



Air-Carriages for Microgravity Testbeds

Sujet Phodapol

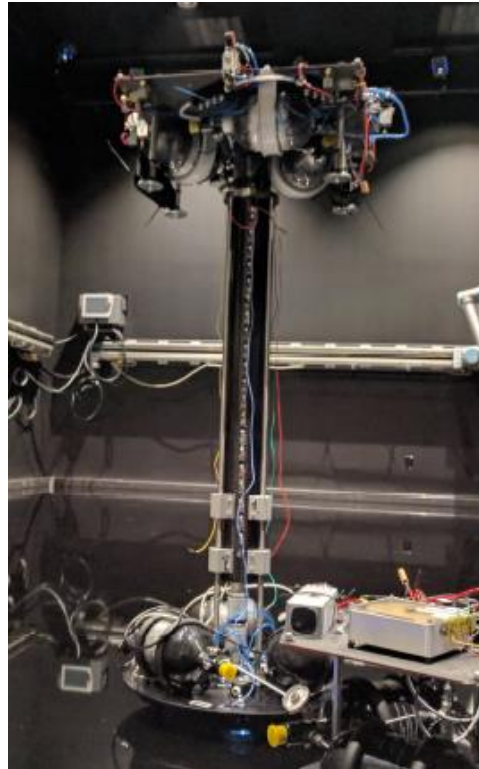
Scope & Motivation

- **Scope - DISCOWER:** Develop algorithm for safe control and planning on weightless environments
- **This project:** Develop a flexible air carriage for testing of microgravity system:
 - Reliable platform for satellite/free flyer testing
 - Easily replicable and build
 - Actuation for active mass and inertia compensation

