# Airstar Aerospace – airships, tethered aerostat systems & stratospheric balloons

Peter Lobner, updated 19 June 2023

# 1. Introduction

Airstar Aerospace, which was established in 1994 in Champ-près-Froges, France, has designed and manufactured tethered aerostat systems, stratospheric balloons, airships, buoyant lighting systems and thermal protection for satellites. They were a team member on the Stratobus stratospheric airship project led by Thales Alenia Space. The Airstar Aerospace website is here: <u>http://airstar.aero/en/airships/</u>

Their product range is illustrated in the following graphic.



Product range. Source: Airstar Aerospace

On 22 March 2019, CNIM Group acquired an 85% share of Airstar Aerospace and rebranded the firm as CNIM Air Space. This was a



short-lived relationship. In October 2022, CNIM Air Space was acquired by Hemeria, which is headquartered in Toulouse, France.



Hemeria continues to offer the tethered aerostat systems, stratospheric balloons and other products and services that it acquired from CNIM Air Space and Airstar Aerospace. The Hemeria website is here: https://www.hemeria-group.com/en/

This article provides a brief overview of the following lighter-than-air (LTA) vehicles developed by Airstar Aerospace in the 2005 – 2018 time frame, before the firm became CNIM Air Space.

- Electroplume series of small, manned, helium blimps: 250, 320 and 500
- Elliptoplume 150 small, manned, spherical, helium blimp
- Colibri 1800 manned thermal (hot air) airship
- AéroLifter aerostat and manned, free-flying derivatives
- Airstar drone airships
- White Hawk, Eagle Owl and Condor tethered aerostat systems
- Stratospheric balloons

# 2. Electroplume small, manned, helium blimps

## Electroplume 250

The Electroplume 250 is a single seat, electric-powered, ultra-light (ULM Class 5) blimp that was created by Jean-Pierre David, commissioned by the French company Airstar, and unveiled in 2005.

Parameter	Electroplume 250	
Length, overall	18.6 m (61 ft)	
Envelope diameter, max	5.2 m (17 ft)	
Envelope volume	250 m <sup>3</sup> (8,829 ft <sup>3</sup> )	
Accommodations	1 seat	
Power source	Batteries, 2 hour endurance	
Propulsion	3 x DC electric motors, each rated @ 2 kW (2.7	
	shp) and driving shrouded propellers.	
Payload	80 kg (176 lb)	
Speed, cruise	30 kph (18.6 mph)	



Electroplume 250 in an Airstar inflatable hangar. Source: Planqueros (2009)



Exiting the Airstar inflatable hangar. Source: Airstar video (2005)

The pilot sits in a seat that is suspended beneath the gas envelope. The airship is powered by three electric motors driving shrouded propellers, with one propeller at the tail and two propellers linked by a common transverse beam that can be manually rotated by the pilot to vector the propellers up / down and left / right in flight.



Electroplume 250 in the Grand Palace in Paris.



Electroplume 250 in flight. Source, both photos: Palenqueros (2009)



ROOM



Electroplume 250 tail details. Source: Screenshot, Airstar video

### Electroplume 320

The single seat, ultra-light Electroplume 320, with a transparent gas envelope, was introduced at the September 2009 Coupe Icare. Like the Electroplume 250, it is powered by three electric motors driving shrouded propellers; one propeller at the tail and two mid-ship propellers that can be manually vectored by the pilot.

Parameter	Electroplume 320	
Length, overall	24 m (78.7 ft)	
Envelope diameter, max	5.2 m ( 17.0ft)	
Envelope volume	320 m <sup>3</sup> (11,301 ft <sup>3</sup> )	
Accommodations	1 seat	
Power source	3 packs of 3 lithium-ion polymer batteries,	
	36 V / 100 Amp	
Propulsion	3 x DC electric motors, each rated @ 3 kW (4 shp),	
	each driving a 90 cm (35.4 in) diameter shrouded	
	propeller.	
Payload	100 kg (220 lb)	
Speed, cruise	20 - 30 kph ( 12.4 - 18.6 mph)	
Speed, max	50 kph (31 mph)	
Altitude, maximum	500 m (1,640 ft)	

#### General characteristics of the Electroplume 320 blimp



Electroplume 320. Source: le dauphiné (2009)



Electroplume 320 profile view. Source: Musée Air + Space (2010)



Electroplume 320, view of the pilot and vectorable thrusters. Note the fixed red rails along the bottom of the envelope supported by external catenary cables. Rails make it easy to attach equipment and reposition the suspension points for the pilot and thrusters. Source: High Art on a Heavenly Stage (2009)

## Electroplume 500

This larger Electroplume model has been reported as having the following general characteristics. I've been unable to find a photo or more information on this model.

