

Modern Airships

Part 2

Peter Lobner

Revision 1
3 April 2021

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Record of revisions to Part 2

Original issue, 18 August 2019: 25 articles

Revision 1, 3 April 2021: Added 37 new articles, split the original variable buoyancy propulsion article into three articles and updated all of the original articles. Also updated and reformatted the summary graphic table. Part 2 now has 64 articles.

1. Introduction

Modern Airships is a three-part document that contains an overview of modern airship technology in Part 1 and links in Parts 1, 2 and 3 to more than 130 individual articles on historic and advanced airship designs. This is Part 2. Here are the links to the other two parts:

- Modern Airships – Part 1: <https://lynceans.org/all-posts/modern-airships-part-1/>
- Modern Airships – Part 3: <https://lynceans.org/all-posts/modern-airships-part-3/>

You'll find a consolidated Table of Contents for all three parts at the following link. This should help you navigate the large volume of material in the three documents.

- Consolidated TOC: https://lynceans.org/wp-content/uploads/2021/04/3-April-2021_Consolidated-TOC_R2-converted.pdf

Modern Airships – Part 2 begins with a summary graphic table identifying the airships addressed in this part, and concludes by providing links to 64 individual articles on those airships.

If you have any comments or wish to identify errors in these documents, please send me an e-mail to: PL31416@cox.net.

I hope you'll find the Modern Airships series to be informative, useful, and different from any other single document on this subject.

Best regards,

Peter Lobner

April 2021

2. Specific airships in Part 2

The airships reviewed in *Modern Airships - Part 2* are summarized in the following set of graphic tables that are organized into the 11 categories listed below:

- Conventional, rigid and semi-rigid airships
- Conventional, non-rigid airships (blimps)
- Semibuoyant hybrid airships
- Hybrid thermal (Rozier) airships
- Variable buoyancy, fixed volume airships
- Variable buoyancy, variable volume airships
- Variable buoyancy propelled airships
- Stratospheric airships
- Semi-buoyant plane / airship hybrids
- Electro-kinetically (EK) propelled airships
- Small LTA drones

Within each category, each page of the table is titled with the name of the category and is numbered (P2.x), where P2 = *Modern Airships - Part 2* and x = the sequential number of the page in that category. For example, “Stratospheric airships (P2.2)” is the page title for the second page in the “Stratospheric airships” category in Part 2. There also are stratospheric airships addressed in *Modern Airships - Parts 1* and *3*.

Links to the individual Part 2 articles on these airships are provided in Section 3. Some individual articles cover more than one particular airship.

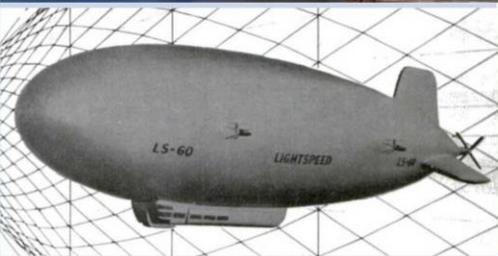
Conventional rigid & semi-rigid airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Flying Whales LCA60T</p>	<p>France</p>	<p>Conventional, rigid</p>	<p>Ballonets + vector thrust + water ballast</p>		<p>Under development and well funded. Prototype 1st flight expected in 2023 - 2024.</p>
<p>Buoyant Aircraft Systems International (BASI) MB-30T & -100T</p>	<p>Canada</p>	<p>Conventional, rigid</p>	<p>Ballonets + vector thrust + water ballast</p>		<p>Conceptual design phase, intended for fixed base operations.</p>
<p>TP Aerospace Atlas 80</p>	<p>USA</p>	<p>Conventional, rigid (inflated air beam primary structures)</p>	<p>Ballonets + vector thrust + ballast</p>		<p>Concept, development discontinued circa 2018. Assets acquired by Global Airships.</p>
<p>Skylifter Ltd. Flying Crane, SL150, SL50, SL25 & SL20</p>	<p>UK</p>	<p>Conventional, semi-rigid, lenticular propelled aerostat</p>	<p>Ballonets + vector thrust + ballast + helium volume control</p>		<p>Conceptual design phase. Validated with Betty and Vikki proof-of-concept demonstrators.</p>

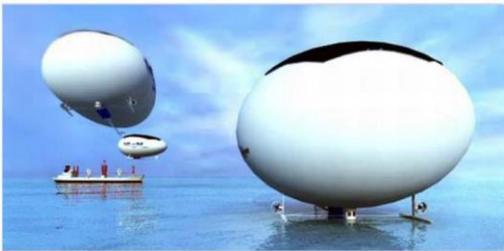
Conventional rigid & semi-rigid airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Augur RosAeroSystems (RAS)</p> <p>DZ-N1</p>	Russia	Conventional, rigid airship	Ballonets + lift gas temperature control + vector thrust + water ballast	 A white rigid airship with a small cabin and tail section, flying over a snowy landscape.	Heavy lift zeppelin-type airship design concept 2001 – 2009. Development discontinued.
<p>Augur RosAeroSystems (RAS)</p> <p>MD-900</p>	Russia	Conventional, rigid airship	Ballonets + vector thrust + water ballast	 A blue and white rigid airship with a large cabin and tail section, flying in the sky. The text 'ГОСКОМСЕВЕР РОССИИ' and '022' is visible on the side.	Modular gondola design concept, early 2000s. Development discontinued.
<p>Pierre Balaskovic & AIRSTAR</p> <p>Alpha</p>	France	Conventional, semi-rigid, unmanned, lenticular airship	Ballonets + vector thrust	 A large, white, lenticular airship being inflated on a grassy field with a cornfield in the background.	Remotely-piloted experimental lenticular airship, flew 1999 to 2002.
<p>Pierre Balaskovic & LTA Corp.</p> <p>Alizé</p>	France	Conventional, semi-rigid, lenticular airship	Ballonets + vector thrust	 A large, white, lenticular airship on a grassy field, with a person standing nearby for scale.	Pierre Balaskovic experimental lenticular airship, flew 2005 to 2008, disassembled & in storage.