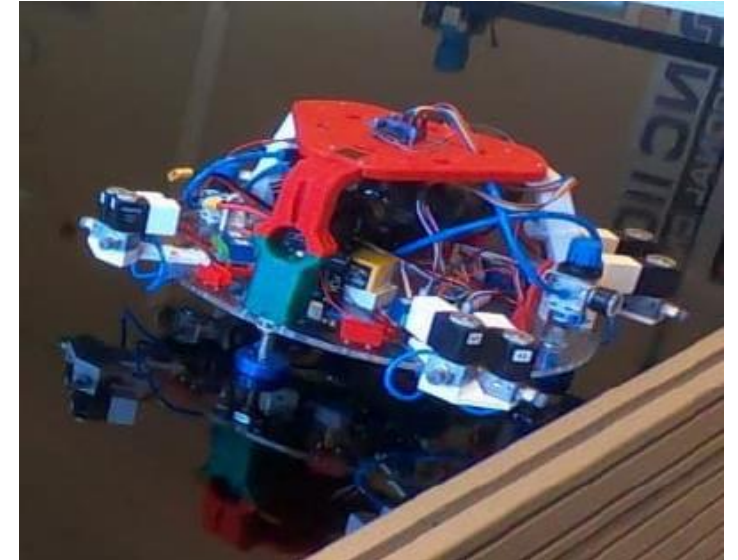
Related works



MIT SPHERE free-flyer robot and the air-carriage system



A SIX DEGREE-OF-FREEDOM SPACECRAFT,
California Institute of Technology



Slider, Luleå University of Technology,

Related works

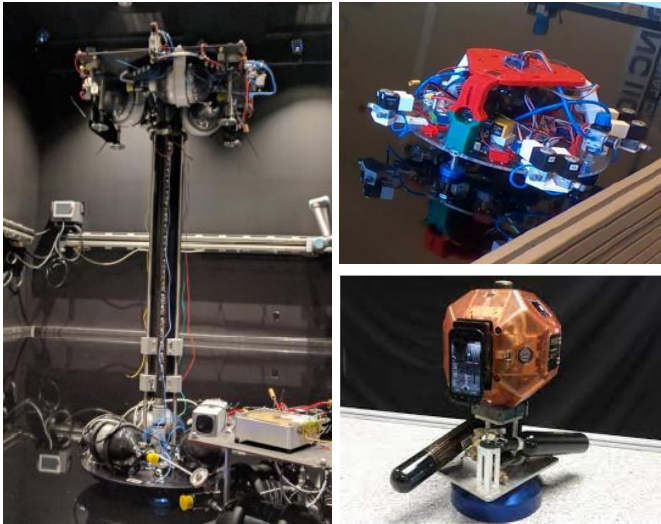
Other Robots

- Complex
