

# Modern Airships

## Consolidated Table of Contents

Peter Lobner, 20 March 2022

*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 230 individual articles on historic and advanced airship designs. Here are the links to the three parts:

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

The following consolidated Table of Contents for all three parts should help you navigate this large volume of material.

# TOC for Modern Airships – Part 1, Rev 5, 8 March 2022

## 1. Introduction

*Modern Airships – Part 1* begins with an overview of modern airship technology, which is followed by a summary table identifying the airships addressed in this part, and concludes by providing links to 91 individual articles on these airships. Some articles cover more than one airship in more than one category.

## 2. Well-established benefits and opportunities, but a risk-averse market

## 3. Status of current aviation regulations for airships

## 4. Lifting gas

## 5. Types of modern airships

### 5.1 Conventional airships

- Rigid airships
- Semi-rigid airships
- Non-rigid airships (blimps)

### 5.2 Semi-buoyant hybrid airships

### 5.3 Semi-buoyant aircraft

### 5.4 Variable buoyancy airships

- Variable buoyancy / fixed volume airships
- Variable buoyancy / variable volume airships
- Variable buoyancy propulsion airships / aircraft

### 5.5 Helicopter / airship hybrids

### 5.6 Stratospheric airships

### 5.7 Thermal (hot air) airships

### 5.8 Hybrid thermal-gas (Rozier) airships

### 5.9 Rocket / balloon (Rockoon) hybrid airships

## 6. How does an airship pick up and deliver a heavy load?

## 7. The scale of large cargo airships

## **8. Specific airships in Part 1**

- Graphic tables

## **9. Links to the individual articles**

### **Conventional, rigid**

- Airfloat Transport Ltd.
- Airship Advertising / Laws Corp. – rigid airship
- Airship Industries – R40/R130 & R150
- Cargo Airship Ltd.
- C.N.R.S. - Titan
- Conrad Airship Company – CA220 & CA80
- LTA Research and Exploration – rigid airships
- Rigid Airship Design (RAD) – RA-180 Holland Navigator
- Shell / Aerospace Developments - methane gas transporter
- SPACIAL SA – XEM-4, MLA-24, -32A & -32B
- Wendel R. Wendel – STAR\*FLITE
- Wren Skyships Ltd. – R.30 & RS.1

### **Conventional, semi-rigid airships:**

- Airship do Brasil (ADB) - ADB 3-30 & 3-15/30
- CargoLifter - CL160 & Joey
- SAIC – Skybus 1500
- SAIC & ArcXeon International - Airstation UAS Carrier
- Tucker Airships – TX-1
- UpShip - UpShip 100
- Zeppelin NT
- Zeppelin ZET

### **Conventional, non-rigid airships (blimps):**

- Advanced Airship Corp. (AAC) – ANR-1
- Aerospace Development – AD-500
- Airship do Brasil (ADB) ADB 3-X01 & 3-3
- Airship Industries – Skyship 500, 500HL & 600
- American Blimp Corp - American Blimp Corp – A-60+, A-150 & A-170 Lightships & Navy MZ-3A (A-170G)
- ATG / HAV – AT-10

- Aviation Industry Corporation of China (AVIC) – AS700
- Bell Aerospace Textron – MPA (Navy MPA)
- Goodyear Aerospace – N-Class blimps ZPG-1, -2, -2W & -3W
- Goodyear Aerospace – Civilian blimps GZ-19, -19A, -20, -20A & GZ-22
- Goodyear Aerospace - ZPG-X (Navy ANVCE)
- Goodyear Aerospace - ZP3G (Navy MPA)
- Goodyear Aerospace - YEZ-2A (Navy Sentinel 5000 proposal)
- Lindstrand Technologies – GA-42
- Martin Marietta – Model 836 (Navy ANVCE)
- Mav6 LLC - Blue Devil Bock II
- Memphis Airships – EXP II, Zephyr 200 & 500
- SAIC – Skybus 80K
- Skyrider – BA-2
- Solar Airship Ltd. – subscale demonstrator & Sunship
- Thunder & Colt – GA-42
- US-LTA – Model 138S
- Vantage Airship Manufacturing Co.- blimps
- Voliris V900
- Westinghouse Airships Inc. (WAI) – Sentinel 1000 & 5000
- WDL – WDL-1

