LS-DYNA Software

Release Notes

Version 971 R6.1.0

Ove Arup and Partners Limited

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Contents

1 Introduction

Herein are summarized most of the new features, enhancements, and significant corrections made since the previous release, 971 R6.0.0. New features are listed first in no particular order. Enhancements and corrections are then listed by category.

2 New Features

- Add new keyword *MAT_THERMAL_DISCRETE_BEAM to define thermal properties for ELFORM 6 beam elements.
- Add option to *CONTROL_THERMAL_SOLVER, invoked by TSF<0, which gives the thermal speed up factor via a curve. This feature is useful when artificially scaling velocity in metal forming. The tool closing occurs first followed by the punch motion. This features allows a different time scaling to be applied to the binder followed by the punch.
- Implement a nonlinear form of Darcy's law in *MAT_ADD_PORE_AIR which allows curves to define the relationship between pore air flow velocity and pore air pressure gradient.
- Extend Option PART in *SET_SEGMENT_GENERAL to allow reference to a beam part. This allows for creation of 2D segments for traction application.
- Add options "SET_SHELL", "SET_SOLID", "SET_BEAM", "SET_TSHELL", "SET_SPRING" to *SET_NODE_GENERAL so user can define a node set using existing element sets.
- Add options "SET_SHELL", "SET_SOLID", "SET_SLDIO", "SET_TSHELL", "SET_TSHIO" in *SET_SEGMENT_GENERAL so user can use existing element sets to define a segment set.
- Implement *BOUNDARY_PRESCRIBED_MOTION_SET_BOX whereby constraints are applied only for nodes that fall inside a defined box.
- Added functionality of IPNINT in *CONTROL_OUTPUT. IPNINT>1 causes d3hsp to list the IPNINT smallest element timesteps in ascending order.
- Section and material titles are echoed to d3hsp.

  section title .....

  (section title)

  material title .....

  (material title)
- Add option MOARFL on Card 1, Column 6 of *DEFINE_CONNECTION_PROPERTIES.

  EQ.0: modeled area goes down with shear (default),

  EQ.1: modeled area stays constant.
- Add option _HALF_SPACE to the keyword *FREQUENCY_DOMAIN_ACOUSTIC_BEM; update on the input card format.
- Create file "kill_by_pid" during MPP startup, which is a shell script. When executed, this will run "kill -9" on every MPP dyna process started as part of this job. This is for use at the end of submission scripts, as a "fail safe" cleanup in case the job aborts.

- Add a new parameter in the second card of *CONTROL_SPH to choose the type of artificial viscosity formulation for the SPH particles:

  EQ.0: Monaghan type artificial viscosity formulation is used.

  EQ.1: Standard type artificial viscosity formulation from solid element is used which may give better energy balance but is less stable in specific applications such as high velocity impact
- Add optional friction in *CONTACT_2D_NODE_TO_SOLID for SPH.
- Add new keyword *ALE_COUPLING_NODAL_CONSTRAINT which provides a coupling mechanism between ALE solids and non-ALE nodes. The nodes can be from virtually any non-ALE element type including DISCRETE_SPHERE, EFG, and SPH, as well as the standard Lagrangian element types.
- Develop *ALE_ESSENTIAL_BOUNDARY to replace EBC in *CONTROL_ALE. The command can be repeated multiple times.
- Implement *DELETE_ALECPL for small restarts in order to delete coupling defined with *ALE_COUPLING_NODAL_CONSTRAINT. Can also be used to reinstate the coupling in a later restart.
- Implement *DEFINE_VECTOR_NODES to define a vector with two node points.
- Add *CONTACT_AUTOMATIC_SINGLE_SURFACE_TIED to allow for the calculation of eigenvalues and eigenvectors on geometries that are connected by a contact interface of the type *CONTACT_AUTOMATIC_SINGLE_SURFACE.
- A new parameter RBSMS on *CONTROL_RIGID affects rigid body treatment in Selective Mass Scaling (*CONTROL_TIMESTEP). When rigid bodies are somehow connected to deformable elements, RBSMS=0 (default) results in spurious inertia due to improper treatment of the nodes at the interface. RBSMS=1 alleviates this effect but an additional cost is incurred.
- Add input parameter TET10JTOL for *CONTROL_SOLID. Sets tolerance for issuing warning when J_min/J_max goes below this tolerance value (i.e., quotient between minimum and maximum Jacobian value in the integration points) for tetrahedron type 16. This is good as an indication of poor meshes in implicit that might cause convergence problems.
- Add option MISMATCH to *BOUNDARY_ACOUSTIC_COUPLING to handle coupling of structural element faces and acoustic volume elements (ELFORMs 8 and 14) in the case where the coupling surfaces do not have coincident nodes.

Airbag

- Fix *AIRBAG_PARTICLE keyword reader error when _ID and _MPP are used in the same command.
- Add porosity leakage formulation in *MAT_FABRIC (*MAT_034, FLC<0) for particle gas airbag (*AIRBAG_PARTICLE).

