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Powder Removal in Microgravity Environments (PRIME)

Team 518

Virtual Design Review 4

Team Introductions

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Thermal Fluids Engineer

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Manufacturing and Design Engineer

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Quality and Design Engineer

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Team Introductions

Cole Daly
Mechatronics Engineer

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Systems Engineer

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Project and Test Engineer

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Sponsor and Advisor

Project Sponsor
Justin McElderry
Materials Engineer -
NASA Marshall Space Flight Center

Academic Advisor
McConomy, Shane Ph.D.

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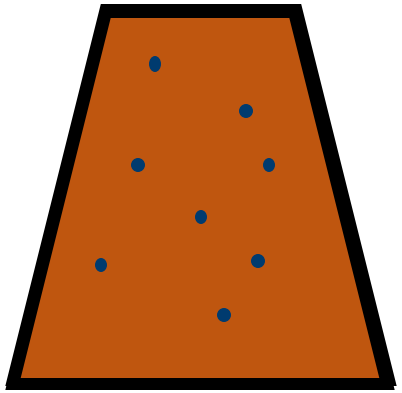
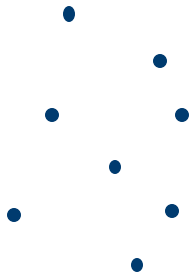
Objective

The objective of this project is to develop a proof-of-concept device for removing powder residue from additive manufactured parts in microgravity environments.

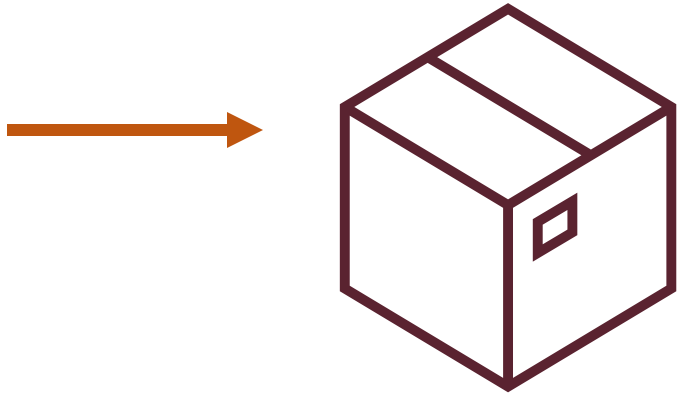
Clean



Remove



Contain

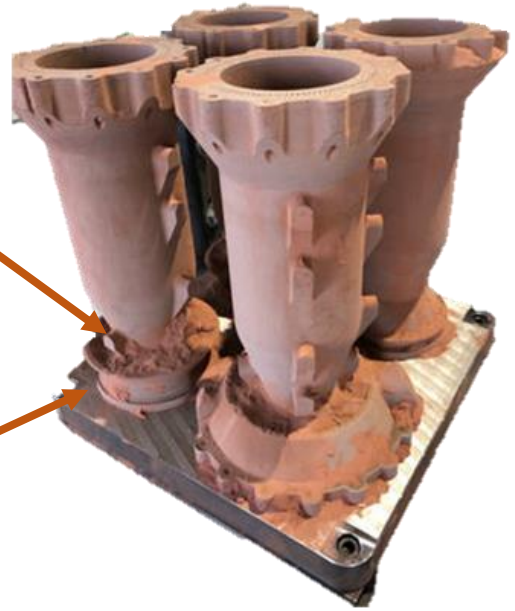


Project Background

Additive Manufacturing offers:
Rapid Prototyping
Reduced Production Time

Trapped powder inside parts

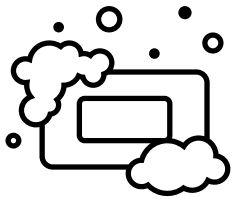
Hazardous particles in microgravity



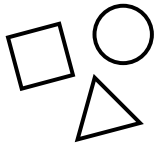
Goal: Portable cleaning device to bring to ISS

