January 29, 2008

v5.2 NASFLA Additions & Changes:

New Stress Intensity Factor Models (also in NASSIF):

- CC11, corner crack at edge of plate, univariant weight function solution
- TC16, through crack in pressurized cylinder (curved panel) with bulging effects

Improvements and Additions to Existing Stress Intensity Factor Models/Features:

- Crack cases CC08, CC11, EC02, SC17, SC18, TC11, TC12, and TC13 now have the following options: residual stress entry, stress input from files, and optimum point spacing (OPS).
- Optimum point spacing for bivariant stress gradient input, residual stress entry and stress input from files was added for CC09, CC10 and SC19.
- Appendix C (Section C-9) was revised to provide additional detail and instructions for bivariant stress gradient input and OPS.
- Ability to plot the thickness variation tabular data for TC15 and a requirement to specify at least four entries in the table. Noted in Appendix C that thickness variation must be smooth and symmetric about centerline of plate.
- Additional transition possibilities for crack cases SC19 and CC11:
  - SC19 now transitions to CC09, TC11, or TC12
  - CC11 now transitions to TC12 (2 possibilities)
- Capability for CC05 and CC09 to transition to a through crack (TC12) when the c-tip reaches the width
- General 1-D compounding option for through crack cases TC01 to TC04 and TC06 to TC10
- Appendix C (Section C-11) was added to provide guidance on using the general 1-D compounding option.
- Added pre-integration routines to speed up several of the univariant weight function cases (TC11, TC12, TC13, TC15, CC08, CC11, SC17 and SC18)
- Added stress echo to output file for CC11.
- Added capability that enables user-defined tabular da/dN data and the Walker equation to be used with 3-dof and 4-dof crack cases (SC17, SC18, SC19, EC02, and BE03). Previously, 3-dof and 4-dof crack cases were only able to be run using the NASGRO equation.

Other NASFLA Items:

- Output is now available for a/c, DKeff, and Klimit
- Net section yield (NSY) calculation capability for crack cases CC11 and TC14
- Tabular net section yield (NSY) input capability for DT01, DT02, and DT03
- Changed transition criterion for SC17:

    - Transition occurs when the ratio of crack length to ligament length = 0.95
    - SC17 to CC09 transition has been replaced by SC17 to CC11 transition
- Enhanced SC19 net section yield (NSY) calculation capability to include symmetric configuration
- Changed stress-intensity-range calculation for crack case SC12 such that if DeltaK (stress intensity range) is larger than Kmax (the maximum stress intensity), DeltaK is set equal to Kmax
- In the da/dt module, the toughness and standard deviation values are now loaded from the material file (in prior versions, conservative toughness values were hard-coded into the GUI, and S.D. was not available). The user now has the option to subtract one or two standard deviations from the toughness value for calculations.
- When checking the "Residual Stress" input box for crack cases CC08, CC09, CC10, EC02, SC17, SC18, SC19, TC11, TC12, and TC13, a message is now printed that the residual stress distribution is not included in the net section stress/net section yield (NSS/NSY) calculations.
- Added new material R3CB18AB1 (MP98T round rod).
- Added GUI limit check of 999,999,999 to number of cycles in manually input load blocks (corresponding to limit in computational core).
- New Appendices added to User's Manual:
    - Appendix U – Rules for use of fracture toughness based on crack case
    - Appendix V – Rules for use of the plastic constraint coefficient (α)
    - Appendix W – Methods for performing sequential or batch analyses

v5.2 NASFLA Fixes:

- Fixed the non-interaction crack-growth computing routines so that correct schedule, block, and cycle counts (for both ordinary and long blocks) were retained when geometry transitions occurred.
- Corrected SIF correction factor calculation (F3) for a family of crack cases: (TC04, CC03, and SC12), and improved code performance. In v5.0 and earlier, the factor was calculated correctly for TC04 and CC03, but incorrectly for SC12 when it transitioned to TC04. In v5.1, calculation of the factor was modified, but abug was introduced due to a typo in the manual. The bug has been fixed completely in v5.2a, and code performance improved.
- Corrected error in fast calculation of threshold (using tables for Newman's crack opening function) for high values of R.
- Modified code in the 3-dof and 4-dof computational engines to enable tip-wise distinctions of variables related to the Cth value option in order to apply the triggering criterion independently, tip from tip, when the "Cth = 0 initially" option is chosen.
- Many fixes were implemented to correct a number of output issues such as column headers and alignment, transition message printing, printout of material IDs, etc. In addition, many minor plotting bugs were resolved.

v5.2 NASMAT Additions & Changes:

- Added new material R3CB18AB1 (MP98T round rod).
- Removed data for R = -0.23 from M7HA11AB01P since these were not constant amplitude data.

v5.2 NASCCS Changes:

The entire NASCCS module has been recast, improved and verified for all crack cases, with improved documentation. Section 3.0 of the User's Manual was completely rewritten. The NASCCS routines now compute critical crack size without the need for the user to enter an initial guess.

v5.2 NASBEM Fixes & Additions:

New and expanded documentation has been developed and provided in Section 7.0 of the User's Manual to describe the data interface and problem entry.

Three NASBEM example problems have been developed and are presented in tutorial form in the new Appendix T.

v5.2 NASFORM Fixes & Changes:

Strain-life tabular data for all four 2000 series aluminum alloys were made accessible to the user.

The following nine materials were removed from the strain-life properties file because their ductility coefficients or exponents are incorrect: two aluminum alloys: 2219-T851 and 7075-T73, two HSLA steels, and five 1080 steels.