Sceye stratospheric airship

Peter Lobner, updated 11 February 2022

1. Introduction

Mikkel Vestergaard, CEO of global public health companies Vestergaard and LifeStraw, founded Sceye SA in Lausanne, Switzerland in 2014. In the same year, Sceye established Sceye Inc. in Roswell, NM, with an airship development team headed by Dr. David Kim. This team's goal is to design and build advanced unmanned stratospheric airships capable of operating at an altitude of 65,000 ft (20 km) for extended periods of time, up to a year, delivering a variety of services, such as real-time Earth observations and equitable regional broadband communications.

The company also is engaged in developing advanced materials and electric power systems for stratospheric airships, including:

- **Sceye® Skin**: A hull fabric that is 5 times stronger relative to weight, 1,500 times more gas tight, and UV and ozone resistant than current fabrics.
- **Sceye® Power**: An advanced lithium-sulphur battery power system with an energy density greater than 400 Wh/kg, approaching the power densities of more complex fuel cells.
- **Sceye® Solar:** An ultra light laminated solar "cape" with weathering layers cover much of the airship's surface. Sceye claims the "cape" is 50% lighter than gallium arsenide solar cells and 85% lighter than copper indium gallium selenide solar cells.

The company conducts its research and development and airship operations at facilities located at the Roswell and Moriarty, NM, airports. The company's website is here: https://www.sceye.com

Sceye plans to utilize expertise from Sandia National Labs, the Air Force Research Lab, New Mexico Tech, New Mexico State University, the University of New Mexico, and others.

In 2017, Sceye built a hangar at Roswell International Air Center and also built and flight tested a 65-foot (19.8 m) prototype non-rigid airship known as the Sub-Scale Vehicle (SSV). In March 2019, that hangar was severely damaged and the SSV was destroyed in a severe wind storm that swept through the area. With support from the State of New Mexico, the hangar was rebuilt in 2020.

In January 2019, Vestergaard stepped down from his CEO role at Vestergaard and LifeStraw to exclusively focus on expansion of Sceye Inc. business.

After spending more than $50 million in developing stratospheric airships and associated technical infrastructure in Roswell and Moriarity, Vestergaard announced In August 2020 his plans for a new development and production facility that will be able to house up to 140 employees and a full-size Sceye stratospheric airship, which will be about 500 feet (152.4 m) long and 130 feet (39.6 m) wide. This new facility, which is estimated to cost $35 to $45 million, is intended to enable Sceye, Inc. to grow to commercial scale.

2. The Sceye stratospheric airship applications

Sceye's High Altitude Platform Station (HAPS) airships have the potential to perform a wide variety of missions from geostationary positions in the stratosphere, including:

- Provide equitable broadband communications coverage.
- Provide real-time data on air quality (AQ) and greenhouse gas (GHG) emissions (i.e., methane).
- Monitor crop conditions.
- Provide various security services, including monitoring for human trafficking activities.

The initial targets for equitable broadband communications services are in rural areas of New Mexico, which include the Navajo Nation and other currently underserved areas. Sceye determined that five of

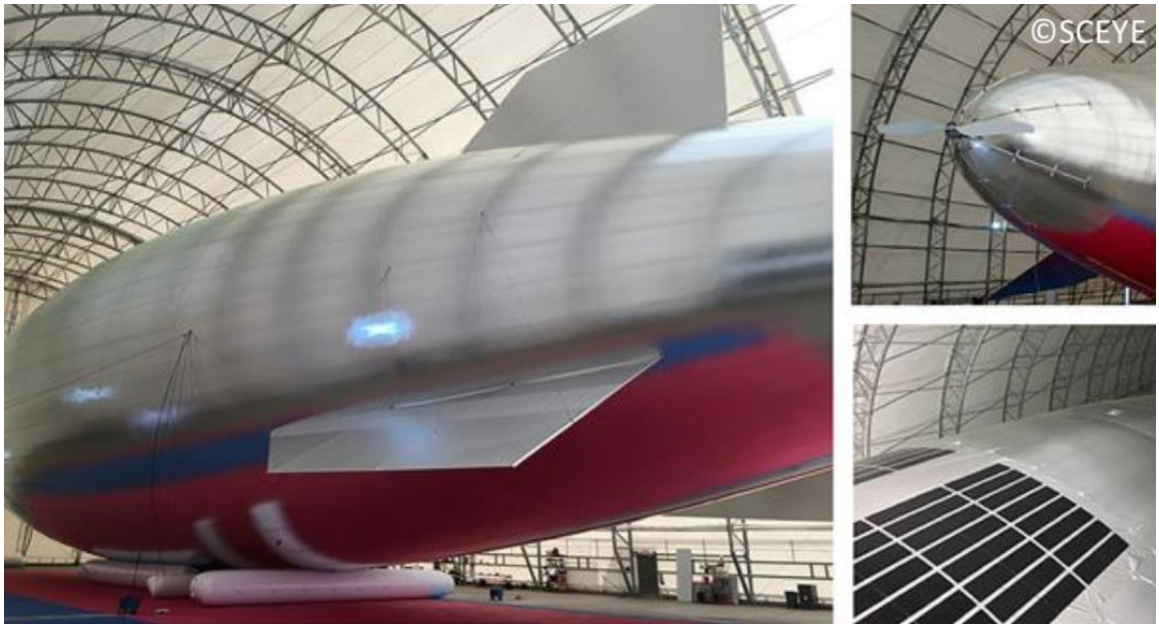
its stratospheric airships can provide 100% wireless internet for all of New Mexico. One airship has a service area 100 miles (161 km) in diameter and can reach a million people. To deliver this type of performance with a high quality of service, the airship deploys state-of-the-art massive active MIMO (multiple-input and multiple-output) array antennas with 3-D beam forming technologies. The result is the ability to deliver reliable service that is far beyond that of currently operating systems.

