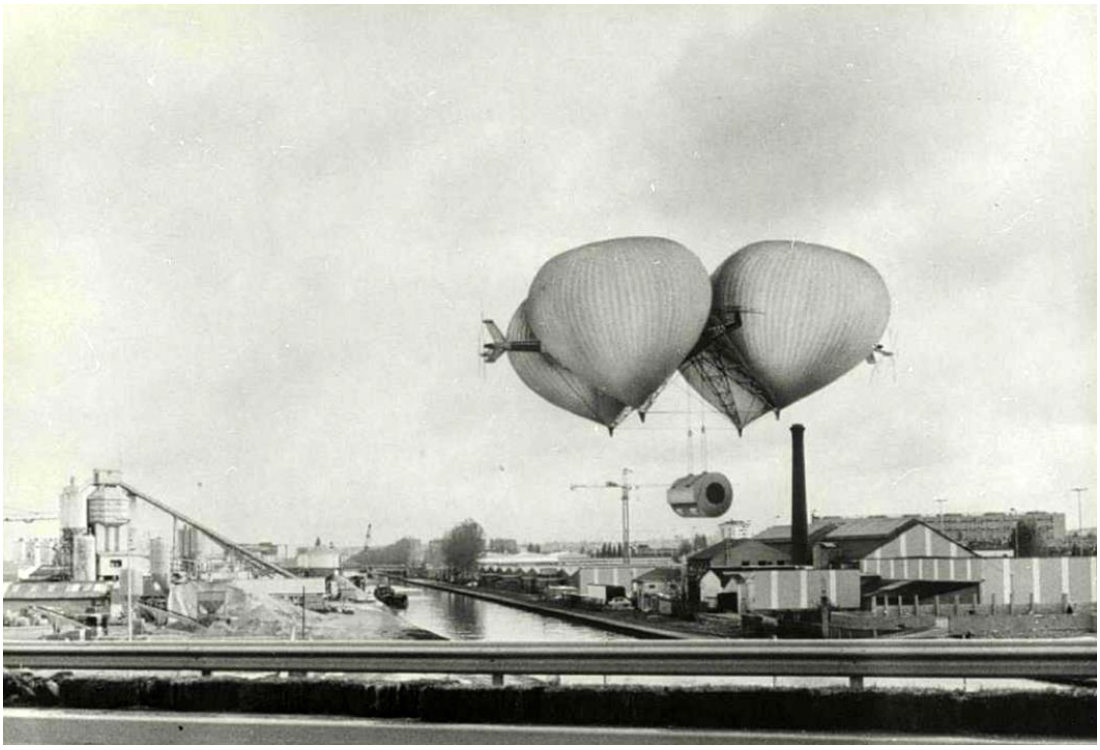
Obélix – flying crane

Peter Lobner, 24 August 2021

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."

