

NASA LEWIS' TRIBOLOGICAL TEST FACILITIES

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The accompanying figures show a few of the tribological test facilities at the NASA Lewis research Center. Included are two pin on disk rigs, a fretting wear apparatus, and the low and high speed foil bearing/brush seal tufts test rigs.

Pin on Disk Rigs

The backbone of NASA Lewis' tribological research has been completed on two pin on disk rigs. These rigs are used for initial characterization of high temperature tribopairs (friction coefficient and wear factors). The first rig has a maximum operating temperature of 1200 °C and can be operated in either unidirectional (22 m/s) or oscillating (4.5 Hz, +/- 60°) mode. Load capacities for this rig are 1 to 90 N radial and 1 to 900 N axial. The second rig has a maximum operating temperature, unidirectional speed, and load of 900 °C, 8 m/s, and 30 N respectively. This rig also provides the additional benefit of a controlled atmosphere. Both rigs use 63.5 mm disks and hemispherical tipped 9.52 mm diameter pins.

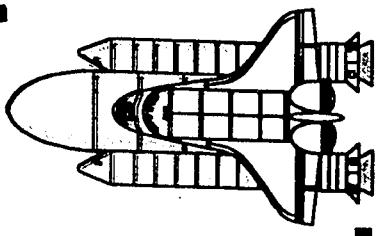
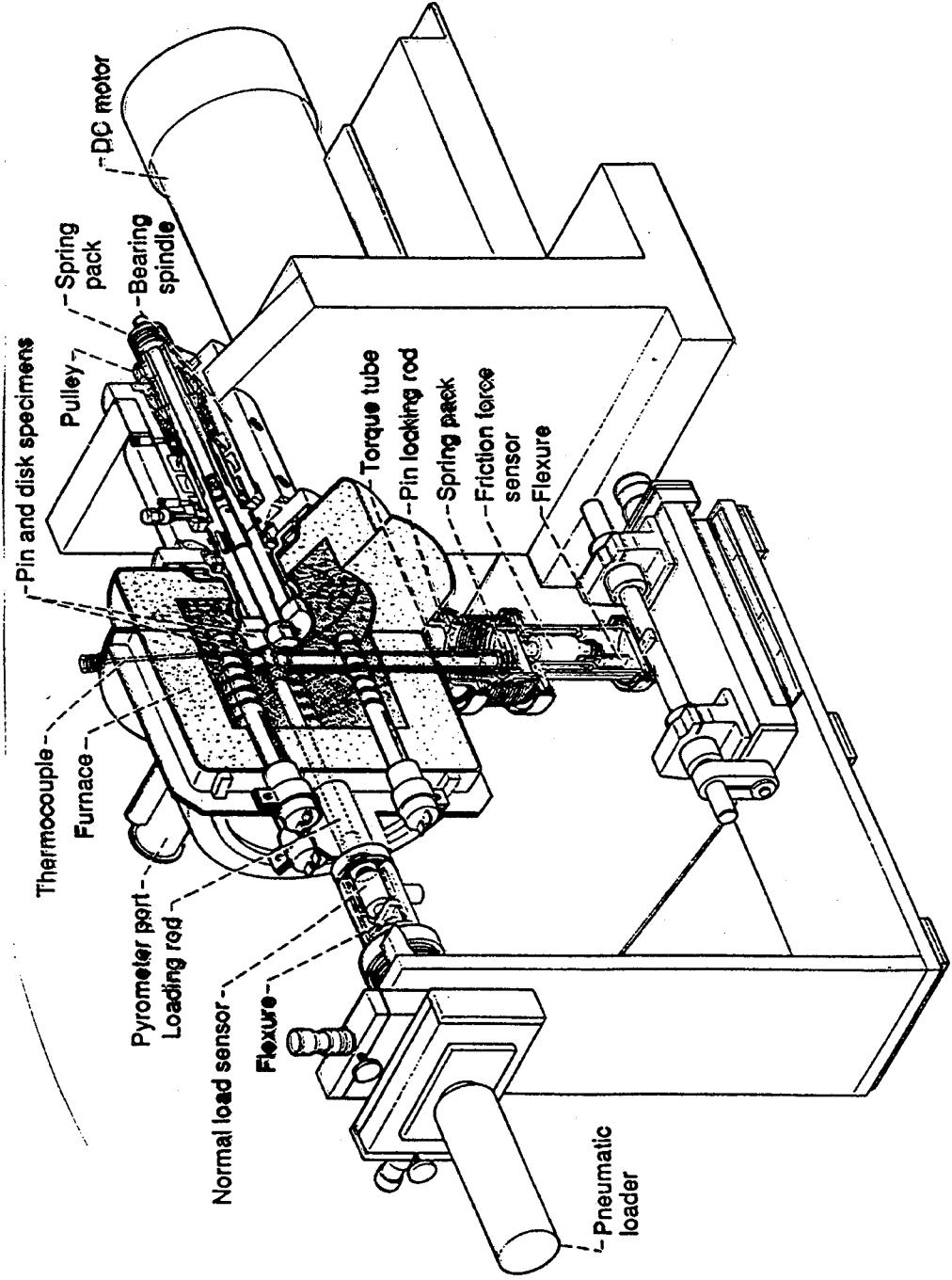
Fretting Wear Apparatus

