A-NSE airships and aerostats

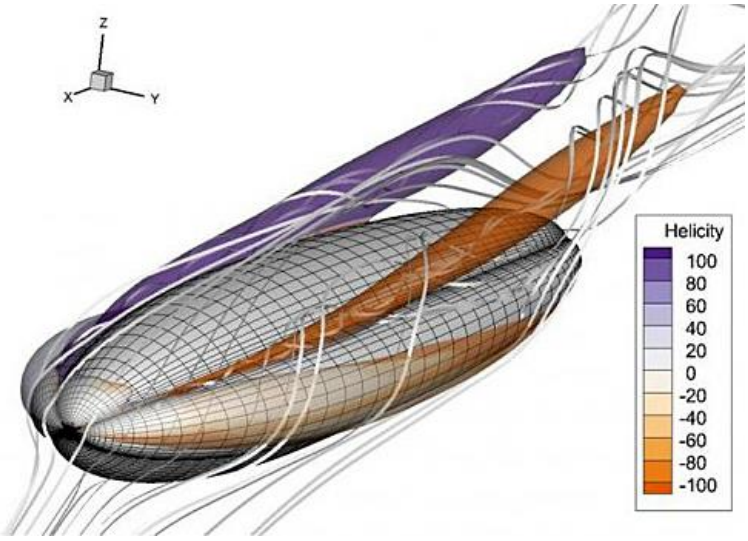
Peter Lobner, 3 April 2021

1. Introduction

Aero-Nautic Services & Engineering (A-NSE) was founded in 2011 and is based in Le Castellet, France. It offers customers a wide range of airborne surveillance systems based on unmanned aerostats (moored balloons) and manned airships. The airships are designed to carry out surveillance missions effectively, at lower operating cost and over considerably longer range than fixed-wing aircraft and helicopters. The aerostats and airships can be configured to conduct a range of missions with equipment such as a radar, an electro-optical / infrared (EO/IR) system, an automatic identification system (AIS), or electronic warfare devices.

The company's website is here: http://www.a-nse.com

2. Variable volume, variable buoyancy lifting gas envelope



Computational fluid dynamics (CFD) model of a tri-lobe hull. Source: A-NSE

A-NSE's larger aerostats and airships have a characteristic variable volume, and hence, variable buoyancy, three-lobe gas envelope, similar in design to the Voliris 901-series airships.

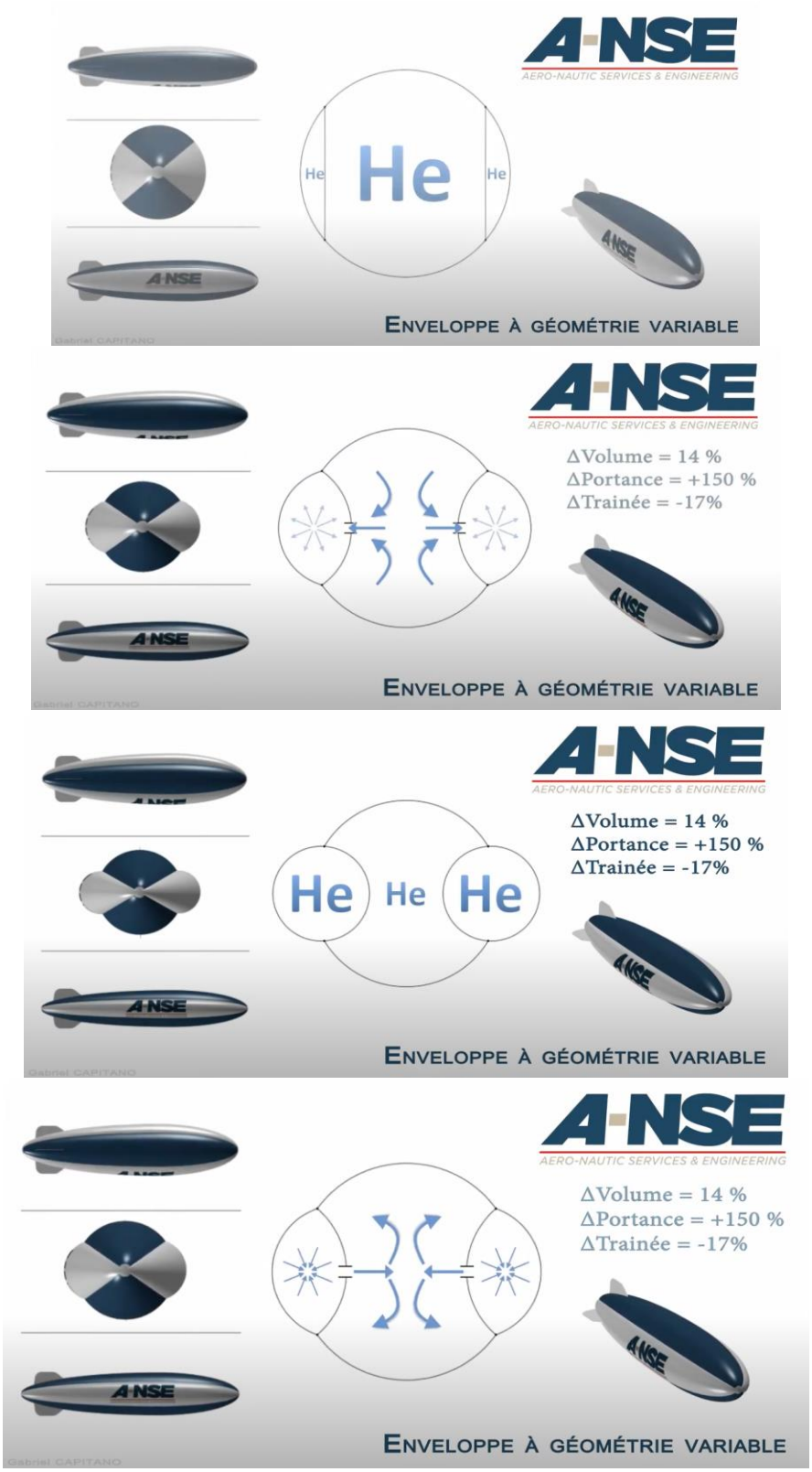
This unusual feature allows the envelope's volume and shape to be altered in flight to adapt to the flying conditions. For example, one shape is better suited to hovering (i.e., high buoyancy), whereas other shapes are better suited for different flight modes where there will be varying degrees of aerodynamic lift (i.e., takeoff, cruise, approach and landing). The system can change envelope volume by 14% and aerostatic lift by 150%.

