**DYNAMIC CHARACTERIZATION OF COMPLIANTLY DAMPED POROUS GAS BEARINGS**

Porous media has served as a successful gas delivery mechanism for bearings in many applications. Sample porous media include bronze, graphite, and sintered iron. The first year of this work investigated graphite (porous carbon) for use as a secondary gas delivery mechanism and contact tolerant surface in a compliantly damped hybrid tilting pad gas bearing (CHGB). With successful implementation of a mechanical mate between porous carbon and a metal bearing support structure, there is scope to support a MW-class dummy rotor on process-lubricated gas bearings. The dummy rotor is representative of a turboexpander system frequently found in natural gas let-down applications, generally supported on active magnetic bearings. Additionally, the testing of a CHGB utilizing porous carbon requires the development of a test rig and bearing support structure. This test rig requires various levels of adjustability for the proposed design case, as well as adaptability to future rotor and bearing designs. The desired rotor critical speed and efforts to maximize the stiffness ratio between the supports and gas film drive the design of the bearing support structure.

The first year completed tasks include the implementation of a mechanical mating between the porous material and pad support, as well as design and fabrication of pads, compliant supports, compact damper, housing, and test rig for non-rotating dynamic characterization. Pad pressurization tests to 200 psi reveal low levels of deflection of the pad surface when using the porous surface as the air delivery system, and no deflection when adding supply ports. Dynamic characterization of the bearing reveals a dependence on mechanical preload to aid the stiffness of the bearing and improve the transmissibility ratio between the film and compliant supports. Static pad testing provides insight into pad stiffness and proves that the compliant supports dominate the stiffness of the system. As part of the improvements to the bearing, the preload of the bearing and reliability of the damper require further investigation. Damper redesign and preload characterization of the current design, as well as design of new springs will be implemented. The bearing will be tested and characterized with four dampers via further non-rotating tests. A component level test rig will be commissioned to evaluate the bearing and dampers both in hydrostatic and hydrodynamic regimes, with operating speeds up to 20,000 RPM.