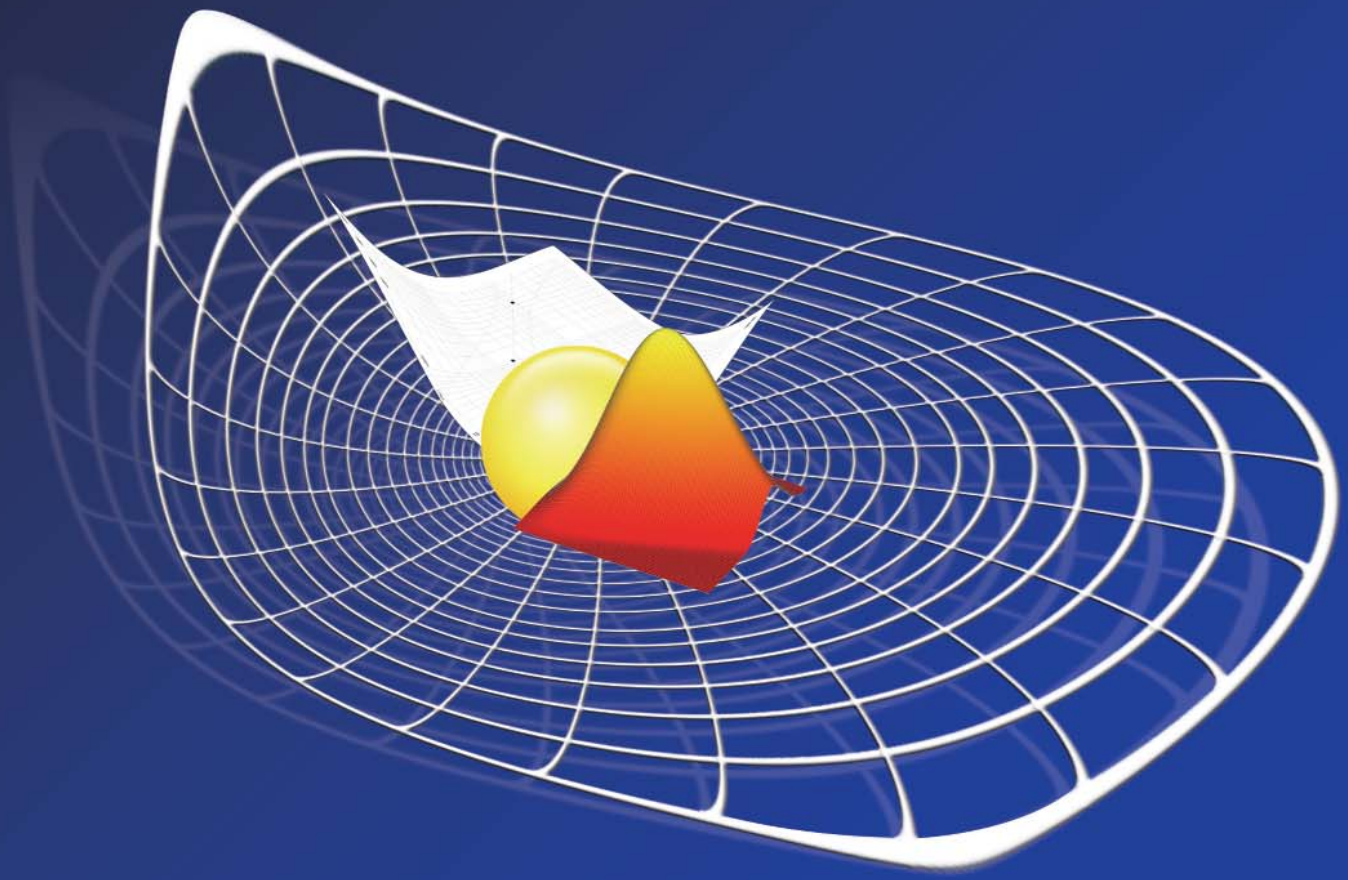
ReliaSoft®

Presents...

Weibull++® 7

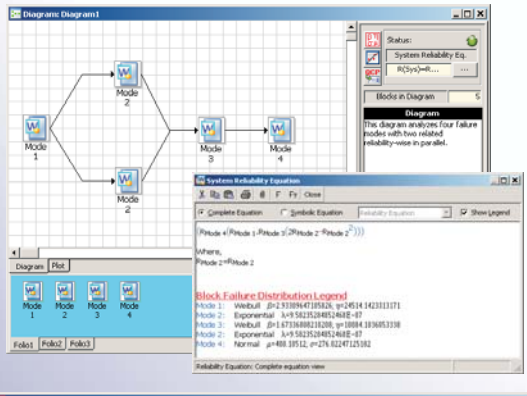


ReliaSoft

Reliability Office

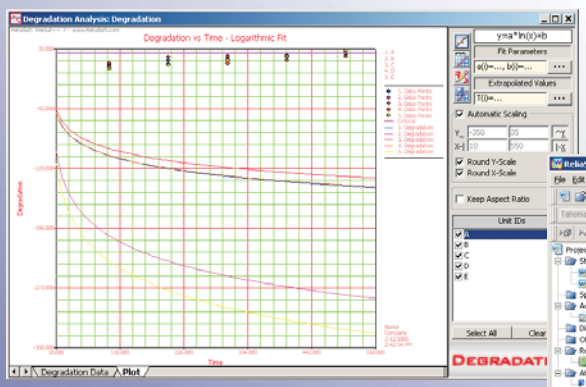
Weibull++® 7

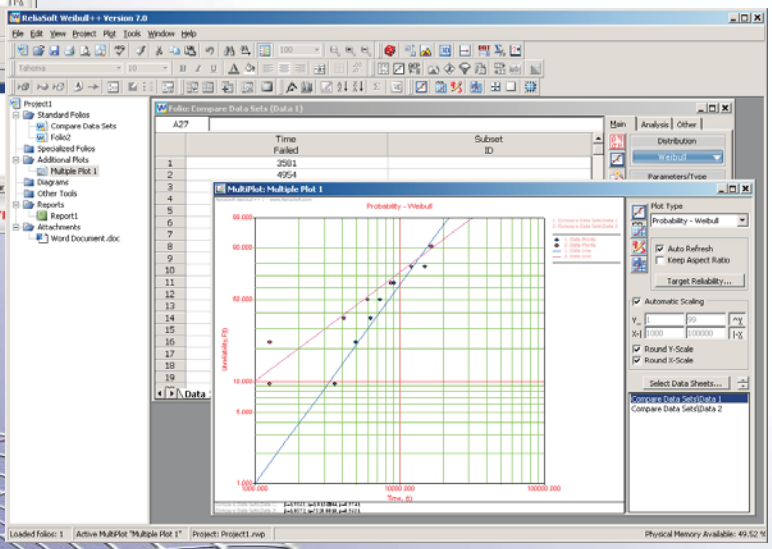
The standard for reliability life data analysis™

