

Lazzarini Design Studio – Air Yacht

Peter Lobner, 8 February 2022

1. Introduction

The Italian firm Lazzarini Design Studio was founded in Rome in 2010 by designer Pierpaolo Lazzarini. The firm describes itself as “a



team of designers, engineers and dreamers which extends the design process from the automotive industry to the yachting world..... We provide full development (concepting, modeling, texturing, animation, programming and engineering) of applications based on high quality 3D real-time visualization.” The firm’s website is here:

<https://www.lazzarinidesignstudio.com>

In early January 2022, the Lazzarini Design Studio revealed their stunning design concept for a very large, solar-powered trimaran airship, aptly named the Air Yacht, which is intended as a custom airship for a private owner.

The solar-powered Air Yacht is designed for vertical takeoff and landing (VTOL), hovering, and long range flight at speeds up to 60 knots (111 kph / 69 mph), comparable to the speed of other modern airships. The Air Yacht can fly almost anywhere in the world within its limits of endurance (48 hours at max speed) and set down on land or water. This would give it enough range to fly Boston-to-LA or Boston-to-London, while operating with zero carbon emissions.

The Air Yacht design concept is a work-in-progress, and Lazzarini is continuing to develop this design. By late January 2022, Lazzarini released renderings of their version 2 design, which retains many of the features of version 1, but has evolved into more of a catamaran shape, with a less pronounced center body.

The Air Yacht project is presented on the Lazzarini website at the following direct link:

<https://www.lazzarinidesignstudio.com/the-air-yacht>



*Rendering of the trimaran Air Yacht version 1.
Source: Lazzarini Design Studio (circa late 2021)*



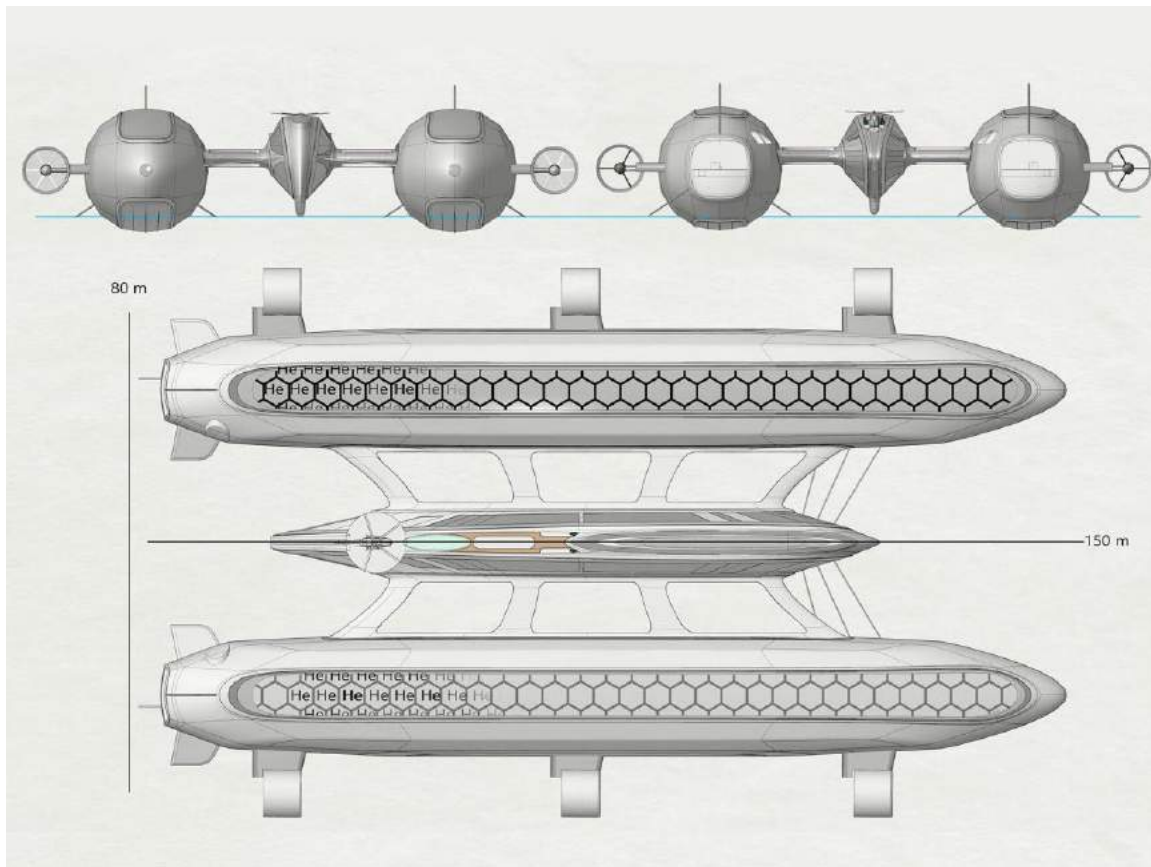
*Rendering of the catamaran Air Yacht version 2.
Source: Lazzarini Design Studio (circa late Jan 2022)*

More details on the Air Yacht versions 1 and 2 are provided in this article, with the aid of annotated Lazzarini graphics. I am grateful to Lazzarini Design Studio for their thoughtful input for this article.

2. The Air Yacht version 1 trimaran airship (circa late 2021)

The Air Yacht version 1 was Lazzarini's first iteration of their evolving design concept for a lighter-than-air, solar-powered hybrid airship yacht that could operate with zero carbon emissions while delivering an unparalleled travel experience to the owner and about 20 guests.