Key Goals

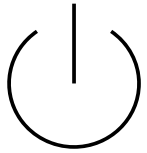
Functions in Microgravity



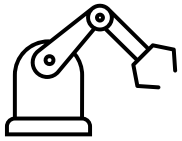
Clean Internal Features



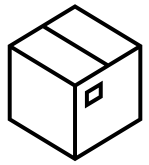
Clean Multiple Parts



Automatic Operation



Physical Prototype



Contain Dirty Solvent

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Targets and Metrics

Design will be able to clean 85-90% of debris

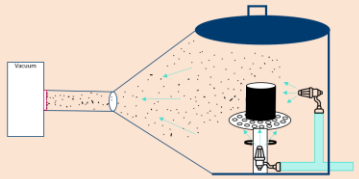
Cleaning

Particle are contained with no leaks in the device

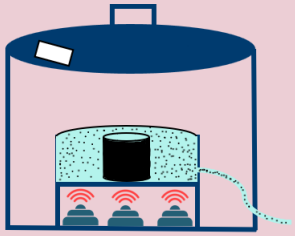
Containment/Safety

Concept Selection Overview

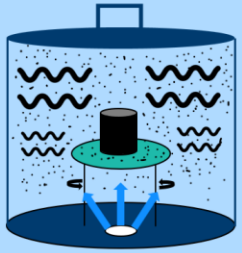
