

Надежность

ReliaSoft®

موثوقية

ReliaSoft®

Fiabilité

Re

性  
ft.®

Affidabilità

ReliaSoft

ReliaSoft®

Confiabilidad

Niezawodność

ReliaSoft®

可靠性

aSoft®

ReliaSoft®

Αξιοπιστία

R

nfiabilidad

Reliability

ReliaSo

aSoft®

信賴性

Confiabilidade

Soft®

ReliaSoft®

موثوقية

Fiabilité

ReliaSoft®

Наде

liaSoft®

Zuverlässigkeit

**ReliaSoft®**

**SOFTWARE AND SERVICES**

## **ABOUT RELIASOFT**



### ***Industry Leader with Established Reputation***

**ReliaSoft Corporation** is the industry leader in reliability engineering software, education, consulting and related services. Founded in 1992, ReliaSoft has evolved into a global reliability solutions company that offers a comprehensive range of services dedicated to meeting the reliability engineering and quality needs of product manufacturers and maintenance organizations worldwide. ReliaSoft's capabilities encompass all aspects of reliability engineering through all stages of product development, deployment and operation.

### ***World-Class Analysis Software and Training***

Acclaimed for their ease of use, analytical power and unparalleled technical support, ReliaSoft's software products facilitate a comprehensive set of reliability and related analysis techniques, including life data analysis (Weibull analysis), quantitative accelerated life testing, system reliability/maintainability, reliability growth, design of experiments, standards based reliability prediction, FMEA, RCM, RBI, FRACAS and others. We also offer an extensive curriculum of reliability training courses that provide thorough coverage of both the underlying principles and theory, as well as the applicable software.

### ***Commitment to Advancing the State-of-the-Art***

ReliaSoft maintains an active R&D program, and we are firmly committed to enhancing the effectiveness and reputation of the reliability discipline through initiatives such as the International Applied Reliability Symposium, the Certified Reliability Professional (CRP) program, the weibull.com reliability engineering resource website, the ReliaSoft.tv multimedia resource website and targeted university partnership programs.

### ***Global Presence***

In order to provide the highest possible level of customer service worldwide, ReliaSoft has established a network of regional centers in selected international locations, complemented by independent sales and support partners in specific countries within these regions.

To contact ReliaSoft's Worldwide Headquarters in Tucson, Arizona, USA or the regional office that serves you, please review the "Sales and Support" details published on the back of this booklet or consult the worldwide directory on the website at <http://Directory.Reliasoft.com>.

<http://www.Reliasoft.com>

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# THE SYNTHESIS PLATFORM®



Reliability Analysis Platform,  
Knowledge Repository and  
Intelligence Center

Synthesis is an integrated reliability platform that can unite any or all of ReliaSoft's best-in-class reliability engineering applications into a **powerful, easy-to-deploy, enterprise-capable, integrated reliability solution.**

This powerful platform is built in to Weibull++, BlockSim, Xfmea and all other Synthesis-powered desktop applications. It provides **intelligent integration** between reliability program activities and tools, while simultaneously facilitating **effective information sharing and cooperation** between engineering teams of any size.

The end result is the ability to maximize the efficiency and effectiveness of reliability activities, which results in **time savings, agility and reductions in both time-to-market and cost**, while **maximizing the achieved reliability and associated ROI**. That's the power of the Synthesis Platform!



## syn·the·sis

noun (from Greek σύνθεσις)

1. The combining of separate elements or substances to form a coherent whole.
2. The act of combining separate ideas, beliefs and styles, etc.

<http://Synthesis.ReliaSoft.com>

## INTRODUCING THE SYNTHESIS PLATFORM

The Synthesis Platform is the result of a multi-year R&D effort focused on developing the right processes, analysis tools and IT framework to synthesize discrete reliability activities into a **continuously self-improving reliability program** with significant contributions from each activity.

Designed to address the feedback and needs expressed by thousands of reliability practitioners in virtually every industry, the platform leverages classical reliability engineering methodologies and existing best practices coupled with a **new and intelligent approach to integration**.

### **Eliminates "Islands" of Information**

In today's dynamic and knowledge-driven business world, data and information sharing are essential for innovation and improvement in products, services and processes.

Without an effective infrastructure in place to facilitate collaboration between engineers with different responsibilities and subject matter expertise, too many organizations face the problem of disconnected "islands" of reliability information that limit their ability to meet and exceed reliability and productivity goals.

The Synthesis Platform eliminates these barriers by providing a **structured, flexible and secure back-end database** that promotes information sharing between teams of any size, with related or different subject matter expertise, and coming from the same or different organizational units.

### **Facilitates Effective Collaboration Between Subject Matter Experts**

Data sharing in itself does not guarantee that the information will be used correctly and effectively by everyone involved. When the organization employs different subject matter experts for different reliability activities, how do you ensure that the often complex information and knowledge shared by one expert will be understood and used appropriately by other practitioners who need it?

The solution is the **revolutionary object-based reliability modeling (OBRM)** concept pioneered by ReliaSoft, which hides activity-specific complexity while exposing what is useful for others to leverage. Each application "knows" what information to provide to other activities, as well as how to use the information it receives.

### **Intelligent Integration Without Sacrificing Analytical Power**

Traditionally, software integration has meant that a certain amount of core functionality was sacrificed or at least compromised. That is certainly not the case with the Synthesis Platform.

Individually, all of ReliaSoft's Synthesis applications continue to stand out as the **most powerful, functional and user-friendly reliability software on the market**. When used together, they retain their own unique strengths while leveraging relevant information from the entire suite of products to achieve an integrated solution that truly is **greater than the sum of its parts**.



# FLUIDLY SHARES INFORMATION BETWEEN RELIABILITY ACTIVITIES

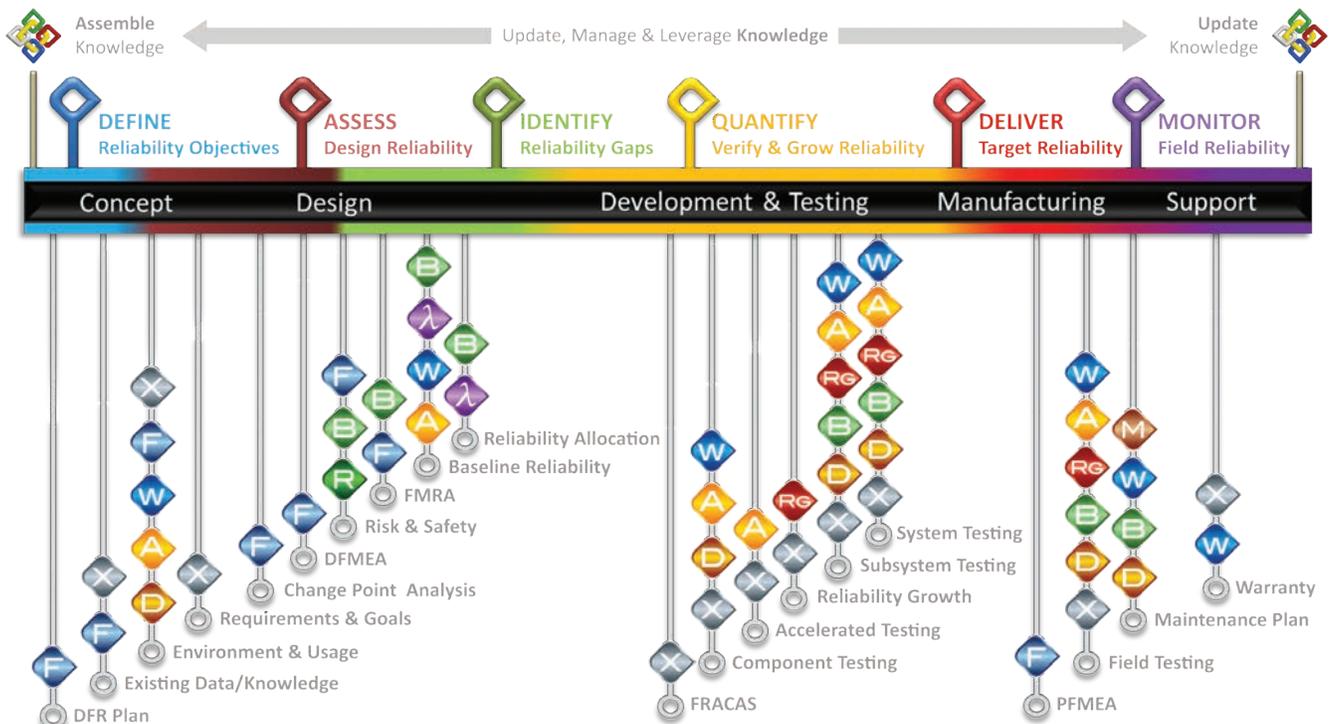
Whether you are a lone reliability engineer in a small organization or an executive with thousands of engineers working together on many different product lines, the Synthesis Platform was designed to meet your needs. The platform and software tools offer both the **depth and breadth of reliability functionality** necessary for a successful reliability program implementation from "cradle to grave."

Engineers with different expertise and responsibilities (and even if they're working in different departments or facilities across the globe) can take advantage of a centralized and structured framework to facilitate the **transfer of reliability knowledge throughout the product life cycle**.

Consider just a few basic examples of the many different ways your organization may choose to use the Synthesis Platform to facilitate, support and enhance **Design for Reliability (DFR)** and **Asset Performance Management (APM)** activities:

- Working in Weibull++ and ALTA, reliability engineers analyze available data to quantify the probability of occurrence for known failure modes. This information is then available for Xfmea where...
- The Design FMEA team links directly to available analysis results in their efforts to understand and reduce the risk in the design. Then the FMEA is available for BlockSim where...
- Design engineers leverage the knowledge recorded in the FMEA to build RBDs and/or fault trees for critical tasks such as estimating the baseline reliability, identifying critical failure modes, allocating reliability requirements, evaluating risk and planning maintenance strategies...

This type of collaboration continues throughout all other reliability activities and life cycle stages. As the body of knowledge improves in each stage, automated feedback mechanisms ensure that the most **up-to-date information** continues to be available to all activities, providing a **continuous, self-improving, closed knowledge loop**.



# ***AN INTELLIGENT, SCALABLE, EVOLVING PLATFORM FOR RELIABILITY***

## ***Automatically Builds a Reliability Knowledge Repository***

At the same time that the Synthesis Platform is facilitating information sharing and collaboration for ongoing projects, the system is simultaneously building a **secure, permission-based and searchable** corporate repository of reliability knowledge.

The data, analysis and lessons learned that are captured by the repository can be accessible to engineers throughout the organization. This provides a huge head start on future projects by making it easy to **reuse and build upon** existing information.

This instant access to versatile, organization-wide reliability data provides a strong foundation that will not only **save a tremendous amount of time**, it will also **greatly improve the outcome of future projects**.

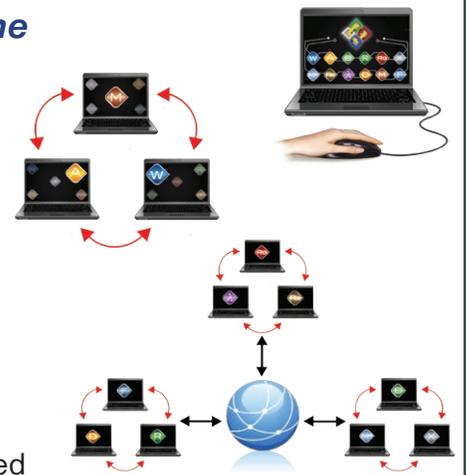
## ***Robust & Scalable Architecture:***

### ***Single-User, Multi-User or Enterprise Deployments in One***

The Synthesis Platform and desktop applications were designed from the ground up to be "connection aware" and to adapt automatically to single-user, multi-user and enterprise configurations.

The exact same software solution that you might deploy for a single reliability engineer on a single computer can be scaled to a global enterprise with thousands of engineers on a server farm functioning as a corporate repository. This provides both **complete deployment flexibility** and, best of all, **true scalability**.

The full functionality is available with every license type (you do not need to purchase a special "enterprise license"). Both SQL Server® and Oracle® enterprise database platforms are supported; users can also share the platform's built-in standard repositories through their own networks with no special configuration required.



## ***API for Data Transfer with External Systems***



## **SYNTHESIS API**

The Synthesis Platform's Application Programming Interface (API) enables you to connect Synthesis applications and data with other systems and tools used within your organization. You can use the API to transfer data to or from a variety of different PLMs, ERPs, CMMS and other external systems.

## ***Built by Reliability Engineers for Reliability Engineers:***

### ***A Revolutionary Reliability Solution That Will Continue to Evolve***

The groundbreaking new features and robust enhancements of the Synthesis Platform are just the latest chapter in ReliaSoft's 20+ year history of innovation and support for engineers engaged in reliability activities throughout all stages of the product life cycle.

Our commitment to continuous investment in R&D and our focus on developing practical solutions means that you can expect to see even more result-driven concepts and innovative additions to the Synthesis Platform for years to come.





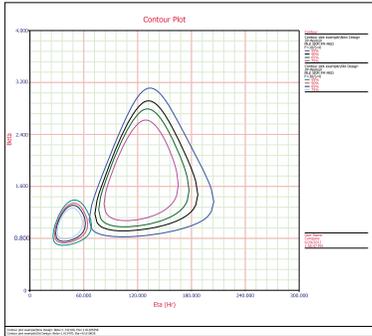
# WEIBULL++<sup>®</sup>

The standard for reliability life data analysis™

*ReliaSoft's Weibull++ is the industry standard in life data analysis (Weibull analysis) for thousands of companies worldwide.*

*The software provides a complete array of data analysis, plotting and reporting tools for standard life data analysis (LDA) with integrated support for a variety of related analyses such as degradation data analysis, warranty data analysis, non-parametric life data analysis, recurrent event data analysis and reliability test design.*

*Weibull++ is part of the Synthesis Platform<sup>®</sup>.*



State	Time to F or S (Hr)	Subset ID
F	40	unit 107
F	72	unit 103
F	75	unit 122
F	96	unit 106
F	124	unit 109
F	142	unit 121
F	161	unit 112
F	166	unit 108
F	176	unit 113
F	190	unit 116
F	193	unit 123
F	200	unit 100
F	214	unit 111
F	227	unit 114
F	240	unit 120
F	264	unit 115
F	269	unit 104
F	284	unit 101
S	300	unit 117
S	300	unit 118
S	300	unit 105
S	300	unit 119
S	300	unit 102
S	300	unit 110
S	300	unit 110

Design a reliability demonstration test

What metric would you like to demonstrate? Metric: Reliability value at a specific time  
Demonstrate this reliability (%) 90  
With this confidence level (%) 90  
At the time (hr) 100

Assume the failure rate behavior is governed by this distribution  
Distribution: 2P-Weibull  
With this Beta: 2

Solve for this value  
Value: Required test time  
With this sample size: 100  
With a maximum of this many failures: 0

Reliability Demonstration Test  
TEST DESIGN METHOD: Parametric: Brossol  
INPUT: Unit: Hour (Hr), Acceleration Factor: 1  
DISPLAY OPTIONS: Show sample size as integer

File Home My Portal Project Insert View Life Data Sheet Options

Calculate Plot Quick Calculation Pad Analysis

Batch Auto Run Specify Points Auto Group Data Insert Data Sheet Insert Additional Plot Insert General Spreadsheet Alter Parameters = Options

Project Manager: Filter based on creator, Project 1, Weibull++ Folios, Folio1, Folio2, Specialized Folios, Degradation (W1), NonParametricLDA1, Warranty1, Event Log1, ParametricRDA1, NonParametricRDA1, Multiplots, Overlay Plot1, SESPlot1, RBDs, Diagram1, Tools, Test Design Folio1, Reports, Workbook1

State	Time to F or S (Hr)	Subset ID
F	245	unit A1
F	535	unit A6
F	793	unit A15

Overlay Plot: Overlay Plot1  
Plot Type: Probability - Weibull  
Units: Hour (Hr)  
Auto Refresh: checked  
Keep Aspect Ratio: checked  
Scaling: Y 1 99, X 100 10000  
Select Data Sheets

WARRANTY ANALYSIS

Usage  
Usage Distribution Period: 1 Years  
Distribution: 2P-Weibull  
Parameters: Beta: 3.5, Eta: 8900

Interval Width Estimator  
Input: End Usage: 15000, Number of Intervals: 15, Number of Suspensions: 60  
Calculated Interval Width: 1000.0000

## SOFTWARE HIGHLIGHTS - RELIASOFT'S WEIBULL++

### Data Types (individually or in groups)

- Complete (Failure Time)
- Right Censored (Suspension Time)
- Left Censored
- Interval Censored
- Free-Form

### Distributions

- Weibull
- Normal and Lognormal
- Exponential
- Gamma and Generalized Gamma
- Logistic and Loglogistic
- Gumbel
- Bayesian-Weibull
- Mixed Weibull
- Competing Failure Modes (CFM)

### Analysis Types

- Rank Regression on X (RRX)
- Rank Regression on Y (RRY)
- Maximum Likelihood (MLE)
- Non-Linear Rank Regression

### Ranking Methods

- Kaplan-Meier
- Median Ranks

### Confidence Bounds Methods

- Likelihood Ratio
- Fisher Matrix
- Beta Binomial
- Bayesian (BSN)

### Plot Types

- Probability
- Reliability vs. Time
- Unreliability vs. Time
- Failure Rate vs. Time
- pdf Plot
- Contour Plot

- Failures/Suspensions Histogram
- Failures/Suspensions Pie
- Failures/Suspensions Timeline

### Integrated Utilities

- Distribution Wizard
- Quick Calculation Pad
- Overlay Plots (aka Multi-Plots)
- Side-by-Side Plots
- 3D Plots
- Monte Carlo Data
- SimuMatic®
- Block Diagrams
- Stress-Strength Analysis
- Data Set Life Comparison
- Reliability Test Design
- Maintenance Planning Tool
- Synthesis Workbooks (spreadsheet and word processing combined)
- Function Wizard
- Non-Linear Equation Root Finder
- Non-Linear Equation Fit Solver
- Quick Parameter Estimator
- Quick Statistical Reference

### Related Analyses

- Warranty Analysis
  - Nevada
  - Times-to-Failure
  - Dates of Failure
  - Usage
- Degradation Analysis
  - Linear
  - Exponential
  - Power
  - Logarithmic
  - Gompertz
  - Lloyd-Lipow
  - User-Defined Model
- Destructive Degradation Analysis
- Event Log Conversion

- Recurrent Event Data Analysis
  - Mean Cumulative Function
  - General Renewal Process
- Non-Parametric Life Data Analysis
  - Kaplan-Meier
  - Simple Actuarial
  - Standard Actuarial

### Import Types

- Microsoft Excel® Files
- Text Files (\*.txt, \*.csv, \*.prn, \*.smc)
- Weibull++/ALTA 6, 7 Files

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server®
- Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications.

