S.E.A.B. Alcyon & Champlain - lenticular airships

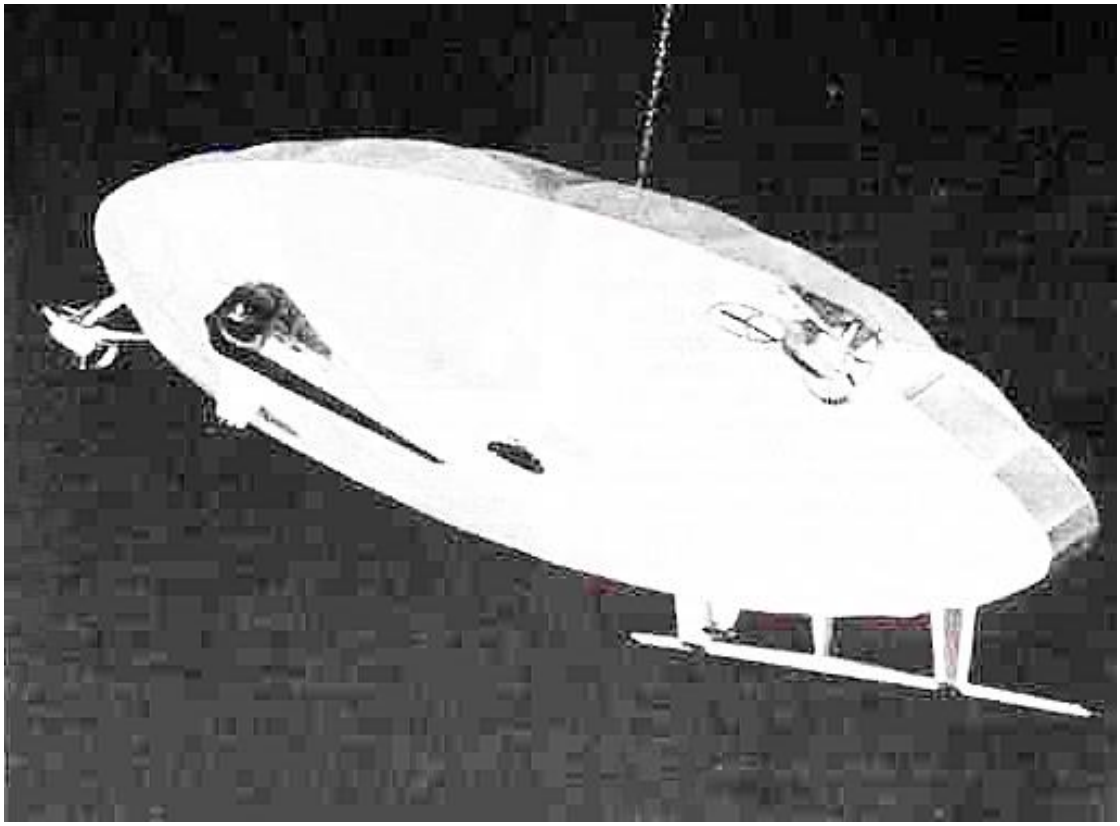
Peter Lobner, updated 8 March 2022

1. Introduction

Alcyon and Champlain were two related lenticular, hybrid airship designs by Pierre Balaskovic and his French company S.E.A.B. The Alcyon was intended to be a small-scale flight demonstrator. Champlain was several times larger, was intended to be a cruising airship for a large number of passengers and incorporated variable buoyancy control.

2. Alcyon (1981 – 1982)

Work on the Alcyon lenticular, hybrid airship was initiated in response to a request from the French post office for a design study of an airship to transport non-urgent mail (prospectus, parcels, etc.).



