Development and Testing of a Lab-Scale Acoustic Resonance Igniter for Rocket Propulsion Applications

Presented by: Aidan Caplan

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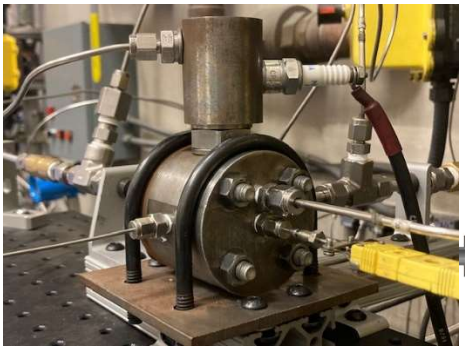

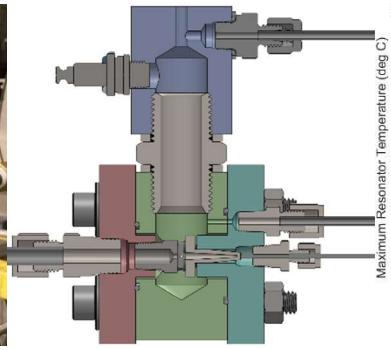

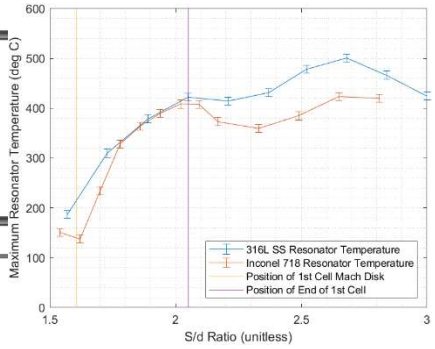

The acoustic resonance igniter is a type of rocket engine ignition system that initiates spontaneous combustion without using an external ignition source. This is possible because the activation energy of the combustion reaction is automatically provided by the igniter as it receives propellant flow. Internally, at least one gaseous propellant travels into a sonic nozzle and immediately exits into a resonance tube closed at one end; this device is called a Hartmann-Sprenger Tube. This produces a complex acoustic phenomenon that heats the propellant mixture to its autoignition temperature, enabling combustion. Since it simplifies the ignition system architecture and lends it high re-usability while enabling the use of high-efficiency propellant combinations, the concept could potentially become a desirable alternative to traditional approaches such as using spark igniters or hypergolic propellants. The present research strove to inaugurate the study of the resonance igniter at Cal Poly by designing, building, and testing a lab-scale prototype of the technology and attempting to achieve resonance ignition with a methane-air mixture.

A Master's Thesis Defense in Mechanical Engineering

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Thursday, June 12th, 2025, 8:10am, Held Virtually

Zoom Meeting ID: 350 427 4841 | https:/calpoly.zoom.us/j/3504274841