

NASA GRC CRYOGENIC SEAL TEST RIG CAPABILITY

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# **NASA GRC Cryogenic Seal Test Rig Capability**

Presented by  
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# Cryogenic Seal Test Rigs at NASA GRC



## 1. LO<sub>x</sub> Seal Test Rig

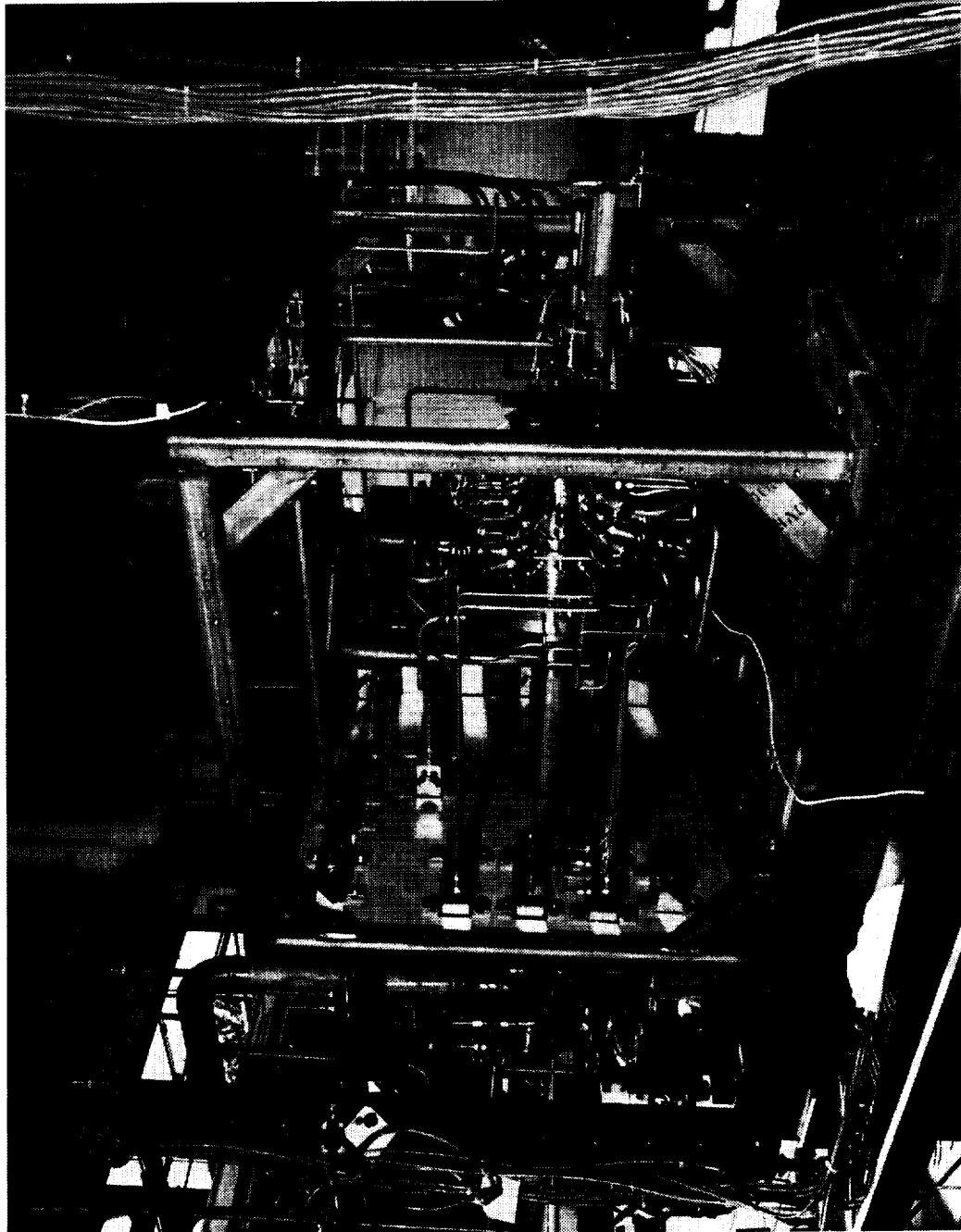
Designed and built by Mechanical Technology Inc. under NASA Contract NAS3-23260 to test seals for liquid oxygen turbopumps.

