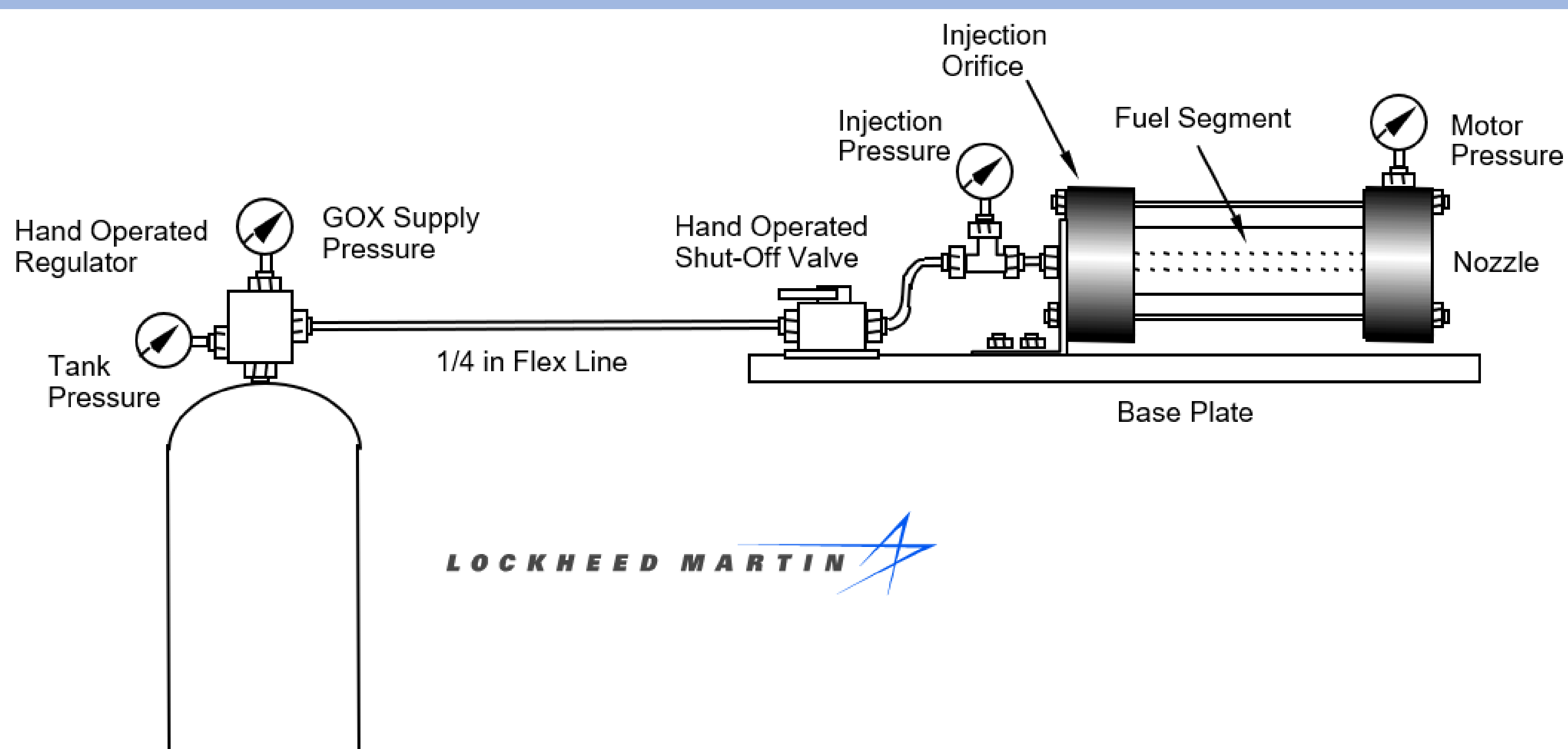


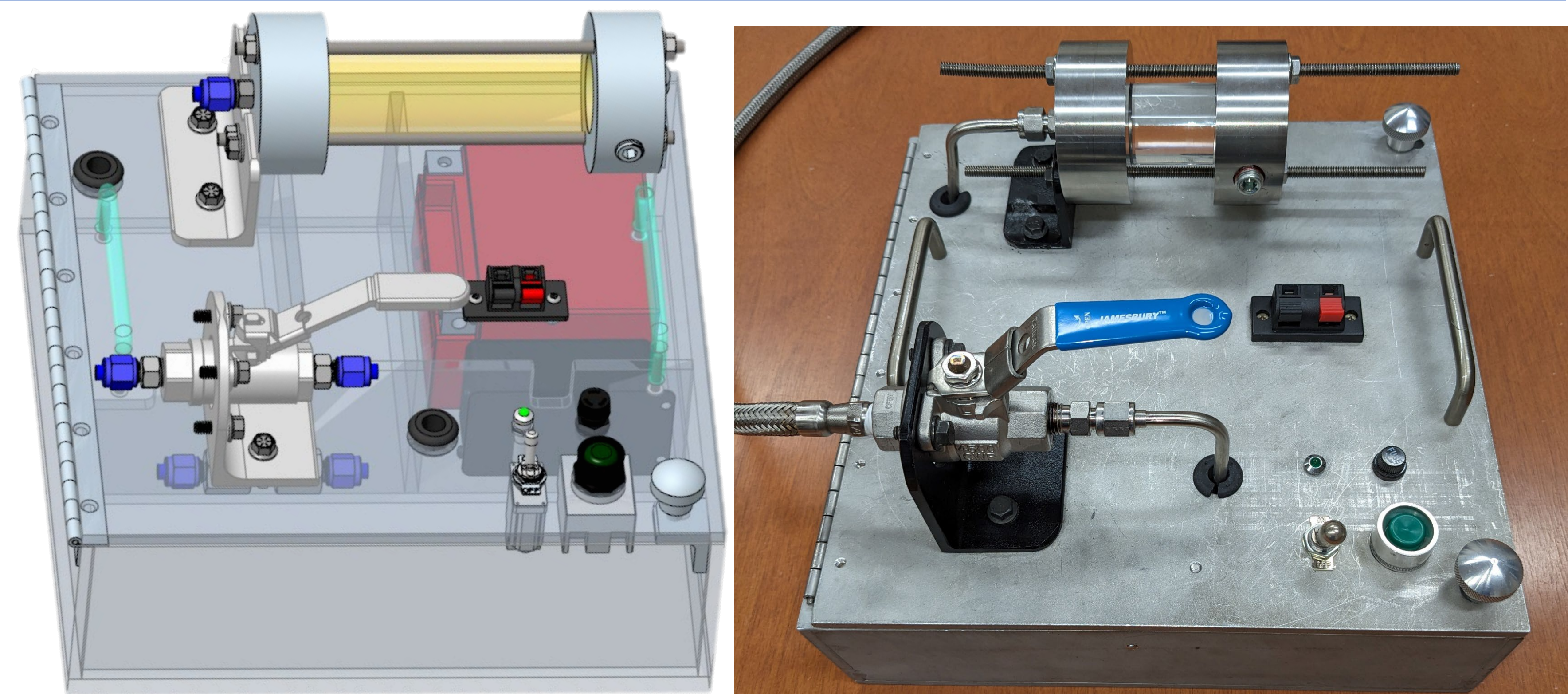
## Abstract:

The need for a small, transportable hybrid motor used to demonstrate and test various hybrid propulsion concepts was identified. Demonstrations would be for public audiences to explain basic hybrid rocket concepts. Tests would be for scientific purposes and hands-on training of engineers. Funded by Technical Excellence and NESG, the system as a whole has served as a learning tool for the NASA project cycle. Coming out of the Preliminary Design Review (PDR), the project was split into two separate configurations, one for demonstrations and one for tests; each would have its own oxidizer feed system. The Demonstration system will be a simple, low pressure system with the ability to recycle for multiple motor firings. The grain design will be a fixed configuration for all firings and utilize a clear material such that the combustion process is visible. The Test Readiness Review has been held and final actions are being pursued before the initial firing.