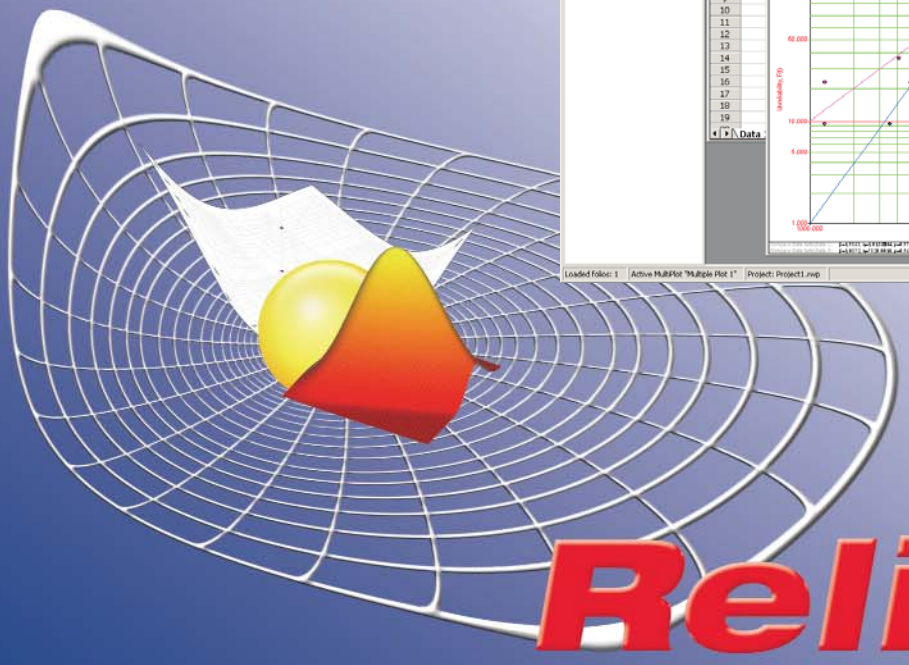


***Weibull++** is the industry standard in reliability and life data analysis (Weibull analysis) for thousands of companies worldwide. The software performs life data analysis utilizing multiple lifetime distributions (including all forms of the Weibull distribution), with a clear and concise interface geared toward reliability engineering.*

*For Version 7, **Weibull++** was redesigned from the ground up. It incorporates many new and enhanced features, including a greatly enhanced user interface, an expanded warranty analysis utility, integrated reliability block diagrams, recurrence data analysis and much, much more...*







Built by Reliability Engineers for Reliability Engineers

ReliaSoft®

Weibull++ provides a complete array of data analysis, plotting and reporting tools for standard life data analysis (Weibull analysis) with integrated support for a variety of related analyses. Built by reliability engineers for reliability engineers, this package continues to raise the bar for statistical analysis software for reliability applications.

All the options you need for standard life data analysis...

- **All Types of Data:** **Weibull++** supports Complete, Right Censored (Suspended), Left Censored, Interval Censored and Free-Form data, entered individually or in groups. A specialized interface to analyze event log data is also available.
- **All Major Lifetime Distributions:** The software supports data analysis with the 1, 2 and 3 parameter Weibull, Mixed Weibull, 1 and 2 parameter Exponential, Lognormal, Normal, Generalized Gamma, Gamma, Logistic, Loglogistic, Gumbel and Weibull-Bayesian lifetime distributions. The Distribution Wizard automatically performs goodness-of-fit tests to help you select the most appropriate distribution for each data set.

Results at the click of a button and unparalleled plots and graphics...

- **Parameter Estimation and Calculated Results:** **Weibull++** supports both Rank Regression and Maximum Likelihood Estimation (MLE) for parameter estimation. Integrated utilities quickly return calculated results (such as reliability given time and BX life) based on the data analysis and your inputs. Confidence bounds are available for all parameters and calculated results.
- **Plots and Automated Reports:** The software automatically generates a complete array of reliability plots, with customizable settings. Plots are metafile graphics that can be annotated and used in your reports and presentations. Automated report generation is also available.

A complete array of related analyses...

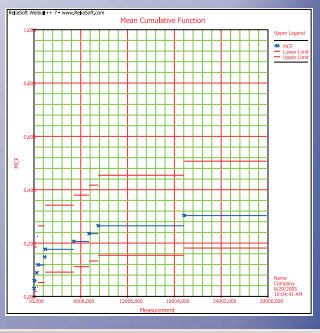
- **Warranty Analysis:** Perform life data analysis and make warranty projections based on sales and returns data, entered in a Nevada, Times-to-Failure or Dates of Failure format.
- **Reliability Block Diagram:** Use Reliability Block Diagrams (RBDs) that are integrated with calculated data folios to analyze competing failure modes and perform other system analyses.
- **Recurrence Data Analysis:** Use parametric or non-parametric methods to analyze events that are dependent and not identically distributed (such as repairable system data) and/or to model the number of occurrences of an event over time.
- **Degradation Analysis:** Use the Linear, Exponential, Power, Logarithmic, Gompertz or Lloyd-Lipow models to extrapolate the failure times of a product based on its performance (degradation) over a period of time.
- **Non-Parametric Life Data Analysis:** Use Kaplan-Meier, Simple Actuarial or Standard Actuarial techniques for non-parametric life data analysis.
- **SimuMatic:** Automatically perform large quantities of analyses on simulated data sets in order to investigate various reliability questions, including confidence bounds, testing scenarios, etc.
- **Design of Reliability Tests:** Determine the appropriate sample size, test duration or other variables for reliability demonstration tests.