## 2. Cryogenic Brush Seal Test Rig

- Originally designed and built by Rocketdyne under NASA Contract to test low thrust pumps.
- Modified by NASA to test brush seals in LN<sub>2</sub> and LH<sub>2</sub>.



# LO<sub>x</sub> Seal Test Rig



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# LO<sub>x</sub> Seal Test Rig Capabilities



- 50-mm and 20-mm seal hardware
- Face Seal or Ring Seals
- 750 psi LN<sub>2</sub> or LO<sub>x</sub> seal supply
- 200 psi GHe seal supply
- 100,000 rpm maximum shaft speed (depending on seal)
- 100 Hp GN<sub>2</sub> turbine drive, overhung, radial in-flow
- Axial vibration can be imposed via thrust bearing control



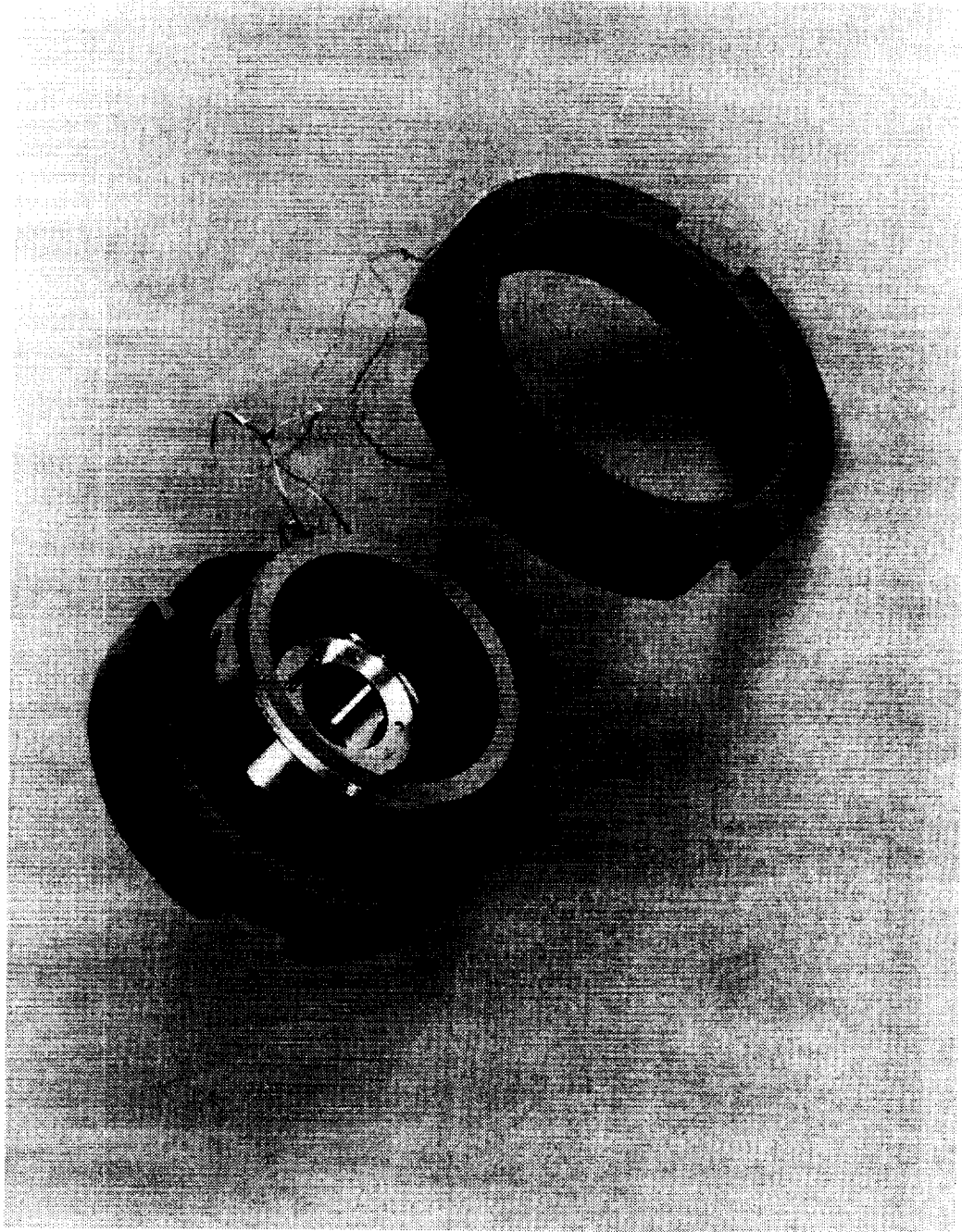
# LO<sub>x</sub> Spiral Groove Face Seal