This system also offers the possibility of reducing the height of the airship's envelope, and therefore the required hangar height, by 30%. This could be important because few airports have hangars that are able to accommodate aircraft over 12 meters (39.4 m) tall.

Fitting into a conventional hangar. Source: A-NSE

The very short 2012 video, "A-NSE Enveloppe de dirigeable à volume et géométrie variables" (0:13 minutes), at the following link, illustrates the variable volume process employed by A-NSE, with narration in French:

https://www.youtube.com/watch?v=rzLB2-va5F0&feature=emb_logo



One cycle for increasing and decreasing envelope volume.
Source: Screenshots from A-NSE video

3. Airships A-N400, A-N800, A-N1800 and A-N20 000

A-N400

A-N400 in flight. Source, both photos: A-NSE

The single-lobe A-N400 is designed for maritime surveillance missions. Radar range is 100 km (62 miles) and EO/IR range is 30 km (18 miles). The airship has an extendable sea landing system.

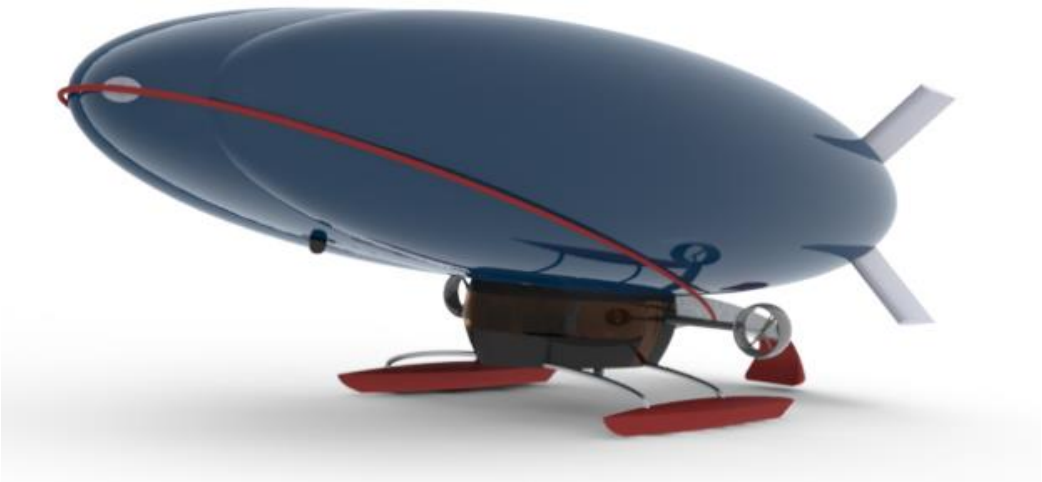
- Type: Manned airship
- Length: 25 m (82 ft)
- Max. diam: 5.5 m (18 ft)
- Envelope volume: 400 m^3 (14,126 ft^3)
- Altitude: 100 to 3,000 ft (30 to 914 m)
- Speed: 0 - 85 kph (0 to 52.8 mph), Cruise @ 65 kph (40 mph)
- Climb rate : 5 m/sec (16.4 ft/sec)
- Endurance: @ 0 kph: 10 h; @ max. speed: 6 h
- Action range: 390 km (242 miles)
- Empty weight: 240 kg (529 lb)
- Payload: 160 kg (353 lb)
- Max. takeoff weight: 400 kg (882 lb)
- Max. wind at takeoff: 45 kph (28 mph)
- Engine: 2 @ 18 hp
- VFR Day & Night