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Theoretical eTextbook
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

The Weibull++ software provides an extensive array of tools to help you understand and communicate how a product will perform over time. Some of the many useful applications include the ability to:

- Compare suppliers or designs based on reliability.
- Demonstrate that an item meets specified reliability.
- Make predictions about performance during the useful life (or warranty) period.
- Use plots and other reports to effectively communicate performance estimates to management.

## Why Upgrade to Version 10? (for details, visit <http://Weibull.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Fractional failure analysis, destructive degradation analysis and the ability to create your own user-defined degradation models.
- A completely upgraded 3D plot utility, interactive plot zoom, the ability to open multiple projects simultaneously, new Synthesis Workbooks for custom reports and the option to import data from an external database (via the Synthesis Data Warehouse).



# ALTA<sup>®</sup>

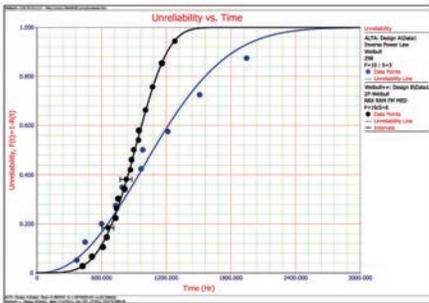
Accelerated life tests... quantifiable results™

*ReliaSoft's ALTA provides an intuitive and user-friendly way to utilize tremendously complex and powerful mathematical models. The software is available in two versions:*

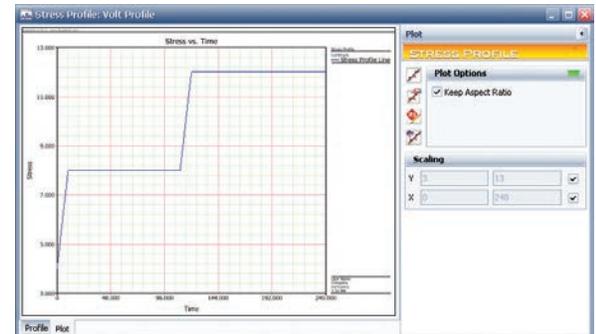
***ALTA Standard** provides the life-stress relationships required to analyze accelerated life test data with 1 or 2 constant stresses.*

***ALTA PRO** offers the advanced statistical modeling power to analyze data with up to 8 simultaneous stress types and scenarios where stress is constant or varies with time.*

***ALTA is part of the Synthesis Platform<sup>®</sup>.***



	Time Failed (Hr)	Temperature K	Relative Humidity %
1	521	333	90
2	561	333	90
3	575	333	90
4	599	333	90
5	609	333	90
6	684	333	90
7	709	333	90
8	713	333	90
9	345	353	90
10	387	353	90
11	439	353	90
12	504	353	90
13	115	353	90
14	119	353	90
15	150	353	90
16	152	353	90
17	153	353	90
18	155	353	90
19	156	353	90
20	164	353	90
21	199	353	90



**Reliability** Hr 15 Lower Captions On

**Calculate** Reliability Input

Probability Prob. of Failure Mission End Time (Hr) 300

Cond. Reliability Confidence level 0.95

Cond. Prob. of Failure

Life Reliable Life

Life BX% Life

Rate Mean Life

Acceleration Failure Rate

Bounds Acceleration Factor

Parameter Bounds

**Calculate** **Report...** **Close**

**Reliability** 0.9671

**Lower Bound (0.05)** 0.8547

**6X% Life** 441.8380 Hr

**910% Life** = 41.8380 Hr

**Lower Bound (0.1)** = 314.9142

Folio1>Data1 Reliability R(t=400) = 0.9246 Lower Bound (0.1) = 0.7987

Folio1>Data1 Reliability R(t=300) = 0.9671 Lower Bound (0.05) = 0.8547

## SOFTWARE HIGHLIGHTS - RELIASOFT'S ALTA

### Data Types (individually or in groups)

- Complete
- Right Censored
- Left Censored
- Interval Censored
- Free-Form

### Life-Stress Relationship Models

(single or multiple stress types; stress is constant or varies with time)

- Arrhenius
- Eyring
- Inverse Power Law
- Temperature-Humidity
- Temperature-NonThermal
- Proportional Hazards
- General Log-Linear  
(with user-defined transformations)
- Cumulative Damage
- Generalized Eyring

### Lifetime Distributions

- Weibull
- Lognormal
- Exponential

### Analysis Methods

- Maximum Likelihood (MLE)
- Fisher Matrix Confidence Bounds

### Calculated Results

- Reliability
- Probability of Failure
- Mean Life
- Reliable Life (aka Warranty Time)
- BX% Life
- Acceleration Factor
- Failure Rate

### Plot Types (some 2D and some 3D)

- Probability
- Reliability vs. Time
- Unreliability vs. Time
- Failure Rate vs. Time
- *pdf* Plot
- Life vs. Stress
- Standard Deviation vs. Stress
- Acceleration Factor vs. Stress
- Standardized Residuals
- Cox-Snell Residuals
- Standardized Residuals vs. Fitted Values
- Stress Profile (for cumulative damage)

### Degradation Analysis

- Linear
- Exponential
- Power
- Logarithmic
- Gompertz
- Lloyd-Lipow

### Accelerated Test Plans

- 2 Level Statistically Optimum Plan
- 3 Level Best Standard Plan
- 3 Level Best Compromise Plan
- 3 Level Best Equal Expected Number Failing Plan
- 3 Level 4:2:1 Allocation Plan

### Integrated Utilities

- Distribution Wizard
- Quick Calculation Pad
- Likelihood Ratio Test
- Overlay Plots (aka Multi-Plots)
- Side-by-Side Plots
- RS Draw® Metafile Graphics Editor
- 3D Plots
- Monte Carlo Data

- SimuMatic®
- Data Set Life Comparison
- Synthesis Workbooks (spreadsheet and word processing modules combined)
- Function Wizard
- Quick Parameter Estimator
- Quick Statistical Reference

### Import Types

- Microsoft Excel® Files
- Text Files (\*.txt, \*.csv, \*.prn, \*.smc)
- Weibull++/ALTA 6, 7 Files

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server®
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### Integration

Integration with all other Synthesis Platform applications.

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### Available Services

- Detailed User Documentation
- Practical Example Files
- Theoretical eTextbook
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

Some of the potential applications and benefits for using quantitative accelerated life testing data analysis techniques and ReliaSoft's ALTA software include the ability to:

- Understand and quantify the effects of stress (or other factors) on product life.
- Design accelerated tests that will be the most effective to achieve desired objectives.
- Significantly reduce the test time required to obtain reliability metrics for a product, which can result in faster time-to-market, lower product development costs and improved designs.

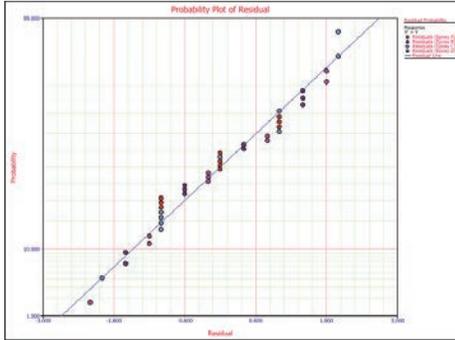
## Why Upgrade to Version 10? (for details, visit <http://ALTA.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- A new stress profile plot for ALTA PRO, a completely upgraded 3D plot utility and interactive plot zoom.
- A completely upgraded 3D plot utility, interactive plot zoom, the ability to open multiple projects simultaneously, new Synthesis Workbooks for custom reports and the option to import data from an external database (via the Synthesis Data Warehouse).



# DOE++<sup>®</sup>

DOE Software Designed with Reliability in Mind!<sup>SM</sup>



*ReliaSoft's DOE++ software facilitates traditional Design of Experiments (DOE) techniques for studying the factors that may affect a product or process in order to identify significant factors and optimize designs.*

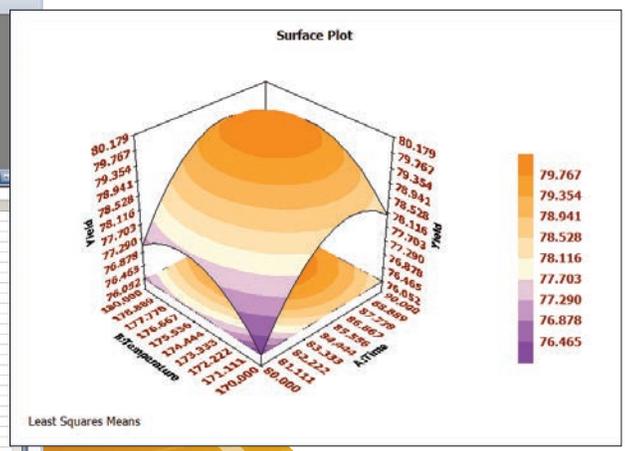
*The software also expands upon standard methods to provide the proper analysis treatment for interval and right censored data. This offers a major breakthrough for reliability-related analyses!*

*DOE++ is part of the Synthesis Platform<sup>®</sup>.*

Run	A: Susceptor-Rotation Method	B: Nozzle Position	C: Deposition Temperature	D: Deposition Time	Thickness
1	Continuous	2	1210	Low	12.886
2	Oscillating	2	1210	Low	14.249
3	Continuous	6	1210	Low	14.029
4	Oscillating	6	1210	Low	13.775
5	Continuous	2	1220	Low	13.758
6	Oscillating	2	1220	Low	13.605
7	Continuous	6	1220	Low	13.767
8	Oscillating	6	1220	Low	14.031
9	Continuous	2	1210	High	14.308
10	Oscillating	2	1210	High	15.09
11	Continuous	6	1210	High	14.629
12	Oscillating	6	1210	High	14.236
13	Continuous	2	1220	High	13.928
14	Oscillating	2	1220	High	13.327
15	Continuous	6	1220	High	13.4
16	Oscillating	6	1220	High	13.723
17	Continuous	2	1210	Low	13.903
18	Oscillating	2	1210	Low	13.9
19	Continuous	6	1210	Low	13.909
20	Oscillating	6	1210	Low	14.568
21	Continuous	2	1220	Low	13.992
22	Oscillating	2	1220	Low	13.328
23	Continuous	6	1220	Low	13.423
24	Oscillating	6	1220	Low	14.467
25	Continuous	2	1210	High	14.133
26	Oscillating	2	1210	High	14.261
27	Continuous	6	1210	High	15.84
28	Oscillating	6	1210	High	13.904
29	Continuous	2	1220	High	14.052
30	Oscillating	2	1220	High	13.457
31	Continuous	6	1220	High	13.396
32	Oscillating	6	1220	High	13.914

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	P Value
Model	15	10.555	0.7037	2.9622	0.0009
A: Susceptor-Rotation Method	1	0.144	0.144	0.6092	0.4385
B: Nozzle Position	1	0.7445	0.7445	3.0079	0.0997
C: Deposition Temperature	1				
D: Deposition Time	1				
A * B	1				
A * C	1				
A * D	1				
B * D	1				
C * D	1				
A * B * C	1				
A * B * D	1				
A * C * D	1				
B * C * D	1				
A * B * C * D	1				
Residual	80	1			
Total	95	12			

S = 0.4874  
R-sq = 95.71%  
R-sq(Adj) = 23.45%



## SOFTWARE HIGHLIGHTS - RELIASOFT'S DOE++

### Design Types

- One Factor Designs
- Factorial Designs
  - Two Level Full Factorial
  - Two Level Fractional Factorial
  - Plackett-Burman
  - General Full Factorial
  - Taguchi Orthogonal Array
- Response Surface Method Designs
  - Central Composite
  - Box-Behnken
- Taguchi Robust Designs
- Mixture Designs
- Reliability DOE Designs (with any of the above design types)

### Design Modification

- Include/Exclude Effects & Responses
- Add/Modify/Delete Factors & Responses
- Add, Remove or Re-order Runs
- Add Replicates
- Fold the Design
- Add Center Points
- Change Design Type
- Alter Reliability Data Type
- Create Custom Optimal Design
- Up to 50 Measurements for Each Test Run

### Design Evaluation

- Detection Power
- Orthogonality
- Alias Structure

### Related Analyses

- Variability Analysis
- Optimization
- Free Form Analysis and Multiple Linear Regression (for data not in an established design type)

### Calculated Results

(depends on the design type)

- Analysis of Variance (ANOVA)
- Fit Metrics to Assess Model Validity
- Factor Level Output and Comparisons
- Contribution of Factor/Interaction to Response Variation
- Variance/Covariance Matrix
- Alias Structures for Factorial Designs
- Regression Model Diagnostics

### Plots

(depends on the design type)

- Level Plots
  - Response vs. Level
  - Level Mean
  - Life Characteristic
  - Box Plot
  - Mean *pdfs*
  - Comparison Chart
- Effect Plots
  - Effect Probability
  - Pareto Chart
  - Main Effects and Interactions
  - Term Effect
  - Cube, Scatter and Contour
- Residual Plots
- Diagnostic Plots
  - Leverage
  - Cook's Distance
  - Box-Cox Transformation

### Advanced Plotting Tools

- Overlay Plots and Side-by-Side Plots
- 3-D Surface Plots
- RS Draw® Metafile Graphics Editor

### Measurement Systems Analysis

- Bias & Linearity Study
- Reproducibility & Repeatability Study
- Gage Agreement Study

### Integrated Utilities

- Analysis History Window
- Response Prediction (for untested treatments)
- Response Transformations (improved ANOVA)
- Simulation Worksheet (obtain simulated responses from BlockSim/RENO)
- Quick Statistical Reference
- Synthesis Workbooks (spreadsheet and word processing modules combined)

### Import Types

- Microsoft Excel® Files
- Text Files (\*.txt, \*.csv, \*.prn, \*.smc)
- DOE++ Version 1 Files

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server®
- Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications.

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Theoretical eTextbook
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

Some of the benefits of using the DOE software to design experiments that are effective for studying the factors that may affect a product or process and analyze the results of such experiments include:

- Identify the significant factors that affect a product or process.
- Evaluate ways to improve and optimize the design.
- Go beyond traditional Design of Experiment techniques in order to apply the proper analysis treatment for product lifetime data—the response information that is often of interest to reliability engineers.

## Why Upgrade to Version 10? (for details, visit <http://DOE.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- New Mixture Designs folio, alpha-based factor levels in Central Composite Designs, the option to ignore specific results, repeated measurements for test runs and the ability to choose the shape parameter for reliability-DOE.
- New and improved optimization plots and 3D plots, interactive plot zoom, the ability to open multiple projects simultaneously and new Synthesis Workbooks for custom reports.



