Liquid Propellent Engine:
Test Stand Integration and Testing

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PSU's Open Source Space Program

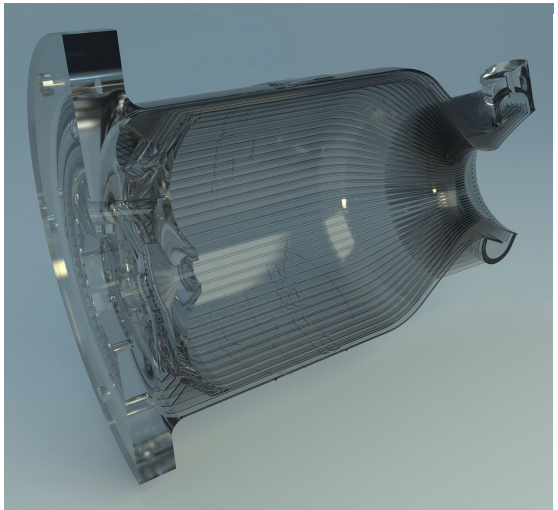
Project Motivation

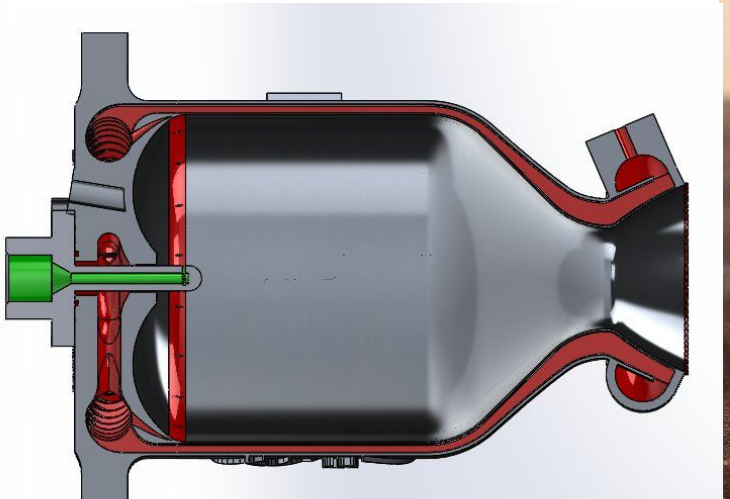
- **PSAS is working to build a 100km liquid propellant rocket**

Liquid Fuel Engine

2.2 kN thrust ground-test engine

- LOX + Isopropyl alcohol (IPA)
- LOX centered pintle injection
- GOX spark-torch ignition
- Regeneratively cooled combustion chamber
- DMLS 3D-printed AlSi10Mg





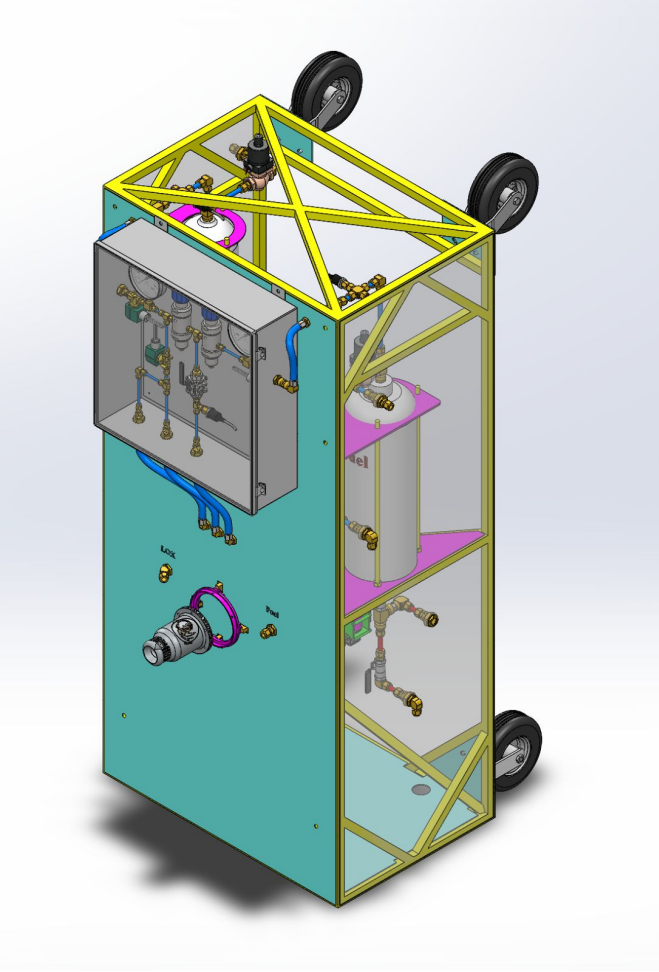
Test Stand

Purpose:

- To allow for the safe testing of liquid propellant engines and related technologies.

