AeroVehicles, Inc. (AVI) Aerocat rigid hybrid airships

Peter Lobner, 28 July 2019

Background

AeroVehicles Inc. (AVI) originally started in California in 2002. In 2014, AVI registered AeroVehicles Inc. Sucursal Extranjera in San Luis, Argentina and then Aerovehicles Paraguay S.A. was opened in 2019 with manufacturing and product support to be located in Oviedo, Paraguay. Their website is here:

http://www.aerovehicles.net

AeroVehicles currently offers a range of aviation-related products and services. Their products include light, fixed-wing intelligence, surveillance and reconnaissance (ISR) aircraft and aerostats. Their services are focused on remote sensing applications (LIDAR, geomagnetic mapping, multi- and hyper-spectral imaging, infrared imaging, and synthetic aperture radar imaging) and related systems integration services.

AeroVehicles is developing designs for rigid, hybrid airships, starting with a sub-scale prototype, which can carry a .5 metric ton (.55 short ton) payload. Designs for three production-scale airships also are being developed; Minicat, which can carry a 6 – 10 metric ton (6.6 – 11 short ton) payload, the Aerocat R-12 with a 20 metric ton (22 short ton) payload, and the larger R-40 with a 40 metric ton (44 short ton) payload. The production-scale airships will have the capability to support a wide range of missions, including:

- Cargo transport
- Passenger transport
- Disaster / humanitarian aid and mobile medical facility
- Land survey and exploration
- Search and rescue (SAR)
- Combatting and controlling wild fires
- Border patrol
- High-endurance radar / surveillance platform
- Tourism / advertising

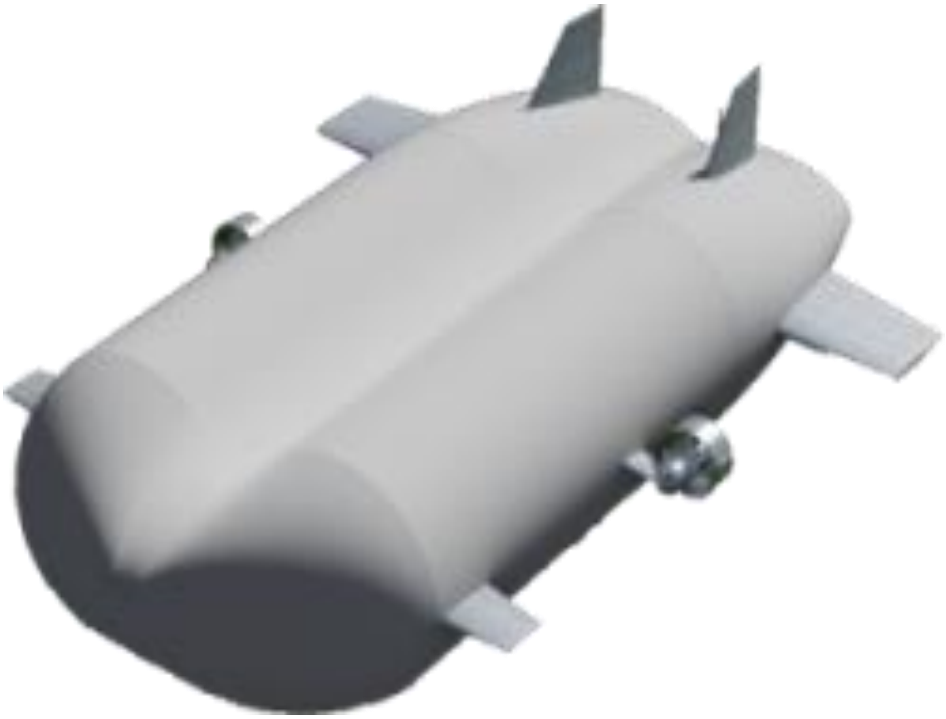
You can view a 2010 AeroVehicles video on their AeroCat airships here:

https://www.youtube.com/watch?v=tdXeGSjibFw

Following are descriptions of the Minicat, R-12 and R-40 airships.