The Air Yacht version 1 design was a trimaran airship comprised of two large, slender, cylindrical airship hulls that form the “outriggers” of the trimaran. These outboard hulls are joined via four carbon fiber bridges and tensioning cables to a streamlined, rigid, carbon fiber center hull. The “outrigger” airship hulls are of semi-rigid construction, with an internal carbon fiber structural framework to carry static and dynamic loads.

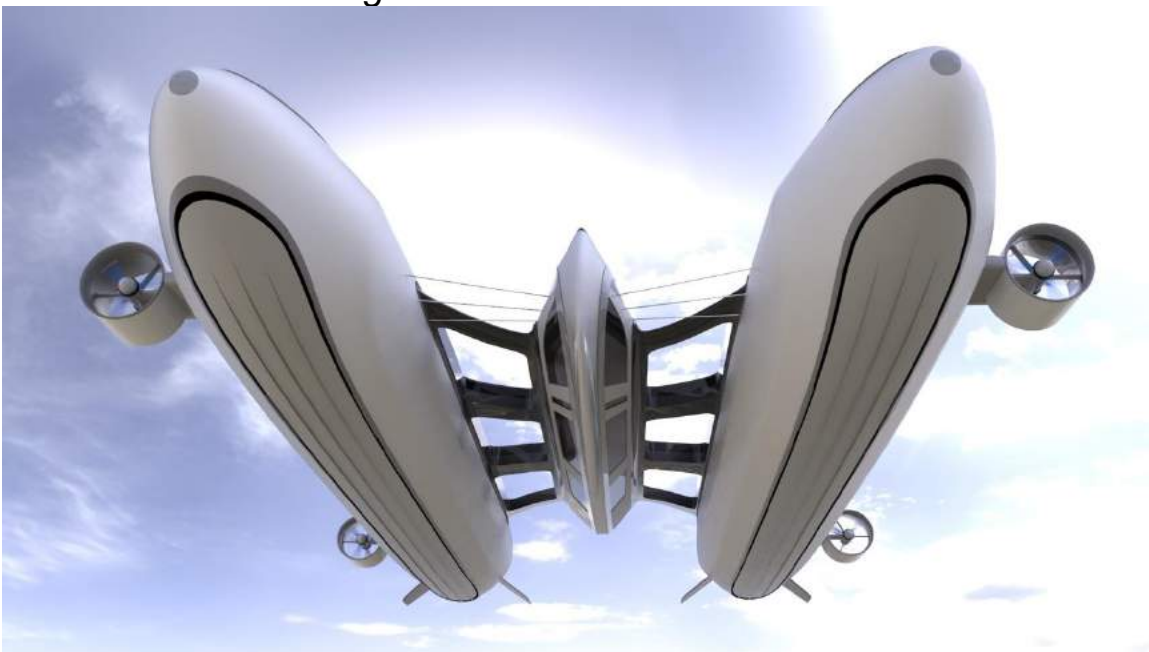


Three-view drawing of the Air Yacht version 1. Note that this drawing shows three propulsors per side; the renderings of the Air Yacht version 1 all show two propulsors per side in an otherwise identical configuration. Source: Lazzarini Design Studio (circa late 2021)

Version 1 in flight

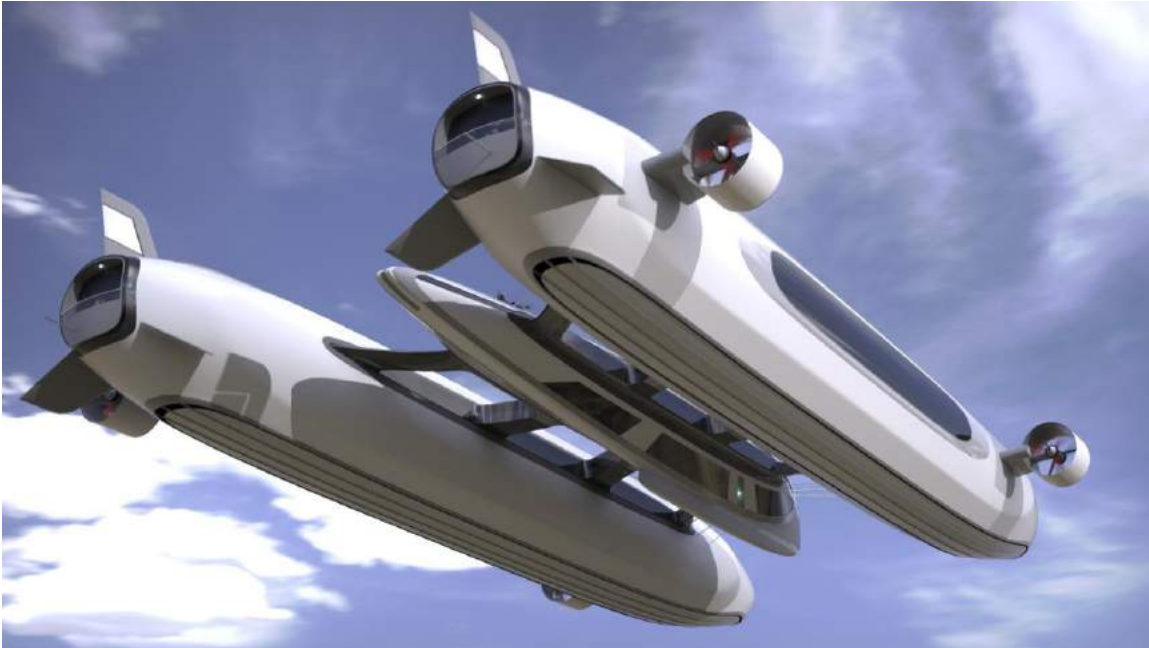


Bow quarter rendering showing the showing the large solar arrays on two outboard hulls and the placement of the fore and aft propulsors along the mid-line of the outer hull.



