

DARWIN 4.1 Release Notes

November, 2002
Southwest Research Institute

Enhancements

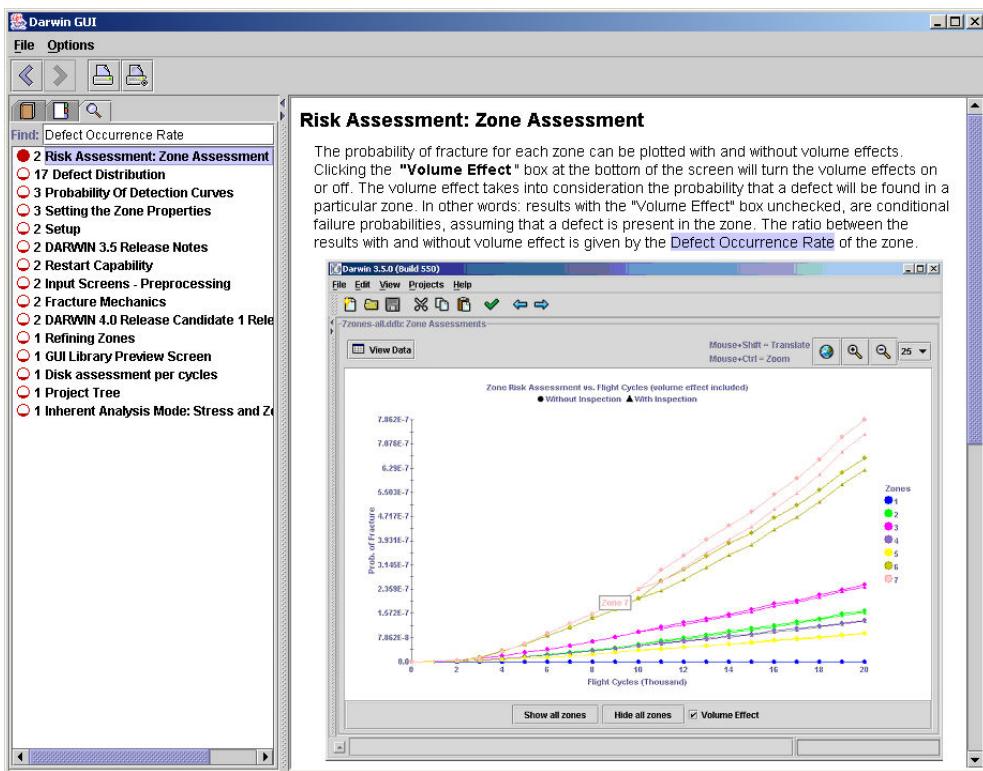
The DARWIN 4.1 release includes several enhancements and new features:

- Electronic Help System
- GUI Capability for Simultaneous Editing of Zone Properties
- Database Converter
- Automated Report Generation
- Importance Sampling Confidence Bounds
- Initial Defect Size for Deterministic Crack Growth
- \$DARWIN environment variable is obsolete for risk assessment code

