

**SHORT COURSE
IN
NDE Engineering /
NDE Reliability and probability of
detection**

**Lecture by:
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This course covers the requirements, principles, applications and implementation of quantitative non-destructive evaluation (QNDE) in design, production, acceptance, maintenance and life-cycle management of modern engineering components, structures and systems.

It is designed to provide an introduction to QNDE and probability of detection (POD) validation concepts to all attendees and to provide a model for development and implementation of QNDE procedures by experienced NDE engineers.

The establishment of design engineering acceptance criteria is discussed in terms of expected QNDE procedures applications, limitations, costs and verification / validation.

Basic principles of QNDE measurements and general

development requirements for QNDE are discussed in terms of rationale for application, “calibration”, procedure application, validation and control.

Requirements for QNDE are expressed in terms of “critical initial flaw size (CIFS)” and “acceptable flaw size (AFS)” and are based on design using fatigue and fracture mechanics analyses for safe-life and damage tolerance. CIFS is used as a primary metric in quantification of the robustness of structural integrity and life-cycle management.

The approach is to develop and apply NDE as a measurement science to support reliable application. NDE reliability is analyzed as:

- Capability – POD
- Reproducibility – Calibration
- Repeatability – Process Control

The “Probability of Detection (POD)” as a function of flaw size is used as the basis for characterization and validation of the quantified detection / discrimination capability of an NDE procedure.

The principles of QNDE measurements and analyses to produce POD data (curve) are discussed in detail. Flaw detection is presented as a problem in conditional probability with decisions based on both deterministic (pattern recognition)

and quantified measurements. Subsets of full POD analysis are presented as corollary procedures to characterize the point estimate of detection capabilities from small data sets.

Transfer and application of quantified NDE procedures from simple specimens to complex structures are discussed.

Elements of QNDE procedure process control and personnel qualification are presented as the basis for continuing detection / discrimination capabilities of a validated NDE procedure.

Requirements for automation and implementation of new / alternated NDE procedures are discussed in terms of POD characterization.

Pre-requisite Requirements

1. A working knowledge of materials engineering and structural design principles;
2. A working knowledge of basic NDE procedures and applications;
3. A working knowledge of measurement principles and practices in industry.

Who Should Attend

- Materials and design engineers
- NDE engineers

- Maintenance engineers
- Engineering managers
- NDE researchers
- NDE equipment developers

The course is presented for the benefit of the Colorado section of ASNT and is open to all interested parties.

Course Highlights:

- Safe Life and Damage Tolerance Design
- Design margins and fatigue life
- Traditional NDE methods:
 - Liquid penetrant
 - Magnetic particle
 - Eddy current
 - Ultrasonic
 - X-radiography
- NDE capabilities and reliability
 - NDE / flaw interactions
 - NDE materials
 - NDE Equipment
 - NDE procedure
 - NDE procedure calibration
 - NDE procedure control
 - Human factors
 - NDE automation
- Measurement approach to NDE "calibration"
- NDE signal response
- Acceptance threshold and decisions
- Signal and Noise analysis
- Requirements for demonstration

- Test specimen preparation and care
- Transfer to production structures
- Personnel qualification processes
- NDE configuration control
- Life- cycle management
- NDE methods improvements
- New NDE methods
- New methods implementation

About the Lecturer:

Ward D Rummel, P.E. is a graduate and registered professional engineer; an American Society for Nondestructive Testing (ASNT) Level III; and an ASNT Fellow. During his forty five years of progressive development of NDE engineering in the aerospace industry, he has served in various capabilities as an officer in the local ASNT section; a member of the original ASNT Personnel Qualification and Certification Committee that was responsible for the ASNT Level III examination program; the author of over 100 technical papers on various elements of nondestructive testing / evaluation; originated the probability of detection (POD) method of quantifying NDE capabilities; has been a lecturer and advisor to various academic and industrial programs. He is currently serving as a consultant in Nondestructive Evaluation Engineering

to various industry, government and educational institutions.



Logistics:

This will be presented as a one day (8 hour / CEU Credit Available) course on Saturday, 13 May 2006. Location will be in the Denver, Colorado area. Site to be announced. Attendance will be limited to 40 on a first come first served basis.

Cost will be \$150 per attendee.

For further information contact:

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