Bow-on rendering of the Air Yacht viewed from below showing the four carbon fiber "bridges" and tensioning cables that join the outboard hulls to the central hull.

Source, both graphics: Lazzarini Design Studio (circa late 2021)

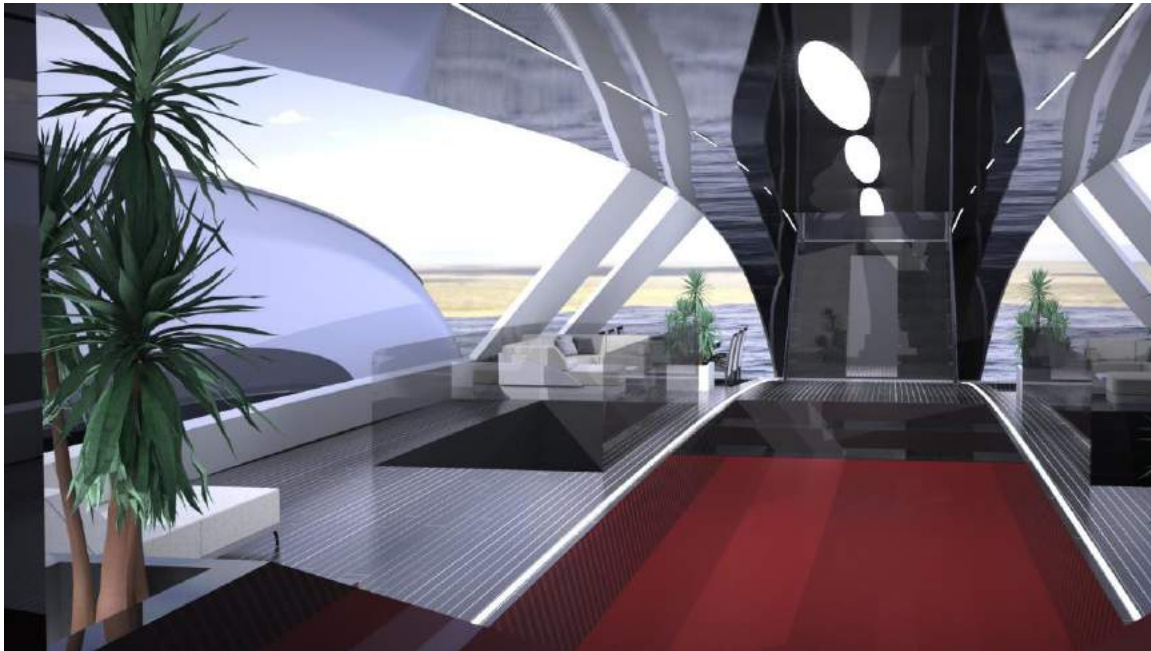


*Stern quarter rendering of the Air Yacht viewed from below.
The grey-shaded area along the bottom of the outboard hulls is an
inflatable “basement” that is used for water landings.*



*Rendering of the stern of one of the outboard hulls showing the
open air observation platform and the inverted-Y control surfaces.
A helicopter is visible on the helipad on the center hull.
Source, both graphics: Lazzarini Design Studio (circa late 2021)*

Version 1 main deck, center hull



The main entrance is on the main deck of the center hull.



Interior view of the salon common area (living room and dining room) on the main deck of the center hull.

Source, both graphics: Lazzarini Design Studio (circa late 2021)

Version 1 upper deck, center hull



Open air swimming pool is in a sheltered area on the top deck of the center hull.



The helipad is on the top deck of the center hull, aft of the swimming pool. Source, both graphics: Lazzarini Design Studio (circa late 2021)

Version 1, owner's and passenger suites



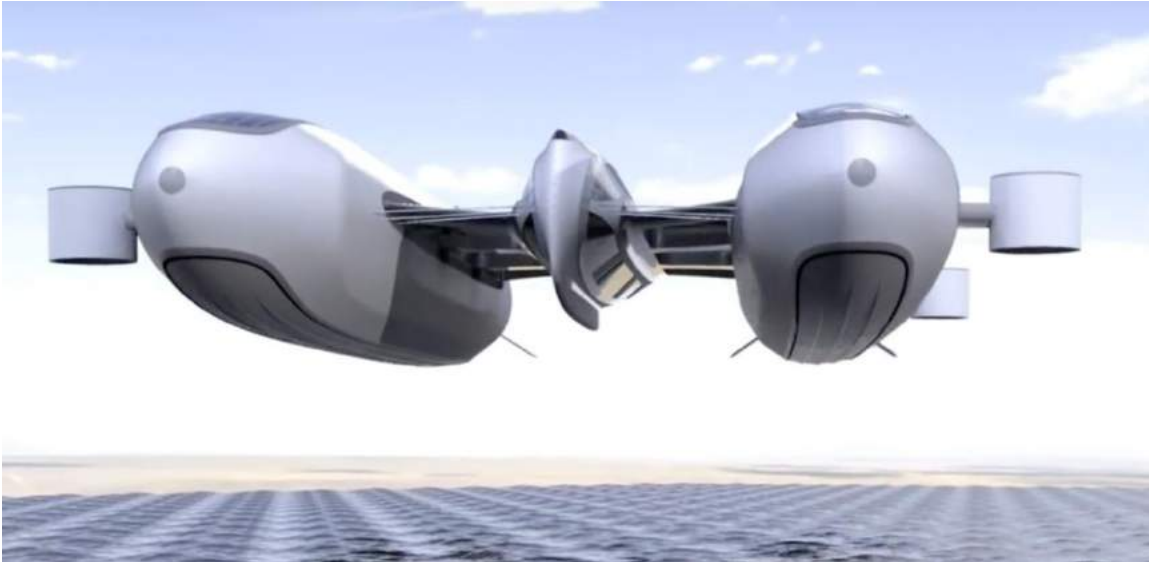
*Rendering of the airship owner's suite
located near the bow on the lower level of the center hull.*



*Five suites for passengers are located along the
outer sides of each of the two outer hulls (10 suites total)
with expansive "sky windows."*

Source, both graphics: Lazzarini Design Studio (circa late 2021)

Version 1 water landing



Bow-on view of the Air Yacht flying making a vertical landing (or takeoff) on a body of water. Note that the main propulsors have been vectored vertically to provide precise control during VTOL operations.