#### **Variable buoyancy, fixed volume airships:**

- Aeros - Aeroscraft *Dragon Dream*
- Aeros – Aeroscraft ML866 / Aeroscraft Generation 2
- S.E.A.B. – Champlain
- Vaeth & Stehling – Helium Horses
- Walden Aerospace / LTAS - lenticular, toroidal, variable buoyancy airships

#### **Variable buoyancy, variable volume airships:**

- Voliris V901, V902, V930, V932 NATAC & SeaBird

#### **Helicopter / airship hybrids:**

- Aerolift Inc. – Cyclocrane & Cyclo-Cruiser
- Aérospatiale – Hélicostats
- Aérospatiale – Obélix & Obélix II
- All American Engineering – Aerocrane

- Bothe – Helitruck & semi-buoyant hybrid aircraft
- Goodyear Aerospace - Dynastats & airline feeder
- Goodyear Aerospace - Quad-rotor heavy-lift helistats
- Piasecki - Quad-rotor heavy-lift helistats & PA-97
- Skyhook International / Boeing - SkyHook JLH-40
- Other helistats:
  - NASA heavy lifter
  - Tentai III
  - Kawasaki Heavy Industries (KHI) helistats
  - Jess hybrid lift air vehicle
  - Boeing LTA vertical load lifting system

### **Semi-buoyant hybrid aircraft:**

- Aereon Corp. - Aereon III
- Aereon Corp. - Dynairships & Aereon 26
- Megalifter Co. - Megalifter
- Ohio Airships - Dynalifters DL-100 & Patroller, Freighter & Cruiser, Drone Runner
- Tumencotrans – BARS & Bella-1

### **Semi-buoyant hybrid airships:**

- Advanced Hybrid Aircraft Ltd. – Patroller 3
- ATG – SkyCat & SkyKitten
- ATG / HAV – Condor
- Boeing Vertol – Helipsoid
- DARPA - Project Walrus
- EERM – Dinosaur & Dino 2
- GNSS / ENSS – StarShadow
- Goodyear Aerospace – SABV
- Goodyear Aircraft - Dynamic lift airship
- Hov-Air-Ship Inc. – HX-1 & HX-2
- Hybrid Air Vehicles / Northrop Grumman - HAV-3 & HAV-304 (LEMV)
- Hybrid Air Vehicles - Airlander 10 prototype
- Hybrid Air Vehicles - Airlander 10 & 50
- Lockheed Martin – Aerocraft
- Lockheed Martin - P-791
- Lockheed Martin - SkyTug & LMH-1

- Lockheed Martin – Rigid hybrid airships
  - Ultra-large hybrid airships
  - Small rigid airship (SRA) - Starship
- S.E.A.B. – Alcyon
- US Navy (NAVAIR) - HULA program
- Vantage Airship Manufacturing Co., Ltd. - CA-60T & CA-200T

### **Stratospheric airships:**

- Airship do Brasil (ADB) - SAGA
- ATG - StratSat
- C.R.N.S. – Pégase
- GNSS / ENSS - StarLight
- Japan stratospheric platform (SPF) - SkyNet
- JP Aerospace – Ascender airships (175 / NSMV & Atmospheric Ascenders 20, 90, 100, 26, 36, 9, Ellipse, 48, 300) & Dark Sky Station
- Lockheed Martin - High-Altitude Airship (HAA)
- Lockheed Martin / DARPA - HALE-D
- Lockheed Martin / DARPA - ISIS
- StratoComm Corp. - STS
- South Korea stratospheric airship - VIA-200
- Southwest Research Institute (SwRI) - HiSentinel
- Walden Aerospace / LTAS - S.O.S.C.S.