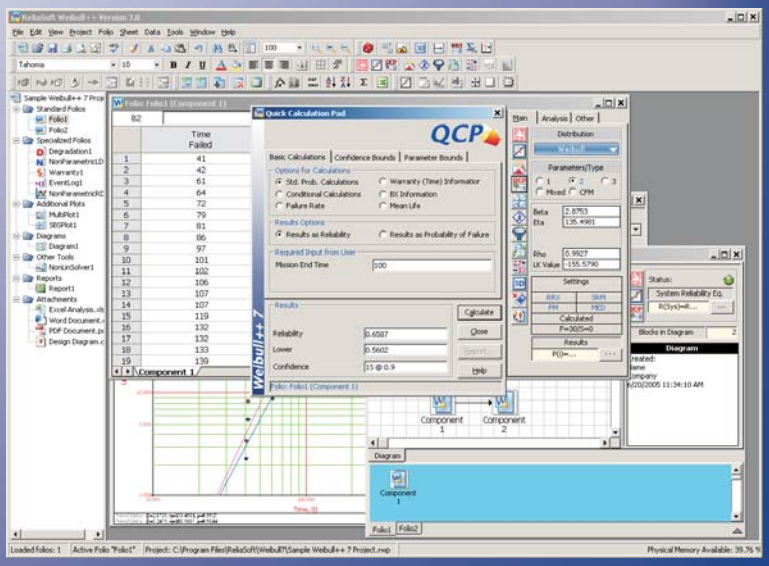
Additional tools and wizards...

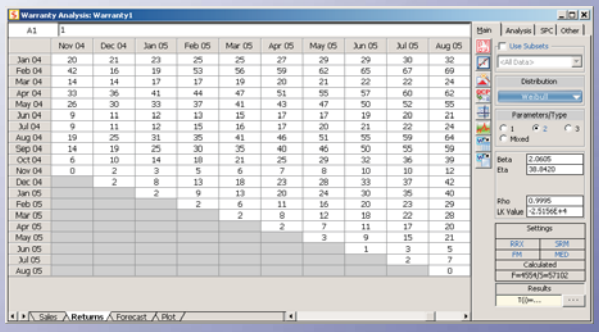
- **Weibull++** provides many additional tools and wizards designed to streamline, enhance and supplement your analyses. These include spreadsheets for custom analyses, statistical comparison wizards, equation solvers, and much more!

New and enhanced features in Version 7:

- Enhanced Interface with Project Explorer
- Additional Distributions
  - Gamma
  - Logistic
  - Loglogistic
  - Gumbel
  - Weibull-Bayesian
- Bayesian Confidence Bounds
- Failures/Suspensions Plots
- Integrated RBDs
- Enhanced Warranty Analysis
- Recurrence Data Analysis
  - Parametric (GRP)
  - Non-Parametric (MCF)
- New Degradation Models
  - Gompertz
  - Lloyd-Lipow
- Event Log Data Entry Sheet
- Using Simulation for Risk Analysis and Probabilistic Design
- SimuMatic
- Enhanced Reporting Utility







All the Options You Need for Standard Life Data Analysis...

All life data types:

- Complete
- Right Censored (Suspended)
- Left Censored
- Interval Censored
- Free-Form
- Individual or Grouped

All major lifetime distributions:

- Weibull
- Mixed Weibull
- Normal
- Lognormal
- Exponential
- Generalized Gamma
- Competing Failure Modes

New in Version 7!

- Gamma
- Logistic
- Loglogistic
- Gumbel
- Weibull-Bayesian

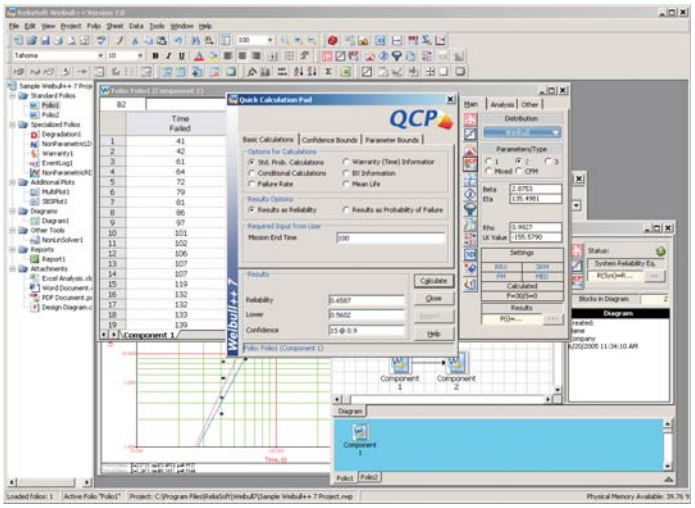
Parameter Estimation Methods:

- Maximum Likelihood (MLE)
- Rank Regression on X
- Rank Regression on Y

with Median Ranks, Kaplan-Meier or ReliaSoft Ranking Methods

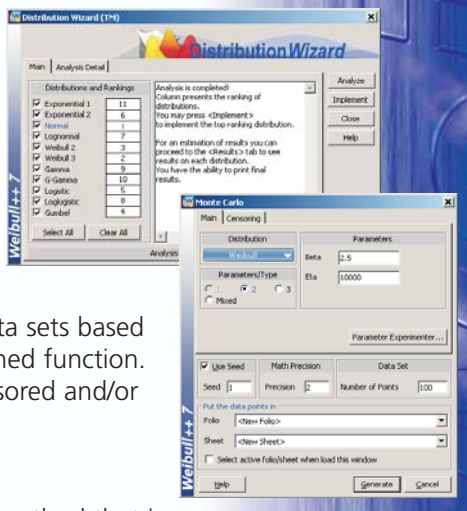
Intuitive and Flexible Work Environment

The **Weibull++** interface is an intuitive, flexible and completely integrated work center designed around the data folio (similar to an Excel® worksheet). In Version 7, the interface has been enhanced to allow you to manage multiple analysis folios and related information all together in a single file. Using the "Project Explorer" approach that was first introduced in ReliaSoft's BlockSim software, **Weibull++** now provides an intuitive, hierarchical (tree) view to allow you to view and manage one or many standard folios, specialized folios, plot sheets, reliability block diagrams, spreadsheet reports and/or attached documents per project. At the same time, the new work environment "stays true to its roots" so that users who are familiar with previous versions of the software will be able to enter and analyze data in much the same way as always.



Support for All Life Data Types and Multiple Lifetime Distributions

Weibull++'s data entry spreadsheets for standard life data analysis support all life data types and all major lifetime distributions. You can analyze time-to-failure (complete), right censored (suspension), left censored, interval censored or free-form data, entered individually or in groups. Available distributions include the 1, 2 and 3 parameter Weibull; 2, 3 and 4 subpopulation mixed Weibull; 1 and 2 parameter Exponential; Normal; Lognormal and Generalized Gamma. In addition, Version 7 now supports the Gamma, Logistic, Loglogistic, Gumbel and Weibull-Bayesian distributions. With the incorporation of the Weibull-Bayesian model, which considers prior knowledge of the Weibull Beta parameter, **Weibull++** now supports methodologies from both Classical and Bayesian statistics.



