1. **Research Title:** Combustion Stability in High-Speed Flows

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3. **Academic Area/Field and Education Level:** Engineering Physics, Applied Physics, Mechanical Engineering, Aerospace Engineering, (MS and/or Ph.D. level)

4. **Objectives:** The proposed thesis topic aims to investigate the limiting combustion phenomena of ignition, flame propagation, and flame stabilization relevant to high-speed combustors, utilizing both small scale bench-top experimental platforms and high-speed environments such as supersonic combustion ramjets (scramjets).

5. **Description:** Presently, the harsh and restrictive reactive environments within high-speed propulsion systems, such as scramjets, can be limiting factors for their development and practical implementation. Typically, these limitations lie in the ability to ignite, propagate, and stabilize a flame near flammability limits, at low temperatures and pressures, and within short residence times. There is a need to better understand the fundamental interactions involved in producing and stabilizing a flame using passive devices (such as strut or cavity flameholders) and active devices (such as energy addition via plasma) across the broad operating range of Mach numbers and dynamic pressures present in expendable and reusable high-speed propulsion platforms. A range of systems are available to interrogate these problems, including simple bench-top experiments (including a variable pressure combustion chamber and linear flow ignition tunnel), to wind-tunnels (including direct-connect scramjet facilities). A host of optical and laser diagnostic assets are available, including, but not limited to planar laser-induced fluorescence (PLIF), particle image velocimetry (PIV), nanosecond-gated laser-induced breakdown spectroscopy (n-LIBS), high-frame-rate UV and visible imaging (up to 10 million frames per second), multi-spectral infrared imaging (up to 90,000 frames per second) and absorption and emission spectroscopy, to study these phenomena.

6. **Research Classification/Restrictions:** 6.1 basic research.

7. **Eligibility:** Open to U.S. citizens