

DAGSI Research Topic

1. **Research Title:** Active Thrust Balance of Engine Mainshaft Bearings
2. **Individual Sponsor:**

Mr. Brian D. Nicholson, AFRL/RQTM
1790 Loop Rd. North, Bldg. 490
WPAFB, OH 45433-7333
brian.nicholson.1@us.af.mil

3. **Academic Area/Field and Education Level:** Mechanical Engineering/Aerospace Engineering (MS or PhD level)
4. **Objectives:** The objective of this proposed 3-year DAGSI project is to conduct research related to turbine engine mechanical systems, specifically in developing an autonomous active thrust balance system for managing loads on heavily loaded thrust bearings for future high Overall Pressure Ratio (OPR) engines. The study will include development of robust thrust load sensing devices, feedback control algorithms, and involve experimental demonstrations using the Air Force Research Laboratory, Aerospace Systems Directorate, Mechanical Systems Research Laboratory (MSRL) facilities.
5. **Description:** As engine OPR levels continue to increase in efforts to improve engine performance, thrust loads on engine mainshaft bearings are anticipated to reach unprecedented levels, impacting bearing life and crack propagation rates in future engine designs. This effort builds on on-going R&D at the AFRL aimed at developing an active thrust balance system that uses modulated high pressure air within the engine to offset high and/or low thrust loads on the mainshaft bearings. Theoretically, bearing thrust loads could be actively managed to increase service life and reduce skidding risk by avoiding null-load conditions. This study will require development of robust, long-life thrust load sensing and load modulation devices, feedback control algorithms, and involve experimental demonstrations using the Air Force Research Laboratory, Aerospace Systems Directorate, Mechanical Systems Research Laboratory (MSRL) facilities.
6. **Research Classification/Restrictions:** US Citizens Only. Some aspects such as engine conditions and configurations may be ITAR restricted.
7. **Eligible Research Institutions:** DAGSI (All DAGSI Universities).

PA Approval #88ABW-2017-3609