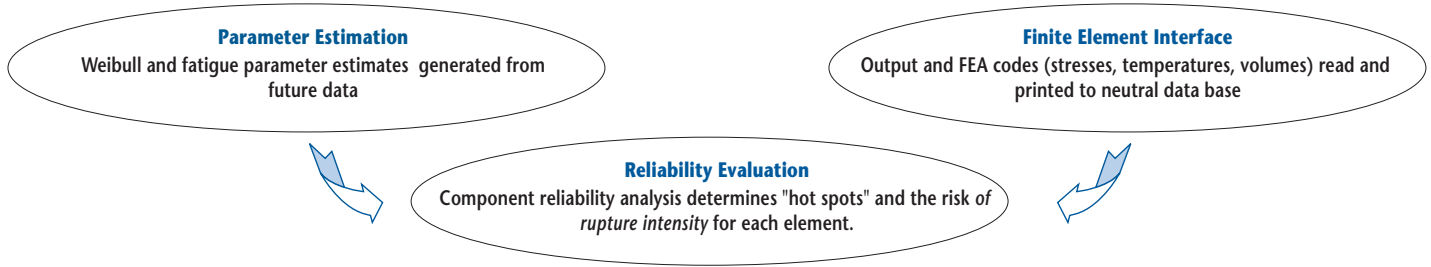# Integrated Reliability Assessment Software

The Integrated Reliability Assessment Software (IRAS) fills the need for a prediction methodology that determines the probability that a ceramic structural component will survive in a gas turbine for a useful operating lifetime.

Key Elements of Life Prediction Analysis

Parameter Estimation
Weibull and fatigue parameter estimates generated from future data

Finite Element Interface
Output and FEA codes (stresses, temperatures, volumes) read and printed to neutral data base

Reliability Evaluation
Component reliability analysis determines "hot spots" and the risk *of rupture intensity* for each element.
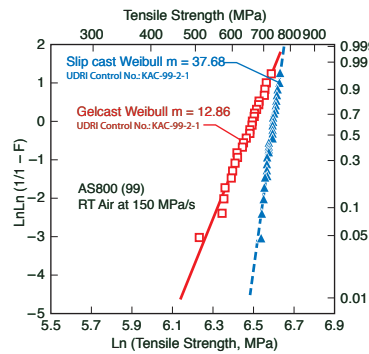
Challenges

Input data must be collected from disparate sources (such as materials suppliers, research laboratories, and universities).

Most reliability algorithms do not possess a user-friendly process for varying properties, thus making it difficult to model components having maximum reliability.

IRAS links a mechanical-properties database to a specific finite element analysis. With IRAS, the user can
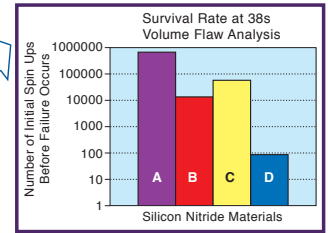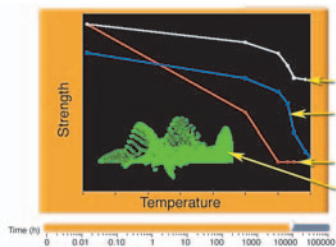- generate an input file for the CARES-Life Reliability Assessment software,
- adjust the strength to account for both slow crack growth and creep, and
- determine the effect of the Weibull modulus and the slow crack growth exponent upon the probability of survival.

Data Input for Materials Composition

Numerical and Analytical Modeling of Rotor

Rotor

Temperature Map

Stress Map

Inert Strength
Strength Limited by Slow Crack Growth
Creep Strength
Stresses & Temperatures in Component

Survival Rate at 38s
Volume Flaw Analysis

Benefits

With IRAS, end users can readily screen ceramics to obtain the best material for their applications.

If existing materials do not have the needed reliability requirements, IRAS can provide target properties for new or improved materials. IRAS is also user-friendly and facilitates manipulation of the variables that affect component reliability.

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