

RQ15-31

AFRL CALL FOR RESEARCH

1. Research Title: *Detonation Engine Propulsion Research*

2. Individual Sponsor:

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

4. Objectives: The proposed thesis topic aims to advance the state-of-the-art in detonation propulsion, utilizing near-constant volume combustion to improve the efficiency of heat addition and improve the performance of unsteady processes.

5. Description: Detonation based propulsion systems are potentially revolutionary technology which utilizes the pressure rise of the detonative combustion process to produce momentum while adding heat with less entropy than conventional deflagrative combustion. Recent work at the Detonation Engine Research Facility at Wright-Patterson AFB has advanced the state-of-the-art through computational and experimental studies utilizing several in-house developed codes and research engines, including pulsed detonation engines, rotary (continuous) detonation engines, and other pressure gain combustors. Areas of work include: detonation initiation, fuel injection, valving, controls, materials, heat transfer/thermal management, nozzles, ejectors, hybrid turbine engines, acoustics, power extraction, emissions, and diagnostics. A wide variety of research opportunities are available utilizing the unique detonation research facility, high speed instrumentation (up to 5 Mhz per channel), high speed imaging (1,000,000 fps), laser diagnostics, and research engines. Recent research projects have included local students from the University of Dayton, Ohio State, University of Cincinnati, Wright State University, and AFIT as well as collaborations with students from the Naval Post Graduate School, MIT, Stanford, University of Texas (Austin), and the University of Southern California.

6. Research Classification/Restrictions: Most aspects of this research fall under the 6.1 basic research classification. However, some aspects and the Pulsed Detonation Research Facility at Wright-Patterson AFB are FOUO with export control/ITAR restrictions.

7. Interest in Summer USAFA Cadet: NO

8. Eligible Research Institutions:

Universities (DAGSI) AFIT USAFA

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