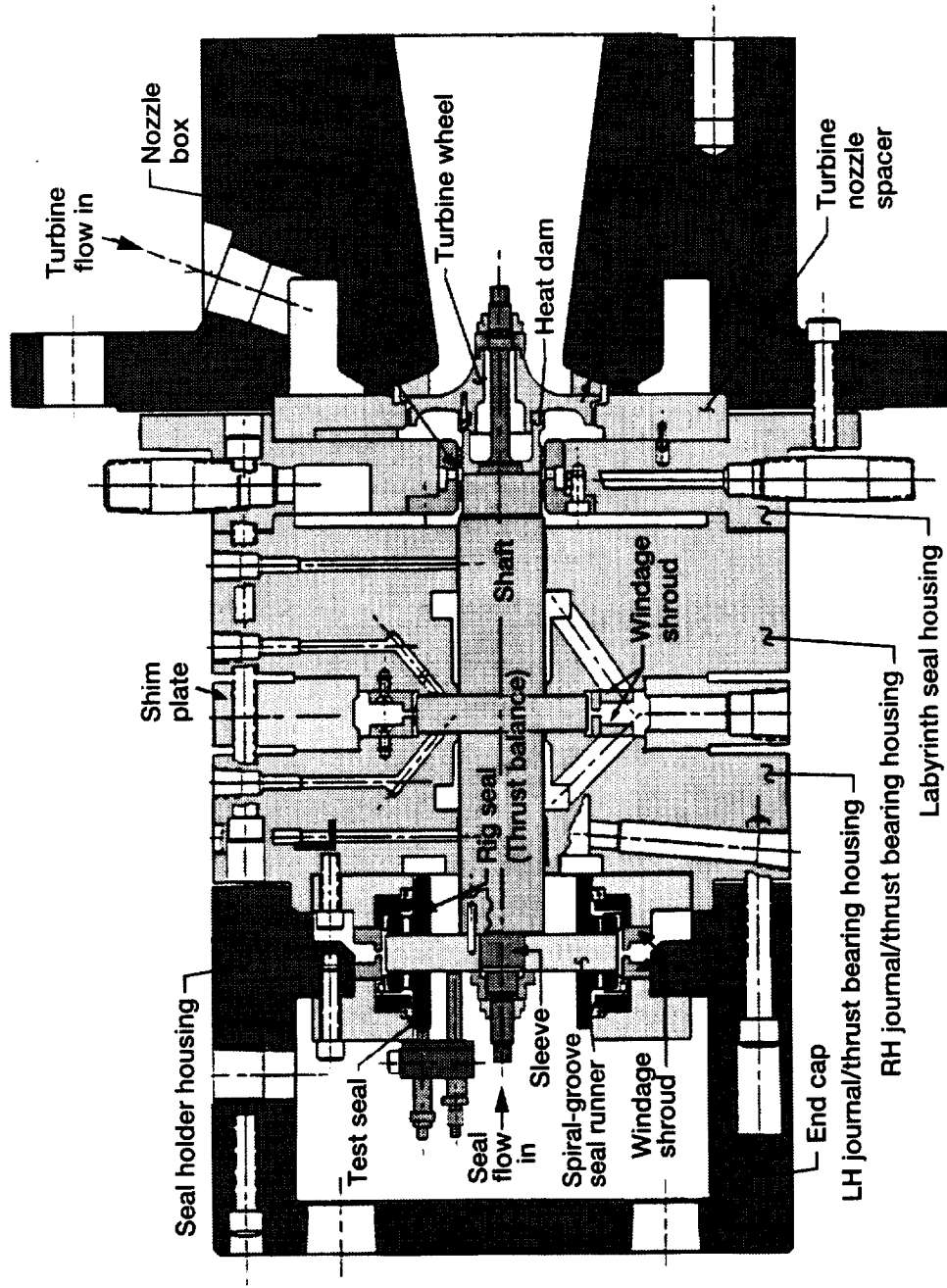
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