

High-Altitude Combustion-Relight Research

1. **Research Title:** High-Altitude Combustion-Relight Research
2. **Individual Sponsor:**
 Dr. Andrew Caswell, AFRL/RQTC
 2130 Eighth Street
 WPAFB, OH 45433-7542
andrew.caswell.4@us.af.mil
3. **Academic Area/Field and Education Level:** Aerospace Engineering / Mechanical Engineering / Chemical Engineering / Engineering Physics (MS or Ph.D. level)
4. **Objectives:** The proposed topic aims to improve the combustion performance, efficiency, and ultimately, the reliability of relighting at high-altitude of a real and operational, aviation, gas turbine combustor after a flame-out event. Research, characterize, and modify the combustion system for an in-depth investigation.
5. **Description:** There exists a need for understanding and enhancing aviation combustor performance and efficiency during extreme, high-altitude-relight conditions. During high-altitude-relight events, the required ignition energy is many times that of atmospheric due to deteriorating combustor performance, efficiency, and atomization. This poses a risk to both military and commercial aviation aircraft. Next-generation combustor technology must demonstrate robust performance at these extreme operating conditions. The ability to simulate the low pressures and temperatures necessary for high-altitude studies is required for a complete investigation. The primary goals of this study are to:
 - a. Evaluate the performance and efficiency of a real, aviation combustion system during high-altitude relight.
 - b. Investigate the ignition characteristics of the combustion system at high-altitude conditions, including the flame propagation, transient behavior, steady state behavior
 - c. Study the effects of hardware modification(s) on its performance and efficiency.
 - d. Propose techniques/modifications to enhance relighting capabilities and combustion efficiency during these extreme conditions.

Emphasis will be placed on developing a reliable system for measuring and obtaining research results and for considering the issues that face designers in regard to relight performance.
6. **Research Classification/Restrictions:** Open to U.S. citizens only. Some aspects of this research may include ITAR restrictions.
7. **Eligible Research Institutions:**



DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)