- Large
- Short operation time



Our goal

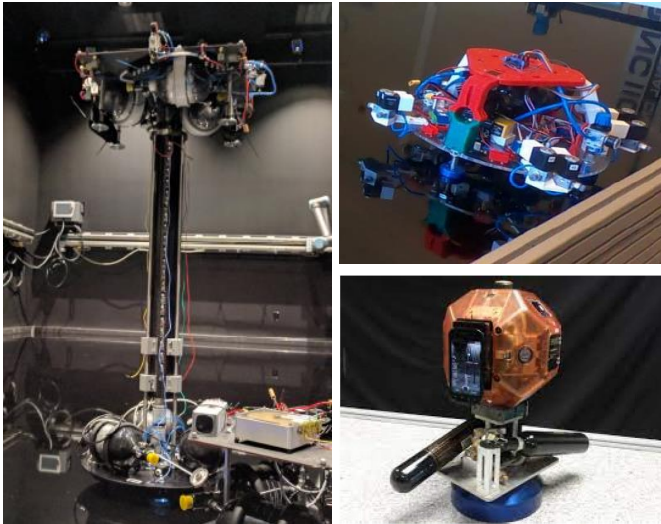
- Simple
- Small
- Long operation time
- Refillable
- Actuation for mass and inertia compensation



Related works

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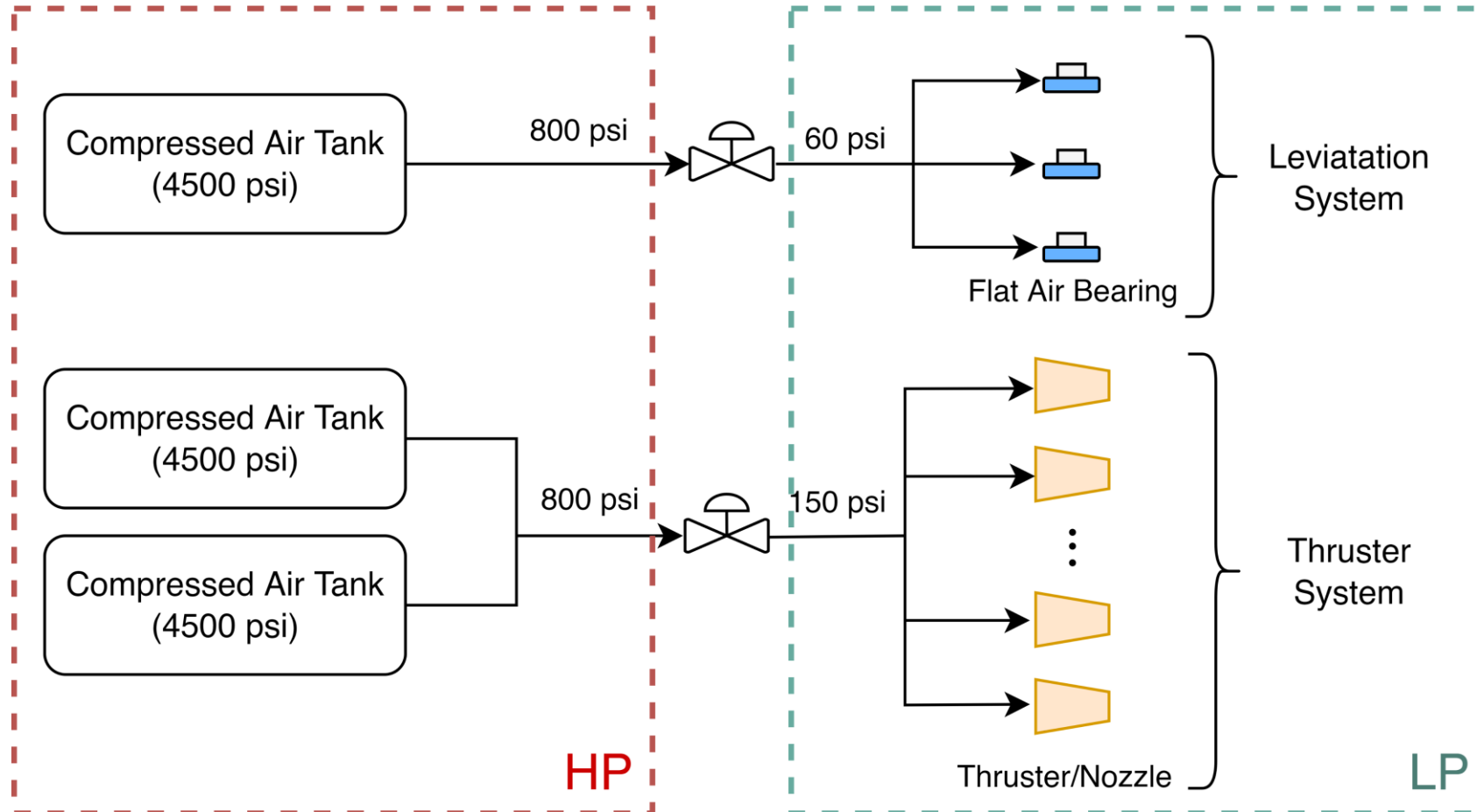
Our goal

