

Features and enhancements included in 971 R3 that were not available in 971 R2:

-New Material Models:

- *MAT_138 (COHESIVE_MIXED_MODE)
- *MAT_153 (DAMAGE_3)
- *MAT_165 (PLASTIC_NONLINEAR_KINEMATIC)
- *MAT_169 (ARUP_ADHESIVE)
- *MAT_171 (STEEL_CONCENTRIC_BRACE)
- *MAT_172 (CONCRETE_EC2)
- *MAT_173 (MOHR_COULOMB)
- *MAT_174 (RC_BEAM)

-Enhanced Material Models:

- *MAT_030 (SHAPE_MEMORY; now for Hughes-Liu beams)
- *MAT_071 (CABLE_DISCRETE_BEAM)
- *MAT_079 (HYSTERETIC_SOIL)
- *MAT_191 (SEISMIC_BEAM)
- *MAT_197 (SEISMIC_ISOLATOR)

-Material orientation by CID number for all orthotropic material models

-Boundary Conditions:

- *BOUNDARY_PRESCRIBED_ORIENTATION_RIGID
 - Input sequence of rigid body rotations about 3 unique axes
- *BOUNDARY_PRESCRIBED_ACCELEROMETER_RIGID
 - Input accelerometer data to drive rigid bodies

-Control Options:

- ESORT=2 in *CONTROL_SHELL to select DKT formulation for all triangles
- IMSCL and DT2MS in *CONTROL_TIMESTEP to invoke selective mass scaling
- LCINT in *CONTROL_SOLUTION to control the rediscrretization of material curves

-Elements:

- PID in *INTEGRATION_BEAM allows mixing of different materials in a beam element
- *ELEMENT_MASS_NODE_SET
 - Distribute a mass over a set of nodes
- *ELEMENT_MASS_PART
 - SET option to distribute non-structural mass over a part set
 - Parameter FINMASS to specify total mass (structural + non-structural mass)
- Solid tet ELFORM 13 implemented for materials 81, 82, 120, 123, 124

-Initial Conditions:

- *INITIAL_STRAIN_SOLID
 - Can now initialize strain in solid elements
- *INITIAL_STRESS_DEPTH
 - Automatically initialize stress in solids (stress assumed linear with depth)

-Loads:

- *LOAD_BLAST_ENHANCED for pressume from multiple and non-spherical charges
 - *DATABASE_BINARY_BLSTFOR to create binary output of blast pressure
- *LOAD_BODY_GENERALIZED
 - SET_NODE option to select node set for body loads and optional local coord system
 - SET_PART option to select part set for body loads and optional local coord system

-Output:

- jntforc now includes energy for each penalty-based joint
- sleout now includes frictional energy for each contact
- eigout now includes participation factors for each mode in an eigenvalue analysis

-General:

Staged Construction

- Breaks building construction process, including excavation, into stages.

Particle method for modelling inflation of airbags

*PART_DUPLICATE to automatically duplicate and transform parts

Tolerable inertia limits for rigid bodies are extended when using a double precision executable

The remainder of this file describes (sometimes quite cryptically) many other enhancements, additions, and bug fixes made since the release of LS-DYNA version 971 R2, rev. 7600.1224. These items are listed chronologically with the most recent items listed first:

Fix some MPP problems in the intfor database.

Fix MPP automatic tiebreak contact to avoid causing memory clobber and segfault.

Fix MPP contact types 3/5/10 that caused some nodes in contact with solid elements to be missed.

Fixed *MAT_034 output error that caused a crash on SGI IRIX systems.

Force orientation of MPP contact interfaces that include solid elements to the orientation implied by those solid elements.

Fix bug #541 associated with a double precision array overrunning boundaries in *BOUNDARY_PRESCRIBED_ACCELEROMETER.

Fixed the effective strain rate calc in spot weld assemblies that use Daimlerchrysler failure.

Update *MAT_115 shell subroutine to fix single precision bug.

Fix uninitialized variable that broke most MPP implicit tied contacts.

Properly set implicit drilling rotation control for tetra 4 elements.

Fix for bug 904 related to lack of convergence for tet type 4.

Fixes for Bug 860 where ELEMENT_INERTIA is ignored by *CONSTRAINED_INTERPOLATION.

