

KNOWLEDGE MANAGEMENT | HIGHLY ACCELERATED STRESS TEST PLANNING | STRESS ANALYSIS | DESIGN OF EXPERIMENTS

ROOT CAUSE FAILURE ANALYSIS | RELIABILITY PROGRAM AUDITING

FAULT TREE ANALYSIS | RELIABILITY PREDICTION | FAILURE MODE EFFECTS AND CRITICALITY ANALYSIS | ALLOCATION



How Reliable and Maintainable are *YOUR* Products and Systems?



THERMAL ANALYSIS | LIFE CYCLE COSTING | VENDOR QUALIFICATION



Quanterion Solutions provides professional **QUAN**titative services to be used as cri**TERION** for critical decisions, specializing in reliability, maintainability and quality practices (RMQ), knowledge and information management, software engineering and cyber security. If you're designing or manufacturing products or systems*, chances are we can help you improve them with a resulting improvement in profitability and customer satisfaction.

If you're a supplier, we can:

- › Help you understand your customers' needs
- › Define or audit your company's approach to RMQ practices
- › Analyze or evaluate your products' RMQ
- › Develop customized knowledge sharing and management tools
- › Solve RMQ-related product and process problems

If you're a customer, we can:

- › Define RMQ requirements to impose on suppliers
- › Help you choose the "right" suppliers
- › Assess the RMQ of products you are procuring
- › Determine the affordability of acquired software

TRAINING

Quanterion offers a variety of training courses that range from free online short courses to multiple day on-site customized courses dealing with RMQ practices.

Courses include:

- › Reliability 101
- › Reliability Growth in Design and Test
- › Software Affordability
- › Software Improvement Business Case Development
- › Maintainability Engineering
- › Failure Mode, Effects and Criticality Analysis
- › Fault Tree Analysis
- › Reliability Modeling
- › Design of Experiments
- › Mechanical Reliability
- › Lean Six Sigma
- › Application of Statistical Tools
- › Statistical Analysis

Our RMQ courses were developed, and are instructed, by American Society for Quality (ASQ) Certified Reliability Engineers (CRE).

Lunchtime Learning Series

These short tutorials are aimed at providing a basic introduction to a variety of topics in which our customers have expressed an interest. Current topics include: The Payoff of Six Sigma, Design of Experiments, Reliability as a Profit Driver, Basic Reliability Distributions, Introduction to Weibull Analysis, FMEA, and Reliability Qualification Testing. These free introductory courses are available at quanterion.com.

CREDENTIALS

As examples of our credentials in RMQ (as well as software engineering, cybersecurity, and knowledge management), we are the day-to-day operator of the DoD's Center of Excellence in these technologies:



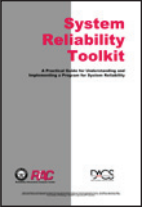
*"Products" is used hereafter to refer to "products and/or systems"

PRODUCTS



The **Quanteron Automated Reliability Toolkit (QuART)** software series is dedicated to providing practical reliability, maintainability and quality (RMQ) knowledge, while including automated versions of many widely used procedures and methodologies in RMQ from our hardcopy toolkit series (as well as from other sources). **QuART PRO** includes over 30 tools useful for predicting or assessing product reliability and associated costs, while **QuART ER** includes all the tools from QUART PRO plus many more, including the “Ask a Quanteron

Expert” function that allows users to direct their reliability questions to an ASQ certified reliability expert at Quanteron.



REPETOIRE **REPETOIRE** is Quanteron’s set of five on-line interactive reliability engineering training courses developed around the American Society for Quality (ASQ) body of knowledge for the Certified Reliability Engineer’s (CRE) exam. Whether you are preparing for the CRE exam or just need basic training in reliability, you’ll like the convenience of training on your own schedule, at your own pace. Periodic quizzes are included so students can assess their progress and review the areas where they need improvement.



The **PROTOCOL (Product Reliability On-line Tools Collection) “RELease”** series of introductory on-line publications will help those not familiar with reliability practices to understand the basics. The series name has a double meaning: (1) the spelling of the name r-e-l-e-a-s-e indicates that the series is intended to “release” the non-expert down the path to reliable products and (2) the complementary terms “REL” with “ease”, imply the series goal of “reliability made easy.” The **RELease series** will soon be accompanied by a set of online analysis tools originally developed for the Army as the “Product Reliability Online Tools Collection.”



The **“Web Accessible Repository of Physics-based Models” (WARP)** collects, analyzes and verifies the existence and characteristics of physics-of-failure (PoF) models for components to support researchers and engineers.

The **Software & Systems Cost and Performance Analysis Toolkit (S2CPAT)** captures and analyzes software and software engineering data from completed software projects that can be used to improve (a) the quality of software-intensive systems and (b) the ability to predict the development of software-intensive systems with respect to effort and schedule.

SERVICES

We provide professional high-quality services in all aspects of RMQ, offering an independent unbiased perspective. We are happy to enter into Nondisclosure Agreements and have a variety of easy to use contracting arrangements.



