Strasa.Tech – HAPS platforms

Peter Lobner, updated 4 September 2022

1. Introduction

On 14 February 2022, Atlas LTA Advanced Technologies Ltd. announced the formation of a new startup firm named Astras (Atlas Stratospheric Solutions) as a "sister company focused on stratospheric platform development and their global operation." Shortly thereafter, the new startup was re-branded as Strasa.Tech (https://www.strasa.tech), with the same mission. On 12 May 2022, Strasa.Tech made its public debut in Israel at the SpaceTech Summit, which was held at Expo Tel Aviv.

Strasa.Tech was founded by Ori Gonen (CEO), Sergey Vichik (CTO), Yuri Friedman (VP Business Development at Atlas) and Gennadiy Verba (President of Atlas).

Strasa.Tech plans to operate a global autonomous fleet of HAPS (High Altitude Pseudo Satellite) platforms for delivering high resolution imagery of up to 5 cm (2 inch) GSD (ground sample distance), at low prices and on a large scale. Additionally, they plan to provide the service of flying partner payloads for long duration missions, such as communication services for rural areas.

In photo above: Strasa.Tech founders at 2022 SpaceTech Summit with a sub-scale demonstrator. Source: Strasa.Tech

2. The Strasa.Tech HAPS platform

The Strasa.Tech HAPS platform is designed for operation in the lower stratosphere, which they characterize as “an underutilized region of airspace, almost two times higher than the airspace used by commercial aviation.” This would place the HAPS operating altitude in the range from 18,288 to 21,366 meters (60,000 to 70,000 ft).

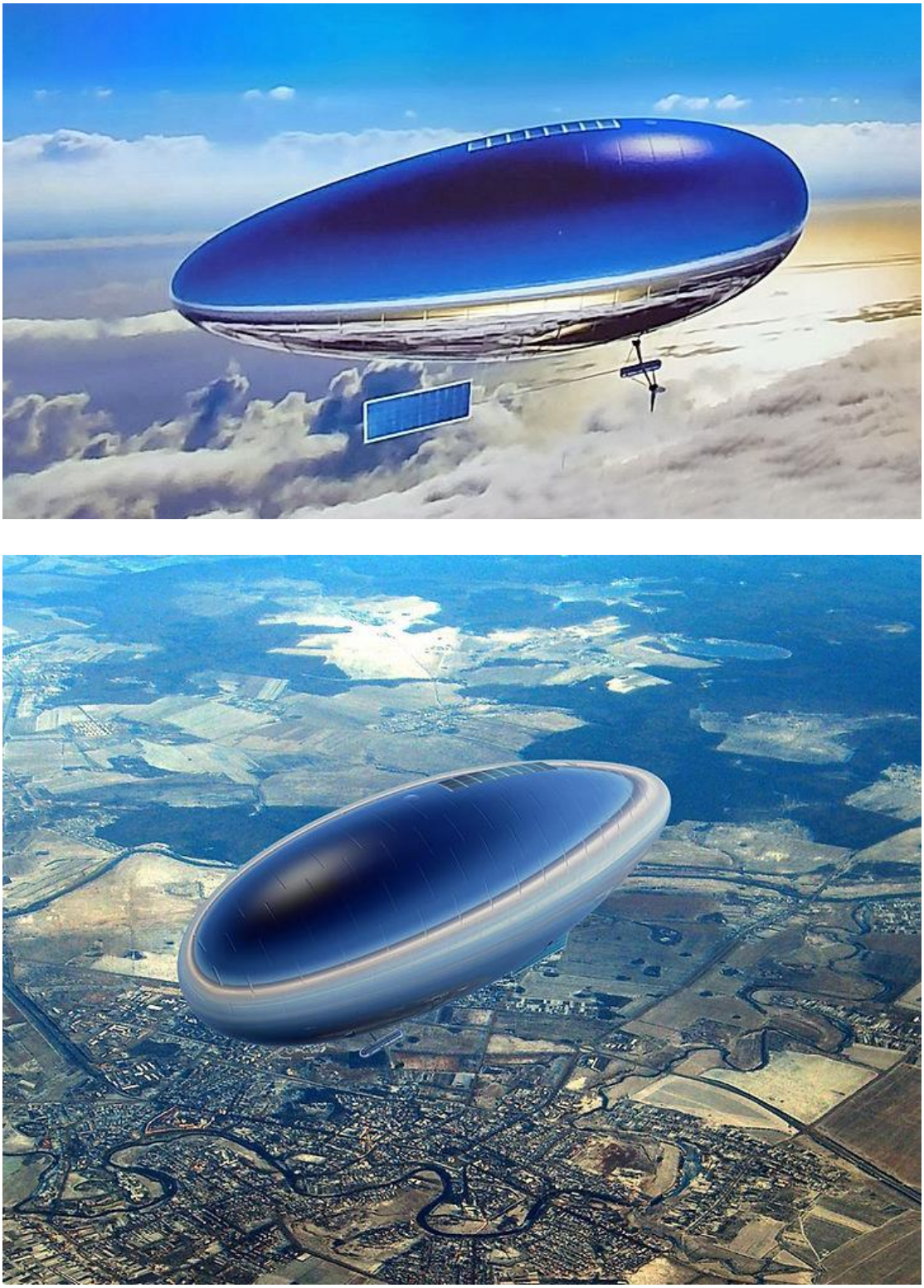
The unique solar-powered platform, with a gas envelope-mounted solar array and a vertically-mounted solar array suspended under the gas envelope, is designed to stay aloft for one year. The flight control system uses a sophisticated artificial intelligence (AI) to exploit stratospheric wind layers together with wind corrections to navigate and efficiently maintain a loose station-keeping in the vicinity of a designated geo-position or to navigate between waypoints during a transit. Using stratospheric wind layers and relaxing geo-positioning requirements greatly reduces the HAPS platform’s propulsion power requirements without unduly affecting mission performance.