- Simple
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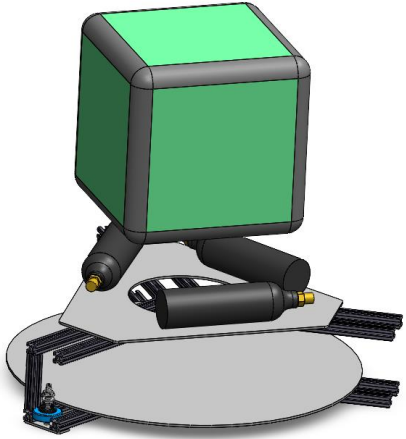


We need a Robot !

Schematic diagram

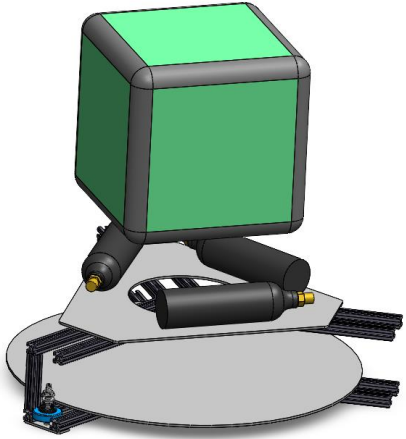


Iterations of the air carriage

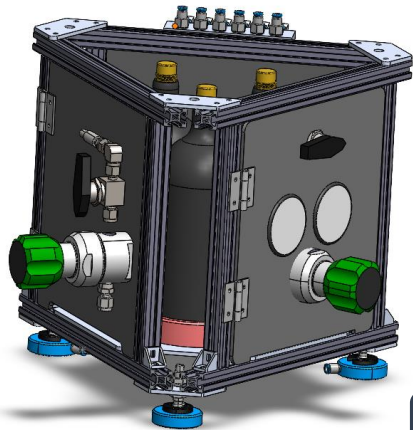


1

Iterations of the air carriage

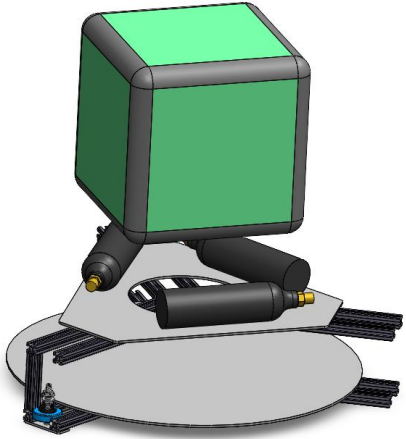


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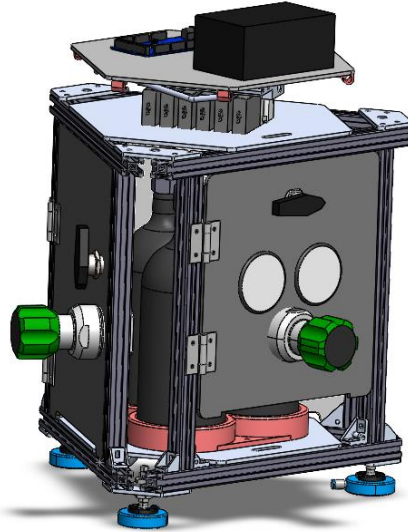


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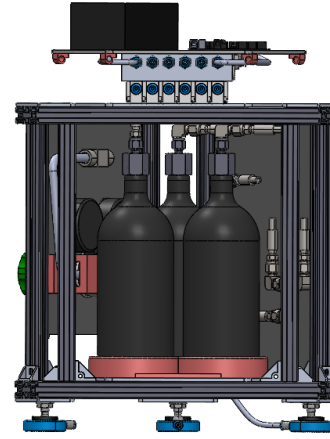
Iterations of the air carriage



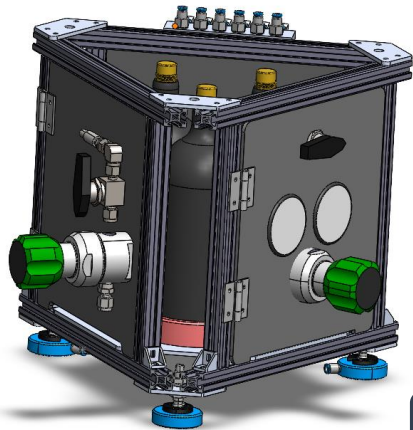
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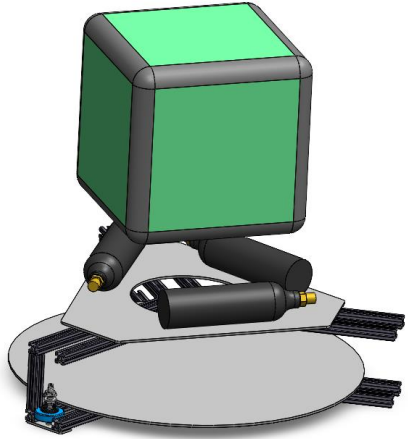
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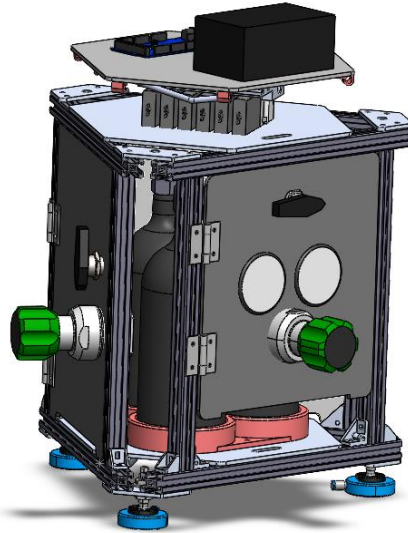
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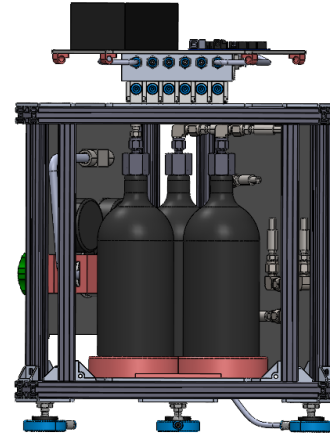
Iterations of the air carriage