Currently, the existing fretting rig is being refurbished for studies to be conducted on tribopairs for turbine engine compressor blade mounts. This rig has an operating frequency of 160 Hz with an amplitude of 0.030 mm.

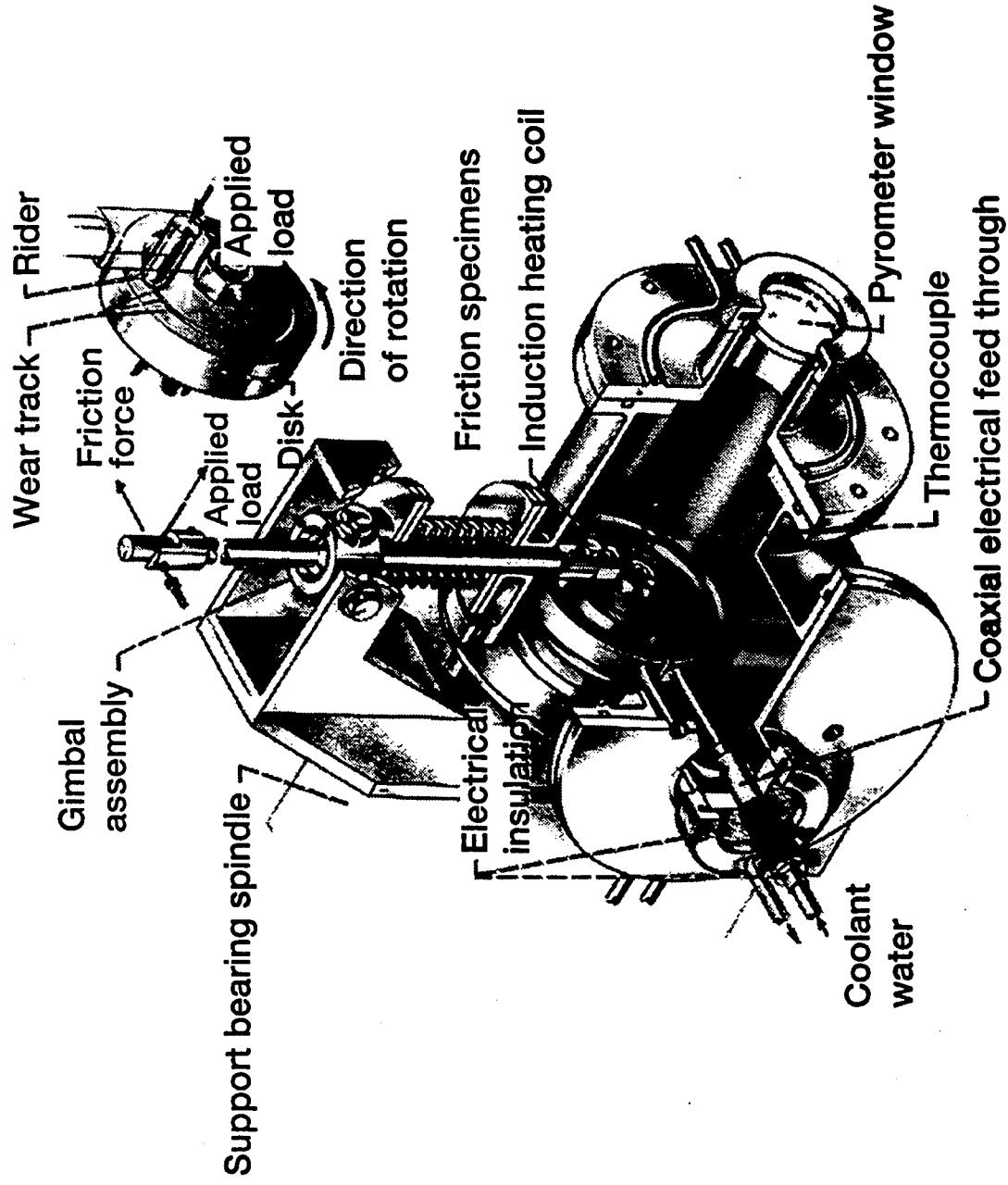
Foil Bearing/Brush Seal Tuft Test Rigs

To provide better materials characterization and foster the development of improved brush seals, an existing foil bearing rig has been modified for brush seal tuft testing. In this test, a "paintbrush" sample tuft is loaded under constant contact pressure against the outside diameter of a rotating journal. Maximum operating conditions for this rig are 800 °C and 34 m/s. Each