Liquid Nitrogen Spray



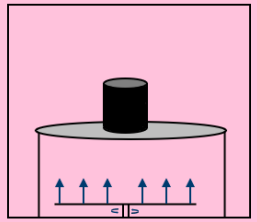
Sonic Wave Cleaner



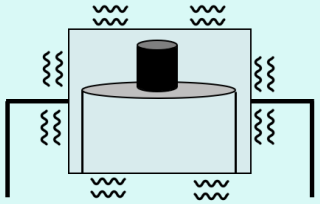
Vacuum Nucleation



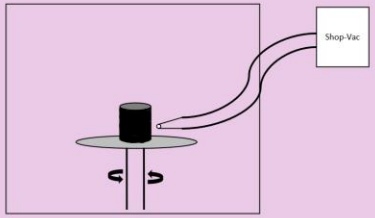
Dishwasher



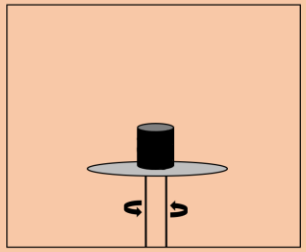
Momentum Shaker



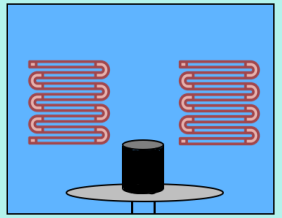
Shop-Vac Hose



Spinning Plate

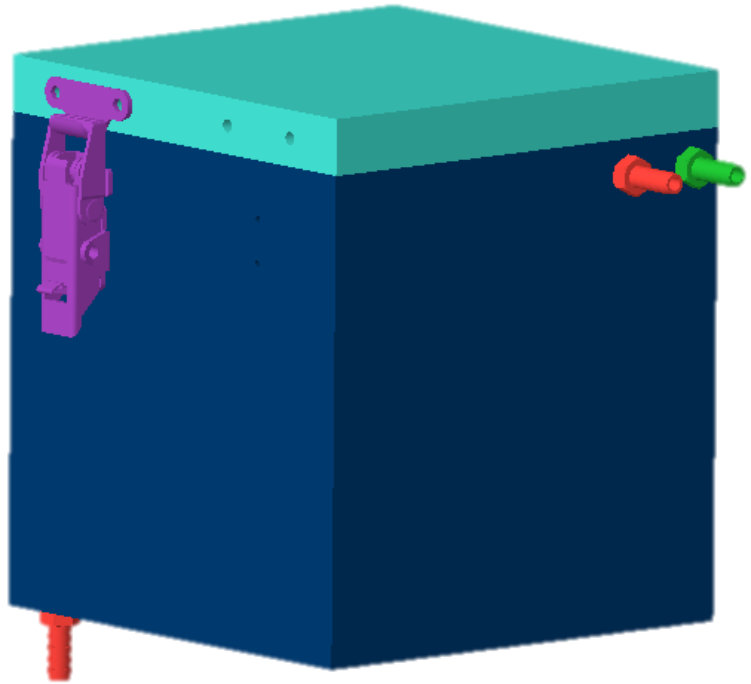


Boiling Water



Sonic Wave Cleaner

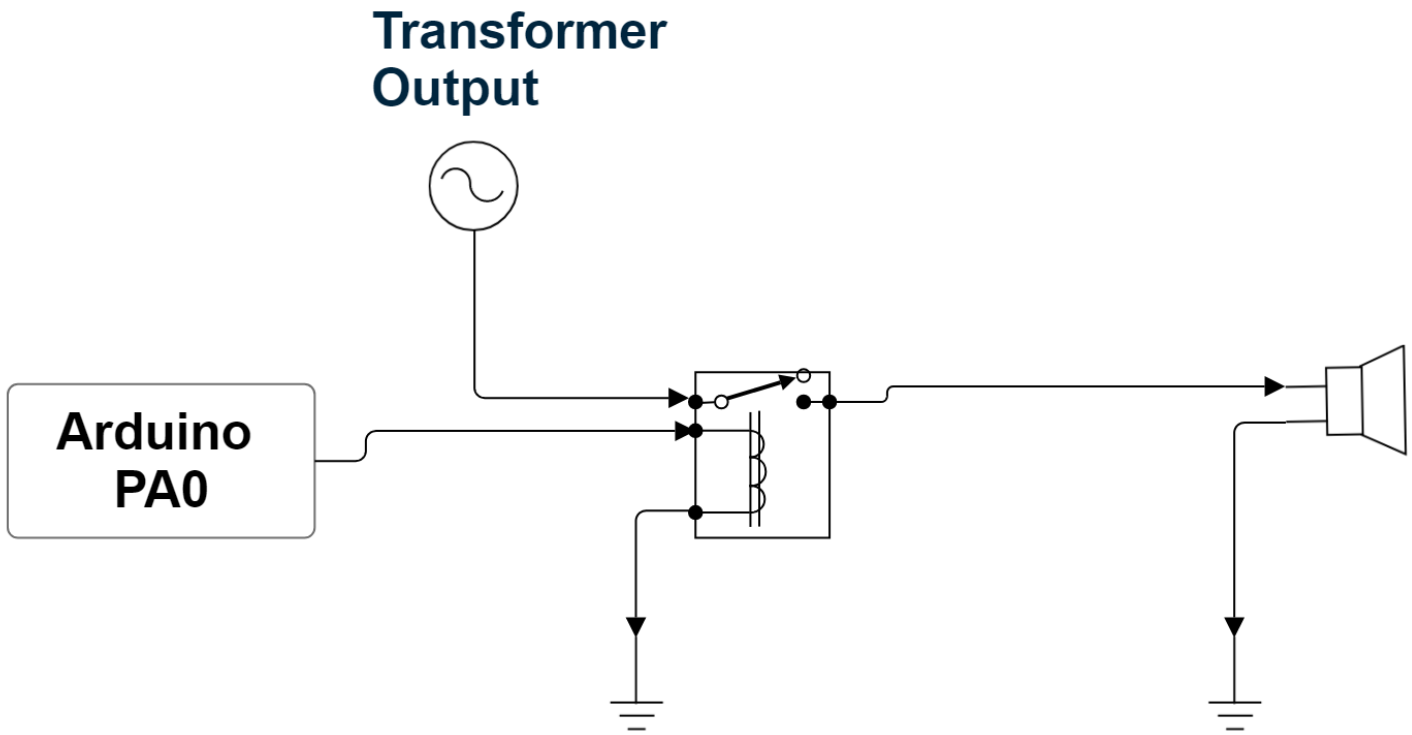
- Sonic waves pulsed underneath fluid
- Fluid is spun creating vortices
- Fluid is drained while being spun to keep the particles away