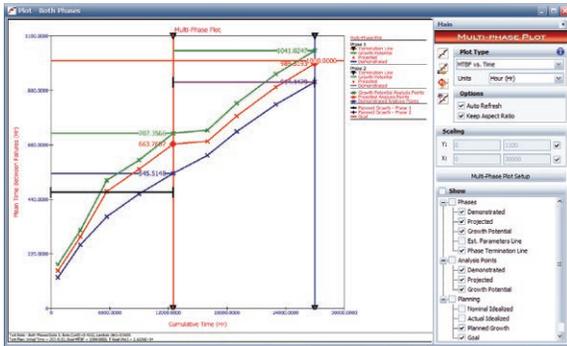
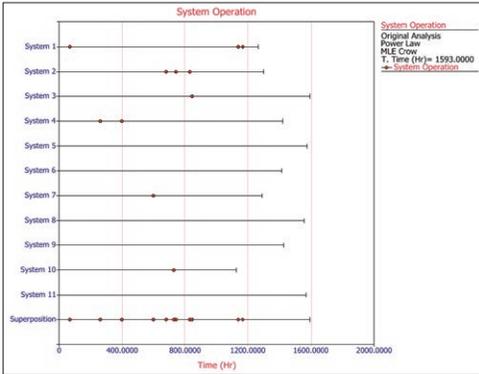
# RGA®

Reliability growth and repairable system analysis

*RGA provides all the tools you need to plan your reliability growth strategy and analyze data from developmental tests.*

*The software also applies reliability growth models for fielded repairable system analysis, which provides optimum overhaul times and other results without the detailed data sets that normally would be required.*

*RGA is part of the Synthesis Platform®.*



Repairable System Analysis

Systems	F-RS	A1	0	Time to Event (Hr)	Comment
System 1				0	Start
System 2				1268	End
System 3				10	
System 4				68	
System 5				156	
System 6				180	
System 7				240	
System 8				301	
System 9				411	
System 10				597	
System 11				623	
System 12				687	
System 13				796	
System 14				807	
System 15				869	
System 16				952	
System 17				997	
System 18				1109	
System 19				1137	
System 20				1167	
System 21					
System 22					
System 23					
System 24					
System 25					

Original Analysis Modified Parameters

Test Plan - Both Phases

NP-T	Event	Time to Event (Hr)	Classification	Mode	Comments
1	F	0.7	BD	100	
2	F	15.7	BD	101	
3	F	33.3	BC	2	
4	I	60	BD	100	
5	F	80.6	BD	102	
6	F	131.1	BD	103	
7	F	185.1	BD	104	
8	F	239.6	BC	3	
9	F	294	BD	105	

Design a reliability growth test plan

5. Do you know how the test time will be accumulated across each test phase?  
 Answer: Yes

5. Which value would you like to calculate?  
 Answer: Initial HTBF (Hr)

Assumed inputs for the reliability growth test plan

Goal HTBF (Hr)	1000
Growth Potential Design Margin	1.4
Average EP	0.7
Management Strategy Factor	0.85
Discovery Beta	0.65

Planned test phases

Phase name	Cumulative Time (Hr)	Average Fix Delay (Hr)
Phase 1: Phase 1	12000	1500
Phase 2: Phase 2	27000	1500

Results (All Modes)

Time at which growth begins (Hr)	297.4122
Initial HTBF (Hr)	469.0000
Final HTBF (Actual) (Hr)	1001.8723
Time to reach goal (Actual) (Hr)	2.6526E-04
Time to reach goal (Nominal) (Hr)	2.5026E-04

System 1 Parameters

Beta	0.8880
Lambda (Hr)	0.0316

Statistical Tests

CVM	Passed
Laplace	No Trend

## SOFTWARE HIGHLIGHTS - RELIASOFT'S RGA

### Data Types

- Times-to-Failure Data
  - Individual or Grouped
  - Multiple Systems
  - Multi-Phase Data
- Discrete (Success/Failure) Data
  - Individual or Grouped
  - With or Without Mode ID
- Reliability Data
- Fielded Systems Data
  - Repairable Systems
  - Fleet Data

### Models for Traditional Reliability

#### Growth Analysis

- Crow-AMSAA (NHPP)
- Duane
- Standard Gompertz
- Modified Gompertz
- Lloyd-Lipow
- Logistic

### Models for Reliability Growth Projections, Planning and Management

- Crow Extended
- Crow Extended-Continuous Evaluation

### Models for Fielded Systems

- Crow-AMSAA (NHPP)
- Power Law
- Crow Extended

### Analysis Methods

*(depends on the data type and model)*

- Parameter estimation using Maximum Likelihood or Least Squares
- Confidence Bounds using Fisher Matrix, Crow or Least Squares
- Goodness of Fit Tests

### Results and Plots - Traditional RGA

*(depends on the data type and model)*

- MTBF and Failure Intensity
  - Cumulative or Instantaneous
- Expected Number of Failures
- Reliability and Unreliability
  - Average or Instantaneous

### Results and Plots - Growth Planning and Management

- MTBF (or Failure Intensity)
  - Demonstrated/Achieved
  - Projected
  - Growth Potential
- Cumulative Number of BD Modes
- Discovery Rate/MTBF for New BD Modes
- Crow Extended Future Projection

### Results and Plots - Fielded Systems

*(depends on the data type and model)*

- Conditional Reliability and Unreliability
- MTBF or Failure Intensity
- Expected Number of Failures
- Optimum Overhaul
- System Operation Plot

### Reliability Growth Program Plans for Multiple Test Phases

- Growth Planning Folio
  - Idealized Growth Curves
- Multi-Phase Data Sheets
  - Flexible Event Codes
  - Test for Fix Effectiveness
- Multi-Phase Plots
  - Show growth across test phases
  - Track test results against the plan

### Mission Profile Folio

- Track actual vs. expected usage
- Convergence points to group test data

### Utilities Based on NHPP Model

- Monte Carlo Data and SimuMatic®
- Test Design for Repairable Systems
- Interval Goodness-of-Fit Test

### Other Integrated Utilities

- Quick Calculation Pad
- Quick Statistical Reference
- Synthesis Workbooks (spreadsheet and word processing modules combined)
- Function Wizard
- Overlay Plots and Side-by-Side Plots
- RS Draw® Metafile Graphics Editor

### Import Types

- Microsoft Excel® Files
- Text Files (\*.txt, \*.csv, \*.prn, \*.smc)
- Analyses from RGA 6 and 7

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server® and Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications.

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Theoretical eTextbook
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

Some of the benefits of using the RGA software to apply powerful reliability growth models on either developmental or fielded systems data include the ability to:

- Quantify reliability growth achieved with each successive design prototype.
- Determine the feasibility of achieving reliability goals with a given test/fix strategy.
- Calculate optimum overhaul times and other results for fielded repairable systems without the detailed data sets that would normally be required.

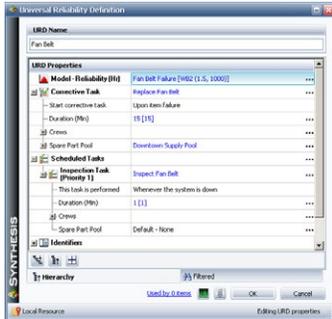
## Why Upgrade to Version 10? (for details, visit <http://RGA.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Optimum overhaul plot, Crow Extended future projection, improved system operation plot and mode fix list for event reports.
- New Synthesis Workbooks for custom reports, the ability to open multiple projects simultaneously and the option to import data from an external database (via the Synthesis Data Warehouse).

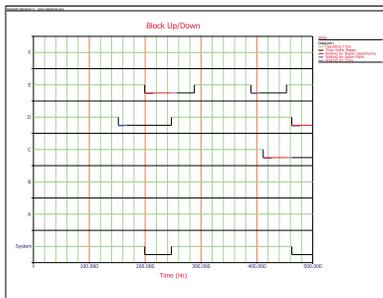


# BLOCKSIM<sup>®</sup>

The ultimate system visualization and analysis tool™

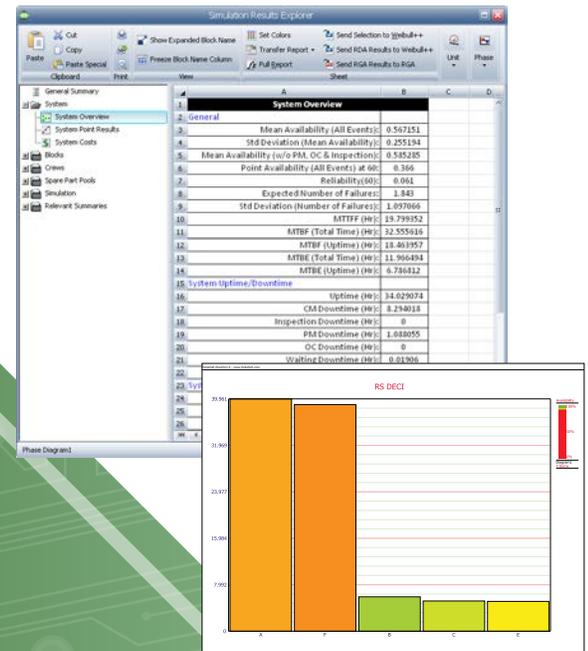
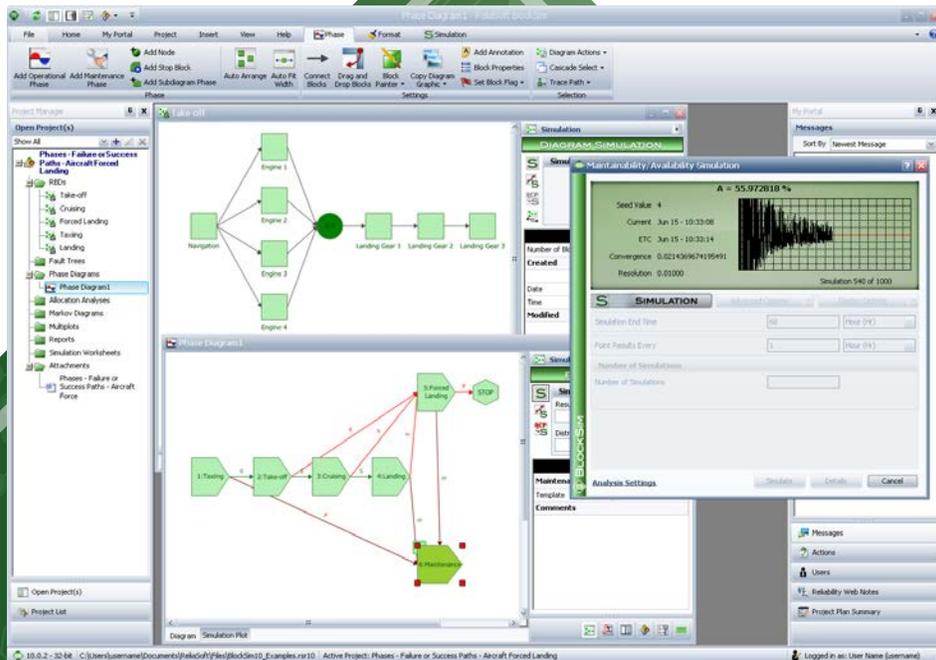


*ReliaSoft's BlockSim provides a comprehensive and flexible platform to model systems and processes using both reliability block diagram (RBD) and fault tree analysis (FTA) approaches. An extensive array of RBD configurations and FTA gates and events are supported, including advanced capabilities to model complex configurations, load sharing, standby redundancy, phases, duty cycles and more!*



*Use the system models to perform reliability, maintainability, availability, reliability optimization, throughput, resource allocation, life cycle cost and other analyses.*

*BlockSim is part of the Synthesis Platform<sup>®</sup>.*



<http://BlockSim.ReliaSoft.com>

## SOFTWARE HIGHLIGHTS - RELIASOFT'S BLOCKSIM

### Reliability Block Diagrams (RBDs)

- Series, Parallel and Complex
- k-out-of-n
- Standby
- Load Sharing
- Subdiagrams
- Multi Blocks and Mirrored Blocks

### Fault Trees

- AND and OR Gates
- Voting Gates (k-out-of-n)
- Inhibit Gates
- NOT, NAND and NOR Gates
- Standby Configurations Using:
  - Standby Gates
  - Priority AND Gates
  - Sequence Enforcing Gates
- Load Sharing Gates
- Subdiagrams

### Analytical Diagrams

- Exact System Reliability Equation
- Minimal Cut Sets
- Metrics:
  - Reliability and Probability of Failure
  - Conditional Reliability
  - Conditional Probability of Failure
  - Reliable Life (aka Warranty Time)
  - BX% Life
  - Mean Life
  - Failure Rate
- Plots:
  - Reliability vs. Time
  - Unreliability vs. Time
  - pdf
  - Failure Rate vs. Time
  - Reliability Importance Plots

### Simulation Diagrams

- Duty Cycles
- Maintenance Durations
- Restoration Factors
- Direct & Indirect Maintenance Costs
- Spare Parts Availability
- Maintenance Crew Logistics
- State Change Triggers
- Batch Simulation
- Metrics:
  - Mean and Point Availability
  - Reliability and Probability of Failure
  - Mean Time to First Failure
- Plots (for System and/or Block):
  - Point Reliability/Availability
  - Mean Availability
  - Costs
  - Up/Down Timeline
  - Block or System Downtime
  - Expected Failures/Downing Events
  - Criticality Metrics (e.g., RS FCI, etc.)
  - Block Bubble Plot
  - Crew and Spare Part Metrics
- Throughput Analysis
  - Excess Capacity and Backlog

### Phase Diagrams

- Maintenance Phases
- Node and Stop Blocks
- Varying Throughput

### Markov Diagrams

- (if supported by your license)
- Discrete
  - Continuous

### System Improvement Tools

- Allocation Analysis
- Optimum Replacement
- FRED Reports
- Overlay Plots (aka Multi-Plots)
- Synthesis Workbooks (spreadsheet and word processing modules combined)

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server® and Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications, including:

- Publish *models* based on diagram analyses and create *metrics* to track and display KPIs
- Use models created from analyses performed in other Synthesis applications

### Multiple Languages Supported

For details, please visit:

<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Theoretical eTextbook
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

BlockSim provides an extensive array of tools to help you model and analyze systems and/or processes. Some of the applications and benefits for using BlockSim include:

- Identify critical components (or failure modes) and determine the most effective ways to improve system performance through design improvements and/or maintenance planning.
- Use simulation to obtain estimated performance metrics that can facilitate decision-making in a variety of areas, such as scheduling planned maintenance, planning for spares, identifying bottlenecks in production throughput and estimating life cycle costs.
- Identify vulnerabilities in a system and determine the most effective ways to reduce the risk.

## Why Upgrade to Version 10? (for details, visit <http://BlockSim.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Discrete and continuous Markov diagrams (if supported by your license), a tool to calculate the optimum inspection interval for a group of components and the ability to set on condition tasks to trigger preventive maintenance even if the item is failed.
- New drag and drop features for building diagrams, universal diagram skins, curved line connectors, set block order for simulation results and FMRA integration with FRED reports, allocation analyses and optimum replacement.



# RENO<sup>®</sup>

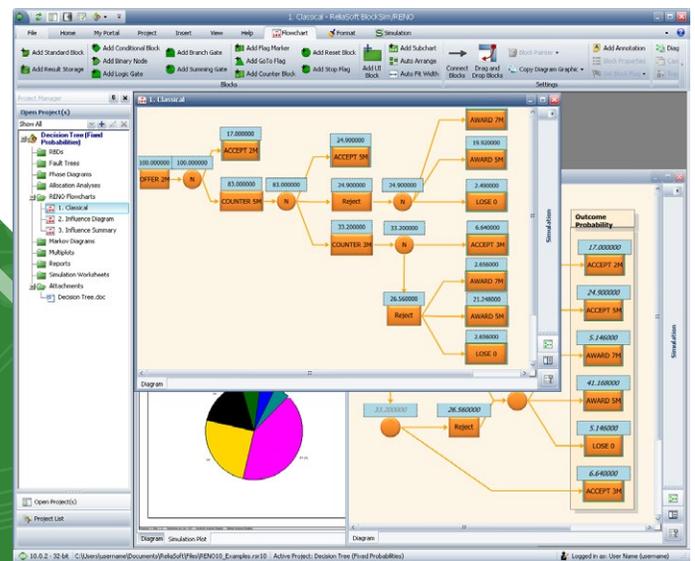
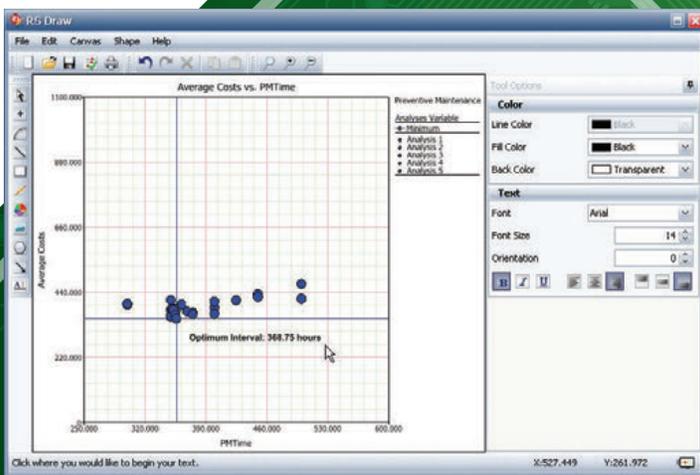
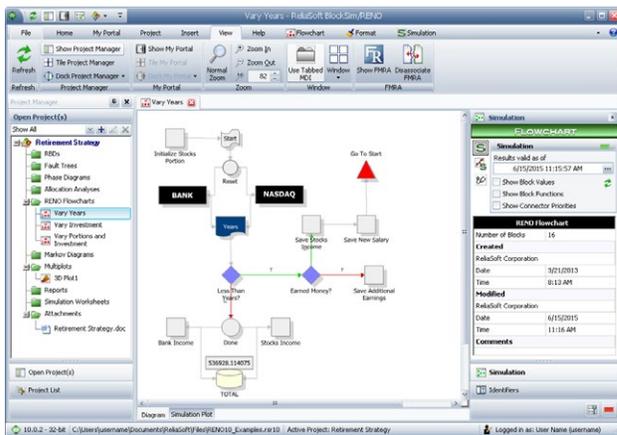
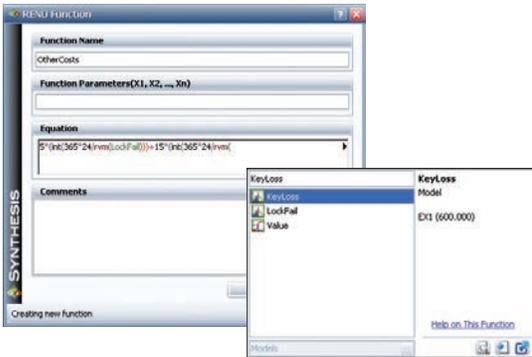
If you can flowchart it, you can simulate it!<sup>™</sup>

*If you thought that building complex models for simulation or discrete analysis would require buying ridiculously expensive software and then writing code on top of that... we have good news for you!*

*ReliaSoft's RENO software is a powerful and user-friendly platform for analyzing any probabilistic or deterministic scenario using an intuitive flowchart modeling approach and discrete event simulation.*

*You can create flowchart models for complex reliability analysis, risk and safety analysis or maintenance planning.*

*RENO is part of the Synthesis Platform<sup>®</sup>.*



## SOFTWARE HIGHLIGHTS - RELIASOFT'S RENO

### Potential Applications

If you can flowchart it, you can simulate it! Some examples include:

- Risk/Safety Analysis
- Complex Reliability Modeling
- Decision Making
- Maintenance Planning
- Optimization
- Operational Research
- Financial Analysis

### Easy to Build Flowchart Models

- Flowchart Blocks
  - Standard Blocks
  - Result Storage Blocks
  - Conditional Blocks
  - Binary Nodes
  - Logic Gates
  - Branch and Summing Gates
  - Flag Markers and Go To Flags
  - Counter Blocks
  - Reset Blocks
  - Stop Flags
  - User Interface Blocks
  - Subchart Blocks
- Resources
  - Variables
  - RENO and Static Functions
  - Simulation Definitions (with BlockSim)
  - Tables
  - Models (created in RENO or in other Synthesis applications)
- Excel®-compatible Spreadsheets
- Integrated Run-Time Debugger
  - Step through the flowchart
  - Watch simulation proceed in "debug" mode

### Equation Building Utilities

- Internal Functions
- Predefined Functions
  - Engineering and Statistical
  - Math and Trigonometry
  - Financial
  - Logical
- Function Selector & Equation Editor
  - to save time and reduce errors
- Color-Coding
  - for variables, functions and operands
- Resource Preview
  - see variable definitions as you type

### Simulation Results

Display results during execution, in Excel®-compatible spreadsheet and/or directly in the flowchart. May include:

- Averages
- Sums
- Arrays
- Minimum/Maximum Values
- Last Values (end of simulation)

### Sensitivity Analysis

- Vary one or two constants across a set of simulation runs
- Analyze how different inputs will affect the final results

### Optimization

- Automatically vary one or two constants within a given range
- Find the value(s) that minimize or maximize a specified result

### Plots

- Plot a result against 1 or 2 varied constants
- Compare one result against another
- Plot results against the cumulative probability of the values
- Display results values in pie charts and bar charts

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server®
- Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications, including:

- Use BlockSim diagram results in RENO flowcharts
- Use RENO flowcharts to simulate response data for DOE++
- Use models created from analyses performed in other Synthesis applications
- Transfer array of results to Weibull++

### Available Services

- Detailed User Documentation
- Practical Example Files
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

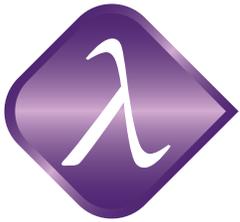
You can use the flowchart models that you create with RENO to estimate results of interest, perform sensitivity analysis to evaluate how key inputs will affect the results and automatically estimate optimum values by performing multiple simulation runs.