Fixed thick shell output with CMPFLG=1 on *DATABASE_EXTENT_BINARY. Also, fixed *MAT_002 with thick shell element type 3.

Fixed stress output for type 1 thick shell elements in d3plot and elout files.

Bug fixed in semi-Lagrangian kernel in stabilized EFG.

Fix MPP support for interface_force file reading, when segment linking is used and there are more than 1 segment interfaces.

Fix for machine dependency problem in 3D EFG adaptivity.

Fixed errors in Genoa keyword reader.

Fixed bug in generated keyword file for *INCLUDE_TRANSFORM when Genoa material is used.

Bug fixed in axisymmetric EFG - replace the generalized disp by nodal value.

Fix extra file created by tracer particle for SPH

Fix 3D EFG adaptivity for *MAT_024.

Fixed shell elements with user integration that mix materials. Before the fix, if materials had non-zero history data such as *MAT_002, the result was likely bad.

Added an error check for mix materials with laminated shell theory with other material types.

Fixed laminated shell theory when for elements with mixed material models of the same type.

Made this version compatible with new Genoa library.

Fixed bug #1008 for dbsensor - memory of sensor location has been reused by ALE sorting routine -- MPP only

Bug fixed in one default setting relating to new EFG formulation.

Fix for bug #942 related to *PART_COMPOSITE and *RIGIDWALL_PLANAR.

Fix several bugs with 3D EFG adaptivity due to new implementation.

Zero out temporary array. This fixes bug #837.

A small Fix to avoid an error for *MAT_135 for alpha and sgi platforms

Fix for bug #965 -- MPP only

Fix Bug #988. Angle shift variable was being converted to a load curve in *BOUNDARY_PRESCRIBED_ORIENTATION_RIGID_ANGLES.

BINOUT support for energy in LSDA based jntforc file.

Fix for *MAT_020 input issue.

Bypass soft=4 contact option in MPP. Any such contacts are switched to soft=1, and a warning issued.

Add gen { lstc_reduce } to pfile and keyword *CONTROL_MPP_IO_LSTC_REDUCE to use special REDUCE function in LSTC source to get consistent summation across processors -- MPP only

Fix for *MAT_108 related to bug #996. The orthotropic transformations were missing.

Retain more digits for birth and death times of *BOUNDARY_PRESCRIBED_MOTION_RIGID to avoid truncation error.

Added an error check for spot weld material that is used by both individual hex spot welds and also hex weld assemblies. The individual welds are not checked for failure if the material is shared.

Fix bug #6 (problem with MPP automatic tiebreak option 6)

Fix for local coordinate systems with large ID's in *MAT_020.

Fix for bug #850.

Fix for spring type 119 which showed too much mass scaling, bug #939.

Added spot weld failure to thermal.

Bug fixed in MAXENT to allow semi-Lagrangian kernel to be activated.

Bug fix in ale tracer.

Make 3D EFG adaptivity work for hex elements at the start.

Reset stress initialization for when implicit rejects a time step.

Fixed the inconsistency of analysis time for LS-DYNA and madymo.

Revision to *MAT_106 to select properties based on ending time of implicit step.

Fix bug in staged construction - could prevent dynain file being written for final stage.

Fix an MPP full deck restart problem that only occurs if the new and previous models had a different number of rigid shell elements.

Bring the element information to the stiffness construction in user material.

Print decomposition file and # of processors info to the screen, d3hsp, and message files when MPP execution starts.

Disable shape function reconstruction for 8 nodes solid in EFG adaptivity.

Fix for tangent stiffness (implicit) of cohesive *MAT_138 and *MAT_186. Implicit had to get activated for mat 186 in the first place.

Fixed 3 new items related to *CONTROL_DEBUG output for spot welds that use *MAT_100_DA. The first item is to add the output for weld assemblies.

The second is to output parts ID's instead of zeros when default connection data is used. The third is to output strength values without scaling by the strain rate curves.

Bug fixed related to IEBT=4 in stabilized EFG.

Fix an undefined variable in ale edge coupling.

Enable new damage type DG_TYP=3 also for hex weld assemblies.

Offer the same output of 'contact gap' (intfor file) for automatic tiebreak options 10 and 11 as already available for option 8.

Bug fix for *INITIAL_STRESS_SOLID with elform 11.

MPP support for EFG solid element new feature (MAXENT).

Major bug fix for elform 11 advection that should help with stability.

