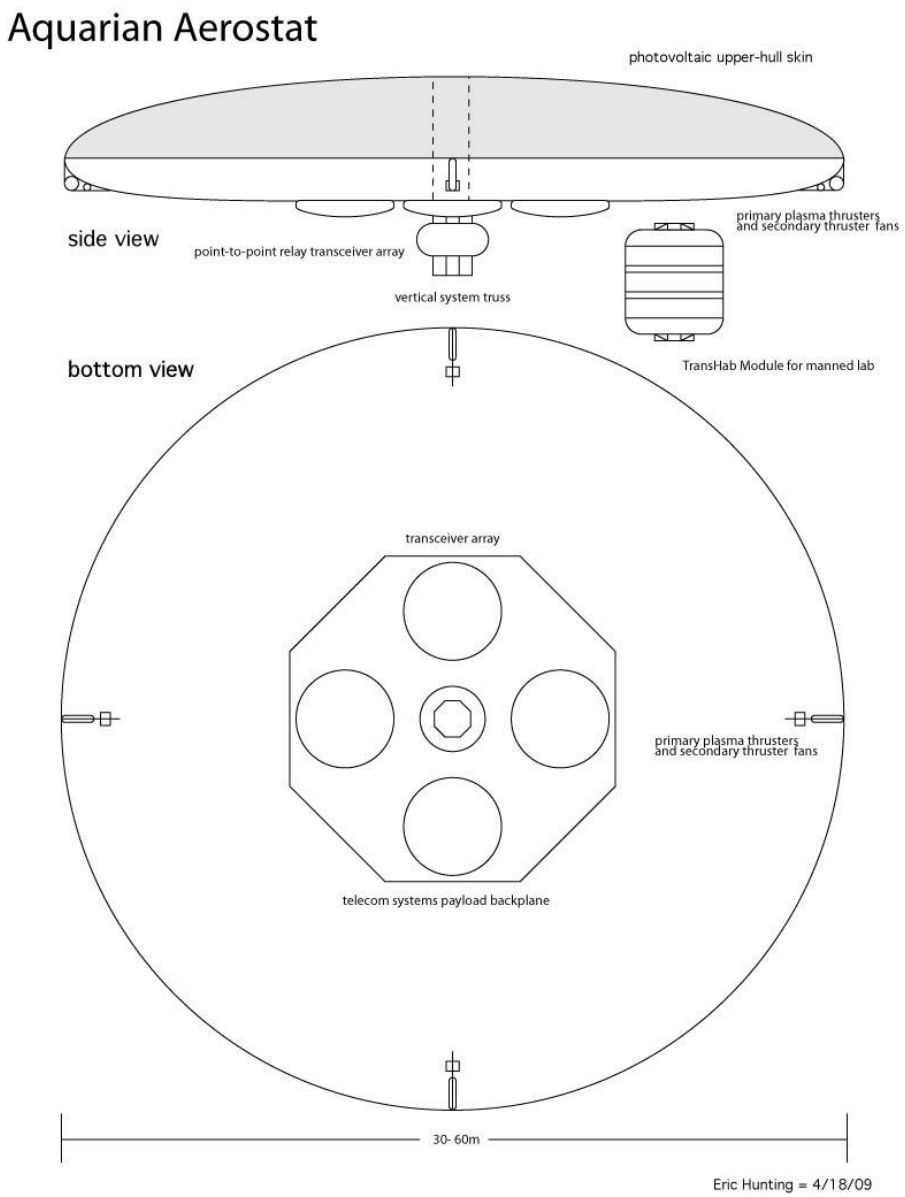



*A later version of the 3rd-generation Aquarian Airship with the "window ribbon" removed and a "cruising" passenger module installed under that aeroshell. Source, both graphics: TMP2*



## 5. Aquarian Communications Aerostat

The 30 to 60-meter (98.4 to 196.8-ft) Aquarian Aerostat high altitude telecommunications platform is a lenticular airship that is a smaller, but functionally and physically similar version of the Sub-Orbital Solar Collection and Communications Station (S.O.S.C.S.) designed in the late 1970s by Michael Walden / LTAS. A network of Aquarian Communications Aerostats would be deployed to link the extended Aquarian Colony.




*Aquarian Communications Aerostat. Source: TMP2*

## 6. For more information

- "The Millennial Project 2.0 - Aquarius - Aquarius Seeds, Aquarius Supporting Technologies, Aquarian Airship, Aquarian Bounty, Aquarian Colony Design Con," Books LLC, Wiki Series, ISBN-13: 978-1-234-78092-0, October 2012: https://www.loot.co.za/product/source-wikia-the-millennial-project-2-0-aquarius/mkgh-1913-g390

**Video**

- "Aquarian Airship Prototype Takeoff Animation," (0:33 minute), posted by Kakaze, 4 December 2012: https://www.youtube.com/watch?v=ZBfmvBGbh-Q

**Other *Modern Airships* articles**

- *Modern Airships - Part 1*: https://lynceans.org/all-posts/modern-airships-part-1/
    - Aereon Corp - Dynairships & Aereon 26
    - Aeros - Dragon Dream
    - Lockheed Martin - P791
    - Ohio Airships - Dynalifter
    - Walden / LTAS - Lenticular toroidal DCB airships
- *Modern Airships - Part 2*: https://lynceans.org/all-posts/modern-airships-part-2/
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/