The HAPS platforms will benefit from using a new family of very low helium leak rate, multi-layer gas envelope materials announced by Atlas in April 2022:

> “Atlas LTA just finished the technology trials with the new family of helium holding materials based on multilayer advanced films and fibers. This solution has a wide range of uses: from stratospheric platforms to the gasbags of rigid airships. The tested helium leaks lowered 8-10 times compare to the best urethane based solutions. Besides, we achieved a great combination of lightness, tensile, tear, puncture and weather resistance.”

This advanced envelope material has the strength needed to operate at a relatively high superpressure of up to 5 kPa (about 0.72 psi).

Strasa.Tech describes their stratospheric HAPS platform as a “..revolutionary variable buoyancy HAPS platform…” VB controls are needed to enable the HAPS platform to reach high altitude and then change altitude as needed to exploit stratospheric winds for station-keeping or for navigation between waypoints.



Conceptual HAPS platform configuration has a tailless, non-rigid, superpressure gas envelope carrying a small suspended gondola with two electric-powered propellers, and two solar arrays (top of envelope & suspended panel). Source, both graphics: Strasa.Tech

At launch and in flight, the non-rigid envelope is fully-inflated and maintained at a superpressure with an air ballonet. For the target operating altitude, the initial helium volume at launch would be quite small (only 5 to 7.5%, as a function of target altitude) because the helium will expand by a factor of up to 20 at peak altitude. As the HAPS platform ascends, air is expelled from the ballonet to provide the needed expansion space for helium within the gas envelope, while maintaining the shape of the envelope with a superpressure.

Rendering of the Strasa.Tech HAPS platform at an operating altitude of 18 to 21 km (60,000 to 70,000 ft). Source: Strasa.Tech

On station, operating altitude is controlled by managing the air in the ballonet. To ascend, air is expelled from the ballonet. This can be done until the helium is fully expanded within the envelope, at the "pressure altitude." To descend, air is pumped into the ballonet. The HAPS platform's AI control system manages altitude to advantageously use high-altitude winds to assist in station-keeping or transiting while minimizing the amount of propulsion power required for these navigational functions. The relatively high mechanical strength of the new family of envelope materials increases the AI system's control range and peak operating altitude.

Two electric motor-driven propellers mounted on outriggers from the gondola section provide propulsion as well as steering for the tailless vehicle.

Potential applications for the Strasa.Tech HAPS platform include:

- Enhance crop yield with precision agriculture
- Monitor & enforce emission standards
- Connect the unconnected communities, primarily in rural areas
- Detect and help control wildfires
- Map and model the Earth

