

Release Notes for Version 970 / Revision 5434

August 2004

Adaptivity

Added internal energy remapping for 2D adaptivity.

Added an element coarsening option for adaptive solutions. It is controlled by parameters on an optional card 3 of *CONTROL_ADAPTIVE.

Enhanced *CONTROL_ADAPTIVE by adding a parameter, IADPNEL90, to optionally give the number of elements round a 90-degree radius. This is used in conjunction with _FORMING_ type contact and look-ahead adaptivity (ADPENE > 0) to specify when to refine mesh due to pending contact with curved tools. ADPTOL is still used for refinement due to bending deformation.

Fixed a problem related to the use of lumped masses with 2D adaptive remeshing.

Fixed I/O error on unit 28 for jobs using ADPTH<0 on *CONTROL_ADAPTIVE.

Fixed a problem related to implicit rigid body behavior after adaptive remeshing.

Fixed adaptive part failure option.

Fixed an inappropriate error termination when *BOUNDARY_SPC_SET was used with *CONTROL_ADAPTIVE.

Enabled the use of *INCLUDE_STAMP in an adaptive run.

Airbags by Control Volumes

Added a new control volume airbag venting and porosity model.

Enabled control volume airbag venting with blockage to work when the venting option is specified on the fabric material card.

Enabled fabric venting option to be input with fabric material keyword data.

Improved the solution method for nonlinear cv-cp equations to deal with instabilities brought about by negative coefficients on quadratic terms.

Fixed a divide by zero leading to core dumps in airbag jetting subroutine before an airbag is activated.

ALE

Added airbag venting for ALE solutions.

Added output message for ALE venting and blockage.

Added support for ALE elements with material 107.

Added a local coordinate system for ALE_REFERENCE_GROUP type 9 zooming.

Added an ALE convection option to treat problems such as heat transfer between a gas and a deflection plate.

Added an alternative way of defining the gas state after advection mixing to solid element material 148, *MAT_GAS_MIXTURE, to avoid non-physical temperature increases in certain situations of fluid-structure interaction.

Added a temperature dependant gas constant option to solid element material 148, *MAT_GAS_MIXTURE.

Added option 9 for ALE moving mesh

Added Wenyu algorithm for a gas flow velocity calculation for ALE airbags.

Enhanced ALE_REFERENCE_SYSTEM_GROUP type 9 to make the margin between the ALE mesh and the Lagrangian mesh inside adjustable during mesh expansion.

Enhanced ALE_REFERENCE_SYSTEM_GROUP type 9 to add a center node (a node on the Lagrangian structure) for ALE mesh expansion.

Tightened the convergence criteria for ALE nonlinear cv-cp temperature and energy iterations to get better results compared with experiments.

Fixed a divide by zero problem that occurred in the gas mixture mass flow rate calculation if the velocity curve at the orifice became zero.

Fixed ALE wedge and tetrahedral elements.

Fixed switching between ALE and control volume airbags.

Fixed ALE convection heat transfer.

Fixed ALE element subroutines for materials 24 and 124.

Fixed the ALE airbag porosity leakage mass calculation when both a vent hole and fabric porosity are activate at the same time.

Fixed ALE coupling with leakage control 2 and triangular segments.

Fixed divide by zero error and nonlinear cv-cp iteration error for material 148.

Fixed small deck restart when deleting an ALE part.

Fixed ALE airbag porous leakage calculation.

Contact - *Non Segment Based*

Added the option to calculate heat due to contact frictional energy in a thermal solution. This is made active by setting FRCENG=1 on card 4 of *CONTROL_CONTACT

Improved the forming contact when the thickness of shells greatly exceeds the distance across the shell.

Improved behavior of eroding contact.

Fixed *CONTACT_GEBOD to allow contact for more than one dummy.

Fixed AUTOMATIC contact for implicit stress initialization.

Fixed birth times for tied contacts.

Fixed contact to work with tied nodes with failure option.

Fixed *CONTACT_TIED_ type contacts when negative thickness offsets were specified on card 3 for SST or MST.

Fixed bugs in birth time for tied interfaces.

Fixed failure to initialize 2D automatic contact optional card A data if the card is omitted.

Fixed a memory error likely to occur on restart of data using 2D automatic contact with the smp parallel consistency option.

Contact - *Segment Based Only*

Modified segment based contact to improve sliding interface energy

Fixed segment based contact to work with thick shell elements.

Fixed sliding option of segment based contact. Prior to the fix, the option was likely not being used when some contact were used with sliding option and others not.