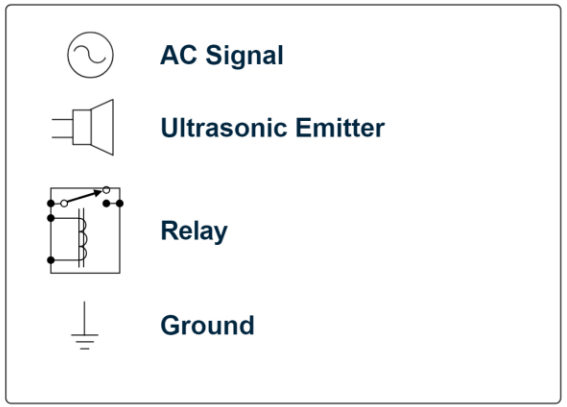


1

Current Work

Preliminary Wire Diagram





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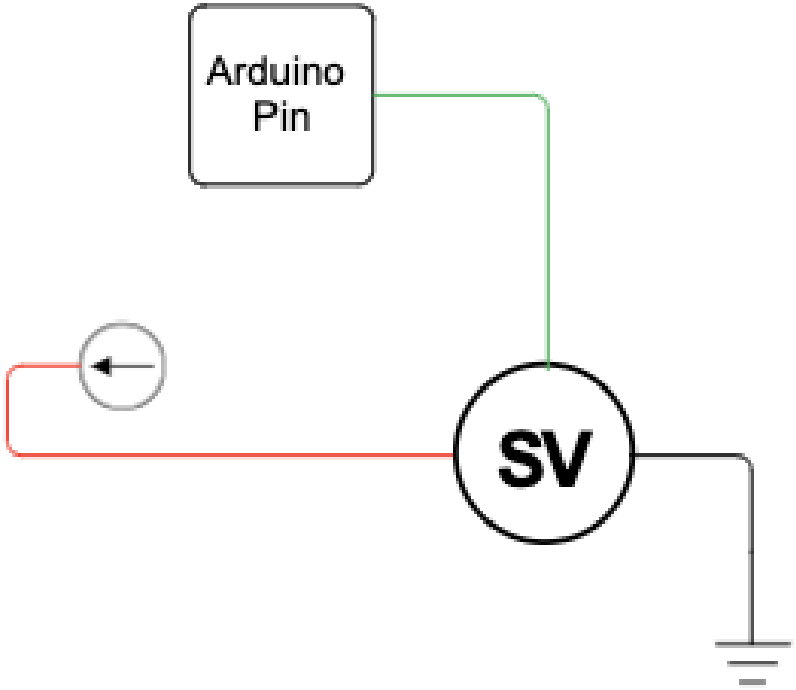
Current Work

