

Capgemini Engineering (formerly Altran Aerospace) - solar powered drone airships

Peter Lobner, 11 February 2022

1. Introduction

Capgemini Engineering (formerly Altran Aerospace, reorganized & rebranded 1 January 2021) has been developing designs for unmanned solar-powered airships for various applications, including long-range cargo transport, communications and Earth observation.

This article describes two autonomous airship projects: the Sun Cloud heavy cargo airship (circa 2013) and the EcoSat stratospheric airship (a current project in 2021).

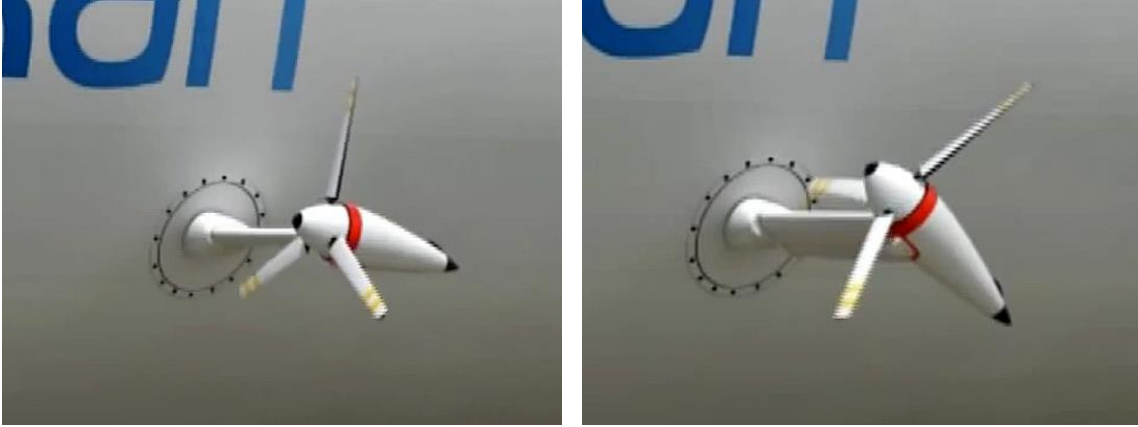
2. Sun Cloud solar-powered heavy cargo airship

The Sun Cloud is a concept, circa 2013, for a large, unmanned, semi-rigid, solar-powered, cargo airship that can fly autonomously on long-range routes. The aircraft design is scalable over a wide range, for example, between 130 to 250 tons. The basic airship design is described in a short 2013 video interview with Altran Aerospace R&D Program Manager Ali Jaafar, which you can watch here:

<https://www.youtube.com/watch?v=v8wYCT9rTcl>



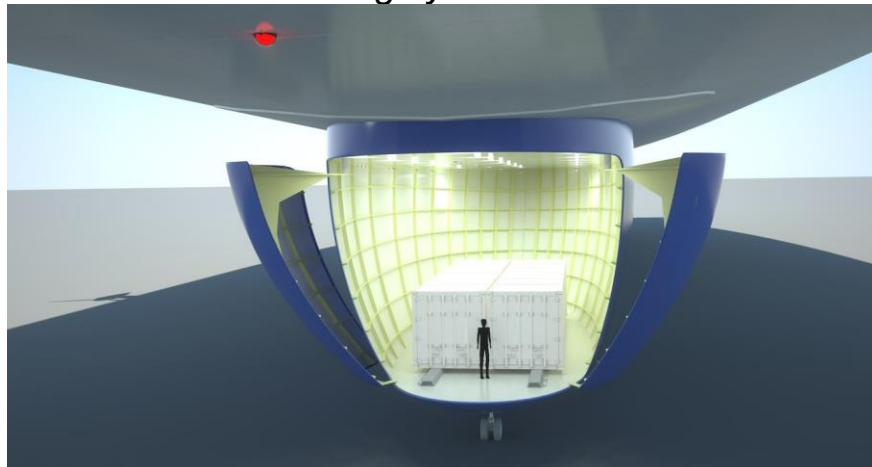
Sun Cloud profile view. Note the large solar array on the top of the hull. Source: screenshot from Altran Aerospace video (2013)

