Stratosyst s.r.o. - Skyrider

Peter Lobner, updated 27 September 2023

1. Introduction

Stratosyst s.r.o. is a small, private firm in the Czech Republic that is developing a low-cost, reusable High-Altitude Pseudo-Satellite (HAPS) stratospheric platform that is capable of flying at an altitude of about 20 km (12.5 miles, 65,600 ft) with a modest payload for weeks to months at a time. The company's website is here: http://www.stratosyst.com

The Stratosyst Skyrider. Source: HAP Alliance

Jiří Pavlík, Stratosyst CEO, described the firm as follows:

> "Stratosyst is a Czech company based in Prague that was founded with one single purpose – to make long-term sustainable stratospheric flight a reality. The original idea was to develop HAPS as an astronomic observatory, and the whole concept was presented this way at the International Astronautical Congress in Adelaide in 2017 and in Washington in 2019. We also won a Space Oscar in the Galileo Masters in

2018. However, as our platform, Skyrider, is unique in its universality, we decided to focus more on market demand. Today our main priorities are earth observation and telecommunication, and the platform can be easily used for GNSS (global navigation satellite system) augmentation or meteorology as well."

2. The sub-scale, low-altitude demonstrator

Stratosyst plans to build a sub-scale, low-altitude flight demonstrator. This is expected to be a toroidal (donut-shaped) vehicle about six meters (19.7 ft) in diameter and designed to operate at an altitude of 3 km (9,842 ft). Key goals are to demonstrate precise navigation and station-keeping capabilities as well as various value-adding mission capabilities that can be executed at low altitude, such as:

- Emergency communication relays
- Emergency airborne search
- Persistent surveillance of large areas
- Long-term airborne meteorology measurements
- Element of the smart city infrastructure and the Internet of Things (IoT)

Visualization of the scale of a Skyrider sub-scale demonstrator. Source: Stratosyst (2020)

3. The Skyrider HAPS

The operational Skyrider HAPS will be a larger, but still modest-sized, toroidal stratospheric platform that is designed to be recoverable at the end of a mission and reusable.

Overhead view of an early Skyrider HAPS configuration, showing solar panels & top-mounted propellers. Source: Stratosyst (circa 2020)

General characteristics of the Stratosyst Skyrider

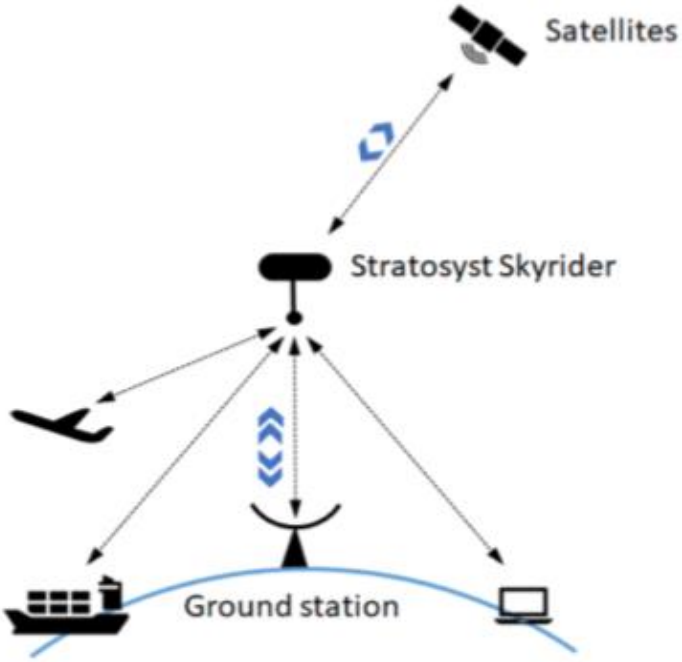
Parameter	**Skyrider HAPS**
Operating altitude	20 km (12.5 miles, 65,600 ft)
Payload	Up to 30 kg (66 lb)
Power system	Solar-electric hybrid power system capable of providing 5 kW of continuous power with zero CO_2 emissions
Station keeping	Electric motor driven propellers can maintain geolocation in winds up to 12 m/s (43.2 kph / 26.8 mph). Skyrider also can reposition with air stream cruising.
Mission duration	Weeks to months

Skyrider HAPS. Source: Stratosyst (circa 2021)

The Skyrider can operate as an individual HAPS or as a member of a HAPS constellation. Skyrider can be configured to deliver a variety of services from the stratosphere, such as:

- **Earth observation**: remote sensing & imagery
- **Telecommunications:** 5G & internet, including service to currently underserved (remote) areas
- **GNSS augmentation**: with applications to autonomous vehicles
- **Disaster management**: real-time remote sensing for improved situation awareness & temporary replacement of failed terrestrial communications systems
- **Infrared astronomy:** viewing from above 95% of the Earth's atmosphere
- **Near-space testing**: near orbital environmental conditions without the expense of an orbital mission
- **Defense:** various surveillance & border protection missions
- **Oil & Gas:** critical infrastructure inspection

The Skyrider HAPS can serve as a gateway between a diverse user community (terrestrial, airborne and seaborne) and existing terrestrial and orbital communications infrastructure. This basic system telcom architecture is shown in the following diagram.



Stratosyst Skyrider basic telcom architecture.
Source: Stratosyst

The small size of the Skyrider is adaptable for compact packaging. Stratosyst is promoting a Skyrider-type vehicle for packaging on a future interplanetary spacecraft and deployment for exploration missions in the low-density atmosphere of Mars.

4. For more information

- "Stratosyst – HAPS Services From Stratosphere," Stratosyst public presentation: http://www.czechspaceyear.com/wp-content/uploads/2019/07/8-CUF-2019_DAY2_04_Stratosyst_Jiř%C3%AD-Pavl%C3%ADk_HAPS-Services-from-Stratosphere.pdf
- Galileo Masters, "Stratosyst – a static observatory in the stratosphere," https://galileo-masters.eu/winner/stratosyst-a-static-observatory-in-the-stratosphere/

- “Stratosyst – Long term Presence in the Stratosphere,” AZO Space of Innovation, 29 October 2019: https://space-of-innovation.com/stratospheric/
- Anna Koucká, “Vesmírní nadšenci sestavují dron za miliony” (in Czech), “Space enthusiasts assemble a drone for millions,” iNDES.cz / ZPRAVODAJSTVÍ, 12 July 2020: https://www.idnes.cz/ekonomika/podniky/kosmicke-cesko-czechinvest-esa-bic-vesmir-stratosyst.A200709_111029_ekoakcie_kou?galerie
- “Unlocking the potential of the stratosphere,” HAPS Alliance, Q3 2022: https://www.hapsmobile.com/en/haps-alliance/pdf/haps-alliance-2022.pdf
- “Stratosyst Planning Stratospheric Airship First Flight in May 2024,” Aviation Week (subscription required), 27 September 2023: https://aviationweek.com/aerospace/emerging-technologies/stratosyst-planning-stratospheric-airship-first-flight-may-2024

Other *Modern Airships* articles

- *Modern Airships - Part 1*: https://lynceans.org/all-posts/modern-airships-part-1/
    - JP Aerospace – stratospheric balloons, near-space testing
    - Walden Aerospace / LTAS – S.O.S.C.S toroidal HAPS
- *Modern Airships - Part 2*: https://lynceans.org/all-posts/modern-airships-part-2/
    - NASA 20-20-20 airship challenge
    - Sceye - HAPS
    - Strasa Tech - HAPS
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/