

A Laboratory-Scale Solid Rocket Motor Thrust Stand

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Abstract

A lab-scale solid propellant rocket motor and thrust stand were developed to test solid composite rocket propellants. This design was aimed at providing a safe and reliable test device that would allow for a quick turnaround time between experiments, be applicable for a wide array of formulations, and output data pertaining to the burning characteristics and propellant performance of solid composite propellants and fuels. The design is meant to operate at a pressure range of 3.4 to 10.3 MPa (500 to 1500 psi), which is expected of a medium-performance motor. The motor utilizes a combustion chamber that is 11.43 cm (4.5 inches) long and has an internal diameter of 2.87 cm (1.13 inches). The fuel grains to be evaluated consist of Hydroxyl Terminated Polybutadiene (HTPB) formulations with different additives and varied solids loading. The ability to change fuel formulations is made possible with the modular design of the test stand and the ability to swap nozzles with different geometries. Simulation data predict the performance of the motor until experimental data can be used.