

# Quick Tour

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# Weibull++

VERSION 2024

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***ReliaSoft***

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# Quick Tour of Weibull++

**Weibull++** offers the most comprehensive toolset available for **reliability life data analysis**, with support for all life data types and all commonly used product lifetime distributions.

**Accelerated Life Testing (ALTA)** and **Accelerated Life Testing PRO (ALTA PRO)** utilize powerful life-stress relationship models to design and analyze data from **accelerated life tests**.

**Reliability Growth (RGA)** supports all of the major **reliability growth models** and can analyze data from both developmental testing and fielded repairable systems. It also includes a comprehensive toolset for advanced reliability growth projections, planning and management.

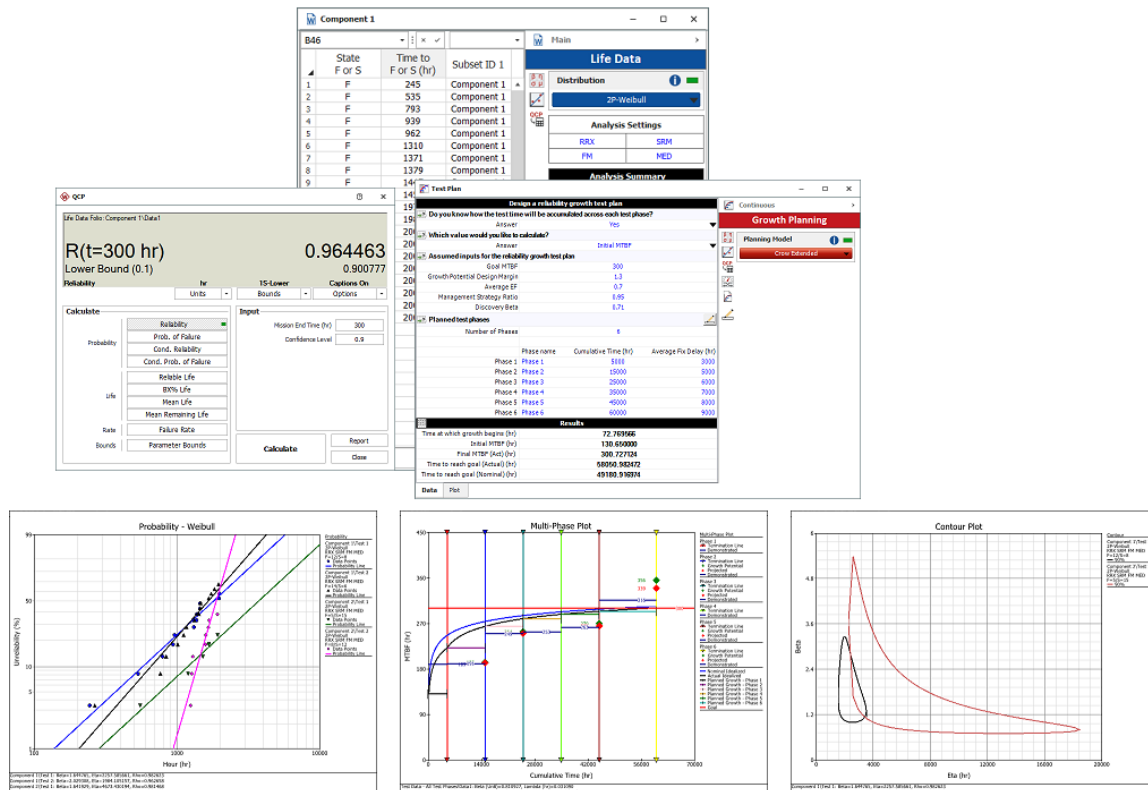
These applications are also packed with tools for related reliability analysis such as degradation data analysis, stress-strength comparison, reliability test design and design of experiments (DOE). In addition, Weibull++ also supports warranty data analysis, non-parametric data analysis and recurrent event data analysis.

For life data and life-stress data analysis, you can use this application to answer a wide variety of questions such as:

- How many units do you need to test? How much test time? At which stress levels?
- Will the product meet the reliability requirement?
- What is the influence of different failure modes? How does accelerated stress affect life?
- Which design (or supplier) will be more cost-effective over time?
- How many units are likely to be returned under warranty?
- Is there an emerging reliability problem in the field? With a particular supplier? In a particular region?
- When will a crack, wear, etc. degrade to the point of failure?
- What is the typical time to repair? How effective are the repairs?

For growth data analysis, you can use this application to answer a wide variety of questions, such as:

- Will the product meet the MTBF goal? How much test time is required?
- How does the product perform across different test phases? At which phase will the product meet the reliability requirement? What is the initial MTBF?
- How do the test data compare to the reliability growth test plan?
- What failure modes should be fixed and when?
- What is the optimum growth maintenance strategy? When is the best time to schedule maintenance/overhauls?



**Note:** For detailed examples for some common life data analysis features, refer to [https://help.reliasoft.com/weibull\\_quickstart/content/quickstart/quick\\_start\\_introduction.htm](https://help.reliasoft.com/weibull_quickstart/content/quickstart/quick_start_introduction.htm).

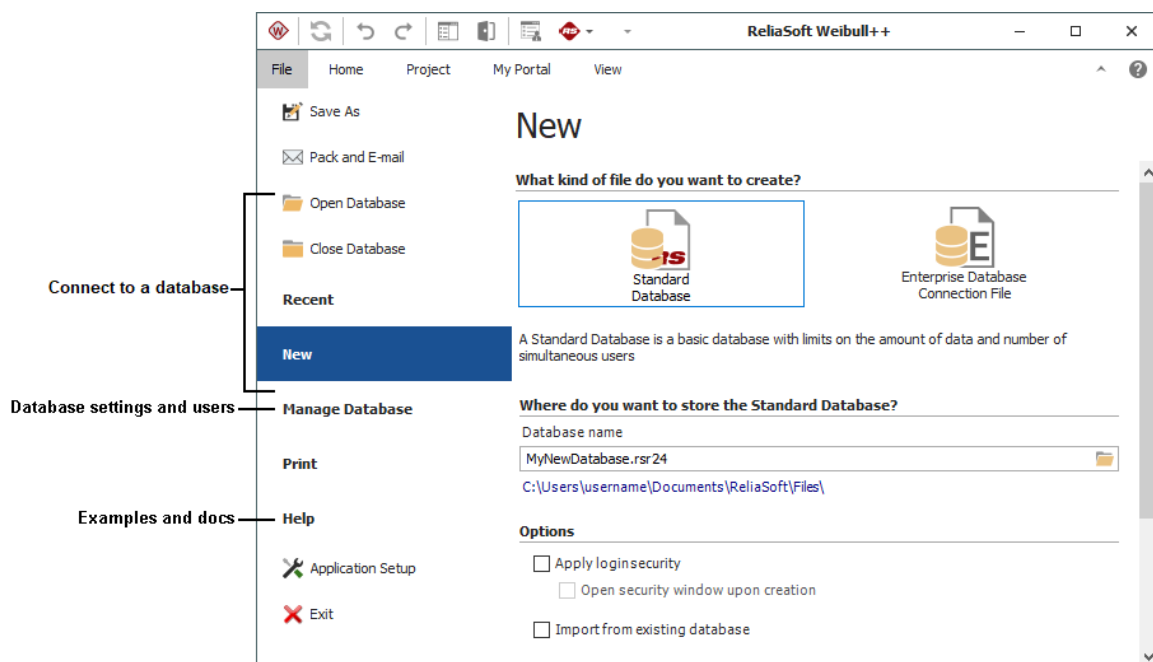
## Using Databases and Projects

### File Menu

Use commands on the **File** menu (**New**, **Recent** or **Open Database**) to create or open a database).

Each database supports simultaneous access by multiple users. If you have admin permissions, use **File > Manage Database** to control user access and manage configurable settings that apply throughout the database.

Use **File > Help** to access online help and shipped examples.

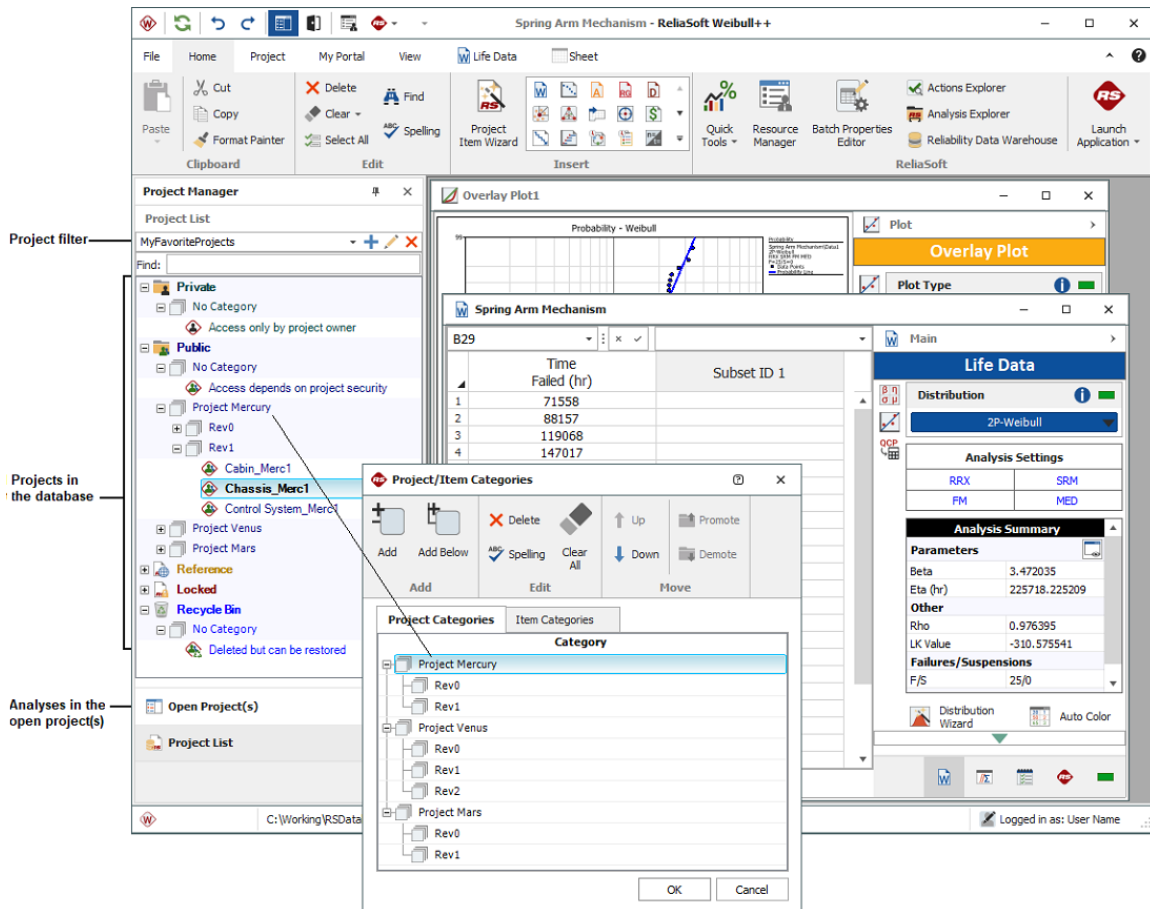


### Project List

Each database can contain multiple projects. Use the **project list** to create or open a project.

If you have a lot of projects:

- Use the **project filter** to limit what's displayed.
- Use the **project category** to group projects within the list.



### Current Project Explorer

Use the **current project explorer** to create or open analyses and reports.