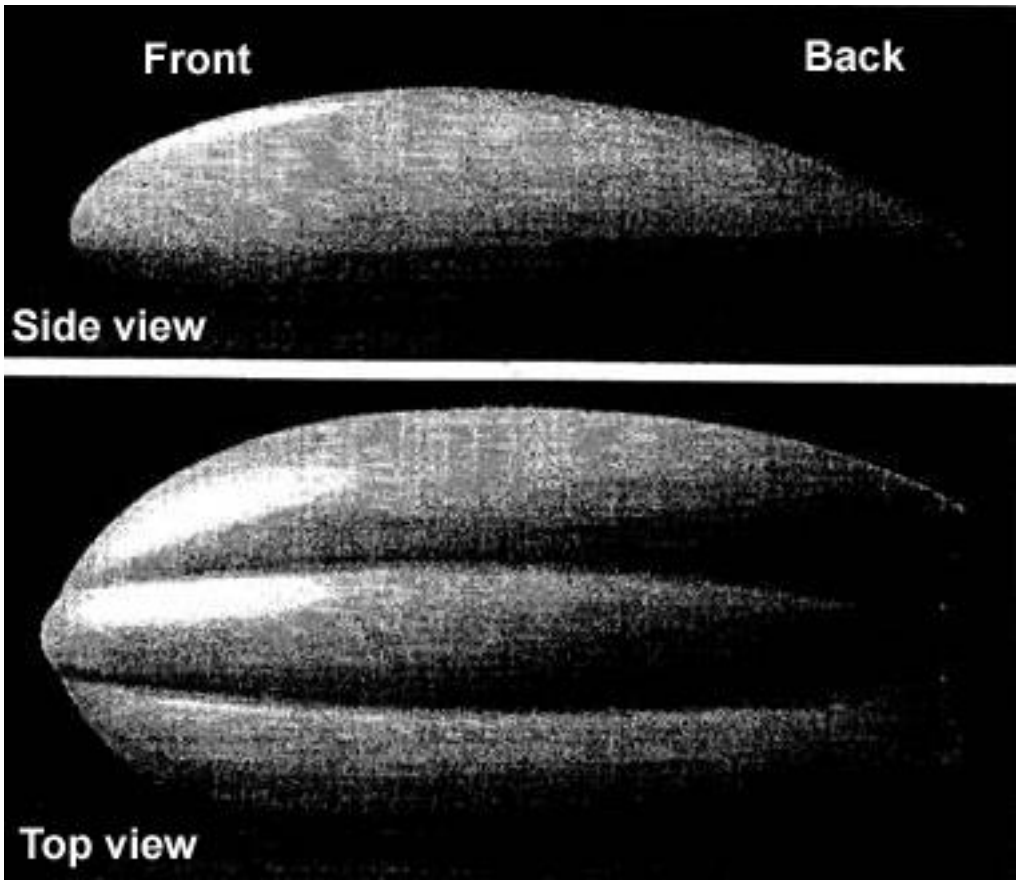
The Minicat

AeroVehicles is developing a 43 meter (141 ft) long, rigid, hybrid airship named Minicat, which is intended to serve as a prototype of the larger Aerocat-series of rigid, hybrid airships. Minicat also can be configured for land survey and exploration, search and rescue, border patrol, high-endurance radar / surveillance platform for specialty passenger or cargo operations. An early concept drawing of the Minicat is shown below.



Minicat early concept drawing. Source: AeroVehicles

The design for the Minicat has evolved and now it has a sub-scale version of the Aerocat lifting-body hull shape shown below.



