Turbomachinery operates at extreme conditions, often at the design limit of components such as turbine blades, bearings, and rotors. Analysis of damaged or failed components with advanced materials for both substrates and coatings requires an integrated approach to understanding the material, environmental, and operational conditions that contributed to the failure.

For more than 50 years, Southwest Research Institute® (SwRI®) engineers have conducted coordinated, multidisciplinary investigations of turbomachinery failures and related materials characterization and testing. SwRI has extensive expertise in turbomachinery materials and comprehensive analytical and test capabilities including:

- **Metallurgical examinations** of failed components to determine active damage mechanism(s) and initiation sites, generate remaining life estimations from fractography, and compare measured material properties against specification requirements.

- **Mechanical testing** of turbomachinery materials to better predict structural performance in application. SwRI has broad expertise in fatigue and fatigue crack growth rate testing in environments including high humidity, high temperatures, and high pressures.

- **Fracture mechanics** and fatigue crack growth software for deterministic and probabilistic prediction of safe operating lifetime and failure conditions. The SwRI-developed NASGRO® and DARWIN® programs are widely used in the turbomachinery industry.

- **Environmental monitoring** to provide advance warning of potential corrosion problems. Corrosion sensors or witness coupons can alert equipment operators when ingested air is causing corrosion rates to be higher than expected.

- **Corrosive environment material qualification testing** to ensure that selected materials are appropriate for their intended service environments, which may include high temperatures, high pressures, and aggressive chemistries.
Metallic coupons are prepared for oxidation/sulfidation testing in gaseous hydrogen sulfide at elevated temperature and pressure.

A creep frame measures mechanical properties of turbine materials in aggressive gaseous and liquid environments.

An SwRI technician prepares environmental test cells to simulate corrosion attack under service conditions.

We welcome your inquiries. For additional information, please contact:

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