Preliminary Valve Wire Diagram

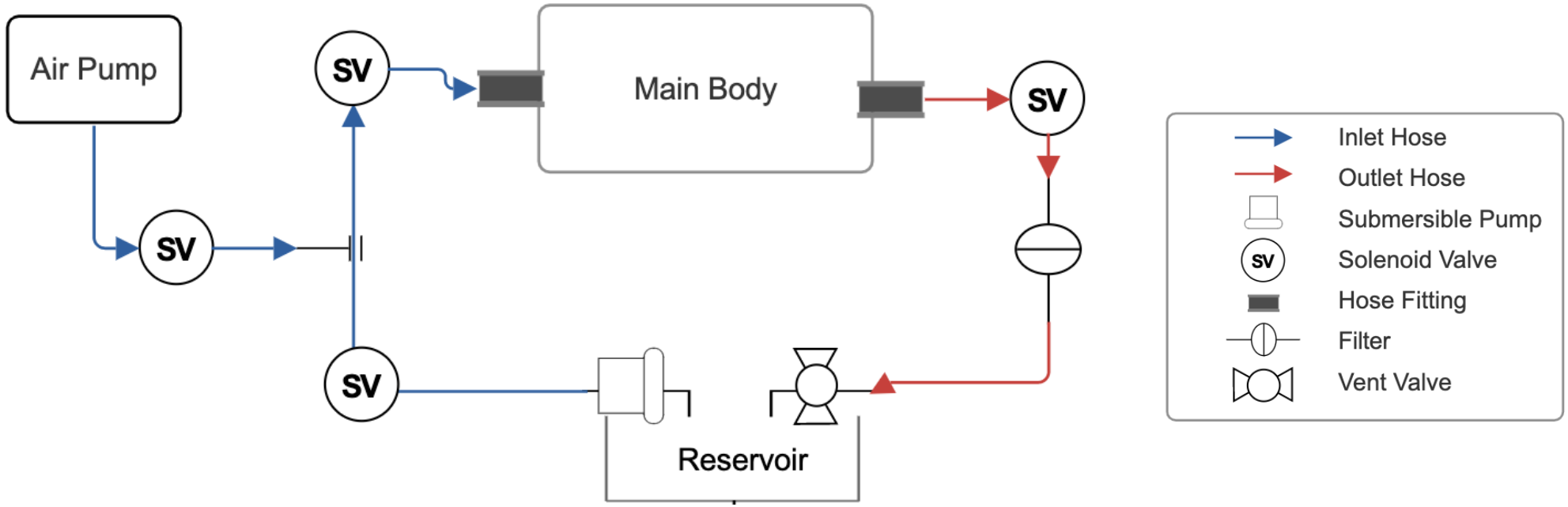
1



1

Current Work

Preliminary Plumbing Diagram



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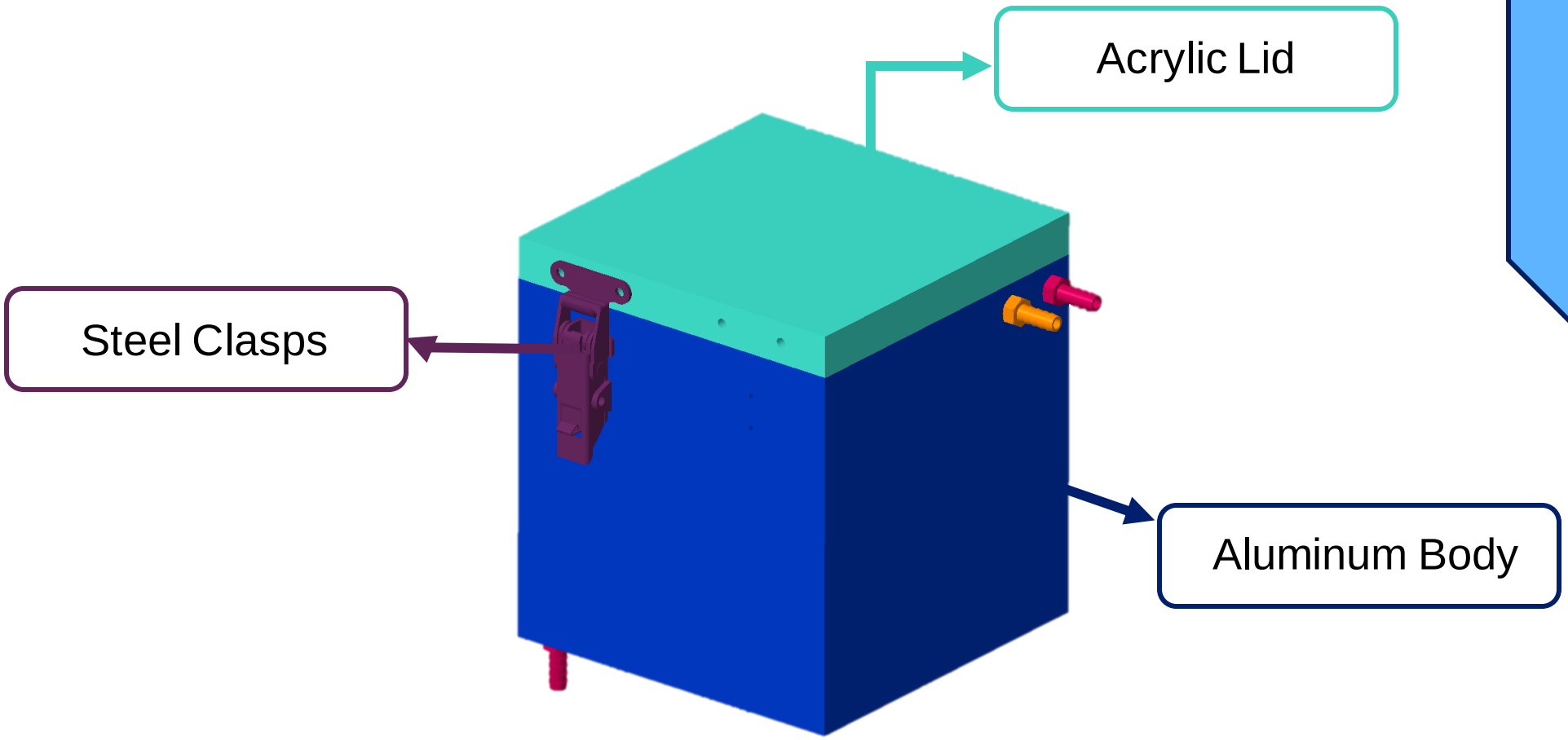
Current Work

