

Accelerated Reliability Solutions Seminar ARS110:

Fundamentals of Accelerated Reliability Improvement Using Highly Accelerated Limit Test (HALT) and Highly Accelerated Stress Screening (HASS)

Revised May 2026

Course Overview

This course provides a practical and engineering-focused introduction to accelerated reliability improvement methodologies used to identify, precipitate, and eliminate latent reliability weaknesses in electronic products and systems. Emphasis is placed on the application of Highly Accelerated Life Testing (HALT), Highly Accelerated Stress Screening (HASS), and related step stress techniques to improve product robustness, reduce field failures, and accelerate design maturity.

Participants will gain an understanding of the physical mechanisms that drive electronic failures, the limitations of traditional reliability prediction approaches, and the use of environmental stress methods to discover real-world reliability risks before products reach customers.

The course combines theory, industry case studies, and practical implementation guidance suitable for engineering, quality, manufacturing, and reliability professionals.

Learning Objectives

Upon completion of this course, participants will be able to:

- Understand the principles and objectives of accelerated step stress testing
 - Recognize the limitations of traditional reliability prediction methodologies
 - Identify common electronic failure mechanisms and their relationship to environmental stress
 - Apply HALT and HASS methodologies to improve product robustness
 - Develop appropriate environmental stress profiles for electronic hardware
 - Distinguish between common-cause and special-cause failures
 - Utilize stress testing as a design evaluation and process improvement tool
 - Interpret stress test results to support corrective action and reliability growth
 - Optimize screening processes for manufacturing and field reliability improvement
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Course Topics

1. Introduction to Accelerated Reliability Improvement

- Why are accelerated step stress methods used
 - Challenges associated with traditional reliability prediction
 - Variation in end-use environments and lifecycle stress
 - Using stress to discover root causes and eliminate weak links
 - Relationship between robustness and field reliability
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2. Historical Development of Environmental Stress Testing

- Evolution of reliability engineering practices
 - Military Handbook 217 and early prediction methodologies
 - Burn-in and screening approaches of the 1970s
 - NAVMAT P-9492 and the development of environmental stress screening
 - Emergence of modern HALT, HASS, and commercial best practices
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3. Failure Mechanisms and Environmental Stress

- Electronic component failure mechanisms
 - System-level stress interactions
 - Thermal, vibration, and combined environmental effects
 - Physics-of-failure concepts
 - Acceleration of electronic degradation mechanisms
 - Wear-out versus latent defect failures
 - Limitations of MTBF as a measure of electronic reliability
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4. Common-Cause and Special-Cause Failures

- Definitions and reliability implications
 - Examples of common-cause failures
 - Examples of special-cause failures
 - Detection and precipitation methods
 - Role of HALT and HASS in identifying systemic and intermittent defects
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5. Environmental Stress Stimuli

- Types of environmental stress stimuli
 - Thermal stress methods
 - Vibration stress methods
 - Multi-axis and combined stress applications
 - Determining appropriate stress levels
 - Practical considerations for stress application
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6. Highly Accelerated Life Testing (HALT)

- Objectives and methodology of HALT
 - Test planning and preparation
 - Step stress approaches for electronic systems
 - Single-stimulus versus combined-stimulus testing
 - Determining appropriate stress limits
 - Relevance of high-stress failures to field reliability
 - Required equipment, instrumentation, and personnel
 - Data collection and analysis techniques
 - Use of HALT during product development and design validation
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7. Highly Accelerated Stress Screening (HASS)

- Purpose and implementation of HASS
 - Developing production screening profiles
 - Determining appropriate screening stress levels
 - Proof-of-screen methodologies
 - Ensuring screens do not damage acceptable products
 - Integration into manufacturing processes
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8. Highly Accelerated Stress Audit (HASA)

- Purpose and application of HASA
 - Periodic audit strategies for manufacturing quality control
 - Examples of electronic system screening processes
 - Long-term monitoring and process verification
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9. Optimization of HALT and HASS Processes

- Determining when screening should be modified or discontinued

- Optimization of thermal and vibration fixturing
 - Continuous improvement through screen feedback
 - Process control and corrective action integration
 - Long-term reliability growth strategies
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10. Additional Applications of Environmental Step Stress

- Supplier benchmarking and component selection
 - Competitive product robustness evaluation
 - Detection of intermittent and “No Defect Found” (NDF) failures
 - Use of stress methods for troubleshooting marginal hardware conditions
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Intended Audience

This course is intended for:

- Reliability Engineers
 - Design Engineers
 - Quality Engineers
 - Manufacturing Engineers
 - Test Engineers
 - Product Development Teams
 - Technical Managers and Program Leaders
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Delivery Format

Available as:

- On-site instructor-led seminar
- Virtual live training
- Customized corporate workshops
- Technical consulting integration sessions

Course duration and technical depth may be tailored to organizational needs and participant experience levels.

About Accelerated Reliability Solutions, LLC

Accelerated Reliability Solutions provides practical reliability engineering expertise focused on discovering and eliminating real-world product reliability risks through advanced accelerated testing methodologies, physics-of-failure analysis, and robust design improvement practices.