Parameter	Electroplume 500		
Length, overall	23.5 m (77.1 ft)		
Envelope diameter, max	6.5 m (21.3 ft)		
Envelope volume	500 m <sup>3</sup> (17,657 ft <sup>3</sup> )		
Accommodations	1 seat		
Power source	5 packs of 3 lithium-ion polymer batteries,		
	36 V / 100 Amp		
Propulsion	5 x DC electric motors, each rated @ 4 kW (5.4		
	shp) and each driving a 72 cm (28.3 in) diameter,		
	four-bladed, shrouded propeller.		
Payload	180 kg (397 lb)		
Speed, cruise	25 - 35 kph (15.5 – 21.7 mph)		
Speed, max	55 kph (34.2 mph)		
Altitude, maximum	500 m (1,640 ft)		

#### General characteristics of the Electroplume 500 blimp

## An unnamed Electroplume? (circa 2018)

This photo appears to show a version of a single-seat Electroplume airship, circa 2018. Propulsion seems similar to an Electroplume 320, except that the stern shrouded propeller is installed in a cut-out in the lower fin and may have a vectoring capability (the shroud appears to



be skewed to the left, presenting an edgeon profile)

An unnamed manned Airstar airship. Source: Bertrand Dampierre, Societe (April 2018)

# 3. Elliptoplume 150 small, manned, spherical blimp

The Elliptoplume, unveiled at the September 2009 Coupe Icare, is an ultra-light, single-seat, helium airship with a small, transparent, ellipsoidal gas envelope. It is propelled by two electric motor-driven shrouded propellers mounted on a transverse beam that can be manually rotated by the pilot to vector propeller thrust, as on the Electroplume 250 and 320. The airship is very maneuverable and can be used as a silent platform for filming outdoors. It can be set up and ready for flight in about two hours.

Parameter	Elliptoplume 150
Envelope width	7 m (23 ft)
Envelope height	6 m (19.7 ft)
Envelope volume	150 m <sup>3</sup> (5,297 ft <sup>3</sup> )
Total weight	80 kg (envelope + equipment)
Accommodations	1 seat
Power source	6 x Lithium-ion polymer batteries,
	2 hour endurance.
Propulsion	2 x DC electric motor-driven caged, vectorable
	propellers.

### General characteristics of the Elliptoplume 150 blimp



Elliptoplume 150. Source: Le dauphiné (2009)



Pilot and propulsion system are suspended beneath the gas envelope. The simple, manual, 2-axis thrust vectoring system directs propeller thrust up / down and left / right in flight.



Elliptoplume 150 (round gas envelope) with the Electroplume 320 in the background at the September 2009 Coupe Icare. Source, both photos: High Art on a Heavenly Stage (2009)

# 4. Colibri 1800 thermal (hot air) airship

The Colibri is a thermal airship that was introduced in 2008. Propane heaters inside the envelope generate the hot air needed for buoyant flight. In a manner similar to the Electroplume 250 and 320, the Colibri originally was propelled by three electric motors-driven shrouded propellers, with one fixed propeller on the lower tail fin and two mid-ship propellers linked by a common transverse beam that can be rotated in flight to vector the propeller thrust up / down and left / right.

Parameter	Colibri 1800		
Length	29.7 m (97.4 ft)		
Diameter, maximum	11.1 m (36.4 ft)		
Height, overall	12.5 m (41.0 ft)		
Envelope volume	1,800 m <sup>3</sup> (63,566 ft <sup>3</sup> )		
Accommodations	2 seats		
Power source	5 packs of 3 lithium-ion polymer batteries,		
	36 V / 100 Amp		
Propulsion	3 x DC electric motors, each rated @ 4 kW (5.4		
	shp) and shrouded propeller.		
Speed, cruise	5 – 20 kph (3 – 12.4 mph)		
Speed, maximum	30 kph (18.6 mph)		
Altitude, maximum	1,000 m ( ft)		

### General characteristics of the Colibri 180 thermal airship



Colibri 1800 (left) & Electroplume 250 (right), circa 2008. Source: Airstar Canada



Colibri 1800 viewed from below, 2009. Note the fixed stern propeller mounted at the bottom of the lower fin.