Minicat & Aerocat hull shape, side view (top) and top view (below). Source: AeroVehicles, "ModelCenter™Model for the MiniCat 2002"

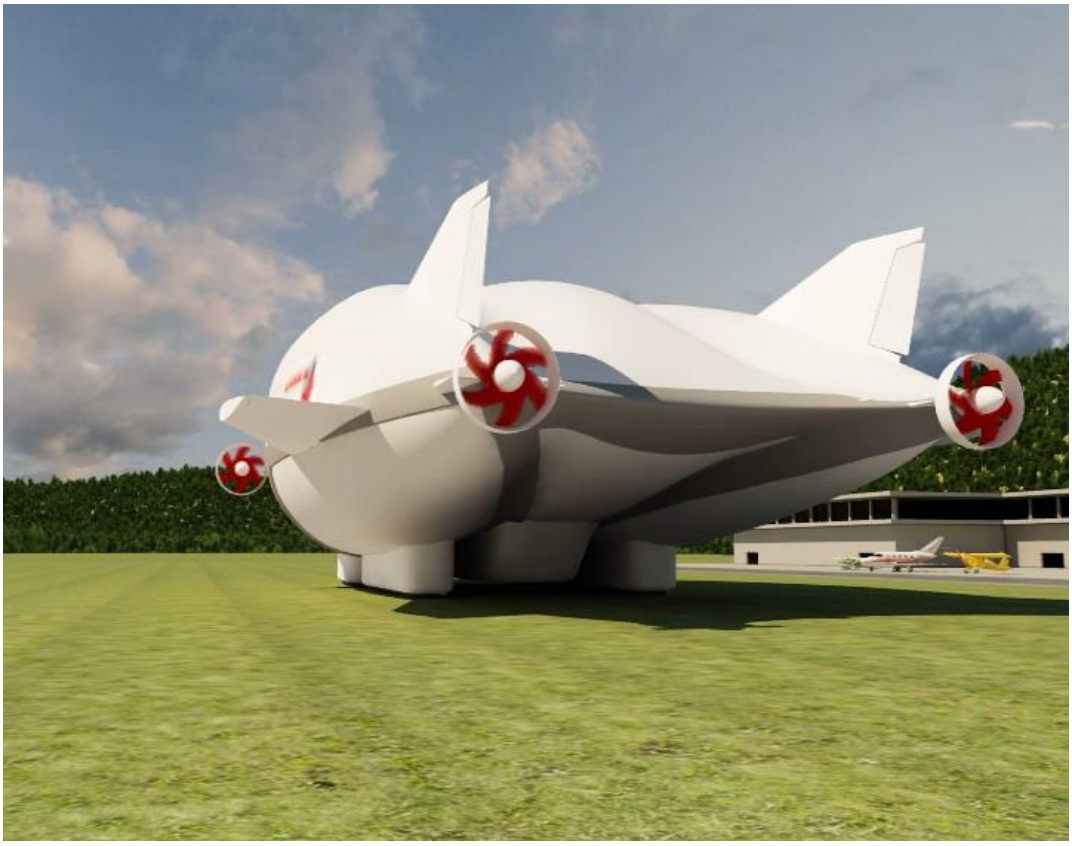
The Minicat airship is being designed to carry a payload of 6 – 10 metric tons (6.6 – 11 short tons), conduct 35 – 48 hour autonomous missions, and conduct VTOL operations (perhaps with cargo limitations). You'll find more information on Minicat here: http://www.aerovehicles.net/product/minicat/

The R-12 airship

The Aerocat R-12 is designed to carry 20 metric tons (44,092 pounds) of cargo 3,000 km (1,862 miles) at a maximum altitude of 2,500 meters (8,202 feet). The payload bay also can be configured to carry about 105 passengers in 5-abreast seating. Cruise speed will be 150 kph (84 knots).

As a hybrid airship, the Aerocat's total lift is the sum of the static lift from buoyant helium plus the dynamic lift from the vectored thrust propulsion system and the aerodynamic lift from the shaped fuselage moving through the air.

Aerocat R-12 concept shown in flight. Source: AeroVehicles.



Aerocat R-12 concept shown on the ground. Source: AeroVehicles.