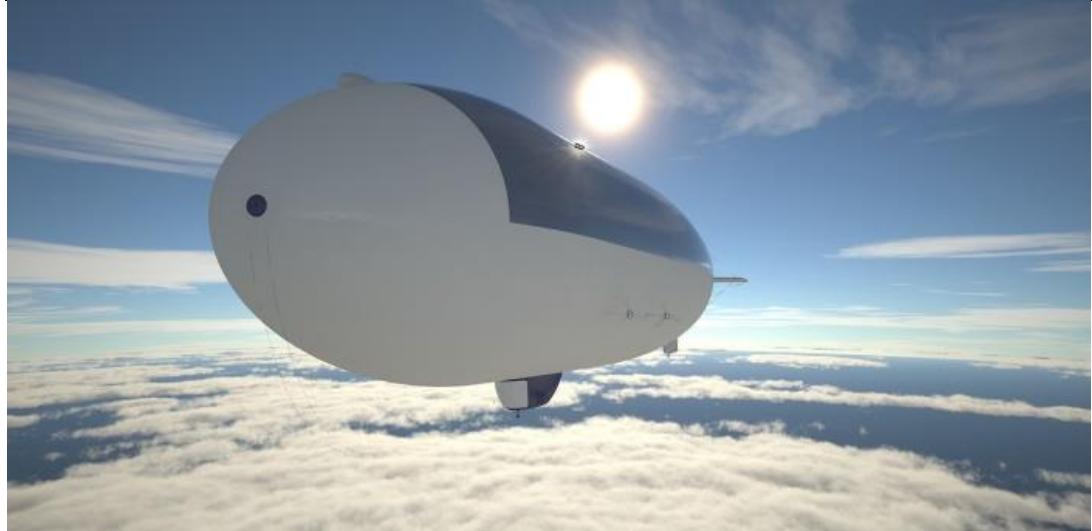
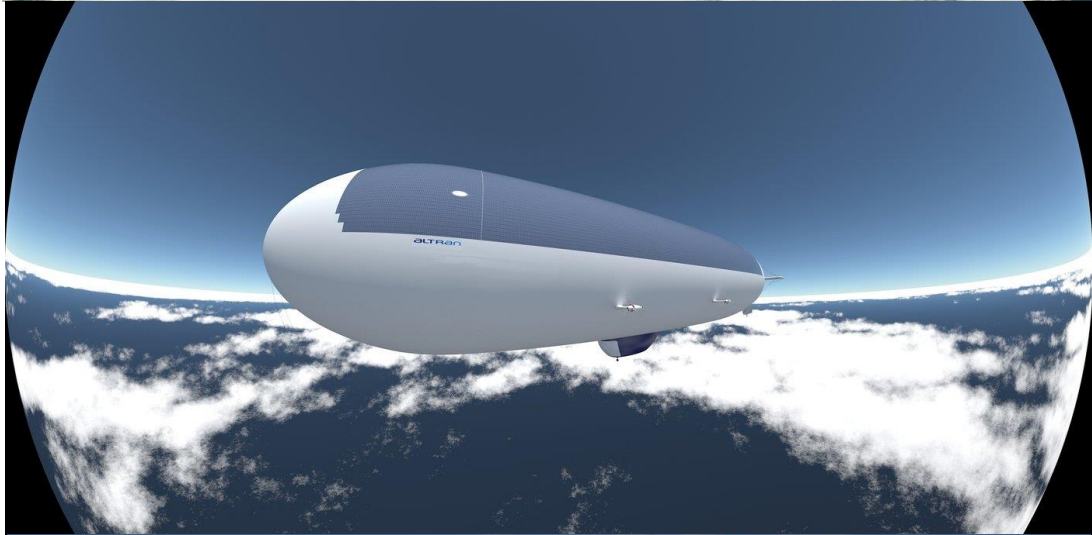


*Sun Cloud is propelled by four electrically-powered vectored propulsors mounted along the flanks of the gas envelope.
Source: screenshot from Altran Aerospace video (2013)*