Conventional rigid & semi-rigid airships (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
The Hamilton Airship Company (THAC) HA-44 prototype	South Africa	Conventional, rigid airship	Ballonets + vector thrust + air ballast system +		Tested novel rigid frame with central spine. 1 st flight in 1998, 50 hours of test flights.
The Hamilton Airship Company (THAC) HA-80 & -140	South Africa	Conventional, rigid airship	Ballonets + vector thrust + air ballast system		Company went bankrupt in May 1999 due to lack of funding for the large airships.
Lightspeed USA Inc. Lightships LS-12 & -60	USA	Conventional, rigid, geodesic frame airship	Ballonets + vector thrust + air jets for slow speed maneuvering + water ballast		LS-60 preliminary design completed in May 1976. No Lightships built.
Solar Flight Sunship	USA	Conventional, rigid, solar-powered	Ballonets + water ballast		Concept, circa 1990

Conventional rigid & semi-rigid airships (P2.4)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>SolarAirShip High-Speed Solar Airship (HSSA)</p>	<p>USA</p>	<p>Conventional, semi-rigid, solar powered</p>	<p>Vector thrust + ballonets</p>		<p>Concept, circa 2010.</p>

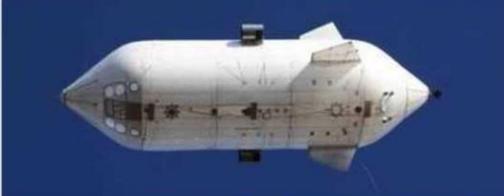
Conventional non-rigid airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Worldwide Aeros Corp.</p> <p>Aeros 40 Sky Dragon</p>	<p>USA</p>	<p>Conventional, non-rigid blimp</p>	<p>Ballonets + ballast + vector thrust (40E only)</p>		<p>Aeros 40E is latest production model.</p>
<p>Atlas LTA Advanced Technology</p> <p>Atlas-6 & -11</p>	<p>Israel</p>	<p>Conventional, non-rigid blimp</p>	<p>Ballonets + vector thrust + ballast</p>		<p>Under development. Unmanned electric variant also will be available.</p>
<p>Blackwater Airships / Guardian Flight Systems</p> <p>Polar 400 / 450</p>	<p>USA</p>	<p>Conventional, non-rigid, blimp</p>	<p>Ballonets + vector thrust + ballast</p>		<p>1st flight in 2007. Demonstrated military surveillance systems in 2008. Did not go into production.</p>
<p>Blackwater Airships / Guardian Flight Systems</p> <p>Polar 600</p>	<p>USA</p>	<p>Conventional, non-rigid blimp</p>	<p>Ballonets + vector thrust + ballast</p>		<p>Modified Airship Industries Skyship 600 with 2 x hydraulically powered tail rotors, optionally manned.</p>

Conventional non-rigid airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p style="text-align: center;">Augur RosAeroSystems (RAS) Au-12M</p>	Russia	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Two-seat blimp, current -12M version in production since 2004.
<p style="text-align: center;">Augur RosAeroSystems (RAS) Au-30</p>	Russia	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Two crew plus up to eight passengers.
<p style="text-align: center;">Augur RosAeroSystems (RAS) SOKOL</p>	Russia	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Medium altitude unmanned surveillance airship concept, circa 2015
<p style="text-align: center;">Project Sol'R Nephelios</p>	France	Conventional, non-rigid blimp, solar-powered	Ballonets + vector thrust + ballast		1 st flight in 2009.

Conventional non-rigid airships (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
21 st Century Airships Voyager prototype	Canada	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Hokan Colting original patent circa 1992. Prototype flew 2007 - 08 as C-FJUI.
21 st Century Airships Voyager	Canada	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Voyager sightseeing blimp design by Hokan Colting developed circa 2007.
E-Green Technologies (EGT) Bullet 125	USA	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Reconfigured Voyager prototype, C-FJUI, flew 2008 - 10.
E-Green Technologies (EGT) Bullet 580	USA	Conventional, non-rigid blimp	Ballonets + vector thrust + ballast		Based on 21 st Century Voyager. 1 st inflation test Nov 2010, then inflated at Moffett Field in Mar 2011, but not completed & flown.

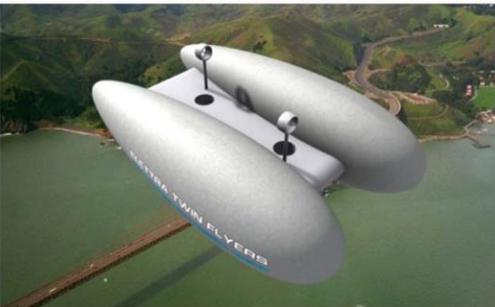
Conventional non-rigid airships (P2.4)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>21st Century Airships & Techsphere</p> <p>Spherical airships</p>	<p>USA</p>	<p>Conventional, non-rigid, spherical blimp</p>	<p>Ballonets + vector thrust + ballast</p>		<p>Design by Hakan Colting, set world record altitude in 2003, licensed to Techsphere in 2002. Several models flew, but no orders.</p>
<p>Aero-Nautic Services & Engineering (A-NSE)</p> <p>A-N400</p>	<p>France</p>	<p>Conventional, non-rigid blimp</p>	<p>Vector thrust + ballonets + ballast</p>		<p>Single-place, twin engine patrol blimp with sea-landing system.</p>

Semi-buoyant hybrid airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
Millennium Airship SkyFreighter SF20T, SF50T & SF500T	US & Canada	Hybrid (semi-buoyant), semi-rigid	Proprietary Integrated Thrust and Maneuvering Management System (ITAMMS)		Development plan & industrial team defined, 1st production craft 6-7 years after financing in place.
Dirisolar DS 12, DS 900, DS 1500 & DS 30	France	Hybrid (semi-buoyant), rigid, solar powered	Vector thrust + aero lift + ballonets		Conceptual design done, industrial team defined, ready to build after financing in place.
Airship-GP AeroTruck, AeroBoat & AeroYacht	Russia	Hybrid (semi-buoyant), semi-rigid	Vector thrust + aero lift + ballonets		Conceptual hybrid designs, also available as “super hybrid” with variable buoyancy control.
Turtle Airships	Spain	Hybrid (semi-buoyant), rigid, solar powered	Vector thrust + aero lift + ballonets		Design concept by Darrell Campbell circa early 1980s.

Semi-buoyant hybrid airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Nautilus SpA Elettra Twin Flyers (ETF)</p>	<p>Italy</p>	<p>Hybrid, (semi-buoyant), semi-rigid, twin hull & monohull</p>	<p>Vector thrust + aero lift + ballonets</p>		<p>Conceptual design circa 2013 evolved from twin to mono-hull.</p>
<p>Flying-Yacht</p>	<p>Canada</p>	<p>Hybrid (semi-buoyant), semi-rigid, pressurized passenger deck structure</p>	<p>Flies in ground effect, lift is controlled by airspeed</p>		<p>Hokan Colting preliminary design circa 2012, based on EGT Bullet. Not developed.</p>
<p>Magnus Aerospace Corp. LTA 20-1</p>	<p>Canada</p>	<p>Hybrid (semi buoyant), semi-rigid, spherical airship with rotating gas envelope</p>	<p>Magnus effect + vector thrust</p>		<p>Rotating gas envelope generates Magnus lift. Patented & developed early-to- mid 1980s. 19-ft diameter Carleton demonstrator flew. Not developed.</p>

Semi-buoyant hybrid airships (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
Egan Airships PLIMP Model D drone	USA	Semi-buoyant plane / blimp hybrid (PLIMP)	Vector thrust + aero lift + ballonets		Prototype flew in 2018. FAA certification in progress.
Egan Airships PLIMP Model J	USA	Semi-buoyant plane / blimp hybrid (PLIMP)	Vector thrust + aero lift + ballonets		Announced in Nov 2018. FAA certification in planned.