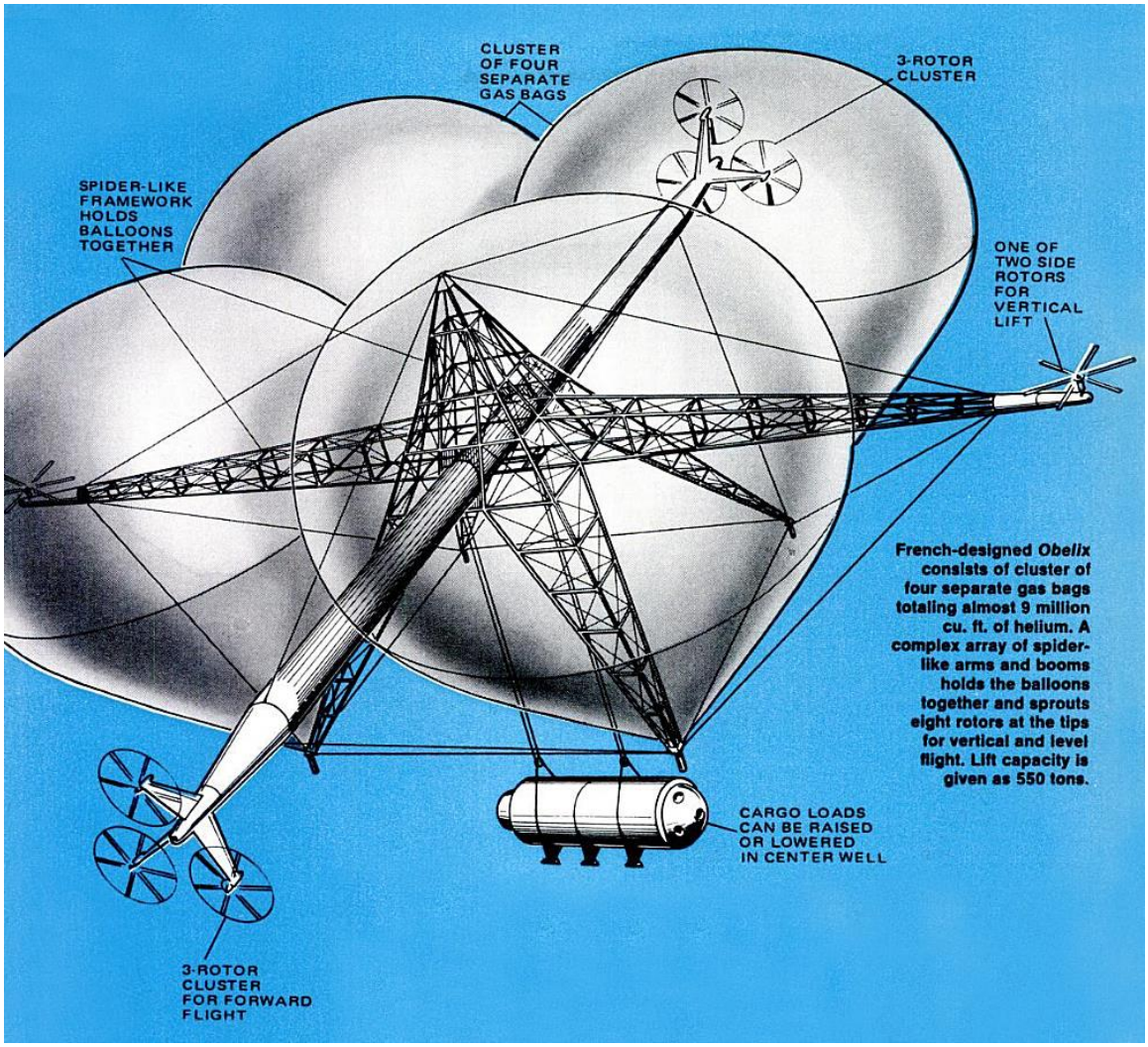
> “The dirigible is urgently needed to solve the specific problem of transporting nuclear reactor (vessels) to the sites where nuclear reactors are being constructed by France’s nationalized electricity and gas company (Électricité de France, EDF).”
>
> “The National Office of Aerospace Study and Research (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.”

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 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 Obélix

Parameter	
Airship type	Heavy-lift, multiple aerostat / rotocraft hybrid
Structure	A 4-legged cruciform structural framework attaches to the aerostats, carries the propulsion units, and connects to the suspended load.
Height	78 m (256 ft)
Lift gas	Helium
Envelope volume	Cluster of 4 aerostats. • about 250,000 m^3 (8.82 million ft^3) * total volume. • about 62,500 m^3 (2.2 million ft^3) * each aerostat.
Useful load	500 metric tons (550 tons) unitary item carried as a sling load
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 • 2 x vectoring rotors provide control (lift, side-force) • Each rotor is driven by 3 x Turbomeca Turmo IIIC turboshaft engines, each capable of generating 1,500 shp (4,500 shp per rotor).
Altitude, operating	Low altitude (100s of meters)
Range	650 km (404 miles)
* This cited envelope volume, which is found in multiple sources, does not appear to be correct. 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).

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.

Mongolian postage stamp shows an Obélix flying crane, History of Airships series, circa 1977

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

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