You can open the same project in any ReliaSoft desktop application. Analyses and reports are visible only in the application(s) that can edit them:

- Life data folios are visible only in Weibull++
- Fault trees are visible only in BlockSim
- FMEAs are visible only in XFMEA/RCM++
- Etc.

Common features such as **resources** and **project attachments** are visible in all ReliaSoft desktop applications.



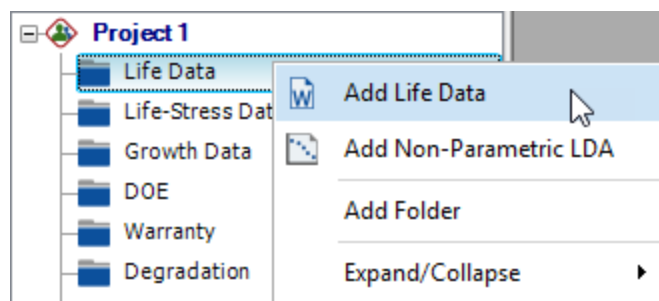
## Using Life Data Folios

Weibull++'s life data folio allows you to fit a statistical distribution to failure time data in order to understand the reliability performance of a product over time or to make projections about future behavior. From the analysis, you can obtain reliability information about a product such as probability of failure, reliability, mean life or failure rate.

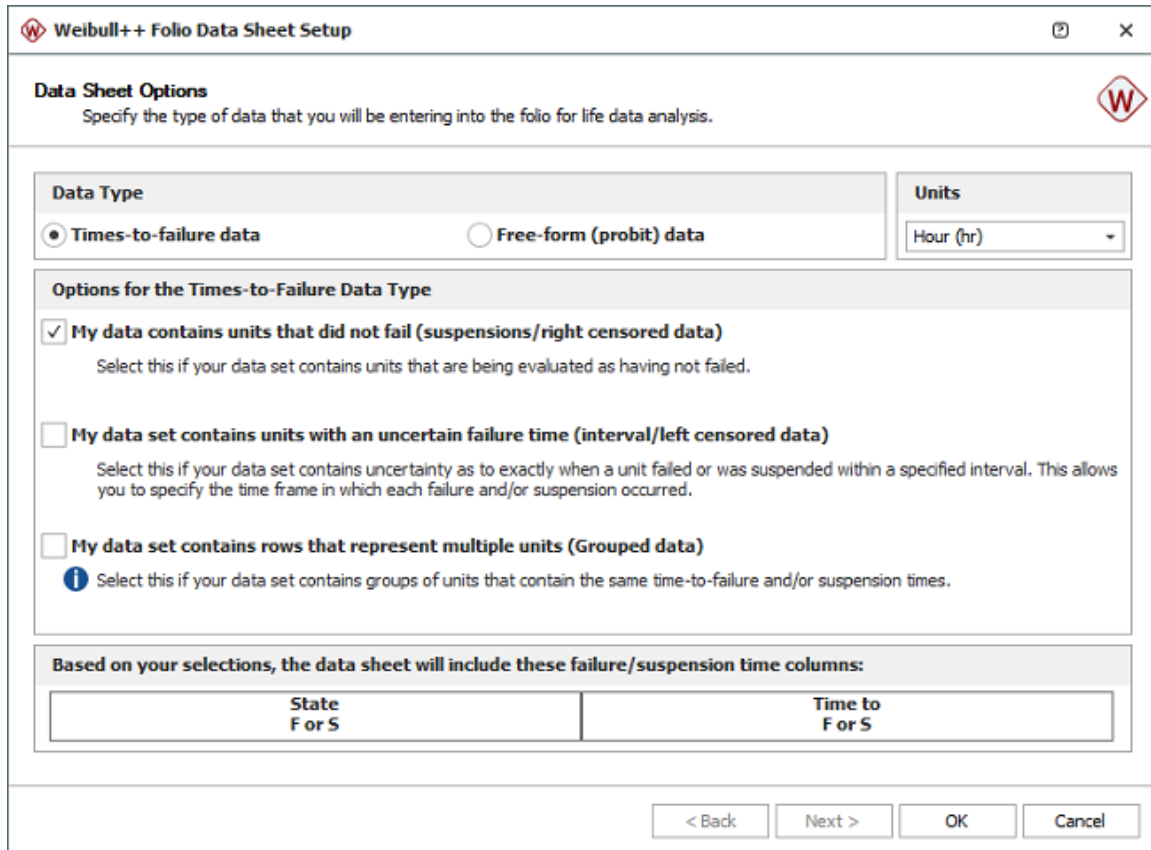
The basic steps for using a life data folio are:

1. Add life data folio

Right-click the Life Data folder in the current project explorer and choose **Add Life Data**.



In the setup window, select the desired data type and the units for time/usage values (hours, cycles, etc.).



The image shows the 'Weibull++ Folio Data Sheet Setup' dialog box. It has a title bar with the Weibull++ logo and window controls. The main area is titled 'Data Sheet Options' with a subtitle 'Specify the type of data that you will be entering into the folio for life data analysis.' and a red 'W' logo in the top right corner. There are two main sections: 'Data Type' and 'Units'. The 'Data Type' section has two radio buttons: 'Times-to-failure data' (selected) and 'Free-form (probit) data'. The 'Units' section has a dropdown menu set to 'Hour (hr)'. Below these is a section titled 'Options for the Times-to-Failure Data Type' with three checkboxes: 'My data contains units that did not fail (suspensions/right censored data)' (checked), 'My data set contains units with an uncertain failure time (interval/left censored data)' (unchecked), and 'My data set contains rows that represent multiple units (Grouped data)' (unchecked). Each checkbox has a brief description. At the bottom of this section is an information icon and a note: 'Select this if your data set contains groups of units that contain the same time-to-failure and/or suspension times.' Below this is a summary section titled 'Based on your selections, the data sheet will include these failure/suspension time columns:'. It contains a table with two columns: 'State' and 'Time to'. The 'State' column has a sub-header 'F or S' and the 'Time to' column has a sub-header 'F or S'. At the bottom of the dialog are four buttons: '< Back', 'Next >', 'OK', and 'Cancel'.

**Weibull++ Folio Data Sheet Setup**

**Data Sheet Options**  
Specify the type of data that you will be entering into the folio for life data analysis.

**Data Type**

☒ Times-to-failure data ☐ Free-form (probit) data

**Units**  
Hour (hr)

**Options for the Times-to-Failure Data Type**

☒ **My data contains units that did not fail (suspensions/right censored data)**  
Select this if your data set contains units that are being evaluated as having not failed.

☐ **My data set contains units with an uncertain failure time (interval/left censored data)**  
Select this if your data set contains uncertainty as to exactly when a unit failed or was suspended within a specified interval. This allows you to specify the time frame in which each failure and/or suspension occurred.

☐ **My data set contains rows that represent multiple units (Grouped data)**  
Select this if your data set contains groups of units that contain the same time-to-failure and/or suspension times.

**Based on your selections, the data sheet will include these failure/suspension time columns:**

State	Time to
F or S	F or S

< Back   Next >   OK   Cancel

## 2. Enter data

Enter the data and use the control panel to specify the life distribution and analysis settings.


The screenshot displays the WEIBULL++ 2024 software interface. On the left, a data table titled 'B29' contains 15 rows of data. The columns are 'State F or S', 'Time to F or S (hr)', and 'Subset ID 1'. The data shows a mix of failure (F) and survival (S) states over time. On the right, the 'Life Data' panel is visible, showing the 'Distribution' set to '2P-Weibull'. Below this, the 'Analysis Settings' section includes options for 'MLE', 'SRM', 'LRB', and 'MED'. A 'Not Analyzed' status bar is present. At the bottom of the interface, there are icons for 'Main' and 'Analysis'.

	State F or S	Time to F or S (hr)	Subset ID 1
1	F	16	prototype unit
2	F	34	prototype unit
3	F	53	prototype unit
4	F	75	prototype unit
5	F	93	prototype unit
6	F	120	prototype unit
7	S	120	prototype unit
8	S	120	prototype unit
9	S	120	prototype unit
10	S	120	prototype unit
11			
12			
13			
14			
15			

### 3. Analyze data

Click the **Calculate** icon on the control panel.



The Analysis Summary area displays the parameters of the distribution. Click the **Detailed Summary** icon  to view more information.

The screenshot displays the 'Life Data' analysis window in WEIBULL++ 2024. The window has a blue header bar with the title 'Life Data'. Below the header, there is a 'Distribution' section with a dropdown menu set to '2P-Weibull'. To the left of the 'Distribution' section are three icons: a box with Greek letters  $\beta$ ,  $\eta$ ,  $\sigma$ ,  $\mu$ , a plot icon, and a QCP icon. Below the 'Distribution' section is an 'Analysis Settings' table with four buttons: MLE, SRM, LRB, and MED. Below the 'Analysis Settings' table is an 'Analysis Summary' section with a 'Parameters' table, an 'Other' section, a 'Failures/Suspensions' table, and a 'Comments' section. The 'Parameters' table shows Beta = 1.506995 and Eta (hr) = 128.641436. The 'Other' section shows LK Value = -35.335766. The 'Failures/Suspensions' table shows F/S = 6/4. Below the 'Analysis Summary' section are five icons with labels: 'Distribution Wizard', 'Alter Data Type', 'Change Units', 'Auto Color', and 'Batch Auto Run'. At the bottom of the window is a toolbar with icons for a document, a plot, a list, a red 'X' mark, and a green bar.

Main

### Life Data

**Distribution**

2P-Weibull

**Analysis Settings**

MLE	SRM
LRB	MED

**Analysis Summary**

**Parameters**

Beta	1.506995
Eta (hr)	128.641436

**Other**

LK Value	-35.335766
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**Failures/Suspensions**

F/S	6/4
-----	-----

**Comments**

Distribution Wizard Auto Color

Alter Data Type Batch Auto Run

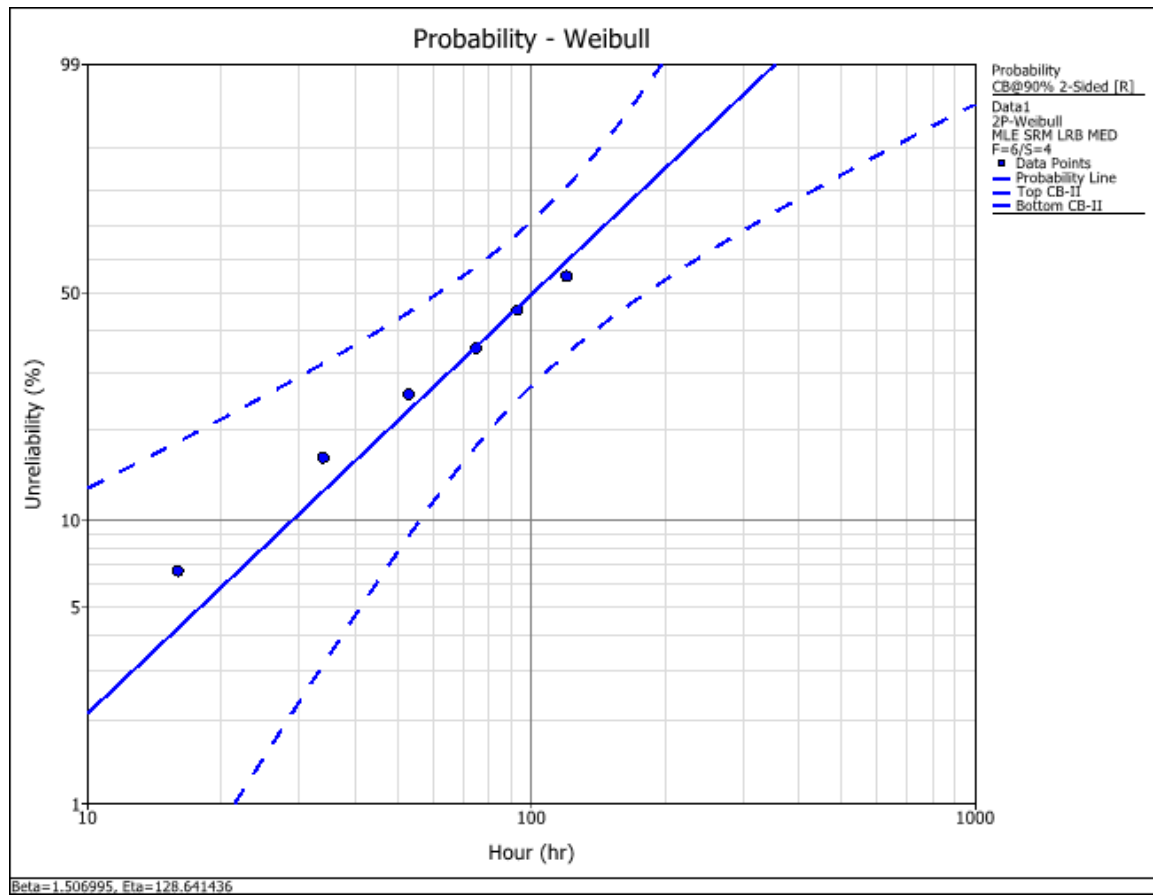
Change Units

#### 4. View plots

Click the **Plot** icon on the control panel to open the plot sheet.