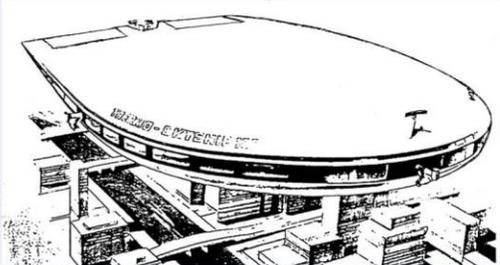
Semi-buoyant hybrid aircraft (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
Solar Ship Caracal	Canada	Hybrid (semi-buoyant, inflated wing), semi-rigid, solar-powered	Aero lift		20 meter prototype flew in 2014. 24 meter production version certification In progress.
Solar Ship Wolverine	Canada	Semi-buoyant, complex inflated aerobody, semi-rigid, solar-powered	Aero lift		Designed to carry five metric ton payload. Design updated after 2017 prototype tests.
Solar Ship Nanuq	Canada	Semi-buoyant, complex inflated aerobody, semi-rigid, solar-powered	Aero lift		Heavy-lift cargo airship. Design updated based on 2017 Wolverine prototype testing.

Hybrid thermal (Rozier) airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Aeroplatform Initiative Design Bureau Aerosmena (AIDBA)</p> <p>A-20, A60, A200 & A600</p>	Russia	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>Designed by Orpheus Kozlov, AIDBA formed 2015, R&D for A200 complete in 2017, 1st flight possible by mid-2020s</p>
<p>LokomoSky</p> <p>LokomoSkyner</p>	Russia	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>Design concept, 2005 – 2012.</p> <p>Not developed.</p>
<p>Design Bureau Thermoplan</p> <p>ALA-200 Thermoplane</p>	Russia	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		
<p>Design Bureau Thermoplan</p> <p>ALA-40 Thermoplane prototype</p>	Russia	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>Moscow Aviation Institute started project in late 1970s. 1/5th scale ALA-40 damaged after 1992 rollout. Never flew.</p>

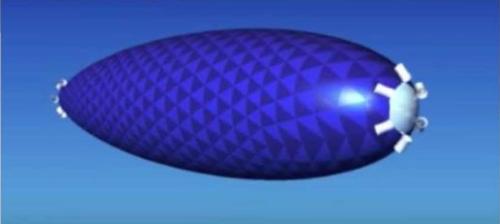
Hybrid thermal (Rozier) airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Thermo-Skyships Ltd. (TSL)</p> <p>Thermo-Skyship sub-scale prototype</p>	UK	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>M.W. Wren design concept circa 1972. 30-ft prototype flew indoors in 1975.</p>
<p>Thermo-Skyships Ltd. (TSL)</p> <p>Thermo-Skyship</p>	UK	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>Several design iterations, development ended circa 1982.</p>
<p>Boeing</p> <p>Hybrid thermal airship</p>	USA	Hybrid thermal airship	<p>Two lifting gases: helium & variable temperature air</p> <p>+ vector thrust</p> <p>+ aero lift</p>		<p>Patented design concept for military airship with 8 MW solar power for directed energy weapons, circa 2008 - 2010.</p>

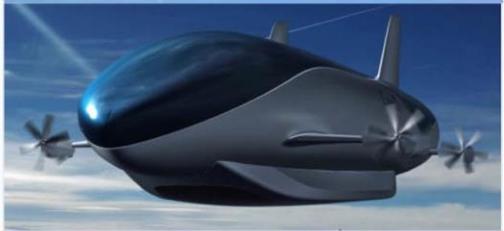
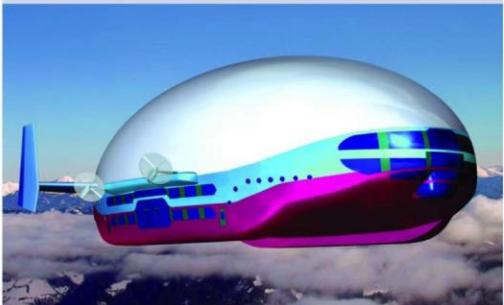
Variable buoyancy, fixed volume airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Atlas LTA Advanced Technology</p> <p>ATLANT 30, 100 & 300</p>	Israel	Rigid, variable buoyancy, fixed volume	Air ballast & lift gas pressurization / release + vector thrust + ballonets		Conceptual design phase. Atlas LTA acquired Augur RAS circa 2018.
<p>Varialift Airships Plc.</p> <p>ARH-PT, ARH 50 & ARH 250</p>	UK	Rigid, variable buoyancy, fixed volume	Lift gas pressurization / release + ballonets		Test rig validated design circa 2011. Manufacturing facility being built. Prototype ARH-PT being built.
<p>Euro Airship</p> <p>Corsair</p>	France	Rigid, variable buoyancy, fixed volume, solar powered	Air ballast pressurization / release + vector thrust + ballonets		Construction-ready design prepared, ready to build after financing in place.
<p>Euro Airship</p> <p>DGPatt</p>	France	Rigid, variable buoyancy, fixed volume	Air ballast pressurization / release + vector thrust + ballonets		Construction-ready design prepared, ready to build after financing in place.

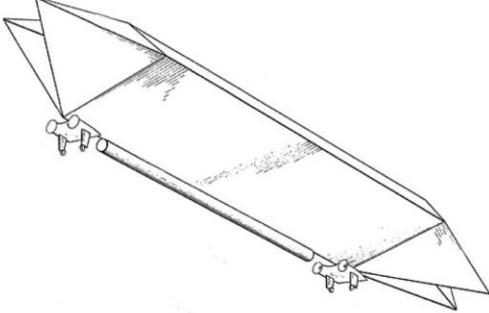
Variable buoyancy, fixed volume airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
Airship-GP "Super Hybrid" AeroTruck, AeroBoat & AeroYacht	Russia	Rigid, variable buoyancy, fixed volume	Lift gas pressurization / release + vector thrust + aero lift + ballonets		Conceptual "super hybrid" designs, also available as a simpler hybrid airship without variable buoyancy control.
AeroVehicles Inc. (AVI) Minicat & Aerocat R-12 & R-40	Argentina	Rigid, variable buoyancy, fixed volume	Lift gas pressurization / release + vector thrust + aero lift + ballonets		Minicat prototype under development with same aero design as larger airships.
Global Airships Atlas	USA	Rigid, likely variable buoyancy, fixed volume	Ballonets + vector thrust + proprietary system		Conceptual design circa 2019.
Skylite Aeronautics GeoShip	USA	Rigid, variable buoyancy, fixed volume, solar powered	Air ballast pressurization / release + aero lift + ballonets		Conceptual design circa 2011.