A-N800

The A-N800 tri-lobe envelope. Source: A-NSE

- Type: Manned airship
- Length: 31 m (102 ft)
- Max. diameter: 7 m (23 ft)
- Envelope volume: 800 m^3
- Altitude: 100 to 10,000 ft (30 to 3,048 m)
- Speed: 0 - 105 kph (0 - 65 mph), cruise @ 85 kph (52.8 mph)
- Climb rate: 8 m/s (26.6 ft/sec)
- Endurance: @ 0 kph: 18 h; @ max. speed: 10 h
- Max. range: 850 km (528 miles)
- Empty weight: 450 kg (992 lb)
- Payload: 350 kg (772 lb)
- Max. takeoff weight: 800 kg (1,764 lb)
- Max. wind at takeoff: 60 kph (37 mph)
- Engine: 2 @ 60 hp
- IFR

A-N1800 Hydroblimp



Rendering of the A-N1800 airship with tri-lobe envelope and floats for water landings. Source: A-NSE

Three floats are adapted for landing on any kind of water surface. An annular structure around the envelope provides reinforcement and distributes loads from wind and waves.

- Type: Manned airship
- Length: 38 m (124.6 ft)
- Max. diameter: 10 m (32.8 ft)
- Envelope volume: 1,800 m^3 (63,566 ft^3)
- Altitude: 30.5 m to 3,048 m (100 to 10,000 ft)
- Speed: 0 - 150 kph (0 - 93 mph), cruise @ 130 kph (81 mph)
- Climb rate: 8 m/s (26.6 ft/sec)
- Endurance: @ 0 kph: 20 h; @ max. speed: 12 h
- Max. range: 1,550 km (63 miles)
- Empty weight: 1,060 kg (3,527 lb)
- Payload: 740 kg (1,631 lb)
- Max. takeoff weight: 1,800 kg (3,968 lb)
- Max. wind at takeoff: 80 kph (50 mph)
- Engine: 2 @ 220 hp flank-mounted motors + 1 @ 40 hp stern motor
- IFR

A-N20 000

This company is developing a multi-mission, medium lift airship, the A-N20 000, that is able to lift 8 to 12 metric tons (8.8 to 13.2 tons) and operate without ground infrastructure. This airship is targeted for the following markets:

- ISR (Intelligence, Surveillance, Reconnaissance), particularly with large antennas
- Point-to-point transport of large loads (i.e., for the construction, mining industries)

Rendering of the A-N 20 000 medium-lift airship concept with tri-lobe envelope. Source: Aerall.org

4. Aerostats (tethered balloons) T-C60, T-C350 and T-C1400

The enormous advantage of aerostats lies in their ability to perform long hover flights and carry very heavy loads. With considerable autonomy, some A-NSE aerostats are designed to operate on station for 40 days or more. Aerostats commonly are implemented from land, for example in the context of a coastal surveillance system. At an altitude of 1,000 meters (3,281 ft), the line-of-sight from the aerostat to the horizon is 100 nautical miles (185 km) away.

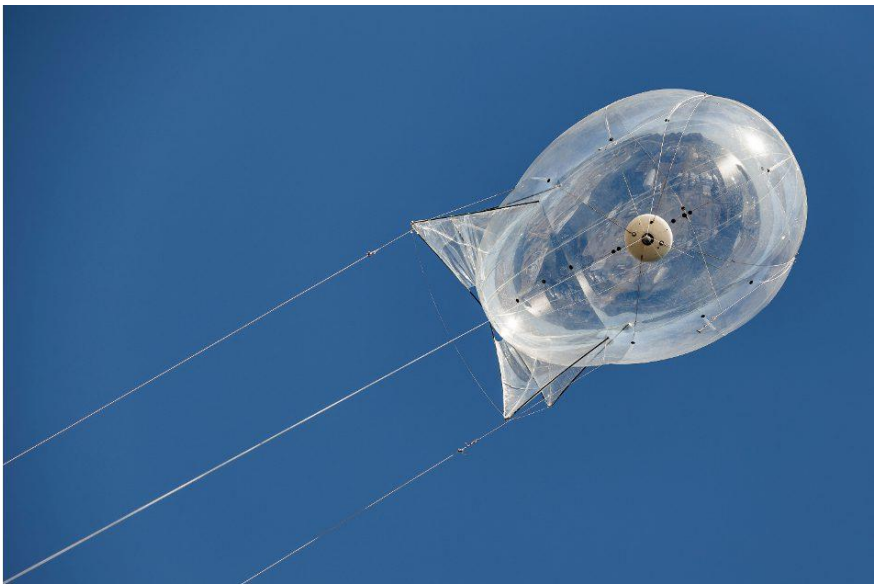
In France, the Ministry of Defense plans to develop an aerostat capable of operating at an altitude of 5,000 meters (16,404 ft) with a 150 nautical miles (278 km) line-of-sight to the horizon.

