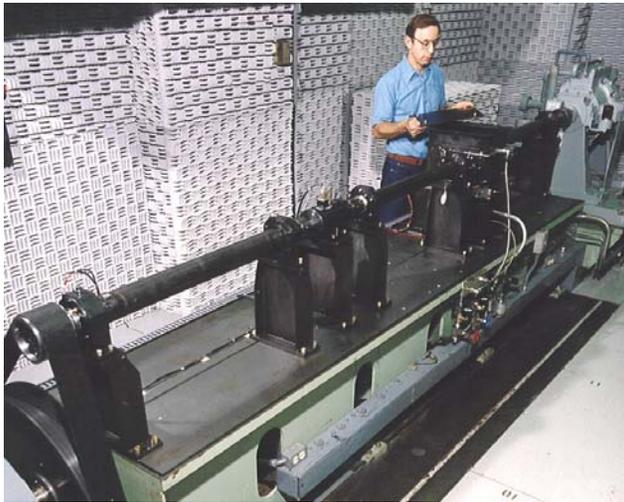
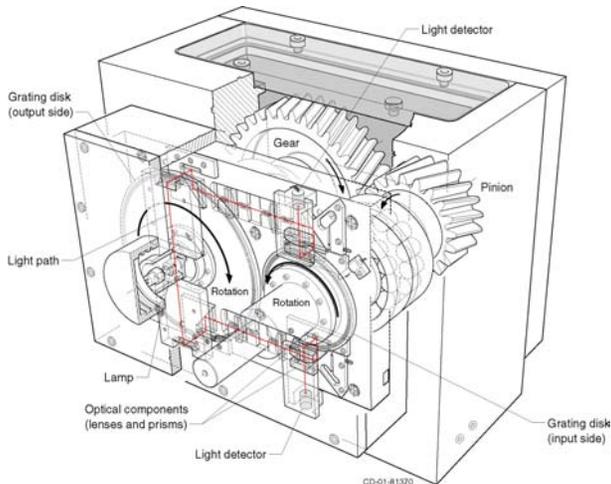


Gear Noise/Dynamics Rig

- Allows study of gear dynamics and gear noise
- Single-mesh gearbox for spur or helical gears
- Instrumented for noise, vibration, strain and transmission error measurements
- Speeds up to 10,000 rpm (input), 6000 rpm (output)
- Powered by 150 kW variable speed electric motor through poly-V belt speed increaser drive
- Loaded by eddy-current dynamometer



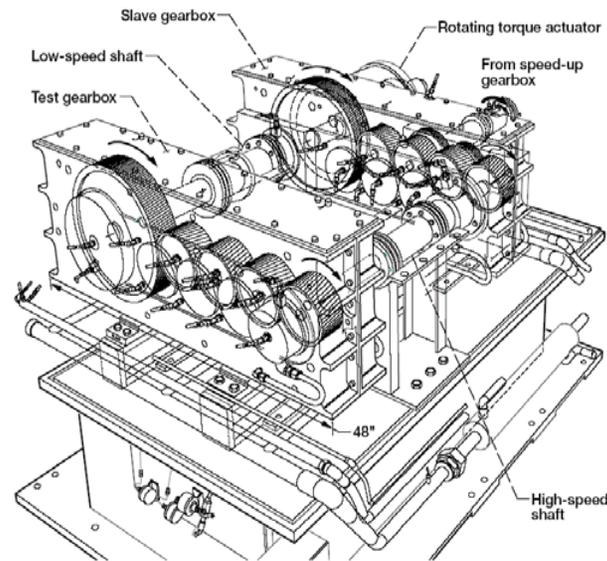
Gear noise/dynamics rig



Gear transmission error measurement system

High-Speed Helical Gear Test Facility

- To study thermal behavior in high-speed helical gears
- Closed-loop, torque-regenerative system with test gearbox and mirror-image “slave” gearbox
- Each gearbox has input gear, three idlers, and bull gear
- Power level to 4000 kW (5000 hp)
- Control of lube oil pressure, flow, and temperature
- Oil protected by 3 micron filters
- Rig operates at various torque levels and speed
- Powered by 400 kW (500 hp) DC drive motor



