

## Airship GP

Peter Lobner, 17 August 2019

### Background

The firm Airship GP was founded in 2011 in Moscow, Russia with the goal of developing “super hybrid airships” that implemented “new propulsion” for cargo and general purpose “wind-resistant” airships. The planned product range includes the heavy-lift AirTruck and the smaller AirBoat and AirYacht.



*General configuration of an Airship GP airship. Source: Airship GP*

The Airship GP website is here: <http://airship-gp.com/>

Airship GP has teamed with the following organizations that have experience in developing aircraft and software and hardware measuring and control systems.

- Moscow Institute of Physics and Technology, the Department of Aeromechanics
- Keldysh Research Center (Moscow)
- MIG aircraft factory (Moscow)

## **Super hybrid airship**

Airship GP describes a “super hybrid airship” as one with the following general characteristics:

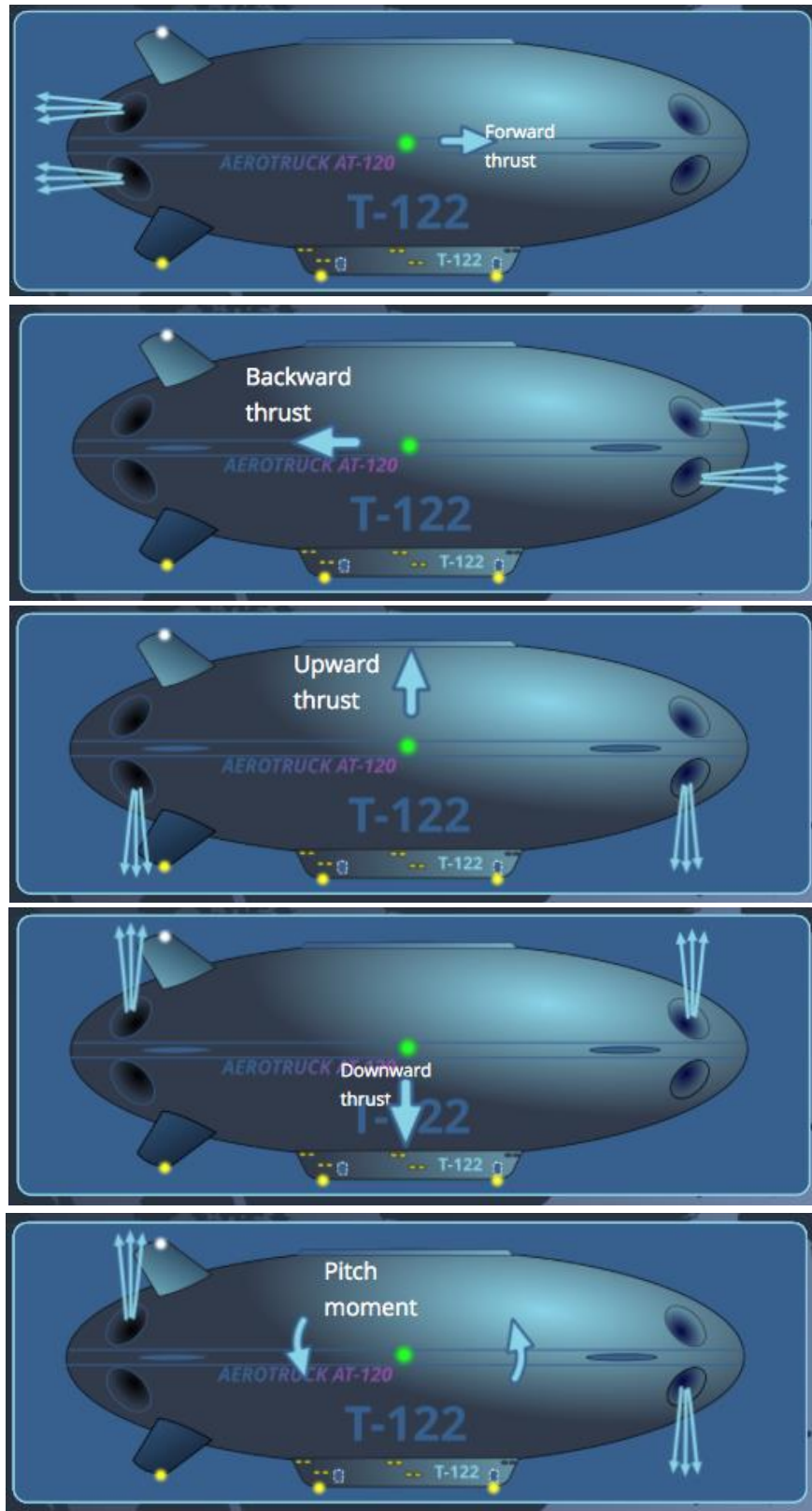
- **Unique airframe designed to withstand the wind and enable all-weather operations:**
  - 3-axis elliptical rigid airframe
- **Unique “tunnel” propulsors:**
  - Coordinated operation of eight “tunnel” propulsors submerged in the hull provides the power and control to operate in high wind conditions.
  - Four tunnel propulsors forward, one in each quadrant of the nose, and four in a similar arrangement aft.