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| <ul style="list-style-type: none">› Requirements Analysis› Metrics and Goal Setting› System Modeling› Analysis of Alternatives› Allocation› Benchmarking› Reliability Gap Analysis› Reliability Program Planning | <ul style="list-style-type: none">› Reliability/Functional Block Diagrams› Reliability Prediction› Reliability Growth Modeling› Failure Modes and Effects Analysis› Fault Tree Analysis› Risk and Safety Analysis› Component and Materials Selection› Stress Analysis and Derating› Vendor Selection› Life Cycle Costing› Warranty and Sparing Analyses› Design of Experiments | <ul style="list-style-type: none">› Reliability Test Plan Development› Highly Accelerated Life Test (HALT) Planning› Environmental Testing› Stress Test Planning› Reliability Demonstration› Failure Analysis & Corrective Action System (FRACAS)› Vendor Reliability Auditing/Assessment› Product Qualification | <ul style="list-style-type: none">› Highly Accelerated Stress Screening› Environmental Stress Screening› Vendor Qualification› Warranty Analysis› Hazard Rate/Risk Analysis› Logistics (Depot) Assessment› Field Reliability Assessment› Data Collection/Analysis› Lifetime Extension |
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EXAMPLE PROJECTS

New DOD RAM Initiatives

Analysis: Participation in various DOD working groups to develop new Reliability, Availability and Maintainability (RAM) Policies, Procedures and Guidelines, and joint government/industry standard ANSI/GEIA-STD-0009, "Reliability Program Standard for System Design, Development and Manufacturing".

Purpose: To ensure a robust DOD Acquisition strategy that complies with Directive-Type Memorandum (DTM 11-003), "Reliability Analysis, Planning, Tracking and Reporting".

Result: DOD approval for use of ANSI/GEIA-STD-0009; release of DOD RAM-C Rationale Report Manual; AMSAA Reliability Scorecard; Multiple recommendations for improving DOD System Acquisitions for RAM.

Multiple – Depot Level Sparing Model

Analysis: Forecast manufacturer depot level spares requirements for thousands of part numbers spread across hundreds of sites.

Purpose: To ensure the correct number of spares are on hand to meet expected demand, while also minimizing unnecessary overhead costs.

Result: Developed an Excel-based tool that customer periodically uses to determine sparing levels needed for the next Quarter, and procures additional spares based on predicted demand.

Government Organization Desiring to Improve Its Reliability Approach

Project: Develop Reliability Knowledge-Environment for an organization to facilitate sharing of reliability policies, information and data, and track the reliability of products from development to operational use.

Purpose: Provide organization-wide reliability tools and expert advisors and ensure that reliability approaches are appropriate and effective.

Result: Browser-based software "living" reliability environment developed including definitions, lesson-learned, rules of thumb, advisors, on-line library, popular guides, tutorial and data.

Mine Countermeasure System

Analysis: Reliability Growth Evaluation

Purpose: Independent Assessment of prior Reliability Growth projections

Result: Recreated the existing Reliability Growth projections, identified flaws in the assumptions made, and generated and confirmed new realistic reliability growth curves.

FPGA Microprocessors

Analysis: Simulation Modeling

Purpose: Modeling FPGA microprocessors in a hard target environment

Result: Simulation model for projectile path presented to the customer along with lifetime reliability projections and ageing risks anticipated under long term storage conditions.

Mechanical Component Manufacturer

Analysis: Audit of Company reliability approaches used to develop/manufacture state-of-the-art mechanical components.

Purpose: Determine the reliability process being used across the company and perform "gap analysis" against "best practices" for similar companies.

Result: Gap analysis showed need for structure in implementation of reliability, causing internal documentation to be developed including company strategy, policies, and process/practice, as well as specialized training.

Optical Frequency Generator

Analysis: FMEA, Highly Accelerated Life Test (HALT)

Purpose: To uncover and correct design-related failure modes before release to production.

Result: FMEA and HALT identified package and process related failure modes that could affect service life, resulting in implemented design and process corrective actions.

Wide Area Air Traffic Control System

Analysis: Monte Carlo system availability simulation model

Purpose: To maximize aircraft tracking performance and system availability while minimizing the number of remote sites required.

Result: Microsoft Excel-based simulation tool was used to perform numerous "what if" simulations, allowing customer to confidently tradeoff system availability versus performance and cost.

PCB Production Test Fixture

Analysis: Gauge Reproducibility and Repeatability (GR&R) Study

Purpose: Measurement System Analysis (MSA) - Identification and quantification of system elements (human, hardware) that contribute to measurement variation.

Result: Study led to test fixture process changes to reduce measurement variation.

Implantable Spinal Cord Stimulator

Analysis: Circuit based component stress analysis, FMECA, FTA

Purpose: Improve design reliability and document the analyses for FDA submission.

Result: Analysis resulted in several component design changes to improve robustness. Fault Tree Analysis identified unacceptable single points of failure which were corrected through hardware and software modifications.

GOVERNMENT

COMMERCIAL

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