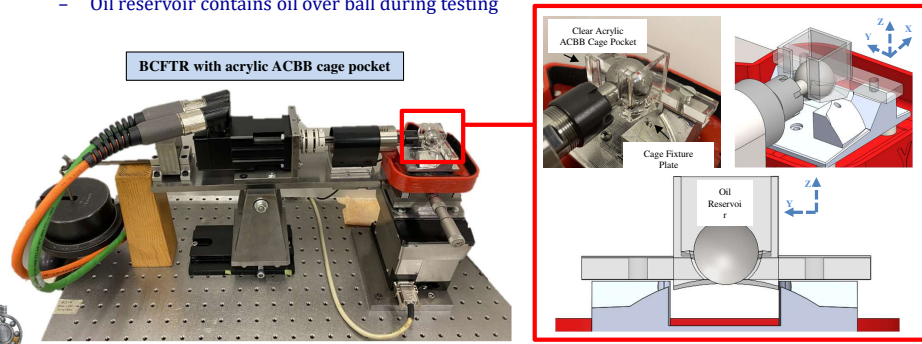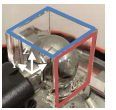# Bearing Cage Friction Test Rig

- **B**earing **C**age **F**riction **T**est **R**ig (BCFTR) enables visualization of oil flow within an isolated bearing cage pocket placed around a rolling element
  - Cage can be positioned relative to ball
  - Range of ball speeds supplied by motor driven spindle
  - A precision 6 axis load cell enables accurate pocket friction measurements
- **T**ransparent **B**earing **C**age (TBC) pockets were designed and manufactured from acrylic for visualization
  - CNC milled with roughness average of 0.8 μm and dimensional tolerance of ±50 μm
  - Oil reservoir contains oil over ball during testing

BCFTR with acrylic ACBB cage pocket

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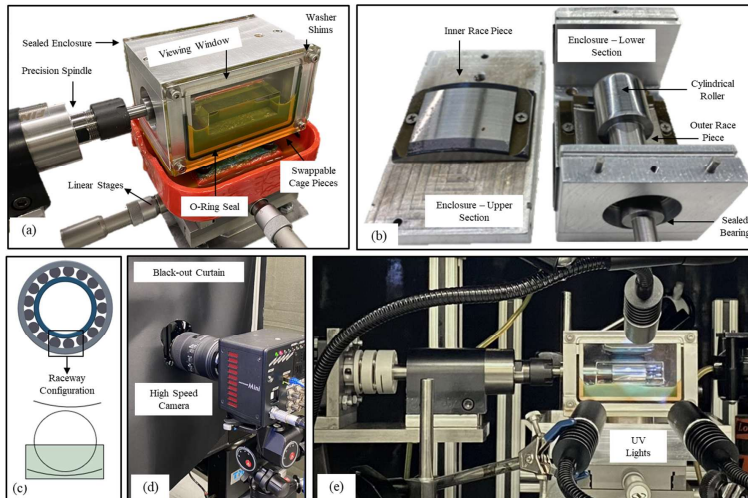

Multiphase CFD Modeling

- Multiphase CFD models were developed in Ansys Fluent to model oil-air distribution imaged from BCFTR
- Models were developed to match experimental conditions and corroborated observed trends
- These multiphase models reached steady state within 1 day of runtime
- CFD Models once validated against experiments can serve as a powerful, cost-effective tool eliminating the test rig development phase when investigating bearing lubricant distribution

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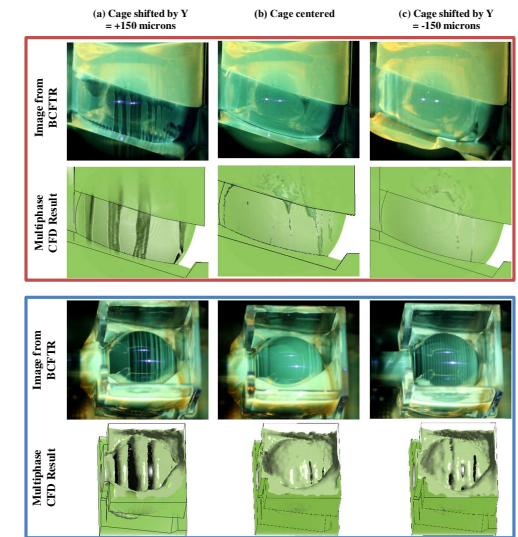
Enclosed Lubrication Environment

- The BCFTR was also retrofitted with a lubricant enclosure setup
- Enabled testing at various oil fill levels for a cylindrical rolling element

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Cage Pocket Friction and Lubrication

- Multiphase models were developed to match experimental conditions
- Cage pocket friction was calculated from precision load cell; modeling demonstrated similar trends
- Lubricant distribution within the pocket was tested for range of conditions and cage geometries

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