To show the confidence bounds, click the **Confidence Bounds** link on the plot's control panel, and then set the desired type of bounds and confidence level.



## 5. Calculate metrics

Click the **QCP** icon on the control panel to open the Quick Calculation Pad.



The following example shows the estimates for the reliability and the lower one-sided 90% confidence bound.

Life Data Folio: Folio1\Data1

**R(t=60 hr)** **0.728448**  
**Lower Bound (0.1)** **0.543195**

Reliability Units hr 1S-Lower Bounds Captions On Options

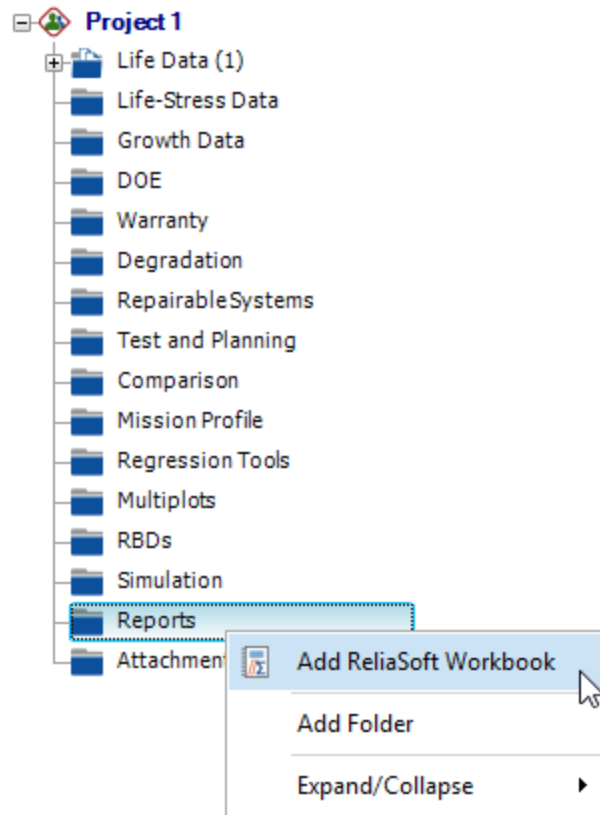
Calculate	
Probability	Reliability <input checked="" type="checkbox"/>
	Prob. of Failure
	Cond. Reliability
	Cond. Prob. of Failure
Life	Reliable Life
	BX% Life
	Mean Life
	Mean Remaining Life
Rate	Failure Rate
Bounds	Parameter Bounds

Input	
Mission End Time (hr)	60
Confidence Level	0.9

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

## 6. Create report

Right-click the Reports folder in the current project explorer and choose **Add ReliaSoft Workbook**.



In the ReliaSoft Workbook wizard, select the folio as the default data source. If desired, you can also select a standard or user-defined report template (e.g., the "Weibull Summary Style 1 Template" is shown below).

Workbook1

Home Document Page Layout Formulas Data Review View

Send to Excel Report Clipboard Font Alignment Number Styles Editing

Modules < C42

Spreadsheet Word Processing

Basic Report Sample

Analysis Settings

Distribution	Weibull 2P			
Method Used:	MLE			
Confidence Limits:	Lower	5.00%	Upper	95.00%
Method for CL:	Likelihood Ratio		2-Sided	90.00%

Estimates and Confidence Bounds for Distribution Parameters

Parameter	Estimate	Lower Limit	Upper Limit
Beta	1.506994639	0.758399828	2.607276213
Eta	128.6414361	84.69230273	257.5742323

Selected Metrics

Parameter	Estimate	Lower Limit	Upper Limit
Mean	116.0654733	74.6168519	220.866107
Median	100.8688464	61.78887984	181.1700023
B10	28.89727771	7.191877701	55.99633019

Sheet1

100%



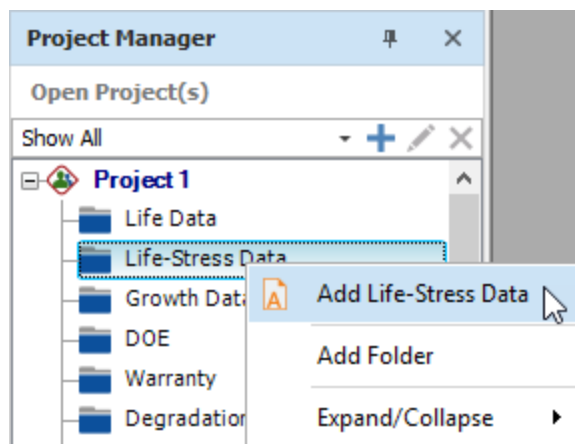
## Using Life-Stress Data Folios

Weibull++'s life-stress data folio allows you to perform quantitative accelerated life testing data analysis. In this analysis, you extrapolate a product's failure behavior at normal conditions from life data obtained at accelerated stress levels. Since products fail more quickly at accelerated stress levels, the analysis allows you to obtain reliability information about a product (e.g., mean life, probability of failure at a specific time, etc.) in a shorter time.

The basic steps for using a life-stress data folio are:

1. Add life-stress data folio

Right-click the Life-Stress Data folder in the current project explorer and choose **Add Life-Stress Data**.



In the setup window, select the desired censoring type and units for time/usage values (hours, cycles, etc.).

**ALTA Folio Data Sheet Setup**

**Data Sheet Options**  
Specify the type of data that you will be entering into the folio for life-stress analysis.

**Data Type**


☒ Times-to-failure data ☐ Free-form (probit) data

**Units**  
Hour (hr)

**Options for the Times-to-Failure Data Type**

☒ **My data contains units that did not fail (suspensions/right censored data)**  
Select this if your data set contains units that are being evaluated as having not failed.

☐ **My data set contains units with an uncertain failure time (interval/left censored data)**  
Select this if your data set contains uncertainty as to exactly when a unit failed or was suspended within a specified interval. This allows you to specify the time frame in which each failure and/or suspension occurred.


☐ **My data set contains rows that represent multiple units (Grouped data)**  
 Select this if your data set contains groups of units that contain the same time-to-failure and/or suspension times.


**Based on your selections, the data sheet will include these failure/suspension time columns:**

State F or S	Time to F or S

< Back   Next >   **OK**   Cancel

On the next page, define the stress type(s) to use in the analysis and the use stress level.

 ALTA Folio Data Sheet Setup ✕

**Select Stress Columns**   
Define the stress columns that will appear in the data sheet, and specify the use stress level(s). The following table contains some commonly used stress types, but you can change any of the labels (e.g., if your vibration values use meters per second squared instead of hertz, you can change Hz to m/s<sup>2</sup>).

**Define Stress Columns and Use Stress Levels**

	Stress Name	Stress Units	Use Level
<input checked="" type="checkbox"/>	Temperature	K	298
<input type="checkbox"/>	Voltage	V	100
<input type="checkbox"/>	Humidity	RH	50
<input type="checkbox"/>	Vibration	Hz	25
<input type="checkbox"/>	Temperature	R	580
<input type="checkbox"/>	Mechanical	kips	25
<input type="checkbox"/>	<Stress name>	<Stress units>	10
<input type="checkbox"/>	<Stress name>	<Stress units>	10

**Based on your selections, the data sheet will also include these stress columns:**

Temperature  
K

< Back Next > OK Cancel

## 2. Enter data

Enter the data and use the control panel to specify the life-stress model.

The screenshot displays the WEIBULL++ 2024 software interface. The main window is titled 'Folio1' and contains a data table with the following columns: 'State F or S', 'Time to F or S (hr)', 'Temperature K', and 'Subset ID 1'. The table has 15 rows of data. The 'Temperature K' column is highlighted with a red border. To the right of the table is a control panel titled 'Main' with a 'Life-Stress Data' section. This section includes a 'Model' dropdown menu set to 'Arrhenius-Weibull', a 'Select Stress Columns...' button, a 'Stress Transformation...' button, and a 'Set Use Stress...' button. Below these buttons is a 'Not Analyzed' status bar and a 'Comments' text area. At the bottom of the control panel is a toolbar with icons for 'Data', 'Analysis', 'Summary', 'Help', and 'Exit'.

	State F or S	Time to F or S (hr)	Temperature K	Subset ID 1
1	F	105	313	
2	F	170	313	
3	F	224	313	
4	F	278	313	
5	S	350	313	
6	S	350	313	
7	S	350	313	
8	F	38	328	
9	F	62	328	
10	F	82	328	
11	F	103	328	
12	F	128	328	
13	F	165	328	
14				
15				

### 3. Analyze data

Click the **Calculate** icon on the control panel.



The Analysis Summary area displays the parameters of the distribution. Click the **Detailed Summary** icon to view more information.

