Project Title: Scalable Autonomously Configured Integrated DAQ/Control System

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Executive Summary

The SMART (Scalable Mobile Autonomous Rocket engine Test) testbed system initiative at SSC was conceived to attempt to address many of the principal cost drivers in developing and maintaining a rocket engine test facility. The system (optimized to test engines and components generating up to 10K lbf nominal thrust) is serving as a testbed for innovative technologies and processes to provide lower cost test services with a rapid test cadence and expedient turnaround times. The system can also potentially be used as a testbed to test other related technologies relevant to surface situations (e.g., moon, Mars associated with crogenic fluid management, engine/component testing, autonomous operations, etc.). This FY20 CIF project, being conducted as part of the SMART testbed system, is the development of an integrated DACS (Data Acquisition and Controls System) capable of low level autonomous operation for the testbed. It will employ an autonomous state machine for control of high-pressure, high flow cryogenic pumps and associated hardware. Designing a state machine that can safely and autonomously transition controlled equipment to a ready state while preventing transitions to unsafe/prohibited states is the primary goal. Utilization of Transducer Electronic Data Sheets and recognition registration routines to enable 'plug n play' functionality in the testbed is a secondary goal. In FY20, the Control/Data Systems and autonomous software were designed and preliminarily assessed, the procurement of necessary materials/hardware was made, and the system hardware has been conceptually configured into a breadboard setup in anticipation of the initial testing ahead after the pump hardware arrival in FY21. Once the pump hardware arrives, planned flow tests utilizing the developed DACS and autonomous software for control of high pressure, high flow cryogenic pumps will demonstrate rapid configurability and safe transition between allowed states.