

Voliris hybrid airships

Peter Lobner, 29 July 2019

Background

Voliris is a small French firm that has been designing and building small airships since it was founded in 2001. Their first airship was a conventional non-rigid blimp, the V900, which first flew in June 2003 from the Clermont-Ferrand airport. The V900 operated for about four years, but was not developed into a commercial airship.



Voliris V900. Source: Wikipedia

Under new ownership since 2008, the company has established its research and development effort at A erodrome de Moulins - Montbeugny, Yzeure, France. The company's website is here:

<http://voliris.com/#natac>

Early Voliris airship prototypes

The V901 was the first hybrid airship created by Voliris. On the ground, this non-rigid airship was heavier-than-air. Its long, three-lobe gas envelope was designed to generate aerodynamic lift in flight. Its first flight was in 2012 followed by a two year testing program.

During its operating life, the V901 appeared in several different configurations; two are shown in the following photos.



V901C. Source: Voliris.



V901D. Source: Voliris.

A remotely controlled version, the V901RC, made its maiden flight in 2012, followed by its use in a two year test program to develop the automation features needed for future unmanned cargo airships.



V901RC. Source: Voliris.

The V901-based cargo airship concept: V930

In 2012, Voliris unveiled the design of a family of hybrid cargo-carrying airships based on the general planform of the V901's long, three-lobe gas envelope. The V930 was dubbed the "flying container project." Basic characteristics of this cargo airship are as follows:

- Transport a standard 40 foot (12.2 m) long 32T container weighing up to 30 metric tons (33 short tons)
- Maximum takeoff weight: 35 metric tons (38.5 short tons)
- Six propellers; maximum 2,000 shp
- Airspeed: maximum 150 kph (93 mph)
- Simple cargo container loading and unloading
- No ballast exchange needed when loading or unloading cargo.

- Takeoff and landing on unprepared runways of approximately 800 m (2,625 ft) length

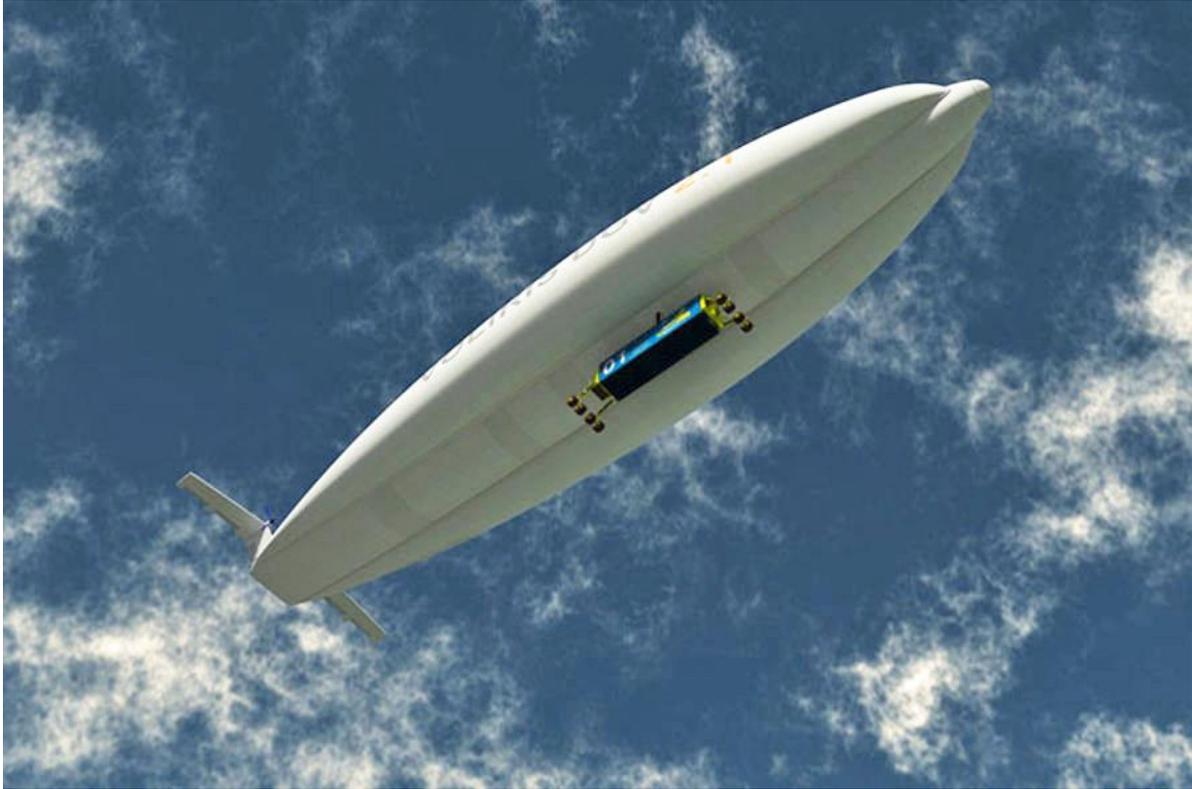
Voliris later discontinued work on the V930 and focused its heavy-lift design work on the more promising V932, which is based on the V902 platform.