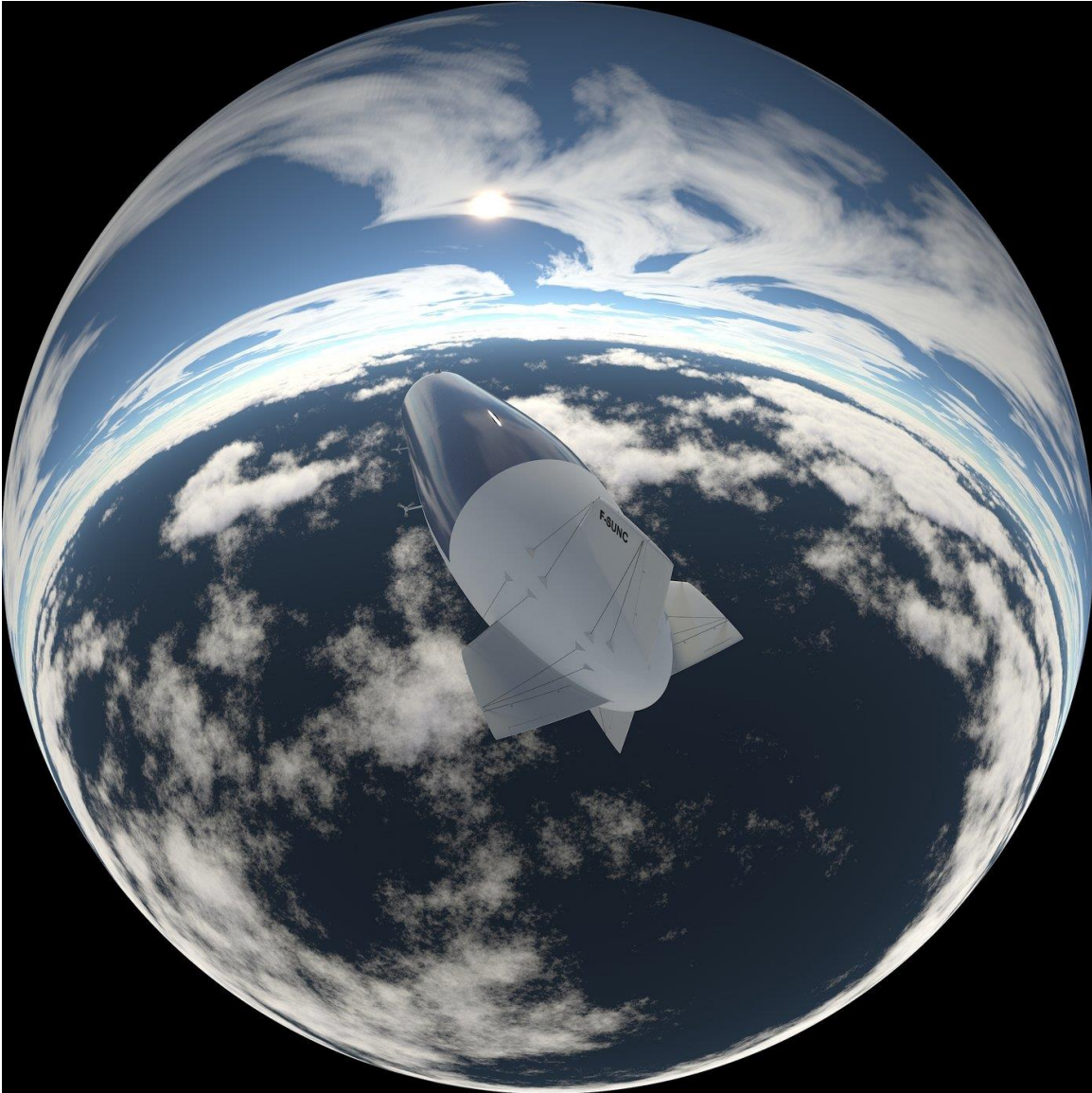


*A large cargo bay with clamshell doors under the gas envelope provides easy loading and unloading.
Source, above: screenshot from Altran Aerospace video,
below: rendering by Bernard Guillaume*





