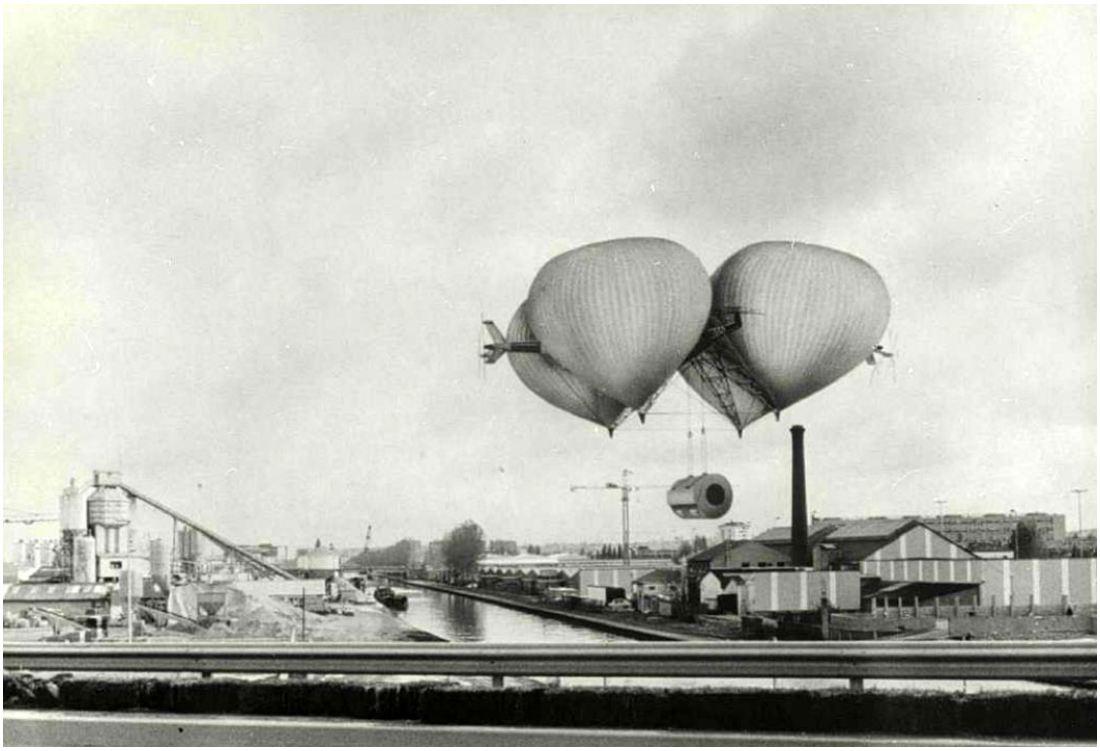
Aérospatiale Obélix and Obélix II – flying cranes

Peter Lobner, updated 12 February 2022

1. Introduction

The Obélix was an aerostat / helicopter hybrid flying crane design concept that was proposed in 1974 by a French consortium headed by Aérospatiale as a means to move large, heavy, indivisible (unitary) loads over relatively short distances, for example, from a factory to a user site.



Artist's concept of an Obélix flying crane carrying a large, unitary load. Source: "A Half Century of Aeronautics in France"

In July 1975, the French embassy's Press Information Division described the goal of the Obélix project:

> "The aim of the project is to develop a dirigible capable of transporting and maneuvering 500 (metric) tons, and to do so in five years, with minimum experimentation. This will mean using components that already have been developed, for example,

the rotors and turbine engines for the ‘Super Frelon’ helicopters.”
“The dirigible is urgently needed to solve the specific problem of transporting nuclear reactor (vessels) to the sites where nuclear reactors are being constructed by France’s nationalized electricity and gas company (Électricité de France, EDF).”

“The National Office of Aerospace Study and Research (ONERA) has therefore selected a number of designs for intensive study: working with the aircraft builder Aérospatiale, it decided to give very careful consideration to project Obélix so that in a few months it could present the government with a strong enough case to warrant the requisite outlay of one billion francs (about US $235 million in 1975 at an exchange rate of 4.25 francs/$) by the Ministry of Industry and Research.”