tuft is made with approximately 920 bristles TIG welded into a superalloy collar and diamond ground to a 45° contact angle. The test journals have a diameter of 38.1 mm and can accommodate five wear tracks. This facility has demonstrated the capability of characterizing brush seal tribopairs at 1/10th the cost of full seal testing. Our latest acquisition has been the high speed foil bearing/brush seal tuft test rig. This newest facility accommodates a 34.9 mm diameter test journal and has a maximum operating temperature and speed of 800 °C and 128 m/s.

High Temperature Pin On Disk Tribometer

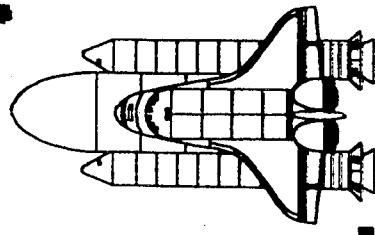
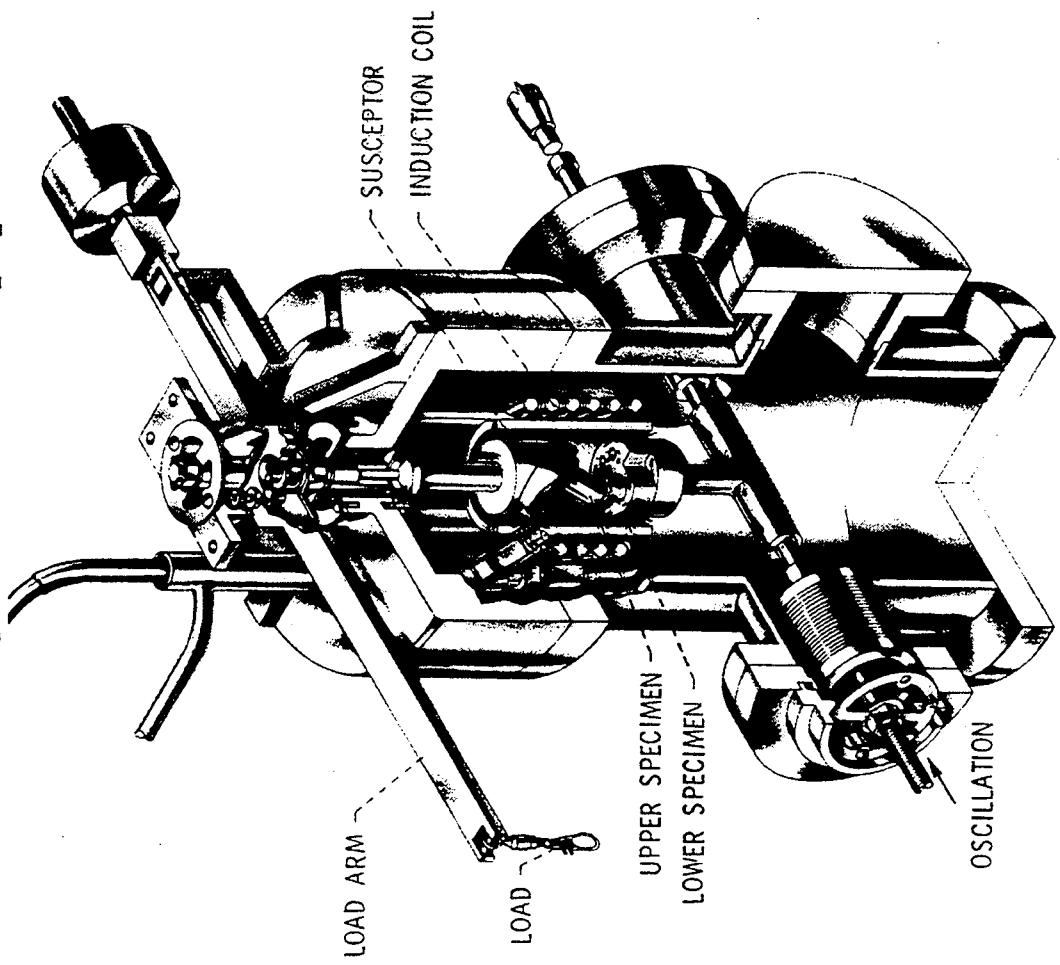