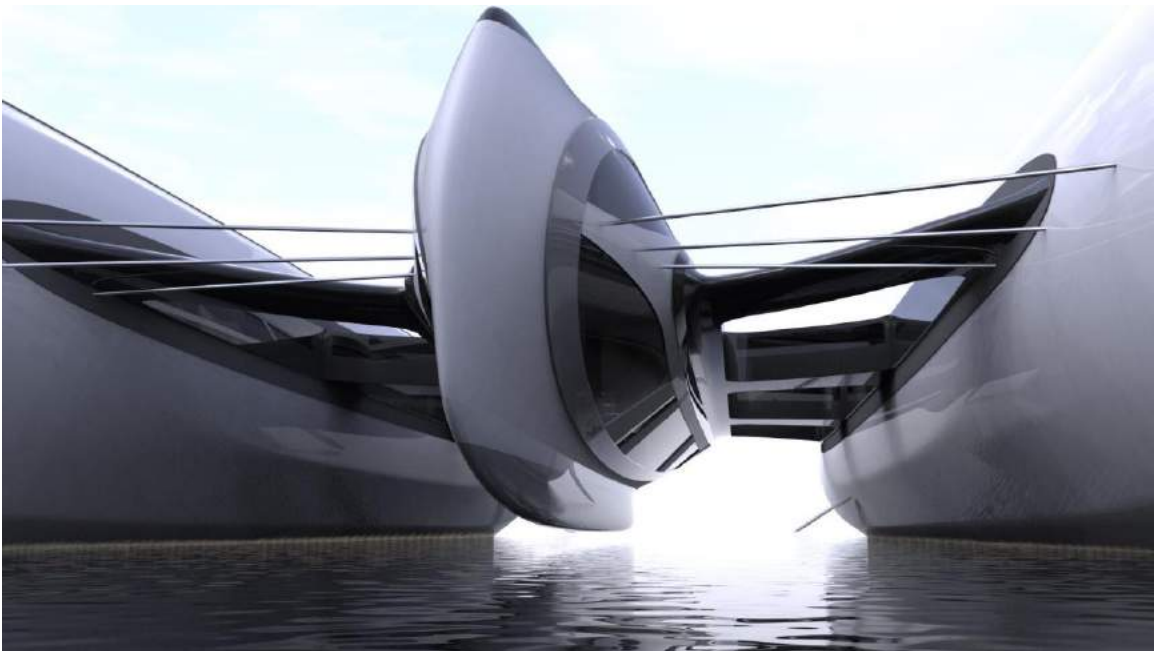
Source: Screenshot from Lazzarini video (Jan 2022)



Rendering of the Air Yacht floating on the water surface.

The variable buoyancy system reduces helium buoyancy after landing, making the airship heavier-than-air. The vessel is further stabilized by a ballast anchor system. Maximum waterborne speed is 5 knots using the same electric main propulsion engines as for flight.

Source: Lazzarini Design Studio (circa late 2021)



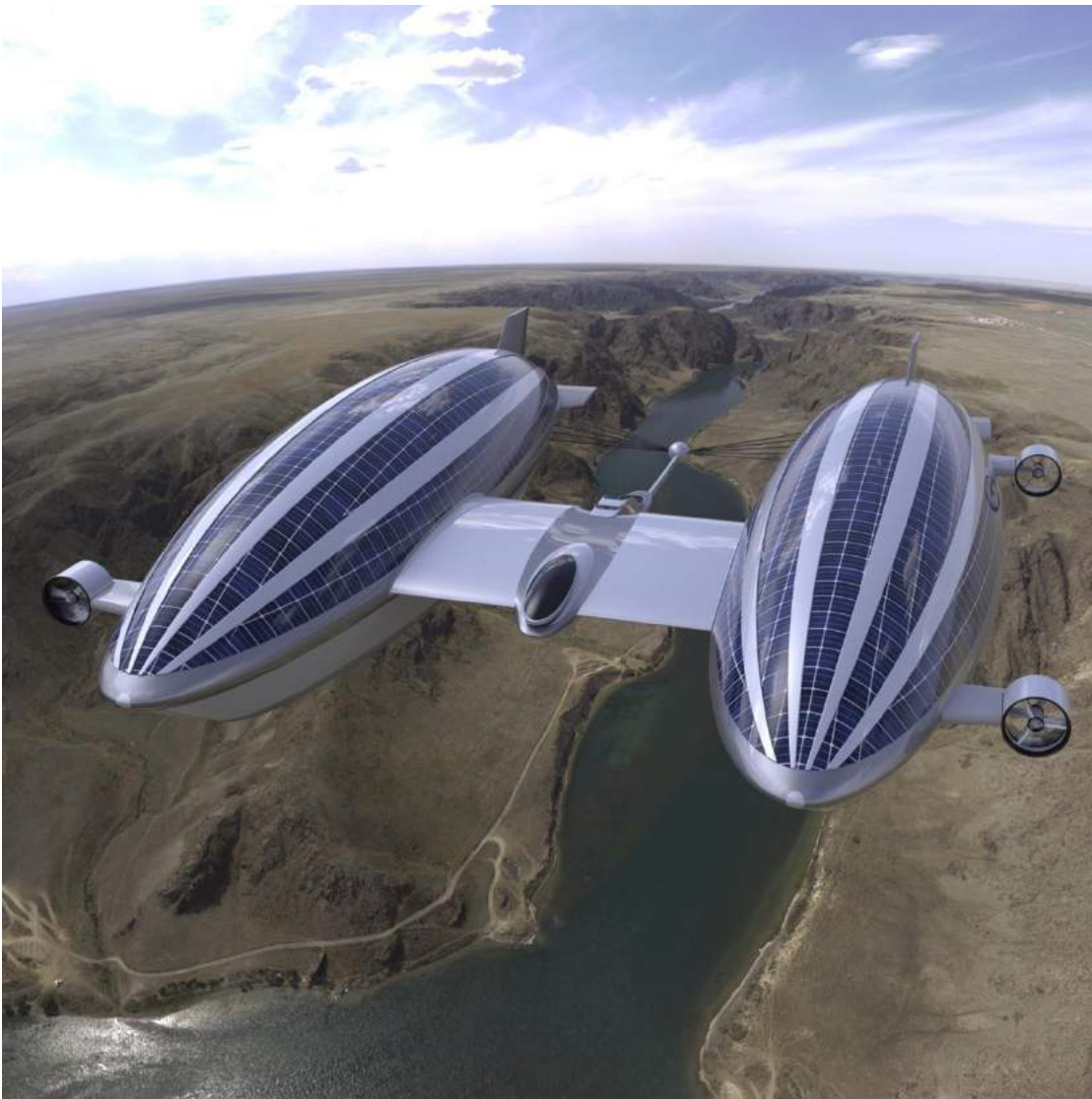
Bow-on rendering of the Air Yacht after a water landing, with the “basement” inflated to provide additional freeboard. Note the carbon fiber bridges and the tensioning cables joining the outboard hulls to the center hull. The bridges connect to the main level of the center hull. The airship owner’s cabin is on the lower level in the center hull.