Fixed possible memory error in segment based contact that could occur when segment based contact is used with other contact types. The sliding option triggered the error.

Fixed possible memory overflow during initialization of segment based contact when a tetrahedral mesh has interior shells which are used for contact

Fixed a possible memory overflow when using segment based contact when very thick shell segments are used (on the order of edge length=thickness/8.)

Fixed segment based contact so the optional thickness on *PART_CONTACT will be used. Before the fix, if the shell thickness was updated (ISTUPD=1 on *CONTROL_SHELL), the current thickness would override the optional thickness.

Fixed friction behavior of segment based contact. Before the change, if the user specified default friction coefficients using parameter on *CONTROL_CONTACT, these values would be used for all segment based contacts, not just those using the *PART_CONTACT parameters.

Fixed error in segment based contact optional edge to edge treatment that could cause unpredictable forces.

Fixed segment based contact problems in Linux version that could cause unstable contact.

Fixed segment based contact so that a time step that increases during automatic rigid-deformable switching will not reduce the contact stiffness

Fixed a segment based contact bug that caused some warped segments to partially penetrate before being resisted by contact forces when the warped segment option was active.

Fixed an uninitialized variable problem in a full deck restart with segment based contact when the contact data was unchanged.

EFG

Added EFG 4-node and 6-node background elements.

Added EFG mix formulation for materials 31 and 77.

Added material 169 for EFG Solid.

Changed default kernel number for mix EFG formulation

Fixed materials 26 and 57 for EFG.

Elements

Added element type 13 to the solid stress initialization option.

Added stress initialization via INITIAL_STRESS_SECTION.

Added strain output for pentahedron element (solid type 15).

Added *PART_STIFFNESS damping to Belytschko-Schwer beam.

Added the incremental update option for the fiber vectors of Belytschko-Wong shells if option IRNXX is set to -2 on CONTROL_SHELL.

Added the resultant stiffness matrix to triangular elements.

Enabled stress initialization with linear solid elements.

Fixed a possible NCFORC file error with tied contacts.

Fixed tapered 2D shell element.

Fixed stress initialization for 2D plain strain shell element type 13.

Fixed stress initialization of shells with Mooney material.

Fixed problems with energy growth in Belytschko-Wong, Belytschko-Leviathan, and the Belytschko-Tsay shells due to warping stiffness and stiffness hourglass control.

Fixed the mass calculation for shell section type 99.

Fixed dynamic relaxation with acoustic elements.

Fixed the pressure in solid element form 15, 2 point pentahedrons, used with an equation of state.

Fixed a spurious damping problem with material 1, *MAT_ELASTIC, when used with type 16 tetrahedral elements.

Fixed problem with mass calculation for 10 node tetrahedral elements.

Implicit

Added implicit support for seatbelt elements and slirings

Added support for material 145 hourglass control type 6 in bricks, enabling material 145 to be used for implicit calculations.

Added geometric stiffness and enhanced drill stiffness to hyperelastic materials used with the Belytschko-Tsay shell element.

Added support for *BOUNDARY_THERMAL_WELD in a coupled implicit mechanical solution.

Added penalty stiffness to penalty tied implicit contact.

Added geometric stiffness for implicit solutions with type 10 shell elements.

Added support for velocity re-initialization after dynamic relaxation by implicit.

Added checking for shared nodes between rigid bodies for implicit to properly handle NASTRAN joints.

Added the ability to compute the eigenvalues of the implicit iteration matrix with dynamic terms included.

Added a check on constrained joints. If nodes are on the same rigid body, the joint is skipped (in implicit) with a warning message.

Added support for equations of state for implicit solutions.

Added the tangent stiffness matrix for implicit calculations to solid element material type 7, *MAT_BLATZ-KO_RUBBER.

Added linear type 6 linear hourglass control option, for both implicit and explicit solutions.

Added laminated shell theory terms to the implicit element stiffness matrix. This option is for shell material types 22, 54, and 55 with LAMSHT=1 on *CONTROL_SHELL.

Added an automatic test for flexible rigid bodies (*PART_MODES) to compare a part's orientation when modes were computed vs. the part's current orientation in the transient simulation, and then transform modes if necessary. A message is written to the d3hsp file indicating whether or not transformation was performed (search for "transform"). This test is for d3eigv and d3mode type modes only, not NASTRAN modes.

Enabled airbags during implicit dynamic relaxation.