Colibri 1800 (left) & Electroplume 320 (right) at 2009 Coupe Icare. Source, both photos: High Art on a Heavenly Stage (2009)



Colibri 1800 & Elliptoplume 150 (above) at the 2009 Coupe Icare. Source, both photos: High Art on a Heavenly Stage (2009)





A later version of the Colibri had a muchrevised tail fin configuration, with the horizontal fins repositioned to the bottom of the vertical tail fin. In addition, the sternmounted propeller was repositioned within a duct in the vertical fin to provide lateral thrust, likely to improve the directional control of the thermal airship.

Revised Colibri configuration. Source, both photos: Airstar Canada

# 5. AéroLifter unmanned aerostat & manned, powered derivatives

# The AéroLifter aerostat (2014)

Under a "New Industrial France" government industrialization policy comprised of nine strategic industrial focus areas, including "transport of tomorrow," and confirmed in 2015, Airstar Aerospace and a consortium of companies, including Echoforêt, Solution F, ONERA (French Center for Aerospace Research) and FCBA (Institut Technologique Forêt Cellulose Bois-construction Ameublement), sought to develop an economic and environmentally sensitive way to harvest timber in mountains and on rough terrain.

The AéroLifter project received about 45% of its funding from the French government under an FUI (Unique Interministerial Fund) as part of the "transport of tomorrow" plan.

Their solution was the AéroLifter project led by Airstar Aerospace, which would develop, manufacture and sell a wire-guided airship specializing in aerial work in mountainous or sloping areas, especially for "timber skidding," to move timber rapidly downhill without the need conventional heavy forestry machinery that requires construction of access roads. What made the AéroLifter project unique was that a pilot flew the AéroLifter LTA vehicle to its operating area, and then it was operated as an unmanned, tethered aerostat that was wireguided uphill and back downhill during timber handling operations.



The AéroLifter aerostat above a load of timber. Source: Airstar Aerospace

Lumber harvesting with the AéroLifter aerostat requires installation of an elevated cableway up to 2 km (1.24 miles) long, running from the area where the trees are cut to an open area with easy access for loading the lumber onto trucks. Use of the cableway avoids having to build access roads in the forest and minimizes environmental damage outside of the designated timber harvesting area. With the cableway in place, AéroLifter deployment can be accomplished in about one day.

The wire-guided aerostat is secured to the cableway and operates like an inverted cable car, always flying above the cable. Timber loads are connected via a common fitting supported by the aerostat, and are suspended under the cable. An empty, buoyant AéroLifter rides along the cableway and rises to the high point where timber will be loaded. The AéroLifter and timber load are winched down the cableway to the unloading point, skidding the timber along the hillside during the descent.



AéroLifter heading up the cableway for a new load of timber. Source: Screenshot from French news video

Originally, two versions of the AéroLifter LTA vehicle were planned, a model capable of transporting a 2 metric ton (2.2 ton) load, and a larger model capable of handling loads up to 4 metric tons (4.4 tons). As tested in 2014 - 2015, the prototype AéroLifter LTA vehicle handled payloads up to 1.7 metric tons (1.87 tons).

#### General characteristics of the prototype AéroLifter aerostat

Parameter	AéroLifter
Envelope volume	5,000 m <sup>3</sup> (176,580 ft <sup>3</sup> ).
Payload	1.7 metric tons (1.87 tons / 3,740 lb)
Speed	About 10 m/s (36 kph / 22.4 mph)
Range	About 2 km (1.2 miles) between timber pickup and drop- off points



AéroLifter aerostat showing the external catenaries along the sides of the gas envelope. These support the suspended load.



AéroLifter aerostat being unloaded. Source, both photos: Airstar Aerospace

# Manned, powered, free-flying derivative of the AéroLifter (2015)

It was contemplated that the AéroLifter LTA vehicle also could be configured for use in free-flying applications such as aerial inspections of critical infrastructure (i.e., high-voltage electrical transmission lines, pipelines), aerial tracking, aerostatic crane, etc.

In 2015, the AéroLifter gas envelope was adapted with new fins and was equipped with a suspended propulsion system and pilot seat, in the style of the Electroplume airships. The result was the free-flying helium airship shown below with registration number 38ADD.



Source: Screenshots from French news video





Source: Screenshots from French news video





Closeup of the pilot showing the 2-axis rotation of the propellers. Source: Screenshot from French news video

# Another adaptation of 38ADD with a revised tail (2015)

Later in 2015, airship 38ADD reappeared with a new tail design.



Source: Screenshot from le dauphiné video



Source: Screenshot from le dauphiné video



Manned 38ADD in flight. Source: Coupe Icare 2015 brochure

### 6. Airstar drone airships

#### Airstar Canada drone airship

The Airstar Canada website included the following photos of an unnamed, unmanned airship designed to carry cargo in a sling load suspended under the airship. This airship has an Electroplume-style electric propulsion system under the gas envelope and an additional propeller mounted on and pivoting with the rudder.