*Renderings of the Altran Sun Cloud airship in flight.
Source: Bernard Guillaume (2013)*



*Rendering of the Altran Sun Cloud airship in flight.
Source: Bernard Guillaume (2013)*

3. EcoSat solar-powered stratospheric airship

The EcoSat is a design for a semi-rigid, solar-powered, stratospheric airship that can operate at a designated geo-stationary point at an altitude of 20 km (65,600 ft) for periods of 3 – 4 years while carrying a payload up to 1,000 kg (2,205 lb). The EcoSat operates autonomously during takeoff and landing and during positioning operations (station-keeping or redeployment) at high altitude. At the end of a mission, the reusable airship is recovered for maintenance and reconfiguration for its next mission.

Principal applications for an EcoSat include:

- Telecommunications:
 - 3G / 4G in low density areas
 - 5G and IoT (internet of things) service
 - Redundancy to terrestrial telecom networks
 - Capacity support for high density telcom traffic areas
 - Service for maritime and air traffic users
 - Replacement telcom coverage in emergencies
- Earth observation:
 - Natural disasters
 - Fire prevention
 - Cartography and remote sensing
 - Agricultural applications
 - Environmental applications
- Defense & security :
 - Border surveillance
 - Migration control
 - Defense communications and surveillance

Development is funded by the European Regional Development Fund (ERDF) of the European Union and the Junta de Castilla y León, through the Institute for Business Competitiveness of Castilla y León (ICE).

The Capgemini website with their case study for the EcoSat, is here: https://capgemini-engineering.com/es/en/case_study/ecosat/

The ExoSat AS30 prototype / demonstrator

The AS30 is a one-third scale stratospheric airship that is expected to fly in Leon, Spain in the 2021 – 2022 time frame. This prototype will support validation of a large part of the technology developed in the stratospheric solar airship program, and reduce technological uncertainties in the remainder of the program. The prototype has the specific objectives to validate the platform systems, hardware, and software, including the flight control laws, validate the manufacturing process, and train the platform's ground operation team.



*EcoSat AS30 prototype on display at the 2019 5G European Forum. Note the positioning of the bow thruster and flank-mounted thruster.
Source: Capgemini Twitter, 24 October 2019*



*Rendering of the one-third scale EcoSat AS30 prototype, circa 2020.
Source: leonoticias.com*

The full-scale EcoSat AS80

Altran reported that its design for the AS80 “.....involves a semi-rigid solar-powered airship. Its particular aerodynamics and configuration allows it to maintain its position for long periods of time with a minimum consumption of power, as well as being able to operate at more extreme north-south latitudes, maximizing the geographical area of operation.”



*Rendering of a full-scale EcoSat AS80 on station in the stratosphere.
Source: Altran Aerospace.*

There will be a full-scale AS80 prototype that will demonstrate its ability to conduct continuous and autonomous operation in the stratosphere for a long period of time. Both the AS80 prototype and the ground control center MCC will have full operating capabilities and should be able to fully validate all the technologies developed in the stratospheric solar airship program.



Rendering of an EcoSat on station in the stratosphere flying above a representation of a terrestrial communications network that it can support. Source: Capgemini.

4. For more information

- Bernard Guillaume, Versailles, France, renderings by of the Altran Sun Cloud airship, March 2013:
<https://www.coroflot.com/GuillaumeBenard/no-wheels>
- “From León to the stratosphere by airship” (in Spanish), LEONOTICIAS, 22 July 2020:
<https://www.leonoticias.com/leon/leon-estratosfera-dirigible-20200722092440-nt.html?ref=https%3A%2F%2Fwww.google.com>

Videos

- YouTube video (0:52 minutes), “Solar-Powered Drone: Crossing Oceans, Using No Gas,” (0:52 minutes), Bloomberg Quicktake, June 2013:
<https://www.youtube.com/watch?v=v8wYCt9rTcl>
- “Altran EcoSat,” David Hernández Carrion, DHC Films, Vimeo, October 2018: <https://vimeo.com/293147400>

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>