1

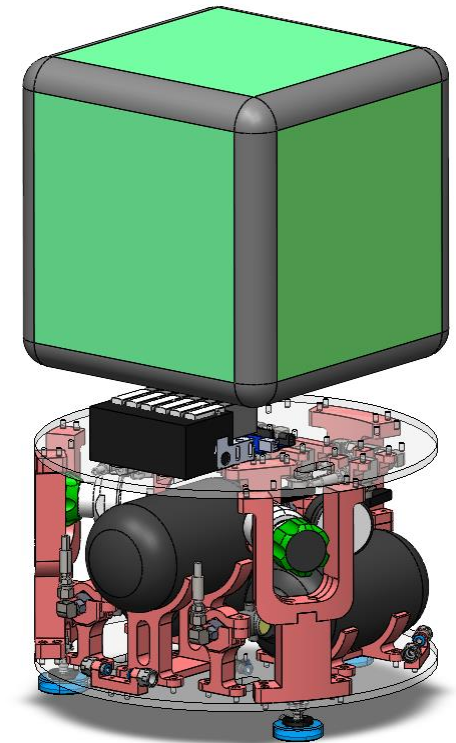


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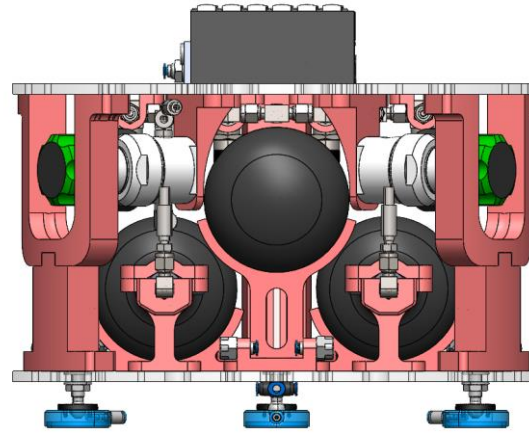
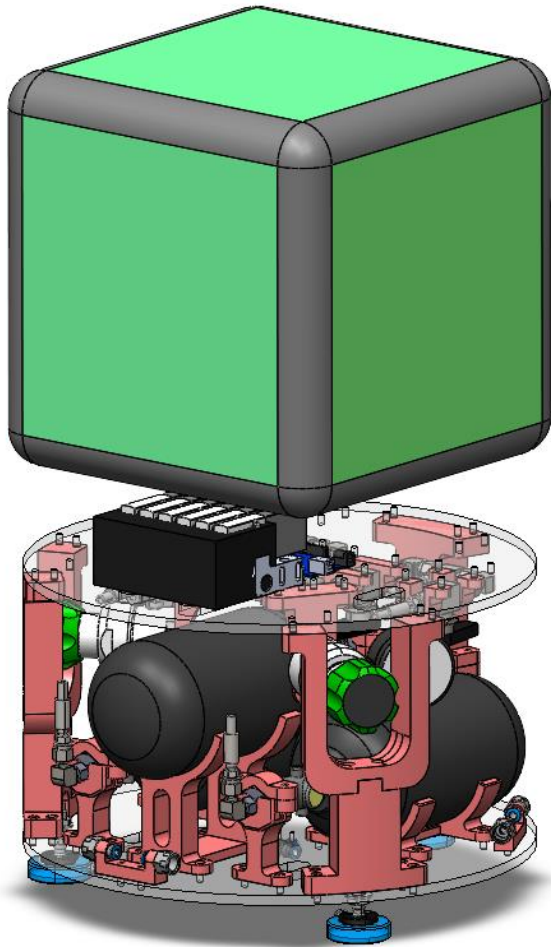