Source, both photos: Airstar Canada





Closeups showing the sling load (above) and the forward propellers in a vectored position (above) and cruise position (below). Source: Airstar Canada





Note the propeller mounted on and pivoting with the rudder. Source, both photos: Airstar Canada

#### Unnamed drone airship

The Airstar Aerospace - Happy New Year 2017 video includes the following photo of an unnamed, unmanned airship that appears to be designed to carry cargo as an external load suspended under the airship. This airship has an Electroplume-style gas envelope. There are four propellers visible: two midship propellers that likely provide thrust vectoring à la Electroplume, a fixed lateral thruster under the nose, and a stern thruster that appears to be capable of two-axis thrust vectoring.



Source: Screenshot from Airstar Aerospace – Happy New Year 2017 video (December 2016)

# 7. Airstar Aerospace tethered surveillance aerostats

Airstar Aerospace developed a family to three tethered aerostat systems: White Hawk, Eagle Owl and Condor, that are each configurable to address a wide range of applications, such as:

- Surveillance: detection, tracking, identification & localization for military and civilian applications:
  - Military facility & deployed forces security
  - Industrials site security
  - Airports & harbor security
  - Sensitive site (nuclear, offshore platforms) security
  - Borders and road control
  - Public events & urban crowd control
  - Anti-smuggling & anti-piracy
- Communications: telecommunication relays, communications intelligence (COMINT)
- Emergency response: situational assessment after natural disasters, search & rescue



Airstar Aerospace tethered aerostats. Source: Airstar Aerospace

## General characteristics of Airstar tethered aerostat systems

Parameter	White Hawk	Eagle Owl	Condor
Role	Tactical-class	Operational-class	Strategic-class
Length	4.4 m (14.4 ft)	19 m (62.3 ft)	30 m (98.4 ft)
Diameter, max.	3.4 m (11.2 ft)	7 m (23.0 ft)	11 m (36.1 ft)
Envelope	40 m <sup>3</sup>	450 m <sup>3</sup>	1,600 m <sup>3</sup>
volume	(1,413 ft <sup>3</sup> )	(15,892 ft <sup>3</sup> )	(56,503 ft <sup>3</sup> )
Payload, max	5 kg (11 lb)	90 kg (198 lb)	250 kg (551 lb)
Wind speed,	40 kph	110 kph	130 kph
max	(24.8 mph)	(68.4 mph)	(80.8 mph)
Altitude, max	200 m (656 ft)	600 m (1,969 ft)	1,000 m (3,281 ft)
Endurance, max	5 days	7 days	15 days
Ground crew &	45 minutes,	4 hours,	4 hours,
deployment	2 operators	3 operators	6 to 8 operators
Logistics &	5 m <sup>3</sup> (177 ft <sup>3</sup> ) van	20 ft shipping	Semi-trailer
transport		container (aerostat	(aerostat +
		+ mooring station)	mooring station)

Source: Airstar Aerospace (circa 2017)

#### White Hawk tactical-class tethered aerostat



The White Hawk is a highly-mobile, low-cost aerostat that can be rapidly deployed with a 5 kg (11 lb) payload from a small, fixed mooring platform, or from the back of a Jeep-size vehicle. An automated launch and recovery system makes it practical to operate the with a two-person ground crew on missions lasting up to five day at altitudes up to 200 m (656 ft) AGL

(Left) White Hawk flying on its tether with suspended payload, (Below) White Hawk ready to deploy from a small vehicle Source, both photos: Defesa Aréas & Naval (12 Sep 2017)



# Eagle Owl operational-class tethered aerostat

Eagle Owl is a transportable, multi-mission aerostat that can be configured with up to 90 kg (198 lb) of sensors and equipment for a variety of missions conducted at altitudes up to 600 m (1,969 ft) AGL and lasting up to seven days. Eagle Owl can be deployed and operated by a three-person ground crew in winds up to 110 kph (68.4 mph) at altitude.



Eagle Owl flying on its tether. Source: Airstar (2017)



Airstar aerostat concept of operations. Source: Airstar

## Condor strategic-class tethered aerostat

Condor is a large, transportable, multi-mission aerostat designed to lift a variety of payloads weighing up to 250 kg (551 lb) to altitudes up to 1,000 m (3,281 ft) AGL on missions lasting up to 15 days. Condor can operate in winds up to 130 kph (80.8 mph) at altitude. A ground crew of 6 to 8 persons is required.



Condor on its mobile mooring platform with tractor trailer.