*Stern view, with access ramp deployed from the center hull.
Source, both graphics: Lazzarini Design Studio (circa late 2021)*

3. Air Yacht version 2 catamaran airship (circa January 2022)

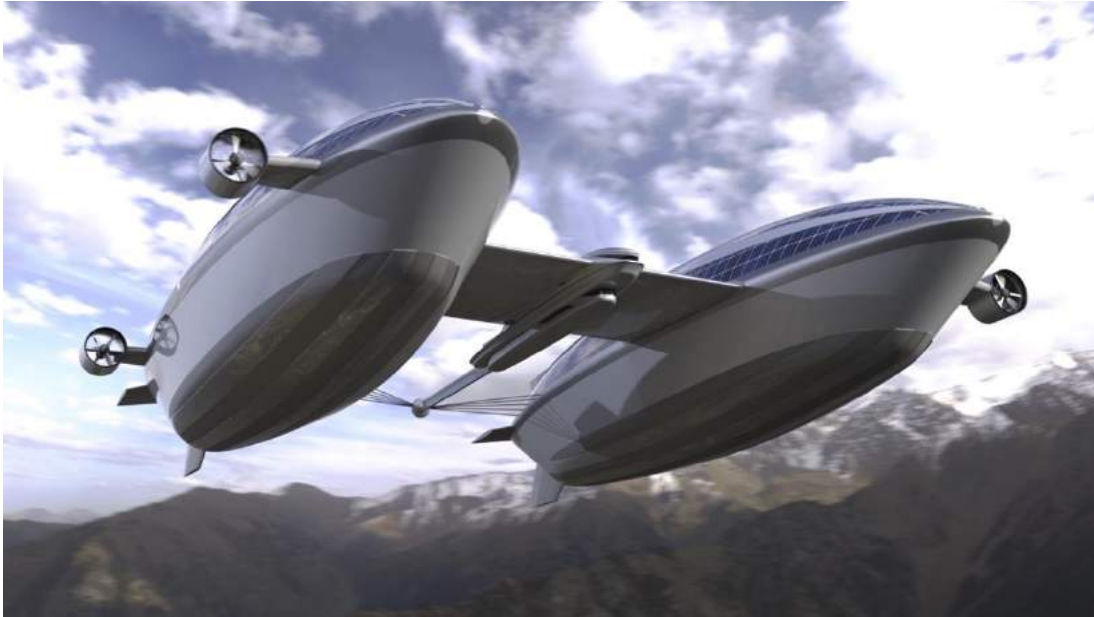
The Air Yacht version 2 retains the basic configuration of two airship hulls, each with two outboard propulsion units, joined via a structural framework that houses passenger accommodations. However, the prominent center hull and structural bridges seen in version 1 are replaced by a single streamlined wing-like structure carrying a long gondola and a trailing structural spine along its longitudinal axis. The spine terminates in a node from which transverse tension cables radiate and connect to the catamaran hulls to increase structural rigidity.