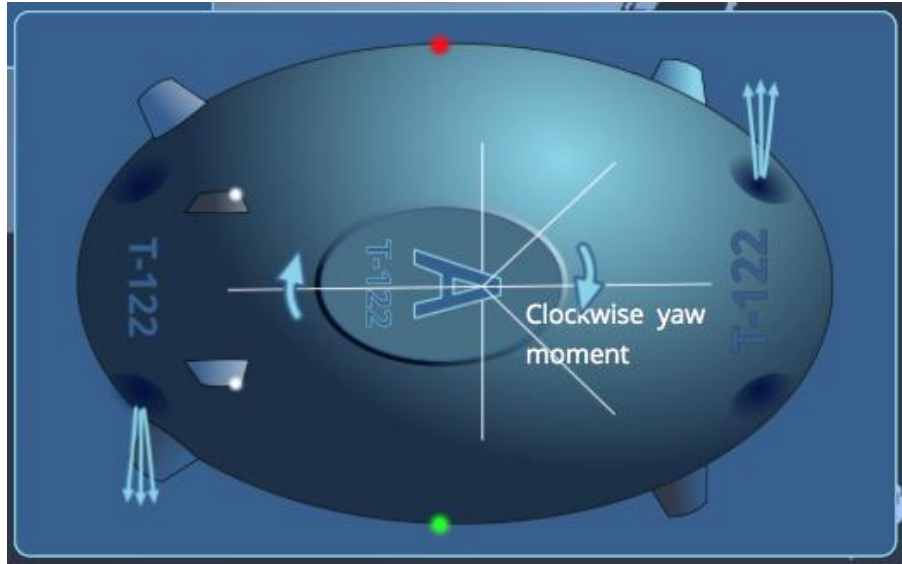
*Tunnel thruster physical arrangement in the hull.*

*Source: Airship GP via NASA*

- Propulsor propellers have blade pitch control.
- Controllable air jet deflectors direct the discharge airflow from each propulsor.
- Full control of all vectors of thrust provide full wind load compensation. Examples of how this control is implemented by the tunnel thrusters are shown below

