



Attendees enjoying
an open Seminar

1. COMPREHENSIVE HALT & HASS 2. HALT & HASS HANDS-ON WORKSHOP

HALT and HASS seminars are presented by
the Inventor of HALT & HASS, Gregg K. Hobbs, Ph.D., P.E.

**Hobbs Engineering offers 18 how-to seminars on accelerated reliability presented by
recognized leaders in their respective fields.**

These are the famous seminars that teachers, engineers and managers have been speaking about.



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**Join us - Spring or Fall -
at the 2006 ARTS Symposia
WEST and EAST**



OBJECTIVE

These classes equip participants with detailed technical knowledge of HALT (Highly Accelerated Life Tests) and HASS (Highly Accelerated Stress Screens). This will enable you to successfully initiate world-class highly accelerated design margin enhancement programs and highly accelerated production stress screen programs. Many of the subtle details required for successful use of the techniques are presented only in this seminar and are not published elsewhere. A recent addition is Rapid HALT, which is available free to previous seminar attendees in the form of a short paper.

CONTENT

This seminar will cover the latest methods for finding weak links in designs and processes that cause field failures in products. Emphasis is placed on environmental and electrical stimulation applied in the design phase (HALT) in order to force accelerated design and process maturity. This technique allows earlier (mature) product introduction and obtains robust design margins. Emphasis is also given to the use of the methods in the production phase (HASS) to assure process and design control. Either application results in cost savings and reliability improvements that are orders of magnitude better than those attained using the traditional approaches. Many leaders in reliability throughout the world are using the methods. Every aspect of the HALT & HASS processes is covered, including step stress testing, burn-in, voltage cycling, vibration, thermal cycling, other stresses as appropriate and cumulative fatigue damage as well as screens for parts, assemblies and systems. Physics of failure, test coverage and resolution, equipment required and management issues will also be discussed. The extreme non-linearities found in vibration of electronics and fixturing for both vibration and thermal cycling are covered. Several case studies are discussed and critiqued in class.

Most of the leaders in the application of accelerated screening technology learned from these seminars. The majority of them are not publishing complete results in order to maintain their technological and financial lead! Many do not publish at all!

Significant changes were made in the techniques in 2004 and are taught and published only in this seminar.

WHO SHOULD ATTEND

The HALT & HASS Seminar is appropriate for managers, executive officers, design engineers, quality & reliability engineers, and production staff involved in Highly Accelerated Stress Screening including failure analysis. The HALT & HASS Hands-on Lab is appropriate for any staff involved in actually performing or evaluating the HALT & HASS activities. Some high level managers will want to attend only the first few hours which is a Management Overview.

BENEFITS

Participants have reported substantial benefits:

Return on investment of 50:1 in the first year!

Dramatically increased field reliability, 838 times improvement in one case!

Greatly reduced warranty and field retrofitting costs!

Reduction of product development time!

Reduced time to market!

Virtual elimination of field failures!

One company reported a savings of \$30 million in one year!

Another company reported savings of over \$200 million in three years!

Reduction in REL-DEMO costs by orders of magnitude!

Substantial savings in manufacturing costs! Almost no scrap and rework!

Vast reduction in screening and test equipment costs!

Elimination of "No Defects Found" in field returns!

INSTRUCTOR

Gregg K. Hobbs, Ph.D., P.E., is the originator of and world leader in the principles of HALT and HASS. He has been a consulting engineer since 1978, specializing in the fields of stress screening, robust and flaw tolerant design, dynamic analysis, and testing. He has been employed as a consultant by many leading companies in the aerospace, commercial, military, and industrial fields and has taught at two major universities as Adjunct Professor (Visiting Full Professor). He has taught courses on these subjects in the USA, Asia, Canada, Europe, the UK, Africa, the South Pacific, Middle-East and Mexico. He has introduced, and continues to introduce, many new concepts, techniques, and equipment that have been proven by 34 years extensive use on many products. The methods have resulted in the savings of several billions of dollars for his clients. New techniques introduced in early 1996 have resulted in at least a ten-fold improvement to these highly effective methods. **Rapid HALT, introduced in 2003, has reduced the time in HALT substantially.** He has acted as "facilitator" for many companies beginning to use these methods and has led teams that enhanced designs using the techniques, selected equipment, and then developed and proved production screens.

Currently the inventor of 12 patents on accelerated testing equipment (with several more pending), Dr. Hobbs has written many important papers on accelerated techniques and introduced a number of new concepts in various technical fields other than HALT and HASS. His book, Accelerated Reliability Engineering, HALT & HASS, is available from Hobbs Engineering.

COURSE OUTLINE

COMPREHENSIVE HALT & HASS

INTRODUCTION

Overall HALT & HASS processes from start to finish in one slide.

Origin of the methods and how they developed through the years.

Load-Strength relationships and how they relate to failures in the field.

Modulated Excitation, the great detector, and why it should be used.

Crossover Effect—a very important concept and one frequently missed.

Some examples of the Crossover Effect.

The Bathtub Curve and how HALT & HASS change it.

Stresses used for particular applications and in general.

