

1. **Research Title:** Fan and Compressor Experimental Aerodynamics
2. **Individual Sponsor:**

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

Aerospace Engineering and Mechanical Engineering/Turbomachinery and Fluid Mechanics (MS or PhD level)

4. **Objectives:** Identify and research complex flowfield phenomena in transonic turbomachinery. Conceive, develop, test, and evaluate instrumentation packages and hardware geometries to assess flow physics and impact on performance and operability of compression systems. Develop new and novel data analysis methods to identify aerodynamic and aeromechanics phenomena in situ and during post-processing.
5. **Description:** The Compressor Aero Research Lab (CARL) investigates gas turbine aero engine fan and compressor aerodynamic/aeromechanic performance to enhance understanding of internal flow physics and enhance feedback of experimental results into the design process. The CARL operates two experimental facilities: a 6000 hp compressor facility and a 70 lbm/s annular cascade facility (see link for more information). The facilities can measure relevant flowfields using a large number of steady and unsteady data channels for instrumentation rakes, Kulites, strain gages, 3D unsteady PIV, 5-hole probes, NSMS light probes, and novel instrumentation.

Current research focuses on the aerodynamic/aeromechanic impact of flowfield non-uniformities. Both facilities are configured for research using pressure screens and novel distortion generating devices. Additional topics of interest include development of stall detection methods and flowfield analysis using over-the-rotor Kulites, evaluation of aeromechanics assessment techniques, study of fan blade geometry and response during operation, and evaluation of novel instrumentation packages for unsteady flowfields.

https://www.afrl.af.mil/Portals/90/Documents/RQ/AFRL_RQ_CARL_2020.pdf

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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