Distribution Wizard™ for Goodness-of-Fit Tests

The Distribution Wizard automatically performs multiple goodness-of-fit tests on the available lifetime distributions and recommends the one that best fits your data set.

Monte Carlo Data Generation

You can use Monte Carlo simulation to generate sample data sets based on any of the supported lifetime distributions or a user-defined function. This can include complete data, right censored, interval censored and/or left censored data points, according to your specifications.

Choice of Parameter Estimation Methods

Weibull++ allows you to choose the parameter estimation method that is most appropriate for your data set. Options include Maximum Likelihood Estimation (MLE), Rank Regression on X or Rank Regression on Y with Median Ranks, Kaplan-Meier or ReliaSoft ranking methods.

Quick Calculation Pad for Results at the Click of a Button

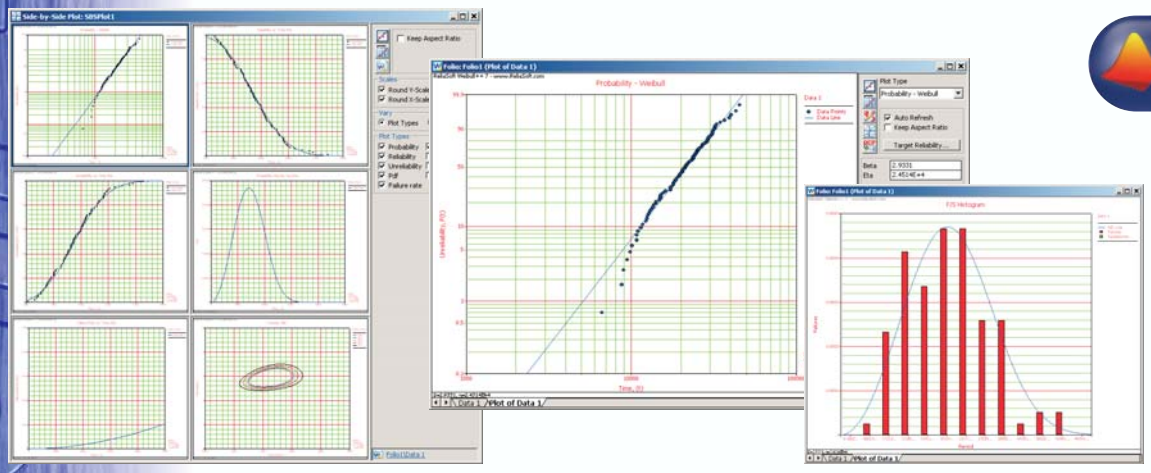
The Quick Calculation Pad (QCP) provides a quick, easy and accurate way for you to obtain results for the most frequently asked reliability questions. This includes Reliability or Probability of Failure, Failure Rate, Warranty Time for a given reliability, B(X) Life and Mean Life calculations. The utility also returns the conditional reliability or probability of failure given the starting age.

Quick Calculation Pad (QCP) results:

- Reliability
- Probability of Failure
- Failure Rate
- Warranty Time
- BX Information
- Mean Life
- Conditional Probabilities

Plots and Graphics to Showcase Your Analyses - Enhanced in Version 7!

Weibull++ continues to offer unparalleled plotting capabilities to demonstrate your analyses visually. You can generate Probability, Reliability vs. Time, Unreliability vs. Time, *pdf*, Failure Rate vs. Time, Contour and 3-Dimensional Likelihood Function Surface plots with the click of a button. In addition, Version 7 now includes histogram, pie and timeline charts to display failures/suspensions data. The Plot Setup allows you to configure the appearance of plot output and the software also provides a Chart Wizard to create your own custom charts. All plot graphics are metafiles that can be pasted or inserted into other reports and presentations.



Standard life data analysis plots:

- Probability
- Reliability vs. Time
- Unreliability vs. Time
- *pdf*
- Failure Rate vs. Time
- Contour
- 3D Likelihood Function

New in Version 7!

- Failure/Suspension Histogram
- Failure/Suspension Pie
- Failure/Suspension Timeline

Multiple Plot Sheets

The Multiple Plot Sheet makes it easy to compare analyses by automatically plotting the results for multiple data sets together in the same plot.

Side-by-Side Plots Utility

The Side-by-Side Plots utility allows you to view (and print) multiple plots for a given data set side-by-side. For example, you may want to show the Probability, Reliability, *pdf* and Failure Rate plots for a given analysis together in the same window. Alternatively, you may wish to compare the Probability or *pdf* plots for a given data set when analyzed with different distributions. Simply select the combination that meets your analysis/reporting needs.

RS Draw to Edit and Annotate Plot Graphics

You can use RS Draw, ReliaSoft's integrated metafile graphics editor, to edit and annotate the plots generated by **Weibull++**. This utility allows you to insert text, highlight a point or line, mark the coordinates of a point, and much more!

Confidence bounds on parameters, results and plots:

- Fisher Matrix
- Likelihood Ratio
- Beta Binomial

New in Version 7!

- Bayesian

Confidence Bounds for Parameters and Results - Enhanced in Version 7!

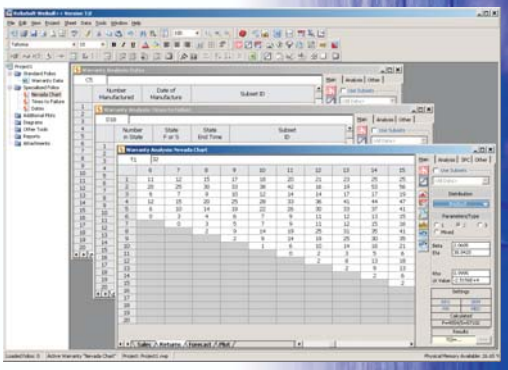
Weibull++ provides confidence bounds for all of the standard life data analysis parameters and results and also for many of the results from related analyses (such as warranty forecasts, recurrence data analyses, etc.). In addition to the Fisher Matrix, Likelihood Ratio and Beta Binomial methods, Bayesian confidence bounds have been added in Version 7. You can choose whether bounds will be displayed and also specify the confidence level and type of bounds.

Warranty Analysis module to use sales and returns data for life data analysis and warranty forecasts

New in Version 7!
- Choice of Data Entry Form
- Consider Design Iterations
- Consider Warranty Length
- Graphical Plots
- Detect Abnormal Months

Warranty Data Analysis - Enhanced in Version 7!