General requirements:

- Deliver propellants to test engine at specified pressure and mass flow rates
- Provide a reliable source of ignition
- Measure engine performance characteristics

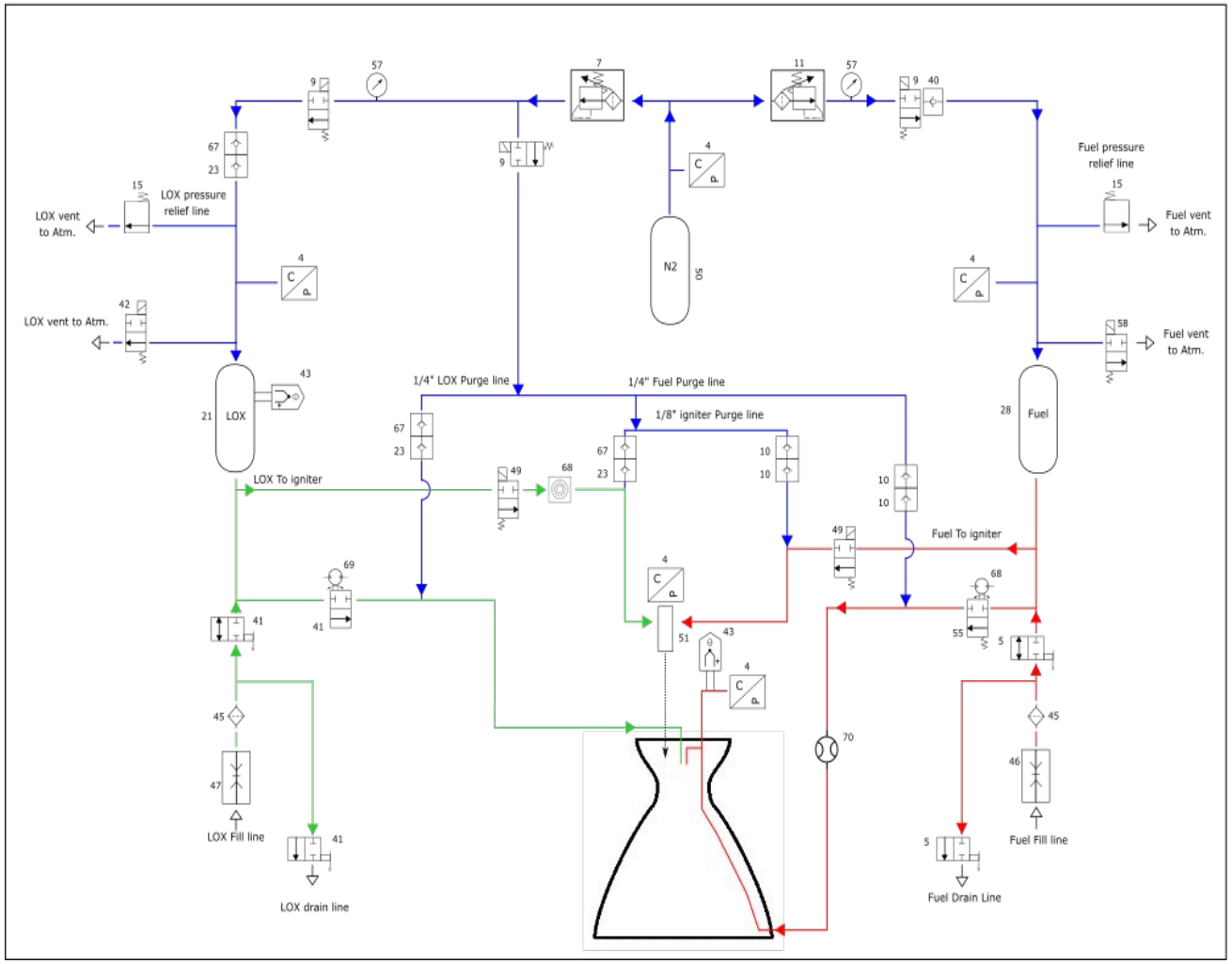


Test Stand

Customer Needs:

- Safety
  - Formal Failure Modes and Effects Analysis (FMEA)
  - Full safety and operational SOP, with contingency operations
- A successful test firing includes:
  - Safety procedures known and followed
  - Sufficient data collection to perform post firing analysis
- The test stand will require:
  - A pressurant (Nitrogen), fuel (isopropyl alcohol), and cryogenic oxidizer (liquid oxygen) system for the engine.
  - Accommodation of Data Acquisition (DAQ) and control system being independently built by PSAS
- Participants:
  - Will interpret, prepare, practice and utilize safety standard as set out in a manual of Standard Operating Procedures (SOP)
  - Will participate in any required safety training

Design Specification: Piping and Instrumentation Diagram (P&ID)



Questions?