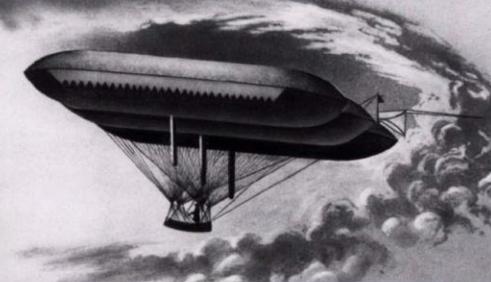
Variable buoyancy, fixed volume airships (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
<p style="text-align: center;">LTA Aerostructures</p> <p style="text-align: center;">LTA-10 & LTA-70</p>	Canada	Rigid, variable buoyancy, fixed volume, lenticular	Lift gas pressurization / release + vector thrust + aero lift + ballonets		<p>Conceptual design phase 2014-2015. Company failed circa 2018. Assets acquired by Global Airships.</p>
<p style="text-align: center;">Imaginative</p> <p style="text-align: center;">Alert, Invitation & Kugaaruk</p>	Canada	Rigid, variable buoyancy, fixed volume	Lift gas pressurization / release + vector thrust + aero lift + ballonets		<p>Conceptual designs, similar configuration, circa 2014 - 2018, intended for Arctic use.</p>
<p style="text-align: center;">Augur RosAeroSystems (RAS)</p> <p style="text-align: center;">ATLANT 30 & 100</p>	Russia	Rigid, variable buoyancy, fixed volume	Lift gas pressurization / release + vector thrust + aero lift + ballonets		<p>Conceptual design phase. Israeli firm Atlas LTA Adv. Tech. acquired Augur RAS circa 2018 and is continuing development.</p>

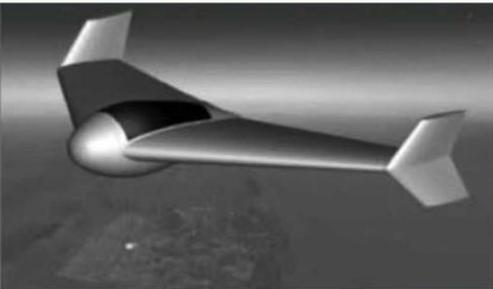
Variable buoyancy, variable volume airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Dynapod Inc. Dynapod</p>	<p>USA</p>	<p>Variable buoyancy, variable volume, "origami" folding hull</p>	<p>Alter volume of ammonia lift gas & envelope + vector thrust + aero lift + ballonets</p>		<p>Patented design concept by A. C. Davenport circa mid-1970s. Not built and flown.</p>
<p>Aero-Nautic Services & Engineering (A-NSE) Tri-lobe airships & aerostats</p>	<p>France</p>	<p>Variable buoyancy, variable volume, tri-lobe hull</p>	<p>Alter volume of helium lift gas envelope + vector thrust + aero lift + ballonets</p>		<p>Aerostats used operationally, several variable buoyancy manned airships have been designed.</p>
<p>EADS Tropospheric airship</p>	<p>France</p>	<p>Variable buoyancy, variable volume, twin-hull</p>	<p>Alter volume of helium lift gas envelope + vector thrust + aero lift + ballonets</p>		<p>Conceptual design, model displayed at Paris Air Show 2013.</p>

Variable buoyancy propulsion airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Solomon Andrews Aereon I & II</p>	<p>USA</p>	<p>Conventional, triple hull, balloon</p>	<p>Ballonets + hydrogen control + aerodynamic lift + disposable ballast</p>		<p>First patent and demonstration of variable buoyancy propulsion in 1863.</p>
<p>Walden Aerospace/ LTAS HY-SOAR B.A.T.</p>	<p>USA</p>	<p>Rigid, fixed-wing, ultra-light class aircraft</p>	<p>Helium lift gas control system enables buoyant & semi-buoyant flight</p>		<p>Single person aircraft design concept by Michael Walden, circa 1990s</p>
<p>Walden Aerospace/ LTAS VAMPIRE</p>	<p>USA</p>	<p>Rigid, fixed wing aircraft</p>	<p>Helium lift gas control system enables buoyant & semi-buoyant flight</p>		<p>3 or 4 person aircraft design concept by Michael Walden, intended for around-the- world flight, circa 1990s</p>

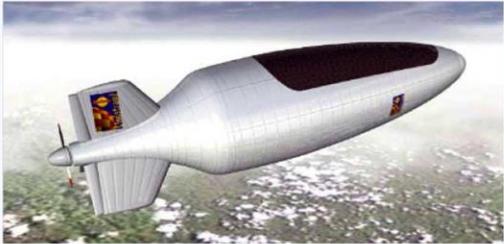
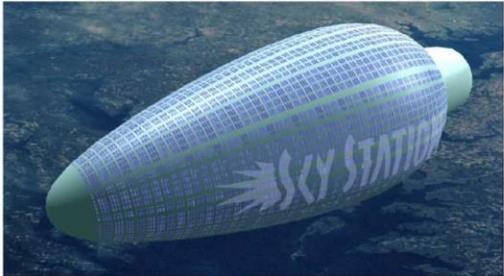
Variable buoyancy propulsion airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>New Mexico State University</p> <p>Advanced High-Altitude Aerobody (AHAB)</p>	<p>USA</p>	<p>Non-rigid, superpressure aerobody, solar powered</p>	<p>Ballonets + helium control + center of gravity control</p>		<p>Sub-scale model indoor test flight demonstrated variable buoyancy propulsion in the early 2000s.</p>
<p>Hunt Aviation</p> <p>Gravity plane</p>	<p>USA</p>	<p>Rigid, variable geometry (wing sweep) aircraft</p>	<p>Originally: helium lift gas control system. By 2010, used phase-change working fluid cycle, possibly ammonia.</p>		<p>Concept unveiled in October 2003.</p>
<p>Phoenix</p>	<p>UK</p>	<p>Semi-rigid, fixed wing, solar powered airship</p>	<p>Ballonets + helium control + center of gravity control</p>		<p>Sub-scale model demonstrated variable buoyancy propulsion in 2019</p>

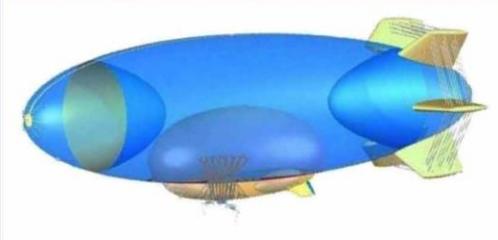
Stratospheric airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Thales Alenia Space Stratobus</p>	<p>France</p>	<p>Non-rigid, comm / data service stratospheric airship</p>	<p>Initial helium charge + ballonets</p>		<p>Pseudo satellite at 20 km. Official project launch in 2016, first flight planned 2023.</p>
<p>TAO Group SkyDragon</p>	<p>Germany</p>	<p>Non-rigid, segmented, multi-mission stratospheric airship</p>	<p>Initial helium charge + fuel gas + ballonets</p>		<p>STS-111 sub-scale prototype flew in 2009. SkyDragon development continuing.</p>
<p>Atlas LTA Advanced Technology PAHAP</p>	<p>Israel</p>	<p>Non-rigid, multi-mission stratospheric airship</p>	<p>Initial helium charge + ballonets</p>		<p>Pseudo satellite at 16 - 22 km. Propulsion Assisted High Altitude Platform (PAHAP) under development.</p>
<p>Sceye Inc. Stratospheric airship</p>	<p>USA</p>	<p>Non-rigid, multi-mission stratospheric airship</p>	<p>Initial helium charge + ballonets</p>		<p>Pseudo satellite at 20 km. Sub-Scale Vehicle (SSV) flew in 2017. Test program for larger vehicle in 2021.</p>