Weibull++'s popular Warranty Analysis module allows you to enter sales and returns data to perform life data analysis and to generate warranty forecasts. Extensively enhanced in Version 7, this utility now provides:



- **Choice of Data Entry Form:** 1) "Nevada" format with quantity shipped and quantity returned per period 2) "Times-to-Failure" format with exact times-to-failure for returns or 3) "Dates of Failure" format with exact manufacturing and return dates.
- **Integrated Handling of Non-Homogeneous Populations:** You can define and analyze data from different design iterations simultaneously and perform forecasts based on mixed sales data.
- **Option to Consider Warranty Length in Forecasts:** Specifying the warranty length allows the analysis to take into account the possibility that failure data were not collected beyond the warranty period and/or to exclude predicted failures that fall outside the warranty period.
- **Graphical Plots:** You can generate a variety of graphical plots to illustrate your warranty analysis and forecasts, including Reliability vs. Time, Unreliability vs. Time, *pdf*, Failure Rate vs. Time, Contour, Failures/Suspensions and Expected Failures vs. Period.
- **Detect Abnormalities:** The utility provides built-in analysis and control charts to monitor and detect abnormal sales and/or return months.

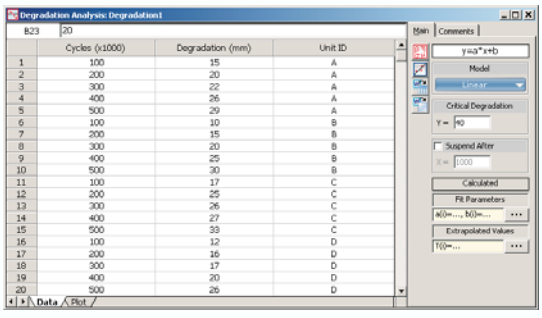
Degradation Analysis Models:

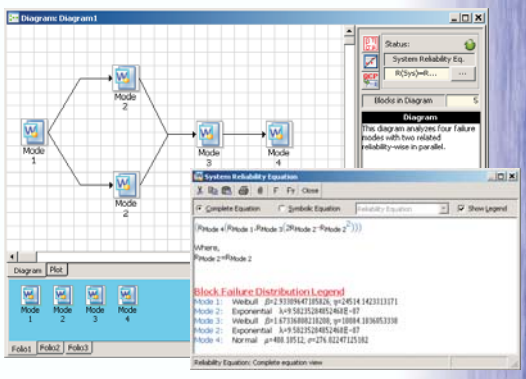
- Linear
- Exponential
- Power
- Logarithmic

New in Version 7!
- Gompertz
- Lloyd-Lipow

Degradation Data Analysis - Enhanced in Version 7!

The Degradation Analysis module allows you to extrapolate the failure times of a product based on its performance (degradation) over a period of time. In addition to the Linear, Exponential, Power and Logarithmic models, the Gompertz and Lloyd-Lipow models are now available in Version 7. The new Model Wizard helps you to select the most appropriate model for your data set. It is easy to generate a Degradation vs. Time plot for the analysis and to transfer the extrapolated failure times to a standard folio for life data analysis.





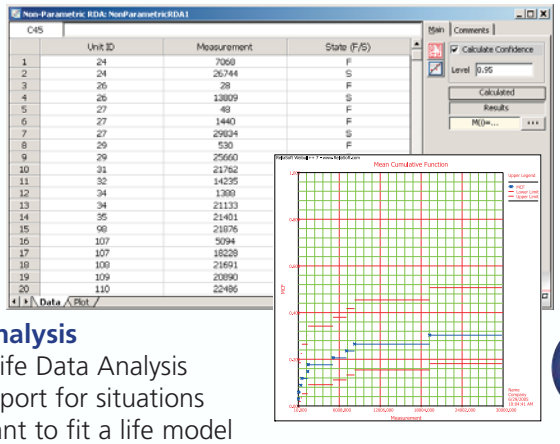
Integrated Reliability Block Diagram (RBD) feature - New in Version 7!

Reliability Block Diagrams to Analyze Failure Modes - New in Version 7!

The Competing Failure Modes option has been a very popular feature among **Weibull++** users. The Reliability Block Diagram (RBD) feature that has been added to Version 7 provides a huge leap forward in both flexibility and analytical power. Now there is no limit to the number of failure modes that you can consider and each mode can be analyzed individually with the appropriate lifetime distribution. In addition, you can use the flexible RBD interface (patterned after the intuitive BlockSim diagram utility) to describe the reliability-wise relationships among the modes (*i.e.* series, parallel, k-out-of-n) and thereby model the failure behavior more accurately and realistically. Using the exact algebraic reliability equation for the configuration that you've defined, **Weibull++** provides common reliability results and plots at the click of a button. You can even consider the uncertainty of the fitted parameters of each data set to calculate confidence bounds on the overall reliability metrics!

Recurrence Data Analysis - New in Version 7!

"Life Data Analysis" methods deal with units that experience only one event, end of life. In contrast, other applications involve repeated events data where a sample unit may accumulate any number of events over time. Examples include number of repairs on a product, number and treatment of recurrent disease episodes, etc. **Weibull++ 7** provides both parametric and non-parametric approaches to analyze such recurrent event data. The non-parametric approach is based on the well-known Mean Cumulative Function (MCF). The parametric approach is based on the General Renewal Process (GRP) model, which is particularly useful in understanding the effects of repairs on system age.

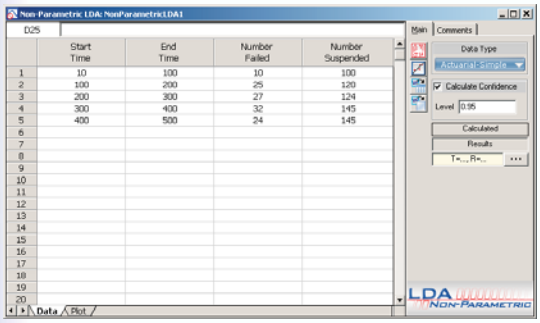


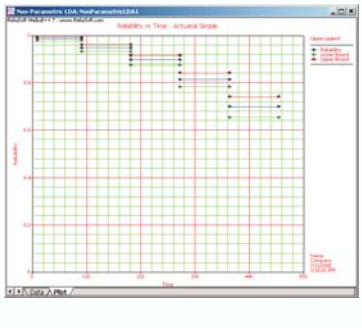
Parametric and Non-Parametric techniques for Recurrence Data Analysis

- New in Version 7!