Fix for Gurson *MAT_120. With initial stresses from dynain several elements failed at t=0 due to a bad starting value for the plasticity algorithm. Now, a better starting value is used for this case.

Fix for *MAT_100_da with spotweld assemblies. The "no failure" option (negative con_id) was not working before.

Added the IFLAG option in *CONSTRAINED_EXTRA_NODES to the source code.

Fix for *MAT_120 for nodal pressure tet (elform 13).

Bug fixed in restart adaptive EFG. Added global control in Semi-Lagrangian kernel for stabilized EFG (8-noded cell).

Added tied penalty contact support to MPP implicit.

Bug fix for initial stresses in solid elements: Element sorting to tets and pentas was not supported. Pentas were not supported at all. Writing of binary dynain was also broken.

Bug fixes for warped element type 11

Bug fix for *MAT_WINFRITH_REINFORCEMENT + *INCLUDE_TRANSFORM.

Fix treatment of scaling factor for prescribed motion on rigid bodies with option 4 and 8.

GM filter data alignment problem on HP UX -- MPP only.

Modified *MAT_106 to optionally use the total alpha for computing incremental thermal strains instead of the instantaneous alpha. Required for implicit.

Fix to *MAT_106 due to initialization problem when restarting with a dynain file.

Fixed memory expansion bug related to shell seatbelts.

Added stabilization terms in EFG MAXENT approximation in 8-noded cells.

Fixed bug in *PARAMETER if more than one definitions are specified.

Added damage type DG_TYP=3 to *DEFINE_CONNECTION_PROPERTIES.

Add support for *TERMINATION_NODE and *TERMINATION_BODY -- MPP only

Fix bug for modal superposition using existing d3eigv.

Fix bug in dummy argument for *INITIAL_VELOCITY_GENERATION bug with SPH elements.

Fixed bug that caused the wrong beam stresses to be written to dynain file (*INITIAL_STRESS_BEAM).

Load curve input added to Gurson material *MAT_120_JC (card 5, row 8). This load curve optionally replaces expression with D1, D2, and D3 (see manual).

Rotational mass bug fixed for shell 24.

Fix bug #219 for forces exchanging for shell type 25 and 26 -- MPP only.

Set all other components to zero in the blstfor buffer array.

Treat enhanced blast loading as an unsupported feature - MPP only.

Fixed an MPP bug in obsolete DEPTH=4 segment based airbag contact option.

MPP fix for auto tiebreak type 9 and 11, extra damping parameters added about 5 months ago.

Fixed bug #887 for wrong node id number

Fix SPC force reporting error for implicit when mass scaling is active.

Add warning that implicit does not support *CONTACT_ENTITY.

Bug fix for intfor file -- MPP only.

Added dynain output for SPF. Fixed a bug in SPF with adaptivity.

Add new input processing capability for superelements.

Bug fix for ale edge coupling.

Bug fixed for MPP EFG shell type 41

Fixed RATE option of *MAT_123.

Fixed restart bug if tiebreak is used.

Implement *INITIAL_VELOCITY_GENERATION for SPH elements defined by part or set part.

Small modifications for *MAT_187 parameters.

Bug fix for single edge contact -- MPP only.

Fix for *MAT_123 to solve element deletion problem.

Bug fix for d3hsp output of *MAT_083 parameters HU and SHAPE.

Remove the limitation on number of geometries ≤ 100 in *INITIAL_VOLUME_FRACTION_GEOMETRY.

Fix of uninitialized variable related to bolt stress initialization.

Fixed output of *MAT_221 to d3hsp.

Fixed bug in *INITIAL_STRESS_BEAM - did not work if beam has 2 x 2 integration points

Preserved the case for *KEYWORD_ID.

Support more than 10 AMMGs in ALE

Added *MAT_221.

Add echo to d3hsp of control data for pore fluid and staged construction

MPP support for soft=1/implicit time step fixes.

Fix for soft=1 option for implicit use. Use element time step calculation for dt2 rather than the input value from the user which can create big problems.

Check for redundant tied constraints (implicit).

Fixed bug in writing d3part (MPP only)

Fix for ALE mass scaling.

Add option STRESS=-3 for *INCLUDE_STAMPED_PART_BINARY, which activates long format for history variables and NO mapping of stresses.