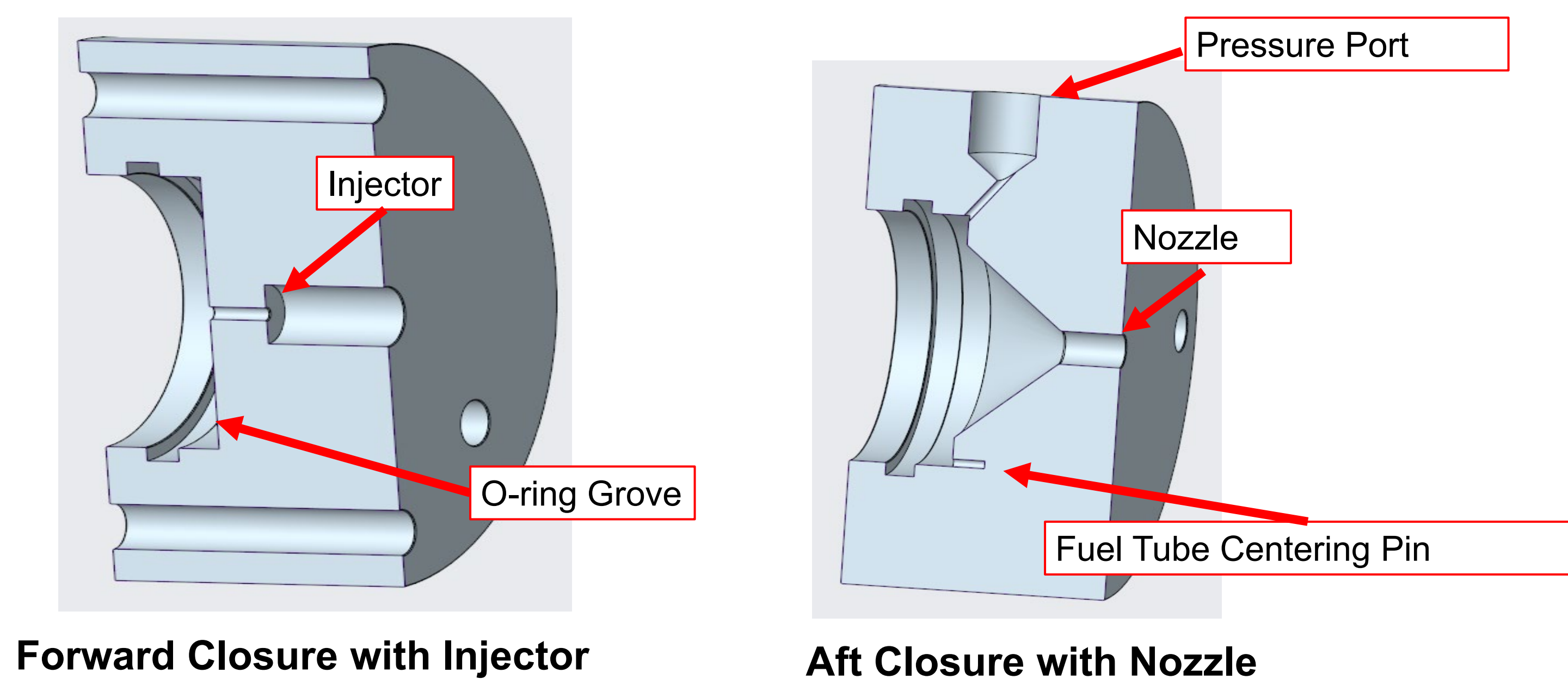
The Terry Able system was used as inspiration and the basis for the new Demonstration System.



Isometric CREO Model: Fabricated out of aluminum, the box will have a lid where the manual valve, initiation switch, and hybrid motor are located. Inside, the box will house spare grains, electronics, and piping.