Early Alcyon design concept, circa 1981.
Source: "Pierre Balaskovic - Balloons and Dirigibles"

General characteristics of Alcyon

Parameter	Alcyon
Airship type	Hybrid, lenticular, rigid aircraft
Length	44 m (144.4 ft)
Height	9 m (29.5 ft)
Lift gas	Helium
Envelope volume	6,200 m^3 (218,951 ft^3)
Lift	5,687 kg @ 305 m, 20°C (12,538 lb @ 1,000 ft)
Propulsion system	• Three Diesel engines located in the aft section of the hull, 885 hp total. • Each engine drives a propulsive unit in the tail and also drives an air compressor. • 3 fixed vertical thrust rotors located at 120° points on the hull perimeter, driven by air jets at the ends of the blades.
Speed, maximum	111 kph (60 knots / 69 mph)
Useful load	998 kg (2,200 lb)

Source: abstracted from UNIDO and N. Mayer, NASA, 1981

Alcyon's hull shape is lenticular and it provides significant aerodynamic lift in forward flight. A stabilizing tail unit is placed in a low position to reduce the effects of the wind on stability.

This airship propulsion system consisted of three Diesel engines located in the aft sector of the hull, each driving a propulsive unit in the tail and also driving an air compressor that supplies a high pressure air system. Three fixed vertical thrust rotors located on the hull perimeter (at the bow and 120° back along the stern quarters) were driven by air jets at the ends of the two-bladed rotors. These rotors provided the vertical thrust vectors for the landing and take-off phases and for pitch and roll control in flight.

The pre-flight aerostatic balance was established with water ballast. Fuel was extra weight, which means that Alcyon was aerostatically heavy at takeoff, with the mass of fuel being balanced by the dynamic lift of the rotors during vertical takeoff and landing (VTOL) and by aerodynamic lift from the lenticular hull during forward flight.

Alcyon had a three-point landing system consisting of inflated tubes surrounding an area maintained a slightly lower pressure by a

vacuum system. Acting as suction cups, this landing system was designed to immobilize the airship on hard surfaces and on grass. In effect, this was one-half (the suction half) of an air cushion landing system (ACLS) that is now common on hybrid airships.

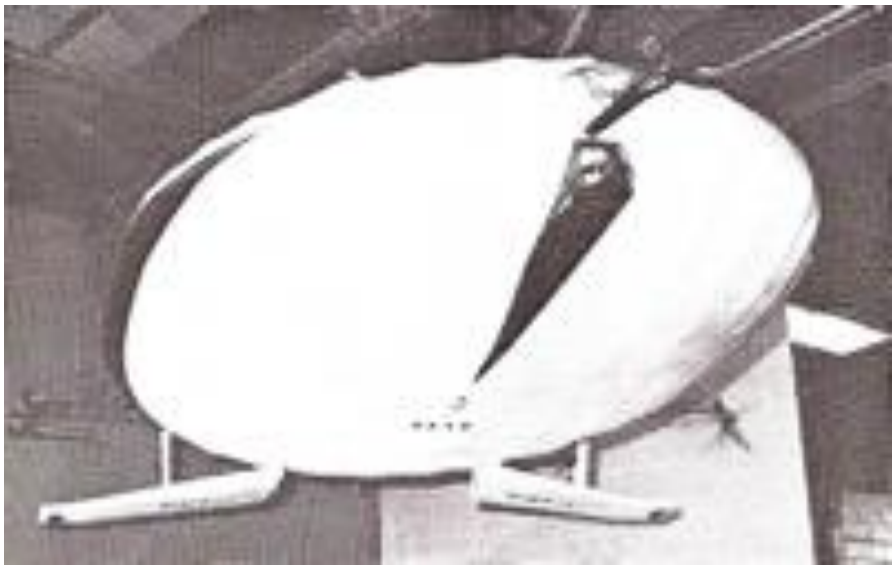
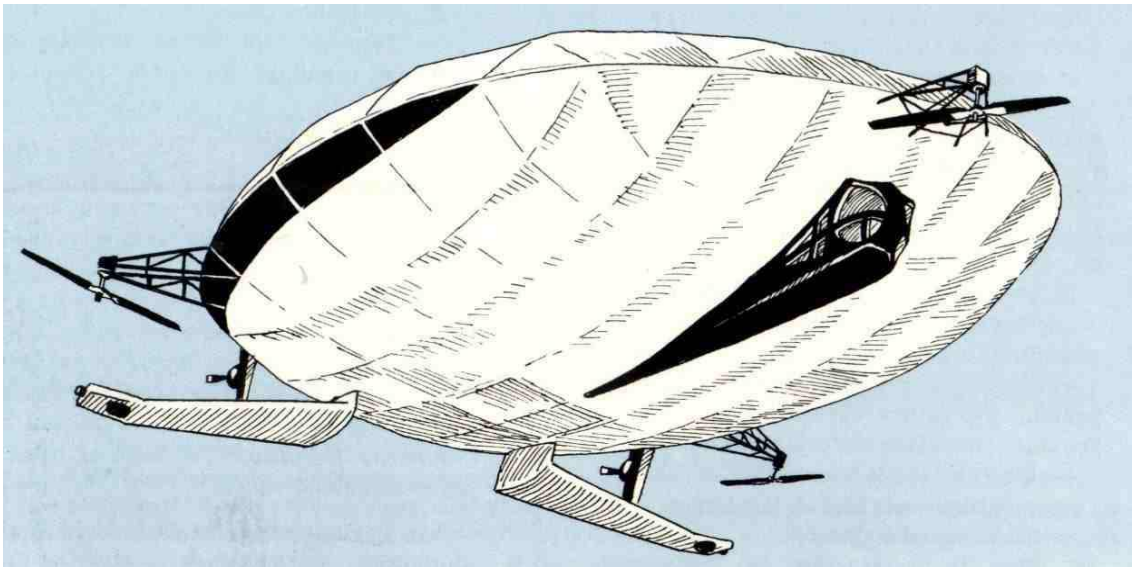