Electronic Help System

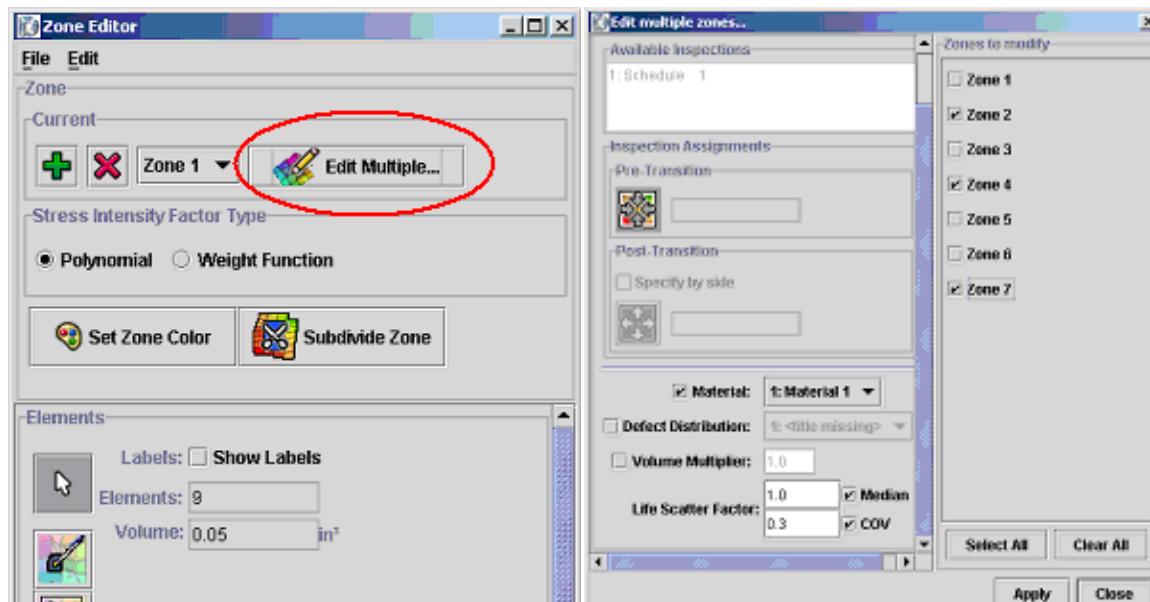
Documentation regarding the use of the DARWIN GUI is now available from within the GUI. The Help System can be accessed by pressing the F1 key at any time. The Help System automatically opens up the appropriate section of the GUI documentation. The Help System has a built-in index as well.

The user can quickly search the entire documentation for a specific word using the **Search Screen**. An example is shown below, where a search is performed for the words "Defect Occurrence Rate". The Help System returns a number of Help screens and orders them according to their relevance.



Capability for Simultaneous Editing of Zone Properties

During zone creation, the user can assign properties (e.g., material, life scatter) to each zone using the GUI zone editor feature. However, previous versions of the GUI did not provide a capability for editing properties of multiple zones (i.e., change life scatter factor of all zones). A new feature was added to the GUI to provide editing of multiple zones (see Figures below).



Multiple zone editor panel

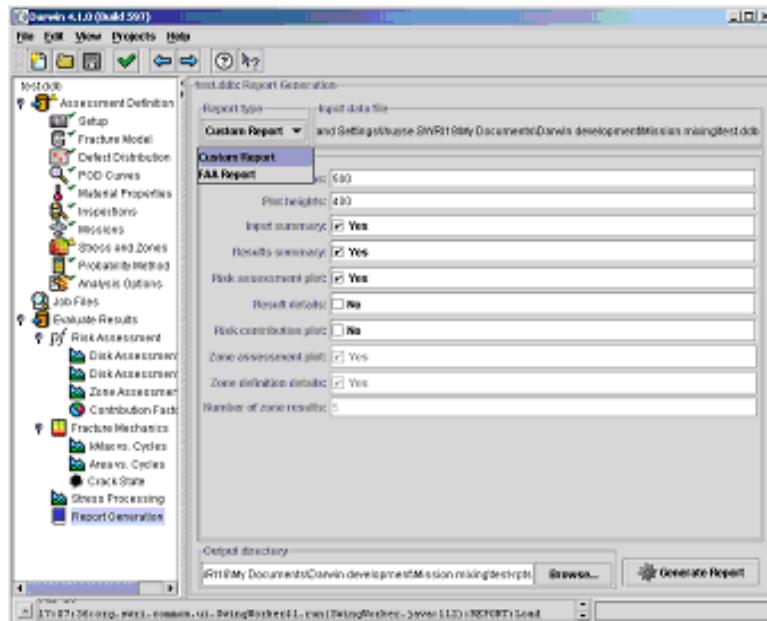
Application of selections to multiple zones