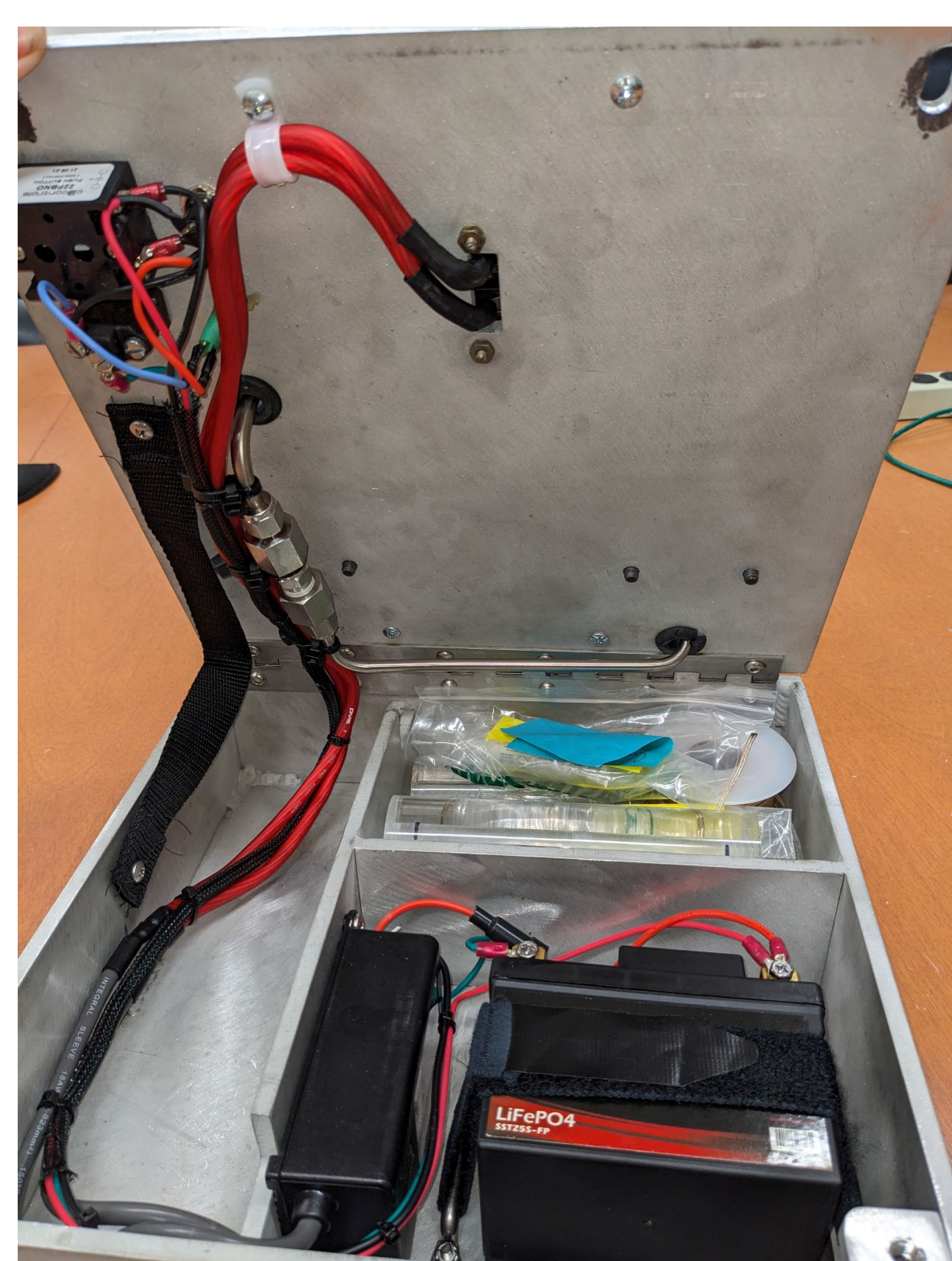
Cross Section Views of the Injector and Nozzle closures.