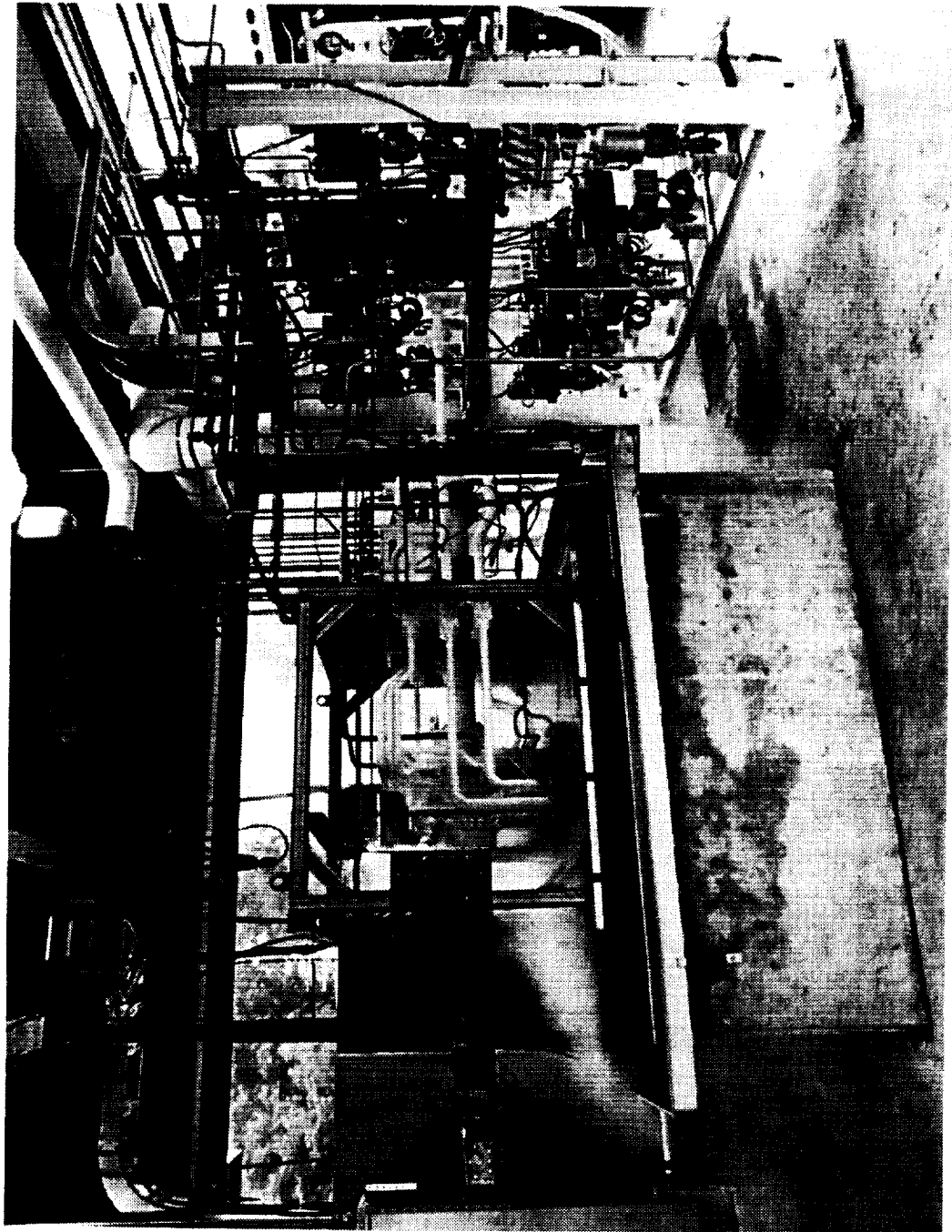
# Raleigh-Step Helium Buffer Seal



