

Maform Design Studio - S.H.A.R.K.

Peter Lobner, 8 February 2022

1. Introduction

Maform Design Studio (<https://www.maformdesign.com>) is an industrial design firm in Budapest, Hungary, with representatives in Vienna, Austria and in the USA in New York and California. In 2020, Maform produced the conceptual design of the unmanned S.H.A.R.K. airship for a client identified as Endrödi Aircraft.



Artist's rendering of S.H.A.R.K. in flight. Source: Maform

This is a modest size multi-mission airship, capable of operating in the stratosphere and supporting applications such as:

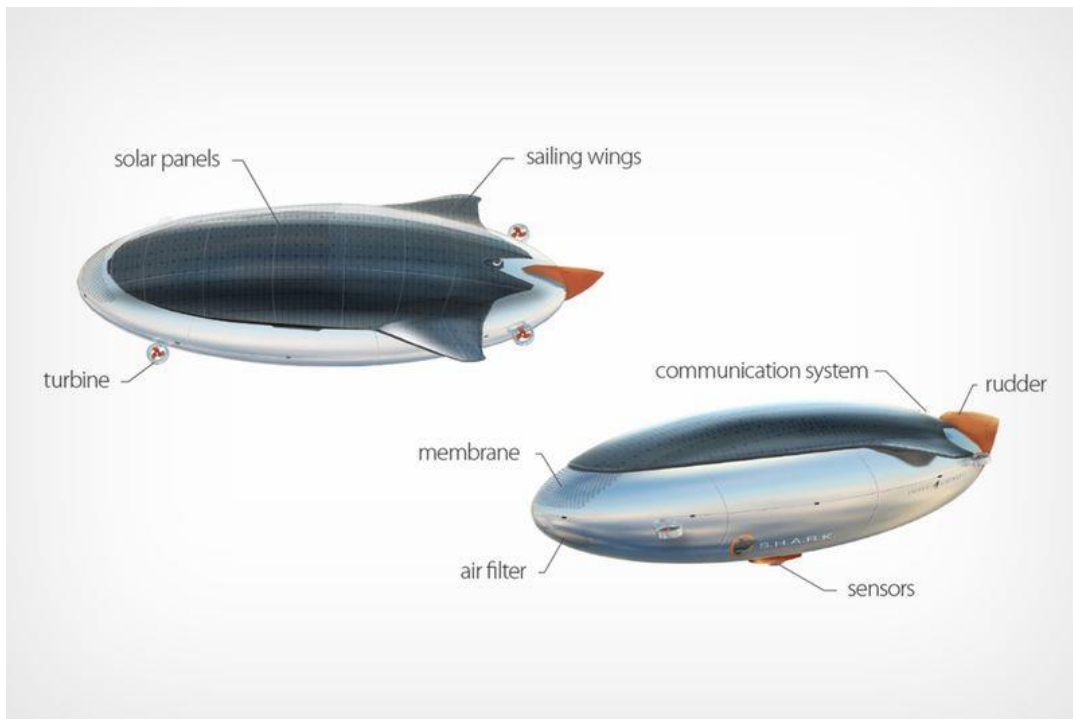
- Climate change & ozone research
- Weather & storm observation
- Communications services, including WiFi, voice & data relay
- Emergency management support

S.H.A.R.K. is intended to make access to the stratosphere less expensive than any previous high-altitude airship.

2. Description of the airship

Basic characteristics of the S.H.A.R.K. airship are listed below:

- Mission payload: at least 30 kg (66 lb)
- Station keeping capability: within a radius of 5 km (3.1 miles)
- Operating altitude: 22 km (13.7 miles, 72,178 feet)
- Power source: Hybrid power system with a solar array on the top of the hull supplemented by a small hydrogen-fueled turbine generator, with water recovery from the turbine exhaust,
- Powered propulsion: 4 x flank mounted, shrouded, vectorable electric-powered propulsors
- Unpowered propulsion as a semi-buoyant airship (heavier-than-air): Aerodynamic gliding flight under the influence of gravity
- Mission duration: at least 168 hours (1 week)



General arrangement of the S.H.A.R.K. airship. Source: Maform

S.H.A.R.K. is a zero-emissions, solar powered airship that uses hydrogen for lift and fuel and can generate more hydrogen on-board from the electrolysis of water produced from hydrogen combustion or obtained by the airship's atmospheric water collection system in the nose of the airship.

Maform explains the operation of this airship:

“Shark Airship Shuttle is the mixture of a traditional airship and an airplane. It is capable of hovering as an airship and also capable of gliding by decreasing the buoyancy. The fuel is provided by hydrogen, which also provides the buoyancy. Both the burning of the hydrogen and the water that is produced in the process as a byproduct decrease the buoyancy, which creates kinetic energy. The craft can glide using this, when it is required by the wind situation, so that the craft can hold its position in the appointed range. Following this, the water can be separated into hydrogen and oxygen using the electricity produced with the help of the solar cells, restoring the buoyancy. Furthermore, the Shark system is equipped with a water collecting membrane, which is capable of extracting the low water content of the atmosphere, or even higher amounts from the stratosphere, this way making up for the water loss gap between the burning and the electrolysis.”

In principle, the hydrogen power cycle implemented on S.H.A.R.K. is quite similar to the system proposed in 2011 by Belgian engineer Lieven Standaert in his design of the Aeromodeller 2 airship. Both use hydrogen for lift and fuel and both electrolyze water to produce more hydrogen. S.H.A.R.K. has a large solar array to generate the electricity needed for electrolysis. Aeromodeller 2 anchors without landing and operates its big propellers as wind turbines to generate the electricity it needs for electrolysis. For more information on Aeromodeller 2, see my separate article.

S.H.A.R.K. is likely to be about the same physical size as Lockheed Martin’s HALE-D stratospheric airship, which flew in 2011 using helium lift gas.

- S.H.A.R.K. carries about 20% less payload than HALE-D
- S.H.A.R.K. uses hydrogen, yielding 10% more lift than helium.
- S.H.A.R.K. maximum altitude is more than 12,000 feet (3.6 km) higher than HALE-D

For comparison, HALE-D had a 500,000 ft³ (14,158 m³) gas volume, a length of 240 feet (73.1 m) and a diameter of 70 feet (21.3 m).



*Artist's renderings of S.H.A.R.K. operating in the stratosphere.
Source, both graphics: Maform*





*Artist's renderings of S.H.A.R.K. in flight approaching New York City.
Source: Maform*

3. For more information

- The direct link to Maform's S.H.A.R.K. conceptual design is here: <https://www.maformdesign.com/references-1/2016/2/13/sustainable-research>
- Sarang Sheth, "This Airship Can Study the Skies While Distributing Wi-Fi to Cities," Yanko Design, 8 May 2020: <https://www.yankodesign.com/2020/05/08/this-airship-can-study-the-skies-while-distributing-wifi-to-cities/>

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/>