



**S&T Campaign: Sciences for Maneuver
Energy and Propulsion**

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Research Facility

EXPERIMENTAL TRIBOLOGY

ARL's tribology lab is used to study fundamental friction, wear, and lubrication phenomena.

WAM14 Ball-on-Disc Tribometer

- High-speed, high-load tribological conditions
- Entrainment and sliding velocities >30 m/s, contact pressure >2.5 GPa, variable skew, temperatures up to 200°C
- Lubricant and material studies
- Simulate gear and bearing contacts
- Isolate specific failure mechanisms

CETR UMT-3 Tribometer

- Reciprocating contacts
- Hot hardness measurements
- Reconfigurable to conduct many standard ASTM tests

LSM700 Confocal Laser Scanning Microscope

- Three-dimensional surface topology
- Bright-field, dark-field, cross-polarized, and luminescence microscopy



WAM14 High-Speed Ball-on-Disc Tribometer



CETR UMT-3 Tribometer



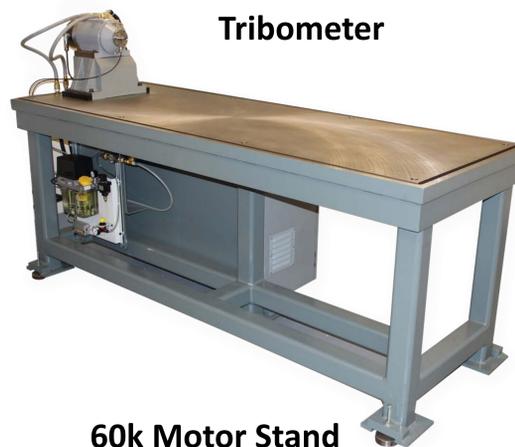
LSM700 Confocal Laser Scanning Microscope

HIGH-SPEED MECHANICAL COMPONENTS

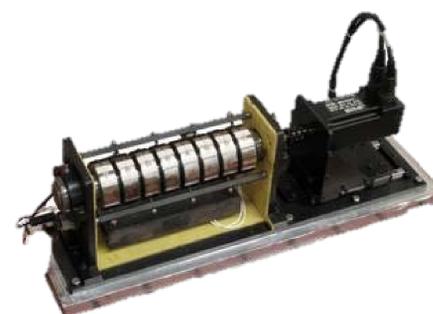
ARL's mechanical components lab is used to study the properties of powerplant and drivetrain mechanical components up to speeds typical of turboshaft engines.

60k Motor Stand and 30k Motor Stand

- 40 hp with a maximum speed of 60,000 rpm
- 60 hp with a maximum speed of 30,000 rpm
- Flexible testbeds that can be adapted to many configurations
- Air/oil seal research
- UAV bearing fatigue research
- Tower shaft gearing research
- Dynamic reverse gear tooth bending
- High-speed rolling element bearings
- Ceramic and/or ceramic hybrid bearings



60k Motor Stand



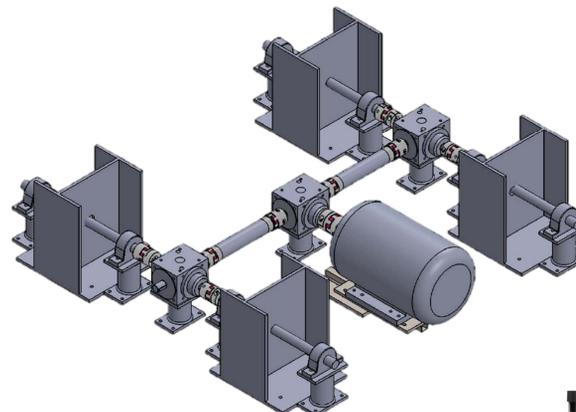
Degraded Grease Bearing Rig

Degraded Grease Bearing Rig

- Mechanical and environmental breakdown of grease lubrication in critical aviation bearings through accelerated bearing testing
- Accelerated grease aging
- 5000 rpm, lateral loading, 170°C

Universal Bearing Research Rig

- Four independent bearing test modules
- Motor: 20 hp, 5000 rpm



Universal Bearing Research Rig

Gear Fatigue Research Rigs

- Two 22 kip load frames operating up to 200 Hz
- Single gear tooth crack initiation and propagation
- Effect of materials, heat treatments, surface engineering, and coatings on durability



Gear Fatigue Research Rigs