# LO<sub>x</sub> Seal Test Rig



# LO<sub>x</sub> Seal Test Rig During Test





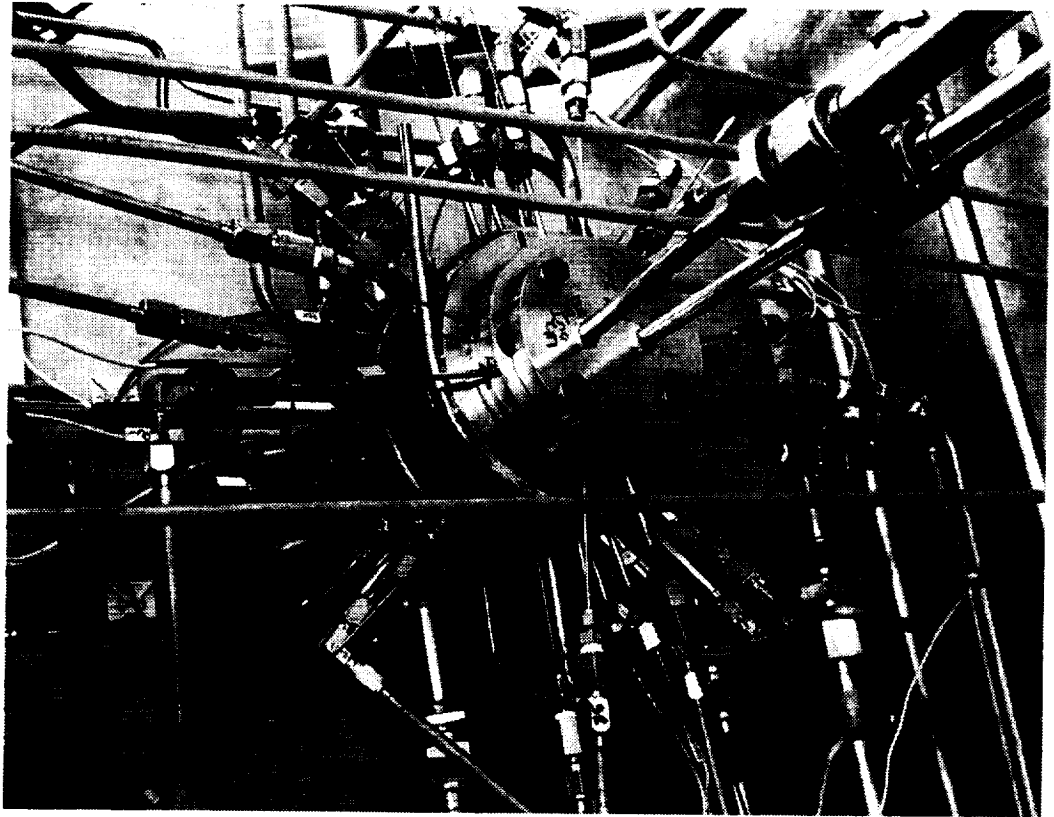
# Cryogenic Brush Seal Test Rig Capabilities