Photo of the Alcyon model exhibited at the Discovery Palace.
Source: "Pierre Balaskovic - Balloons and Dirigibles"

In 1981, NASA program manager and consultant Norman Mayer reporting on the UN Industrial Development Conference on LTA Systems for the Benefit of Developing Countries, described the Alcyon as follows:

> "Present plans by Pierre Balaskovic and his company SEAB include development of a 6,200 cubic meter airship called ALCYON. ….. It is intended as a low altitude VTOL vehicle. Vertical thrust is obtained from 3 rotor systems located at 120 degree points on the hull perimeter, forward thrust is provided by 3 propulsive units mounted on the tail support structure of the aircraft. Although the vehicle has a large horizontal tail, it was judged to be inherently stable (in pitch) without this appendage on the basis an analysis provided by CERT (the Toulouse branch of ONERA). Wind tunnel tests to measure drag were also run by ONERA. A full scale vehicle is planned for completion in 1982."

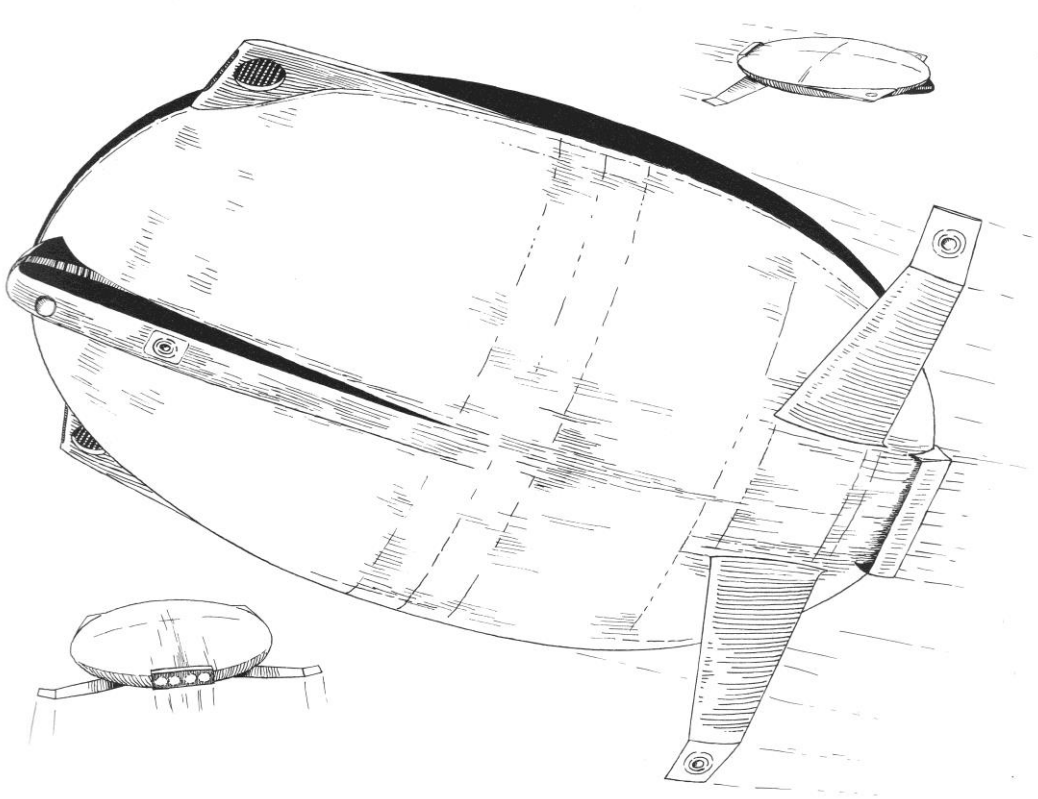
The Alcyon lenticular, hybrid airship was not built.