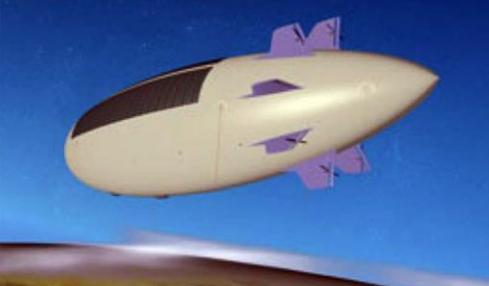
Stratospheric airships (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
ESA / Lindstrand High-Altitude Long-Endurance (HALE) aerostatic craft	EU	Semi-rigid, multi-mission stratospheric airship	Initial helium charge + ballonets		20 km pseudo satellite for communications, astronomy. Design concept.
SkyStation International Inc. Sky Station	USA	Non-rigid comm / data service stratospheric airship	Initial helium charge + ballonets		Founded in mid-1990s. 21 km communications pseudo satellite. Business failed in early 2000s.
Sanswire Stratellite One	USA	Rigid comm / data service stratospheric airship	Initial helium charge + ballonets		Full size airship built & float tested in 2005. Abandoned in 2007. Never flew.
Sanswire / WSGI Argus One	USA	Non-rigid, prototype of a multi-mission segmented stratospheric airship	Initial helium charge + ballonets		Development of TAO STS-111, flew 2009 – 2011. Work on 70 meter stratospheric airship discontinued.

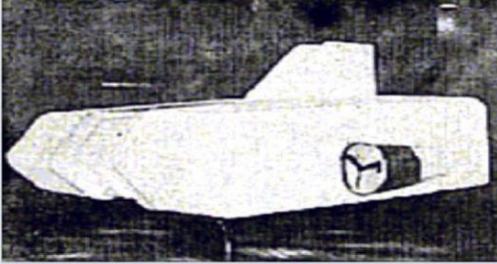
Stratospheric airships (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
StratXX X-Station	Switzerland	Non-rigid, solar powered, multi-mission stratospheric airship with “fly-back” payload plane	Initial helium charge + ballonets		Founded 2005. Successful with aerostats, but not with high-altitude X-Station. Filed for bankruptcy in 2019.
Beijing Aerospace Technology Co. & BeiHang Yuanmeng (Dream)	China	Non-rigid, prototype of a solar powered, multi-mission stratospheric airship	Initial helium charge + ballonets		75 m prototype made 1 st flight in October 2015.
World Wide Aeros Global Rapid Redeployable G2R stratospheric airship	USA	Non-rigid, solar powered stratospheric military airship	Initial helium charge + ballonets & expandable “super-envelope”		20 km pseudo satellite concept for Army Missile Defense Agency, circa 2006.
NASA 20-20-20 airship challenge	USA	Semi-rigid, solar powered, stratospheric astronomical & Earth observatory airship	Initial helium charge + ballonets		Planned design competition for stratospheric astronomical & earth observatory, 20 km, 20 hours, 20 kg payload

Stratospheric airships (P2.4)

Airship	Country	Airship type	Lift control	Graphic	Status
<p style="text-align: center;">EU CAPANINA</p>	<p style="text-align: center;">EU</p>	<p style="text-align: center;">Notional non-rigid, comm / data service stratospheric airship</p>	<p style="text-align: center;">Initial helium charge + ballonets</p>		<p style="text-align: center;">2003 - 2007 CAPANINA program focus on communications system design from a notional airship.</p>
<p style="text-align: center;">Augur RosAeroSystems HAA Berkut</p>	<p style="text-align: center;">Russia</p>	<p style="text-align: center;">Semi-rigid, solar powered, multi-mission stratospheric airship</p>	<p style="text-align: center;">Initial helium charge + ballonets</p>		<p style="text-align: center;">Design concept circa 2015.</p>

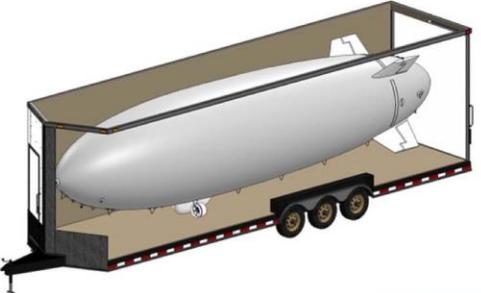
Electro-kinetically (EK) propelled airships (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
LTAS XEM-1	USA	Rigid, solar powered, hybrid EK drive	Aerostatic + ballast		Sub-scale, proof-of-concept demonstrator, design by Michael Walden, indoor EK flight tests 1974 - 1977.
LTAS EK-1	USA	Conventional, non-rigid, skin integrated EK drive	Aerostatic + ballast		Sub-scale, proof-of-concept demonstrator, design by Michael Walden, indoor EK flight tests in 2003.
Walden Aerospace Big Black Delta (BBD)	USA	Rigid, EK drive	Variable buoyancy control		Concept design by Michael Walden circa 2002.
Festo b-IONIC Airfish	Germany	Non-rigid, superpressure, EK drive	Aerostatic + ballast		Indoor EK flight tests in 2005.

Small LTA drones (P2.1)

Airship	Country	Airship type	Lift control	Graphic	Status
Aerotain AG Skye drone	Switzerland	Non-rigid, superpressure, spherical blimp	Vectored thrust + “tuning” weights		Entertainment drone, 2.7 m (8.6 ft) diameter, capable of collision-free choreographed group flights.
Research and Development Center “BAK and Technologies” BAK EM50 drone	Belarus	Conventional, non-rigid blimp	Vectored thrust		8.8 m (28.5 ft) multi-mission LTA drone. 1 st flight in 2014. Manufacturing capability in place awaiting orders.
DBBA (aka DKBA) DP-27 Anuta drone	Russia	Conventional, semi-rigid lenticular airship	Vectored thrust		16 m (62.5 ft) diam. multi-mission drone. 1 st flight in Sep 2011. Development discontinued.
DBBA (aka DKBA) DP-29 drone	Russia	Conventional, semi-rigid airship	Vectored thrust		Multi-mission LTA drone. 1 st flight in September 2014. Larger cargo drone version expected in 2021.