*Bow-on view of the Air Yacht version 2.
Source: Lazzarini Design Studio (circa Jan 2022)*

Other major design changes relative to version 1 include:

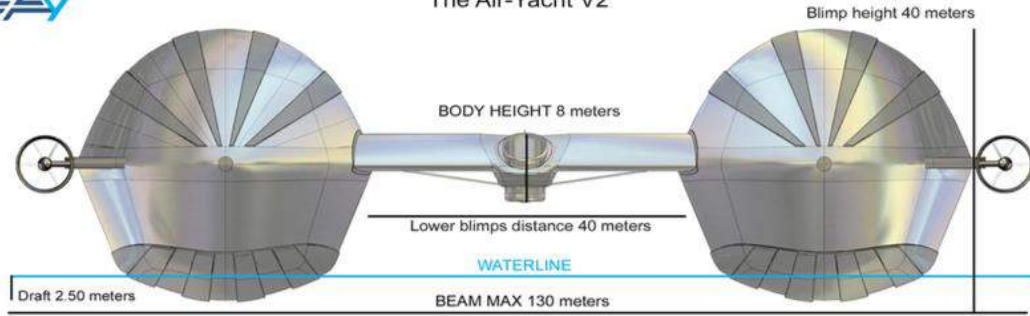
- A boat-like lower hull shape and a 2-D curved upper hull shape replace the cylindrical hull.
- A streamlined cruciform tail replaces the inverted-Y tail and open-air observation deck at the stern.
- The pool appears to have been deleted, saving 10's of tons.



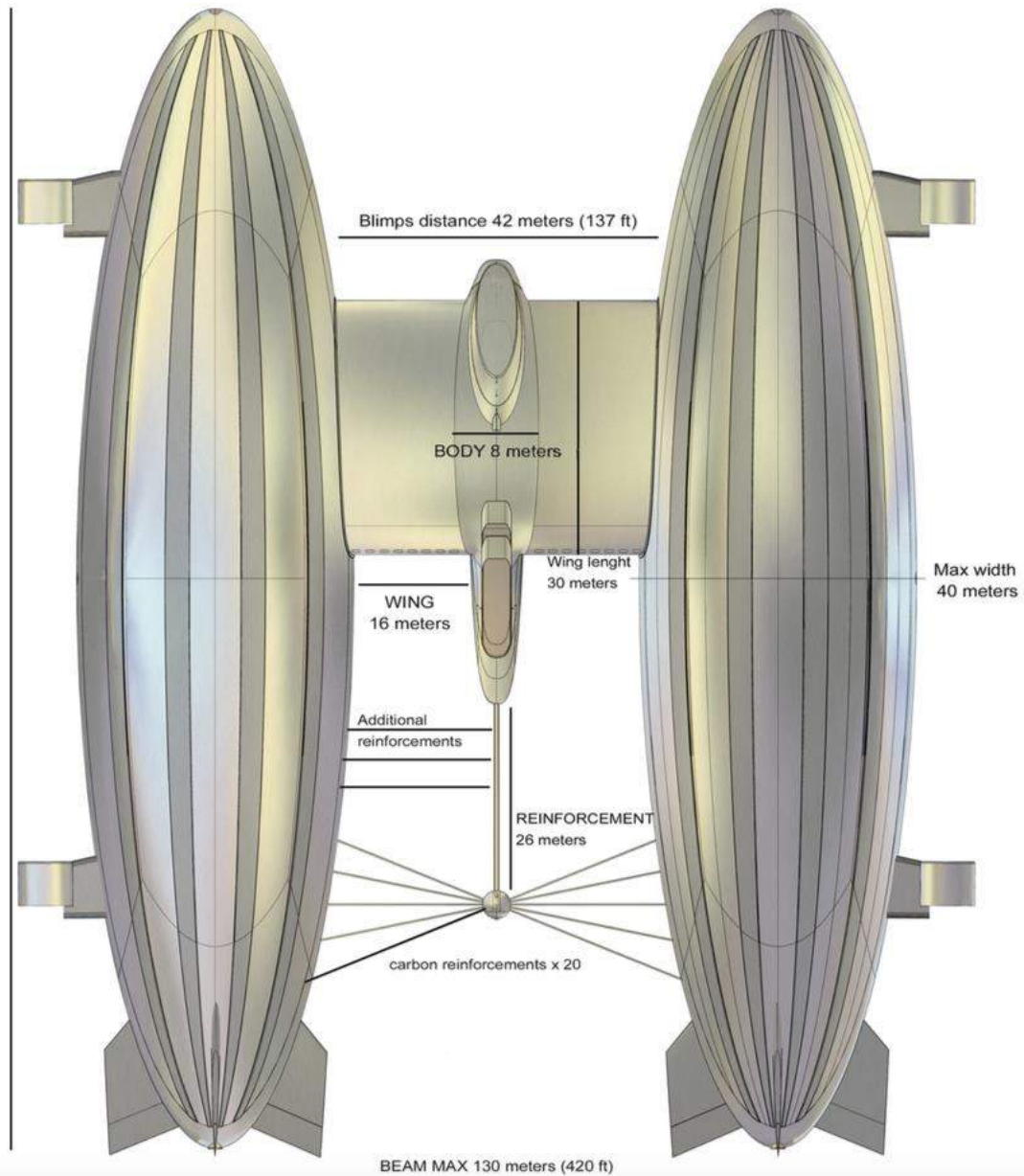
*Renderings of Air Yacht version 2 in flight.
Source, both graphics: Lazzarini Design Studio (circa Jan 2022)*