High-speed helical gear test facility

For further information about Mechanical Components Branch research and facilities, please see our web site: www.grc.nasa.gov/WWW/5900/5950/, or call Dr. Robert Handschuh, 1-216-433-3969, or write to
Mechanical Components Branch, MS 23-3
NASA Glenn Research Center
Cleveland, OH 44135

Mechanical Drives Test Facilities

Overview of facilities of the Mechanical Components Branch at NASA Glenn Research Center

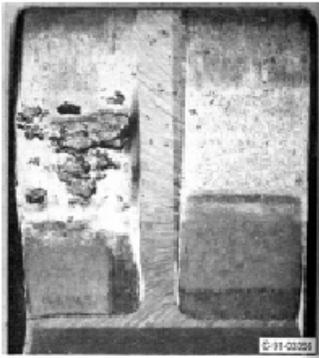
The Drives Team conducts research on transmissions and gearing for rotorcraft and for advanced gas turbine propulsion systems for conventional aircraft. The primary goals of the drives team are to improve safety, reduce weight and noise while increasing life and reliability of gears and transmission systems. This research involves advanced transmission concepts, transmission load distribution, drive system diagnostics and health monitoring, gear failure mechanisms, gear materials, gear tooth surface improvement and lubricants, gear vibration and noise, gear thermal analysis and optimization programs to develop improved methods for transmissions design and analysis.

Spur Gear Fatigue Rigs

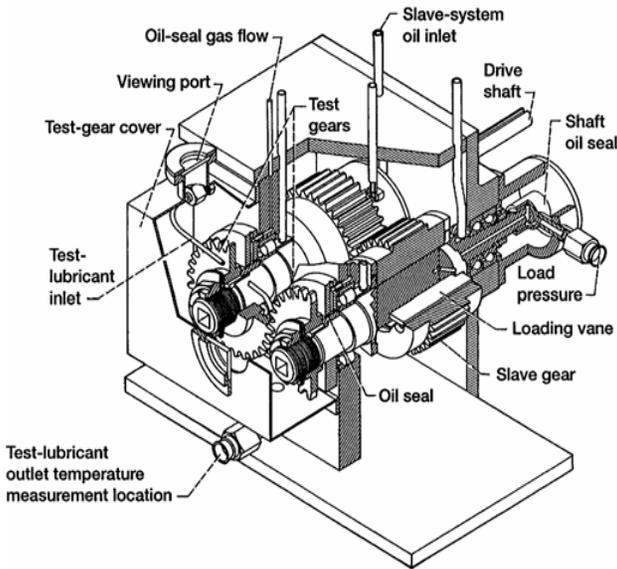
- Provides accelerated pitting fatigue life testing for standard spur gears
- Standard gears are 88.9 mm (3.5") pitch diameter, 6.3 mm (1/4") face width spur gears
- 10 000 rpm test speed
- Typical Hertz contact stress 1.7 GPa (250 ksi)
- Investigates effect of materials, heat treat, shot peen, lubricants, etc.
- Gears usually tested offset (1/2 of tooth face loaded).
- Supports gear health & usage monitoring experiments
- Used for gear surface fatigue research since 1972



Test gears in spur gear fatigue test rig



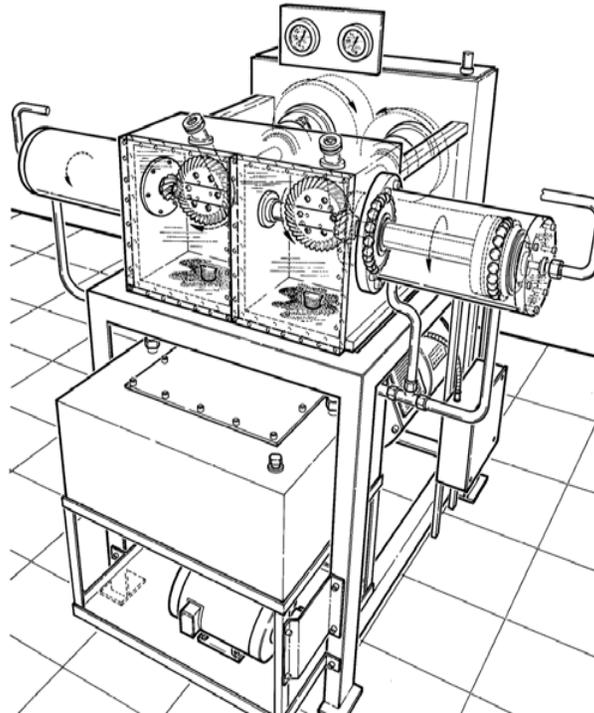
Typical fatigue failure on left side of test gear tooth.
(In a different test, the right half did not fail.)