Fixed a problem with large forces in segment based contact caused by tied contacts moving nodes in the first cycle.

MPP support for eroding/failing cohesive elements

Fix for calculating new velocities and temperature after advection for ALE single material with void.

Fix for wrong results with type 3 solid and ncpu=-number.

Fix for cohesive element deletion to correctly handle both tied and merged cohesive nodal points.

New `_VECTOR` option for prescribed orientation.

Add decomp option

`*CONTROL_MPP_DECOMPOSITION_ELCOST`

2

or, in pfile,

`decomp { elcost 1 }`

option : 1 fjevpp, sun

2 ia 64, AMD

3 Intel xeon 64, xeon 32

4 other

element costs for decomposition calculation. Users should be able to use different platforms for pre-decomposition to get consistent decomp -- MPP only.

Removed `*TRANSLATE` keyword.

Fixed bug #633 restart problem.

Added option to `*CONTROL_ACCURACY`. If `INN=-2` triangular elements do not use the invariant system.

Fix for shells with offsets. Not all options worked correctly and this is now fixed (bug #836).

Bug fix for Madymo coupling - MPP only

Bug fix for d3part output -- MPP only

Increased minimum number of history variables from 11 to 14 for `*MAT_187`.

Fix energy calculation with more than one processor (bug #847) -- MPP only.

Fixed a segmentation fault problem with binary interface force output of force-transducer contact.

Fixed 2-surface force transducers with MPP segment-based contact. It was possible for a job to hang.

Allow more than one `presc_motion_rigid` to be applied to the same rigid material if at least one of them is initially turned off by sensors

Fixes bug #724: MPP smooth contact was not offsetting the control points for some non-forming contacts.

Fix for `*PART_DUPLICATE` line with commas.

Fix for `TITLE` option for `*MAT_ADD_EROSION` and `*MAT_ADD_THERMAL`. Bug #739.

Fix for rigid wall ID in the Binout files. Bug #828.

Transform stresses for solid elements after switching from rigid to deformable. Bug #707.

Time step calculation problem with solid element type 12 and `*MAT_106`.

Discrepancy in tying criteria between SMP and MPP is resolved by these updates. Related to bugs #404 and #770.

Fix adaptivity problem related to two-pass option. Bug #751.

Fix GLSTAT system damping energy calculation -- MPP only.

Fixed a bug in type 20 triangles for buckling analysis.

Fix for MPP implicit contact/stiffness scale factor for nodes not in contact and for solid elements. Avoids divide by 0. This fixes bug #589.

Included 4-noded integration cell in MAXENT approximation for EFG 3D.

If any PARAMETER definition is duplicated, we will issue an error message and terminate the code after input phase. Fixed bug #786.

Included 6-noded integration cell in MAXENT approximation for EFG 3D.

Enhance MPP beam-to-beam contact to agree with SMP results -- MPP only.

Fix for ESORT=2 problem when mixed with 1 point elements.

Added MPP code so that solid weld elements will be deleted if any of their nodes are attached to a shell that erodes. This matches the SMP behavior. This was bug #506.

Bug fix for parallel consistency with shells 25+26

Considered the diffusive term in the MAXENT approximation for 3D EFG.

MPP support for node mass info output to d3plot. This fixes bug #518.

Fix bug for explosive materials with SPH. Elements with *MAT_HIGH_EXPLOSIVE_BURN were not detonating.

Change pressure calculation in *MAT_084 to incremental. This fixes a bug that caused pressure jumps when the algorithm switched between crack-open and crack-closed modes. Results from existing models are likely to change.

Fix principal stress direction calculation in *MAT_173.

Fix for bug #799.

Output first state of spcforc at t=0 rather than t=dt.

Fix to change solid element type 18 to type 1 for explicit calculations. Type 18 is for linear static problems only. Bug #775.

Fix for timestep calculation for tet 17 + correct connectivity output for tet 17 in the dynain file. Bug #477.

Fix to write all integration points to the elout file for 2D elements.

Fixed bug in *MAT_024 viscoplastic, $vp=1.0$, for solid element related to bug #613.

Fix for problem with HCONV when defined by a load curve ID. Bug #676.

Fix for rigid body motion with lagrange multipliers. Bug #644.

Fix to terminate calculation if *ELEMENT_MASS_PART is used to add mass to solids or beams. Also, minor change to avoid including added mass distribution specified on the *SECTION_SHELL in the determination of the rotational mass at the nodal points. Bug #674.

