

What's New in NASGRO v5.0



NASFLA:

Stress Intensity Factor Crack Cases (also in NASSIF):

- New CC10, corner crack at offset hole in plate, bivariant weight function solution
- New SC18, offset surface (bore) crack at offset hole in plate, univariant weight function solution
- New SS12, standard specimen: eccentrically-loaded single edge crack tension ESE(T); also in NASCCS and NASGLS
- New piecewise linear and Hermite polynomial interpolations are now available (in addition to cubic splines) for the one-dimensional data table crack case, DT01. A capability to plot and compare these interpolations has been added. Also added in NASCCS and NASGLS.
- Checks for cracks exceeding geometric bounds in DT03 have been made more robust to prevent erroneous error messages for some combinations of input parameters.

Temperature-dependent Analysis Features:

- Crack growth analysis can be based on properties at “closest” or “next highest” temperature
- Special logic added to address curve inflections near threshold and instability
- Interpolation now performed on strength properties in addition to da/dN.

New Spectrum Features and Changes:

- The "Define Spectrum" tab was renamed to "Load Blocks."
- A new tab named “Build Schedule” was added immediately following "Load Blocks." The controls for "Assemble Schedule from Distinct Block Cases" previously located on "Define Spectrum" tab (now renamed to "Load Blocks") were moved to this new tab.
- New spectrum editing features were added to the “Load Blocks” tab and can be accessed by clicking on the “Edit Spectrum” button. Spectrum editing features now include clipping, truncation, cycle counting and randomization.
- A spectrum generation features was added and is accessible via the “Tools” menu.
- Spectrum file format "Agusta" has been renamed to "Time-mean-range."
- New spectrum file format: "Blocked S(t1), S(t2), Cycles" is now available (this format is a commonly used format in AFGROW).

Other NASFLA Items:

The choice of a "Non-closure" analysis option was made clearer by introducing GUI option and text in output file.

Warning messages have been added to the GUI to alert users that net-section yield (NSY) calculations are not performed for certain stress intensity factor solutions: CC09, CC10, DT01, DT02, DT03, DT04, PS01, SC02, SC04, SC06, SC10, SC17, SC18, TC11, TC12, TC13. (Note: Testing of v5.0 identified some weight function crack cases for which historical NASGRO NSY algorithms may be inaccurate, and these algorithms have been disabled in the v5.0 release pending a comprehensive review of all NSY algorithms. This effort is currently underway, with revisions scheduled for v5.1).

Material selection method now uses a selection button and dialog window, allowing user to view choices for all material selection lists simultaneously (similar to NASMAT).

A Walker interpolation scheme was added for interpolating between user-supplied tabular crack growth data sets. This scheme permits interpolation to be performed with data at two or more stress ratios. The previous NASGRO interpolation scheme requires data at four or more stress ratios and was retained as an option.

The Constant Closure load interaction algorithm was modified to accurately represent the original constant closure model, correcting a coding error dating back to the original introduction of the Constant Closure model in Version 3.0. The GUI was updated to reflect this corrected formulation. The incorrect algorithm used a closure factor f based on the applied spectrum's controlling overload value, while the corrected algorithm uses a closure factor based on the maximum applied stress of the load cycle being calculated. The erroneous algorithm could in many cases yield faster crack growth since the controlling overload was generally larger than any cycle's maximum applied stress.

NASMAT:

The number of data points that can be placed in a user-supplied new data file was increased from 500 to 1000.

Added buttons "Write all data" and "Write this R val" to the Examine/Edit dialog box. These allow writing da/dN and Delta K data to a file with user-chosen header lines.

Added a "Write Data To File" button to the "Toughness Data" page to allow the user to write a comma delimited file of header data and toughness data.

Replaced the existing digitizer with the Engauge Digitizer providing the ability to read several graphic formats (bmp, gif, jpg, etc). A help file for the digitizer will now be displayed when the "Digitizer Help" button is clicked. Changed the code for loading a digitized file to correspond to the format of the file saved from the Engauge Digitizer.

Appendix Q has been added to the User's Manual to document changes made to curve fits to the NASGRO equation for different materials. The NASGRO v4.0 material property curve fits are taken as the baseline. For materials in which a change has been made to the curve fit, Appendix Q lists the parameters changed, the reason for the change, and provides before/after plots of the $da/dN-\Delta K$ curves for comparison.

Three new materials were added to the database and changes were made to the files that contain material properties and curve fit constants for six materials. Refer to Help/Recent Changes in NASMAT for details.

The help menu to NASMAT now displays Recent Changes.

NASBEM:

A redesigned version of the NASBEM GUI was implemented that provides the user a view of the drawing surface from all pages of the notebook. Numerous cosmetic and labeling changes were made.

Capability to print crack opening displacements is now available. The output format for crack line nodal displacements was revamped to clearly distinguish values when there is more than one crack.

On special holes with applied pin load, traction boundary conditions are now properly derived from pin load magnitude by taking into account the hole diameter.

Error messages for mixed boundary conditions have been corrected.

Corrected drawing of boundary conditions on an arc to show normal and tangential loading instead of x and y loading. BC symbol is shown on the arc.

Modified drawing of segments so that if previously entered points are used, the midpoint is calculated from the existing points and not from the mouse click (whose location might not coincide perfectly with the coordinates of those points). Also the number of places after decimal point is increased for midpoints to prevent false error messages regarding midpoints not being midway.

Corrected procedure for deleting a segment that has boundary conditions.

Replaced the print button for the drawing with a clipboard button that allows the user to put the drawing on the clipboard as a bitmap and paste it into Word, Excel, Paint, etc.