Spur gear fatigue test rig schematic

Spiral Bevel or Face Gear Rig

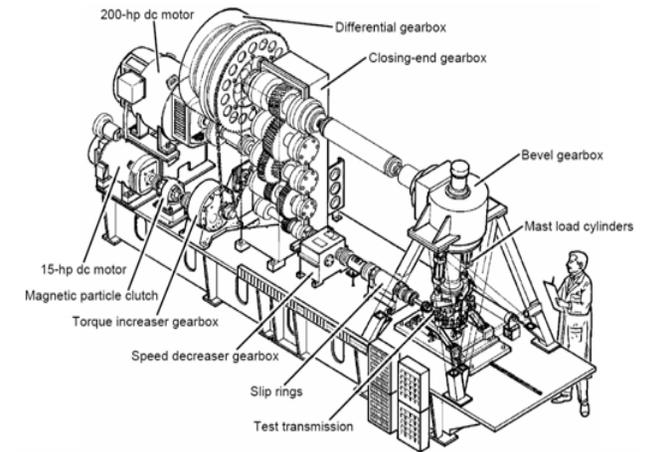
- Spiral bevel or face gears to 560 kW (750 hp), pinion speed to 20,000 rpm, output speed to 5000 rpm, torque adjustable during operation
- Standard gears 12-tooth test pinion and 36-tooth gear, 25.4 mm face width, 90 degree shaft angle
- Investigates thermal behavior, surface fatigue, strain, vibration and noise
- Study effects of gear tooth design, materials, and lubrication on fatigue strength



Spiral bevel or face gear test rig

Helicopter Transmission Test Stand

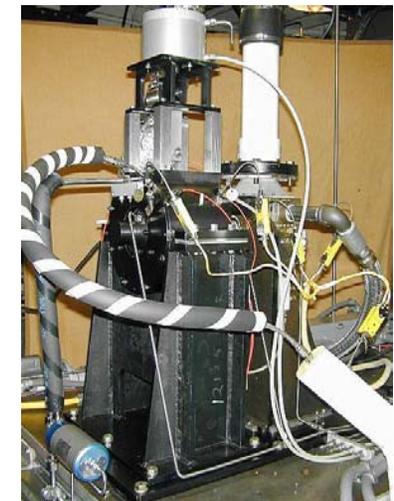
- Full-scale, single-input helicopter main-rotor transmission testing.
- Capacity: 400 kW (500 hp), single input 6,200-36,000 rpm, output 350 rpm.
- Closed-loop arrangement, differential torque loading mechanism.
- Research: stress, deflection, efficiency, noise, vibration, diagnostics and gear configuration.
- Accelerometers, thermocouples, and chip detectors for health and condition monitoring.
- Transmissions tested include Army OH-58 helicopter transmission, hybrid and bearingless planetary designs
- Simulates transmission mast lift and bending loads
- Powered by 150 kW (200hp) variable speed electric motor



Helicopter Transmission Test Stand

Oil Journal & Thrust Bearing Rig

- Tests fluid film thrust journal bearings to 100 mm (4") dia and 50 mm (2") length
- Speed to 25,000 rpm, radial loads to 13 kN (3000 lbs), axial loads to 1300 N (300 lbs)
- Oil pressure to .55 MPa (80 psi), temp. to 370°C
- Steady-state and dynamic loading
- Arbitrary start-stop cycles
- Oil supply conditions: normal, starvation, start-stop



Oil Journal & Thrust Bearing Rig