These techniques can be applied for a wide variety of applications including, but not limited to:

- Risk/Safety Analysis
- Complex Reliability Modeling
- Decision Making
- Maintenance Planning
- Optimization
- Operational Research
- Financial Analysis

## Why Upgrade to Version 10? (for details, visit <http://RENO.Reliasoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- A new 3D plot for sensitivity analysis and the ability to quickly transfer an array of results to Weibull++.
- Universal diagram skins, curved line connectors, open multiple projects simultaneously and Synthesis Workbooks for custom reports.



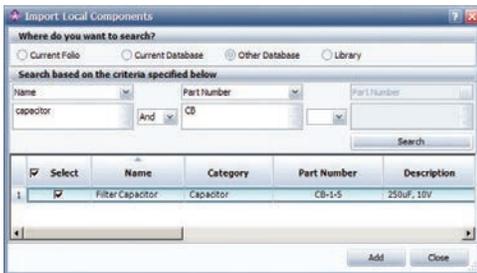
# λ PREDICT®

MIL-217 \* Bellcore/Telcordia \* FIDES \* NSWC Mechanical

*When actual product reliability data is not available, standards based reliability prediction may be used to evaluate design feasibility, compare design alternatives, identify potential failure areas, trade-off system design factors and track reliability improvement.*

*ReliaSoft's Lambda Predict facilitates failure rate and MTBF predictions based on the major reliability prediction standards. The software also offers reliability allocation, derating analysis and a full set of supporting tools.*

*Lambda Predict is part of the Synthesis Platform®.*



Name	Category	Quantity	Failure Rate(=INF)
MIL-HDBK-217F	Block	1	0.5920 F999H
Driving Circuit	Block	1	0.7183
D1	Diode, Low Frequency	1	0.1656
C1	Capacitor	1	0.0735
C2	Capacitor	1	0.0093
C3	Capacitor	1	0.0166
C4	Capacitor	1	0.0057
R1	Resistor	1	0.0424
R2	Resistor	1	0.0753
R3, R4	Resistor	2	0.1826
HB1	Hybrid Block	1	0.0915
Hybrid Layer	Hybrid Layer	1	-
IC1	Micro, Digital	1	0.0006
C5	Capacitor	1	0.0019
R5	Resistor	1	0.0026
Amplifier Circuit	Block	1	0.2367
C6	Capacitor	1	0.0106
VR1	Resistor	1	0.1139
TL1, T2	Transistor, LP Bipolar	2	0.0090
TL3, T4	Transistor, LP Bipolar	2	0.0106
HB1	Linked Block	1	0.0915

Name	Category	Quantity	Failure Rate(=INF)	MTBF	Contribution	Failure Rate Upper Bound(=INF)
TL1 Speaker System	Telcordia SR-332 Issue 3	1	76.7614 FITS	1.3027E+07 hrs	1.0000	97.5084
Power Supply Circuit	Block	1	14.5527	6.8716E+07	0.1896	20.3809
S1	Switch	1	10.2322	9.7720E+07	0.7031	15.5993
R1	Resistor, Fixed	1	0.1998	5.0058E+09	0.0137	0.2513
R2	Resistor, Fixed	1	0.1609	6.2169E+09	0.0111	0.2024
LED1	Opto-Electronic	1	0.3186	3.1391E+09	0.0219	0.5405
C1	Capacitor	1	2.7894	3.5801E+08	0.1574	4.6438
C2	Capacitor	1	0.0555	1.1604E+09	0.0500	1.4270
Driving Circuit	Block	1	38.1087	2.6242E+07	0.4964	57.5078
R3, R4	Resistor, Fixed	2	0.3995	2.5029E+09	0.0105	0.4727
R5, R6	Resistor, Fixed	2	0.3217	3.1084E+09	0.0084	0.3806
C3, C4	Capacitor	2	0.8505	1.1788E+09	0.0223	0.9128
Hybrid Block	Hybrid Block	1	36.5350	2.7371E+07	0.9580	55.8730
AMP	IC, Analog/Linear	1	2.0570	4.8614E+08	0.0623	3.4684
VR1, VR2	Resistor, Variable	2	26.4520	3.2839E+07	0.0218	39.8577
C5, C6	Capacitor	2	0.5260	1.9011E+09	0.0159	0.7820
Left Speaker	Block	1	6.8960	1.4822E+08	0.0897	7.1488
SPK1	External	1	6.3600	1.5723E+08	0.9236	-
C7, C8	Capacitor	2	0.5260	1.9011E+09	0.0764	0.7828
Right Speaker	Block	1	17.2160	5.8084E+07	0.2243	-
Left Speaker	Linked Block	1	6.8960	1.4822E+08	0.4000	7.1488
USB1	External	1	18.3300	9.6805E+07	0.6000	-

## SOFTWARE HIGHLIGHTS - RELIASOFT'S LAMBDA PREDICT

### Reliability Prediction Standards

- MIL-HDBK-217F
  - Part Stress and Parts Count Methods
  - Option to define failure rates for custom connection types
  - Option to calculate non-operational failure rates based on RADC-TR-85-91
- Bellcore/Telcordia
  - Telcordia SR-332 Issues 1 - 3
  - Bellcore TR-332 Issue 6
- FIDES
- NSWC (Mechanical)
  - 2007
  - 2011
- For all standards, option to define failure rates for "external" components not addressed in the standard

### Data Management

- Easy to build system configurations
- Multiple views for data entry
  - Tree View
  - Pi Factor View
- Easy to find and reuse data
- Import/export and copy/paste

### Derating Standards

- NAVSEA-TE000-AB-GTP-010
- MIL-STD-975M
- MIL-STD-1547A
- Naval Air System Command AS-4613
- ECSS-Q-30-11-A

### Reliability Allocation Methods

- Equal
- AGREE
- Feasibility of Objectives
- ARINC
- Repairable Systems

### Real Power for Real Applications

Some of the benefits of using the Lambda Predict software to make reliability predictions based on the major published standards include the ability to:

- Obtain an initial indication of whether a design will be able to meet reliability objectives, and identify potential problem areas early in development.
- Compare design alternatives and/or trade-off system design factors.
- Consider environmental and other stress factors that have a significant impact on system performance yet may otherwise be overlooked.

### Why Upgrade to Version 10? (for details, visit <http://Predict.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Support for NSWC-11 and a dedicated folio for MIL-217 parts count analysis.
- Phase sets to manage life profiles for FIDES analyses, and new FIDES analysis plots.

### Supported Calculations

- For all predictions:
  - Failure Rate( $t=\infty$ )
  - MTBF
  - Contribution
- For Bellcore/Telcordia:
  - Early Life Factor
  - Standard Deviation( $t=\infty$ )
  - Failure Rate Upper Bound( $t=\infty$ )
- For MIL-217:
  - Connection Failure Rate
  - Non-Operational Failure Rate & MTBF
  - Non-Operational Contribution
- For blocks that use redundancy:
  - Mission Time
  - Failure Rate( $t$ )
  - Unreliability( $t$ )

### Supported Plot Types

- Failure Rate
- MTBF
- Unreliability
- Mission Phase
- Temperature Plots
  - Failure Rate/MTBF vs. Temperature
  - Unreliability vs. Temperature
- Environment Plots
  - Failure Rate/MTBF vs. Environment
  - Unreliability vs. Environment
- Stress Plots (Current, Power, Voltage)
  - Failure Rate/MTBF vs. Stress
  - Unreliability vs. Stress

### Extensive Parts Libraries

- MIL-HDBK-217F Parts Count
- MIL-M-38510
- EPRD-97
- NPRD-95

- PartLibraries.org (via subscription)
  - 300,000+ commercial components
  - 140+ manufacturers

### Import Types

- Microsoft Excel® Files
- Text Files (\*.txt, \*.csv)
- Analyses from Lambda Predict 1, 2 & 3
- Components from Libraries

### Centralized Data Storage

- Standard Repository (\*.rsrp)
- Microsoft SQL Server®
- Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integration

Integration with all other Synthesis Platform applications, including:

- Publish *models* based on the predicted failure rate
- Use system configuration and prediction data in BlockSim and Xfmea/RCM++/RBI

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services



# PARTLIBRARIES.ORG

**PartLibraries.org** is a web portal for the collection and dissemination of component data for use in standards based reliability predictions and other reliability analyses. When used correctly, these part libraries can help to save time and improve the accuracy of your MIL-HDBK-217, Bellcore/Telcordia or NSWC Mechanical reliability predictions.



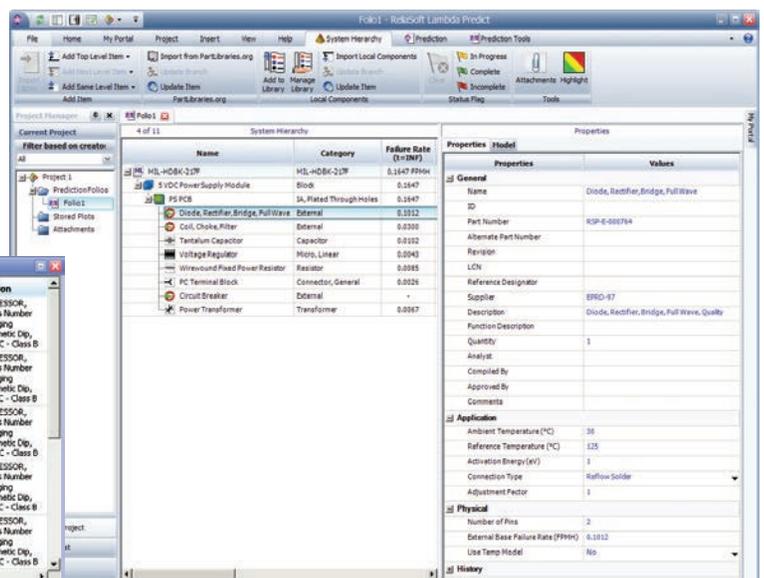
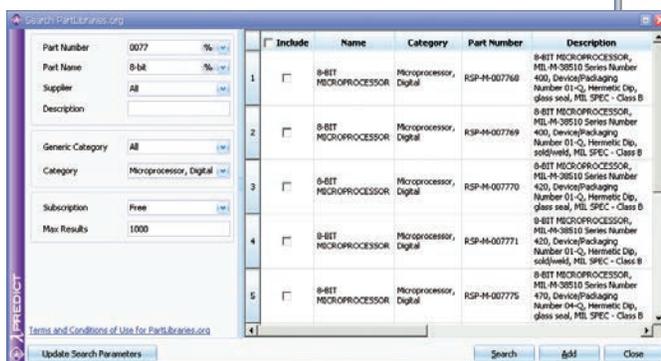
This resource is currently available **exclusively to users of ReliaSoft's Lambda Predict** software, which provides a specialized interface that makes it easy to find and import the information you need. All Lambda Predict users receive free access to the integrated circuit (IC) component definitions published in **MIL-M-38510**, the electronic component failure rates published in **EPRD-97** (Electronic Parts Reliability Data) and the mechanical, electrical and electromechanical component failure rates published in **NPRD-95** (Nonelectronic Parts Reliability Data).

## Multiple Ways to Easily Access the Information You Need

The Lambda Predict software provides several flexible options to make it easy for you to find the component you need and import the data into your reliability prediction analysis. This includes **specialized search utilities** that make it easy to search the library based on category, part number, supplier, part name and/or part description.

The software can also compare each part number in a system configuration against the data in PartLibraries.org. If there is a match, Lambda Predict can **automatically import** the reliability prediction parameters and/or failure rate.

## Search by category, part number, supplier, name and/or description



Easily import the failure rate or the reliability prediction parameters required by the standard

## EXPAND YOUR COMPONENT LIBRARY WITH A PARTLIBRARIES.ORG SUBSCRIPTION

If you want access to **more than 300,000 commercial electronic components** with reliability prediction parameters predefined based on the published manufacturer spec sheets, you can also purchase a yearly subscription that offers unlimited access to the full parts data library. The library currently contains component data from **more than 140 manufacturers**, and the information will continue to be updated in response to user requests and as new data become available. Available component types include:

### Cables and Wires

### Capacitors

### Circuit Protection

- Circuit Breakers and Fuses

### Discrete Semiconductors

- Diodes, Transistors and Thyristors

### Frequency Control

- Crystals and Oscillators

### Integrated Circuits (ICs)

- Analog ICs, Digital ICs, Memory, Microprocessors

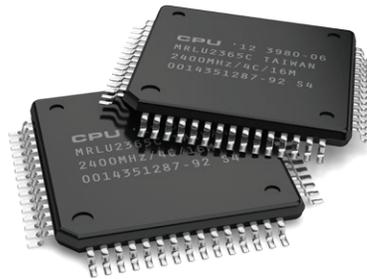
### Magnetic

- Coils, Inductors and Transformers

### Optoelectronics

### Relays and Switches

### Resistors and Thermistors



<http://www.PartLibraries.org>



# XFMEA®

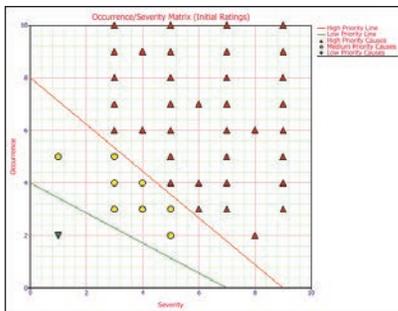
Expert support for all types of FMEA and FMECA™

*ReliaSoft's Xfmea facilitates the FMEA/FMECA process and provides flexible data management and reporting capabilities.*

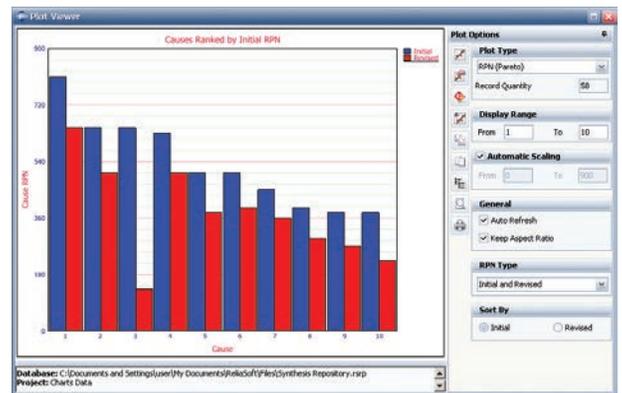
*The software also provides integrated support for related analyses such as Design Verification Plans (DVP&Rs), Design Reviews Based on Failure Mode (DRBFMs), Process Flow Diagrams (PFD Worksheets) and Process Control Plans (PCPs).*

*Xfmea is part of the Synthesis Platform®.*

Label	Question	Response	Comments
New Technology	Will the design involve new technology?	No	
New Application	Will the design apply existing technology in a new way?	Yes	Enter the reason why the team answered "yes" to this question.
Historical Problems	Is there a history of problems for a similar design?	No	
Safety Issues	Is there a potential for safety-related issues?	No	
Regulation Issues	Is there a potential for regulation-related issues?	Yes	Enter the reason why the team answered "yes" to the question.
Mission-Critical	Is this a mission-critical item?	No	
Supplier Capability	Are there concerns about the supplier's capability?	No	



Description	RPN
Difficult to steer	54
Interface of frame to handle bar shaft and bearings has high friction due to corrosion	36
Interface of frame to handle bar shaft and bearings has high friction due to inadequate geometric clearances	125
Interface of frame to handle bar shaft and bearings has high friction due to debris	10
Difficult to operate the pedals	60



Recommended Action(s)	ID	Action Status	Responsibility	Target Completion Date	Effective Date
1. Add the reliability and durability testing to overall bicycle test plan	224	Completed	User Name	10/8/2011	10/7/2011
2. Based on Tire Design FMEA, modify tire composition for enhanced durability	223	Overdue	User Name	10/4/2011	
3. Begin research on new chain material with less friction and more corrosion resistance. Report back at next Product Team meeting.	219	In Progress	John User	10/13/2011	
4. Offer free safety clips to all bicycle users, covering proper brake adjustment, and other safety features.	229	In Progress	Jim User	10/25/2011	
5. Perform design sensitivity analysis on brake adjustment system to improve the adjustment feature under varying geometry and usage stresses.	227	Reviewed and Approved	User Name	10/3/2011	10/12/2011
6. Perform design sensitivity analysis on handle bar adjustment system to improve the adjustment feature under varying geometry and usage stresses.	225	Completed	User Name	10/3/2011	10/3/2011
7. Perform Tire Design FMEA jointly with the manufacturer	222	In Progress	SE User	10/20/2011	
8. Require all bicycle riders to check brake adjustment before delivery to customer.	228	Completed	SE User	10/13/2011	10/12/2011
9. Revise Bicycle system stability testing to include enhanced steering regimen.	215	In Progress	Fred User	10/12/2011	
10. Revise maintenance procedure to include more frequent chain lube.	220	In Progress	Pat User	10/27/2011	
11. Set up marketing clinic to establish improved range of seat adjustment parameters	221	Overdue	Dave User	10/11/2011	
12. Verify or modify bicycle performance test regimen to ensure adequate handle bar adjustment testing.	226	Completed	User Name	10/11/2011	10/12/2011

## SOFTWARE HIGHLIGHTS - RELIASOFT'S XFMEA

### FMEA Standards

- AIAG and SAE J1739
- IEC 60812
- ISO 14971
- VDA-4 (German Automotive Industry)
- MIL-STD-1629A
- *Also highly configurable to define your own custom profiles*

### FMEA Types

- Design FMEA (DFMEA)
- Process FMEA (PFMEA)
- System FMEA
- FMECA
- *Also highly configurable to define your own custom profiles*

### Risk Assessment Methods

- Risk Priority Numbers (RPNs)
- Criticality Analysis
- Quantitative Consequence Priority Numbers (QCPNs)
- Priority Highlights and Configurable Risk Ranking Logic

### Integration with Related Analyses

- Transfer DFMEA to PFMEA
- DVP&R and Test Plans
- Control Plans
- Process Flow Diagrams
- Design Reviews Based on Failure Mode

### Organization and Data Structure

- Easy to Build System Configurations
- Hierarchy, Worksheet and Filtered Views

### Finding and Reusing Data

- Browse or query to import existing analysis data
- Use keywords to find and import existing record descriptions (including new Smart Add tools)
- Copy/paste and drag/drop

### Tools and Utilities

- Custom Query Utility
- Customized Templates for Imports, Queries and Reports
- Change Log
- Analysis Planning Tool
- Links and Attachments
- Find and Replace
- Action Alerts
- Cause and Effect Diagrams

### Predefined Reports

- FMEA/FMECA Worksheets
- Control Plan Worksheets
- DVP&R Worksheets
- DRBFM Worksheets
- Other Tabular Reports (e.g., Causes by RPN, Actions by Due Date, etc.)

