

# THETA

## Tri-lobed Hydrogen Emission-free Transport Airship (Group 12 - Personal Airship)

In a world threatened by the effects of climate change, the need for green energy is ever so prominent. One of the most promising fuels of the future is hydrogen, a gas which is abundant, easily extractable, and has minimal environmental impact. With the ever-growing demand for hydrogen, there arises a need for hydrogen transportation. Currently, trucks are used as a means of transportation, although the problem remains that trucks are dependent on unsustainable fuels, and they are limited by local infrastructure. The question remains, is there a more sustainable and efficient method of transporting hydrogen, given the anticipated demand in the market?

### Mission Objective

"Provide sustainable transport of hydrogen payload over intra-continental distances by 2040"

Airships are a great substitute for hydrogen transport due to their endurance and ability to avoid densely populated areas. THETA's mission of transporting hydrogen consists of an airship which delivers a minimum payload of 800kg hydrogen over a range of 2000km, so that it may outperform the best of trucks. Additionally, THETA aims to create a more sustainable solution when it comes to cargo transport, whereby the airship shall fly using less energy consumption compared to its competitors, and shall carry out its operations emission-free.

### Airship Design

The design proposed by THETA is a tri-lobed airship, consisting of one main lobe in the middle with two smaller lobes attached to its side, all filled with hydrogen as lifting gas. Due to the high buoyancy provided by hydrogen compared to helium, the designed airship can be made approximately 10% smaller for the required payload.

The hydrogen payload is pressurized in tanks which are placed behind the gondola under the main lobe, and detached once reaching the drop-off location. Empty tanks are then re-attached so that the airship may refill them at the base for the next trip. Through the use of external modular cargo, the design is multi-functional, allowing for the transport of other high-risk payload such as Sustainable Aviation Fuels.

THETA aims to address point 7 (affordable clean energy) and point 12 (responsible consumption and production) of the United Nations' sustainability goals. With the use of off-the-shelf engines which run fully on hydrogen using hydrogen fuel cells, the propul-

sion unit produces zero emissions. Furthermore, THETA's fuel consumption of hydrogen is lower than that of current transportation alternatives, which makes the mission significantly more efficient energy-wise.

With the use of hydrogen and the Hindenburg disaster (1937) in mind, safety was addressed by using new technology methods and lessons learned from the disaster. The risks were addressed by creating an improved design and technology, such as better cover materials, which mitigates the risks associated with hydrogen used as a lifting gas in an airships.