### **Rocket / balloon (Rockoon) hybrid airships:**

- JP Aerospace - Mach Gliders & Orbital Ascender

### **Thermal (hot air) airships:**

- APEX Balloons thermal airship
- GEFA-Flug (Impacto Aereo) - AS-105GD/4 & AS-105GD/6
- Skyacht - Personal Blimp

### **LTA drones:**

- Lindstrand Technologies – GA-22 drone blimp
- SAIC - Skybus 80K drone blimp
- Vantage Airship Manufacturing Co., Ltd. - drone blimps

**Aerostats:**

- CargoLifter - CL75 AC (AirCrane)
- GNSS / ENSS – StarTower
- JP Aerospace – High-altitude balloons
- NSC - High Altitude Shuttle System (HASS)
- StratoComm Corp. – TTS

## Record of revisions to Part 1

- **Original *Modern Airships* post, 26 August 2016:** addressed 14 airships in a single post.
- **Expanded the *Modern Airships* post and split it into three parts, 18 August 2019:** Part 1 included 22 linked articles.
- **Part 1, Revision 1, 21 December 2020:** Added 15 new articles, split the existing Aeros article into two articles and updated all of the original articles. Part 1 now had 38 articles.
- **Part 1, Revision 2, 3 April 2021:** Updated the main text and 10 existing articles, and expanded and reorganized the graphic tables. Part 1 still had 38 articles
- **Part 1, Revision 3, 26 August 2021:** Added 34 new articles, split the existing Helistat article into five articles and the Aereon article into two articles, and expanded and reorganized the graphic tables. Also updated 23 existing articles. Part 1 now had 77 articles.
- **Part 1, Revision 4, 12 February 2022:** Added 12 new articles, split the existing Airlander article into two updated articles (prototype, production), moved Halo to Part 3, expanded the graphic tables and updated 17 additional existing articles. Part 1 now had 89 articles.
- **Part 1, Revision 5, 8 March 2022:** Added 2 new articles, split rigid & semi-rigid airships in the graphic tables, and updated 58 existing articles. With this revision, all Part 1 linked articles have been updated in February or March 2022. Part 1 now has 91 articles.



# TOC for Modern Airships – Part 2, Rev 5, 10 March 2022

## 1. Introduction

Modern Airships – Part 2 begins with a summary table identifying the airships addressed in this part, and concludes by providing links to 91 individual articles on these airships. Some articles cover more than one airship in more than one category.

## 2. Specific Airships in Part 2

- Graphic tables

## 3. Links to the individual articles

### **Conventional rigid airships:**

- Aerostatica / RosAeroSystems - A-06
- Augur RosAeroSystems (RAS) - DZ-N1 & MD-900
- Buoyant Aircraft Systems International (BASI) - MB-30T & -100T
- Flying Whales - LCA60T
- FlyWin – demonstrator airship
- H2 Clipper Inc. – H2 Clipper hydrogen transport
- Leningrad OKB – heavy-lift rigid airships
- Lightspeed USA Inc. - Lightships LS-12 & -60
- Solar Flight – Sunship
- The Hamilton Airship Company (THAC) - HA-44, -80 & -140
- TP Aerospace - Atlas 80

### **Conventional semi-rigid airships:**

- Airstar – Alpha
- LTA Corp. - Alizé lenticular airship
- Altran Aerospace – Sun Cloud
- SkyLifter Ltd. - Flying Crane, SL150, SL50, SL25 & SL20
- SolarAirShip - High-Speed Solar Airship (HSSA)

### **Conventional, non-rigid airships (blimps):**

- 21<sup>st</sup> Century Airships - Voyager
- 21<sup>st</sup> Century Airships & Techsphere - spherical blimps
- Aerial Concept Group & Transoceans - IRIS Challenger I & II
- Aeros (Worldwide Aeros Corp.) - Aeros 40 Sky Dragon
- Aerostatica - 01, 02 & 300
- Aerovehicles, Inc. (AVI) – AV-10 blimp
- A-NSE - A-N400
- Atlas LTA Advanced Technology - Atlas-6 and -11 blimps
- Augur RosAeroSystems (RAS) - MA-55, PD-300, Au-11, -12M. -30 & SOKOL
- Blackwater Airships / Guardian Flight Systems - Polar 400 / 450 & Polar 600
- DKBA conventional airships - 2DP & DP-6000 blimps
- E-Green Technologies (EGT) - Bullet 125 & 580
- Myasishchev Experimental Design Bureau (OKB-23) – 2AB & Cruise-1 blimps
- Ural OKBD (Bimbat) – cargo blimp

