

1. **Research Title:** Unsteady Flow Physics and Aerodynamic Flow Control in Turbine Passages

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Mechanical or Aerospace Engineering (MS and/or PhD level – PhD preferred)

4. **Objectives:** The objective of this DAGSI project is to conduct research on the complex, unsteady, and highly three-dimensional flow fields typical of advanced turbine passages to improve aircraft propulsion systems and mission performance. Research can focus on fundamental flow physics, computational modeling, application of data-driven methods, or development of loss reduction strategies.

5. **Description:** The research area covers the design and development of advanced turbine concepts that reduce size, weight, cost, and manufacturing time and complexity of gas turbine engines and improve aircraft mission performance. Topics of interest include flow stability under strong pressure gradients, boundary layer separation, thermal streak and unsteady wake interactions, endwall secondary flows, and the aerodynamic implications of advanced manufacturing methods (e.g., surface topology, non-traditional geometries, or integrated features from additive manufacturing). Work may also encompass active or passive flow control technologies to mitigate passage losses, with applications such as high-lift turbine architectures, including low-pressure turbines (LPTs).

Detailed experimental measurements can be made using the Air Force Research Laboratory Aerospace Systems Directorate turbine cascade facilities. Tomographic and High-speed Stereo Particle Image Velocimetry (SPIV), hotwires, surface mounted hot films, and various pressure probes are available.

6. **Research Classification/Restrictions:** The bulk of this research will fall under the 6.1 basic research classification. Some aspects, in particular those dealing with specific engine configurations and performance parameters, will be Official Use Only and may have ITAR restrictions.

7. **Eligible Research Institutions:** DAGSI Universities