Preliminary Creo Design



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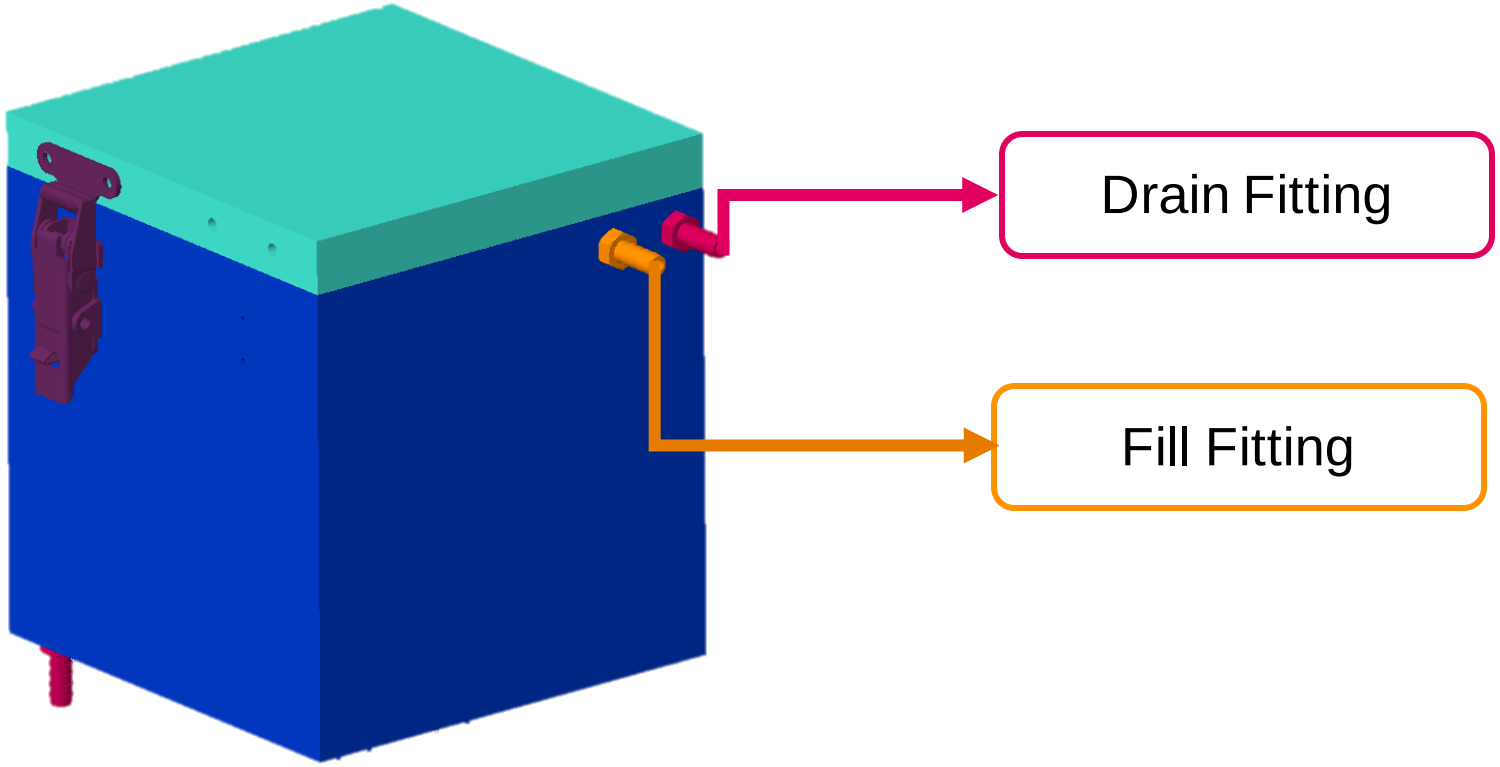
Preliminary Creo Design



