

1. **Research Title:** Fan and Compressor Design, Modeling, and Simulation
2. **Individual Sponsor:**

Dr. Michael G. List, AFRL/RQTT  
AFRL/RQT  
2130 8th Street  
WPAFB, OH 45433  
[michael.list.2@us.af.mil](mailto:michael.list.2@us.af.mil)

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 using hi-fi simulation techniques. Conceive and develop reduced order models for design and assessment of turbomachinery performance. Develop new and novel data analysis methods to identify aerodynamic and aeromechanic physics and compare to experimental datasets.
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 results into the design process. The CARL conducts numerical experiments using a variety of government and commercial design tools and CFD solvers on an in-house computational cluster and supercomputing resources provided by the DOD. Numerical simulations are mined for flow physics, compared to experimental datasets, and formulated into models for design tools using a variety of linear and non-linear techniques.

Current research focuses on the aerodynamic/aeromechanic impact of flowfield non-uniformities. Research interests include fluid-structure interaction simulations, demonstration of scalable solvers using HPC systems and codes, multidisciplinary design and optimization, novel design techniques, and development of models for improved design.

6. **Research Classification/Restrictions:** Open to U.S. citizens only. Some aspects of this research may include ITAR restrictions.
7. **Eligible Research Institutions:** **DAGSI** (All DAGSI Universities).  
PA Approval #88ABW-2017-3609.