RQ17-2

Intelligent Gas Turbine Control Systems and Engine Integrated Health Management Research

1. **Research Title:** Intelligent Gas Turbine Control Systems and Engine Integrated Health Management Research
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**
   Aerospace Engineering, Mechanical Engineering, and Electrical Engineering: Guidance, Navigation and Control, Turbine-Engines Health Monitoring (MS or PhD level)
4. **Objectives:** Application of bio-inspired control techniques and decision making systems to application for gas turbine control systems and engine health management systems focusing on:
   - Non-linear control system including autonomous development of rule-base and gains using an evolutionary computational approach.
   - System level decision making to enhance adaptability for high performance based on mission profile and temporal operational demands.
   - Integrated health monitoring system that diagnoses probable faults and provides prognosis of their development
5. **Description:** Intelligent control techniques are gaining traction and increased focus. Recent technological opportunities in both hardware and real-time implementation enable us to push the envelope with regards to introducing "intelligence" into aerospace systems design for numerous important applications such as propulsion systems, and multi-objective, real-time adaptation of system properties to enhance mission effectiveness. The basic approach is to make most of what resources are available in order to get the best possible results. We are seeking a high performing, real-time, robust and scalable "optimal" action. Furthermore, increasing the reliability of turbo-engines requires an online process that matches detected anomalies with known modes of failure. Using a pattern-matching process, the possible risks caused by an anomaly can be assessed, how much time there is to mitigate any risk, and suggestions for critical maintenance can be made before the failure occurs between engine dynamics and flight dynamics so that better control and diagnostics schemes can be designed for extending the life of the engine and airframe.
6. **Research Classification/Restrictions:** Unclassified
7. **Eligible Research Institutions:**

[✖] **DAGSI** (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati).