



Development and Validation of Advanced Gear and Drive Systems

TECHNOLOGY OPPORTUNITY

Over the past 30-plus years, NASA's Glenn Research Center (GRC) has been conducting pioneering research on advanced gear and drive systems technologies. GRC's research and development of novel gear materials, lubrication formulations and applications, and super finishing technologies have helped to significantly increase the reliability and power-to-weight ratio of modern rotorcraft drive systems. GRC's expertise in these and other advanced drive system technologies combined with its unique test facilities represent a national asset that can, through partnerships, provide a competitive edge for U.S. industry.

BENEFITS

U.S. industries can leverage GRC's expertise, testing data, and state-of-the-art facilities to develop new products and enhance competitiveness in the marketplace:

- GRC expertise in advanced drive systems technologies can be leveraged for industrial applications where reduced weight and increased durability of drive systems substantially impacts product competitiveness.
- GRC gear component test facilities have over 30 years of data on the effects of gear materials, lubrication, and surface finish on gear tooth surface fatigue life.
- New test facilities have recently been added to provide experimental validation in new research areas such as high cycle gear tooth bending fatigue, gear windage losses, and vapor mist lubrication.





EXPERTISE AT GRC IN ADVANCED GEARING AND DRIVE SYSTEMS TECHNOLOGIES

Gear Fatigue

- Extensive database documenting the effects of material, lubrication, etc., on gear fatigue life

High-Speed Gear Lubrication

- Gear system thermal and windage modeling
- Advanced lubrication concepts (e.g., vapor mist and additives)

Mechanical Systems Diagnostics and Prognostics

- Gear and bearing damage detection methods
- Data fusion technology to improve reliability and reduce false alarms

Gear Fatigue Crack Modeling

- High-fidelity, experimentally validated three-dimensional modeling of gear fatigue crack growth

Gear Geometry

- Novel gear concepts, including high pressure angle gears and face gears

Bearings

- State-of-the-art rolling element bearing analysis capabilities



EXPERIMENTAL FACILITIES AT GRC IN ADVANCED GEARING AND DRIVE SYSTEMS TECHNOLOGIES

Gear Surface Fatigue Test Facilities

- Capable of gear tooth surface durability and wear, fatigue, scoring, and dynamics testing. Four test rigs available, including two capable of testing well beyond the material and lubrication limits of current technology

Gear Bending Fatigue Test Facility

- Capable of conducting gear tooth bending fatigue tests at up to 1000 cycles per second, allowing for high cycle fatigue tests to be completed in weeks

High-Speed Helical Gear Test Facility

- Capable of conducting high-speed gear lubrication and oil research

Gear Windage Test Facility

- Capable of conducting high-speed gear windage tests at pitch line velocities of up to 55,000 ft per minute

Gear Noise and Dynamics Test Facility

- Capable of isolating and measuring vibration and noise of test gear mesh in a semi-anechoic chamber environment

Bevel Gear Test Facilities

- Capable of testing durability and dynamics of right angle gear drives, including bevel gears and newly developed face gears

LICENSING AND PARTNERING OPPORTUNITIES

Glenn's Office of Technology Partnerships and Planning seeks to transfer technology to and from NASA to benefit the space program and U.S. industry. NASA Glenn offers partnership opportunities for the development and validation of advanced gear and drive systems.

FOR MORE INFORMATION

For more information about this and other technology licensing opportunities, please contact

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