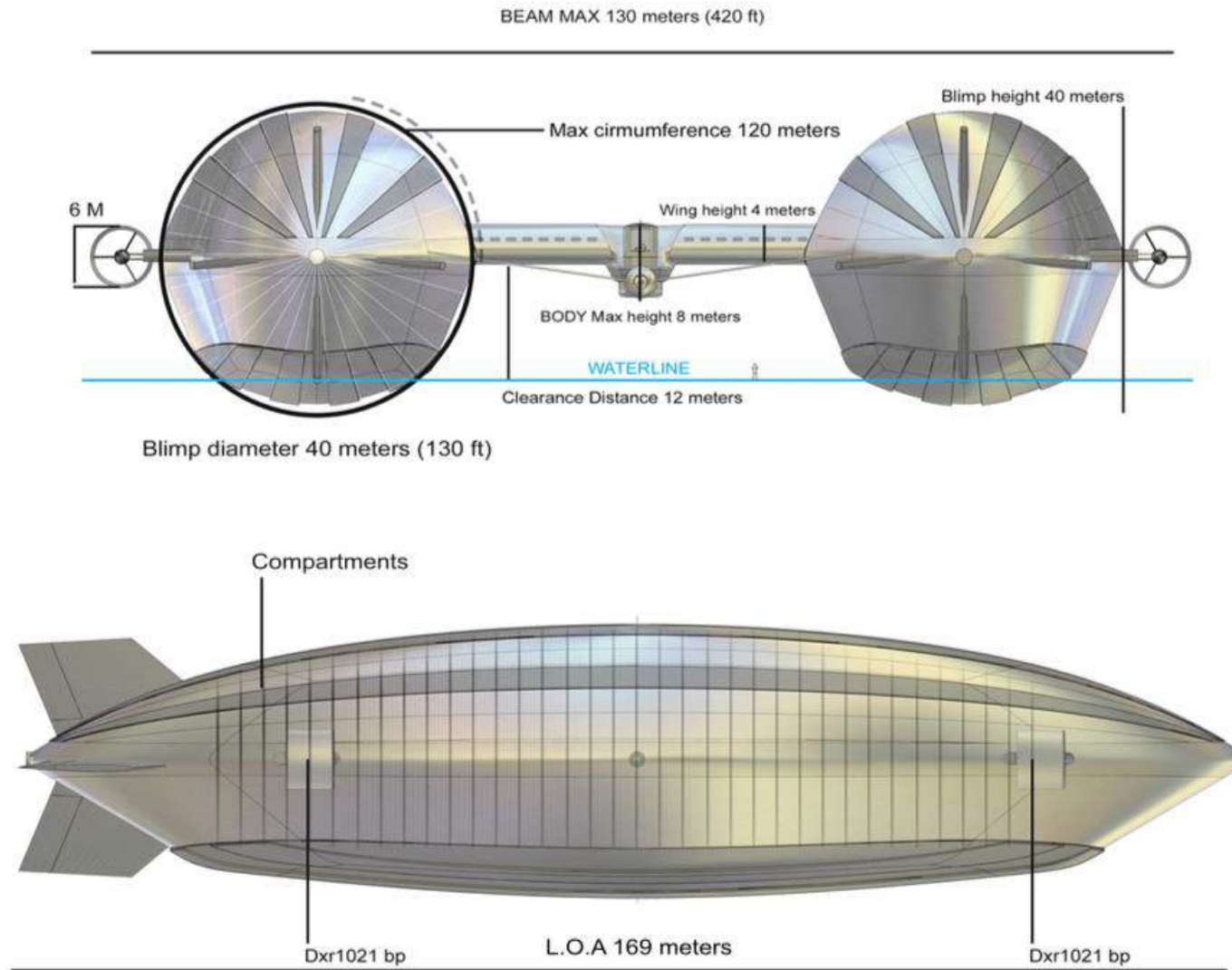
The Air-Yacht V2



L.O.A. 169 meters (555 ft)



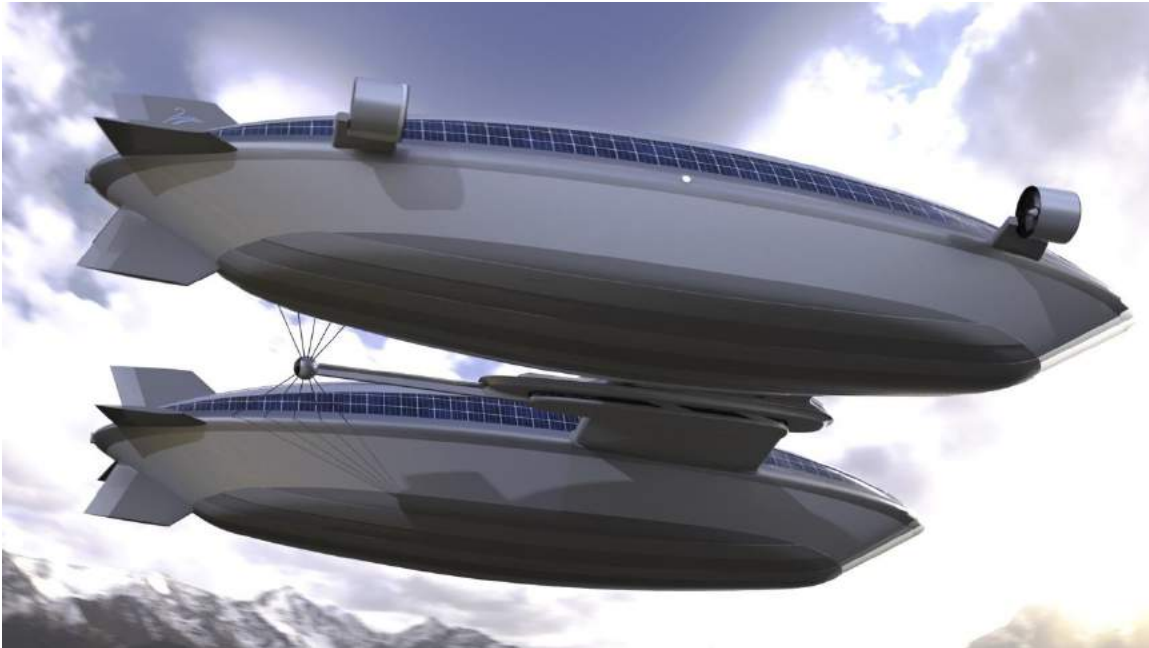
Bow and overhead views. Source: Lazarrini Design Studio (2022)



Stern and side views. Source: Lazzarini Design Studio (2022)



*Renderings of Air Yacht version 2 in flight: bow quarter (top), stern quarter (bottom).
Source, both graphics: Lazzarini Design Studio (circa Jan 2022)*



A long, slender gondola extends like a nacelle under the broad center wing. The gondola houses the cockpit, owner's suite and the salon common areas. Passenger suites are in the center wing.