Fix to prevent segmentation fault if *SECTION_SOLID has ELFORM=11 which is unused. Bug #634.

Implement *CONSTRAINED_SHELL_TO_SOLID -- MPP only.

Fix for GM filter to take care of memory clobber. Bug #616.

Fixed bug in *CONTACT_TIEBREAK_SURFACE_TO_SURFACE with failure values set incorrectly. Bug #533.

Fix for hot stamping problem related to Bug #574.

Fix for segmentation fault when writing the AVSFLT file. Bug #504.

Fix for SPH problem during contact initialization. Bug #520.

Fixed confusing output problem in d3hsp when CON2 in *MAT_020 is set to 011111. Also, illegal values of CMO are not detected in the input. Error termination will now occur.

Fix for Puso hourglass control with a negative coefficient. Internally the negative coefficient caused Puso control to get confused with Lee Bindeman's type 7 which quickly caused the problem to go unstable. Bug #549.

Fix for *DEFINE_COORDINATE_..._TITLE when used with *INCLUDE_TRANSFORM. The title was lost causing major problem when using the dyna.inc file.

Fix for *INITIAL_STRAIN_SHELL which now works even if there is no *INITIAL_STRESS_SHELL input. Bug #742.

Fix printout for *MAT_018. Bug #801 coefficient "n" is printed as "m".

Fix for bug #685 related to FIR, *MAT_143. Core dump occurs rather than clean error termination.

Fix for bug #677 where interface forces are zero for the slave segments.

Fixed minor bug related to improper input into *MAT_036 which caused error termination.

Add *MAT_169, *MAT_173, *MAT_198 to wedge element (ELFORM 15) - without this, the automatic sorting would not work with these materials.

Add MPP support for intfor file larger than 4GB.

Fix seamless springback processing for removed parts.

Fix processing of intermittent eigenvalue controls for MPP.

Minor fix for accelerations in NODOUT whenever global damping is active.

Fix for *MAT_002 with unreasonable large stress output for small strain values.

Correct left C-G tensor update in *MAT_112.

Bugfix in RCDC option of *MAT_082.

Fix for segmentation fault when NPLANE=4 with shell elements types 1 and 6.

If a segment fails which is attached to 1 node of a spotweld brick then delete the brick.

Support type 26 beam contact force transducer -- MPP only.

Resolve *MAT_ACOUSTIC, *boundary_part_acoustic discrepancies with two-sided coupling.

Support correct reading and writing initial stresses for element type 3.

Fix bug in *MAT_ARUP_ADHESIVE - for XEDGE=0, element failure could lead to a memory corruption with unpredictable consequences.

Add *MAT_084 for wedges (elform 15) and add missing calls to rstrss for tet elements (elform=10) for *MAT_084.

Fix for 2D adaptive remeshing to include initialization of 2D beam elements. Also fixed problem related to 2D rigid bodies sharing nodes with deformable bodies that are remeshed.

Fixed bug in Belytschko-Schwer beam related to offset vectors not being accounted for in the calculation of the beam fiber vectors. This caused large forces to develop with no applied loads.

*DAMPING_FREQUENCY_RANGE energy now included in System Damping Energy in GLSTAT file. Previously, the energy was counted as negative external work - this is no longer the case.

Fix bug in *LOAD_THERMAL_VARIABLE if >99999 load curves.

Fix a load curve check for *BOUNDARY_PRESCRIBED_ORIENTATION_RIGID_DIRCOS. Add load curve check (consistent number of points) for _ANGLES and _EULERP.

Support runrsf NR option -- MPP only

Bug fix for *LOAD_BEAM_ELEMENT idtrans translation -- MPP only.

Fix sign error in evaluation of *DEFINE_FUNCTION_TABULATED.

Enable type 3 and 17 triangle shells for *MAT_058.

Fixed collapsed type 6 and 7 shell elements that are sorted to type 4 triangles for use with anisotropic materials. The stress was wrong if angles per layer was used.

Small modification in *MAT_169: With new input parameter THKDIR (card 2, column 7), the determination of thru-thickness direction can be changed. THKDIR=0.0: smallest element dimension (default), THKDIR=1.0: direction face 1-2-3-4 to 5-6-7-8.