Small LTA drones (P2.2)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Galaxy Unmanned Systems LLC GC-35 UTAS drone</p>	<p>USA</p>	<p>Non-rigid blimp drone</p>	<p>Vectored thrust</p>		<p>35 ft fully-inflated blimp is transportable in a trailer. In production.</p>
<p>Galaxy Unmanned Systems LLC GC-75 LUTAS drone</p>	<p>USA</p>	<p>Non-rigid blimp drone</p>	<p>Vectored thrust</p>		<p>Based on 60-ft GC-60 prototype. 75-ft GC-75 is in production.</p>
<p>TAO Group Lotte drone</p>	<p>Germany</p>	<p>Semi-rigid, superpressure, solar powered airship drone</p>	<p>Vectored thrust + ballonets</p>		<p>16 m (52.5 ft) Lotte-1 1st flight in 1992. Lotte-2 & -3 continued flying until 2014.</p>
<p>Airship Surveillance / R&D1 drone Airship Manufacturing / Sky Sentinel drone</p>	<p>USA</p>	<p>Non-rigid blimp drone</p>	<p>Vectored thrust</p>		<p>R&D1 drone 1st flight in March 2008. Similar Sky Sentinel 1st flight likely in 2013.</p>

Small LTA drones (P2.3)

Airship	Country	Airship type	Lift control	Graphic	Status
<p>Blackwater Airships / Guardian Flight Systems</p> <p>RC-36 drone</p>	<p>USA</p>	<p>Conventional, non-rigid, blimp</p>	<p>Ballonets + ballast + vector thrust</p>		<p>11 m (36 ft) drone, 1st flight circa 2006, used for developing flight controls for Polar 400.</p>

Among the airships included in the above tables, more than 35 have flown.

Several airships that have not yet flown have well-established designs and their manufacturers seem to be poised to start building their full-scale prototype(s) and engaging aviation regulatory authorities in the long process leading to a type certificate for their production airships. Several manufacturers have received orders that are conditional on having a type certificate. Almost all are limited by a lack of funding to get from Point A (today) to Point B (having a type certificate).

The most promising new heavy-lift airship manufacturers identified in Part 2 are:

- **Flying Whales (France):** The firm appears to have solid funding from diverse sources in France, China, Canada and Morocco, which should be adequate to fund the construction and flight testing of a prototype LCA60T airship. Full-scale production facilities are planned in France, China and Canada and commercial airship operating infrastructure is being planned. In 2019, the LCA60T prototype maiden flight was expected to take place in 2021. That date has slipped to 2024.
- **Varialift (UK):** The factory in France and the ARH-PT prototype are under construction, but the schedule for completing the prototype has slipped, perhaps by three years to 2022, primarily because of tenuous funding. Without a stronger funding stream, the future schedule is unpredictable.
- **Euro Airship (France):** The firm claims that production-ready drawings exist for their Corsair and the larger DGPAtt. When funding becomes available, it seems that they're ready to go.
- **BASI (Canada):** The firm has a well developed design in the MB-30T and a fixed-base operating infrastructure design that seems to be well suited for their primary market in the Arctic. When funding becomes available, it seems that they're ready to go.
- **Millennium Airship (USA & Canada):** The firm has well developed designs for their SF20T and SF50T SkyFreighters, has identified its industrial team for manufacturing, and has a

business arrangement with SkyFreighter Canada, Ltd., which would become a future operator of SkyFreighter airships in Canada. In addition, a development plan defines the work needed to build and certify a prototype and a larger production airship. When funding becomes available, it seems that they're ready to go.

- **Aerosmena (AIDBA, Russia):** The firm offers the latest designs for heavy-lift hybrid thermal (Rozier) "aeroplatforms," which use two lift gases: helium and heated air. The A20 will be the prototype for the entire family of Aerosmena aeroplatform. When funding becomes available, it seems that they're ready to go.
- **Atlas LTA Advanced Technology (Israel):** After acquiring the Russian firm Augur RosAeroSystems in 2018, Atlas is continuing to develop the ATLANT variable buoyancy, fixed volume heavy lift airship. They also are developing a new family of non-rigid manned and unmanned blimps. However, the development plans and schedules have not yet been made public.

These heavy-lift airships will be competing in the worldwide airship market with the leading candidates identified in *Modern Airships - Part 1*, which could enter the market in the same time frame if they get adequate funding:

- **Lockheed Martin (USA):** LMH-1 hybrid airship
- **Hybrid Air Vehicles (UK):** Airlander 10 hybrid airship
- **Aeros (USA):** Aeroscraft ML866 / Aeroscraft Gen 2 variable buoyancy / fixed volume airship
- **Voliris (France):** V932 NATAC & SeaBird semi-buoyant, inflated wing airships

For decades, there have been many ambitious projects that intended to operate an airship as a pseudo-satellite, carrying a heavy payload while maintaining a geo-stationary position in the stratosphere on a long-duration mission (days, weeks, to a year or more). None were successful. This led NASA in 2014 to plan the 20-20-20 airship challenge: 20 km altitude, 20 hour flight, 20 kg payload. The challenge never occurred, but it highlighted the difficulty of developing

an airship as a persistent pseudo-satellite. The most promising new stratospheric airship manufacturers identified in Part 2 are:

- **Sceye Inc. (USA):** This small firm is developing and, since 2017, has been flight testing mid-size, multi-mission stratospheric airships. The firm also is building a new headquarters and manufacturing facility in New Mexico. Plans for stratospheric communications system flight tests in 2021 have been filed with the Federal Communications Commission.
- **Thales Alenia Space (France):** The firm is developing the multi-mission Stratobus. Their latest round of funding from France's defense procurement agency calls for a full-scale, autonomous Stratobus demonstrator airship to fly by the end of 2023, five years later than another demonstrator that was ordered in the original 2016 Stratobus contract, but not built.

China remains an outlier after the 2015 flight of the Yuanmeng stratospheric airship developed by Beijing Aerospace Technology Co. & BeiHang. The current status of the Chinese stratospheric airship development program is not described in public documents.

Among the many smaller airships identified in Part 2, the following manufacturers could have their airships flying in the early-to-mid 2020s if adequate funding becomes available.

- **Dirisolar (France):** The firm has a well developed design for their five passenger DS 1500, which is intended initially for local air tourism, but can be configured for other missions. When funding becomes available, it seems that they're ready to go.
- **A-NSE (France):** The firm offers a range of aerostat and small airships, several with a novel tri-lobe, variable volume hull design. Such aerostats are operational now, and a tri-lobe airship could be flying in the early 2020s.
- **Egan Airships (USA):** The PLIMP Model J drone has already flown and the Model J plane / blimp hybrid is the likely candidate for FAA type certification. When funding becomes available, it seems that they're ready to go.
- **Solar Ship (Canada):** The firm's 24-meter Caracal semi-buoyant, inflated wing airship has already flown successfully.

However, that basic design did not scale up successfully. Hence, the larger Wolverine has been redesigned as a significantly different semi-buoyant aircraft. Solar Ship has not described their current development and certification schedules.

There seems to be a proliferation of small LTA drone blimps and other small LTA drone vehicles. Some were developed initially for military surveillance applications, but all are configurable and could be deployed in a range of interesting applications.