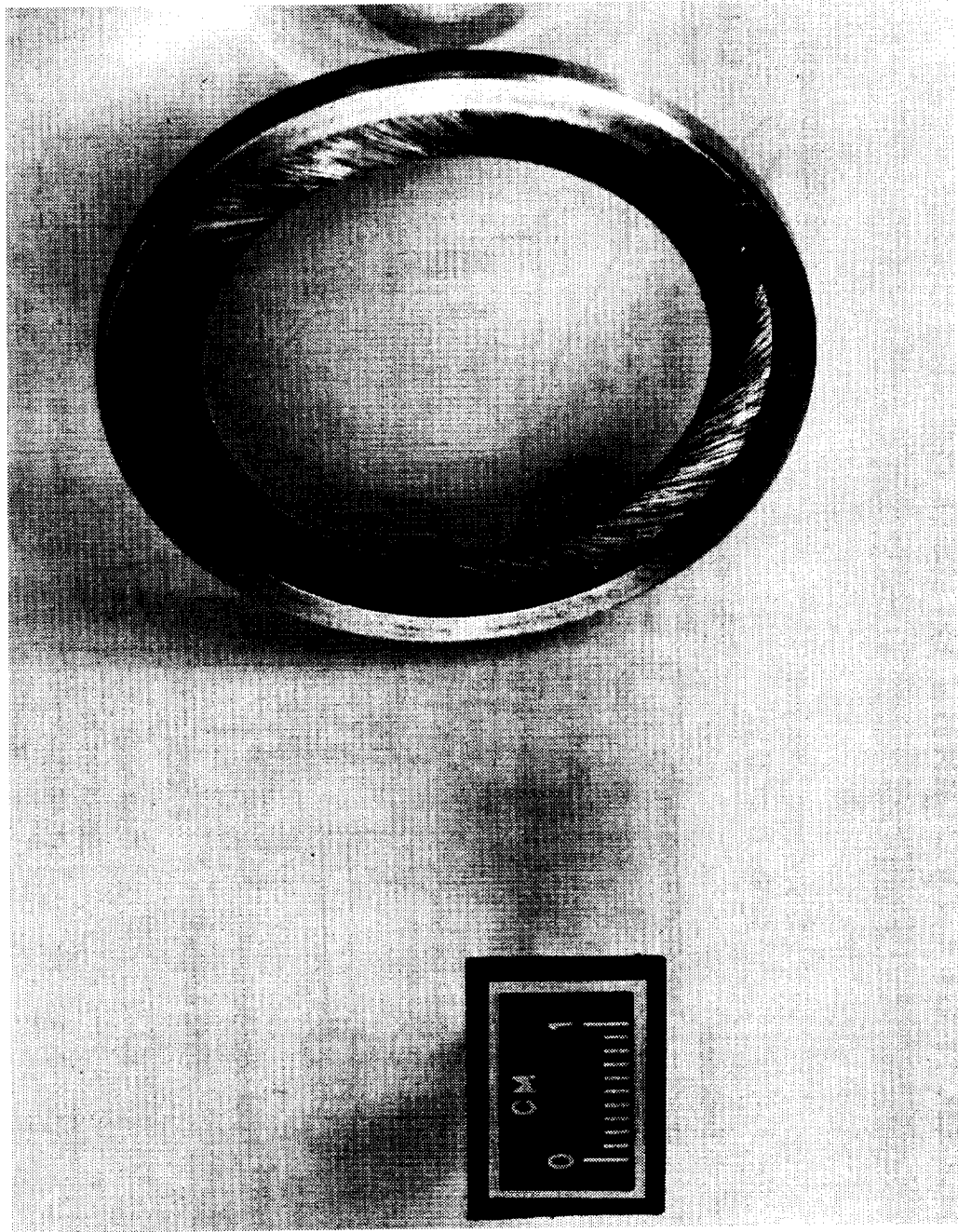
- 2 inch diameter bore seals
- 5 brushes at one time - use long, low speed runner  
maximum speed 40,000 rpm
- 1 brush at a time - use short, high speed runner  
maximum speed 65,000 rpm
- 800 psig MAWP of rig
- Maximum Delta-P across seal is 300 psi  
due to balance piston capability
- LH<sub>2</sub> or LN<sub>2</sub>
- 14 seal temperature measurement locations
- 14 seal pressure measurement locations
- 3 proximity probes measure rotor orbit