### **Semi-buoyant hybrid airships:**

- Airship-GP - AeroTruck, AeroBoat & AeroYacht
- Dirisolar - DS 0.6, DS 12, DS 900, DS 1500 & DS 30
- Dolphin Luftschiff
- Flying-Yacht
- Kamov Company – Aerolet
- Krylo Design Bureau – SHa-10b
- Magnus Aerospace Corp. – LTA 20-1 spherical Magnus effect airship
- MBDA - Armatus airship
- Millennium Airship - SkyFreighter SF20T, SF50T & SF500T
- Nautilus SpA - Elettra Twin Flyers (ETF)
- Turtle Airships

### **Semi-buoyant plane / airship hybrids:**

- Egan Airships - PLIMP Model D drone & Model J
- Nimbus Eos Xi & Metaplano – inflated wing aircraft
- Prospective Concepts AG – Stingray
- Solar Ship - Caracal, Wolverine & Nanuq

- Tumenecotrans – Rescue sloop & “Micro” RVK
- Ural OKBD (Bimbat) – Hybrid winged airship

#### **Variable buoyancy, fixed volume airships:**

- AeroVehicles, Inc. (AVI) - Minicat, Aerocat R-12 & R-40
- Airship-GP - “Super Hybrid” AeroTruck, AeroBoat & AeroYacht
- Anumā Aerospace – vacuum airship
- Atlas LTA Advanced Technology - ATLANT 30, 100 & 300
- Augur RosAeroSystems (RAS) – ATLANT
- Euro Airship - Corsair & DGPAAtt
- Global Airships - Atlas
- Imaginative - Alert, Invitation & Kugaaruk
- Kiev OKBV – D-1
- Krylo Design Bureau – SHa-2000
- LTA Aerostructures - 10T & 70T
- Skylite Aeronautics - GeoShip
- Third Dimension Project – SHa-3500
- Varialift Plc. – ARH-PT, ARH 50 & 250

#### **Variable buoyancy, variable volume airships:**

- A-NSE - tri-lobe airships & aerostats
- Dynapod
- EADS - Tropospheric Airship
- PK Vozdukh - all-metal, variable volume airship
- Ural OKBD (Bimbat) – Ural-2, Ural-3, Double hull airship, Horizontal wing airship, Lenticular airship, Triangular (delta) wing airship, Vertical wing airship

#### **Variable buoyancy propulsion airships:**

- Hunt Aviation - Gravity Plane
- New Mexico State University - Advanced High-Altitude Aerobody (AHAB)
- Phoenix
- Solomon Andrews - Aereon & Aereon 2 (1863)
- Walden Aerospace / Lighter Than Air Solar (LTAS) - Variable buoyancy propelled airships / aircraft: HY-SOAR B.A.T & VAMPIRE

### **Hybrid thermal (Rozier) airships:**

- Aerosmena (AIDBA) - A20, A-60, A200 & A600
- Boeing - hybrid thermal airship
- Design Bureau Thermoplan - Thermoplane ALA-40 & -200
- LocomoSky – LokomoSkyner
- Thermo-Skyships Ltd. (TSL) - Thermo-Skyship

### **Thermal (hot air) airships:**

- Airstar - Colibri 1800
- Augur RosAeroSystems (RAS) – Au-29, -31, -35 & -37
- Ural OKBD – Thermostat (spindle & lenticular)

### **Helicopter / airship hybrids:**

- Kiev OKBV – Albatros
- Myasishchev Experimental Design Bureau (OKB-23) – VS-80 & VS-90 Vertostats
- PK Vozdukh - multi-purpose, helicopter / airship hybrid