Non-Parametric Life Data Analysis

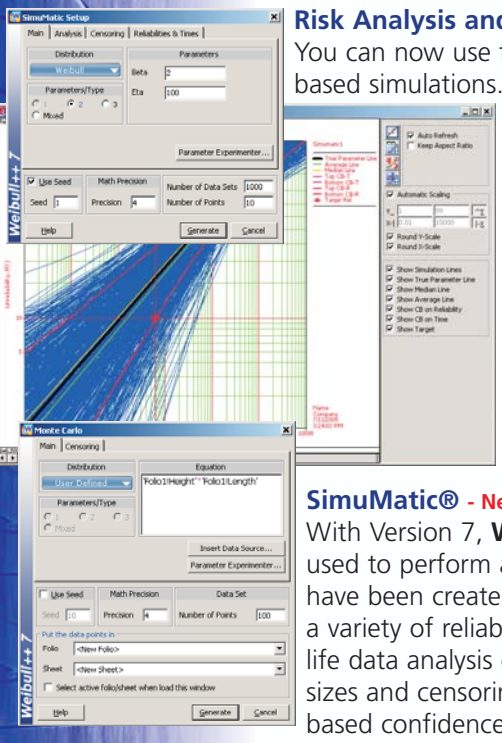
Weibull++'s Non-Parametric Life Data Analysis module provides complete support for situations where the analyst does not want to fit a life model to the data, but instead wants to look at the data non-parametrically. Models include Kaplan-Meier, Simple Actuarial and Standard Actuarial.





Non-Parametric Life Data Analysis Techniques:

- Kaplan-Meier
- Simple Actuarial
- Standard Actuarial



Risk Analysis and Probabilistic Design - New in Version 7

You can now use the Monte Carlo simulation tool to perform relationship-based simulations. The new "User Defined" distribution feature allows you to specify an equation relating different random variables. You can then determine the joint *pdf* for the simulated data set. This type of simulation has many applications in probabilistic design, risk analysis, quality control, etc. For example, if the height and length of a rectangle are distributed, so is the area. To find the distribution of the area, you can generate random height and length values based on their corresponding distributions and then apply the equation A = H x L. A distribution can then be fitted to the resulting set of area values.

Risk Analysis and Probabilistic Design using Monte Carlo simulation and user-defined functions

- New in Version 7!

SimuMatic® - New in Version 7

With Version 7, **Weibull++** integrates the SimuMatic utility, which can be used to perform a large number of reliability analyses on data sets that have been created using simulation. You can use this utility to investigate a variety of reliability questions, including analyses to a) better understand life data analysis concepts, b) experiment with the influences of sample sizes and censoring schemes on analysis methods, c) construct simulation-based confidence bounds, d) better understand the concepts behind confidence intervals, e) design reliability tests, and much more!

SimuMatic performs a large of number of reliability analyses on simulated data sets

- New in Version 7!

Additional Tools and Wizards...

General Spreadsheets and Template-Based Report Generator for Custom Analyses and Reports

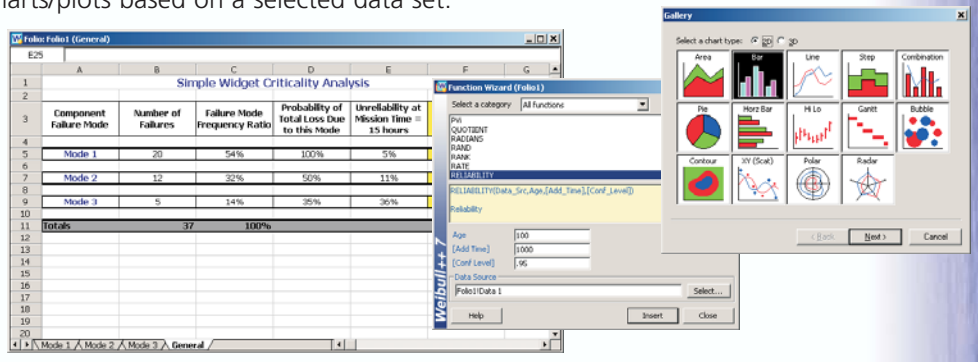
- Enhanced in Version 7!

Spreadsheets for Custom Analyses

General Spreadsheets, which can be incorporated into any **Weibull++** standard folio, are used just like an Excel® worksheet to perform your own customized analyses. These spreadsheets provide complete in-cell formula support, cell references and over 140 built-in functions.

Function Wizard and Chart Wizard - Enhanced in Version 7!

You can use the Function Wizard to insert a wide array of calculated results based on your inputs and, when applicable, a referenced data sheet. Available results range from basic math/statistical functions to common reliability analysis results, and much more. In Version 7, this now works more like Excel® functions, with the ability to type functions directly into cells and results that are updated automatically when the inputs change. The Chart Wizard leads you through a step-by-step process to create and configure your own custom charts/plots based on a selected data set.



Quick Statistical Reference:

- Median Ranks
- Standard Normal Values
- Cumulative Poisson
- Cumulative Binomial
- F-Distribution Values
- Chi-Squared Values
- Incomplete Beta Function
- Gamma Function
- Student's t Values

Template-Based Report Generator - Enhanced in Version 7!

The Report Wizard utility allows you to design print-ready reports to showcase your analyses and to perform customized related analyses based on calculated data sets. The template feature makes it easy to apply the same report format to different data sets. This utility has been revised and enhanced in Version 7 and now provides an intuitive spreadsheet-based interface for creating and formatting reports. The software also comes with an extensive array of report templates for analyses designed to determine Optimum Burn-In Time, Optimum Preventive Replacement, and much more!

Quick Statistical Reference

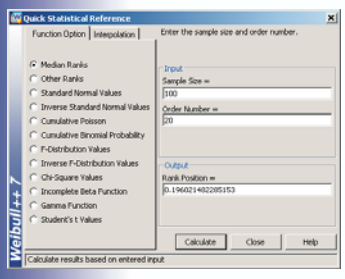
Weibull++'s Quick Statistical Reference frees you from tedious lookups in tables by returning results for common statistical functions, such as Median Ranks, Chi-Squared values and more at the click of a button.

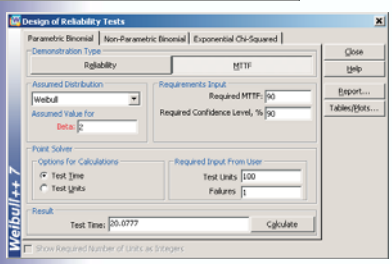
Design of Reliability Tests:

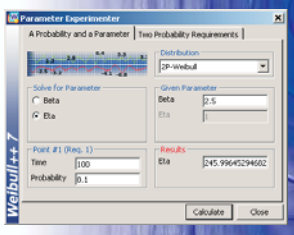
- Parametric Binomial
- Non-Parametric Binomial
- Exponential Chi-Squared

Design of Reliability Tests

You can use the Design of Reliability Tests utility to determine the appropriate sample size, test duration or other variables for reliability demonstration tests. Parametric Binomial, Non-Parametric Binomial and Exponential Chi-Squared methods are available.