# Cryogenic Brush Seal Tester Installation

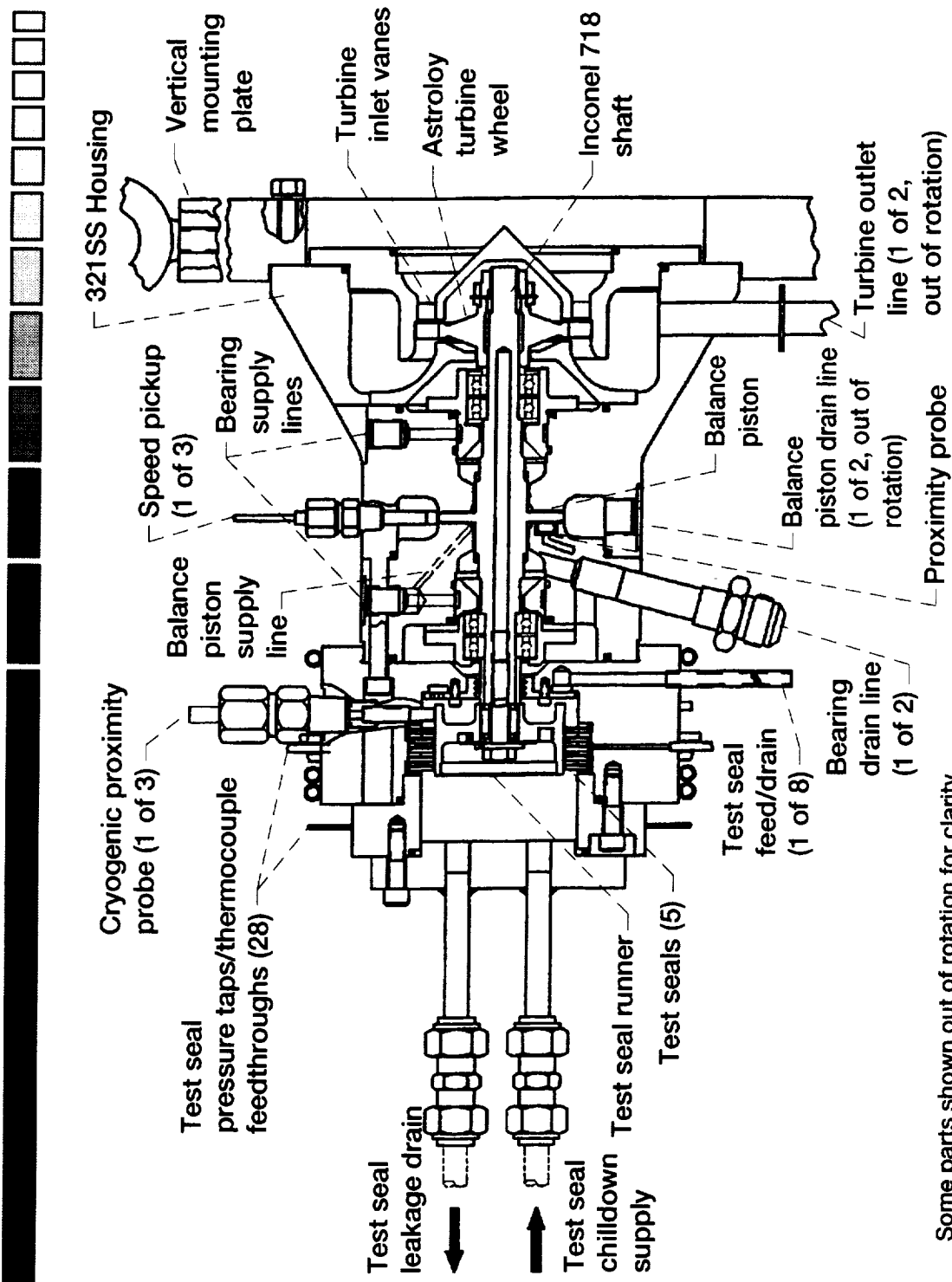


# Typical Brush Seal



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# Cross Section of Cryogenic Brush Seal Tester