The screenshot shows the 'Life-Stress Data' window in WEIBULL++ 2024. The window has a title bar with a file icon and the text 'Main'. Below the title bar is a yellow header with the text 'Life-Stress Data'. To the left of the main panel are three icons: a box with Greek letters  $\beta$ ,  $\eta$ ,  $\sigma$ ,  $\mu$ , a plot icon, and a QCP icon. The main panel has a 'Model' section with a dropdown menu set to 'Arrhenius-Weibull'. Below this are three links: 'Select Stress Columns...', 'Stress Transformation...', and 'Set Use Stress...'. The 'Analysis Summary' section is a table with the following data:

Analysis Summary	
<b>Parameters</b>	
Beta	2.282545
B (K)	8245.573645
C (hr)	1.296656E-09
<b>Activation Energy</b>	
Ea (eV)	0.710548
<b>Scale Parameter (at Use Stress)</b>	
Eta (hr)	1347.806035
<b>Other</b>	
LK Value	-58.425859
<b>Use Stress</b>	
Temperature	298
<b>Failures/Suspensions</b>	
F/S	10/3
<b>Comments</b>	

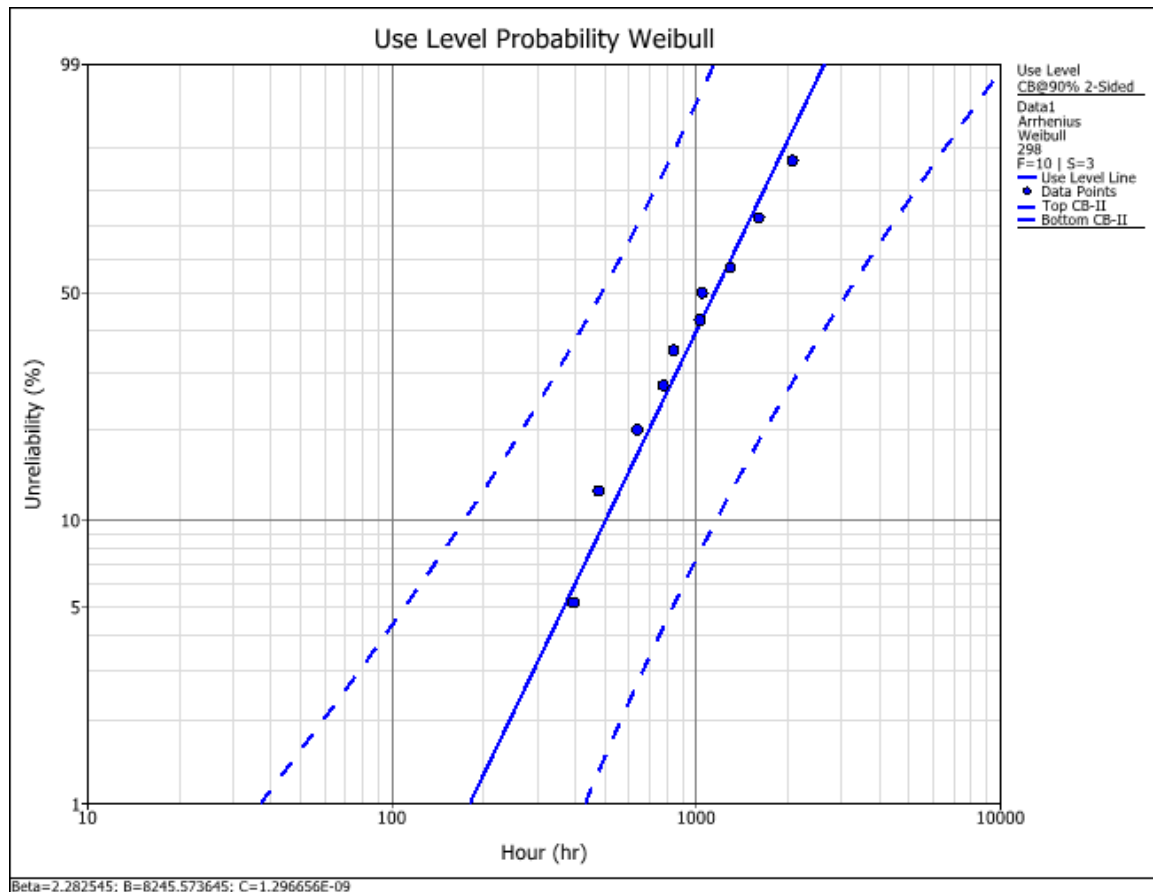
Below the table are six icons with labels: 'Distribution Wizard', 'Alter Data Type', 'Add/Remove Columns', 'Change Units', 'Likelihood Ratio Test', and 'Transfer To Weibull'. At the bottom of the window is a toolbar with icons for file operations, statistics, and a red 'AS' icon.

#### 4. View plots

Click the **Plot** icon on the control panel to open the plot sheet.



To show the confidence bounds, click the **Confidence Bounds** link on the plot's control panel, and then set the desired type of bounds and confidence level.






## 5. Calculate metrics

Click the **QCP** icon on the control panel to open the Quick Calculation Pad.



The following example shows the estimates for reliability and the lower one-sided 90% confidence bound.

 QCP

Life-Stress Data Folio: Folio1\Data1

**$R(t=300 \text{ hr})$**  **0.968113**

Lower Bound (0.1) 0.842874

Reliability

hr

Units


1S-Lower

Bounds

Captions On

Options

**Calculate**

Probability	Reliability	
	Prob. of Failure	
	Cond. Reliability	
	Cond. Prob. of Failure	
Life	Reliable Life	
	BX% Life	
	Mean Life	
	Mean Remaining Life	
Rate	Failure Rate	
Acceleration	Acceleration Factor	
Bounds	Parameter Bounds	

**Input**

Stress 298

Mission End Time (hr) 300

Confidence Level 0.9

**Calculate**

Report

Close

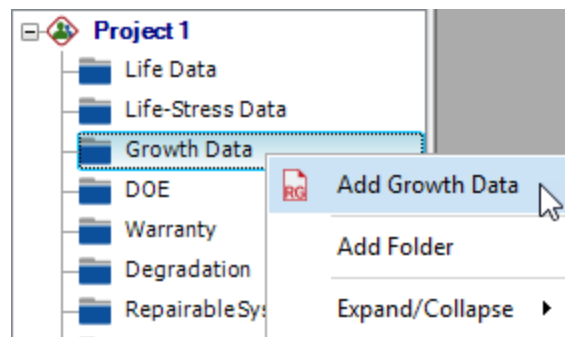
## Using Growth Data Folios

Weibull++'s growth data folio supports traditional reliability growth analysis, repairable systems analysis and reliability growth projections. The data type you select determines the type of analysis you can perform.

The basic steps for using a growth data folio are:

1. Add growth data folio

Right-click the Growth Data folder in the current project explorer and choose **Add Growth Data**.



In the setup window, select the desired data type. Then click **Next** to set the units for values (hours, cycles, etc.) and other preferences.



The screenshot shows the 'Project Item Wizard' dialog box, specifically the 'Data Sheet Options' screen. The title bar reads 'Project Item Wizard' with a close button (X) on the right. Below the title bar, the text 'Data Sheet Options' is followed by the instruction 'Select the data type for the folio.'.

On the left, under 'All Data Types', there are four categories: 'Developmental', 'Times-to-Failure Data' (which is highlighted with a blue dashed border), 'Discrete Data', and 'Fielded'. Under 'Developmental', there are sub-options: 'Multi-Phase Data' and 'Reliability Data'.

In the center, under the 'Times-to-Failure Data' category, there is a list of data types, each preceded by a red 'RG' icon: 'Failure Times', 'Grouped Failure Times', 'Multiple Systems - Known Operating Times', 'Multiple Systems - Concurrent Operating Times', 'Multiple Systems - Dates', and 'Multiple Systems with Event Codes'.

On the right, there is a text box explaining the 'Failure Times' data type. It states: 'The Failure Times data type is used for situations where the exact failure times have been recorded. This data type can be used to analyze the data from a single system or for the combined times from multiple systems (e.g., if 3 identical systems are tested and 1 fails at 10 hours, the recorded failure time is 30 hours). If you will assume that all fixes are applied during the observed test time, you can use the Crow-AMSAA (NHPP) or Duane models for analysis. If you want to account for different fix strategies used for different failure modes, choose the Crow Extended model. The extended model requires you to identify and classify the failure mode responsible for each failure (A = no fix, BC = fixed during test or BD = delayed fix), and also specify the 'effectiveness factor' for each delayed fix.' Below this text is a blue link labeled 'Learn More'.

At the bottom of the dialog box, there are four buttons: '< Back', 'Next >', 'OK', and 'Cancel'.

## 2. Enter data

Enter the data and use the control panel to specify the growth model and analysis settings.

The screenshot shows the Folio1 software interface. On the left, a data table with 20 rows and 2 columns is displayed. The first column is labeled 'Time to Event (hr)' and the second is 'Comments'. The data values are as follows:


	Time to Event (hr)	Comments
1	0.7	
2	3.7	
3	13.2	
4	17.6	
5	54.5	
6	99.2	
7	112.2	
8	120.9	
9	151	
10	163	
11	174.5	
12	191.6	
13	282.8	
14	355.2	
15	486.3	
16	490.5	
17	513.3	
18	558.4	
19	678.1	
20	688	

A red box with the text "Note: Complete data set is not shown." is overlaid on the bottom right of the data table. To the right of the data table is a control panel titled "Main". It has a "Growth Data" section with a "Model" dropdown set to "Crow-AMSAA (NHPP)". Below this is a "Calculation Options" section with two radio buttons: "Standard" (selected) and "Change of Slope". There are also buttons for "Developmental", "Failure Times", "MLE", "Crow", "No Gap", and "Cumulative". At the bottom of the control panel, there is a "Failure Terminated" button. The bottom of the window shows a "Data1" tab and a status bar with various icons.

### 3. Analyze data

Click the **Calculate** icon on the control panel.



The Analysis Summary area displays the parameters of the growth model. Click the **Detailed Summary** icon  to view more information.

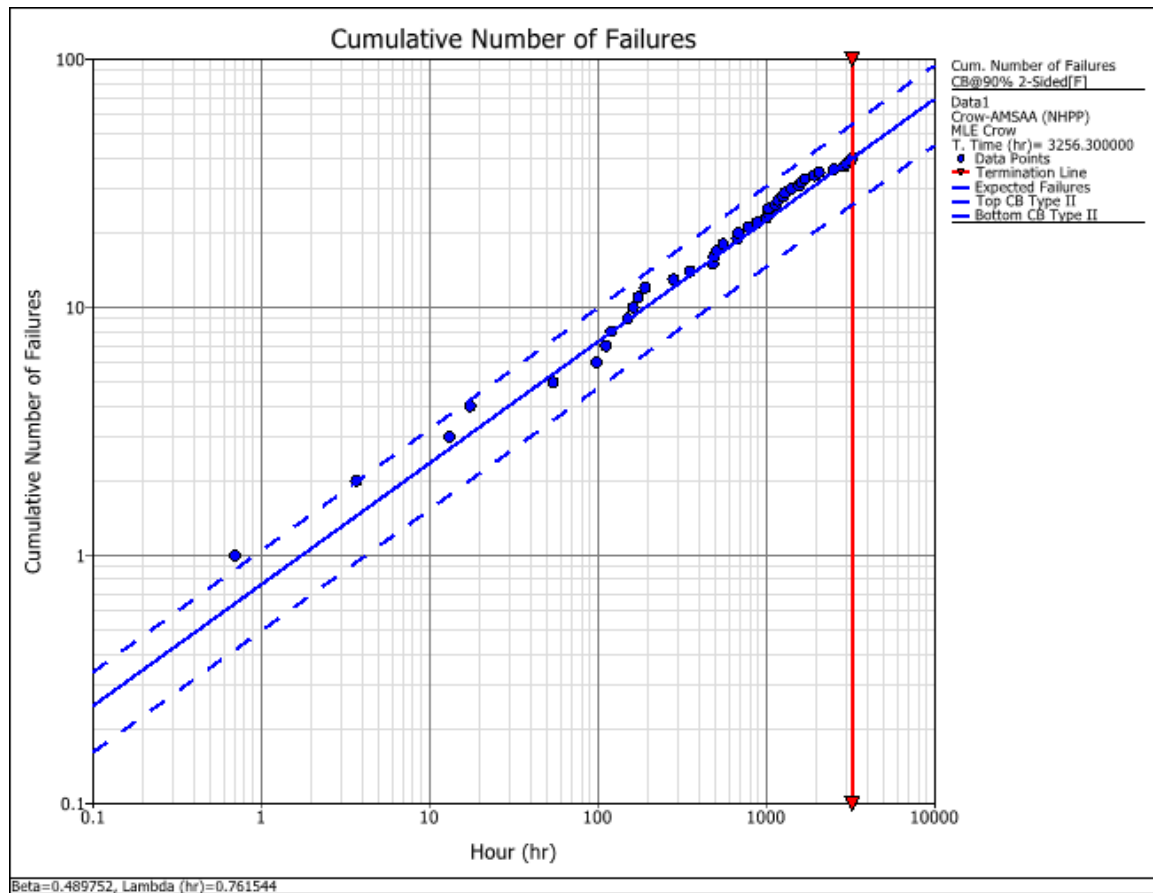
Results	
Parameters	
Beta	0.489752
Lambda (hr)	0.761544
Growth Rate	0.510248
DMTBF (hr)	166.221749
DFI	0.006016
Statistical Tests	
Significance Level	0.1
CVM	Passed
Other	
Termination Time (hr): 3256.300000	

#### 4. View plots

Click the **Plot** icon on the control panel to open the plot sheet.