2. Obélix

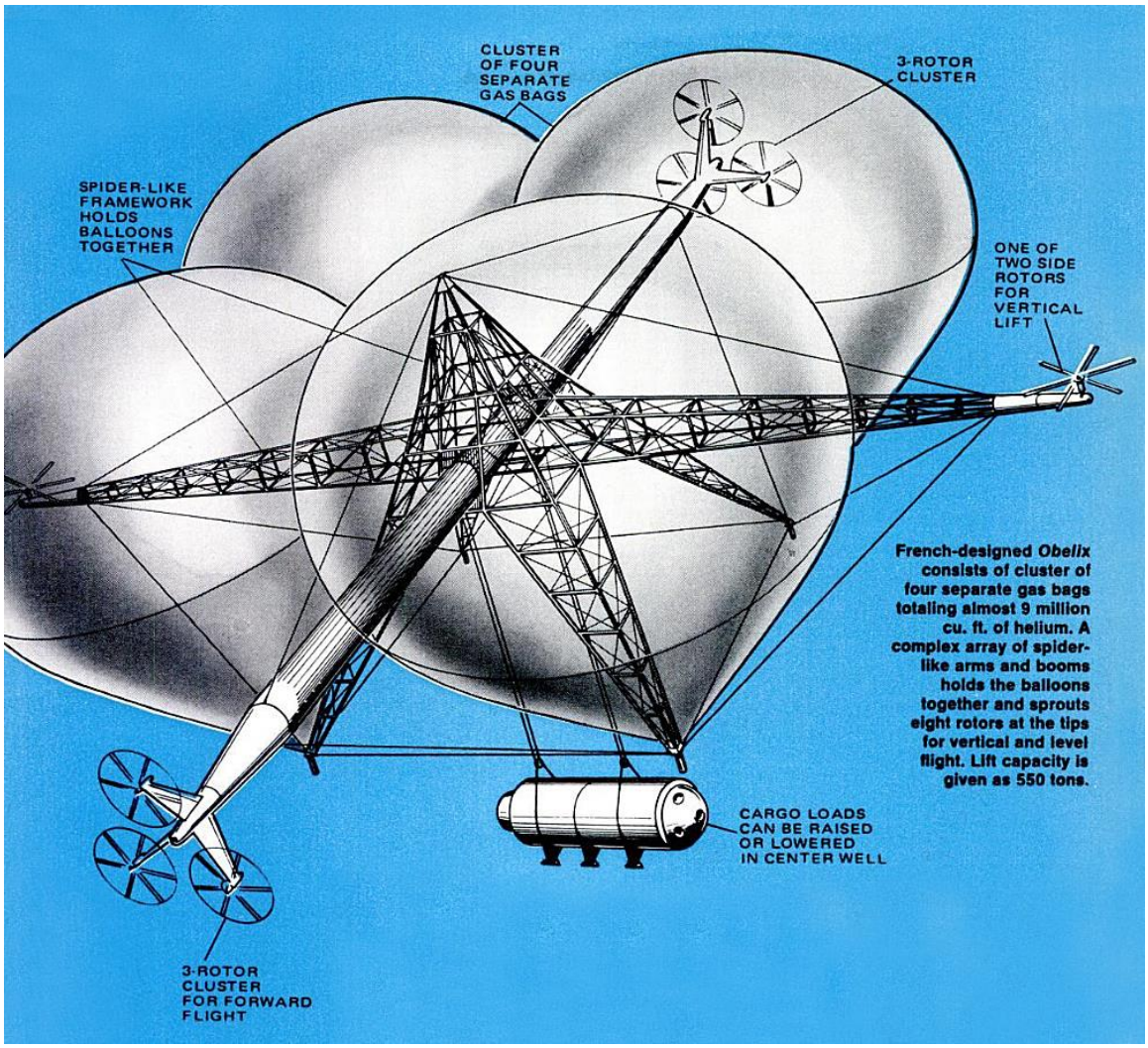
The design of the Obélix aerostat / helicopter hybrid vehicle applies the "Aerostat Formula", which dictates that a flying crane should have an aerostatic lift capacity that includes the load, with one or more rotors being used only for propulsion and control. Unlike a helistat, in which aerostatic lift carries the vehicle empty weight and the rotor dynamic lift carries the payload weight, the Obélix uses aerostatic lift to carry both the vehicle empty weight and the payload weight.

In the Obélix, the aerostatic lift is derived from four large balloon-shaped aerostats that are attached to a giant, 4-legged, cruciform structural framework, which separates the aerostats, carries the propulsion and control units, and connects centrally to the suspended load.

Eight helicopter engine / rotor units from Aérospatiale Super Frelon helicopters were deployed on Obélix to provide propulsion and control. A long, tubular structural stalk extending through the 4-legged central framework supports clusters of three fixed engine / rotor units at each end to provide propulsion for forward flight. A long framework stalk, at 90° to the tubular stalk, also extends through the 4-legged central framework and supports one engine / rotor unit at each end for vertical lift. The four legs of the central framework serve

as the landing gear. Depending on size, some loads can be hoisted up into the large open space under the central crane, under the aerostats and in the middle of the four legs.