Condor on its mobile mooring station. Source, both photos: Airstar

# 8. Airstar Aerospace stratospheric balloons

Since 1971, Airstar Aerospace has acquired a strong experience in textile design and manufacturing of stratospheric balloons. Our balloons lift anything from a few kilograms to several tons and are able to operate at an altitude as low as a few hundred meters or as high as 40 km.

### Open stratospheric balloons

Open (zero-pressure) stratospheric balloons are gas-filled balloons (hydrogen or helium) that have one or several openings that enable an equilibrium pressure to be maintained between the atmosphere and the lifting gas inside the balloon. General characteristics include:

- Flight duration: up to 1 week
- Payload: up to 2,700 kg (5,952 lb)
- Flight altitude: up to 45,000 meters (147,638 ft / 28.0 miles)



Airstar stratospheric balloon. Source: Mimifromgalaxy via Wikimedia Commons (16 July 2017)

# Pressurized stratospheric balloons

Pressurized stratospheric balloons have a very low leakage sealed envelope that retains a slight superpressure inside the balloon. These balloons can remain aloft much longer than open balloons and can be deployed on long-term flights above inhabited areas. General characteristics include:

- Long term flights: up to 6 months
- Payload: up to 50 kg (110 lb)
- Flight altitude: up to 20,000 meters (65,617 ft / 12.4 miles)



Launching an Airstar pressurized stratospheric balloon. Source: Airstar (2010)

## 9. For more information

- Serge Zuin, "Les Dirigeables Un nouveau depart?" (In French) / "Airships – A New Beginning?", Airstar Space Lighting, 2009:
  - Original article in French: <u>https://www.yumpu.com/fr/document/read/3936812/les-</u> <u>dirigeables-aeur-un-nouveau-dacpart-ecole-ffaacrostation</u>
  - Article translated to English: <u>https://lynceans.org/wpcontent/uploads/2023/04/The-AIRSTAR-Airships\_A-newbeginning\_2009.pdf</u>

- Ian Sheppard, "Airstar Deploys Eagle Owl Over Le Bourget Show," AlNonline, 19 June 2017: <u>https://www.ainonline.com/aviation-news/aerospace/2017-06-19/airstar-deploys-eagle-owl-over-le-bourget-show</u>
- Bertrand Dampierre, "Airstar Aerospace High Aims," Societe, 9 April 2018: <u>https://www.societe.com/actualites/airstar\_aerospace\_vise\_hau\_t-26184.html</u>

# **Electroplume**

- Tate Slow, "Palenqueros," 2009 :
  <u>http://palenqueros.blogspot.com/2009/04/blog-post\_07.html</u>
- "Innovation en Iseré Les nouveaux dirigeables d'Airstar," (in French, Electroplume 320) le dauphiné, 19 September 2009: <u>https://www.ledauphine.com/isere-sud/2009/09/19/les-</u> <u>nouveaux-dirigeables-d-airstar</u>
- "High Art on a Heavenly Stage," (In Russian, a review of the 36<sup>th</sup> Icarus Cup, September 2009), Airflow Information, 23 November 2009: <u>http://lj.rossia.org/users/aerocrat/74518.html</u>

# <u>AéroLifter</u>

- Airstar Aerospace, A Major Player in the AéroLifter Project, Airstar Aerospace: <u>http://airstar.aero/fr/solutions-de-levage-aerolifter/</u>
- "SAFE cluster build up the industrial airship sector," circa 2015: <u>http://www.safecluster.com/wp-content/uploads/2016/03/GB-version.pdf</u>

# <u>Video</u>

 "2005 09 22 Airstar Space Lighting Dome Electroplume Airstar" (3:46 minutes, includes Electroplume 250 in flight), airstar.it, 22 September 2005:

https://www.youtube.com/watch?v=apzDkJ4engl&t=41s

 "Airstar Aerospace - Happy New Year 2017," (1:05 min), posted by Airstar, 21 December 2016: <u>https://www.youtube.com/watch?v=NPN0xJAnfOw</u>

# Other Modern Airships articles

- Modern Airships Part 1: <u>https://lynceans.org/all-posts/modern-airships-part-1/</u>
- Modern Airships Part 2: <u>https://lynceans.org/all-posts/modern-airships-part-2/</u>
  - Aérial Concept Group & Transoceans IRIS Challenger & Leiló
  - Hemeria (formerly CNIM Air Space) drone airship & tethered aerostats
  - o Alpha & Alizé lenticular airships
  - Thales Alenia Space Stratobus
- Modern Airships Part 3: <u>https://lynceans.org/all-posts/modern-airships-part-3/</u>