Database converter

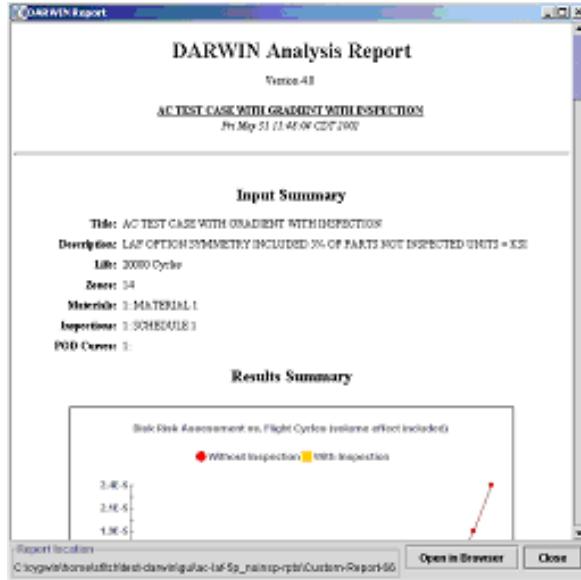
Added a converter to allow the user to view results files (*.ddb) from previous version of DARWIN (i.e., convert version 3.5 or 4.0 results for viewing in the 4.1 GUI).

Automated Report Generation

A draft automatic report generator is included in DARWIN 4.1. Two report formats are available: **Standard Report** and **Analyst Report**. The Standard report format is based on the format provided by the Steering Committee. For the Analyst Report, the user defines the information to be included via a GUI selection screen.

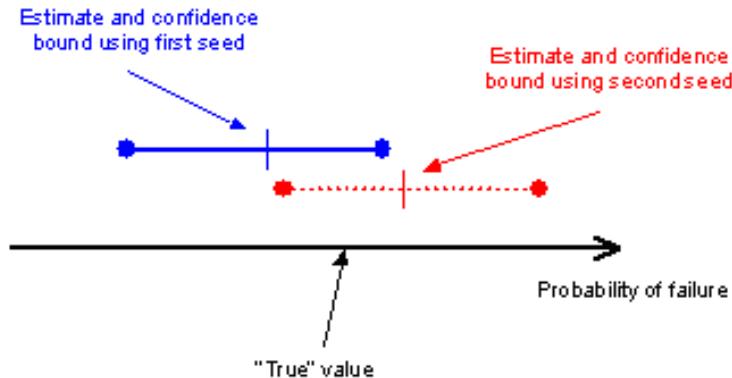


Both reports are created in an HTML format that allows for additional editing if desired by the user. In addition, new plotting parameter features have been added to the GUI to allow the user to specify rotor display properties. An example showing partial report output is shown in the Figure below.



Importance Sampling Confidence Bounds

As shown below, failure probability estimates can vary depending on the initial seed value used in the random number generator. Since a range of values is possible, confidence bounds are often provided to specify a range values in which the “exact” value can be found.

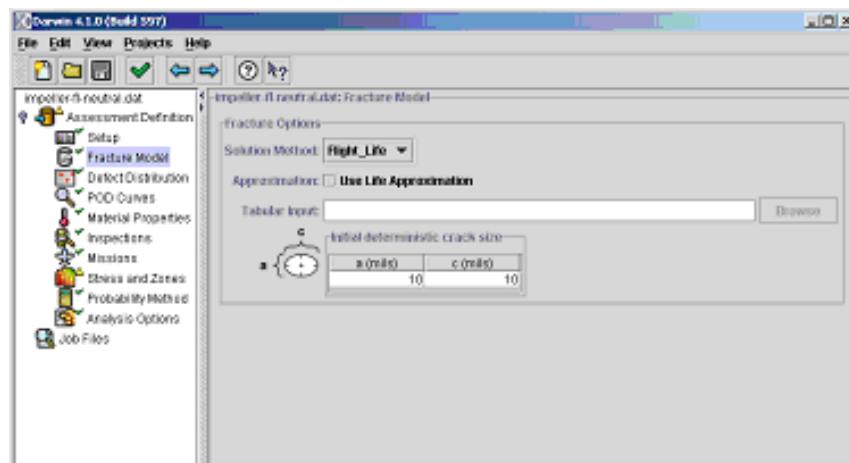


Confidence bounds for Monte Carlo simulation were introduced in the 3.5 release of DARWIN. These bounds are included to estimate the uncertainty or accuracy associated with sampling-based probabilistic methods. In the 4.1 release, confidence interval values were added for the Importance Sampling method. For an identical number of samples, Importance Sampling confidence bounds are narrower than those associated with Monte Carlo simulation, indicating a more accurate solution. Typically Monte Carlo simulation requires 100 times as many samples as Importance Sampling to achieve a comparable accuracy. The confidence bounds are not shown in the GUI plots; they are available in the ASCII *.out DARWIN output file.