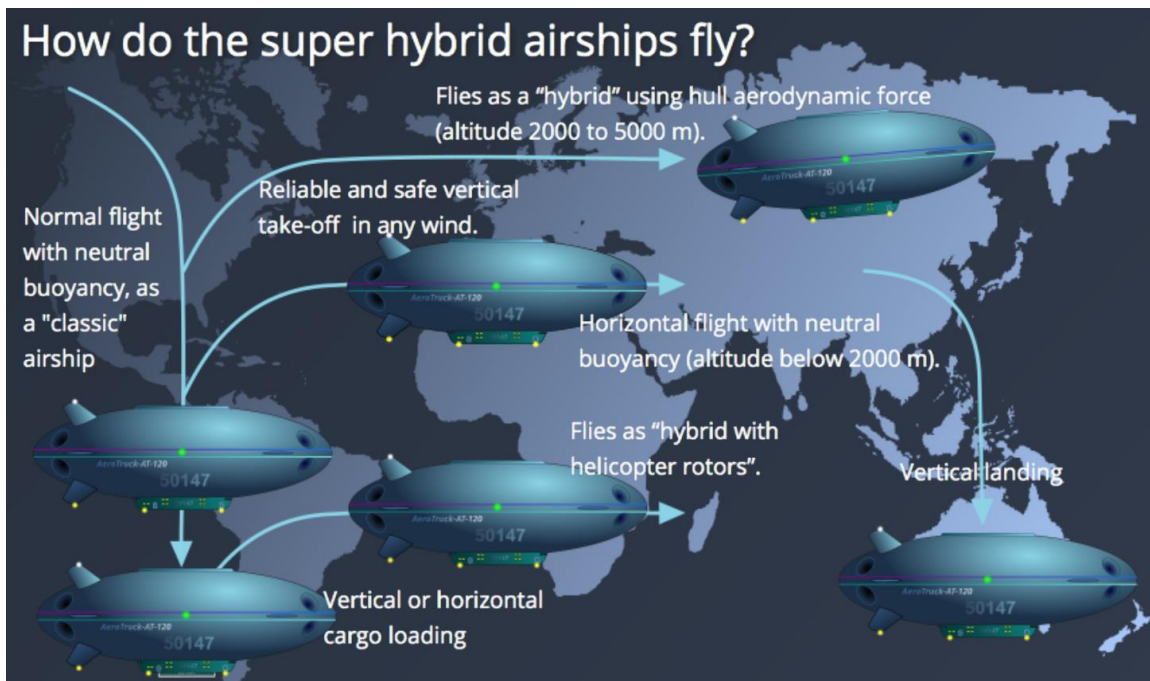


Source: All thruster control diagrams are screenshots from the Airship GP website.



- **Fly as a conventional airship:**
  - Efficiently and safely fly long distances with a heavy load, trimmed for neutral buoyancy like a conventional airship at altitudes less than 2,000 m (6,660 ft).
- **Fly as a hybrid airship:**
  - Fly heavier-than-air (negatively buoyant) at higher altitudes, 2,000 - 5,000 m (6,660 - 16,400 ft), with aerostatic lift supplemented by aerodynamic lift.
  - Fly heavy at low altitudes using a combination of aerostatic lift, aerodynamic lift and propulsive lift.
- **Vertical takeoff and landing:** VTOL is available in all flyable weather conditions.
- **Hover:** Can hover indefinitely like a conventional airship.
- **Long range:** Range is a function of speed and payload.
- **Large internal cabin / cargo hold:**
  - The cabin, located under the gas envelope, can be configured for carrying cargo, passengers or other mission payloads.
  - Comfortable, low noise.
- **Flexible cargo handling system:**
  - Roll-on, roll-off (Ro-Ro) cargo loading.
  - Two 40-foot containers and some oversize items can be loaded by precisely “landing on the cargo.”

- Using an internal crane, cargo can be picked up and delivered from the internal cargo bay.
- Can operate as a flying crane and carry suspended loads.
- **Comprehensive ballast / buoyancy control system:**
  - Most models carry conventional water ballast in internal tanks.
  - Some AeroTruck models have a controllable (variable) ballast system that eliminates the need to carry conventional ballast, but at the expense of a reduced cargo capacity.
  - Can carry alternative ballast in standard 20-foot shipping containers in the cargo hold.
- **Independent of ground infrastructure:**
  - Can park on the ground using own landing devices, without the need for ground infrastructure.
- **High operational availability**
- **Low operating cost**
- **Can operate in pairs or quadruples:** Deliver very heavy loads that are several times the capacity of a single airship.