Enabled load curves when SIDR=1 on *DEFINE_CURVE and implicit dynamic relaxation IDRFLG=5 is used.

Enhanced treatment of nodal single point constraints applied to rigid bodies for implicit, especially NASTRAN jobs.

Enabled default solver to use all available memory, in case its memory requirement estimate is too conservative and/or it needs to pivot on a nearly singular matrix.

Enabled "redundant" prescribed motion boundary conditions provided the dynamic relaxation flag SIDR on *DEFINE_CURVE makes them unique.

Improved memory messages by referencing total memory, not just that needed for implicit. Also added one-time out-of-core warning and minimum in core messages.

Improved restart with automatic implicit/explicit switching to allow redefinition of the time to switch back to implicit.

Improved the accuracy of implicit solutions using shell element type 16 when elements are distorted.

Improved shell element material model 36 for implicit calculations.

Improved handling and error checking for prescribed motion along a vector direction, combined with SPC constraints perpendicular to the motion vector.

Modified implicit dynamics and implicit eigenvalue computations to include rotary masses.

Eliminated redundant final plot state for normal termination.

Fixed structured input format to allow large node IDs for the arc length method's controlling node

Fixed Belytschko-Wong shell with full projection for implicit calculations.

Fixed the truss element stiffness matrix for implicit solutions which caused slow convergence (*SECTION_BEAM, ELFORM=3)

Fixed solution option 3, implicit/explicit switched by setting the dynamic relaxation flag to 5.

Fixed writing of d3eigv and d3iter data bases for implicit mechanics when using thick shells.

Fixed implicit convergence with material 19 for shell and solid elements.

Fixed velocity initialization of rigid bodies via implicit dynamic relaxation.

Fixed rotational convergence tests in brick-only models that also contain rigid bodies

Fixed the new alternative convergence test (separate displacement and rotation tests) to prevent a divide-by-zero error when the model has no rotational degrees of freedom.

Fixed the beam geometric stiffness, which was incorrect unless the beam axis was parallel to global X-direction.

Fixed load behavior to ignore curves flagged for dynamic relaxation (SIDR=1) during transient analysis phase.

Fixed initial velocities by *INITIAL_VELOCITY_GENERATION after implicit dynamic relaxation when INPHASE was not equal to 1.

Fixed brick element type 18 connectivity output to the d3eigv database.

Fixed the constitutive matrix for material 76 for solid elements.

Fixed the stiffness matrix assembly for *CONTACT_AUTOMATIC_GENERAL_INTERIOR.

Fixed output of d3drif and d3plot files during implicit dynamic relaxation (idrflg=5 on *CONTROL_DYNAMIC_RELAXATION)

Fixed checking of redundant prescribed motion boundary conditions with rigid/deformable switching.

Fixed the initialization of the rotational dynamic motion of rigid bodies when switching between implicit and explicit.

Fixed initialization of rotational velocities and accelerations for rigid bodies after switching from explicit to implicit (dynamic implicit only).

Fixed shell section type 16 with hourglass type 8 and geometric stiffness.

Fixed implicit truss elements so that rotational degrees of freedom are constrained.

Fixed drilling stiffness in type 10 shell for implicit solutions.

Fixed negative eigenvalue problem in implicit Belytschko-Wong shell elements.

Fixed implicit/explicit switching with superelements when the implicit phase is static. Switching with dynamic implicit is still not available.

Fixed implicit solver's treatment of beam release conditions in local coordinate systems.

Fixed the output to the BNDOUT and SPCFORC output files for implicit solutions.

Fixed problem associated with single point constraints on adaptive nodes for implicit solutions.

Fixed implicit dynamics treatment of initial velocity for rigid bodies.

Fixed 2D automatic contact stiffness for implicit calculations. The stiffness will now be much more predictable, but back compatibility of data tuned to address the bug will not be possible. It's likely that the stiffness scale factor will need to be set back to the default value.

Material Models

Added an option to material 123 to have strain rate dependent failure. To use this option, add `_RATE` to the `*MAT` keyword so that a new card 5 will be read. Card 5 has a single parameter in field 1, a curve ID of a curve that defines thinning plastic strain at failure as a function of the rate of plastic strain.

Added filtering to material 123.

Added warning message and automatically switch to solid element type 1 if solid element type 9 is used with any material other than 126.

Added solid element material model 169, `*MAT_ARUP_ADHESIVE`.

Added user failure model to material 103.

Added error termination if material types 161 and 162 are used with element types other than type 1.

Added two parameters for solid element foam material 75.

