

Attachment 1 – DAGSI Research Topic Template

NOTE: Under the Cooperative Agreement, Technical Directorates have three options for topics. First, a topic can strictly be considered in the pool for the state allocation of funding. DAGSI will work across the TDs for this allocation. Second, the TD can be prepared to be a funding partner with the State of Ohio. This would include: providing additional funds to support additional recipients of a topic, or expand the proposers team to include additional members on a topic. Third, the TD may elect to fully fund a topic not selected for State of Ohio funding or to pursue University teams outside the State of Ohio. Contact lindsay.kotouch.2@us.af.mil for questions.

1. **Research Title:** Advanced Multi-Scale Combustion Systems
2. **Individual Sponsor:**
Dr. Brent A. Rankin, AFRL/RAPC
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3. **Academic Area/Field and Education Level**
Aerospace Engineering / Mechanical Engineering / Chemical Engineering / Chemistry / Physics (MS or PhD)
4. **Objectives:** Perform research and development related to advanced multi-scale combustion systems useful for enabling future Air Force capabilities.
5. **Description:** Developing advanced concepts for future multi-scale (i.e., small- and medium-scale) combustion systems is important for many propulsion and power applications with significant impact and broad relevance to next-generation Air Force systems. Advanced multi-scale combustion systems provide the potential for enhancing the range, speed, and affordability of gas turbine engines. The primary objective involves developing advanced multi-scale combustion systems concepts for small- and medium-scale gas turbine engines. The experimental or computational research should focus on one of the following areas:
 - (a) Investigate fundamental phenomena associated with flame structure, flame dynamics, fuel-air mixing, turbulence, or chemical kinetics in advanced multi-scale combustors.
 - (b) Explore advanced combustion technologies for enhancing ignition under low-pressure low-temperature conditions or improving flame stabilization in high-speed compressible flows.
 - (c) Develop and apply intrusive or non-intrusive diagnostic techniques for measuring fuel-air mixing, pressure, temperature, or velocity in advanced multi-scale combustors.
 - (d) Develop and apply large eddy simulations to advanced multi-scale combustors for providing new insights, interpreting experimental observations, or guiding designs of future systems.The research is expected to be conducted in collaboration with the Air Force Research Laboratory Air Warfare Directorate Platform Systems and Propulsion Division Combustors Branch. The Combustors Branch provides access to state-of-the-art experimental and computational resources including the Combustion Research Complex, High Pressure

Combustion Research Facility, and Department of Defense High Performance Computing Centers.

6. Research Classification/Restrictions: Open to U.S. citizens only. Some aspects of this research may include ITAR restrictions.

7. Eligible Research Institutions: DAGSI Universities

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