This unusual hybrid craft looked like it was designed by a Steampunk artist instead of a consortium of aeronautical engineers.



General arrangement of the Obélix flying crane.
Source: Popular Mechanix, July 1977, page 67

In flight, Obélix would be trimmed for approximate neutral aerostatic buoyancy. A load exchange (pickup or delivery) requires an exchange of ballast at least equal to the weight of the load. At the pickup site, Obélix would need to dump ballast in order to lift off with the payload attached. At the delivery site, Obélix would need to take

on ballast so it could transfer the weight of the payload to the ground, safely disconnect the load, and then fly away in good aerostatic trim.

General characteristics of the Obélix flying crane

Parameter	**Obélix**
Airship type	Heavy-lift, multiple aerostat / rotocraft hybrid
Structure	A 4-legged pyramidal truss structure attaches to four aerostats at the base of each leg. A tubular longitudinal beam and a transverse truss attach to the pyramidal truss, carry the propulsion units, and connect to the suspended load at the intersection of the longitudinal beam and transverse truss.
Length, overall	200 m (656 ft)
Width	170 m (558 ft)
Height	78 m (256 ft)
Lift gas	Helium
Envelope volume	Cluster of four non-rigid, insulated aerostats, each divided into five compartments, four compartments containing helium and one air ballonet • about 250,000 m^3 (8.82 million ft^3) * each aerostat. • about 1,000,000 m^3 (35.3 million ft^3) * total.
Useful load	500 metric tons (550 tons) unitary item carried as a sling load
Accommodations	5 x crew members
Weight compensation	Likely water ballast
Propulsion system	8 x helicopter engine / rotor units from Aérospatiale SA-321 Super Frelon helicopters. • 6 x fixed axis rotors in 3-unit clusters provide horizontal thrust along the longitudinal axis • 2 x vectoring rotors provide control (lift, side-force) along the transverse axis • Each rotor is driven by 3 x Turbomeca Turmo IIIC turboshaft engines, each capable of generating 1,500 shp (4,500 shp per rotor).
Speed, max	80 kph (50 mph)
Altitude, operating	Low altitude (100s of meters)
Range	650 km (404 miles)
* Obélix aerostatic lift carries both the vehicle empty weight and the payload weight. In Piasecki helistats, vehicle empty weight was about 50% of maximum gross weight. Assuming the same ratio for Obélix, a 500 metric ton payload would require 1,000 metric tons of aerostatic lift. This would require 943,000 m^3 (33,300,000 ft^3) of helium at STP. This is very close to the envelope volume for Pierre Balaskovic's Titan lenticular flying crane, circa 1975, which also was designed for a 500 metric ton load.	