1) The 5th field of the 2nd line has an optional bulk modulus that will be used to scale contact stiffness, bulk viscosity, and wave speed for the time step calculation. The default bulk modulus is the inputted Young's modulus divided by 3.

2) The 6th field of the 2nd line has a tensile stress flag that selects an optional interpretation of the x-axis of the yield stress curve when an element is in tension. The default interpretation of the curve is yield stress vs. volumetric strain. The optional behavior, flagged by setting the new parameter=1, changes the interpretation to yield stress vs. deviatoric effective strain.

Added a more conservative sound speed calculation for `*MAT_SOFT_TISSUE` for the case where transverse fibers becomes very stiff.

Added an option to initialize material angles if the input supports both a pair of vectors (`AOPT=2`) and a material angle.

Added failure options to `MAT_SOFT_TISSUE` and `MAT_SOFT_TISSUE_VISCO` for shell elements only.

Added three new optional parameters for solid element material 124. The first two are curve ID's input in fields 3 and 4 of card 2 of the `*MAT` data. The curves define scale factors vs. strain rate and are used to scale the two yield stress curves. These new curves will be interpreted as a function of either total strain rate or deviatoric strain rate based on the value of the third new parameter, input in field 5 of card 2. The default value of 0 flags them as total strain and 1 flags them as deviatoric.

Added shell element material model 170, `*MAT_RESULTANT_ANISOTROPIC`

Added visco-elastic stresses to solid element material 124 to model plastic materials.

Added support for materials 98 and 145 with hourglass type 6.

Added shell element material 158, *MAT_VISCOELASTIC_COMPOSITE_FABRIC or *MAT_RATE_SENSITIVE_COMPOSITE_FABRIC. This is a modification of material 58.

Added shell element material 133, Barlat yld2000.

Added new option for shell element material 126.

Enabled material model 181 to be used with shell elements.

Enabled *ELEMENT_SOLID_ORTHO for use with user defined materials.

Enabled material 58 to be used with thick shell elements.

Improved the accuracy and fixed various problems with material 181.

Improved *MAT_SOFT_TISSUE (material 91) for shell elements.

Improved the stability of the hyperelastic shell.

Improved solid element material 124 by using a yield stress table look up that is more robust for noisy data.

Updated material 77 for shell elements.

Updated material 37 for thick shells elements.

Fixed material 22 related to user failure constants that were too big for single precision.

Fixed material type 84 for type 1 solid elements.

Fixed bug in reading the keyword for material 72 with regularization of Hillerborg

Fixed the slope for discrete spring material 4, *MAT_SPRING_NONLINEAR_ELASTIC.

Fixed hourglass control type 6 for solid element material 181.

Fixed section force output with material 129 and solid element formulation 9.

Fixed round-off problem in material type 94 in single precision.

Fixed simplified material model 103.

Fixed orthotropic solid element user defined materials to properly transform the tangent stiffness to the global axes.

Fixed orthotropic user defined materials to properly initialize material angles.

Fixed material 103 for shells when AOPT=0.

Fixed problem with MAT_EROSION not working for 2D solids.

Fixed BLATZ-KO material such that triangular shells are not deleted in the first cycle.

Fixed hyperelastic option for solid element user defined material models.

Fixed material 146 for discrete beam element type 6. Before the fix, coupling between rotational degrees of freedom gave wrong results.

Fixed shell and solid element material 106 to use the qr2 value as input.

Fixed thickness update calculation for shell element material 106.

Fixed Cowper Symonds rate effects for shell element material 106.

Fixed user defined integration rules for shell element types 18-21.

Fixed user defined integration rules for thick shell elements.

Fixed user integration rule input for materials 116 and 118.

Fixed viscoplastic table look-up for material 24 with solid elements.

Fixed the anisotropic behavior for material # 103 and # 104 when used with 2D plane strain elements.

Miscellaneous

Added input checking to catch invalid boundary codes on *BOUNDARY_SPC.

Added new pretensioner types 6 and 7.

Added *BOUNDARY_SPC_NODE and *DEFINE_COORDINATE_option to dynain file.

Added support for dynamic relaxation with velocity boundary condition load curves.

Added new option, *CONSTRAINED_BUTT_WELD.

Added *FORMING_TEMPLATE feature.