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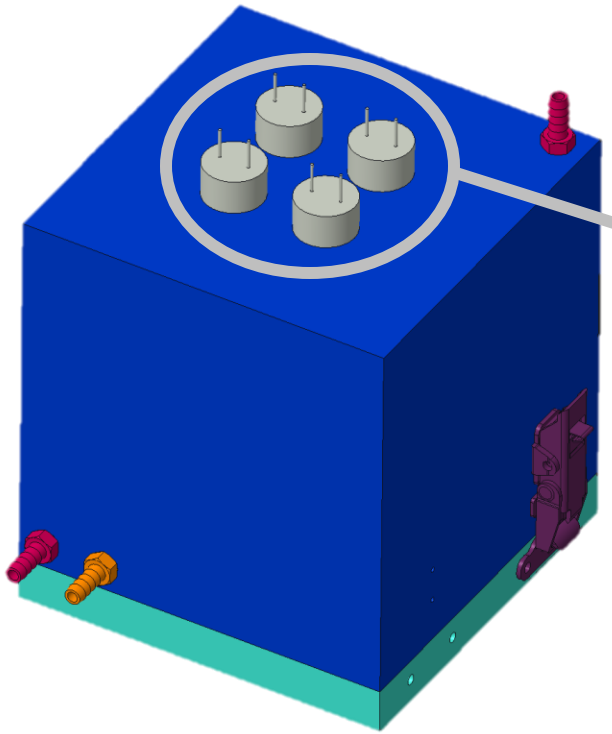
Current Work

Preliminary Creo Design



Ultrasonic Emitter

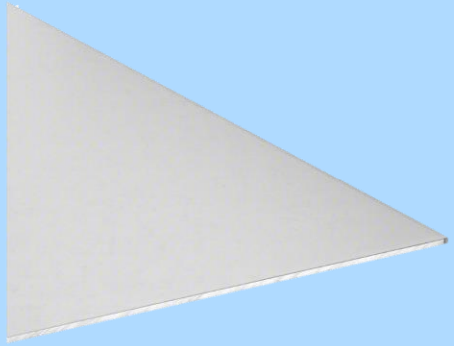
1

2

Current Work
Bill of Materials

Ultrasonic Transducers, Transformers, Valves

Ordered



Fittings, Hose, Aluminum

February 3

Acrylic, Latches, Gasket Material

February 18

1

2

3

Future Work

Transformer and transducer testing

Assemble and test circuit

Prototype testing

Code Arduino to function with circuit

Assemble base prototype

Reference

- Justin McElderry, J.E. (2023, September 22). Intro to PRIME. NASA Marshall Space Flight Center

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Questions

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