### **Stratospheric airships:**

- Aeros (Worldwide Aeros Corp.) - G2R high altitude airship
- Aerostatica – Stratospheric airship
- Atlas LTA Advanced Technology - Propulsion Assisted High Altitude Platform (PAHAP)
- Augur RosAeroSystems (RAS) - HAA Berkut
- Beijing Aerospace Technology Co. & BeiHang - Yuanmeng stratospheric airship
- Capgemini Engineering (formerly Altrans Aerospace) – EcoSat AS30 & AS80
- ESA / Lindstrand - High-Altitude Long-Endurance (HALE)
- EU CAPANINA
- NASA 20-20-20 airship challenge
- Sanswire / WSGI – Stratellite One & Argus One
- Sceye Inc. - stratospheric airship
- SkyStation International Inc. - Sky Station
- Stratosyst – Skyrider
- StratXX – X-Station
- TAO Group – SkyDragon
- Thales Alenia Space – Stratobus

### **Electro-kinetically (EK) propelled airships:**

- Festo - b-IONIC Airfish
- Walden Aerospace / Lighter Than Air Solar (LTAS) - XEM-1, EK-1 & BBD

### **Personal airships:**

- Airstar - ElectropLume 250 & 320, Elliptoplume 150 & Manned AéroLifter
- A-NSE - A-N400
- Project Sol'R – Nephelios

### **LTA drones:**

- Aerotain AG - Skye spherical blimp
- Airship Surveillance - R&D1 blimp & Airship Manufacturing - Sky Sentinel blimp
- Airstar - AéroLifter & Airstar Canada cargo airship drone
- BAK - EM50 blimp
- Blackwater Airships / Guardian Flight Systems – RC-36 blimp
- Buoyant Aero – twin hull drone
- CNIM Air Space (formerly Airstar Aerospace) – Diridrone
- DKBA conventional airships - drones
- DKBA lenticular airships - drones
- Galaxy Unmanned Systems - GC-35, -60 & -75 blimps
- Hipersfera d.o.o. - Hypersphere HS-5K multipurpose drone
- Hyperblimp – blimp drone
- Mustafa Demir - blimp drone
- TAO Group - Lotte airship
- Transoceans – Léilo, Trans-Mediterranean & Trans-Atlantic drone airships
- Ural OKBD - Ural-4 (MIASS-1) drone

### **Unpowered aerostats:**

- Aero-Nautic Services & Engineering (A-NSE) - T-C350 & T-C1400 aerostats
- Airstar – AéroLifter
- Mustafa Demir – tethered aerostat
- Novosibirsk OKB - Heavy-lift airship towed barge
- StratXX – X-Tower tethered aerostat

## Record of revisions to Part 2

- **Original *Modern Airships* post, 26 August 2016:** addressed 14 airships in a single post.
- **Expanded the *Modern Airships* post and split it into three parts, 18 August 2019:** Part 2 included 25 articles
- **Part 2, Revision 1, 21 December 2020:** Added 2 new articles on Walden Aerospace. Part 2 now had 27 articles
- **Part 2, Revision 2, 3 April 2021:** Added 35 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 had 64 articles.
- **Part 2, Revision 3, 9 September 2021:** Updated 7 articles. Added category for “thermal (hot air) airships” and added pages for them in the summary graphic table. Part 2 still had 64 articles.
- **Part 2, Revision 4, 11 February 2022:** Added 26 new articles, expanded the graphic tables and updated 12 existing articles. Part 2 now had 90 articles.
- **Part 2, Revision 5, 10 March 2022:** Added 1 new article, split rigid & semi-rigid airships in the graphic tables, and updated 52 existing articles. With this revision, all Part 2 linked articles have been updated in February or March 2022. Part 2 now has 91 articles.

# TOC for Modern Airships – Part 3, Rev 3, 18 March 2022

## **1. Introduction**

Modern Airships – Part 3 begins with a summary table identifying the airship concepts addressed in this part, and concludes by providing links to 49 individual articles on these airship concepts. Some articles cover more than one airship in more than one category.

The airships described in Modern Airships – Part 3 are relatively exotic concepts in comparison to the more utilitarian and heavy-lift airships that dominate Parts 1 and 2. Many of the airship concepts in Part 3 are designed for operation with very low or zero carbon emissions. Except for a few sub-scale models, none of the airship concepts in Part 3 have flown. A few of these airships look good as concepts, but may be impossible to build. Nonetheless, all of these relatively exotic concepts point toward an airship future that will benefit from the great creativity expressed by these designers.