To show the confidence bounds, right-click the plot, choose **Show Confidence Bounds**, and then set the desired type of bounds and confidence level.






## 5. Calculate metrics

Click the **QCP** icon on the control panel to open the Quick Calculation Pad.



The following example shows the instantaneous MTBF with the lower one-sided 90% confidence bound.

 QCP

Folio1\Data1

IMTBF(t=32...

166.221749 hr

Lower Bound (0.1)

131.212225 hr

Instantaneous MTBF

hr

1S-Lower

Captions On

Units

Bounds

Options


Calculate

Cumulative

MTBF

Failure Intensity

Instantaneous

MTBF 

Failure Intensity

Time (hr)

Time Given:

Failures

Number of Failures

Bounds

Parameter Bounds

Input

Time (hr)

3256.3

Confidence Level

0.9

Calculate

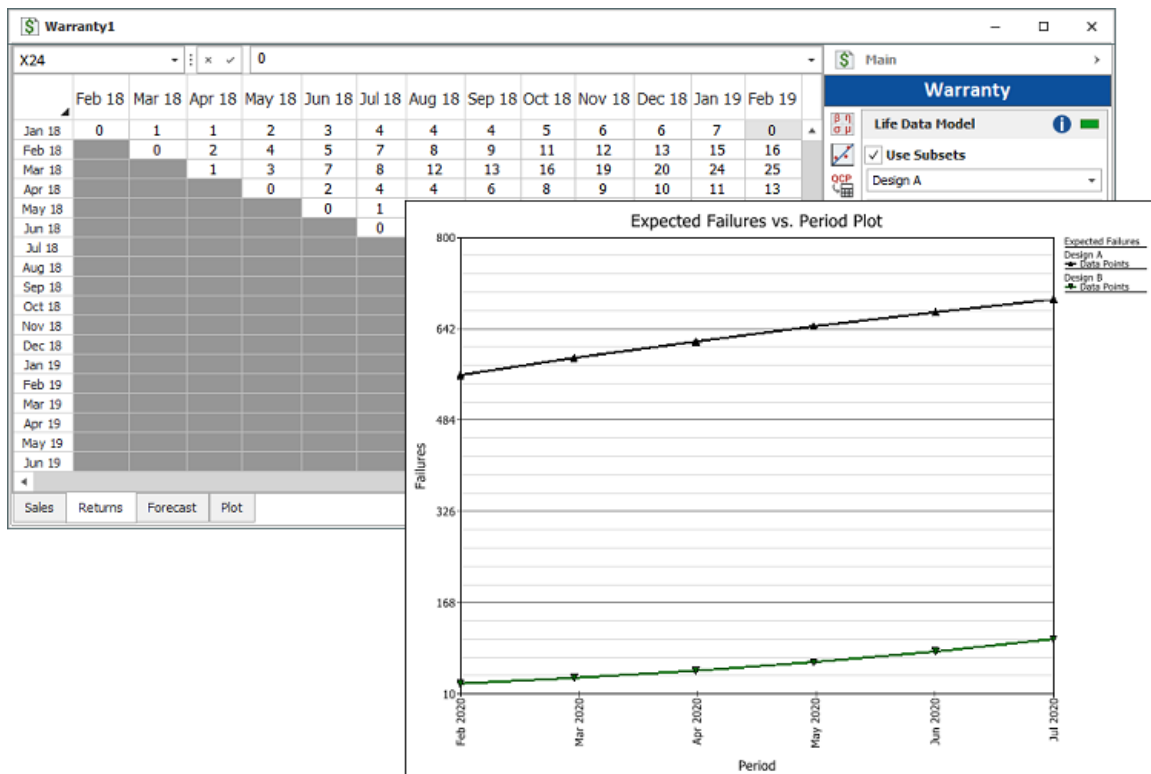
Report

Close

## More Analyses and Tools

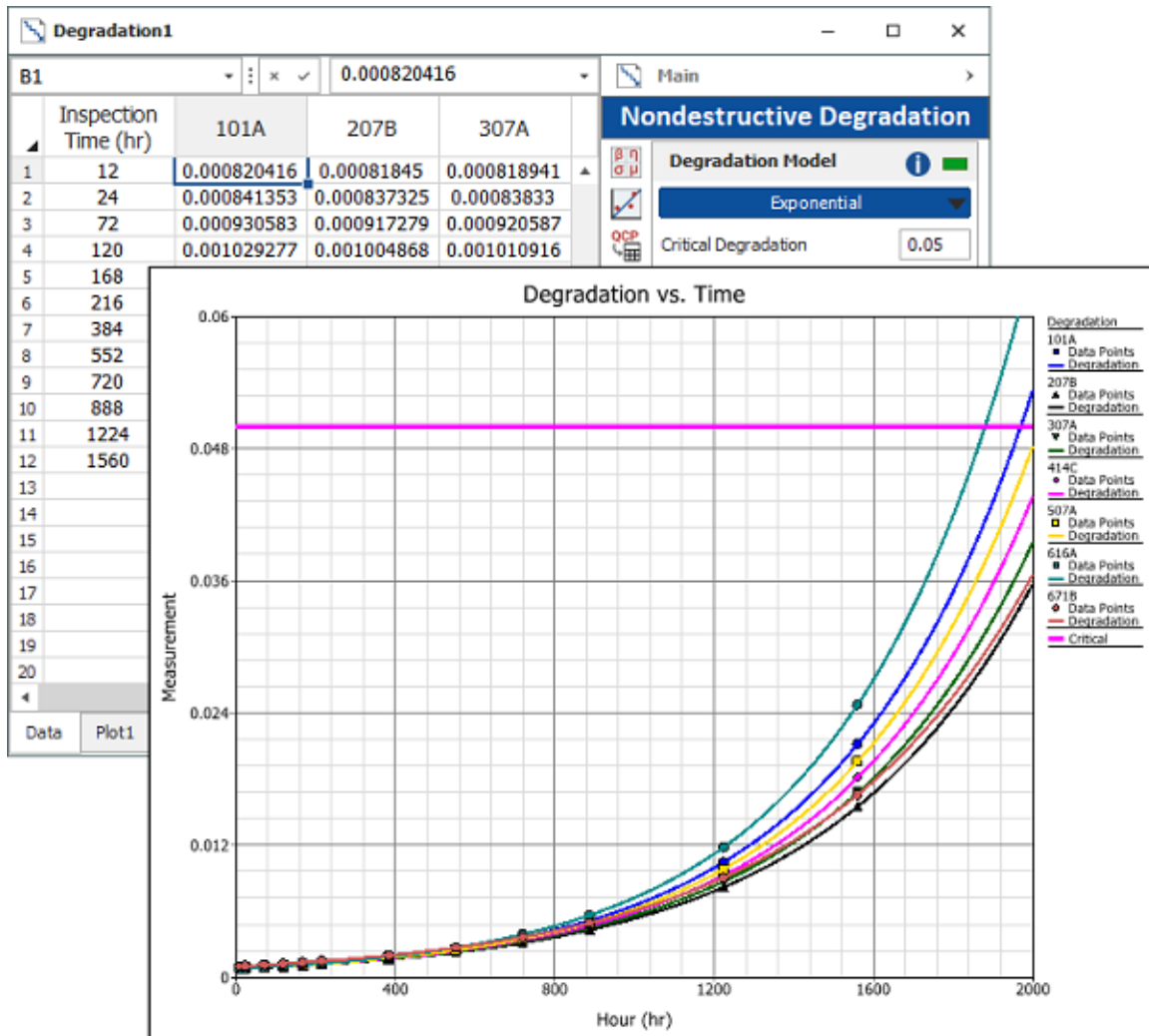
### Warranty Data Analysis

For life data analysis, the warranty folio offers a choice of 4 data entry formats that use sales and returns data to predict future returns under warranty: Nevada, Times-to-Failure, Dates of Failure and Usage.



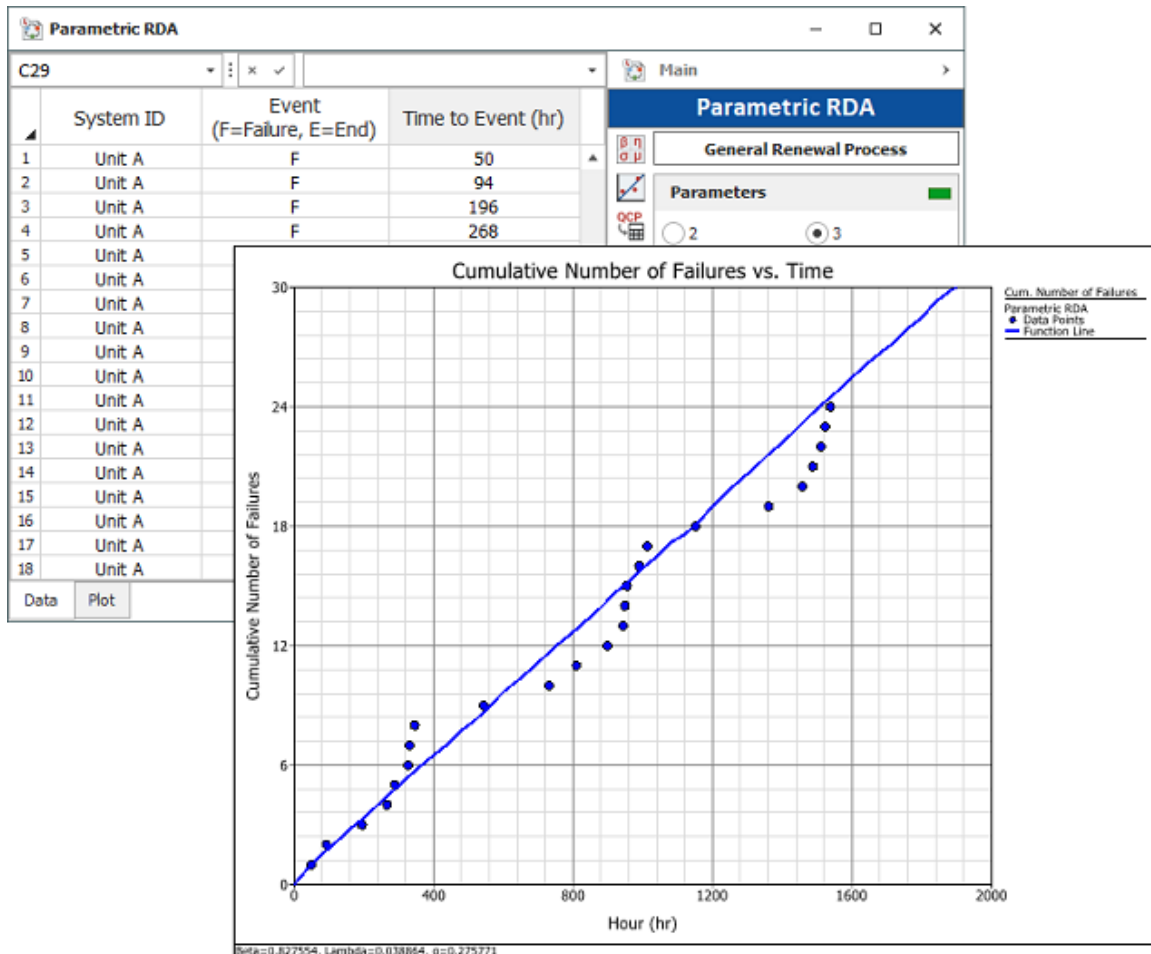
## Degradation

For life data and life-stress analyses, the degradation folio extrapolates expected failure times based on how a performance measure (e.g., crack propagation, tread depth, vibration) has degraded over time.