When fully loaded the Aerocat R-12 is heavier than air. AeroVehicles reports that the Aerocat R-12 will have both short takeoff and landing (STOL) and vertical takeoff and landing (VTOL) capabilities. The VTOL

capability likely is available only when the airship is lightly loaded and the combination of helium lift and vectored thrust is sufficient to lift the airship vertically. After a vertical takeoff, the vectored thrust system transitions the airship to horizontal flight where aerodynamic lift comes into play as airspeed builds. In cruise flight, the vectored thrust system is delivering thrust for propulsion and lift is being generated by helium and aerodynamic lift from the fuselage and wings.

Aerocat will utilize a helium compression system to manage buoyancy and helium volume both inflight and during ground operations.

The Aerocat makes its short takeoff and landing (STOL) runs on an air cushion landing system (ACLS). Functionally, this system should be quite similar to the ALCS demonstrated on the Lockheed Martin P-971 and Aeroscraft Dragon Dream prototype airships. In the “lift” mode, the ALCS enables the airship to move on a cushion of air over uneven terrain, ice and water. In the “suction” mode, the ALCS holds the airship to the ground, which can be an important feature for stabilizing the hybrid airship during a load exchange on the ground (i.e., off-loading heavy cargo) or in strong winds.

For example, after heavy cargo has been unloaded on the ground, ALCS suction may be needed to temporarily stabilize the airship while the helium system adjusts for buoyancy or new cargo and/or additional ballast is loaded to restore airship gross weight and maintain net buoyancy in a prescribed range.

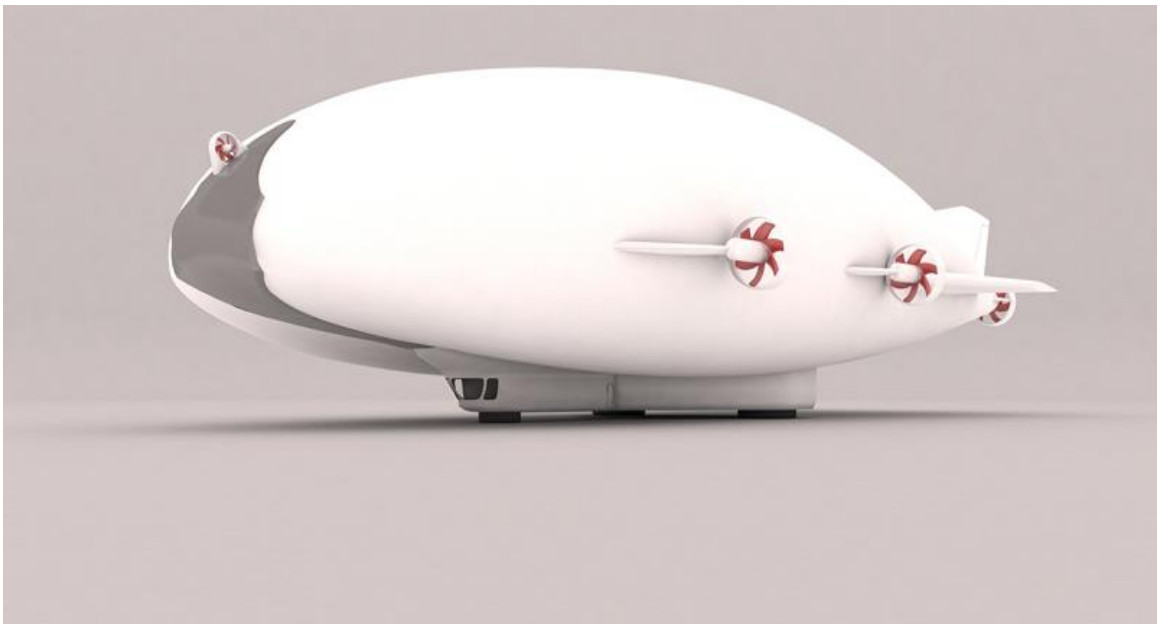
Managing net lift during a load exchange from a hovering airship with a sling load (i.e., cargo suspended under the airship) is a more difficult proposition. AeroVehicles claims that the Aerocat R-12 is capable of handling a sling load, but due to the known handling characteristics of lighter-than-air aircraft, AVI does not recommend this type of operation except in perfect conditions and where precision is not required. Buoyancy management during this type of load exchange is very difficult as helium compression takes time based on the weight of the sling load released.

