

Reliability Engineering

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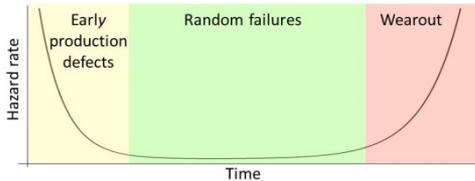
Reliability Engineering

Tools and capabilities to provide lifecycle support for high-reliability mission-critical systems

BACKGROUND & MOTIVATION

Current practice in reliability is often fragmented, does not cover the full system lifecycle

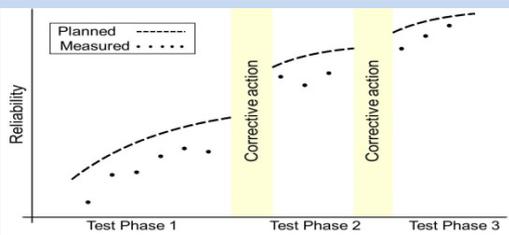
- Reliability needs to be addressed in design, development, and operational life
- Reliability analysis should integrate information from components and systems



INNOVATION

Integrate proven reliability methods with world-class statistical science

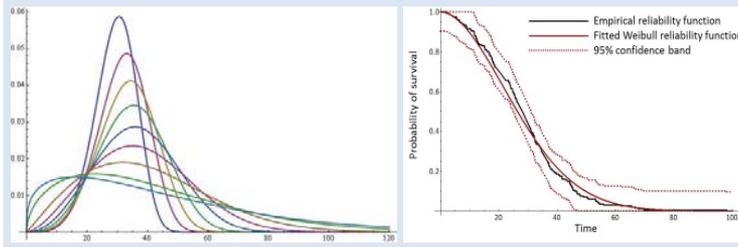
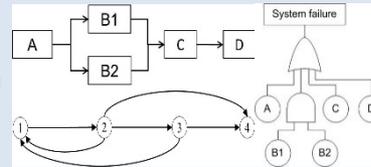
- Use methods and tools appropriate to each phase of the system lifecycle
- Target reliability growth and measure progress
- Integrate component and system models
- Use advanced statistical methods



DESCRIPTION

LANL's Statistical Sciences Group has a record of leadership in reliability science and technology

- Design for reliability: FMEA, fault trees, event trees, reliability block diagrams, flowgraph models, Bayesian predictive modeling
- Reliability growth models and measurement during system development
- Operational reliability: system health assessment, predictive life models
- Statistical tools, synergies with other capabilities: Design of experiments, accelerated aging/failure models, Bayesian methods with expert elicitation of priors, flowgraph analysis /algorithms, Monte Carlo simulation, Gaussian process models, uncertainty quantification
- Industry-standard COTS software if available, custom coding when needed
- Wide range of applications and subject-area knowledge
- Long record of peer-reviewed papers and project successes

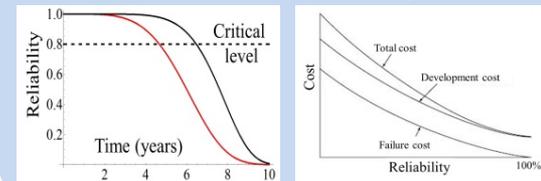


TRL 6: We have combined industry-standard software and analysis techniques with custom coding to provide integrated solutions for reliability prediction and analysis for a variety of systems inside and outside LANL.

ANTICIPATED IMPACT

Lower lifecycle costs by delivering a reliable product faster, with less downtime and reduced maintenance

- Total cost is lower in every phase when reliability engineering is integrated
- Reliability methods are also applicable in other areas, such as risk analysis and biomedical survival analysis



PATH FORWARD

Continue to develop new methods while delivering high-quality support to existing customers

- Maintain a high level of expertise in reliability-related science and technology
- Document and encourage the use of standard processes for reliability management
- Seek new customers and new challenges

Potential End Users:

- LANL programs, other agencies, external industry customers

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