A tethered balloon also can be operated from a vessel at sea, allowing it to significantly expand its detection capacity while also using the aerostat as a communication relay. The size of the aerostat depends on that of the carrier ship.

A-NSE offers three different aerostat models, ranging from a small, almost spherical tactical balloon to larger three-lobe aerostats that resemble the shape of A-NSE's airships. Following is a brief summary of these aerostats.

T-C60

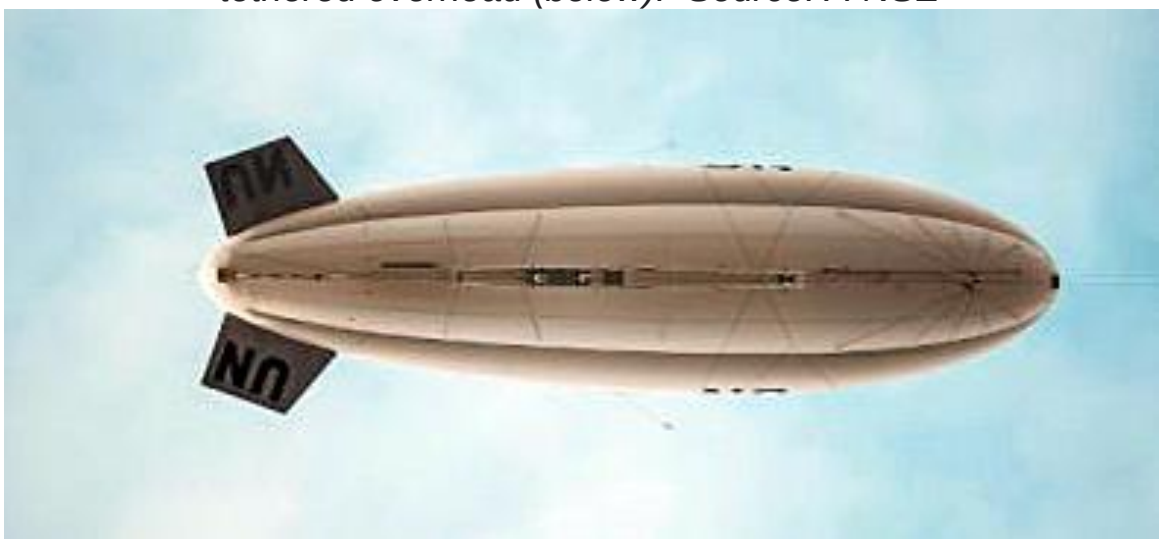
T-C60. Source: A-NSE



- Type: Tethered balloon
- Diameter: from 4 to 8 m (13 to 26.2 ft)
- Envelope volume: from 30 to 120 m^3 (1,059 to 4,238 ft^3)
- Altitude: up to 1,000 ft (305 m)
- Max. wind: 80 kph (50 mph)
- Payload : from 5 to 50 kg (11 to 110 lb)
- Equipment: EO/IR, Communication system
- Endurance: 10 days

T-C350

Three-lobe T-C350 ready for launch (above), tethered overhead (below). Source: A-NSE



- Type: Tethered balloon
- Length: from 25 to 35 m (82 to 115 ft)
- Envelope volume: from 150 to 900 m^3 (5,297 to 31,783 ft^3)
- Altitude: up to 3,000 ft (914 m)
- Max. wind: 110 kph (68.4 mph)
- Payload: up to 200 kg (441 lb)
- Equipment: EO/IR, Radar, Electronic Warfare, Communication system\ Endurance: 40 days

T-C1400

Three-lobe T-C1400 on the ground (above) and tethered (below). Source: A-NSE

- Type: Tethered balloon
- Length: from 38 to 60 m (124.6 to 196.9 ft)
- Envelope volume: from 1,000 to 5,000 m^3 (35,314 to 176,573 ft^3)
- Altitude: up to 9,000 ft (2,743 m)
- Max. wind: 130 kph (80.8 mph)
- Payload: up to 750 kg (1,653 lb)
- Equipment: EO/IR, radar, electronic warfare, communication system
- Endurance: 60 days