



Continuation Project

**A WATER LUBRICATED HYBRID THRUST BEARING:
IDENTIFICATION OF AXIAL STIFFNESS AND DAMPING FORCE COEFFICIENTS (YEAR III)**

Thrust hydrodynamic bearings (TBs), oil or process fluid lubricated, are vital components in rotating machinery. Axial loads in a turbomachine arise from pressure fields on the front shroud and back surface of an impeller, hence are shaft speed (and load) dependent. To date, prediction of aerodynamic induced thrust loads is still largely empirical. Hence, the need to design and manufacture proven thrust bearings into any turbomachinery. This proposal addresses to the shortcomings in TB technology by delivering reliable experimental results to validate predictive tools that will better the engineering design of TBs.

Technical report TRC-B&C-03-15 [2] describes the revamping of the thrust bearing test rig as well as measurements taken during its preliminary operation. On year III, the main objective is to measure the performance of a water lubricated hybrid thrust bearing (eight pocket). The tasks to be performed are:

- Complete design and installation of mechanism for applying static and dynamic axial loads into thrust bearing.
- Measurement of axial clearance vs. thrust load (max. $W=670$ N [2.0 bar specific load]) for a range of rotor speed (max. 9 krpm) and (max. 6 bar(g)) water supply pressure into the thrust bearings.
- Measurement of rotor axial response from dynamic loads exerted by a shaker for a range of rotor speed (max. 9 krpm), supply pressure (max. 6 bar), clearance (min. 25 μm), and excitation frequency (max. 150 Hz).
- Parameter identification for estimation of axial stiffness, damping and inertia force coefficients for the test thrust bearing.