Pin-On-Disk Test Rig*

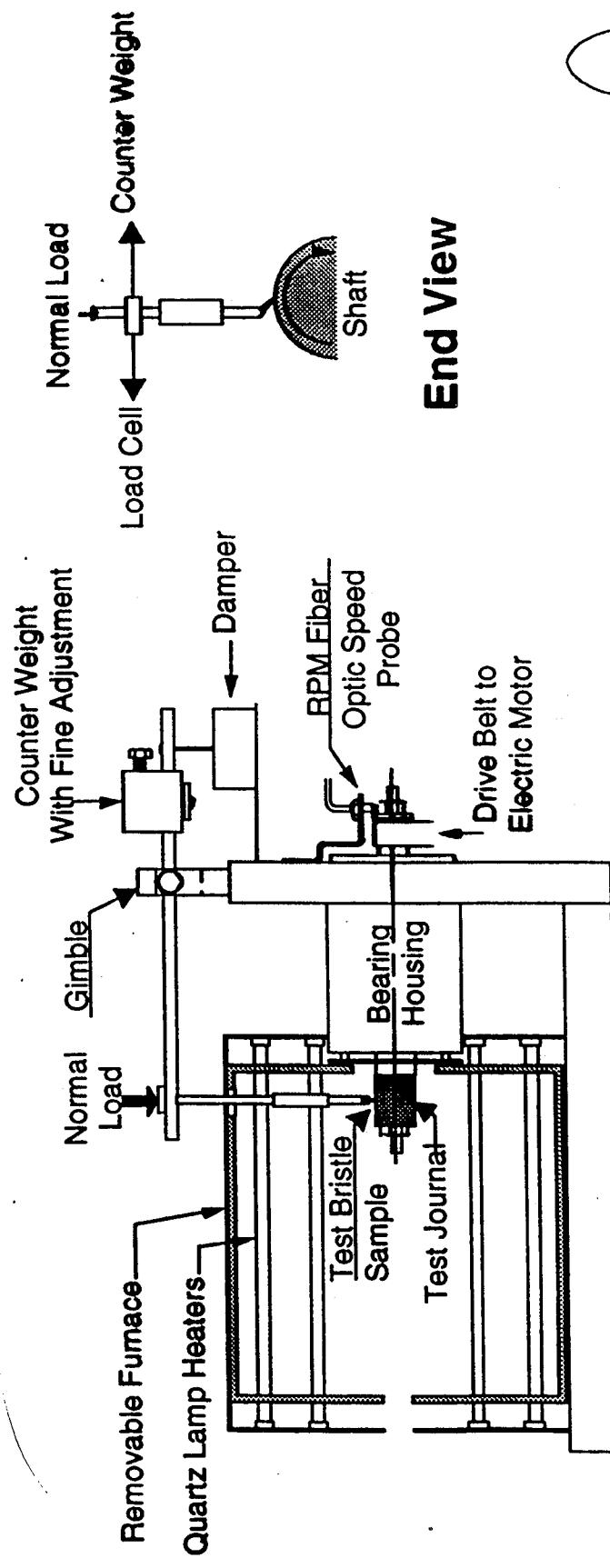


*Tests conducted using inlet air at 25 °C, 50% R.H.

Fretting Wear Apparatus

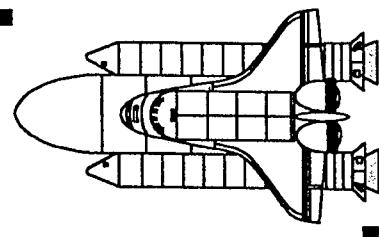


Cross Section and End View of Brush Seal Tuft Tester



Cross Section

End View



Schematic View of High-Temperature, High-Speed Foil Bearing Test Rig