The 2020s will be an exciting time for the airship industry. We'll finally get to see if the availability of several different heavy-lift airships with commercial type certificates will be enough to open a new era in airship transportation. Aviation regulatory agencies need to help reduce investment risk by reducing regulatory uncertainty and putting in place an adequate regulatory framework for the wide variety of advanced airships being developed. Customers with business cases for airship applications need to step up, place firm orders, and then begin the pioneering task of employing their airships and building a worldwide airship transportation network with associated ground infrastructure. This will require consistent investment over the next decade or more before a basic worldwide airship transportation network is in place to support the significant use of commercial airships in cargo and passenger transportation and other applications. Perhaps then we'll start seeing the benefits of airships as a lower environmental impact mode of transportation and a realistic alternative to fixed-wing aircraft, seaborne cargo vessels and heavy, long-haul trucks.

3. Links to the individual articles

The following links will take you to 64 individual articles that address all of the airships identified in the preceding graphic table.

Conventional, rigid and semi-rigid airships:

- Flying Whales - LCA60T: https://lynceans.org/wp-content/uploads/2021/04/Flying-Whales_R1-converted.pdf
- Buoyant Aircraft Systems International (BASI) - MB-30T & -100T: https://lynceans.org/wp-content/uploads/2021/04/BASI_R1-converted.pdf
- TP Aerospace - Atlas 80: https://lynceans.org/wp-content/uploads/2021/04/TP-Aerospace_Atlas-80_R1-converted.pdf
- SkyLifter Ltd. - Flying Crane, SL150, SL50, SL25 & SL20: https://lynceans.org/wp-content/uploads/2021/04/Skylifter_R1-converted.pdf
- Augur RosAeroSystems (RAS) - DZ-N1 & MD-900: https://lynceans.org/wp-content/uploads/2021/04/Augur-RosAeroSystems_R1-converted.pdf
- AIRSTAR - Alpha & LTA Corp. - Alizé lenticular airships: <https://lynceans.org/wp-content/uploads/2021/04/Alpha-Alize-converted.pdf>
- The Hamilton Airship Company (THAC) - HA-44, -80 & -140: <https://lynceans.org/wp-content/uploads/2021/04/Hamilton-Airships-converted.pdf>
- Lightspeed USA Inc. - Lightships LS-12 & -60: <https://lynceans.org/wp-content/uploads/2021/04/Lightspeed-USA-converted.pdf>
- Solar Flight – Sunship: https://lynceans.org/wp-content/uploads/2021/04/Solar-Flight_Sunship_R1-converted.pdf
- SolarAirShip - High-Speed Solar Airship (HSSA): https://lynceans.org/wp-content/uploads/2021/04/SolarAirShip_High-Speed-Solar-Airship-HSSA_R1-converted.pdf

Conventional, non-rigid airships (blimps):

- Worldwide Aeros Corp - Aeros 40 Sky Dragon: <https://lynceans.org/wp-content/uploads/2021/04/Aeros-40-Sky-Dragon-blimp-converted.pdf>
- Atlas LTA Advanced Technology - Atlas-6 and -11: <https://lynceans.org/wp-content/uploads/2021/04/Atlas-LTA-Advanced-Technology-airships-converted.pdf>
- Blackwater Airships / Guardian Flight Systems - Polar 400 / 450 & Polar 600: https://lynceans.org/wp-content/uploads/2021/04/Blackwater_Polar-airships-converted.pdf
- Augur RosAeroSystems (RAS) - Au-12M & -30: https://lynceans.org/wp-content/uploads/2021/04/Augur-RosAeroSystems_R1-converted.pdf
- Augur RosAeroSystems (RAS) - SOKOL: https://lynceans.org/wp-content/uploads/2021/04/Augur-RosAeroSystems_R1-converted.pdf
- Project Sol'R - Nephelios: https://lynceans.org/wp-content/uploads/2021/04/Project-SolR_Nephelios_R1-converted.pdf
- 21st Century Airships - Voyager: https://lynceans.org/wp-content/uploads/2021/04/21st-Century_Voyager-converted.pdf
- E-Green Technologies (EGT) - Bullet 125 & 580: https://lynceans.org/wp-content/uploads/2021/04/EGT_Bullet-converted.pdf
- 21st Century Airships & Techsphere - spherical blimps: <https://lynceans.org/wp-content/uploads/2021/04/21st-Century-Techsphere-converted.pdf>
- A-NSE - A-N400: <https://lynceans.org/wp-content/uploads/2021/04/A-NSE-converted.pdf>

Hybrid (semi-buoyant) airships:

- Millennium Airship - SkyFreighter SF20T, SF50T & SF500T: https://lynceans.org/wp-content/uploads/2021/04/Millennium-Airship_SkyFreighter-R1-converted.pdf
- Dirisolar - DS 0.6, DS 12, DS 900, DS 1500 & DS 30: https://lynceans.org/wp-content/uploads/2021/04/Dirisolar_R2-converted.pdf

- Airship-GP - AeroTruck, AeroBoat & AeroYacht: https://lynceans.org/wp-content/uploads/2021/04/Airship-GP_R1-converted.pdf
- Turtle Airships: <https://lynceans.org/wp-content/uploads/2021/04/Turtle-Airships-converted.pdf>
- Nautilus SpA - Elettra Twin Flyers (ETF): https://lynceans.org/wp-content/uploads/2021/04/Nautilus_Elettra-Twin-Flyers_R1-converted.pdf
- Flying-Yacht: https://lynceans.org/wp-content/uploads/2021/04/Flying-Yacht_R1-converted.pdf
- Magnus Aerospace Corp. – LTA 20-1 spherical Magnus effect airship: https://lynceans.org/wp-content/uploads/2021/04/Magnus-Aerospace_spherical-airship-converted.pdf

Hybrid thermal (Rozier) airships:

- Aerosmena (AIDBA) - A20, A-60, A200 & A600: https://lynceans.org/wp-content/uploads/2021/04/Aerosmena_hybrid-thermal-airships-converted.pdf
- LocomoSky – LokomoSkyner: https://lynceans.org/wp-content/uploads/2021/04/LocomoSky_hybrid-thermal-airships-converted.pdf
- Design Bureau Thermoplan - Thermoplane ALA-40 & -200: https://lynceans.org/wp-content/uploads/2021/04/Thermoplan_hybrid-thermal-airships-converted.pdf
- Thermo-Skyships Ltd. (TSL) - Thermo-Skyship: https://lynceans.org/wp-content/uploads/2021/04/Thermo-Skyships_hybrid-thermal-airships-converted.pdf
- Boeing - hybrid thermal airship: https://lynceans.org/wp-content/uploads/2021/04/Boeing_hybrid-thermal-airship-converted.pdf

Variable buoyancy, fixed volume airships:

- Atlas LTA Advanced Technology - ATLANT 30, 100 & 300: <https://lynceans.org/wp-content/uploads/2021/04/Atlas-LTA-Advanced-Technology-airships-converted.pdf>