## Recurrent Event Data Analysis

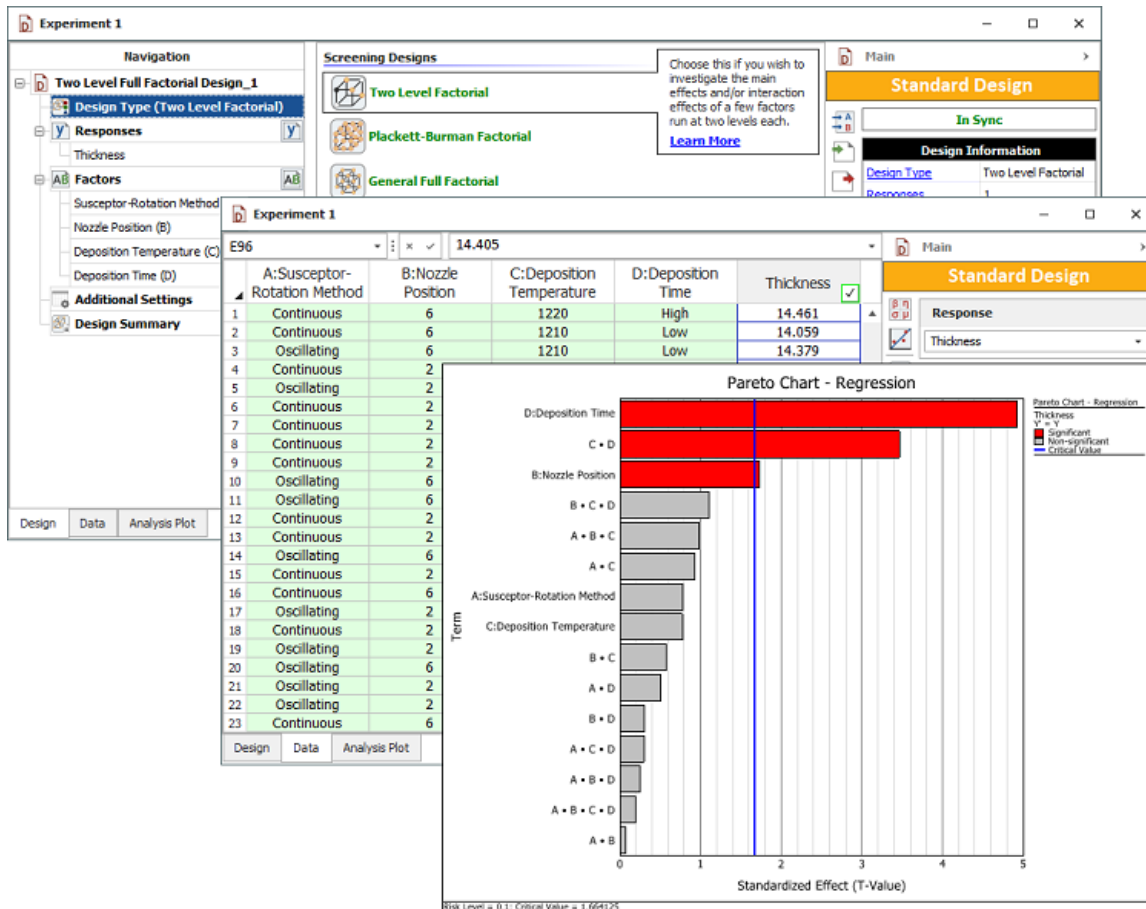
For life data analysis, the non-parametric RDA folio uses the Mean Cumulative Function to plot the average number of recurring failures over a given period of time. The parametric RDA folio uses the General Renewal Process (GRP) model, which considers the effectiveness of repairs, to model the cumulative number of failures over time.





## Design of Experiments

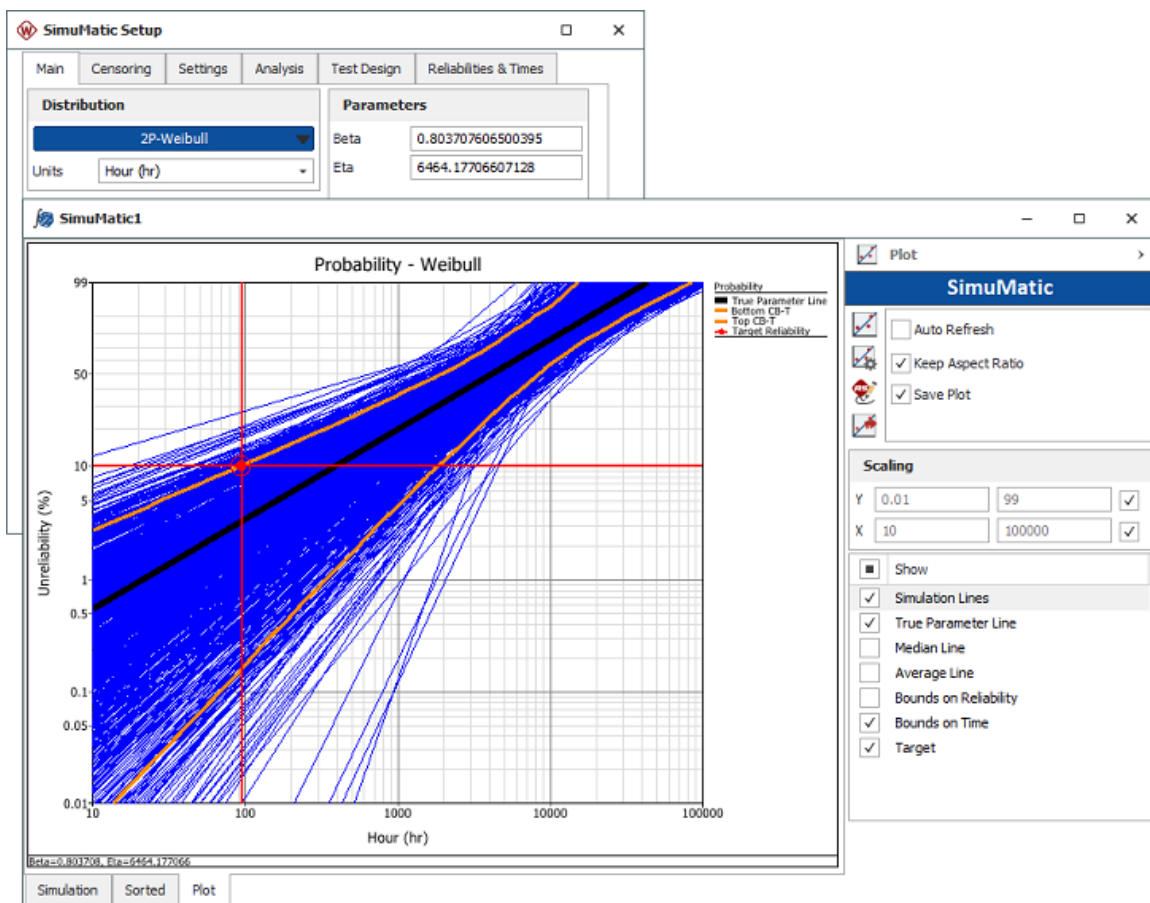
A set of design folios provide techniques for DOE analyses such as identifying key factors that affect performance (standard design), minimizing a system's sensitivity to noise (robust design) and determining the best proportion of components in a mixture (mixture design).



## Monte Carlo Data Generation and SimuMatic

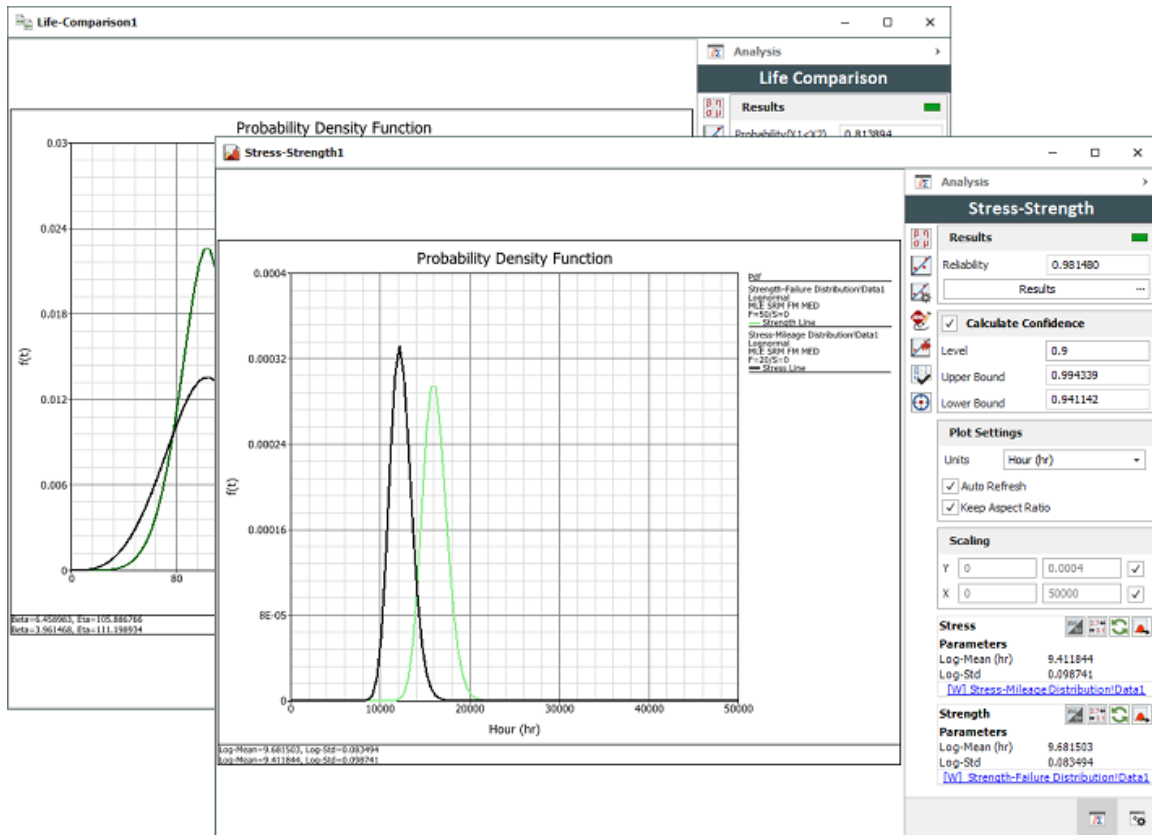
For life data and life-stress data analyses, the Monte Carlo utility generates a data set based on a specified probability distribution. SimuMatic performs analyses on a large number of simulated data sets, based on a specified probability distribution. For growth data analysis, the Monte Carlo utility generates a data set based on the Crow-AMSAA model, with specified beta and lambda parameters while SimuMatic performs analyses on a large number of simulated data sets, based on the Crow-AMSAA model.

The life data versions look like this:



## Comparison Folios

The life comparison folio determines the probability that the life of one population will be greater or less than that of the second. The stress-strength analysis folio determines the probability of failure based on the probability of stress exceeding strength.