### Graphical Charts

- Bar Charts (e.g., Top 10 Failure Modes by RPN, Top 5 Effects by Severity, etc.)
- Pie Charts (e.g., Actions by Status, Controls by Type, etc.)
- % Reduction in RPN
- Occurrence/Severity Matrix
- FMEA/FMRA Dashboards

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server® and Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Import Types

- Microsoft Excel®
  - Build and manage custom templates for import/export
- Import from RCM++, RBI, MPC and XFRACAS

### File Output

- Microsoft Excel® and Word®
- Easily export to \*.pdf, \*.rtf or \*.html from Word or Excel
- Save chart graphics

### Integration

Integration with all other Synthesis Platform applications.

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

Some of the potential applications and benefits of performing FMEA and related activities with ReliaSoft's Xfmea software include the ability to:

- Proactively consider potential failures, prioritize issues based on risk and then initiate improvements early in development when modifications tend to have the greatest impact for the lowest cost.
- Create a keyword-searchable knowledge base of reliability-related information for your designs, which can contribute to the development of test plans, control plans, future design efforts and other activities. Establish consistency throughout the organization and make it easy for multiple users to cooperate on the analyses.
- Utilize charts, reports, automated e-mails and other features to effectively support decision-making and make sure that corrective actions are implemented.

## Why Upgrade to Version 10? (for details, visit <http://Xfmea.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Linked FMEAs, Smart Add (to find relevant text from similar analyses), filter the system hierarchy and automatic test plan generation.
- FMEA/FMRA dashboards, interactive FMEA Block Diagram, universal diagram skins and change log manager. Quantitative Consequence Priority Numbers (QCPNs) and the ability to allocate target reliability/availability from the FMRA.



# RCM++<sup>®</sup>

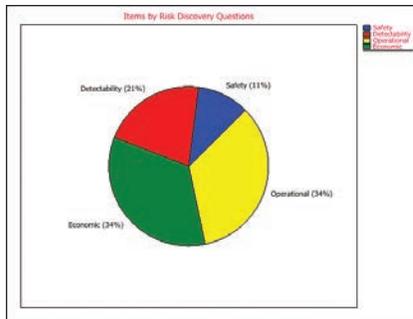
Putting the reliability back into reliability centered maintenance™

Label	Question	Response	Comments
Safety	Could failure affect safety or have other hazardous consequences?	Yes	Enter the reason why the team answered "yes" for this question. This information will provide a complete record of the decisions that were made for this analysis.
Detectability	Could failure be undetectable or not likely to be detected during normal operation?	No	
Operational	Could failure have significant operational impact?	Yes	Enter the reason why the team answered "yes" for this question. This information will provide a complete record of the decisions that were made for this analysis.
Economic	Could failure have significant economic impact?	No	

*ReliaSoft's RCM++ facilitates the Reliability Centered Maintenance (RCM) analysis approach for creating effective scheduled maintenance plans.*

*The software includes configurable capabilities for Equipment Selection, Failure Effect Categorization and Maintenance Task Selection. RCM++ also provides simulations that can be used to compare maintenance strategies based on cost and availability, and a calculator to estimate the optimum replacement interval.*

*RCM++ is part of the Synthesis Platform<sup>®</sup>.*



The screenshot displays the RCM++ software interface for an aircraft maintenance analysis. The main window shows a System Hierarchy on the left, a detailed description of a failure mode in the center, and a Failure Effect Categorization dialog on the right. The Task Manager window at the bottom right shows a table of tasks and their associated costs and availability.

Question	Yes/No	Explanation
7A: Is lubrication or servicing task applicable and effective?	No	Task is not applicable because there is no consumable to replenish.
7B: Is an inspection or functional check to detect degradation of function applicable and effective?	Yes	CVI for condition and security is applicable and effective.
7C: Is a restoration task to reduce failure rate applicable and effective?	No	Task is not applicable because item does not show degradation at an identifiable age.
7D: Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	Task is not applicable because item does not show degradation at an identifiable age.

Tasks	Name	Type	Operating Cost	Cost per Operating Time	Availability
1	Detailed Inspection of Engine Fire Detection Loops.	RS			

## SOFTWARE HIGHLIGHTS - RELIASOFT'S RCM++

### RCM Standards

- SAE JA1011/1012
- MSG-3
- NAVAIR 00-25-403
- *Also highly configurable to define your own custom profiles*

### Support for RCM Logic

- Equipment Selection
  - Yes/No Questions
  - Criticality Factors (Rating Scales)
- Failure Effect Categorization (FEC)
- Maintenance Task Selection
- *Also highly configurable to define your own logic charts*

### Maintenance Strategies

- Run to Failure
- Preventive Maintenance (PM)
  - Scheduled Repair
  - Scheduled Replacement
  - Scheduled Service
  - Failure Finding Inspection
- Predictive Maintenance (PdM)
  - On Condition Inspection

### Reliability Calculations

- Analytical and/or Simulation Results
- Reliability
- Average Availability
- Operating Costs

### Maintenance Planning

- Optimum Replacement Time
- For a Given Maintenance Strategy:
  - Cost per Operating Time
  - Average Availability
- Flexible Task Packaging

### Organization and Data Structure

- Easy to Build System Configurations
- Multiple Views for Data Entry
  - Hierarchy (Tree) View
  - Worksheet View
  - Filtered View

### Finding and Reusing Data

- Browse or query to import existing analysis data
- Use keywords to find and import existing record descriptions
- Copy/paste and drag/drop

### Predefined Reports and Charts

- Equipment Selection
- Functional Failure Analysis
- Failure Effect Categorization
- Maintenance Task Selection
- Maintenance Task Summaries
- Pie, Bar and Pareto Charts

### Tools and Utilities

- Custom Query Utility
- Customized Templates for Imports, Queries and Reports
- Analysis Planning Tool
- Links and Attachments
- Find and Replace
- Action Alerts via E-mail, SMS Text Message or Synthesis Portal Message

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server® & Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Integrated FMEA Capabilities

- Configurable for All Types of FMEA
- Risk Priority Numbers (RPNs)
- Criticality Analysis (Qualitative & Quantitative)
- Track Corrective Actions
- FMEA Reports, Charts and Dashboards

### Import Types

- Microsoft Excel®
  - Build and manage custom templates for import/export
- Import from Xfmea, RBI, MPC and XFRACAS

### File Output

- Microsoft Excel® and Word®
- Easily export to \*.pdf, \*.rtf or \*.html from Word or Excel
- Save chart graphics (\*.jpg, \*.gif, \*.png or \*.wmf)

### Integration

Integration with all other Synthesis Platform applications.

### Multiple Languages Supported

For details, please visit:  
<http://www.ReliaSoft.com/languages>

### Available Services

- Detailed User Documentation
- Practical Example Files
- Step-by-Step Example Guide
- Training for Theory + Software
- Professional Consulting Services

## Real Power for Real Applications

Some of the potential applications and benefits for using reliability centered maintenance (RCM) techniques and ReliaSoft's RCM++ software as part of your organization's asset management program include the ability to:

- Develop a scheduled maintenance plan for a physical asset that will provide an acceptable level of functionality, with an acceptable level of risk, in an efficient and cost-effective manner.
- Evaluate whether preventive maintenance (PM) is appropriate and determine the optimum preventive maintenance intervals.
- Promote analysis processes that are more efficient and more effective, utilizing lessons learned from past analyses when applicable.

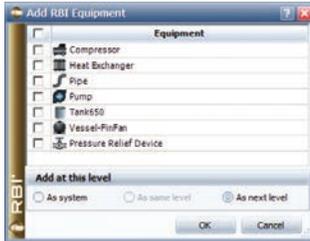
## Why Upgrade to Version 10? (for details, visit <http://RCM.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- Linked FMEAs, Smart Add (to find relevant text from similar analyses), filter the system hierarchy and automatic test plan generation.
- FMEA/FMRA dashboards, interactive FMEA Block Diagram, universal diagram skins and change log manager. Quantitative Consequence Priority Numbers (QCPNs) and the ability to allocate target reliability/availability from the FMRA.



# RBI®

Risk based inspection analysis for oil & gas, chemical and power plants



*ReliaSoft's RBI software facilitates risk based inspection (RBI) analysis for oil & gas, chemical and power plants in adherence to the principles and guidelines presented in the American Petroleum Institute's recommendations in the API RP 580 and RP 581 publications, as well as the American Society of Mechanical Engineers' recommendations in ASME PCC-3-2007.*

*Full-featured Reliability Centered Maintenance (RCM) and FMEA / FMECA functionality is also included.*

*RBI is part of the Synthesis Platform®.*



Risk Categories (Current Repository)

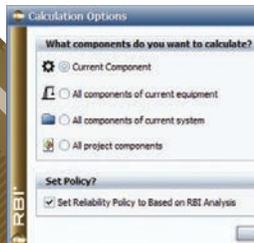
Failure Probability			
Category	Range (0 to 1)	Display	
1	<= 0.1	0.1	1
2	<= 0.2	0.2	2
3	<= 0.3	0.3	3
4	<= 0.5	0.5	4
5	<= 1	1	5

Area Consequence			
Category	Range (m <sup>2</sup> )	Display	
1	<= 92.9	A	
2	<= 92.9	B	
3	<= 279	C	
4	<= 929	D	
5	> 929	E	

Financial Consequence			
Category	Range (\$)	Display	
1	<= 10000	A	
2	<= 100000	B	
3	<= 1000000	C	
4	<= 10000000	D	
5	> 10000000	E	



Hydrogen Generation Unit - ReliaSoft RBI

Name	Component Type	Area Risk (Plan Date)	Financial Risk (Plan Date)
en Generation Unit			
en Transport Pipe	PIPE-E		13
en Fuel Tank			
en Fuel Tank Bottom 100K Max Risk	TANKBOTTOM	Medium	47
en Fuel Tank Bottom 500K Max Risk	TANKBOTTOM	Medium	47
en Hydrogen Storage Tank			
en High Pressure Tank Bottom	TANKBOTTOM	Low	53
en Hydrogen Generation Reactor			
en Reactor Casing	REACTOR	Medium High	58
en Reactor Casing 2nd Internal Circle Protect	REACTOR	Medium High	58
en Heat Exchanger for Primary Cooling			
en Heat Exchanger for Primary Cooling	HEXTUBE	Medium High	52
en Pressure Relief Device Protecting Reactor			
en Pressure Relief Device Protecting Reactor			61

Property Name	Value
Apply to Multiple Damage Factors	Yes
Internal Cracking Present	5
pH of Process Fluid	58 to 1000 ppm
H2S Content of Process Fluid	No
Cyanide Present	No
Post-Weld Heat Treatment (PWHT)	No
Thinning Type	General Thinning - a 1...
Date of Last Wall Thickness Inspection	2/1/2008
Number of Inspections	2 - Inspections
Inspection Effectiveness	C - Fairly Effective
Last Inspection Thickness (mm)	24
Corrosion Rate of Base Metal (mm/yr)	0.02
Minimum Wall Thickness Per Code (mm)	21.2
Corrosion Allowance (mm)	4
Cladding Present	No
Type of Online Monitoring	Corrosion Coupons
Thinning Mechanism	Other Corrosion Mecha...
SCC Damage Factor - Sulfide Stress Cracking	
Date of Last Inspection	2/1/2008
Number of Inspections	1 - Inspection
Inspection Effectiveness	D - Poorly Effective
Has Brinell Hardness	< 200
SCC Damage Factor - MIC/SOHC-H2S	
Date of Last Inspection	2/1/2008
Number of Inspections	1 - Inspection

Management Systems Score (Project: Petrochemical Plant Examples)

Management Score Options

Enter score from 1 to 1000 without answering questions

Assume average score of 500

Answer questionnaire and calculate score

Score: 500

#	Category	Possible Score	Actual Score	Question	Possible Score	Actual Score
1	Leadership and Administration	70	0	Are Material Safety Data Sheets (MSDS) available for all chemical substances used or handled in each unit?	5	
2	Process Safety Information	80	0	a. Is the maximum on-site inventory of each of these chemicals listed?	2	
3	Process Hazard Analysis	100	0	b. Is this information available to operations and maintenance personnel and any appropriate contract personnel in the unit?	2	
4	Management of Change	80	0	c. Are the hazardous effects, if any, of inadvertent mixing of the various materials on site clearly stated in the Standard Operating Procedures and emphasized in operator training programs?	3	
5	Operating Procedures	80	0	Are quality control procedures in place and practiced to ensure that all identified materials meet specifications when received and used?	10	
6	Safe Work Practices	85	0	Is up-to-date written information readily available in the unit that:	3	
7	Training	100	0	Summarizes the process chemistry?		
8	Mechanical Integrity	120	0			
9	Pre-Startup Safety Review	60	0			
10	Emergency Response	65	0			

<http://RBI.Reliasoft.com>

## SOFTWARE HIGHLIGHTS - RELIASOFT'S RBI

### RBI Standards

(principles and concepts)

- API RP 580 and RP 581
- ASME PCC-3-2007

### RBI Analysis

- Define Risk Categories (risk tolerance)
  - Failure Probability
  - Area Consequences
  - Financial Consequences
- Define Management Systems Score
- Easy to add RBI equipment types and components to system hierarchy
- Specify units for temperature, pressure, etc.
- Quick Qualitative Assessment
  - Configurable Rating Scales
  - Select Equipment for Detailed Analysis
- Detailed RBI Assessments
  - Compressor
  - Heat Exchanger
  - Pipe
  - Pump
  - Tank650
  - Vessel/FinFan
  - Pressure Relief Device (PRD)
- Detailed Results
  - Damage Factors
  - Probability of Failure
  - Financial Consequences
  - Area Consequences
  - Recommended Inspection Date
  - Area Risk and Financial Risk Plots

### Easy to Find and Reuse Data

- Browse or Query to Import Existing Data
- Use Keywords to Find and Import Existing Record Descriptions
- Copy/Paste and Drag/Drop

### Real Power for Real Applications

Some of the potential applications and benefits for using risk based inspection (RBI) analysis techniques and ReliaSoft's RBI software tool as part of your organization's asset management program include the ability to:

- Rank assets using a customizable qualitative risk discovery rating system, and then use a quantitative analysis based on industry standards to predict the risk for selected assets.
- Develop an inspection schedule that optimizes inspection time and cost while maintaining acceptable risk based on the recommended inspection types and inspection date for each asset.
- Use reliability centered maintenance (RCM) to develop scheduled maintenance plans that will provide an acceptable level of functionality, with an acceptable level of risk, in an efficient and cost-effective manner.

### Why Upgrade to RBI 10? (for details, visit <http://RBI.Reliasoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as an integrated Project Planner with expanded actions tracking, automated watches and alerts, easier to find and filter analyses, batch properties editor for managing resources, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- New Area Risk and Financial Risk plots that show the risks vs. the various critical dates during the analysis, and the ability to set the measurement unit for many RBI properties.
- Enhancements for FMEA and RCM capabilities, such as linked FMEAs, Smart Add, the ability to filter the system hierarchy, interactive FMEA block diagrams, FMRA dashboards, etc.