Fixed shell element types 6 and 7 when used with anisotropic material. The angle cosines and sines were not being initialized correctly. Also, fixed the output of stress and strain in shell elements that use different material models in different layers using either *INTEGRATION_SHELL or *PART_COMPOSITE.

Fix bug that may cause error in reading of integration point dat for user defined element.

Fixed the OPTT option on *PART_CONTACT for segment based contact. It was using the input value as the added thickness rather than half of it.

Fix related to shell element sorting and bulk viscosity. Bulk viscosity was not considered, but now is.

A bug fix in *AMBIENT_HYDROSTATIC_ALE.

For the uppermost AMMG there is no need to determine mixed element or not.

A bug in *INITIAL_HYDROSTATIC_ALE. e0 in *EOS was calculated wrong.

Fix problem related to *SET_NODE_GENERAL whenever the part ID is an SPH part.

Normalized the distance function in MAXENT for EFG. This is to reduce the conditioning number in Hessain matrix.

Fix ncforc output in LSDA/binout file for interfaces with IDs of more than 5 digits.

Fix for beam elements whose internal energy is not kept as eroded internal energy when the beam fails.

Slight modifications to prevent a nonzero pressure state in the reference configuration for parts with equation of state.

Fix bug for SPH elements during initialization of eos type
*EOS_IGNITION_AND_GROWTH_OF_REACTION_IN_HE and
*EOS_PROPELLANT_DEFLAGRATION.

Added a modified maximum entropy approximation for 3D EFG.

Fix roundoff problem in *BOUNDARY_PRESCRIBED_MOTION_RIGID.

Bug fixed in EFG MPP (3D).

Two minor fixes in d3hsp output of joint stiffnesses.

Fix bug in pore pressure output - on MPP systems the keyword *DATABASE_PWP_OUTPUT could cause LS-DYNA to hang with certain large models.

Fix bug that could lead to thermal material data being missed during Keyword input. This occurred occasionally in large mmodels, that contained lots of other data before the thermal material data.

Small mod to sliping convergence: if the user input 0.0 for the material "birth size" (min element size), then the code would not converge for slipings, because this value was used when computing the initial guess. Now if they input 0.0, a small fraction of the element size is used.

Change MPP handling of *CONSTRAINED_JOINT_TRACTION_TRANSLATIONAL, which was not working correctly.

Fix MPP problem converting set ID information for velocity boundary conditions, which made it impossible to turn them on/off via SENSORS

Change to keyword processing of solid/beam/shell/thickshell element labels/ids related to time history blocks: previously they were all written together in the structured file. This caused the d3hsp file to be wrong (all were identified as being SOLID elements), as well as the legends being written to the wrong places in the binout file.

Fixed a typo in *ELEMENT_SUPER, *CONTROL_SOLID and *CONSTRAINED_ADAPTIVITY.

Fixed bug in restart job if deleted element set is specified.

Fixed bug for adaptivity and *DATABASE_BINARY_D3PART.

Fixed timestep calculation for *MAT_089. Previously the material could go unstable if the elastic modulus increased or if the elements gained volume during elastic stretching.

Fixed a single precision bug in EFG solid 41.

Bug fix for MPP using *DEFINE_FUNCTION with BEAM() function -- MPP only.

Fix read problem in *MAT_135 to ensure that is consistent with the new 971 manual.

Fix to stop auto sorting of degenerate solids for *MAT_100, *MAT_126.

Fix bug if *CONTROL_ACCURACY 2nd order stress update is on and fully integrated solid elements are used with EOS.

If implicit controls are present in the structured input deck but no implicit analysis is to be performed set mthsol = 0 so that explicit element computations are not compromised by sloppy user input.

Fix for 3D EFG adaptivity with using TDEATH in adaptive control.

Bug fixed for smooth contact output information.

Fixes for MPP contact in implicit.

Fix for *MAT_017 to correct the stress reduction after failure.

Add MPP/idtrans support for *INITIAL_LOAD_AXIAL_BEAM.

Fix for zero length discrete beams with SCOR set to 2.

Modification for parameter usage of automatic tiebreak contact (dycoss9). If CT2CN and CN are > 0, then normal stiffness CN and tangential stiffness $CT=CN*CT2CN$ are used, otherwise penalty stiffness is used.

Fixed segment based eroding contact when used with an ALE solution. The contact either crashed or failed to detect some contact after erosion.