More information is available in the R-12 airship specifications here: http://www.aerovehicles.net/rd/aerocat-r12/

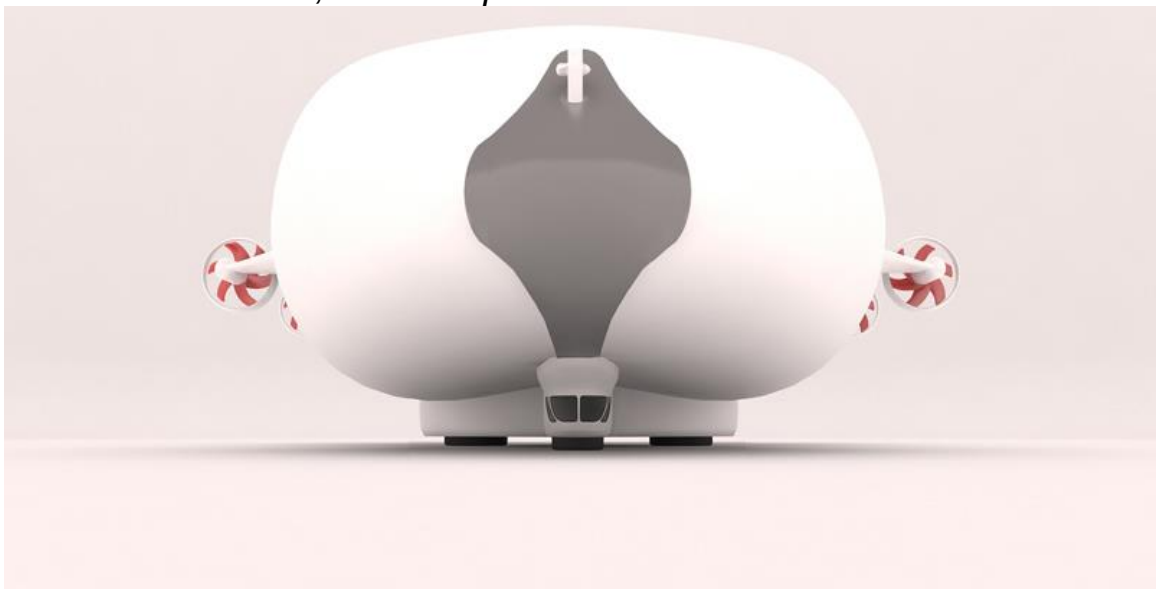
The R-40 airship

AeroVehicles describes their R-40 airship as follows: “Per client requests, the Aerocat R-40 has been designed to operate in all environments from arctic regions to arid deserts. The envelope structure includes a composite nosecone and an internal ‘rigid’ structure to give strength to the envelope. This rigid structure also removes the upper surface lobes where ice and snow accumulate and the nosecone protects the hull material from blowing sand or ice particles. Aerocat’s design includes three separate anti- and de-icing systems necessary to operate in arctic regions. Without these features a cargo airship’s ability to operate in hostile environments is greatly reduced. Additionally, the Aerocat R-40’s payload bay has 1,888 cubic meters of clear area with a 4 meter overhead clearance for cargo. Combined with the ability to transport 55 metric tons 900 nautical miles and the R-40 is an extremely efficient and versatile transport aircraft.”

Aerocat R-40, in flight concept drawing. Source: AeroVehicles



Aerocat R-40, forward quarter view. Source: AeroVehicles



Aerocat R-40, front view. Source: AeroVehicles

More information is available in the R-40 airship specifications here: http://www.aerovehicles.net/rd/aerocat-r40/

Beyond the R-12 and R-40

The Aerocat R-12 and R-40 designs can be scaled up to meet emerging customer needs. AeroVehicles anticipates that airships capable of handling 350 – 500 tons of cargo will be requested by some future customers.