### Full-Featured RCM

- RCM Standards
  - SAE JA1011
  - SAE JA1012
  - MSG-3
  - NAVAIR 00-25-403
  - *Option to use your own custom profile*
- Support for RCM Logic
  - Equipment Selection
  - Failure Effect Categorization (FEC)
  - Maintenance Task Selection
    - Run to Failure
    - Preventive Maintenance (PM)
    - Predictive Maintenance (PdM)
  - *Option to customize the logic*
- Calculations and Planning
  - Optimum Replacement Time
  - Cost per Operating Time
  - Average Availability
  - Flexible Task Packaging

### Integrated FMEA Capabilities

- Configurable for All Types of FMEA
- FMEA Standards
  - AIAG
  - SAE J1739
  - IEC 60812
  - ISO 14971
  - VDA-4 (German Automotive Industry)
  - MIL-STD-1629A
  - *Option to use your own custom profile*
- Risk Priority Numbers (RPNs)
- Criticality Analysis
  - Quantitative
  - Qualitative
- Track Corrective Actions
- FMEA Reports, Charts and Dashboards

### Tools and Utilities

- Flexible Templates for Imports, Queries and Reports
- Links and Attachments
- Action Alerts via E-mail, SMS Text Message or Synthesis Portal Message

### File Output

- Microsoft Excel® and Word®
- Easily export to \*.pdf, \*.rtf or \*.html from Word or Excel

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server® and Oracle®
- Simultaneous Access by Multiple Users
- Shared Analysis Settings and Data
- Flexible User Access Levels

### Import Types

- Import/Export via Microsoft Excel®
  - Build and manage custom templates
- Import from Xfmea, RCM++ and XFRACAS

### Integration

Integration with all other Synthesis Platform applications.

### Available Services

- Detailed User Documentation
- Practical Example Files
- Step-by-Step Guide
- Training for Theory + Software
- Professional Consulting Services



# MPC

An MSG-3 Compliant Maintenance Program Creator

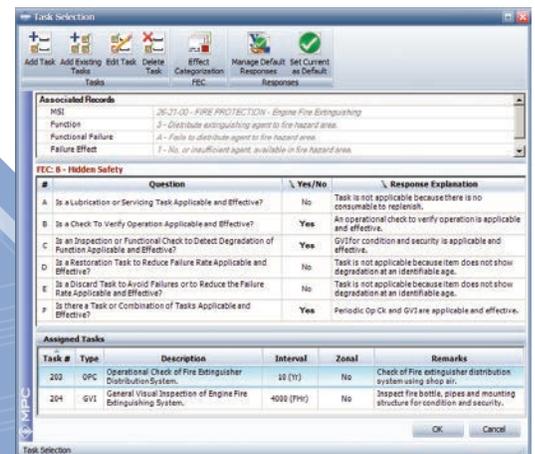
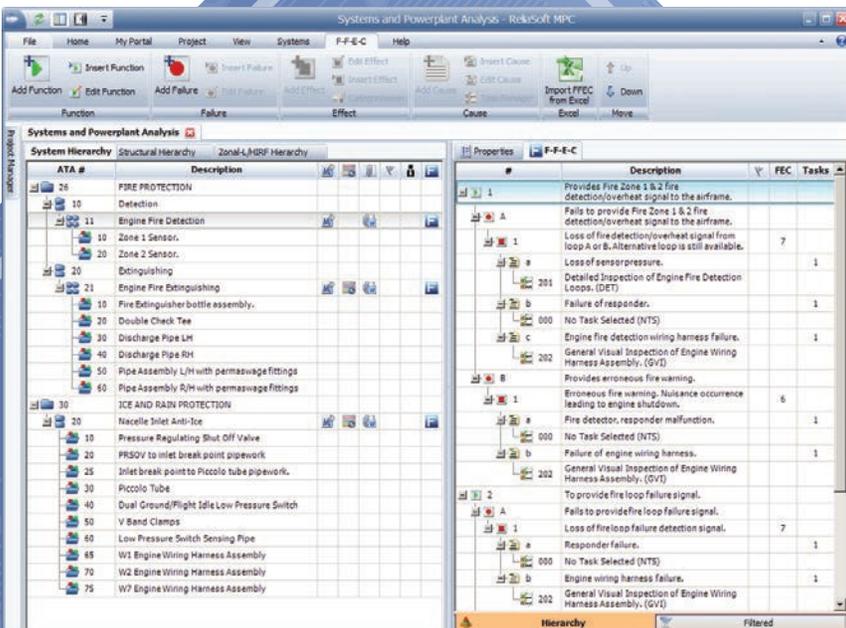
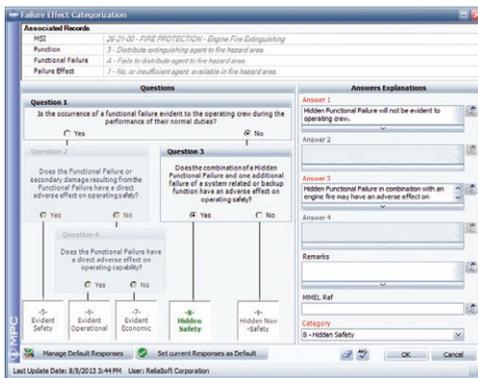


*ReliaSoft's MPC is an MSG-3 compliant maintenance program creator for the aircraft / aerospace industry. It facilitates the analysis process, provides flexible data management capabilities and offers automated report generation in templates that have been accepted for submission to the aircraft industry maintenance review board. The software is available in two versions:*

*MPC Standard supports the entire process for aircraft Systems and Powerplant Analysis.*

*MPC Plus includes additional support for aircraft Structural Analysis and Zonal-L/HIRF Analysis.*

*MPC is part of the Synthesis Platform®.*



<http://MPC.ReliaSoft.com>

## SOFTWARE HIGHLIGHTS - RELIASOFT'S MPC

### MSG-3 Systems and Powerplant Analysis

- Predefined Systems and Subsystems
  - Based on ATA iSpec 2200
- Identify Maintenance Significant Items (MSIs)
- Functional Failure Analysis (F-F-E-C)
- Failure Effect Categorization (FEC)
  - Evident Safety
  - Evident Operational
  - Evident Economic
  - Hidden Safety
  - Hidden Non-Safety
- Maintenance Task Selection
  - Lubrication (LUB) or Servicing (SVC)
  - Operational Check (OPC)
  - Visual Check (VCK)
  - General Visual Inspection (GVI)
  - Detailed Inspection (DET)
  - Special Detailed Inspection (SDI)
  - Scheduled Structural Health Monitoring (S-SHM)
  - Functional Check (FNC)
  - Restoration (RST)
  - Discard (DIS)
- Check MSI Analysis (highlights potential discrepancies in the application of MSG-3 logic)

### Automatic Report Generation

- Microsoft Word® or Microsoft Excel®
- Easy to modify, print, PDF and distribute
- Choice of predefined templates for MSI reports (Standard, Dassault and Sukhoi)
- Customizable report templates

### Real Power for Real Applications

Some of the benefits of using the MPC software to facilitate the analysis and reporting for MSG-3 analysis include:

- Guides analysts through the process to implement the MSG-3 logic.
- Provides centralized data storage that allows multiple users to cooperate on the analysis and makes it easy to reuse relevant information from prior analyses.
- Automatically generates the complete maintenance program report document in Microsoft Word®. This report can be generated in a fraction of the time required to manually prepare report documents.

### Why Upgrade to Version 10? (for details, visit <http://MPC.ReliaSoft.com/version10.htm>)

- Major upgrades to the Synthesis Platform®, such as expanded actions tracking, automated watches and alerts, better integration with Active Directory® for user account management, and the option to implement a Synthesis Enterprise Portal website.
- New analysis options in MPC Plus, including fatigue damage analysis, Detectability and Composition ratings for environmental deterioration analysis, Residual Strength and Damage Growth ratings for accidental damage analysis.
- A new report that lists all tasks in the project from all analysis types, and expanded options for tasks reports in structural and zonal analysis.

### Description & Operation (D&O) Documents

- Attached to the Analysis
- Integrated into Report Output

### MSG-3 Structural Analysis (Plus Only)

- Predefined Structures and Sub-Structures
  - Based on ATA iSpec 2200
- Identify Structural Significant Items (SSIs)
- Configurable Rating Systems
  - Environmental Deterioration Analysis
  - Accidental Damage Analysis
  - Fatigue Damage Analysis
- Structural Analysis Tasks
  - General Visual Inspection (GVI)
  - Detailed Inspection (DET)
  - Special Detailed Inspection (SDI)
  - Scheduled Structural Health Monitoring (S-SHM)

### MSG-3 Zonal-L/HIRF Analysis (Plus Only)

- Predefined Major Zones
  - Based on ATA iSpec 2200
- Logic for selecting the appropriate analysis
- Configurable Rating Systems
  - Standard Zonal Analysis
  - Enhanced Zonal Analysis
  - L/HIRF Analysis
- Zonal Analysis Tasks
  - General Visual Inspection (GVI)
  - Transfer "zonal candidate" tasks from other analyses

### Facilitating Team Effort

- Management of "Working Group Stamps"
- Option to store notes and status updates
- Option to flag portions of the analysis
- Link or attach other related files

### Data Management

- Import from Excel
- Cut/Copy/Paste or Drag & Drop
- Browse and import from existing analyses
- Find and reuse existing text descriptions
- Import into RCM++, Xfmea or RBI

### Centralized Data Storage

- Standard Repository
- Microsoft SQL Server®
- Oracle®
- Simultaneous Access by Multiple Users
- Check-in and Check-out
- Shared Analysis Settings and Data
- Flexible User Access Levels
- Restore Points (to roll back to a previous stage in the analysis)

### Integration

Integration with all other Synthesis Platform applications.

### Available Services

- Detailed Online Help File
- Detailed User Documentation
- Practical Example Files
- Professional Consulting Services



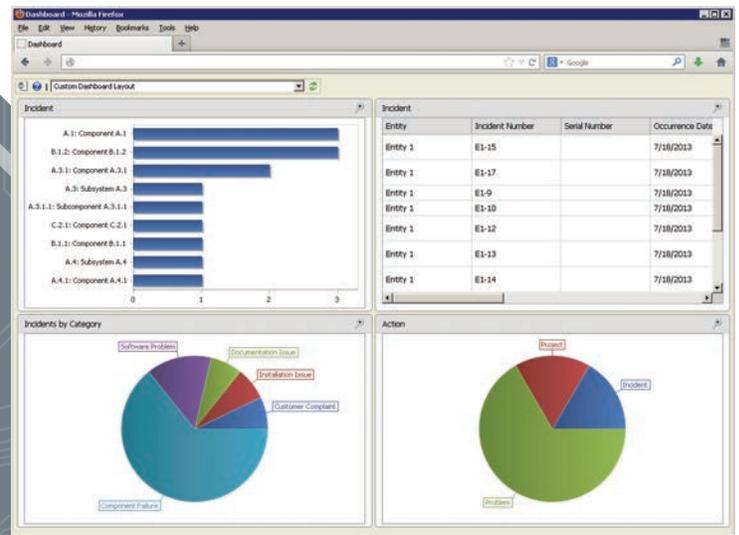
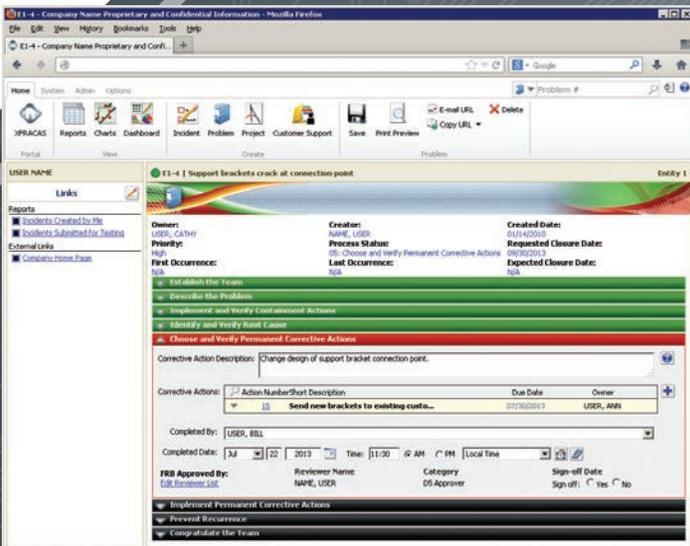
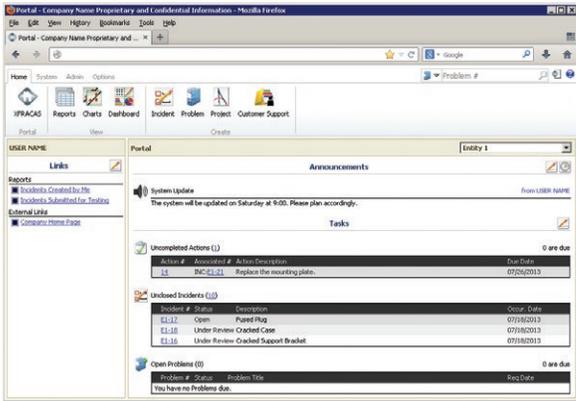
# XFRACAS®

The only truly web-based, closed loop, user-configurable, enterprise-wide FRACAS in a box!™

*ReliaSoft's XFRACAS is a highly configurable, web-based, closed-loop, enterprise-wide Failure Reporting, Analysis and Corrective Action System and much, much more!*

*The system facilitates incident reporting, failure analysis, part tracking, root cause analysis, team-based problem solving, actions management and other related activities. It simultaneously supports the acquisition, management and analysis of product reliability, quality, safety and risk management data from multiple locations.*

*XFRACAS is part of the Synthesis Platform®.*



<http://XFRACAS.ReliaSoft.com>

## SOFTWARE HIGHLIGHTS - RELIASOFT'S XFRACAS

### Practical Applications

- FRACAS Process Management
- Safety Process Management
- Non-conformance Process Management
- CAPA Process Management
- Risk Reduction Management
- Risk Assessment Process
- Process Control System
- Incident Reporting System
- Corrective Action System
- Quality Management
- Reliability Management

### Supported Processes and Reporting

- ISO 9000 Compliance
- COPQ Improvement
- Field Failures and RMAs
- Service & Support History
- Customer Complaints
- Safety Incidents
- Software or Manufacturing Defects
- Testing Issues
- Quality Issues
- Analytics (e.g. Warranty, Reliability)

### Problem Resolution Methodologies

- 8D
- DMAIC
- Six Sigma/DFSS Approaches
- User-defined (4-8 Steps)

### System/Part/Process Configuration

- System Tree and Processes
  - Unlimited Tiers/Indenture Levels
  - Serialized/Non-serialized Systems
  - Unlimited Tiers/Indenture Levels

### Highly Configurable Interface

- Easily implement your own terminology
- Add fields for gathering custom data
- Define drop-down selection lists
- Assign user permissions by group
- Personalize user portals

### Analysis/Key Metrics

- Operational Availability
- System Downtime
- MTBF
- Criticality Fields
- Root Cause/Failure Analysis

### Customer Support Information

- Complete System and Warranty Details
- Customer Contact Details
- Complete Incident History with Part Repairs and Replacements

### Corrective Actions Management

- Role-based Workflow
- Progress Tracking Reports
- Alerts via Portal and/or E-mail

### Reports

- Extensive reporting capabilities via GUI
- Custom SQL reports for flexibility

### Report Formats

- HTML or XLST
- Reports in \*.xls(x), \*.pdf, \*.rtf, \*.csv
- Charts in \*.pdf, \*.xls(x), \*.rtf, \*.mht, \*.png, \*.jpg, \*.bmp, \*.tiff and \*.gif

### Data Imports and Exports

- Microsoft Excel® and Access®
- Text or XML
- Oracle® or SQL Server®
- Any database with an OLE DB connection

### Integration

Integration with all other Synthesis Platform applications, including:

- Use Weibull++, ALTA or RGA to extract and analyze FRACAS data
- Share system configuration and failure mode/cause data between XFRACAS and Xfmea/RCM++

### Databases Supported

- Microsoft SQL Server® or Oracle®

### Built-in Enterprise Features

All-inclusive enterprise system; purchase of additional modules not required!

- Administration
- Workflow Definition
- Alerts via Portal and/or E-mail

### Available Services

- Detailed User Documentation
- Training for Theory + Software
- Go-Live/Implementation Service
- Professional Consulting Services

## Real Power for Real Applications

ReliaSoft's XFRACAS serves as a highly configurable, web-based, enterprise-wide FRACAS system, allowing you to customize the system to meet your organization's particular needs — no custom programming required! Some of the potential applications and benefits of performing FRACAS and related activities with the XFRACAS system include the ability to:

- Streamline incident reporting and problem resolution activities. Address data capture and management deficiencies to provide timely and accurate product reliability, quality and safety data.
- Provide a closed-loop system for managing corrective actions.
- Contribute to design improvements, faster product release, better service and enhanced customer satisfaction. Also generate financial rewards through better product designs, enhanced control of product warranties and more efficient customer support.

## Why Upgrade to Version 10? (for details, visit <http://XFRACAS.Reliasoft.com/version10.htm>)

- User interface enhancements, such as making it easier to reassign responsibilities (for incidents, actions, etc.), allowing users to customize the task order in personalized portals and the option to create customized print previews for report output.
- New administrative capabilities, including the option to associate XFRACAS user groups with the Microsoft Active Directory security groups that your organization already maintains and more flexibility for import scheduling.
- Increased integration with the Synthesis desktop applications, such as common item categories, new API functions and the ability to access saved XFRACAS reports from Weibull++, ALTA and RGA.



# Orion eAPI<sup>®</sup>

Reliability Business Intelligence™

*What is the equipment reliability during the operational lifetime?*

*How many spare parts are needed to keep the equipment operating efficiently?*

*What is the effect of scheduled maintenance on system downtime?*



Access to this information should be quick, easy and reliable...

ReliaSoft's Orion eAPI (enterprise Asset Performance Intelligence) is an enterprise software solution for asset performance management.

The system is a powerful tool for transforming raw data into meaningful information that will support strategic decisions for your organization.