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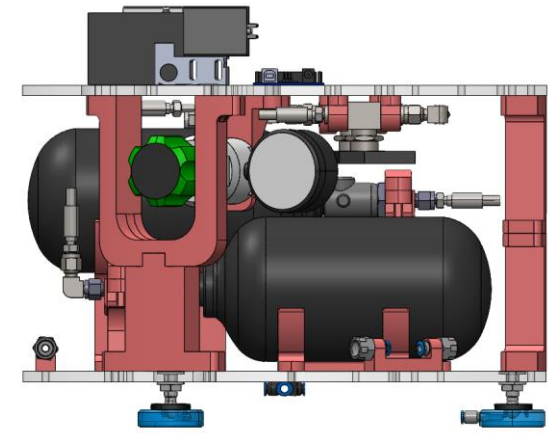
Final!



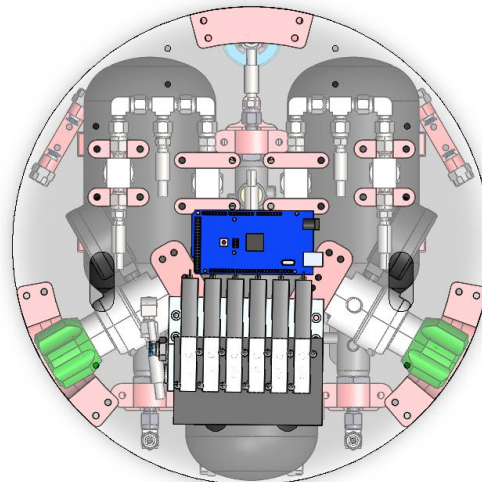
Final Design



Front



Right



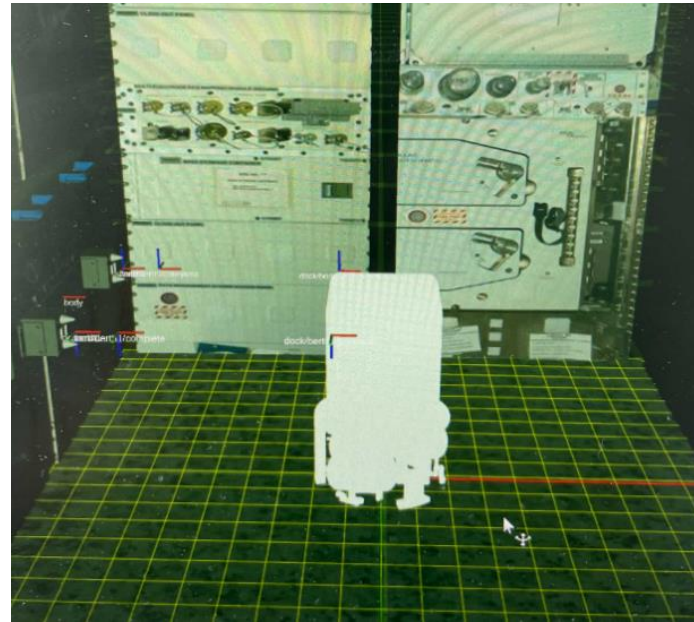
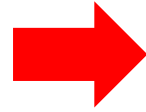
Top

