1. **Research Title:** Energy Efficient Utilization of Auxiliary Streams in Adaptive Turbine Engines

2. **Individual Sponsor:** Ms. Valerie Van Griethuysen and Dr. Nicholas Kuprowicz

AFRL/RQTE Bldg 18
1950 Fifth St.
WPAFB, OH 45433-7251
valerie.vangriethuysen@wpafb.af.mil and
nicholas.kuprowicz@wpafb.af.mil

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

4. **Objectives**: Research and develop concepts to more efficiently utilize auxiliary stream flows and interfaces in adaptive turbine engine architectures. Identify novel concepts enabling synergistic improvements in overall engine performance, engine heat sink capacity (including vehicle-level thermal loads), and harvesting of thermal and/or acoustic energy in three-stream turbofan architectures. Establish models to simulate the operation and performance of proposed concepts, with quantification of efficiency improvement relative to appropriate baseline.

5. **Description**: The proposed project will delve into the identification, analysis, and simulation of candidate approaches to improve the operational capabilities provided by auxiliary streams in adaptive turbofan engine architectures. Concepts of interest include, but are not limited to, shaping and surface treatments of third stream duct passage, structural integration of heat exchange components/systems utilizing the third stream, thermoelectric devices to harvest thermal energy along boundaries of third stream, and piezoelectric devices to harvest mechanical energy associated with engine vibration. Parametric studies are necessary to identify the impacts of the enhancement approaches, leading to quantification of the benefits and penalties consistent with conceptual design exploration. Coordination with one or more industry partners is highly encouraged in order to gain insight on operational parameters, constraints, configurations, and realism.

6. **Research Classification/Restrictions**: This research is FOUO and has ITAR restrictions, U.S. citizens only.
7. **Eligible Research Institutions**: Universities (DAGSI)