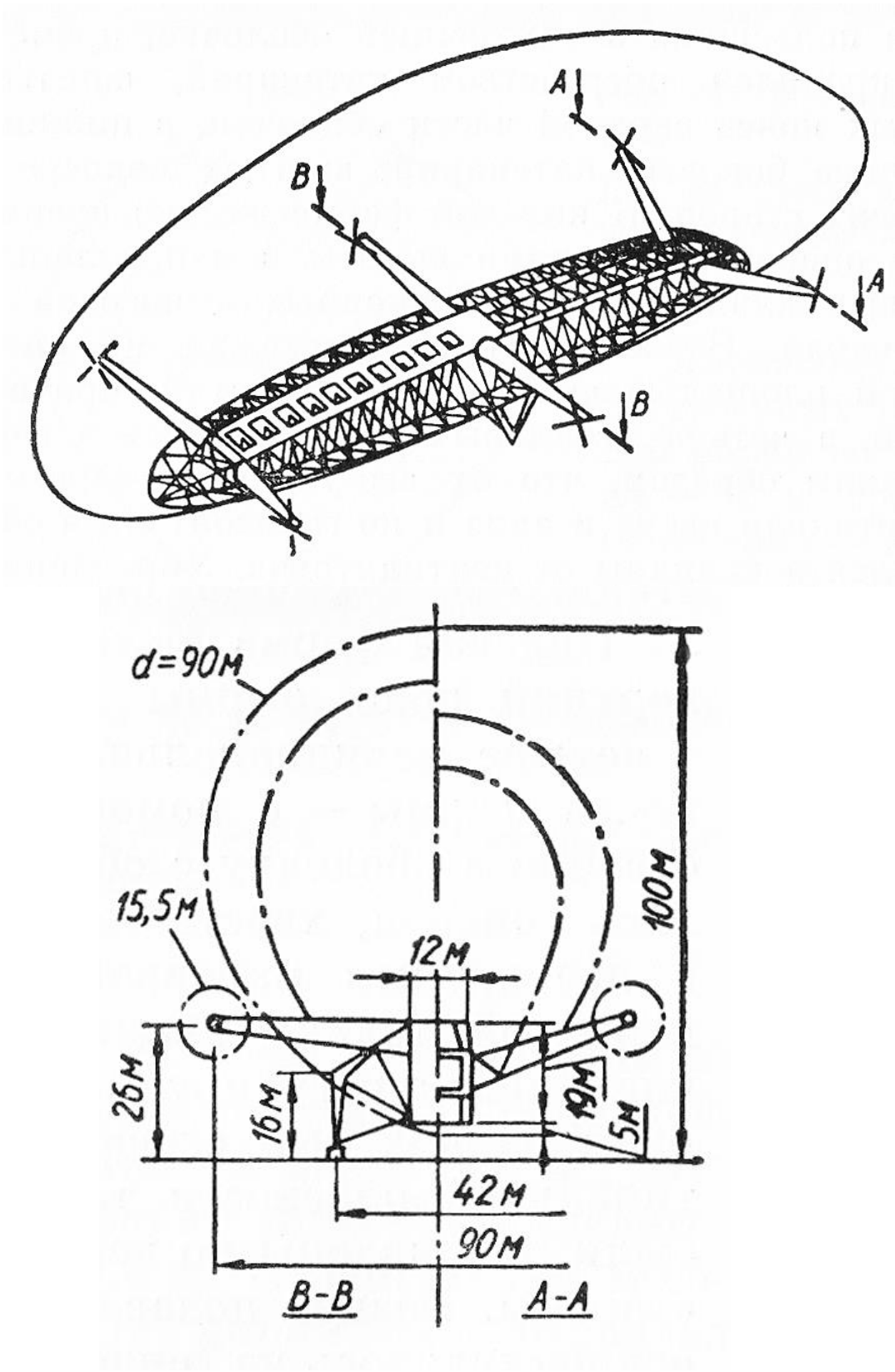
The giant airship was too large to be brought into a hangar, so it would be moored outdoors when not in use. When moored, it was designed to withstand severe winds of 150 kph (93 mph).

Mongolian postage stamp shows an Obélix flying crane, History of Airships series, circa 1977. Source: dreamstime.com

3. Obélix II

The Obélix II was a much more conventional concept for a flying crane, in the form of a semi-rigid helistat consisting of a large non-rigid, pressure-stabilized gas envelope, a rigid, longitudinal primary truss structure running along the bottom of the envelope, and six cantilevered transverse trusses, each supporting a thrust vectoring prop / rotor that provided dynamic lift and propulsion. The crew compartment and the landing gear were attached to the longitudinal truss.

Like the original Obélix, Obélix II is designed to carry a 500 metric tons (550 ton) unitary item as a sling load.



General layout of the Obélix II.
Source: Source: Arie, "Dirigibles" (1986)

General characteristics of the Obélix II flying crane

Parameter	Obélix II
Airship type	Heavy-lift, single aerostat / rotocraft hybrid
Structure	A longitudinal truss structure forms a rigid keel under the single gas envelope and carries the propulsion units, landing gear, and crew compartment, and connects to the suspended load.
Length	270 m (886 ft)
Diameter, max.	90 m (295 ft)
Lift gas	Helium
Envelope volume	1,250,000 m^3 (44,100,000 million ft^3)
Takeoff weight	910 metric tons (1,001 tons)
Useful load	500 metric tons (550 tons), unitary item carried as a sling load
Weight compensation	Likely water ballast
Propulsion system	6 x cantilevered, thrust vectoring, 15.5 m (50.9 ft) diameter prop / rotors, each driven by two turboshaft engines
Speed, max	130 kph (80.8 mph)
Altitude, operating	Up to 1,500 m (4,921 ft)
Range	2,000 km (1,243 miles)

Source: Source: Arie, "Dirigibles" (1986)

4. Requiem for the Obélix

An Obélix flying crane was never built. EDF's "urgent" need ended when they determined that they could deliver reactor vessels and other large components to power plant construction sites by other means.

5. For more information

- Bill Allen, "Big Boom in Gas Bags," Popular Mechanics, July 1977, page 65: https://books.google.com/books?id=tOIDAAAAMBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
- "Le projet: Obélix," Aerall: http://aerall.org/Principaux-Projets-depuis1975.htm

- Jean-Marc Weber, “A Half Century of Aeronautics in France – Volume 2” Center for Advanced Armament Studies, 2008: http://www.eurosae.com/wp-content/uploads/2017/09/Weber_Etudes__recherches_II.pdf
- M. Ya. Arie, “Dirigibles” (in Russian), Publishing House "Naukova Dumka", Kiev, Ukraine, 1986

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