Final selection

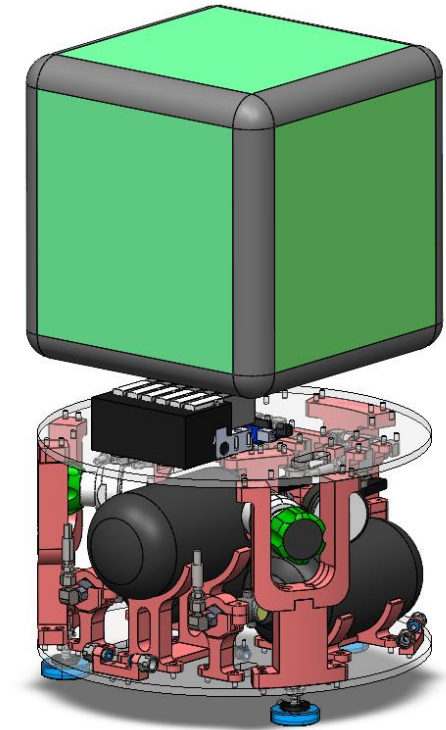
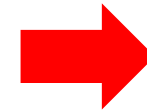
- 3 Air tanks
- 3 Bearings
- 6 Actuators

Simulation

Control
Algorithm

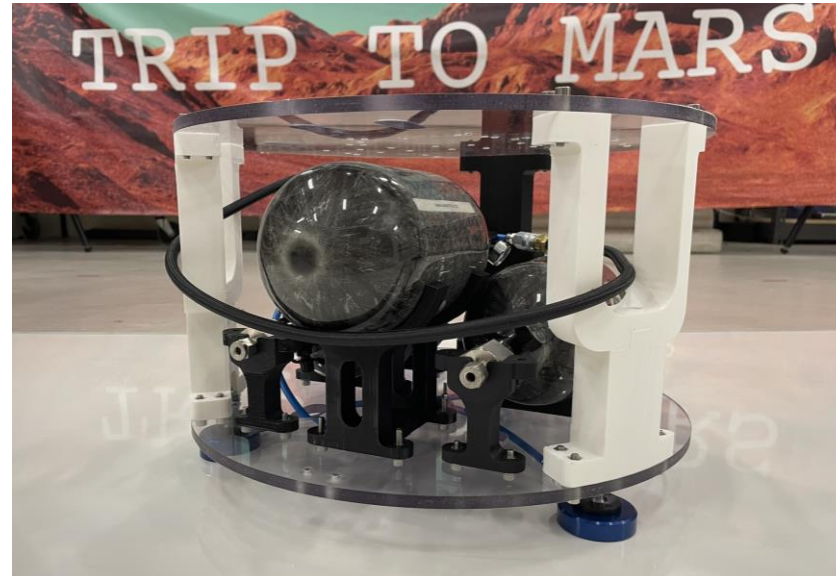
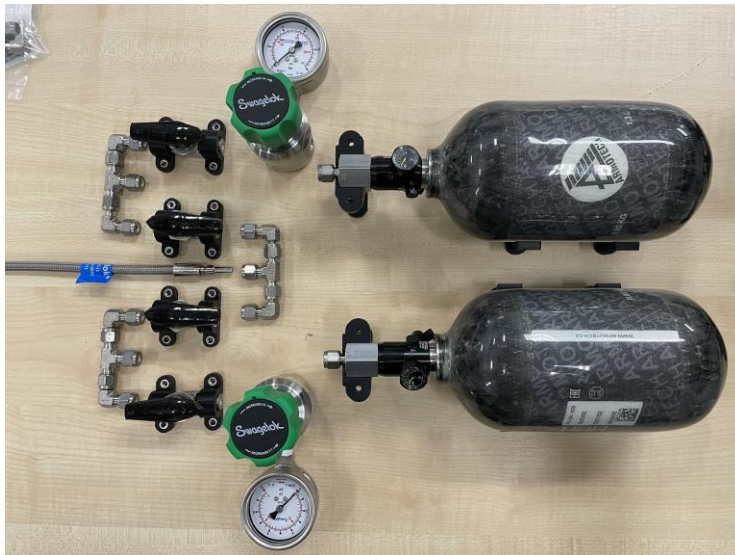


Gazebo simulation



Real Robot

Prototype



Thank You!