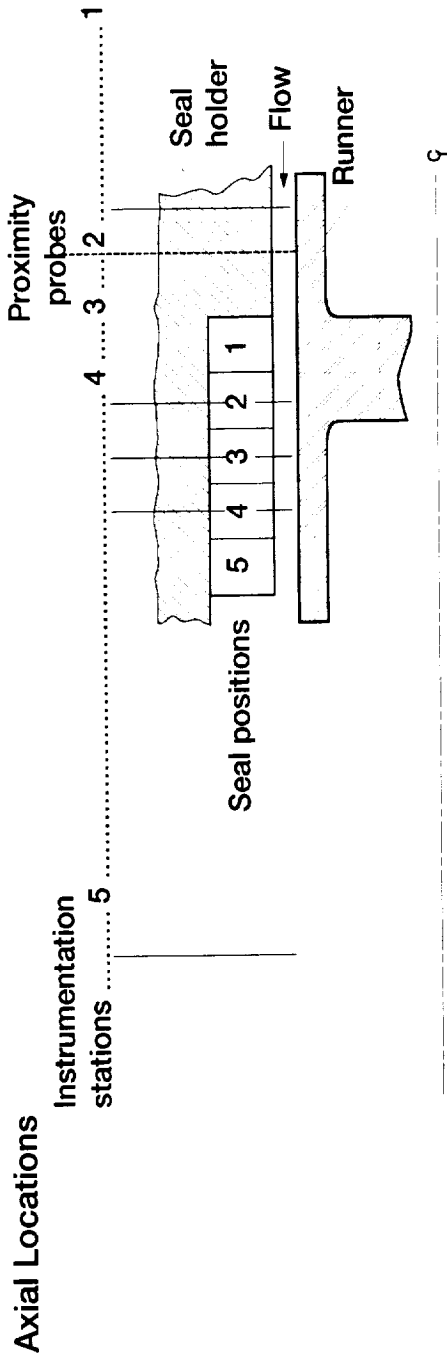
Some parts shown out of rotation for clarity



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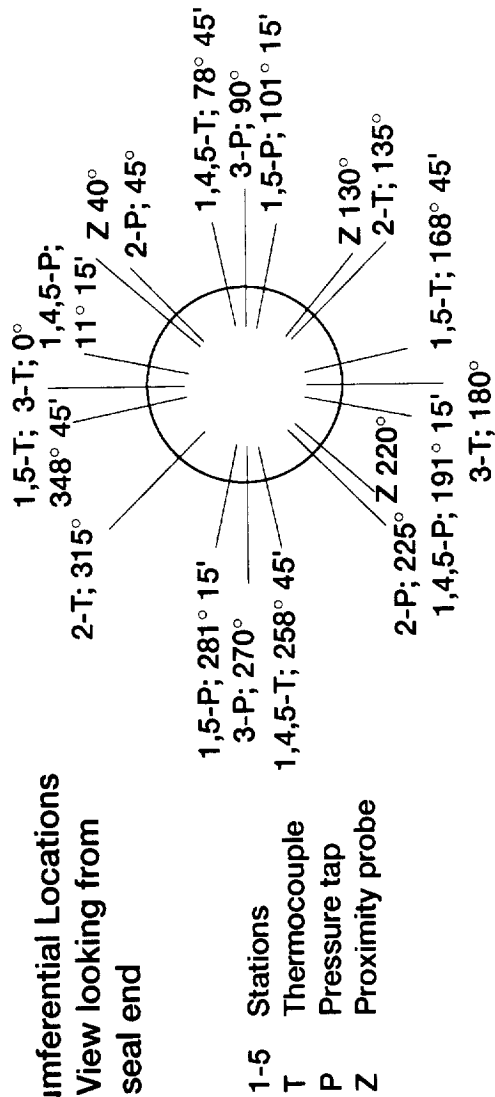
# Location of Brush Seal Positions and Instrumentation Stations

## Low-Speed Runner Shown



### Circumferential Locations

View looking from seal end



# Cryogenic Brush Seal Tester During Test