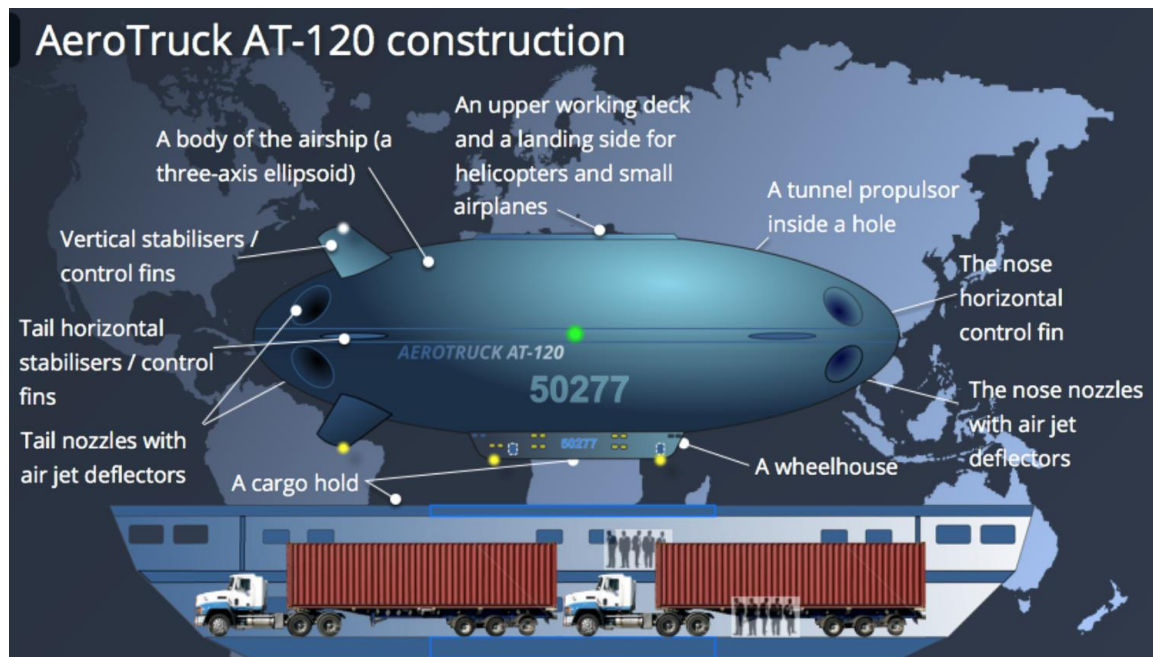


*Super hybrid airship mission profiles. Source: Airship GP*

## AeroTruck airships

AeroTruck is the largest airship concept developed by Airship GP. Typical AeroTruck applications are expected to include:

- Full support for construction, and later dismantling, of oil and gas exploration / production rigs in remote regions without road access.
- Delivery of oversize cargo in regions with dense road networks that can't accommodate the oversize item (i.e., wind turbine blades).
- Year-round delivery of any cargo to remote settlements and industrial sites.
- Direct delivery of large manufactured items from the factory to the construction site.



*General arrangement of an AeroTruck. Source: Airship GP*

The AeroTruck is available in two basic models, the AT-120 and the smaller AT-100, each of which is available with two ballasting options: conventional or variable ballast. In the same airship model, the conventional ballasting option provides twice the cargo capacity of the variable ballasting option with a 25% larger helium volume (since the variable ballast system is absent).

**Conventional ballasting:** A load exchange requires the movement of conventional ballast (water or 20-foot ballast containers) onto or off the airship.