Added universal restart capability to both. This allows restart dump files to be written by one system (for example Linux), and the dump files used to restart the problem on any other system (for example AIX, HPUX etc). One limitation is that the number of processors used and the value of NLQ must be

consistent between runs. A command line option (NLQ=n, where n is an integer) has been added so that NLQ can be specified by the user; however NLQ can not be set higher than the maximum allowed value of each system. If the NLQ=n option is not used, NLQ will default to the maximum allowed value. For any run, the value of NLQ used and the maximum allowed NLQ value is reported near the bottom of the d3hsp file.

Added error checking for redundant extra nodes in *CONSTRAINED_EXTRA_NODES.

Enabled rigid bodies with prescribed acceleration.

Enabled more than 9999 load curves to be used.

Enabled restart for mesh-free analysis.

Enabled rigid walls to be used with relative damping option.

Improved coarsening when using *ELEMENT_MASS: it no longer requires that all nodes have mass or do not have mass within a part.

Improved the triangular surface mesher to avoid some poorly formed elements

Improved the precision when computing rigid body accelerations.

Improved the treatment of discrete beam joints.

Fixed problem with massless beam nodes.

Fixed a bug that could cause spot weld failure option 7 to use the default failure values rather than the failure values from the table.

Fixed round-off problem related to restart and setting new termination time.

Fixed a format bug in *DEFINE_TRANSFORMATION.

Fixed the vectors defined by *DEFINE_SD_ORIENTATION when transformed by *DEFINE_TRANSFORMATION

Fixed *COMPONENT_HYBRIDIII flexion-torsion joints. Limits on gamma dependency were incorrect.

Fixed the cylindrical wall for prescribed displacements.

Fixed problem with asymmetry in *CONSTRAINED_INTERPOLATION option.

Fixed full deck restart with one or more hyperelastic parts that are not initialized from the dump file.

Fixed a problem with a load mask and negative pressures.

Fixed accelerometer with INTOPT=1 on *ELEMENT_SEATBELT_ACCELEROMETER when used with initial velocities.

Fixed pretensioner load curves so that it does not need to be extended to a late time.

Fixed delay time for pressure loading on segment.

Fixed the rigid body inertia array to include the rotary nodal mass at superelement attachment nodes.

Fixed the superelement for the case of one degree of freedom for every superelement node.

Fixed superelement to not include forces on rigid body slave nodes.

Fixed units of frequencies (multiplied by 2π) for flexible rigid body analysis.

Fixed the shift strategy for the Lanczos eigensolver.

Fixed restarting with the incompressible flow solver.

Fixed *CONSTRAINED_GENERALIZED_WELD to work if the user failed to include a local coordinate system ID.

Fixed the initial velocity of the 9th and 10th nodes, midside nodes of 10 node tetrahedron elements, when *INITIAL_VELOCITY_GENERATION was used.

Fixed the use of *PART_DELETE for discrete elements during a small deck restart.

Fixed many *INCLUDE_TRANSFORM problems.

Fixed *INCLUDE_TRANSFORM when used with *CROSS_SECTION_PLANE.

Fixed the scaling of curve definitions outside the include file when using *INCLUDE_TRANSFORM

Fixed the *RAIL_TRAIN input to ignore data in fields 3 and 5 of the first line of input.

Fixed small deck restarts with *NODE_SET_GENERAL input.

Fixed beam release conditions.

Fixed the setting of default element types when using *INCLUDE_NASTRAN

Fixed NASTRAN CBAR input of orientation vectors.

Fixed the NASTRAN reader to properly transform coordinates.

Fixed NASTRAN input reader conversion error for PBAR data with nonstructural mass.

Fixed mapping of strains when using *INCLUDE_STAMPED_PART.

Fixed mapping of fully integrated shell element stresses when using *INCLUDE_STAMPED_PART.

Output Databases

Added SECFORC file output for the type 18 brick.

Added the ability to change the output interval of DATABASE_DBFSI on restart.

Added switch time info for d3hsp, messag and screen output.

Added an option to include bulk viscosity energy in the internal energy calculation for shell elements type 2, 10, and 16. To use this option, set TYPE=-2 on *CONTROL_BULK_VISCOSITY.

Added rivet forces from *CONSTRAINED_RIVET to the SWFORC file.

Added LSDA support for new output in SWFORC file.

Added a weld failure parameter to the SWFORC file for solid element welds.

Added OPT =-1 option to spot weld failure. Failure is computed for SWFORC file, but no failure is allowed.

Fixed SECFORC file output with type 15 solid prism elements.

Fixed SECFORC file output for type 10 tetrahedral elements.