Alcyon. Source: "Les ballons du futur" (1983)

3. Champlain (circa 1983)

Champlain was a design concept for a large lenticular cruising airship for 250 passengers, based generally on the Alcyon design.



Champlain. Source: "Les ballons du futur" (1983)

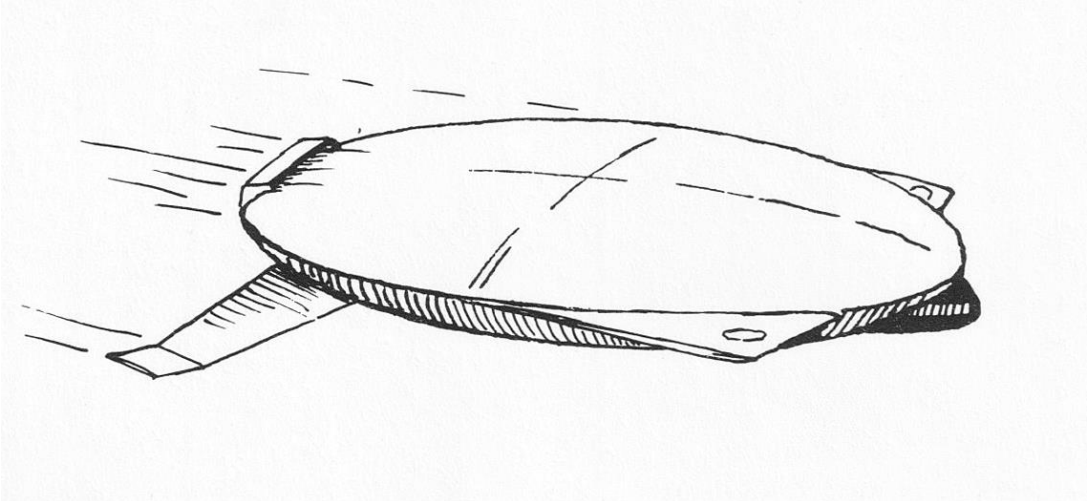
General characteristics of Champlain

Parameter	Champlain
Airship type	Hybrid, lenticular, rigid aircraft
Length	148 m (485.6 ft)
Width	92 m (301.8 ft)
Height	31 m (101.7 ft)
Lift gas	Helium
Envelope volume	200,000 m^3 (7,063,000 ft^3)
Lift	188,300 kg (188.3 metric tons / 207 tons) @ 300 m, 20°C
Empty weight	95,300 kg (95.3 metric tons / 104.8 tons)
Gross weight	230,000 kg (230 metric tons / 253 tons)
Propulsion system	• 3 x Diesel engines (or turbines) each drive a large blower in the stern and an alternator for providing on-board electricity. • Total installed power: 2,500 hp total • Large pipes distribute the air leaving the blowers to all points of the hull where propulsive thrust is required, including four large exhausts at the stern for main propulsion and smaller, side-mounted air jets for maneuvering.
Altitude, cruise	300 m (984 ft)
Altitude, maximum	1,500 m (4,921 ft)
Speed, cruise	110 kph (68 mph)
Speed, maximum	150 kph (93 mph)
Range	5,000 km @ 110 kph (3,107 miles @ 68 mph)
Useful load	93,000 kg (205,030 lb), including:
Passengers & crew:	23,100 kg (50,927 lb), 50 crew & 250 passengers
Baggage:	6,000 kg (13,228 lb)
Food for 3 days:	3,500 kg (7,716 lb)
Sanitary water:	9,000 kg (19,842 lb)
Sports equipment:	7,000 kg (15,432 lb)
Fuel:	30,000 kg with 7,000 kg of reserve (66,139 lb with 15,432 lb of reserve)
Reserve buoyancy:	14,400 kg (31,747 lb)