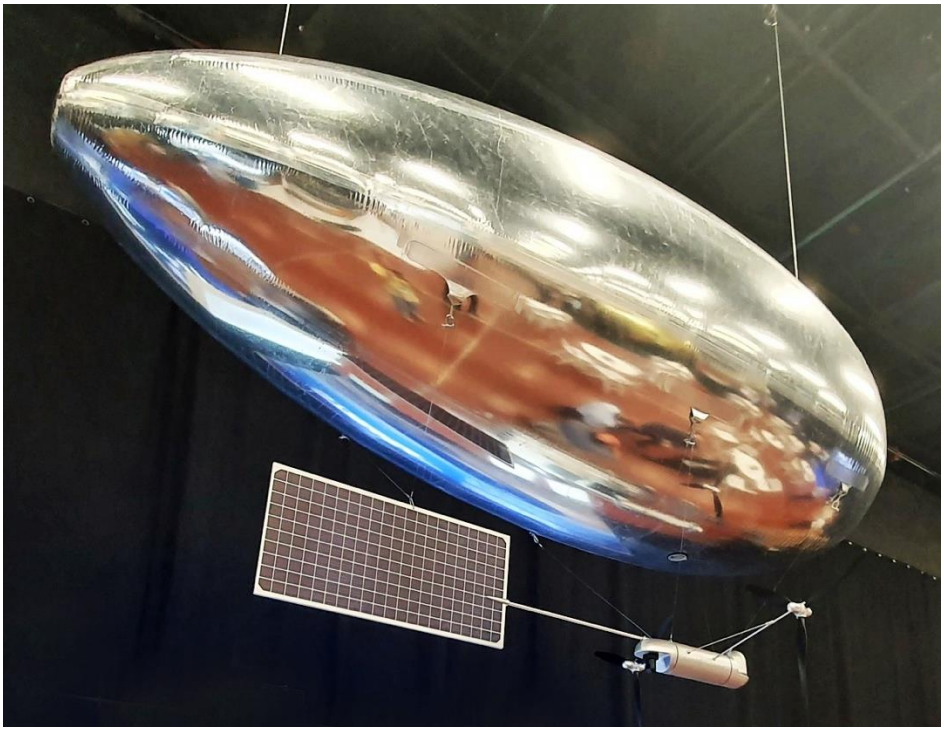
At the end of year-long mission, the gondola section containing all of the flight control, communications, navigation and mission equipment is separated from the gas envelope and is recovered by parachute. The gas envelope is not recovered.

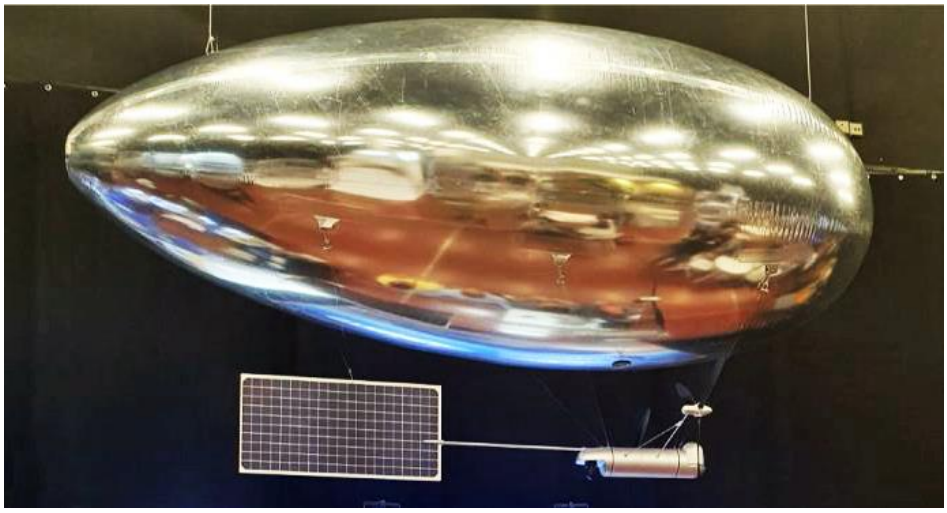
3. Sub-scale demonstrator

The company's booth at the SpaceTech Summit included the sub-scale demonstrator shown in the following photos. This general configuration closely follows the design concept graphics for the operational vehicle.

Strasa.Tech has not yet announced a schedule for commencing test flights with their sub-scale demonstrator.

This Strasa.Tech HAPS program replaces the Propulsion Assisted High Altitude Platform (PAHAP) development program that had been underway at Atlas for several years.





Sub-scale demonstrator in May 2022. Note the three reinforced attachment points along the lower flank of the gas envelope. Source, both photos: Strasa.Tech

I am grateful to Strasa.Tech CTO Sergey Vichik for his thoughtful input for this article.

4. For additional information

- Strasa.Tech on LinkedIn: https://www.linkedin.com/company/strasa-tech/?originalSubdomain=il

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