A sundeck shielded from the wind is located at the aft end of the gondola.

The long structural spine extending from the gondola and the spherical node at the end are accessible to crew and passengers. The tension cables securely position the aft end of the catamaran hulls and contribute to the structural rigidity of the entire vessel.

Source, both graphics: Lazzarini Design Studio (circa Jan 2022)

Each of the two catamaran hulls contains many individual lifting gas cells ("hive" cells), which are at atmospheric pressure and can be individually controlled during normal operation and isolated in the event of leakage / damage.

The variable buoyancy control system included in the Air Yacht version 1 design is retained in the version 2 airship. This system works by moving helium gas between the lifting gas cells and four compressed helium storage tanks in each hull. To generally increase aerostatic buoyancy, some compressed helium is released (vented) into all of the lifting gas cells, which expand at atmospheric pressure. To generally decrease buoyancy, some helium from the lifting gas cells is pumped into the compressed helium storage tanks, allowing the lifting gas cells to contract.

By selectively controlling buoyancy in some lifting gas cells, fore-aft trim (pitch angle) and side-to-side trim (roll angle) can be adjusted in flight to compensate for changes in weight distribution.

After making a vertical landing with the aid of the thrust-vectoring propulsors, the buoyancy of the airship can be reduced significantly by pumping helium from the lifting gas cells into the compressed helium storage tanks. This will make the airship heavier-than-air, which will improve airship stability on the ground or in the water.

The application of this type of variable buoyancy control system to airships was developed in the 1970s by Michael Walden (LTAS / Walden Aerospace), and was demonstrated by Igor Pasternak's firm Aeros in 2008 on a modified Aeros 40D blimp and in 2013 on the *Dragon Dream* semi-rigid airship.

General characteristics of the Air Yacht version 2

Parameter	Lazzarini Design Studio Air Yacht version 2
Type	Catamaran configuration, with two elliptical, semi-rigid airship hulls joined by a streamlined central wing.
Length, overall	169 m (555 ft) (length of each outboard hull)
Diameter, outboard hull, max	About 40 m (131.2 ft)
Length, center wing	30 m (98.4 ft)
Width, center wing	40 m (131.2 ft) (distance between outboard hulls)
Width, overall	About 130 m (420 ft) (maximum width between the outer edges of the shrouded propulsors)
Crew	Not stated
Passenger accommodations	<ul style="list-style-type: none"> • Ship owner's suite and common areas along the wing centerline • About 10 suites for passengers in the center wing
Power source	<ul style="list-style-type: none"> • Hybrid solar photovoltaic system with hull-mounted solar arrays and ultra-light batteries for energy storage.
Propulsion	<ul style="list-style-type: none"> • Four shrouded, thrust vectoring propulsors, each with two contra-rotating propellers. • Two electric motors drive each propulsor, for a total of eight propulsion motors.
Buoyancy control	<ul style="list-style-type: none"> • Variable buoyancy system moves helium gas between lifting gas cells at atmospheric pressure and compressed helium storage tanks. • 4 x compressed helium tanks in each hull.
Air speed, max	60 knots (111 kph / 69 mph)
Waterborne speed, max	5 knots (9.3 kph / 5.7 mph), using the same electric powered main propulsion engines as for flight
Altitude, cruise	About 1,524 m (5,000 ft)
Endurance	48 hours @ max speed
Range, max	5,530 km (3,312 miles)

4. The future

Lazzarini reports that the basic Air Yacht design is scaleable and various sizes are under engineering study. They expect to fly the first sub-scale prototype by the end of 2022.

Lazzarini estimates that the first full-scale Air Yacht built on demand for a client will require a budget of about €550 million (about \$625 million USD). While this is a very high price, the first-of-a-kind Air Yacht would be less costly than some contemporary mega-yachts that just sail on water.

For example, Russian billionaire Roman Abramovich owns the 168.5 m (553 ft) luxury yacht Eclipse, which is estimated to have cost €1.32 billion (\$1.5 billion USD) to build. There are several other mega-yachts that are estimated to have cost between \$400 and \$600 million.

So, the potential market for the Air Yacht may be there. It will be interesting to watch this design concept mature. Hopefully, there is a client who will fund the first-ever airship mega-yacht. The bragging rights will be incredible. In addition, the airship industry will learn a lot from the experience.

5. For more information

- Rachel Cormack, “Meet Air Yacht, a Bonkers Flying Superyacht Concept Powered by Two Helium Blimps,” Robb Report, 11 January 2022: <https://robbreport.com/motors/marine/lazzarini-air-yacht-concept-helium-blimps-1234657677/>
- Jonathan Chadwick, “A luxury boat that's perfect for high-flyers! 'Mega' 490ft-long superyacht-cum-blimp that is designed to FLY as well as sail is unveiled in futuristic concept,” Daily Mail, 11 January 2022: <https://www.dailymail.co.uk/sciencetech/article-10390311/Mega-air-yacht-helium-filled-blimps-designed-FLY.html>

Video

- “The Air Yacht concept,” (1:27 Minutes), Lazzarini Design, 12 January 2022:
<https://www.youtube.com/watch?v=RPSnwlrgwgg>

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
 - Walden LTAS - Lenticular toroidal DCB airships, including twin hull yacht
 - Aeros - Dragon Dream
- *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/>