## Test Design

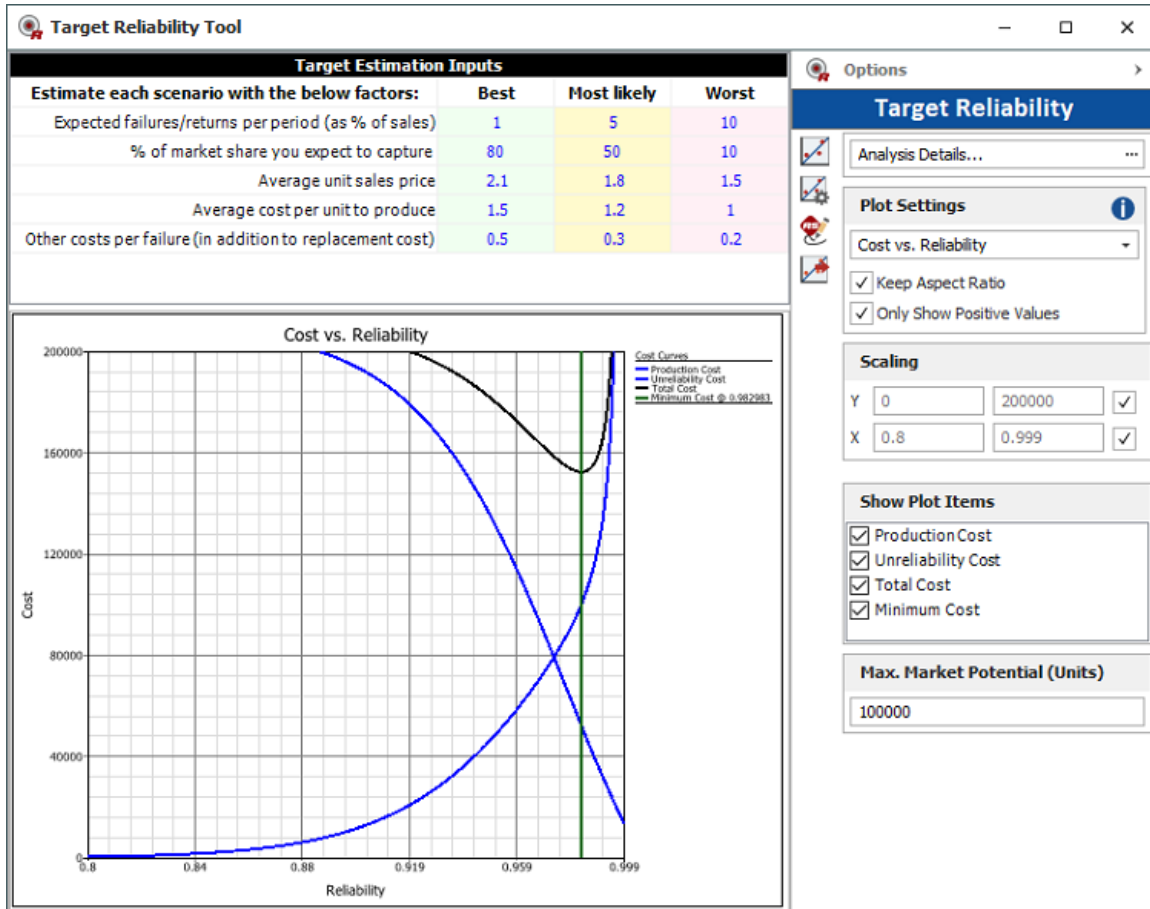
For life data analysis, Weibull++ offers a choice of tools to assist with reliability test design: Reliability Demonstration Test (Parametric Binomial, Non-Parametric Binomial, Exponential Chi-Squared or Non-Parametric Bayesian), Expected Failure Times Plot and Difference Detection Matrix. For growth data analysis, the Test Design folio uses the non-homogeneous Poisson process (NHPP) to design a demonstration test for repairable systems by solving for either the test time required per system or the number of systems that must be tested.

The screenshot displays the 'Test Design Folio1' window, which is a central hub for reliability test design. It features several sub-windows and panels:

- Design 1 Mean Life:** A table showing the relationship between Design 1 Mean Life (300 to 3000) and Design 2 Mean Life (300 to 2400). The table is color-coded with red and black cells.
- Expected Failure Times:** A plot showing 'Units vs. Time' with a curve representing the expected failure times.
- Parametric Binomial:** A panel for designing a reliability demonstration test. It includes fields for 'Metric' (Reliability value at a specific time), 'Confidence level (%)' (90), 'At this time (hr)' (100), 'Distribution' (2P-Weibull), and 'With this Beta' (2). It also has a 'Solve for this value' section with 'Value' and 'With this test time (hr)'.
- Test Design Assistant:** A dialog box titled 'Select Test Design' that prompts the user to specify the type of test they would like to perform. It lists three options: 'Reliability Demonstration Test Design', 'Expected Failure Times Plot', and 'Difference Detection Matrix'.
- Test Design (Right Panel):** A panel for configuring the test design. It includes sections for 'Expected Failure Time', 'Plot Setup' (Sample Size, Two-Sided Confidence (%), Acceleration Factor, Actual Failures), 'Expected Failure Model' (WB2 (2, 500)), 'Plot Options' (Keep Aspect Ratio, Auto Refresh), 'X-Axis Scaling' (Linear, Logarithmic), and 'Scaling' (Y, X).

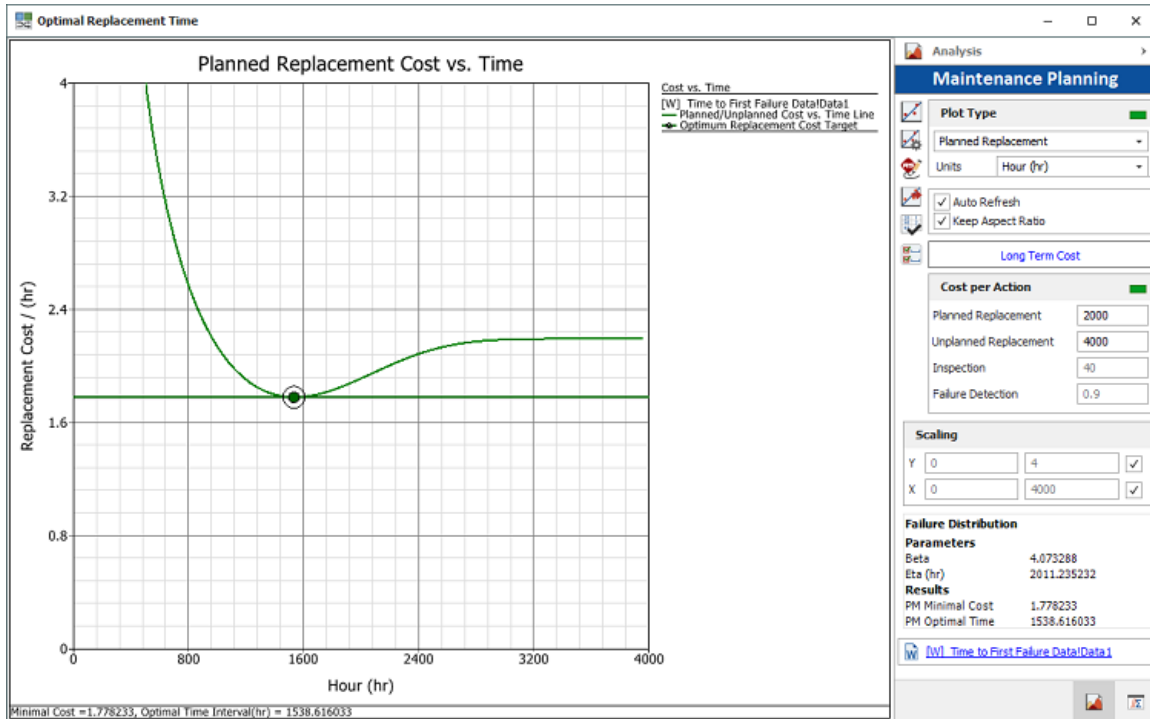
## Target Reliability Planner

For life data analysis, the Target Reliability folio finds the optimum cost and reliability of a product, given estimates for various factors involved in the product's production and sale.



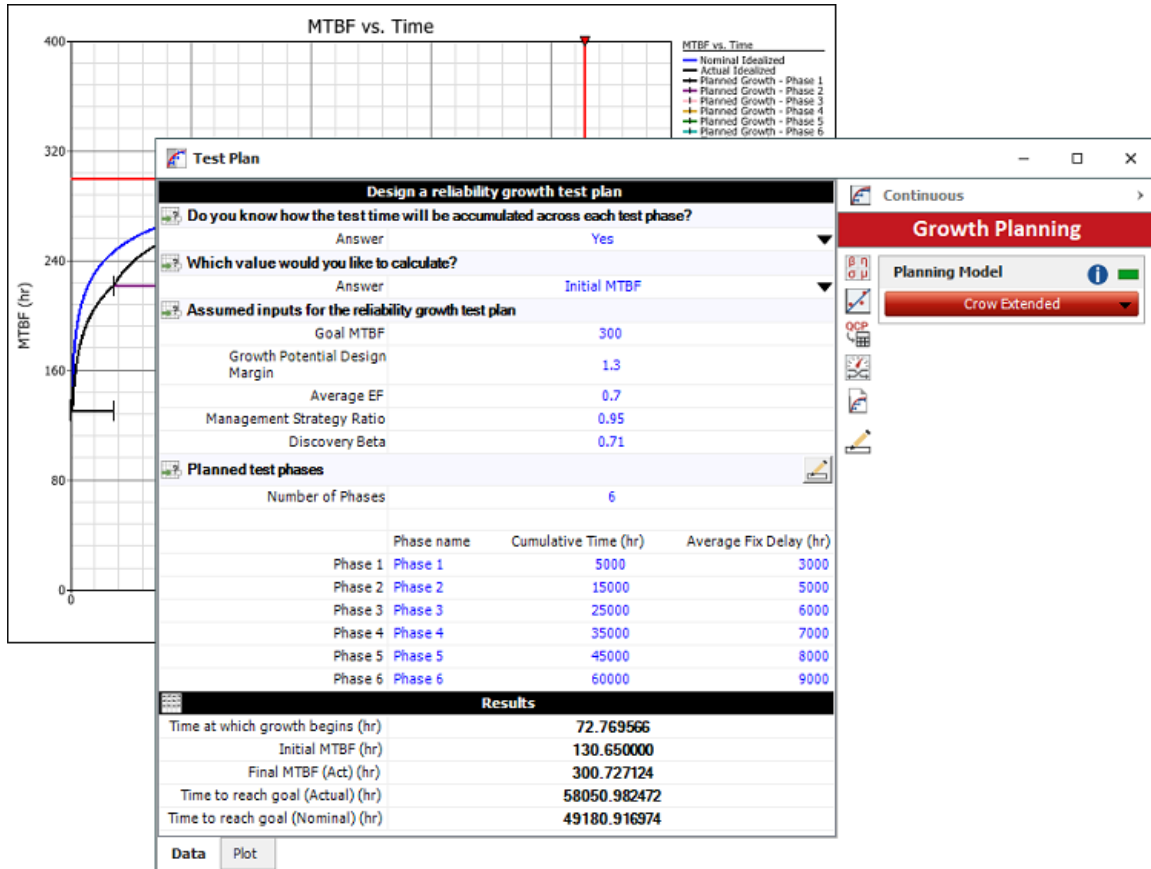
## Maintenance Planning

For life data analysis, the Maintenance Planning folio uses the optimum replacement age model to determine the most cost-effective time to replace aged components.