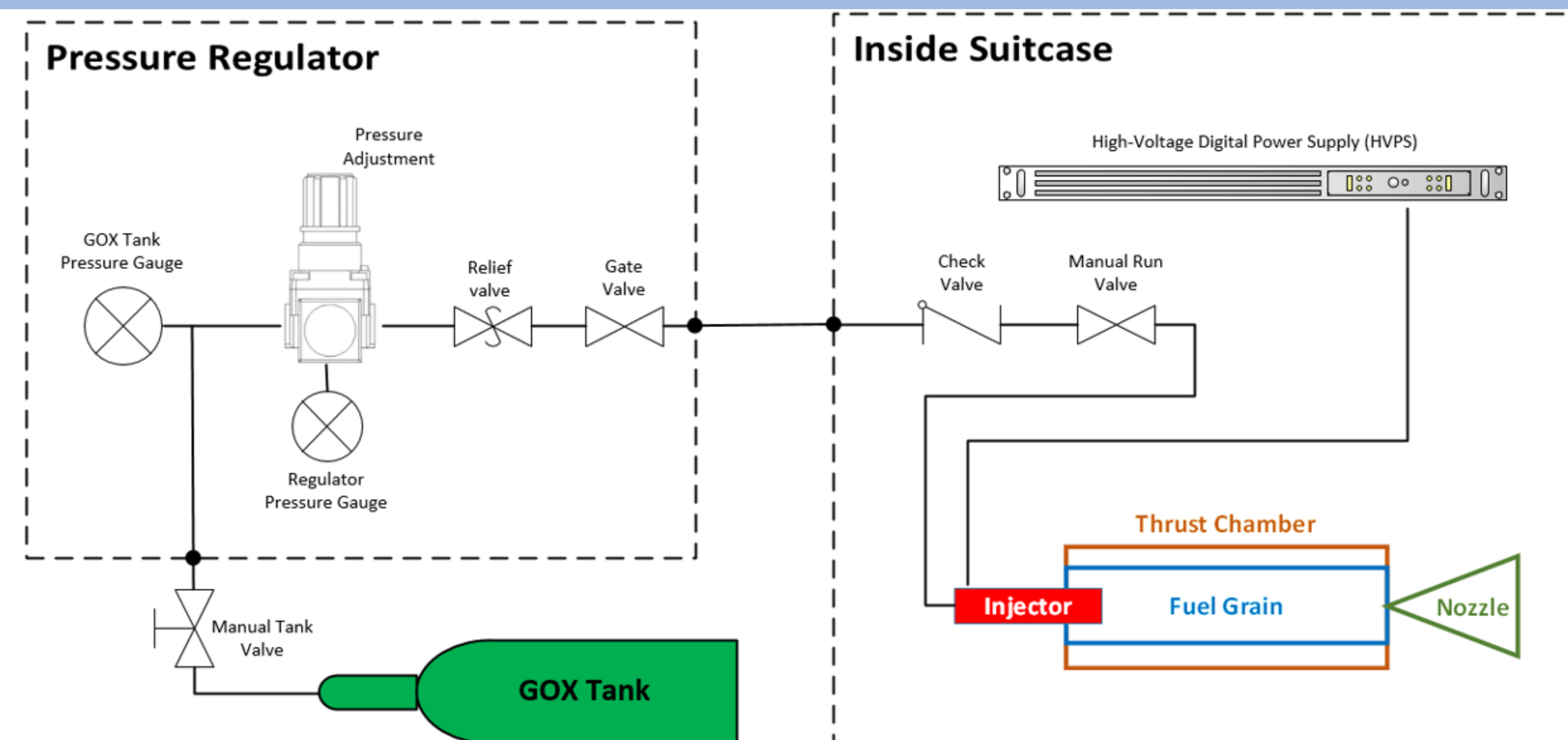
Forward Closure with Injector

Aft Closure with Nozzle

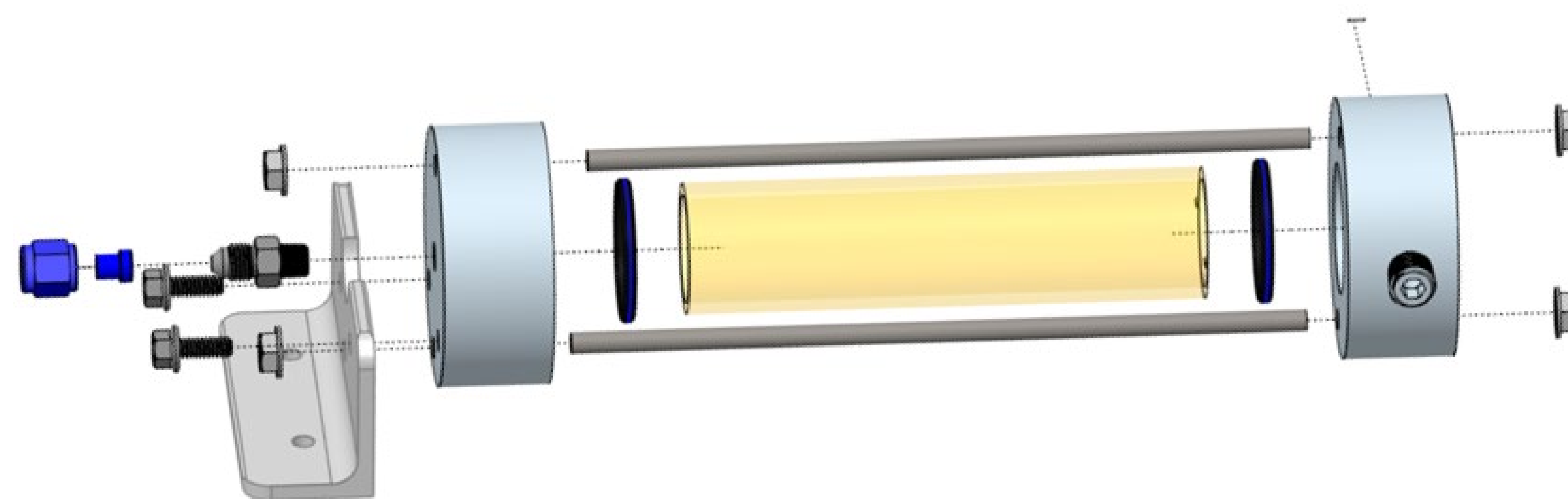
Electrical Circuit / Igniter System



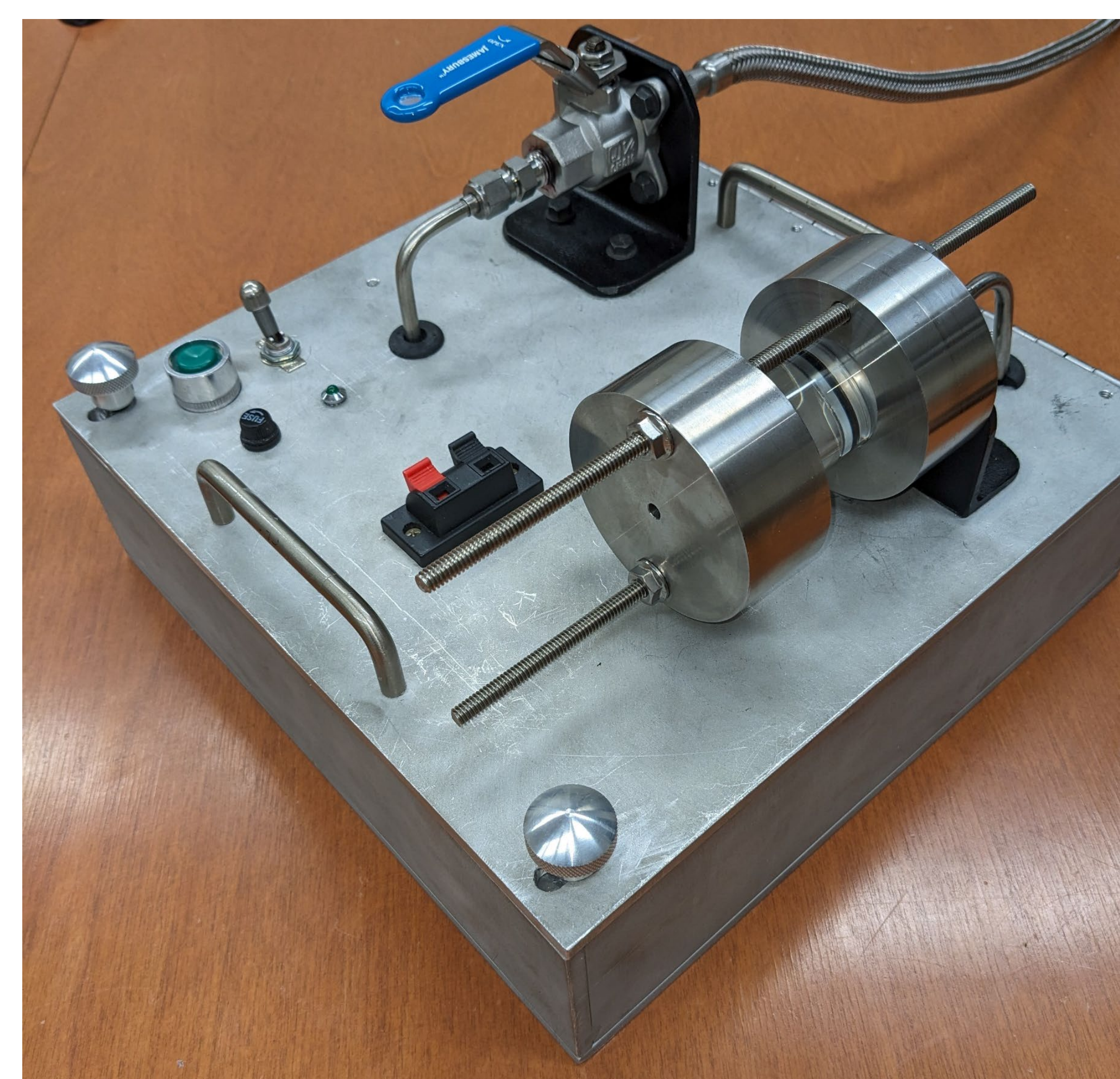
System Schematic of the Hybrid Motor Suitcase Demonstration System



Exploded view of motor shows the injector, center port PMMA grain, and nozzle.



Hybrid Suitcase



The first hybrid concept being pursued for the Test System is an axially-injected end-burner (AIEB) motor. For AIEB, oxidizer flows through multiple small ports in the fuel and burns on the aft end face of the grain. Early research suggests fuel regression rate is a function of pressure. The test assembly is being designed for high chamber pressure, with a water-cooled throat. Some case components have been machined.