Fixed non-zero stress at time=0 in d3plot file when prescribed velocity is applied with a non-zero value at time=0.

Fixed stress output of solid element type 0 to d3plot files.

Fixed double precision dumpbdb file.

Fixed h3out file. Damping and stiffness torques were reversed for the lumbar and lower neck joints.

Fixed the seatbelt element energy calculation for output only.

Fixed the DBFSI database for coupling with fluid on both sides.

Fixed IACCOP option of *CONTROL_OUTPUT to work for rigid body nodes.

Fixed the strain values in the output databases when triangular membrane elements (shell section type 5) were used and the number of thru-thickness integration points was omitted. This condition caused the reported strains values to be doubled.

Fixed beam IDs in SWFORC file data in LSDA database.

Fixed an output problem in d3eigv for 10 node tetrahedral elements.

SPH

Added the elliptic shape for smoothing length in SPH.

Added new formulations for SPH.

Added material 13, *MAT_ISOTROPIC_ELASTIC_FAILURE, for SPH elements.

Improved SPH initialization to speed up the solution.

Optimized neighbor search for elliptical SPH.

Fixed bug on BOUNDARY_SPH_SYMMETRY_PLANE. Lagrangian nodes (of shells or bricks) were constrained by this boundary condition.

Fixed neighbor search for SPH for vector machines

Fixed bug in box activation for SPH particles that occurs on HP.

Fixed SPH when material #9 and equation of state #1 are used together.

Fixed memory allocation and restart errors for SPH.

Spot Welds

Added automatic thinning option for shell element segments tied to solid or beam spot weld elements by types 2, 6, or 7 contact. This option reduces the contact thickness of shell segments in the vicinity of the weld to reduce contact forces that may contribute artificially to weld failure. Thinning is done for single surface contacts that treat the welded parts. If SOFT=2, then thinning is done for both single surface and surface to surface contacts.

Added a true weld thickness parameter to reduce the peak normal stress calculated for failure types 2, -2, 6, and 7 of material type 100 for solid weld elements. During shear loading of a weld, an artificial moment is created because the shear forces are carried through the nodes making the moment arm equal to the weld thickness, and the nodes are at the shell mid-planes. The true stress distribution is not through the shell midplanes but nearer to the welded faces, so the true moment arm is much less.

The artificial moment is balanced by normal forces on the weld which causes an artificially large measured normal stress. The true weld thickness, inputted on *MAT_SPOTWELD, Card 3, field 4, is used eliminate the normal stress contribution from the artificial moment. A small value is most likely most accurate.

Added material 100 solid element weld failure options 6 and 7. Both failure options calculate a stress resultants on the weld cross section. Option 6 uses *DEFINE_SPOTWELD_RUPTURE_STRESS to define the weld strength. Option 7 uses *DEFINE_SPOTWELD_FAILURE_RESULTANTS to define a default weld strength and optional strengths for individual pairs of welded parts.

Added a warning message for material 100 spot weld if yield stress is zero, and reset it to one percent of the young's modulus.

Modified the material 100 solid element failure types 2, -2, 6, and 7 to use a coordinate system that remains normal to the top and bottom weld surfaces. The same coordinate system is now used to evaluate SWFORC output.

Reduced the solid element spot weld time step to improve stability.

Fixed the material 100 solid weld element failure option options 2, -2, 6, and 7. Before the fix, the calculated normal stress term was too high.

Fixed internal energy calculation in spot weld beam. The energy was off by 25% but the results were otherwise correct.

Fixed failure strengths criterion for material 100 beam element spot weld failure.

Fixed problem with spot weld element deletion due to excessive shortening.

Thermal

Fixed restart capability of a coupled thick thermal shell problem.

Improved the accuracy of thermal thick shell elements by changing from a simple average to weighted average for the distribution of work-to-heat to the 12 nodes.

Fixed thermal tetrahedral elements.

This bug fix affects thermal problems that used non-contiguous load curve numbering for *BOUNDARY_TEMPERATURE

Added thermal energy extracted from a fluid to the internal and total energy to conserve the energy in the energy summary to the screen or in GLSTAT file.

Fixed the reading of the *INITIAL_TEMPERATURE keyword.

Adaptivity (MPP Specific)

Fixed crash during first adaptive step caused by incorrect beam output IO.

Fixed adaptive run from a restart file.

Fixed adaptivity with tied interfaces.

Improved the behavior of the ADPENE adaptive option of *CONTROL_ADAPTIVE.