V930 general arrangement. Source: adapted from Voliris.



Rendering of a V930 in flight. Source: Voliris.



Rendering of a V930 in flight showing cargo container. Source: Voliris



Cargo container handling equipment for the V930. Source. Voliris

The V902

The next step in development was the V902, which was a small, hybrid, semi-buoyant airship with a broad gas envelope that resembled an inflated wing. This design offered greater aerodynamic lift than the slender V901. The original piloted V902ULM, with a 30 cubic meter (1,060 cubic feet) gas envelope, holds the Guinness World Record as the world's smallest airship.



Original V902ULM. Source: Mooceur via Wikipedia

The V902RC was a remotely-controlled adaptation of the V902 design used to test cargo-carrying configurations. The V902RC was modified to become a 1/7-scale demonstrator (the V902 Mini) for a future heavy cargo airship to be known as NATAAC. The propulsion and cargo handling systems and landing gear were integrated in a framework that was suspended under the buoyant gas envelope. A container gripping module (CGM) was developed to facilitate attaching and carrying cargo containers. The modified V902 Mini, also known as the mini-NATAAC, made its maiden flight on 30 August 2017. It demonstrated stable flight and confirmed the utility of the twin nacelle design and the cargo suspension system. You can view a short video of this flight testing here:

<https://www.youtube.com/watch?v=IQ86ytiuT70>



V902 Mini 1/7-scale NATAC demonstrator.
Source: Voliris

The V932 NATAC

Voliris currently is focused on developing an autonomous cargo airship designed to carry one 40-foot (12.2 m) long, standard 32T international freight shipping container. Such containers are widely used in ground transportation. However, there are areas where logistical infrastructure does not exist or does not offer satisfactory quality and safety for ground transportation. For such cases, Voliris is developing the Automatic Container Transport by Air Shuttle (NATAC) to ferry a shipping container between two locations.

The unmanned NATAC V932 hybrid airship shown in the following graphic shares the general configuration of the V902 Mini.



Concept drawing of an NATAC V932 hybrid airship on the ground, connected to a mooring mast. Note the suspension lines connecting the engine and landing gear nacelles to the buoyant envelope.

Source: Voliris

NATAC offers the following operational characteristics

- Transport a standard 40 foot (12.2 m) long 32T container weighing up to 30.5 metric tons (33.6 short tons)
- Simple cargo container loading and unloading with the container gripping module (CGM) on the airship
- No ballast exchange is needed during a load exchange.
- Takeoff and landing on unprepared runways of approximately 800 m (2,625 ft) length
- On the ground, only a single operator is needed to provide assistance during takeoff and landing approach
- Autonomous flying at low altitude and low speed
- Range of about 1,000 kilometers (621 miles)
- Unhijackable control system
- Able to operated in segregated air corridors



*Details of the NATAC engine and landing gear nacelles and a centerline mounted standard 32T shipping container engaged by a container gripping module (CGM).
Source: Voliris*



*Truck unloading a standard 32T shipping container directly onto the airship.
Source: Voliris*

Voliris describes an NATAC mission as follows:

“Once NATAC has been programmed, it is limited to back and forth journeys from a given departure base to a given destination base. NATAC adapts to different wind directions as long as weather condition are within the limits defined by the test pilot who did the programming. On arrival, the operator needs to check that the runway is clear. He can order the machine to make 360° rounds above a safety altitude to clear the runway if necessary.

NATAC sends its position by satellite, but is not radio-controlled during the flight. This is an important feature to prevent misuse or terrorist hijack. The trajectory is defined according to license granted by the government. As many waypoints as necessary can be programmed on the trajectory which does not necessarily need to be a straight line.”

You can watch a video of a NATAC mission here:

<http://voliris.com/flying-container-project/>



Concept drawing of an NATAC V932 hybrid airship in flight. Source: Voliris

In May 2018, the Voliris team made a presentation on the NATAC concept to the French Army as a means to automatically deliver a 30 metric ton (33 short tons) payload to a destination 500 km (311 miles) away.