Added new option to initialize bolt stress: *INITIAL_AXIAL_FORCE_BEAM.

Add missing initialization that caused problems in adaptive problems.

Fix for *SET_NODE_ADD_ADVANCED where memory is clobbered if all node sets are defined with the advanced option.

Fix for *MAT_123 for solid elements.

Fix implicit's treatment of interface linking and a further enhancement to the shell-to-solid interface treatment.

Fix for flexible rigid body with only solid elements.

Avoid deadlock for nodouthsf -- MPP only.

Bug fix for multiple eroding coupling defined in model -- MPP only.

Fix bug when multiple symmetry planes with SPH were used.

Fix for LSDA matsum output: the material numbers were mixed up.

Fix time step drop for ALE problem -- MPP only.

MPP fix for incorrect mass reported in rcforc file.

Transform user-defined local coordinate system (LCO.ne.0) for rigid bodies reoriented during vehicle kinematics initialization.

Set default generalized coordinates for GEBOD dummies in the event that the positioning file is absent.

Remove defunct instantaneous axis method originally used for prescribing orientation.
Eliminate all related fval load curve evaluations.

Fixed hex spotweld assembly output to swforc.

Add solid element connectivity array to loadud.

Modifications to ENHANCED_BLAST Option #3. Use *DEFINE_VECTOR to establish warhead axis. Eliminate Mach number as input.

Restrict unit system to IUNIT=3 for enhanced blast model type=3.

Fix for new option in airbag linear fluid.

Add effective plastic strain failure to *MAT_106 shells.

Bug fix for full deck restart -- MPP only.

Fix for bug #576 related to SECFORC file and null beams.

Bug fix for rb-velocity output to d3plot, matsum, glstat -- MPP only.

Fix computation of separation distance for tied contact after an adaptive step. Fixes Bug #585.

Fix memory problem while using ALE coupling Ctype=5 -- MPP only.

Fix bug in SPH initialization of material data.

Fix bug in MPP treatment of DEFINE_CURVE_FUNCTION.

Fix for *MAT_172 (CONCRETE_EC2) beams - FRACA was treated as 1.0 if set to any non-zero value.

Fix for round-off error related to deformation gradient calculations for *MAT_057 foam.

Added *MAT_236 based on Boeing user material for silicon carbide coating on reinforced carbon carbon composite.

Fix flexible rigid body containing nodal rigid bodies in MPP run.

Fixed *MAT_021 and *MAT_023 thermal strain so that good for large strain.

MPP fix for rbdout output of rigid bodies that are shared among processors.

Allow part set to be specified for *control_timestep erode.

Add 3 damping coefficients for dycoss 9 and enable VDC.

Fixes to triangular thick shell contact.

Fixed a bug that could cause MPP segment based contact to hang if both single surface and surface eroding contact were used in the same model.

Add fix for implicit MPP with superelements and inertia relief.

Some MPP single surface contact improvements.

Fix MPP non-single surface contact behavior when viscous damping is given as a negative value.

Fixed a bug in EFG shell 42 single precision.

Added two options in implicit 2D EFG.

1. 2nd order basis function.
2. Higher-order integration rule.

Minor bug fix for shell element failure in *MAT_120. Resurrection of failed IP was possible in very special cases.

Small modification of *MAT_138: more conservative "ek" (stiffness/area) for time step calculation.

Revision 2 of fix for Implicit's treatment of shell-to-solid interface.

Add new decomp option based on airbag reference geometry instead of folded geometry. It gives better load balancing while the bag is fully deployed.

Modified cohesive *MAT_138 to be more robust. Only one damage variable instead of two is used.

The input is backwards compatible, i.e. old input files run.

Fixed thick shell type 2 strain output.

Added some useful output for LPRINT .ge. 1 (implicit only).

Fixed output of *DEFINE_CONNECTION properties to message file to output parts instead of material ID's.

Added pressure limit to airbag LINEAR_FLUID option.

Recoded thick shell output to elout d3plot d3part, d3thdt and d3hsp. Due to missing info, the CMPFLG=1 output is not available for *MAT_002 or *MAT_086 or for any material with thick shell type 3.

Fix interplay between implicit and explicit when inertia relief is involved.

Fix for shell *MAT_120: element deletion after NUMINT IPs failed did not work correctly.