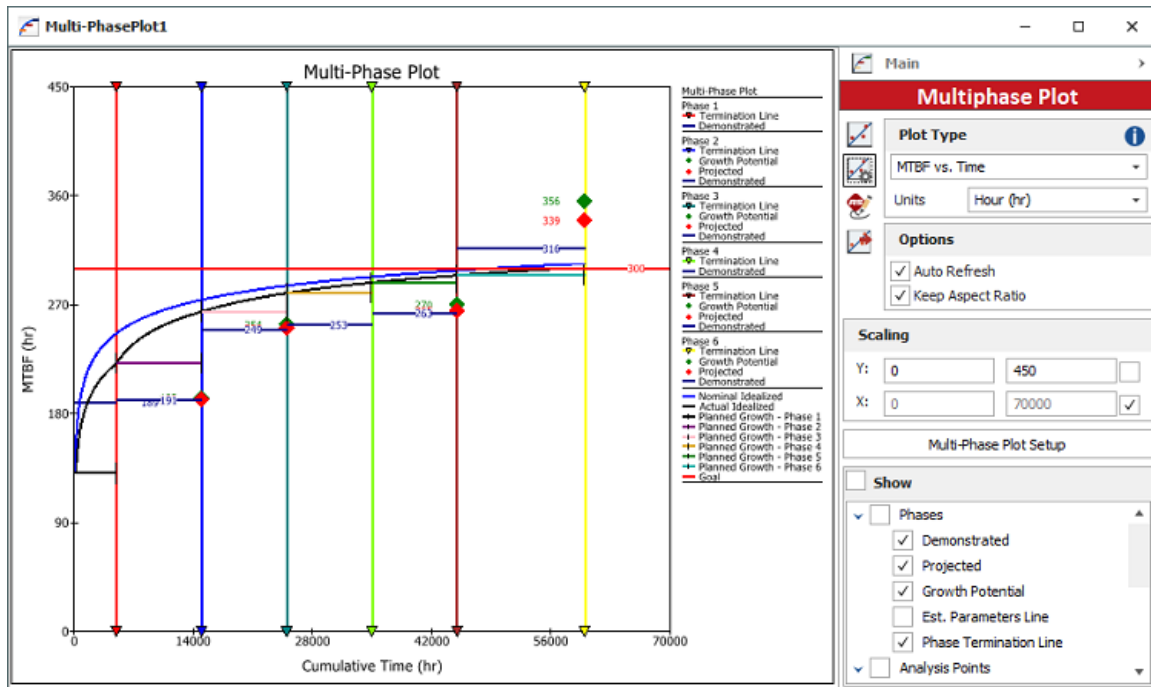
## Growth Planning

For growth data analysis, the growth planning folio helps you to create a multi-phase reliability growth testing program that is designed to achieve a specific MTBF or reliability goal.



## Multi-Phase Plot

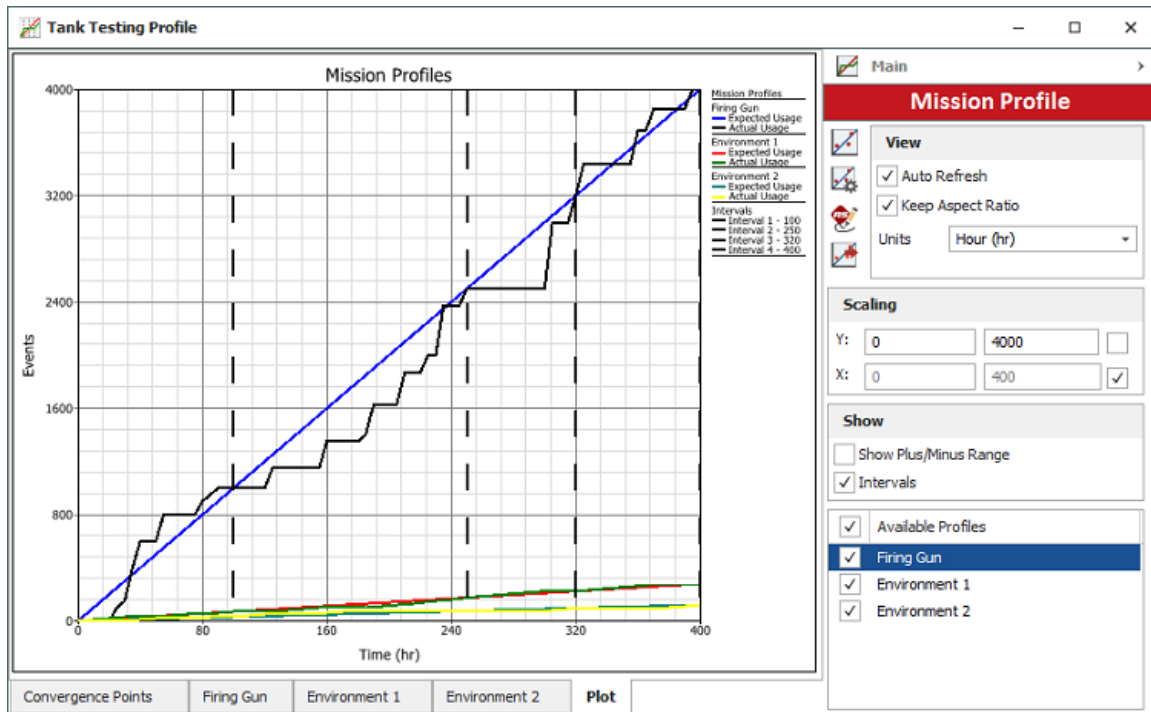
For growth data analysis, the multi-phase plot displays actual test results (e.g., demonstrated, projected and growth potential MTBF or failure intensity) across multiple analysis points and/or test phases. It can be linked to a growth planning folio to compare actual test results against the test plan.





## Mission Profiles

For growth data analysis, mission profiles help to create a balanced operational test plan and track the actual testing against the plan to make sure the data will be suitable for reliability growth analysis.



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10.2 Subject to clause 9.1, the Licensor shall have no liability for any losses or damages which may be suffered by You (or any person claiming under or through You), whether the same are suffered directly or indirectly or are immediate or consequential, and whether the same arise in

contract, tort (including negligence) or otherwise howsoever, which fall within any of the following:

- (a) loss of income;
- (b) loss of business profits or contracts;
- (c) business interruption;
- (d) loss of the use of money or anticipated savings;
- (e) loss of information;
- (f) loss of opportunity, goodwill or reputation;
- (g) loss of, damage to or corruption of data; or
- (h) any indirect or consequential loss or damage of any kind howsoever arising and whether caused by tort (including negligence), breach of contract or otherwise;

provided that this clause 9.2 shall not prevent claims for loss of or damage to Your tangible property that fall within the terms of clause 8 or a claim for a refund of the License fees paid to the Licensor or the Authorised Reseller (as applicable) for the License of the Software Product.

10.3 Subject to clause 9.1 and clause 9.2, the Licensor's maximum aggregate liability under or in connection with this License Agreement, or any collateral contract, whether in contract, tort (including negligence) or otherwise, shall be limited to a sum equal to the fees paid by You to the Licensor or the Authorised Reseller (as applicable) for the License of the Software Product.

10.4 Subject to clause 9.1, clause 9.2 and clause 9.3, the Licensor's liability for infringement of third party intellectual property rights shall be limited to breaches of third party rights subsisting in the UK and USA.

10.5 This License Agreement sets out the full extent of the Licensor's obligations and liabilities in respect of the supply of the Software and Documentation. In particular, there are no conditions, warranties, representations or other terms, express or implied, that are binding on the Licensor except as specifically stated in this License Agreement. Any condition, warranty, representation or other term concerning the supply of the Software and Documentation which might otherwise be implied into, or incorporated in, this License Agreement, or any collateral contract, whether by statute, common law or otherwise, is hereby excluded to the fullest extent permitted by law.

## 11. Term and Termination

11.1 This License Agreement is effective for the period referred to in clause 2.1 or until otherwise terminated in accordance with that clause. The Licensor may terminate this License Agreement immediately by written notice to You if:

- (a) save in respect of a Perpetual License, if You purchase the Software Product directly from the Licensor, You fail to pay any renewal or other fees due by You to the Licensor in respect of this License Agreement;
- (b) You fail to comply with any provisions of this License Agreement;
- (c) You commit a material or persistent breach of this License Agreement which You fail to remedy (if remediable) within 14 days after the service on You of written notice requiring You to do so;
- (d) a petition for a bankruptcy order to be made against You has been presented to the court; or
- (e) where You, as the Corporate Licensee, become insolvent or unable to pay its (the company's) debts, enters into liquidation, whether voluntary or compulsory (other than for reasons of bona fide amalgamation or reconstruction), passes a resolution for its winding-up, has a receiver or Administrator manager, trustee, liquidator or similar officer appointed over the whole or any part of its assets, makes any composition or arrangement with its creditors or takes or suffers any similar action in consequence of its debt, or becomes unable to pay its debts or ceases to trade.

11.2 In the event of termination in accordance with clause 10.1, You must immediately pay to the Licensor any sums due to the Licensor under the License Agreement and (at the Licensor's sole option) You must return, destroy or delete all copies of the Software Product from all storage media in Your control and, in the case of destruction, certify to the Licensor that You have done so.

## 12. Export

12.1 You will comply with all applicable laws, rules, and regulations governing export of goods and information, including the laws of the countries in which the Software Product was created. In particular, You will not export or re-export, directly or indirectly, separately or as a part of a system, the Software Product or other information relating thereto to any country for which an export License or other approval is required, without first obtaining such License or other approval.

## 13. General

13.1 You agree that the Licensor shall have the right, after supplying undertakings as to confidentiality, to audit any computer system on which the Software Product are installed in order to verify compliance with this License Agreement.

13.2 You agree that the Licensor may use Your company name in Licensor's customer lists and other promotional materials describing Your company as a customer or user of Licensor's software or services, as applicable, unless it receives written notice from You objecting to such use.

13.3 This License Agreement, its subject matter or its formation (including non-contractual disputes or claims) shall be governed by and construed in accordance with English law and submitted to the non-exclusive jurisdiction of the English courts.

13.4 This License Agreement constitutes the complete and exclusive statement of the agreement between the Licensor and You with respect to the subject matter of this License and supersedes all proposals, representations, understandings and prior agreements, whether oral or written, and all other communications between the parties relating to that subject matter except for those expressly referred to in this License Agreement.

13.5 Any clause in this License Agreement that is found to be invalid or unenforceable shall be deemed deleted and the remainder of this License Agreement shall not be affected by that deletion.

13.6 Failure or neglect by either party to exercise any of its rights or remedies under this License Agreement will not be construed as a waiver of that party's rights nor in any way affect the validity of the whole or part of this License Agreement nor prejudice that party's right to take subsequent action.

13.7 This License Agreement is personal to You and You may not assign, transfer, sub-contract or otherwise part with this License or any right or obligation under it without the Licensor's prior written consent.

13.8 In certain cases as indicated during installation, the Software Products track and store anonymized usage data so that Licensor can better understand how the Software Products are being used. This includes, but is not limited to, the following technical and statistic data: flow runs, file formats usage, help usage, crash statistics, etc. The information tracked and stored does not contain any identifying information for any of the users beyond a single machine-based identifier that Licensor does not track anywhere else. In addition, the tracking mechanism does not collect any proprietary information, but stores data relating to the usage of the Software or may communicate with computers controlled by Licensor in order to report such collected data.

Where usage data is available to be tracked, there is a prompt during installation to opt out of this data collection and this can be turned on, or off, at any time within the software applications themselves within the standard user settings. Licensor shall not provide any of the information it gathers in connection with this tracking process to any third party, except as may be required by law or legal process.