## **2. Specific Airships in Part 3**

- Graphic tables

## **3. Links to the individual articles**

### **Cargo & multi-purpose airships:**

- Airship Archangel - large, multi-purpose airship
- Airship One - medium, hybrid airship / semi-buoyant aircraft
- Aquarian airship
- Bauhaus Luftfahrt - VTOL semi-buoyant hybrid aircraft
- Cloudea - large, multi-purpose airship
- Green Solar Airship
- KNAAR - heavy-lift cargo airship
- Maform S.H.A.R.K.
- Rediscovery - Presidential airship

**Mass transportation airships:**

- Airbia - suburban passenger ferry airship
- Alpha Crucis airship
- Eco Airliner
- Flight 2.0 - basic air transportation
- Imaginative Aerostratos & Terzi - regional passenger transport system
- KLM - WB-1010 Spruce Whale - large buoyant passenger aircraft
- KLM - Cloudliner - large buoyant passenger aircraft

**Flying hotel airships:**

- Aircruise - luxury airship hotel with land dock
- Airship Traveling - luxury airship hotel
- Avalon Airships – Aether luxury airship hotel
- Dassault Systems - flying cruise liner
- Hydrogenase - bio-hydrogen airship / building with land dock
- Manned Cloud - luxury airship hotel
- Walden Aerospace - Earth Station One

**Touring airships:**

- Airmotion - scenic touring airship
- Avalon Airships - Hemera luxury tourist ferry
- Mario Merino - touring airship
- Solera & Lucci - cruise airship
- Stalker - exploration airship
- Walden Aerospace - LTA-1701-D entertainment airship

**Flying yacht airships:**

- Aeromodeller II - personal hydrogen airship yacht
- Aeros - Neona sky yacht
- Bauhaus Luftfahrt - luxury cruiser
- Eunoia - luxury airship yacht
- Flying Diamond airship & Dare to Dream yacht
- Halo - personal airship yacht
- Lazzarini Design Studio - Air Yacht
- LZ-73 - small luxury airship
- Renault Zep'lin - solar-powered racing airship yacht



- Strato Cruiser - luxury airship yacht
- Wolke7 - personal airship yacht / flying home

### **Remotely-piloted special purpose airship:**

- Air Hydroelectric Station (Air-HES) - water collection system
- Avalon Airships - EOS autonomous, multi-purpose hybrid airship
- Imaginative - Templar autonomous agricultural airship
- Qatar University - Robotic Cloud

### **Personal airships:**

- Aeolus - personal airship yacht
- Alpha-D project - personal airship
- Escape - hybrid personal airship & land vehicle
- OSKBES MAI - SkyBoat HELIOS hybrid airship
- Sky Voyage - hybrid personal airship / glider

### **Thermal (hot air) airships:**

- Sterling - solar-powered thermal airship
- Sunrise - solar-powered thermal airship
- Tensairity - thermal airship

### **Biomimetic airships:**

- Aerolabe - solar-powered airship / ornithopter hybrid
- Imaginative Medusa and Cubozo - airship / jellyfish hybrids

### **Rocket / airship hybrids:**

- Walden Aerospace - Silver Dart shuttle, W.A.V.E.S. & HYPER

### Record of revisions to Part 3

- **Original *Modern Airships* post, 26 August 2016:** addressed 14 airships in a single post.
- **Expanded the *Modern Airships* post and split it into three parts, 18 August 2019:** Part 3 included 32 linked articles.
- **Part 3, Revision 1, 21 December 2020:** Added 1 new article on Walden Aerospace. Part 3 now had 33 articles
- **Part 3, Revision 2, 8 February 2022:** Added 14 new articles, moved over the Halo article from Part 1 and updated 11 of the original articles. Part 3 now had 48 articles.
- **Part 3, Revision 3, 18 March 2022:** Added 1 new article, reorganized the graphic table and updated 22 of the original articles. With this revision, all Part 3 linked articles have been updated in February or March 2022. Part 3 now has 49 articles.