Fixed the writing and mapping of hourglass energy and shell element formulation so that MPP adaptivity will work with stiffness based hourglass control.

Fixed the MPP curvature calculation that is used to do look ahead adaptivity for metal forming problems.

Fixed penetrations that grew during adaptive remeshing when MPP contact was used with initial penetration tracking.

Fixed _TIED contacts for spot welds with coarsening.

ALE (MPP Specific)

Added support for ALE airbag blockage option.

Added support for ALE reference system types 5, 7, and 9.

Added support for van Leer algorithm in ALE advection.

Added error message and termination if ALE coupling flag is not 4 or 6.

Added support for *AIRBAG_ALE. This enables an airbag deployment to be solved with the gas flow calculated in an ALE mesh for some part of the simulation, after which the gas flow calculation is switched off and a HYBRID inflator model used to calculate gas pressure on the bag.

Enabled adjusting of ALE coupling and ALE bucket sort frequencies.

Fixed running restart files with for ALE solutions.

Fixed decomposition plot if ALE elements exist.

Fixed ALE point source gas mixture calculation.

Fixed memory error in the ALE point source routine.

Fixed results along the decomposition boundary for 2nd order advection in ALE.

Fixed a memory error in ALE advection method 2.

Fixed deadlock problems in ALE.

Fixed a restart problem for MPP ALE Optimized MPP ALE airbag calculations for 25% speedup.

Contact - Non Segment Based (MPP Specific)

Added support for superelements with *ELEMENT_DIRECT_MATRIX_INPUT.

Added MPP support for the RCDC failure option of materials 82 and 120.

Added an option that enables the maximum cycles to contact value to be input by the user instead of the default (3rd field of the second optional MPP contact card) for contact types 3,4,5,10,13 and the eroding types.

Added support for the "load curve for bucket sort frequency" field (3rd field of the first optional MPP contact card) for contact types 3,4,5,10,13 and the eroding types.

Added a warning if beam to beam/edge to edge contact is used with friction parameters on the *PART card because it is not supported. friction parameters.

Added option to MPP metal forming contact to automatically delete segments that are problematic. Specifically, if the projected surface used in contact has surface normals pointing in a direction opposite from the original surface (dot product < 0), then that segment is deleted. This basically means extremely thin or poorly formed elements which would cause contact problems.

Added option 960c13 to switch contact to restore 960 contact algorithm.

Improved MPP contact with poorly formed meshes by modifying the nodal normal calculation with contact offsets.

Improved the tracking treatment of nodes as they pass through the segment centerline in MPP contacts type 26 and a13.

Improved *CONTACT_TIED to locate the proper segment to form the tie.

Modified thickness update for MPP contact to take into account PART specific thickness and scaling.

Modified MPP surface to surface contact with eroding to match the smp contact.

Modified the MPP contact types 3/5/10 to match the maximum penetration depth before nodal release described in the manual for the PENMAX parameter on *CONTACT optional card B.

Modified MPP drawbeads to better handle cases where the drawbead extends past the edge of the blank.

Disabled the shooting node logic for the METALFORMING option in MPP contact to match the behavior of the serial version

Fixed MPP contact in double precision

Fixed memory problem for eroding contact types 14 and 16.

Fixed the _MPP card option for beam-to-beam contact that allows the user to adjust the number of segments to track and the bucket sort frequency.

Fixed deadlock during output of d3full file (full deck restart) if one of the CPUs has no contact definition.

Fixed initialization problem with MPP tied interfaces when PART_CONTACT thickness was used.

Fixed friction for beam to beam contact (type 22 and 26).

Fixed some contact problems that use oriented surfaces by correctly orienting disconnected surfaces if they meet at an acute angle. .

Fixed MPP eroding contact to reliably detect contact after erosion occurs.

Fixed a deadlock that would occur during decomposition if force transducer contact (type 25) was used.

Fixed the initial penetration check to avoid picking up the wrong segment and moving the slave node to the wrong position.

Fixed the MPP binary data output database which was corrupted when any *CONTACT_TIED was used for interface linking.

Fixed to prevent possible hang during phase 4 input phase when eroding contact is used.

Contact - *Segment Based Only* (MPP Specific)

Fixed a possible memory error during initialization of segment based airbag contact.

Fixed an MPP error that could occur with segment based contact if segments have a very small area.

Fixed an error that could occur with surface to surface segment based contact when a processor has 0 master segments.

Fixed an inconsistency between smp and mpp segment based contact when solid elements are in contact with other solids.