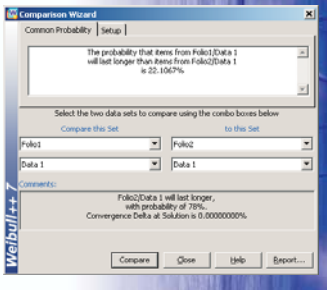






Tests of Comparison and Stress-Strength Comparison

Weibull++ provides two wizards designed for quick comparisons of data sets. The Tests of Comparison Wizard allows you to compare two data sets to determine whether items from the first set will outlast those of the second. The Stress-Strength Wizard allows you to compare a data set with strength data against a data set with stress data to determine probability of failure (*i.e.* stress exceeds strength).

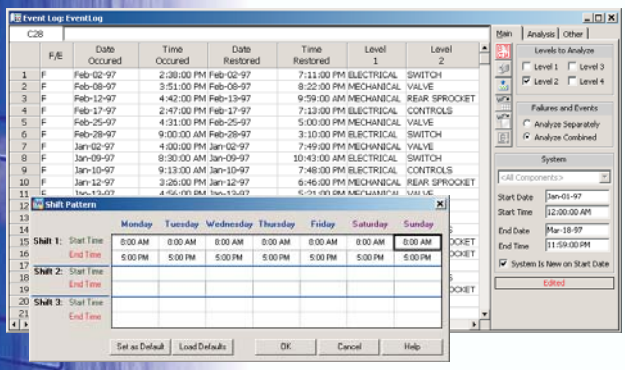


Parameter Experimenter

The Parameter Experimenter allows you to solve for a parameter of a distribution given the other parameter(s) and one data point (unreliability at a given time) or to solve for all parameters of a distribution given two unreliability data points.

Event Log Interface for System Up and Down Times - New in Version 7!

New in Version 7, **Weibull++** now provides a specialized folio designed specifically to capture data in an event log format (commonly used in the Machine Tools and other industries). This data entry sheet captures the type of event, the date/time when the event occurred and the date/time when the system was restored to operation. The software then converts this information to time-to-failure and time-to-repair data that can be analyzed with life data analysis techniques. The folio provides a number of options to tailor the analysis to fit your particular requirements, including the ability to define shift patterns, consider unique system IDs, perform the analysis at the system, subsystem, assembly or component level, etc. You can also export the results to BlockSim for system reliability, maintainability and availability analyses.

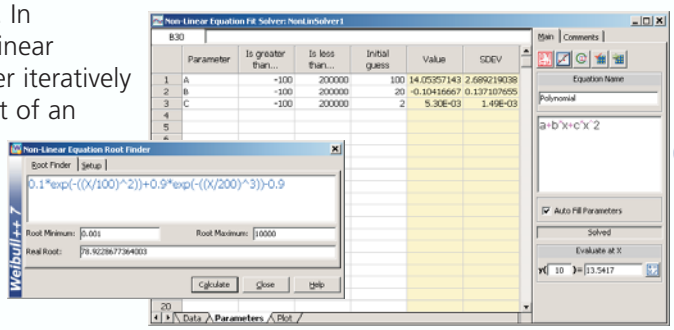


Specialized interface to analyze event log data

- New in Version 7!

Non-Linear Equation Fit Solvers

The Non-Linear Equation Fit Solver module allows you to enter a user-defined equation, information about the parameters and applicable X and Y data points then solves the equation using an iterative process. Results are displayed in both tabular and graphical form and you have the option to save and re-use equation templates. In addition, the Non-Linear Equation Root Finder iteratively solves for a real root of an unconstrained non-linear function using a variable order improved memory method.



Non-Linear Equation Fit Solver and Root Finder

Import Data from Excel® and Other Delimited Files

In addition to providing a variety of data sheet formats designed to fit your specific data and analysis requirements, **Weibull++** makes it easy to import data from outside sources, including: Weibull++ 4, 5, 6 or MT; ALTA; Excel® and Tab, Comma, Space or Semi-colon delimited files.

Import data from other file types:

- Weibull++ 4, 5, 6 or MT
- ALTA
- Excel®
- Tab Delimited (*.txt)
- Comma Delimited (*.csv)
- Space Delimited (*.prn)
- Semi-colon Delimited (*.smc)

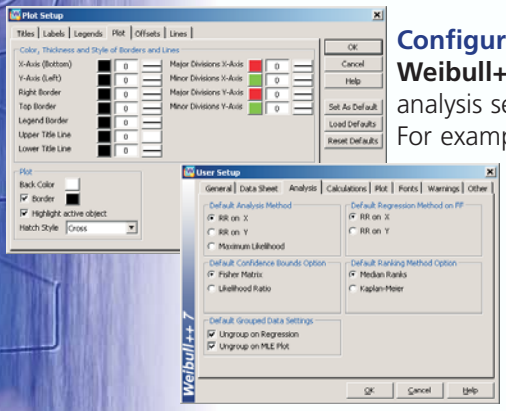
Integration with Other ReliaSoft Software

Weibull++ is directly integrated within other ReliaSoft software whenever you need to specify a distribution and parameters based on a calculated data set. Integration is currently available for the following products: ALTA, BlockSim, RENO, RGA, Xfmea and RCM++.

Integration with other ReliaSoft software:

- ALTA
- BlockSim
- RENO
- RGA
- Xfmea
- RCM++

Configure the Workspace to Meet Individual Needs



Weibull++ makes it easy to configure the interface and analysis settings to meet your specific preferences and needs. For example, the User Setup allows you to specify default options for data sheets, analysis settings, fonts/symbols, etc. The Plot Setup allows you to configure the appearance of the plots that are automatically generated by the software. In addition, you can customize the toolbars and/or adjust the appearance of the workspace by hiding/displaying or changing the position of the Project Explorer and other panels.

Detailed user documentation in printed manual and on-line help files

Comprehensive Documentation

ReliaSoft's **Weibull++** comes with complete and detailed printed user documentation and on-line help files, as well as a multitude of example files and guides designed to get you up and running the minute the application is installed.

Total Customer Support

ReliaSoft is totally committed to providing you with immediate support to answer any questions you might have and/or to assist you with any problems that may arise. Support options include free telephone, fax and e-mail support as well as free minor version product updates.

System Requirements

Weibull++ is compiled and designed for Windows NT, 2000 and XP and takes advantage of the features available in these platforms. Minimum system requirements: 433-MHz Intel Pentium-class processor or equivalent, with 32MB RAM (64MB or more is recommended), SVGA display and at least 80MB of hard disk space.