- Varialift Plc. – ARH-PT, ARH 50 & 250: https://lynceans.org/wp-content/uploads/2021/04/Varialift-Airships_R1-converted.pdf
- Euro Airship - Corsair & DGPAAtt: https://lynceans.org/wp-content/uploads/2021/04/Euro-Airship_R2-converted.pdf
- Airship-GP - “Super Hybrid” AeroTruck, AeroBoat & AeroYacht: https://lynceans.org/wp-content/uploads/2021/04/Airship-GP_R1-converted.pdf
- AeroVehicles, Inc. (AVI) - Minicat, Aerocat R-12 & R-40: https://lynceans.org/wp-content/uploads/2021/04/AeroVehicles_Aerocat_R1-converted.pdf
- Global Airships - Atlas: https://lynceans.org/wp-content/uploads/2021/04/Global-Airships_Atlas_R1-converted.pdf
- Skylite Aeronautics - GeoShip: https://lynceans.org/wp-content/uploads/2021/04/Skylite-Aeronautics_GeoShip_R1-converted.pdf
- LTA Aerostructures - 10T & 70T: https://lynceans.org/wp-content/uploads/2021/04/LTA-Aerostructures_R1-converted.pdf
- Imaginative - Alert, Invitation & Kugaaruk: https://lynceans.org/wp-content/uploads/2021/04/Imaginative_-Alert-airship_R1-converted.pdf
- Augur RosAeroSystems (RAS) – ATLANT: https://lynceans.org/wp-content/uploads/2021/04/Augur-RosAeroSystems_R1-converted.pdf

Variable buoyancy, variable volume airships:

- Dynapod: <https://lynceans.org/wp-content/uploads/2021/04/Dynapod-converted.pdf>
- A-NSE tri-lobe airships & aerostats: <https://lynceans.org/wp-content/uploads/2021/04/A-NSE-converted.pdf>
- EADS - Tropospheric Airship: https://lynceans.org/wp-content/uploads/2021/04/EADS_Tropospheric-Airship_R1-converted.pdf

Variable buoyancy propulsion airships:

- Solomon Andrews - Aereon I & II (1863): https://lynceans.org/wp-content/uploads/2021/04/Solomon-Andrews_Aereon-I-and-Aereon-II_R1-converted.pdf
- Walden Aerospace / Lighter Than Air Solar (LTAS) - Variable buoyancy propelled airships / aircraft HY-SOAR B.A.T & VAMPIRE: https://lynceans.org/wp-content/uploads/2021/04/Walden-LTAS_VB-propelled-airships_R1-converted.pdf
- New Mexico State University - Advanced High-Altitude Aerobody (AHAB): https://lynceans.org/wp-content/uploads/2021/04/New-Mexico-State-University_AHAB_R1-converted.pdf
- Hunt Aviation - Gravity Plane: <https://lynceans.org/wp-content/uploads/2021/04/Hunt-Aviation-Gravity-Plane-converted.pdf>
- Phoenix: https://lynceans.org/wp-content/uploads/2021/04/Phoenix_R1-converted.pdf

Stratospheric airships:

- Thales Alenia Space – Stratobus: https://lynceans.org/wp-content/uploads/2021/04/Thales-Alenia-Space_Stratobus-converted.pdf
- TAO Group – SkyDragon: <https://lynceans.org/wp-content/uploads/2021/04/TAO-Group-airships-converted.pdf>
- Atlas LTA Advanced Technology - Propulsion Assisted High Altitude Platform (PAHAP): <https://lynceans.org/wp-content/uploads/2021/04/Atlas-LTA-Advanced-Technology-airships-converted.pdf>
- Sceye Inc. - stratospheric airship: https://lynceans.org/wp-content/uploads/2021/04/Sceye_stratospheric-airship-converted.pdf
- ESA / Lindstrand - High-Altitude Long-Endurance (HALE) aerostatic craft: https://lynceans.org/wp-content/uploads/2021/04/ESA_Lindstrand-HALE-converted.pdf
- SkyStation International Inc. - Sky Station: <https://lynceans.org/wp-content/uploads/2021/04/SkyStation-converted.pdf>

- Sanswire / WSGI – Stratellite One & Argus One: <https://lynceans.org/wp-content/uploads/2021/04/Sanswire-WSGI-airships-converted.pdf>
- StratXX – X-Station: <https://lynceans.org/wp-content/uploads/2021/04/StratXX-airships-converted.pdf>
- Beijing Aerospace Technology Co. & BeiHang - Yuanmeng stratospheric airship: <https://lynceans.org/wp-content/uploads/2021/04/China-Yuanmeng-stratospheric-airship-converted.pdf>
- Worldwide Aeros Corp. - G2R high altitude airship: <https://lynceans.org/wp-content/uploads/2021/04/Aeros-G2R-high-altitude-airship-converted.pdf>
- NASA 20-20-20 airship challenge: <https://lynceans.org/wp-content/uploads/2021/04/NASA-20-20-20-airship-challenge-converted.pdf>
- EU CAPANINA: <https://lynceans.org/wp-content/uploads/2021/04/EU-CAPANINA-converted.pdf>
- Augur RosAeroSystems (RAS) - HAA Berkut: https://lynceans.org/wp-content/uploads/2021/04/Augur-RosAeroSystems_R1-converted.pdf

Semi-buoyant plane / airship hybrids:

- Egan Airships - PLIMP Model D drone & Model J: https://lynceans.org/wp-content/uploads/2021/04/Egan-Airships_PLIMP_R1-converted.pdf
- Solar Ship - Caracal, Wolverine & Nanuq: https://lynceans.org/wp-content/uploads/2021/04/Solar-Ship_R1-converted.pdf

Electro-kinetically (EK) propelled airships:

- Walden Aerospace / Lighter Than Air Solar (LTAS) - XEM-1, EK-1 & BBD: https://lynceans.org/wp-content/uploads/2021/04/Walden-LTAS_EK-propelled-airships_R1a-converted.pdf
- Festo - b-IONIC Airfish: https://lynceans.org/wp-content/uploads/2021/04/Festo_b-IONIC-Airfish_R1-converted.pdf

Small LTA drones:

- Aerotain AG - Skye spherical blimp: https://lynceans.org/wp-content/uploads/2021/04/Aerotain_Skye-spherical-drone-converted.pdf
- BAK - EM50 blimp: https://lynceans.org/wp-content/uploads/2021/04/BAK_EM50-drone-blimp-converted.pdf
- DDBA (aka DKBA) - DP-27 & -29 airships: <https://lynceans.org/wp-content/uploads/2021/04/DDBA-airships-converted.pdf>
- Galaxy Unmanned Systems - GC-35, -60 & -75 blimps: <https://lynceans.org/wp-content/uploads/2021/04/Galaxy-Unmanned-Systems-blimps-converted.pdf>
- TAO Group - Lotte airship: <https://lynceans.org/wp-content/uploads/2021/04/TAO-Group-airships-converted.pdf>
- Airship Surveillance - R&D1 blimp & Airship Manufacturing - Sky Sentinel blimp: <https://lynceans.org/wp-content/uploads/2021/04/RD1-Sky-Sentinel-blimps-converted.pdf>
- Blackwater Airships / Guardian Flight Systems – RC-36 blimp: https://lynceans.org/wp-content/uploads/2021/04/Blackwater_Polar-airships-converted.pdf