Various methods in “success” and “discovery” testing.

Discipline interactions in HALT & HASS.

Some failure modes and mathematical expressions of them.

Definition of terms for operational and destruct limits.

Basic application of HALT & HASS and how to perform them.

Why 6 Sigma will work well only after HALT.

What the operational and destruct limits look like on a chart.

Where to stop improving the product in a logical way.

Proper selection of stresses for HASS profile for a particular case using the HALT data.

Seven basic parts of HALT & HASS.

Comparisons of philosophies of Mil-Spec and accelerated methods.

Benefits of HALT & HASS.

Comparisons of costs when vibration and thermal stresses are increased.

Some successes from various fields.

Summary of Management Overview.

HALT IN DETAIL

Substituting stress level for sample size.

Major mistakes made by many and how to avoid them.

How many samples would be necessary at field stress levels?

How to find the limits. Only the first step! Improvement is the desired step.

Guidelines in step stress testing for beginners and experienced engineers.

Some very important points missed by many that have led to disasters.

Margins obtained in graphical representation and how distributions affect them.

A few critical guidelines for vibration and why they must be followed.

How four-corner testing without modulated excitation can lead to disaster.

HALT on super fast track products, some examples.

How to become “product smart” and not forget the lessons learned.

How many units to HALT and when.

Uses for HALT units.

Assembly levels on which to perform HALT and why.

Where to perform HALT.

Where should one stop and why.

Comparison of the classical and HALT spending rates over time.

HALT process flow diagram.

Disciplines required to perform HALT.

Lessons learned database.

Some disastrous mistakes made by many in a HALT program.

HASS

Some screens used on parts, assemblies and systems.

Selecting the stress magnitudes from the HALT results.

Precipitation and Detection screens and why.

Examples of what was found in some detection screens and why.

What a good HASS profile must do.

Progressing to a sample—HASA (Highly Accelerated Stress Audit).

Some products HASSed.

PROOF OF HASS – very important

Safety of HASS and why it must be performed.

How to perform Safety of HASS.

Why not to run the product to end of life to prove Safety of HASS.

HASS Effectiveness and why it should not be performed.

HASS OPTIMIZATION

How to optimize profiles for minimum cost and maximum effectiveness.

Several examples of optimization.

Convergence.

Some incorrect approaches to selecting screens and why they have led to disasters of large scale.

The “typical HASS profile.”

How to achieve solder joint creep failure and how not to.

Why tight uniformity and repeatability are not generally necessary.

Examples from the literature.

PHYSICS OF FAILURE

Why things fail and how.

Main activities of Physics of Failure.

Some examples showing time compression and flaws detected.

SOFTWARE HALT – Fault insertion to determine coverage and resolution and improve them.

Insertion types and pros and cons of each.

Results for a few products.

Shipped defect levels as a function of coverage and yield for PCBs.

Automated Signal Integrity Testing.

Time domain reflectometry.

EQUIPMENT NECESSARY for HALT & HASS

Vibration Systems – pros and cons.

Thermal Systems – pros and cons.

Cost impact of selections is very large, maybe even critical.

A few considerations of failure modes and how to excite them.

Probability distributions of the various shakers available.

Use of pseudo products for control in order to speed screens.

Comparison of compressor and LN2 systems.

Vendor selection, a very critical and long lasting decision.

Some use examples from industry.

CONCLUSIONS, RECOMMENDATIONS AND PITFALLS TO AVOID

Ways of accomplishing the goals.

Proof of Concept.

Getting management to accept HALT & HASS.

Examples of some failures to convince and why they occurred.

Other uses of HALT.

A checklist on performing your own HALT or for grading others.

Outsourcing—the double-edged sword!

Some examples of outsourcing without HALT & HASS.

How to succeed in achieving reliability when outsourcing.

Pitfalls to avoid in HALT & HASS.

How to perform HALT & HASS on attendees’ products.

Seminars Available for Open, In-House, and Consulting

1. Comprehensive HALT & HASS - 2 days
2. HALT & HASS Hands-on Workshop - 1 day
3. Accelerated Test Data Analysis - 4 days
4. Demonstrating Reliability Requirements With Accelerated Testing - 2 days
5. Rapid and Reliable Product Development - 2 days
6. Physics of Failure - 2 days
7. Practical D.O.E. Strategies - 4 days
8. Design for Reliability - 2 days
9. Lead-Free Solder Joint Reliability - 2 days
10. Software Reliability - 2 days
11. Designing for Warranty Cost Reduction - 1 day
12. Cooling Techniques for Electronic Equipment - 2 days
13. Preventing Vibration & Shock Failures - 2 days
14. Preventing Thermal Cycling & Vibration Failures - 2 days
15. Mechanical Dynamic Measurements - 2 days
16. Principles & Practice of Shock & Vibration Testing - 2 days
17. Essential Reliability Tools - 2 days
18. HALT/HASS and Classical Reliability Methods Integrated - 3 days (In-House only)

World Class Instructors

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Comprehensive HALT & HASS: US\$1,195
Payment is due by the seminar date.
Check, Visa, and Mastercard accepted.