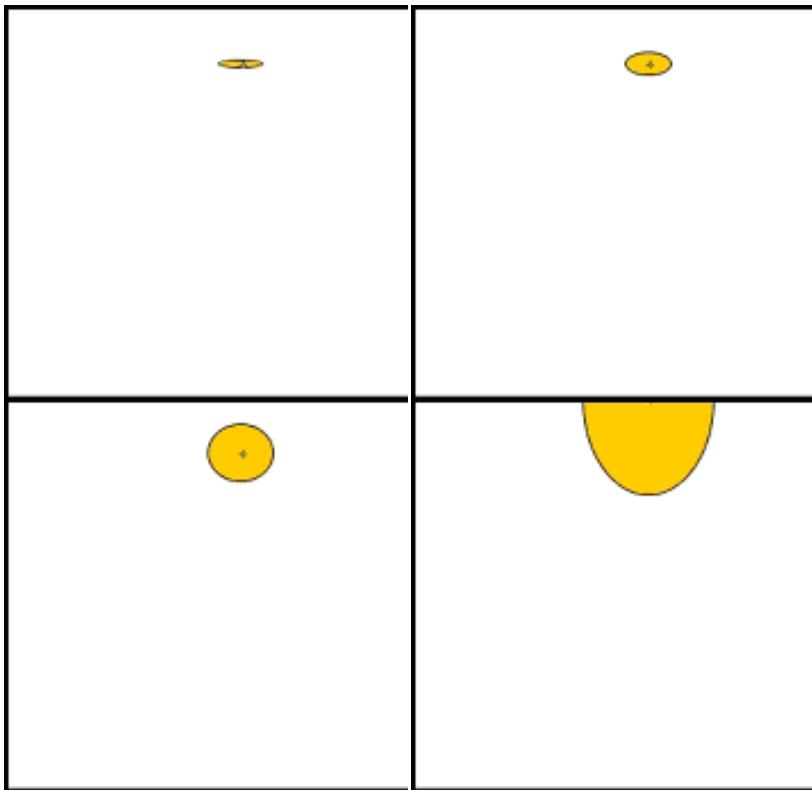
Initial Defect Size for Deterministic Crack Growth

DARWIN 4.1 allows the user to specify the initial crack size and aspect ratio for deterministic crack growth (see Figure below). Currently, only a single size can be specified, which applies to all zones. The default value is a 10 x 10 mil flaw (or metric equivalent). The following limits on the aspect ratio are enforced:

$$\begin{aligned} \text{CC01: } 1\text{E}-3 &\leq a/c \leq 1\text{E}+3 \\ \text{SC02, EC02: } 0 &\leq a/c \leq 2 \\ \text{CC05, SC15: } 0.1 &\leq a/c \leq 2 \end{aligned}$$



With this feature, the user can evaluate deterministic fracture behavior using previously developed GUI visualization techniques. For example, as shown in the frames below, the GUI crack animation feature can be used to visualize deterministic crack growth for user-specified initial crack aspect ratio.



\$DARWIN environment variable is obsolete for risk assessment code

Previous releases of DARWIN included the ANS2NEU translator (which is built upon SIESTA, a code provided by GE) as an integral part of the risk assessment code, requiring the user to specify a \$DARWIN environment variable. The ANS2NEU translator was recently removed from the risk assessment code, so the environment variable is no longer needed to execute it. Note, however, that the environment variable is still needed to execute the stand-alone ANS2NEU program.