## SOFTWARE HIGHLIGHTS - RELIASOFT'S ORION EAPI

### Practical Applications

- Asset Management System
- Reliability Business Intelligence
- Compliant with the PAS 55 standard
- Database connections with SAP®, Maximo®, Oracle®, Access®, Microsoft SQL Server®, etc.
- Optimum PM interval calculation
- Spare parts forecasting
- Convenient access to ReliaSoft's standard software tools for related analyses
- Portals are configurable for individual users and groups
- Flexible, graphical display for key performance indicators (KPIs)
- Manage improvement projects and track the return on investment (ROI)
- Manage the data, analyses, improvement projects and action plans in a single system

### Portals

- My Portal
- Create Portal Groups (e.g., Electrical, Mechanical, Instrumentation, etc.)
- All Portals have:
  - KPI Alerts & Reliability Forecast
  - News
  - Analysis
  - Improvement Management & Actions
  - Reports

### Analysis

- Life Data Analysis (LDA) for Reliability and Maintainability
- Reliability Growth (RGA)
- Spare Parts Forecast (SPF)
- Root Cause Analysis (RCA)
- Reliability Forecast Analysis

### Production

- Monitor production quantities
- Monitor performance/production losses

### Improvement Projects

- Manage improvement projects and action plans
- Calculate return on investment (ROI)
- Prioritize improvements
- Send automatic e-mails to the professionals involved in the action plan

### KPI Dashboard

- Production
  - Overall Equipment Effectiveness
  - Production
  - Asset Mechanical Reliability (AMR)
  - Asset Capability (AC)
  - Asset Utilization (AU)
  - Flaring Percentage (Oil & Gas industry)
- Asset Performance
  - MTBF & MTTR
  - Inherent Availability
  - Achieved Availability
  - Operational Availability
  - Expected Number of Failures
- Costs
  - Total Maintenance Cost
  - Predictive Cost
  - Preventive Cost
  - Corrective Cost
  - Labor Cost & Spare Part Cost

### Reports

- Number of Failures
- MTBF & MTTR
- Maintenance Costs
- Availability
- Production Loss
- Reliability Forecast

### Report Formats

- HTML
- Microsoft Excel® and Word®
- Charts in \*.wmf, \*.jpg and \*.bmp

### Total Integration with ReliaSoft's Software

- Store/manage analysis files
- Attach the analysis to any part of the structure (i.e., TAG)
- Show RCM and FMEA analyses created in the RCM++ or Xfmea software
- Automated update of RBDs in BlockSim
- Export data for more advanced analysis in Weibull++ and RGA

### Data Imports and Exports

- Microsoft Excel® or Access®
- Text Files or XML
- Oracle®
- Microsoft SQL Server®
- Any database with an OLE DB connection
- CMMS integration (SAP®, Maximo®,...)

### Searches

- Search the consolidated "raw" data
- Search analyses
- Search improvement projects
- Search action plans
- Save and reuse your searches

### Extensive GUI Configuration Options

- Multi-language capability
- Easily substitute existing terminology with your own
- Enable custom fields for gathering custom data

### Databases Supported

- Microsoft SQL Server®

### Available Services

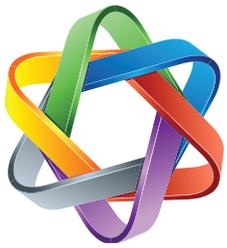
- Free Technical Support (With Active Maintenance Agreement)
- Detailed Online User Documentation
- Training for Theory + Software
- Go-Live Implementation Service
- Professional Consulting Services

## Real Power for Real Applications

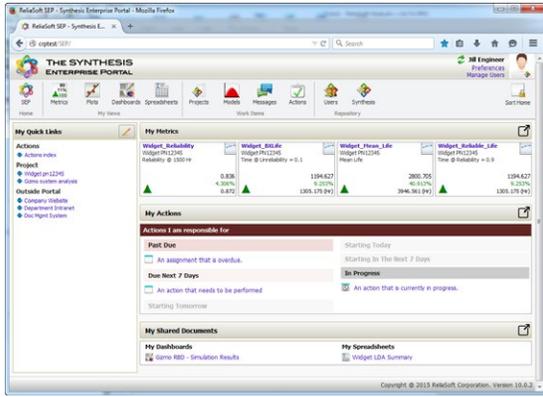
By offering all of these capabilities in a single enterprise-wide, database-driven system, Orion eAPI will enable your organization to bring together all relevant data, analyses, improvement projects and action plans in a centralized, searchable knowledge base for equipment reliability.

This cross-functional information sharing will facilitate current asset management activities while also preserving a history of "lessons learned" that will help to save time and money in the future. Orion eAPI will improve your company's ability to:

- Collect raw data from a variety of data sources.
- Apply the most effective RAM analyses.
- Display and track key performance indicators (KPIs).
- Manage improvement projects to control costs and improve availability.



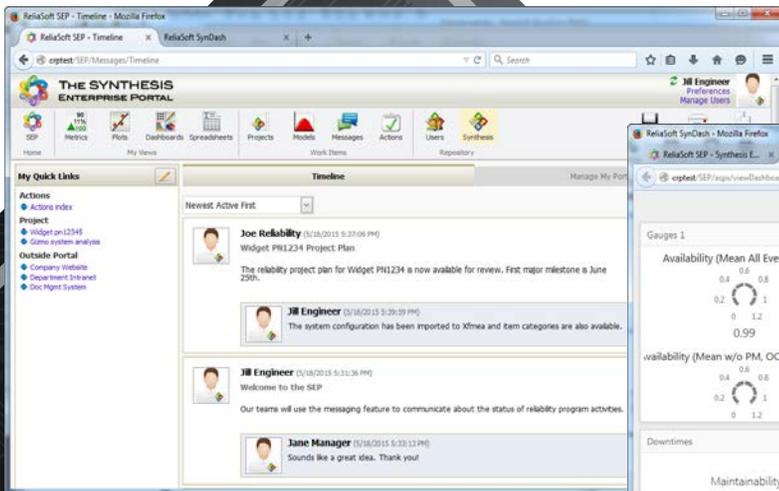
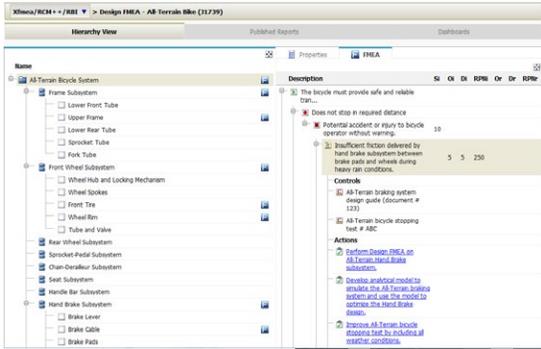
# THE SYNTHESIS ENTERPRISE PORTAL



*The web-based Synthesis Enterprise Portal (SEP) enables your entire organization or team*

*— including managers and colleagues who don't have any of the Synthesis desktop applications installed —*

*to access key analysis and project management details from any web-enabled device!*



<http://SEP.ReliaSoft.com>

## SOFTWARE HIGHLIGHTS - RELIASOFT'S SYNTHESIS ENTERPRISE PORTAL



### ***KPI metrics and selected analysis results***

The analysts using Synthesis desktop applications decide which metrics, models, analysis summaries, reports and dashboards will be shared via the SEP website.

Then each user can choose what to monitor from his/her own personalized web portal.



### ***Project plans and assigned actions***

The SEP shows a streamlined view of the project plan (gates and actions) for each analysis project and makes it easy for your team to track and report progress for assigned actions. This enables the entire team to stay informed about the progress – even when they're on-the-go or don't have any of the Synthesis desktop applications installed!



### ***System hierarchies and FMEAs***

SEP users throughout your organization can view the FMEAs and published reports created in Xfmea/RCM++/RBI without having the desktop application installed! This provides convenient web-based access to the wealth of lessons learned, troubleshooting recommendations and other valuable information from your investment in these analyses.



### ***Timeline-style messages***

The Synthesis Platform's messages feature allows users to communicate regarding progress, recent changes and other notifications. The SEP website provides access to these messages via mobile devices and enables more team members to participate in the discussion.



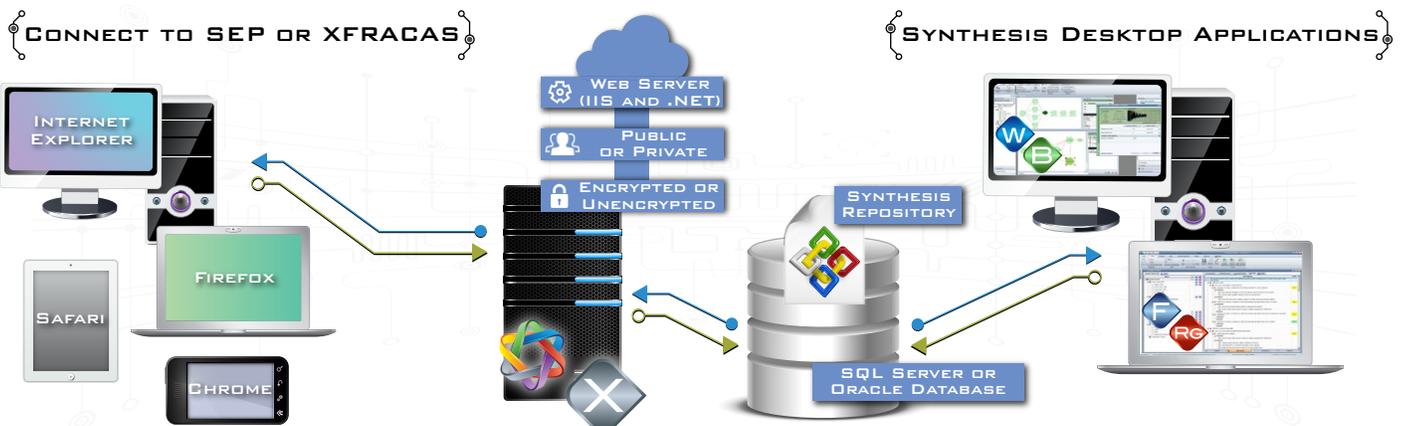
### ***Integration with XFRACAS (incident tracking system)***

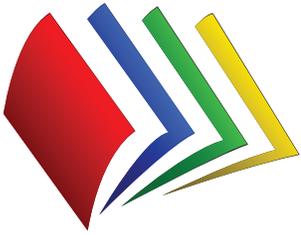
For the most comprehensive enterprise reliability solution available, you can deploy the SEP on the same database and web server with ReliaSoft's XFRACAS. Each user can access the tool(s) that fit their particular roles.



### ***Scalable and distributable web-based architecture***

Whether you have 15 users or 15,000 users, the SEP is scalable and easy to distribute with nothing extra to install for each user. Your team can access the portal with their preferred web browsers (such as Internet Explorer, Chrome, Firefox or Safari) from a variety of devices (smart phone, tablet, laptop, etc.).





# EDUCATION TO EMPOWER THE RELIABILITY PROFESSIONAL



ReliaSoft is the leading provider of reliability engineering software, training and services to companies worldwide.

Since 1992, our expert instructors have provided education to more than 20,000 engineering professionals from more than 4,500 companies and government agencies.

ReliaSoft's results-oriented training courses focus on methodologies and software tools that can be employed to help your organization to **improve reliability, speed time-to-market, reduce warranty costs, improve brand name, reduce risk, optimize maintenance strategies** and a host of other tangible and intangible benefits.



<http://Seminars.Reliasoft.com>

# OUR MASTER THE SUBJECT, MASTER THE TOOLS<sup>®</sup> PHILOSOPHY AND COURSE COLLECTION

ReliaSoft's unique *Master the Subject, Master the Tools*<sup>™</sup> approach to reliability engineering education is focused on the primary objective of teaching you the core subject and underlying fundamentals. This is augmented with best-in-class software tools to facilitate and enhance your learning experience through extensive hands-on examples and real world case studies, empowering you with both the knowledge and the capability to put it to use.

## Success Assured!

Our core competencies in reliability engineering theory, best practice applications and analytically powerful software-based solutions make ReliaSoft uniquely qualified to offer a comprehensive curriculum of results-oriented reliability training seminars.

You will walk away from any training course confident and able to successfully apply the learned principles and concepts at your workplace.



## Meeting the Needs of Beginners, Experienced Practitioners and Management

Over the years, ReliaSoft's seminars have proven to be enormously effective for training individuals who are new to the field of reliability engineering — quickly bringing them up to speed on current best practices.

The unique blend of theory, practical examples and software application will greatly enhance the knowledge and skill set of new and practicing engineers alike. At the same time, many of the available courses can be instrumental for management personnel who wish to understand the tenets and tools of the discipline.

## Training Options That Fit Your Needs:

### Choose from Any of Our Worldwide Public Venues, or Schedule Training at Your Site

Most of ReliaSoft's training courses are offered as public seminars scheduled throughout the year in a variety of locations worldwide. Visit <http://Seminars.Reliasoft.com/dates.htm> for the latest public event calendar.

Our expert instructors are also available to present any of ReliaSoft's training courses at a specified time and location that meets your organization's needs. These on-site seminars can save both time and money, especially when five or more staff members require training at the same time. Visit <http://Seminars.Reliasoft.com/onsite.htm> for more information about on-site training options.

## Don't Just Take Our Word for It, We Guarantee Your Satisfaction

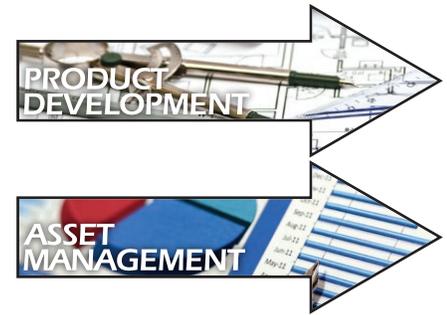
ReliaSoft's training courses are consistently ranked as the best available in the subject area and praised for their outstanding quality. But don't just take our word for it. We invite you to review the detailed course outlines, instructor biographies, calendar of upcoming public training events and hundreds of comments from satisfied attendees on our seminar website at <http://Seminars.Reliasoft.com>. We are 100% confident that ReliaSoft's training seminars will meet and exceed your expectations. If we fail to do so, we will refund your registration fee in full!



# THE NEW MASTER THE SUBJECT, MASTER THE TOOLS!® COURSE LINEUP

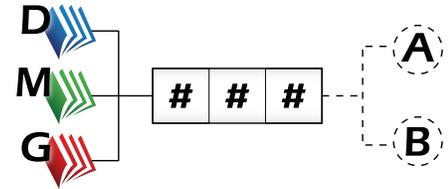
## Track Approach

To address the growing needs and diversity of our attendees, we have expanded, restructured and reconfigured our course offerings. Courses are now divided into two main tracks, one maintaining our traditional focus on reliability in product development and the other focusing on reliability engineering from an asset management perspective.



## Course Numbering Scheme

- ▶ **Prefixes:** Courses that focus on product development aspects are prefixed with the letter D; while courses focusing on maintenance (and asset management) start with M. Courses that are equally applicable to both tracks are prefixed with the letter G (General).
- ▶ **Numbers:** Courses sharing the same course number but a different prefix (e.g., D560 and M560) offer the same fundamental knowledge content but use different verbiage, examples and case studies specific to each track.
- ▶ **Suffixes:** Courses with the same number but different suffixes (e.g., A and B) are closely related and offered as a series.

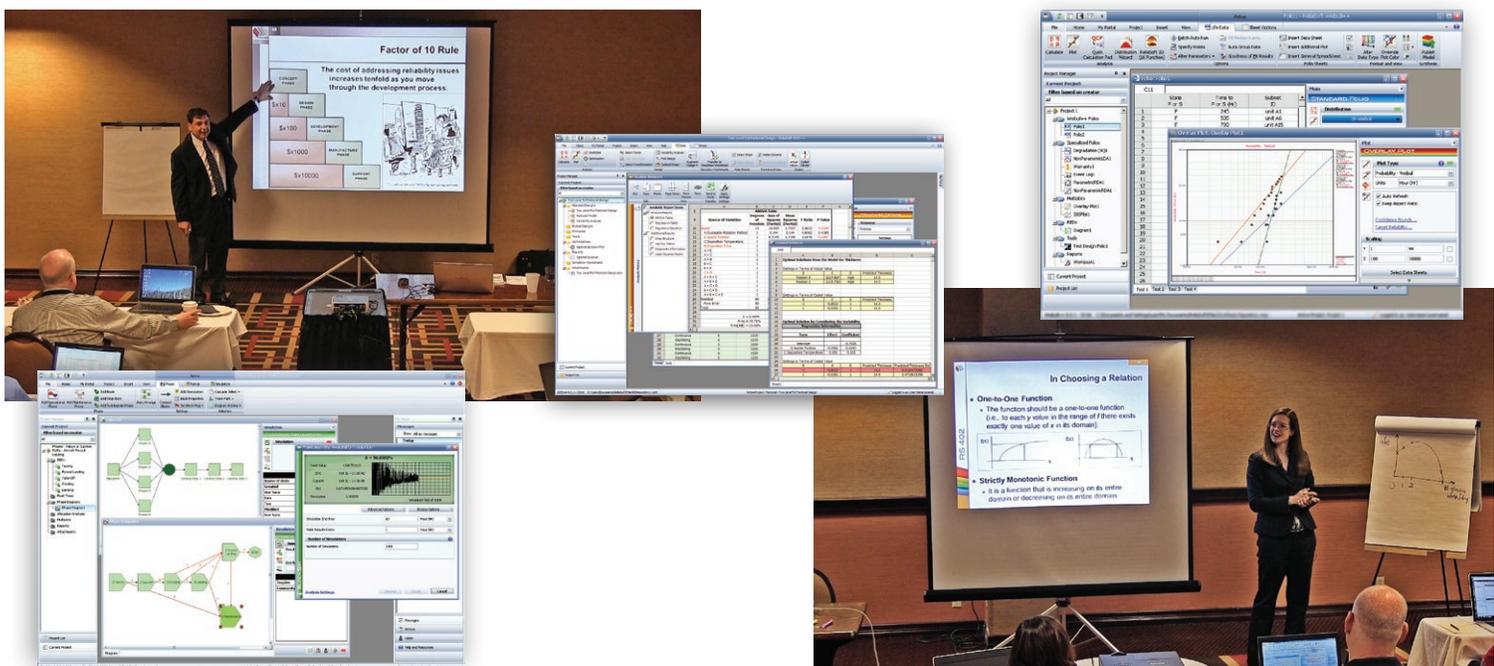


## Essential Core, Supporting Core and Optional Courses

Each track includes a set of *Essential Core* courses that every reliability engineer needs to master; they form the foundations of reliability engineering and are the basis for subsequent supporting courses. The *Supporting Core* courses explore different reliability engineering activities and can be taken in any sequence. *Optional* courses are offered as a refresher or as a quick way to come up to speed in a specific subject area.