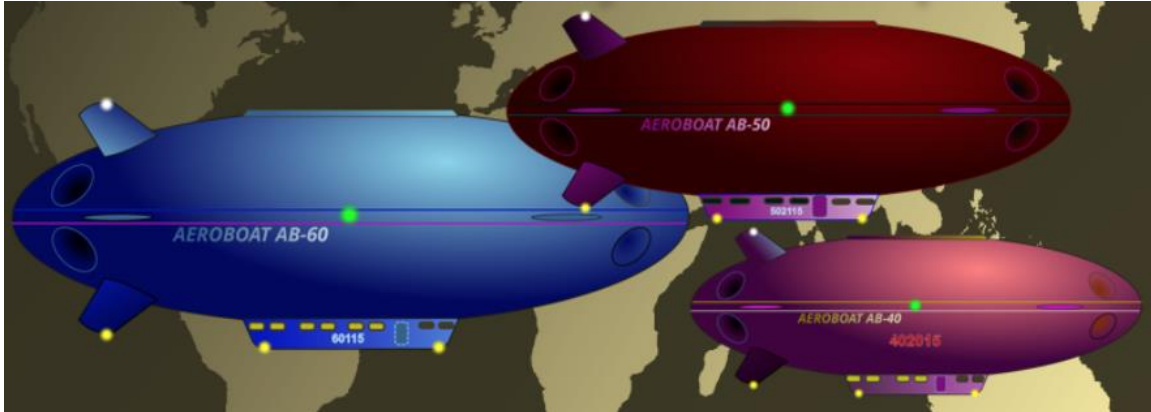
	<b>AT-120-50</b>	<b>AT-100-25</b>
Length	125 m (410 ft)	100 m (328 ft)
Width	63 m (206 ft)	50 m (164 ft)
Height	40 m (131 ft)	30 m (98 ft)
Helium volume	125,000 m <sup>3</sup> (4,400,000 ft <sup>3</sup> )	63,000 m <sup>3</sup> (2,200,000 ft <sup>3</sup> )
Nominal cargo	50 metric tons	25 metric tons
Unload ballast	50 metric tons	25 metric tons
Total engine power	8,000 kW (10,00 hp)	6,400 kW (5,00 hp)
Cruise speed	63 kph (39 mph)	63 kph (39 mph)
Range with full load	1,000 km ( miles)	1,000 km ( miles)

**Variable ballasting:** During a load exchange, ballasting air is pumped into pressurized tanks onboard the airship or vented to atmosphere as needed to establish the required ballast conditions. No conventional ballast is moved.

	<b>AT-120-25</b>	<b>AT-100-12</b>
Length	125 m (410 ft)	100 m (328 ft)
Width	63 m (206 ft)	50 m (164 ft)
Height	40 m (131 ft)	30 m (98 ft)
Helium volume	100,000 m <sup>3</sup> (3,500,000 ft <sup>3</sup> )	50,000 m <sup>3</sup> (1,800,000 ft <sup>3</sup> )
Nominal cargo	25 metric tons	12 metric tons
Variable ballast	± 25 metric tons	± 12 metric tons
Total engine power	8,000 kW (10,00 hp)	6,400 kW (5,000 hp)
Cruise speed	63 kph (39 mph)	63 kph (39 mph)
Range with full load	1,000 km (621 miles)	1,000 km (621 miles)

## AeroBoat airships

AeroBoats are light-to-medium-lift utility service airships that can be configured for a wide variety of applications. These are designed to compete against the helicopter market segment. Their general arrangement is similar to an AeroTruck, but on a smaller scale. Three versions are planned: AB-40, AB-50 and AB-60.



*Three sizes of AeroBoat. Source: Airship GP*

	<b>AB-40</b>	<b>AB-50</b>
Length	40 m (131 ft)	50 m (164 ft)
Width	25 m (82 ft)	32 m (105 ft)
Height	15 m (49 ft)	19 m (62 ft)
Helium volume	3,500 m <sup>3</sup> (123,600 ft <sup>3</sup> )	7,000 m <sup>3</sup> (247,200 ft <sup>3</sup> )
Crew + pax	5	10
Total engine power	800 kW (1,073 hp)	1,200 kW (1,609 hp)
Cruise speed	63 kph (39 mph)	63 kph (39 mph)
Range	200 km (124 miles)	400 km (248 miles)

## AeroYacht airships

AeroYachts are private airships intended for corporate customers as an alternative to high-end business jets. Three versions are planned: AY-40, AY-50 and AY-60, built on the same basic platforms as the AirBoats, but outfitted to meet the specific customer's needs.