Free comprehensive technical support via phone, fax or e-mail

How much does ReliaSoft's Weibull++ cost and how do I order it?

For pricing, see http://Weibull.ReliaSoft.com. To order, use the on-line Web store, print-ready order form or contact ReliaSoft (1.888.886.0410 or +1.520.886.0410). Please visit http://www.ReliaSoft.com/internat.htm for a list of international offices and distributors.

How quickly can I get Weibull++?

ReliaSoft will process your order on the same business day that we receive it, with shipment via Federal Express (2nd Day or International). If requested, domestic orders can be shipped via FedEx Overnight so that you can have the package on your desk by the next business day. For faster access, we also offer the option of immediate software downloads via ReliaSoft's Web site.

Can I get training in Weibull++ and related reliability engineering subjects?

ReliaSoft's training seminars provide instruction in reliability engineering principles and theory as well as the ReliaSoft software tools designed to put that theory into practice. Courses on reliability life data analysis and **Weibull++** are available. For complete details, see http://Seminars.ReliaSoft.com.

Try a demonstration copy of Weibull++ and decide for yourself!

Is Weibull++ better than the package I am using now?

ABSOLUTELY. We invite you to try **Weibull++** and compare it with any other package on the market. If you do not agree that the software is better than any competitor, just return the package within 30 days for a full refund.

What other reliability software is available from ReliaSoft?

ReliaSoft's reliability analysis software products have become the industry standard for complete reliability analysis and are used worldwide by most manufacturers with an active quality/reliability engineering program. Complete product details are available on the Web at http://www.ReliaSoft.com.

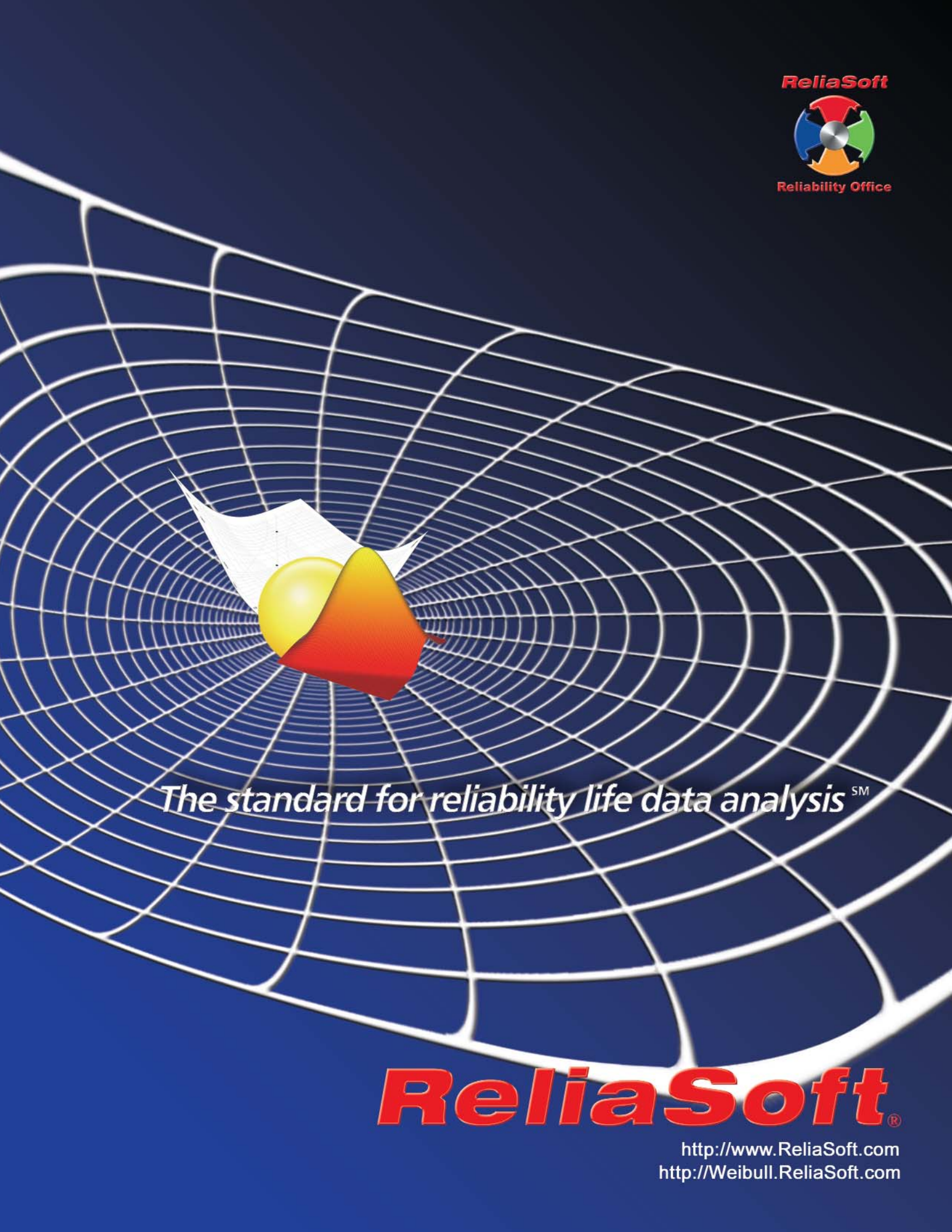
- **ALTA** for quantitative accelerated life testing (QALT) data analysis
- **BlockSim** for system reliability, maintainability, availability and related analyses using Reliability Block Diagrams (RBDs) or Fault Tree Analysis
- **RGA** for reliability growth and repairable system data analysis
- **Xfmea** for failure modes, effects and criticality analysis (FMEA/FMECA)
- **RCM++** for reliability centered maintenance (RCM) analysis
- **MPC 3** for MSG-3 aircraft systems and powerplant analysis and reporting
- **Lambda Predict** for standards based reliability prediction analysis
- **RENO** for visual stochastic event simulation
- **QTMS** for failure reporting, analysis and corrective action (FRACAS)

ReliaSoft®

Weibull++® 7

ReliaSoft Corporation
ReliaSoft Plaza, 115 South Sherwood Village Drive, Tucson, AZ 85710
Phone: +1.520.886.0410, Fax: +1.520.886.0399

http://Weibull.ReliaSoft.com


ReliaSoft
Reliability Office
The standard for reliability life data analysis SM
ReliaSoft®
http://www.ReliaSoft.com
http://Weibull.ReliaSoft.com