Fixed a possible memory error in segment based contact initialization when the sliding option or edge to edge contact is used.

Fixed a segment based contact error that could have occurred when the sliding option was active with eroding contact.

Fixed MPP segment based contact to correctly treat very thick segments. Before the fix, the program could hang.

Element (MPP Specific)

Fixed decomposition problem with 10 node tetrahedral elements in the model.

Modified hourglass control for shell section type 8.

Implicit (MPP Specific)

Fixed convergence problem with linear shell type 21 for implicit solutions when the smp parallel consistency option was used.

Fixed kinetic energy calculation when RBE3'S are used.

Fixed RBE3 initialization problem.

Fixed deadlock with RBE3's.

Fixed RBE2 constraint when shared by more than one processor.

Miscellaneous (MPP Specific)

Added error termination if nonlocal property option is used.

Added support for SCALI MPI.

Added support for Madymo 6.1 on IBM.

Added support for initial velocity of rigid bodies.

Added support for *CONSTRAINED_INTERPOLATION.

Added option to do decomposition by part list in the pfile.

Added support of user defined load input.

Added a pfile option "runrsfonly" which suppresses all d3dump writing

Added a command line option "runrsf=N" which will override whatever the user specified in the input, and output N running restart files between time 0 and the endtime. This option can be given on restart, and it will output N evenly spaced between the restart time and the new endtime. .

Added MPP support for *CONSTRAINED_POINTS keyword.

Added support for extra history variables in MPP dynain file.

Improved the accuracy of initial velocities.

Improved the accuracy of cyclic boundary conditions.

Fixed extended Madymo coupling.

Fixed Madymo decomposition.

Fixed a phase III input phase bug that could occur when airbag interaction is used.

Fixed reading of keyword _MPP card.

Fixed the volume fraction value from *INITIAL_VOLUME_FRACTION_GEOM.

Fixed *BOUNDARY_PRESCRIBE_MOTION type 4.

Fixed *CONTRAINED_SHELL_TO_SOLID.

Fixed memory error in deformable to rigid switching.

Fixed the option to do pre-decomposition in MPP on 1 processor, to be used later for a run on many processors and only puts out runrsf files. runrsf files will be output whenever the code would have output d3dump files IN ADDITION TO whenever it would have output runrsf files.

Fixed out of sync problem in Madymo coupling with single surface contact with SOFT=1.

Fixed an instability problem that occurred with some constraint types involving nodes that are shared across processors.

Fixed EFG control card reading.

Fixed bug in MPP implementation of cyclic symmetry in case ndof=6

Fixed a problem of MPP reporting errors (and terminating) when deleting elements on restart and some processors have no elements in some of the delete blocks.

Fixed MPP interface linking of segments, specified by *INTERFACE_LINKING_SEGEMENT.

Fixed MPP interface linking of discrete nodes, specified by *INTERFACE_LINKING_DISCRETE_NODE.

Output (MPP Specific)

Added support for new JNTFORC output for dumpbdb.

Added additional information in ELOUT for materials 58 and 158.

Added joint energy calculations and output to GLSTAT.

Added support for writing out blocked and unblocked areas of airbags to the ABSTAT data in the LSDA database.

Added support for Winfrith crack model output to d3crack.

Modified RCFORC output to match the SMP version for dbout and binout.

Reactivated support of NASBDF and DEFGE0 output and added support of DEFGE0 from I2a ASCII file translation.

Fixed JNTFORC file output.

Fixed ELOUT file data in binout files.

Fixed rigid body velocities output as MATSUM data in the BINOUT file.

Fixed SECFORC file user ids in old style dbout MPP output file.

Fixed output of material area information to ABSTAT file for the hybrid inflator.

Fixed the dbfsi average pressure calculation and coupling area for triangular segments.

SPH (MPP Specific)

Added more options for the SPH.

Improved memory allocation for the MPP SPH.

Fixed SPH input deck problem.

Fixed SPHOUT file.

Fixed SPH for 2D problems.

Fixed bug in SPH neighbor search.

Fixed initialization for SPH.

Fixed d3plot for SPH.

Fixed decomposition plot if SPH elements exist.

Spot Welds (MPP Specific)

Added support for SPOTSTP option on *CONTROL_CONTACT for a spot weld connected to a rigid part.

Added support for "*DEFINE_SPOTWELD_RUPTURE_STRESS".

Fixed decomposition errors with spot welds.

Fixed a deadlock that could occur if spot weld (type 7) contact is used and one or more processors do not participate in contact.