3. The Sub-Scale Vehicle (SSV)

In 2017, Sceye built a 65-foot (19.8 m) prototype airship known as the Sub-Scale Vehicle (SSV) to test different designs, materials, systems and operating processes that may be applied to the remotely controlled full-scale stratospheric airship that will conduct long-duration missions and be capable of returning to its home base at the end of the mission for servicing and redeployment.

Sub-scale Vehicle (SSV) launch. Source: Sceye Inc.

Sub-scale Vehicle (SSV) launch. Source: Sceye Inc.



SceyeOne in the hangar at Roswell.
Note the single, two-bladed stern-mounted propulsor (upper right). An array of mounting straps for transferring propulsor weight and propulsion loads into the envelope are also visible. Also note the solar array on the top of the envelope (bottom right).
Source: Sceye Inc. via HAPSVIEW 2019

4. Sceye facilities

Dr. David Kim stands in front of the hangar being erected in 2017 on the west end of the Roswell International Air Center. Source: Lisa Dunlap / Roswell Daily Record Online

The 65-ft SSV approaching the hangar at Roswell. Source: Sceye Inc.

Damaged Roswell hangar after 12 March 2019 windstorm that also destroyed the 65 ft SSV. Source: Summit.com

Sceye resumed flight operations at Roswell in 2020 after completing the hangar restoration. Source: Lisa Dunlap photo / Roswell Daily Record Online

Below: Airship leaves the hangar. Source, both photos: Sceye Inc.

5. Prototype flight operations

In 20 July 2020, Sceye file a Federal Communications Commission Application for Special Temporary Authority to communicate with their remotely piloted stratospheric airship platforms using L and S band radio communications for command/control and video downlink from the platform. The application describes the following test program:

> "Flight testing of two funded airship platforms are planned. Airships will ascend from ground level and operate at a nominal cruise altitude of 60,000 to 65,000 ft. The first flight is scheduled for September to October of 2020, and second flight for May to July 2021, depending on weather windows and flight conditions. The first flight has a nominal operation time of 24 hours and is primarily a technology demonstrator. Radio testing will be carried out of our Roswell, NM and Moriarty, NM facilities. A separate application will be put in for the second ship as it will be more than 6 months separated from the first ship flight."

Sceye's stratospheric communications payload implements Open Radio Access Network (OpenRAN), which is an approach being developed within the wireless cellular industry to promote the interoperability of hardware, software, and interfaces for cellular wireless networks. OpenRAN defines a standard a set of network functional units and open interfaces among them. Goals include creating a broad base of suppliers offering interoperable equipment that meets the OpenRAN standards, providing greater flexibility to meet diverse application requirements, reducing the time from concept to operational service, reducing network management cost, and enabling the introduction of artificial intelligence (AI) for operational network optimization.

In 2021, Sceye announced results from increasingly complex tests of key parts of their planned stratospheric communications service. In May 2021, Sceye tested their active communications array from a helicopter and demonstrated a range of 140 kilometers (87 miles), which significantly exceeds the range of standard LTE service. Later in May, a prototype stratospheric platform flew for two hours at an altitude of 64,600 ft (almost 20 km), which will be the normal

operating altitude for a production airship. In August 2021, Sceye was contracted by the US Environmental Protection Agency (EPA) to provide environmental monitoring in the stratosphere, starting in 2022. By October, Sceye began conducting system-level tests and successfully communicated via a 4G antenna with 3D beam forming on its airship flying in the stratosphere.

Sceye has not announced their development plans for 2022 or a schedule for starting pilot LTE service in New Mexico.

6. For more information

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- *Modern Airships - Part 2*: https://lynceans.org/all-posts/modern-airships-part-2/
  - China's *Yuanmeng* (Dream) stratospheric airship
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