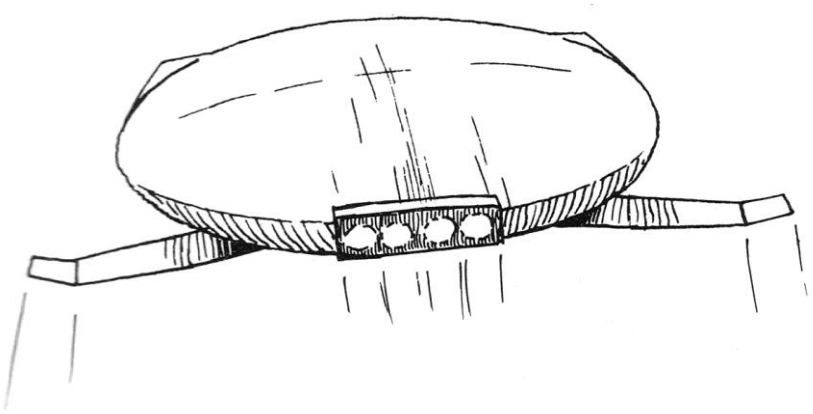
Source: Adapted from "Les ballons du futur" (1983)

In their 1983 book, "Les Ballons du Futur," Balaskovic and Moizard describe a hypothetical three week airship cruise of “the marvelous landscapes of North America, from Niagara to Vancouver, from California to Florida,” in a Champlain airship. They described the following airship features:

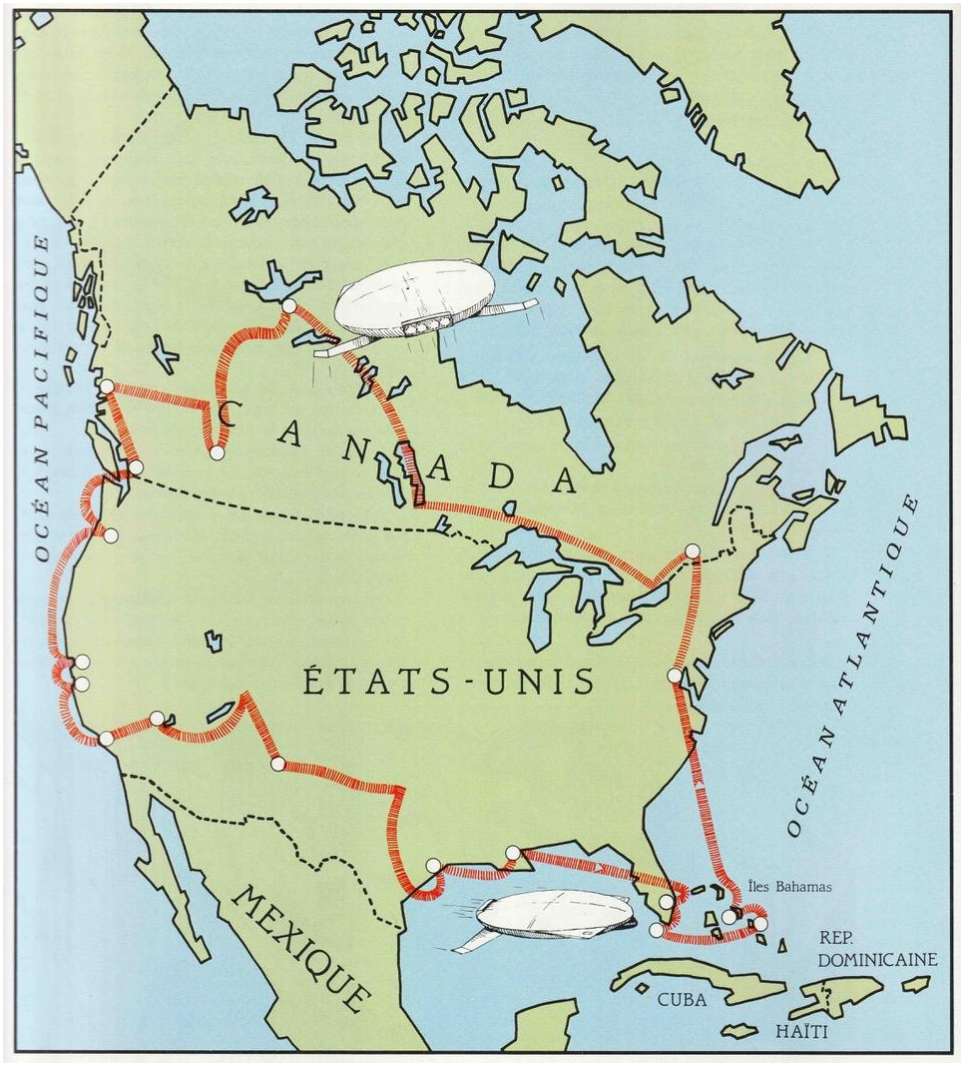
- The cockpit is at the bow. A video system gives the pilot a view of the entire rear sector.
- On the ground, the airship sits on inflated landing tubes. These enable the airship to land on the ground or water. These inflated tubes probably were designed to function like the ALCS on the Alcyon.
- Large carts are wheeled aboard with luggage and supplies.
- The main passageway stretches for 140 meters (459 ft), from the cockpit to the stern surveillance cabin.
- The hotel facilities are distributed over two levels:
    - The main deck houses a self-service bar-dining room and the first-class cabins.
    - The promenade deck brings together the rest of the public spaces and the tourist-class cabins arranged along the sides of this deck.
    - The panoramic lounge and a luxurious library are in the nose of the airship, one level above the cockpit.
    - The restaurant offers “the best dishes in discreet comfort.”
- Propulsion is by “integrated blowers.” Side-mounted air jets provide maneuvering control.
- Champlain has a variable buoyancy control system: “If we want to ‘weigh down’ the airship, it suffices to take the helium from the carrier balloons using a pump to compress it in the reservoir balloons. Due to compression, the volume of helium decreases as does the load-bearing force. To ‘lighten’, it suffices to re-inflate the carrier balloons from the helium compressed in the tank balloons.”



Champlain. Source: "Les ballons du futur" (1983)



Champlain, stern view. Source: "Les ballons du futur" (1983)



Hypothetical Champlain airship cruise route map.
Source: "Les ballons du futur" (1983)

4. For more information

- Pierre Balaskovic & François Moizard, "Les Ballons du Futur," ACE éditeur, 1983
- “Le programme Alcyon," which is included in "Les ballons du futur," ACE éditeur, 1983, reproduced online here: http://jb.aeronef.pagesperso-orange.fr/images/alcyon.htm
- “Le programme Champlain," which is included in "Les ballons du futur," ACE éditeur, 1983, reproduced online here: http://jb.aeronef.pagesperso-orange.fr/images/champlain.htm
- “Pierre Balaskovic - Balloons and Dirigibles” https://balaskovic.pagesperso-orange.fr/ballons-et-dirigeables.html
- Anthony J. Dolman, “Current and Possible Future Developments in Lighter-Than-Air (LTA) System Technology,” Section 4.4, “France,” United Nations Industrial Development Organization (UNIDO), 1983: https://open.unido.org/api/documents/4793600/download/CURRENT%20AND%20POSSIBLE%20FUTURE%20DEVELOPMENTS%20IN%20LIGHTER-THAN-AIR%20
- Norman Mayer, "Current Developments in Lighter Than Air Systems,” NASA paper reporting on the UN Industrial Development Organization (UNIDO) Conference on LTA Systems for the Benefit of Developing Countries, Vienna, Austria, 18 – 22 October 1981: https://ntrs.nasa.gov/api/citations/19820016300/downloads/19820016300.pdf

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