## Software Usage in Courses

Our primary objective in all courses is, first and foremost, to teach you the subject and underlying fundamentals. To enhance this learning and prepare you for real-world practical application of the learned concepts, most courses utilize software applications. The level of exposure to a specific software varies by course. In some courses, we make extensive use of a specific application and help you to become thoroughly familiar with it. In others, we may briefly introduce an application to accomplish a specific task, thus giving you only a high level exposure to that software.



## RELIABILITY ENGINEERING: PRODUCT DEVELOPMENT TRACK

### Essential Core Courses

**G400** Foundations of Reliability Engineering  
Data Analysis and Modeling

**G522A** System Reliability and Maintainability  
Analysis and Optimization

**D560** Design for Reliability (DFR)  
Program Planning and Implementation

### Supporting Core Courses

**D470A** Foundations of Effective FMEAs

**D470B** FMEA Facilitation and Application Skills

**G475** FRACAS Principles and Applications

**D490** Standards Based Reliability Prediction

**G511** Application of Reliability Growth Models in  
Developmental Testing and Fielded Systems

**D521** Advanced Quantitative  
Accelerated Life Testing Analysis

**G522B** Simulation Modeling for  
Reliability and Risk Analysis

**G588** Applications of Experiment Design  
and Analysis in Reliability Engineering

## RELIABILITY ENGINEERING: ASSET MANAGEMENT TRACK

### Essential Core Courses

**G400** Foundations of Reliability Engineering  
Data Analysis and Modeling  
or

**M440** Reliability and Maintainability Analysis  
for Repairable Systems

**G522A** System Reliability and Maintainability  
Analysis and Optimization

**M560** Reliability-Based Program Planning and  
Implementation in Asset Management

### Supporting Core Courses

**G475** FRACAS Principles and Applications

**M480A** RCM Principles and Applications

**M480B** RCM Facilitation and Application Skills

**M485** RBI Overview and Application

**G511** Application of Reliability Growth Models in  
Developmental Testing and Fielded Systems

**G522B** Simulation Modeling for  
Reliability and Risk Analysis

**G588** Applications of Experiment Design  
and Analysis in Reliability Engineering



# International Applied Reliability Symposium

"Sharing applications, success stories and lessons learned in reliability and maintainability engineering."

The International Applied Reliability Symposium (ARS) provides a forum for expert presenters from industry and government to come together with reliability practitioners from all over the world to discuss the application of reliability principles to meet real-world challenges.

The Symposium has been designed to encourage results-oriented presentations with interactive discussions about best practices, success stories and lessons learned. Most of the presenters have been applying reliability, maintainability and related techniques in their day-to-day work for years.

The Symposium is held annually at multiple locations throughout the world.



<http://www.ARSymposium.org>

## Experience ARS

Reliability engineering has never been more important than in today's economic environment. Whether you are just beginning your reliability journey or you are a weathered veteran, this conference has something for you. You will have the opportunity to network with others in your field while learning first-hand about real world applications by expert practitioners. To make the most of your Symposium experience, you can:

**Choose the sessions that you will attend:** Each event offers a wide array of presentations and expert tutorials that you can select to best fit your needs and interests, covering a range of subjects, such as:

- Reliability programs
- Design for Reliability (DFR)
- Design for Six Sigma (DFSS)
- Reliability specifications and metrics
- Data collection, management and analysis
- Experiment design and analysis
- Accelerated testing
- Failure Modes and Effects Analysis (FMEA)
- Reliability growth analysis
- Software reliability
- System analysis
- Asset management and maintenance planning
- Risk and safety analysis
- Warranty cost reduction

**Take advantage of opportunities to converse with colleagues:** The catered breaks between sessions and other networking events provide great opportunities to talk with — and learn from — fellow reliability practitioners.

**Learn about available software tools and services:** We encourage you to spend some time visiting the exhibit booths to learn about a variety of available products and services.

## Call for Presentations

Prior to each event, the Symposium issues an open call for presentation proposals, offering practitioners throughout industry and government the opportunity to share their experiences with the successful application of reliability, maintainability and related techniques. Presenting at the Symposium allows you to share your knowledge, experience and passion for reliability with your peers. Your presentation not only opens a dialogue with colleagues who may be facing similar challenges, but also enhances your company's image as an active leader in the reliability field.

## For More Information

The International Applied Reliability Symposium is organized by ReliaSoft Corporation (with assistance from partners and sponsors that vary by region). For more information, please visit the Symposium website at <http://www.ARSymposium.org>, send an e-mail to [Info@ARSymposium.org](mailto:Info@ARSymposium.org) or contact the ReliaSoft office that serves your region (<http://Directory.Reliasoft.com>).

# Global Issues, Local Perspectives!<sup>SM</sup>

Europe   South America   North America   India   Asia Pacific   Middle East



# Certified Reliability Professional

The **Certified Reliability Professional (CRP)** program has been designed to distinguish professionals who have gained and successfully demonstrated unquestionable expertise in the field of Reliability Engineering.

Each activity earns points toward achieving certification (called "CRP credits"). All requirements must be completed within a 5-year span.



## Learn - Course Requirement

**20 of the 40** credits required for CRP certification must be earned by attending eligible training courses.

### CRP Core Curriculum

In order to assure that all Certified Reliability Professionals possess the minimum required skills for reliability-related work, all participants must complete 13 credits from the CRP Core Curriculum.

If you are following the **Reliability Engineering: Product Development Track**:

- **G400** Foundations of Reliability Engineering Data Analysis & Modeling - 5 credits
- **D560** Design for Reliability (DFR) Program Planning and Implementation - 5 credits
- **G522A** System Reliability and Maintainability Analysis and Optimization - 3 credits

If you are following the **Reliability Engineering: Asset Management Track**:

- **G400** Foundations of Reliability Engineering Data Analysis & Modeling  
OR **M440** Reliability and Maintainability Analysis for Repairable Systems - 5 credits
- **M560** Reliability-Based Program Planning and Implementation in Asset Management - 5 credits
- **G522A** System Reliability and Maintainability Analysis and Optimization - 3 credits

### CRP Elective Courses

For the remaining 7 credits, you can select any combination of additional courses that meet your particular interests and needs. Potential subjects include FMEA, RCM, FRACAS, Standards Based Reliability Prediction, Quantitative Accelerated Life Testing, DOE and many others. The latest version of the *Reliability Education Course List* (accessible from the CRP website) provides a complete list of eligible courses, along with their CRP credit values.

<http://www.ReliabilityProfessional.org/courses/>

## Apply - Project Requirement

**15 of the 40** credits required for CRP certification must be earned through a project that demonstrates the candidate's ability to apply the learned body of knowledge in a way that will benefit his/her company. The project consists of three stages:

- **Project Proposal** - before initiating the project, the proposal will be submitted to the CRP Board for preliminary approval and a Project Mentor will be assigned.
- **Mid-Way Status Report** - mid-way through the project, a status report will be submitted for review and feedback from the Project Mentor.
- **Final Report** - when the project is completed, a final report will be submitted for review and approval by the CRP Board.

For more detailed information about the project requirement, including the necessary project proposal and progress report forms, please visit the CRP website.

<http://www.ReliabilityProfessional.org/project/>

## Present - Presentation Requirement

**5 of the 40** credits required for CRP certification must be earned by publishing a paper or delivering a presentation in an industry conference or journal. The paper/presentation must demonstrate the candidate's experience from completing the CRP project.

Acceptable venues include the International Applied Reliability Symposium (ARS), the Annual Reliability and Maintainability Symposium (RAMS), *International Journal of Reliability, Quality and Safety Engineering*, *IEEE Transactions on Reliability*, and many other conferences and journals.

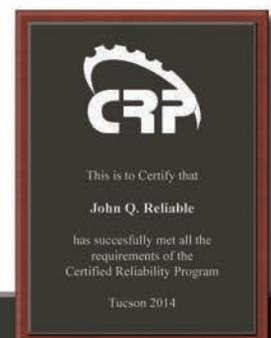
<http://www.ReliabilityProfessional.org/presentation/>

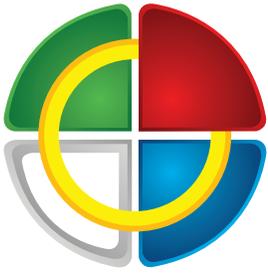
## Program Administration and Group Certification

The CRP program was initiated and is administered by ReliaSoft Corporation and its partners/distributors worldwide.

The program provides a web-based system for participants to manage and track their progress toward certification. When you have completed all program requirements, a record of your certification can be published on the CRP website. All that will be needed to verify certification is the web link and your unique CRP Number.

We also provide support for Engineering Managers who wish to develop a plan to certify a group of engineers at the same time while meeting the organization's specific training objectives. For example, if your organization is focused on certain, more specialized, aspects of reliability (such as Design for Reliability Asset Performance Management), we can work with your team to develop a detailed schedule of recommended courses to better suit those specific needs while ensuring that all requirements for CRP certification are met. For details, please contact [CRPAdmin@ReliaSoft.com](mailto:CRPAdmin@ReliaSoft.com) or the ReliaSoft office that serves your region.





# CONSULTING TO EMPOWER THE RELIABILITY PROFESSIONAL

## Total life cycle support and expert resources

on demand for the reliability engineering professional™



If your organization does not have sufficient time, expertise or objectivity in-house to accomplish specific reliability goals, turning to ReliaSoft's expert reliability consultants can prove to be the most effective and economical solution.

Whether you need a quick statistical analysis, a complete assessment of your reliability program plan or something in between, ReliaSoft Consulting Services (RCS) is ready to help!

- ◆ Our team has combined expertise in almost **all areas of reliability and quality engineering** with experience that spans a **broad spectrum of product types**, from micro-electronics and appliances to advanced weapons systems and off-shore oil well drilling equipment.
- ◆ Unlike engaging a consultant who works independently, RCS consultants have **direct access to all of ReliaSoft's global resources, expertise and contacts**.
- ◆ Our **team-based approach to consulting**, combined with ReliaSoft's global reliability engineering organization, allows us to provide you with reliability consultants who understand your culture and speak your language while ensuring that the appropriate reliability expertise can be applied to each and every project.
- ◆ RCS is structured to **accommodate requests of any size or complexity**, from short telephone consultations to multiple experts at a client's site for an extended time period.

<http://Consulting.ReliaSoft.com>

## **AVAILABLE RELIABILITY CONSULTING SERVICES**

The Reliability Consulting Services team is structured to accommodate requests of any size or complexity in a wide variety of areas. Some commonly requested reliability consultancy services are described below, and many other services may be available upon request. Please contact ReliaSoft to discuss your particular project requirements.

### **Data Analysis and Modeling**

- Reliability Data Analysis
  - Life data analysis (also referred to as "Weibull analysis")
  - Accelerated testing data analysis
  - Degradation data analysis
  - Shelf life and stability analysis
  - Burn-in analysis and optimization
  - Design comparisons
  - MTBF/MTTF determination
  - Stress-strength analysis
  - Variations and comparisons between production lots or design iterations
- Reliability growth planning and analysis
- Warranty Analysis
  - Field data analysis
  - Warranty predictions and forecasting
- Recurrent event data analysis and MCF calculations
- Standards based reliability predictions
  - MIL-HDBK 217 predictions
  - Bellcore/Telcordia predictions
  - FIDES predictions
- Modeling and analysis of systems or processes
  - Estimating reliability, availability and related metrics
  - Spare parts planning
  - Throughput analysis
  - Maintenance task selection and optimization
  - Optimum PM intervals
- Physics of failure modeling
- Risk and safety analysis

### **Specifications and Test Design**

- Defining and interpreting reliability specifications
- Testing to and complying with reliability specifications
- Traditional life test design
- Accelerated life test design
- Reliability demonstration test design
- Experiment design and analysis (Design of Experiments, DOE)

### **Reliability Program Plan Activities**

- Assessment of current reliability program and gap analysis
- Reliability program planning, implementation and review
- Design for Reliability (DFR) implementation
- Supplier reviews
- Change point analysis
- FMEA training, facilitation and/or audits
- RCM training, facilitation and/or audits
- FRACAS implementation and training
- On-site training and certification in various reliability disciplines

### **Regulatory and Legal Support**

- Preparation of reliability-related evidence
- Independent analysis of reliability-related evidence
- Expert witness testimony

### **Why Choose ReliaSoft Consulting Services?**

ReliaSoft's expert reliability consulting services team offers a uniquely powerful combination of industry insight, unparalleled subject mastery and, most important of all, direct access to all of ReliaSoft's global resources, expertise and contacts. Some of the benefits from choosing RCS include:

- Quick same-day analyses for small reviews and analyses by one of our subject matter experts.
- Customized "gap analysis" to identify the improvements to your reliability program that will provide the biggest impact for your investment.
- Flexible cost-minimizing consultations via the use of teleconferencing and/or web meetings, as well as the option to meet on-site at your company or at a ReliaSoft office.
- Upon completion, a complete and thorough report describing our findings, analysis and recommendations.
- Unparalleled expertise from seasoned professionals who have provided personalized consultations and on-site education for hundreds of companies worldwide.

## **RELIASOFT'S ONGOING COMMITMENT TO THE COMMUNITY**

ReliaSoft has assembled a dedicated team of engineers, statisticians, mathematicians and software programmers to achieve a unique and powerful blend of subject matter expertise combined with the ability to develop software-based solutions for reliability, quality, maintenance and related disciplines.

We share the results of our ongoing, cutting-edge R&D efforts in the form of powerful new software capabilities, world-class training and consulting, and a variety of special initiatives designed to enhance the effectiveness and reputation of the reliability profession.

### ***Reliability and Maintainability Conferences***

ReliaSoft's research scientists are active participants in independently organized reliability conferences and publications, such as the annual Reliability and Maintainability Symposium (RAMS) and the IEEE Transactions on Reliability journal.

In addition, ReliaSoft established and continues to organize the **International Applied Reliability Symposium (ARS)** to provide opportunities for reliability professionals to collaborate and explore productive, real-world applications of reliability theory and methods.



### ***Training and Professional Certification***

ReliaSoft initiated and currently manages the Certified Reliability Professional (CRP) program, a professional certification program to distinguish reliability engineers who have gained and successfully demonstrated unquestionable expertise in the field.



To achieve certification, candidates must complete a series of training courses focused on important reliability engineering topics, successfully apply the learned body of knowledge in the workplace and publicly present this expertise in an industry conference or journal.

### ***Free Multimedia Software Examples and Educational Resources***

[www.Reliasoft.tv](http://www.Reliasoft.tv) is a multimedia resource portal for both users of our software tools as well as all professionals in reliability engineering and related fields.



With new videos always in development, this website provides reliability experts with the tools they need to perfect their trade.

# RELIAISOFT'S ONGOING COMMITMENT TO THE COMMUNITY (CONT'D)

## Free Theoretical and Practical Resources

ReliaSoft offers an extensive array of free theoretical and practical resources devoted to reliability engineering and related topics. Distributed primarily through the web at [www.weibull.com](http://www.weibull.com) and [www.ReliaWiki.org](http://www.ReliaWiki.org), some of the most popular services include:

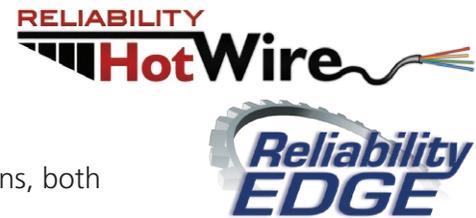


### Reliability Discussion Forum

An open forum for engineers to discuss reliability engineering and related issues, with contributions by ReliaSoft's subject matter experts when needed.

### Reliability Edge and Reliability HotWire

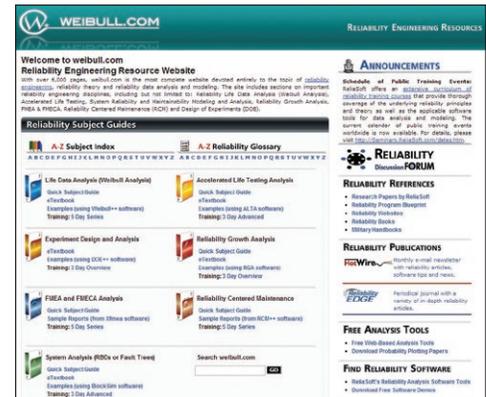
Periodical publications (distributed via mail, e-mail and/or the web) that include a wide range of articles about reliability techniques and applications. From the latest reliability engineering news to guest-submitted articles by various subject matter experts to software-focused tool tips for ReliaSoft applications, both publications are a valuable asset for practicing reliability engineers.



### Online Theoretical Textbooks

Keyword searchable, web-based references that address fundamental reliability topics such as:

- Life data analysis (Weibull analysis)
- Accelerated life testing analysis
- Experiment design and analysis
- Reliability growth analysis
- System analysis (RBDs or fault trees)



### Free Software Tools and Probability Plotting Papers

Web-based analysis tools, downloadable utilities for specialized applications, probability plotting papers and rank tables.

## University Partnerships

ReliaSoft engages in university partnership programs that provide software, mentoring and research opportunities for students preparing to join the profession. One such program, the **ReliaSoft Risk, Reliability and Maintainability Research Alliance** (called **R<sup>3</sup>M**), is intended to provide the space and tools necessary to facilitate fundamental and applied research in the core areas of reliability engineering, maintainability engineering and risk analysis. Funded through an endowment from ReliaSoft, the lab operates in cooperation with the University of Arkansas, Department of Industrial Engineering.



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<http://Directory.Reliasoft.com>.

**[www.Reliasoft.com](http://www.Reliasoft.com)**