Multi flexible bodies with KMFLAG in MPP version (for d3eigv and for NASTRAN.pch)

Added local coordinate system option for RCFORC file.

Fix Implicit's treatment of shell-to-solid interface constraint.

Add implicit sense switches to screen output.

Fixed *INCLUDE_TRANSFORM bug related to shells where _THICKNESS was left off of dyna.inc keyword.

Fix for *INCLUDE_TRANSFORM related to ascii databases.

Fix load curve ID output for nonuniform load option.

Support the missing option in *element_mass_part_set -- MPP only.

Fix for *MAT_DAMAGE_3, *MAT_153 to store plastic strain.

Added LCINT to input for CONTROL_SOLUTION to allow the number of intervals to be defined in the load curve discretization.

Fix energy growth related to bugs in moving flat rigid walls.

Fix related to *MAT_153 where a segmentation fault occurs.

Fix *MAT_015 to take the absolute value of D3 since many users input this constant as a negative number when it should be positive.

Fix for load curve option in *ELEMENT_MASS_PART keyword.

Gracefully exist when NaN detected.

Fix for unloading curve in rigid body to rigid body contact.

Added time dependent added mass option by load curve for keyword *ELEMENT_MASS_PART.

Fix for MPP implicit contact convergence.

Change MPP single surface and surface to surface contacts to do calculations in double precision, pad the initial penetration (by roundoff amount) and do edge projection (was missing in single surface for triangles).

Fixed thick shell strain output for case of more than 10 through thickness integration points or 3 or 5 integration points with user defined integration or Labatto quadrature.

Fix for multiple ALE elform 5 parts.

Allow detecting NAN and exit DYNA cleanly and fix node number in rotation DOF -- MPP only.

Bug fix for shell *MAT_123 with VP=1.0. Added upper bound for strain rates if table is used.

Bug fix for keyword input for *MAT_120 (MAT_GURSON_JC):
One external load curve number (LCDAM) was not converted to internal.

Fix treatment of prescribed motion rigid_local option.

Fix some possible cases of MPP hanging in problems with automatic-tiebreak contacts.

Fix for bug in *MAT_187.

Fix for KE calculation with *CONSTRAINED_INTERPOLATION.

Change to the way MPP handles initial penetrations, so the full penetration amount is compensated for at first contact (no tolerance). The fixes some cases of nodes moving in models with no loads or movement.

Fix for prescribed acceleration problem with scale factor being applied twice. -- MPP only

Added an implicit flag in EFG 2D.

Fixed a bug in *INITIAL_VELOCITY_GENERATION for solid type 17.

Modified the stiffness in 2D plain strain EFG.

Update to *MAT_019, *MAT_031, *MAT_036, *MAT_039, *MAT_040, *MAT_078, *MAT_079, *MAT_089, *MAT_101, *MAT_106, *MAT_127, *MAT_129, *MAT_144, *MAT_177, *MAT_178, *MAT_192 (and others) to eliminate load curve ID round-off in single precision.

Add use of *define_curve_function for prescribed motion and implicit.

Added Contact ID to contact message "Penetrating node eliminated ...".

Modified new history variable #11 of MAT_120 and MAT_120_JC.

Fixed restart problem.

An bug related to *MAT_060 in implicit is now fixed.

Fixed fabric (*MAT_034) triangle elements when ESORT=2 on *CONTROL_SHELL. A major history variable bug caused two-thirds of triangular elements to have zero stress.

Changes for beam types 2 and 12 with unsymmetric cross-section. Fix related to bug #303. Already done for R4, now for R3.

Bug fix for one node deformable spotweld.

Error stop if initial yield stress is zero for *MAT_142.

Fix for *MAT_002 with initial stress in implicit shell.

A small bug fix for ALE small restart.

Fix for rbdout file in the LSDA/binout file, when rigid deformable switching is active, the number of rigid bodies can be different every cycle.

Fix for bug #467, initialization of 1 noded beam/spotwelds, to better handle the case where there are parallel layers of material.

Added new history variable (history var#11 in lspp) to Gurson material (MAT_120 and MAT_120_JC). It is a dimensionless value showing material damage: $gurdam = (f - f_0) / (ff - f_0)$. Only for postprocessing.

Initialization issues for full deck restart related to prestressed bolts. Fix for bug #430.