*BOUNDARY

- Disable *BOUNDARY_PRESCRIBED_ACCELEROMETER during dynamic relaxation.
- Fix real*8 mismatches in *BOUNDARY_PRESCRIBED_ORIENTATION. Also, for implicit only, fix array dimensioning error.
- Promote some local variables in *BOUNDARY_PRESCRIBED_ORIENTATION to double precision; fixes a problem which showed single and double gave different results when small deviations in angle were prescribed. Also, fix all settings so BODY=1 and PIDA=0 is consistent with the old method of PIDA=PIDB.
- Fix a bug in *BOUNDARY_PRESCRIBED_ORIENTATION_RIGID where rotations about body-fixed axes are desired. Issue a warning to use BODY=1 instead of PIDB=PIDA and set defaults accordingly. Also, clean up some warning/error messages for blast coupled to ambient ale and initial angular offset for JNTF=1.
- Add new parameter, CVRPER, to *BOUNDARY_PAP. CVRPER is cover material porosity, see User's Manual for details.
- Redefine BLOCK in *BOUNDARY_PAP to take care of partial leakage when nodes of solid elements are involved in contact. BLOCK serves as an interpolation factor between the boundary pressure and the calculated pressure.
- Fix bug in *INCLUDE_TRANSFORM with *BOUNDARY_CONVECTION_SET or *BOUNDARY_RADIATION_SET. The segment set id was incorrectly offset by the element offset.
- Make corrections for Implicit and *BOUNDARY_PRESCRIBED_ORIENTATION needed due to relative motion feature.
- Fix bug affecting staged construction models (*..._STAGED_CONSTRUCTION) having more than one stage and in which time-dependent soil consolidation (*..._PORE_FLUID) is simulated with automatic time-factoring. (Time-factoring allows long consolidation times to be modeled within a reduced analysis time.) The bug caused the second and subsequent stages to commence with high time-factoring instead of resetting the time factor to 1, leading to inaccurate results in those stages.

*CONTACT

- Fix a bug affecting *CONTACT_ENTITY when GEOTYP=1 and INTORD>0.
- Add incremental update of normal option (TIEDID in optional card D of *CONTACT_TIED_SURFACE_TO_SURFACE for SMP to eliminate spurious stresses that may appear in some applications.
- Fix part set not found error when using *SET_PART_ADD for the *DEFINE_FRICTION parts.

- Fix bug in *CONTACT_AUTOMATIC_..._TIEBREAK options 7/10 in MPP where the offset was treated incorrectly.
- Fix MPP initialization error affecting *CONTACT_RIGID_SURFACE.
- Fix several issues that could result in instability in *CONTACT_TIED_SHELL_EDGE_TO_SURFACE_BEAM_OFFSET in MPP, including case where solid element surfaces comprise the slave side and offset distance is very large.
- Fix instability of MPP for full deck restart that includes *CONTACT_AUTOMATIC_..._TIEBREAK.
- Fix for MPP improperly generating node numbers for display of geometric contact entities when running problems with adaptivity (*CONTACT_ENTITY; *CONTROL_ADAPTIVE).
- Fix for deep penetration (past shell centerline) problem in MPP single surface contacts in the case where IGNORE=1 is turned on. Also, fix rare case of migrating nodes that could get dropped from contact.
- Fix MPP so contact segments from TSHELL elements are deleted when the elements fail.
- Fix bug resulting in divergence between the location of *CONTACT_ENTITY and the associated rigid body if the rigid body had prescribed motion.
- MPP tied contact: if someone puts soft=2 on a tied contact definition, silently switch it to soft=1. Soft=2 makes no sense for these contacts, and was confusing the input processing.
- Add new option SPOTSTP=3 in *CONTROL_CONTACT to retain spot welds even though the welds were not found in the *CONTACT_SPOTWELD.
- Fix MPP implementation of *CONTACT_..._ORTHO_FRICTION.
- Fix MPP groupable *CONTACT_TIED_... energy calculations. The contact was working correctly, but the energy calculation was incorrect since the changes of r71470.
- Fix MPP problem of contact not properly honouring the I2D3D parameter on Optional Card B of *CONTACT_....
- Fix possible floating point exception affecting *DEFINE_FRICTION_ORIENTATION.
- FTIED=1 in *CONTROL_PORE_FLUID allows the pore fluid to flow through tied contacts. Because this doesn't work for MPP Groupable tied contacts, an error trap has been added.
- Add consistency option to ORTHO_FRICTION contact options for SMP (ncpu<0).
- Added forces from *CONTACT_GUIDED_CABLE to ncforc (ASCII and binout).

- Fix initial penetration check of SOFT2 MPP contact. The reporting of initial penetrations between segments on different processors was accessing memory incorrectly and caused a segmentation fault.
- Fix bug in *CONTACT_AUTOMATIC_GENERAL in which forces from beams were not properly reported to rcforc and intfor in some cases (*DATABASE_RCFORC, *DATABASE_BINARY_INTFOR).

*CONSTRAINED

- Fix an issue with implicit storing the resultant forces for *CONSTRAINED_SPOTWELD.

*CONTROL

- Fix an error in integrating psi for JNTF=1 in *CONTROL_RIGID. This bug has been present since revision 68515.
- Fix for echoing of *CONTROL_FORMING_PARAMETER_READ parameters (and parameter_expressions that depend on them) to the d3hsp file.
- Fix MPP bug that caused improper check of dynamic relaxation convergence when a part set was selected for convergence checking (IDRFLG=3 in *CONTROL_DYNAMIC_RELAXATION).

*DATABASE

- Correct a bug in gceout data (*DATABASE_GCEOUT) for MPP.
- Correct an MPP bug in nodal stress/strain output written according to NODOUT in *DATABASE_EXTENT_BINARY.
- Discrete beam materials 70, 71, 74, 94, 121 are based on change in length from initial length to calculate the axial force. Output the change in length instead of zero axial relative displacement to ASCII file disbout.
- Fix incorrect stress/strain output in elout when CMPFLG=1 in *DATABASE_EXTENT_BINARY for *MAT_002 solids.
- Fix incorrect stress output to d3plot for thick shells. Now in agreement with stress from elout.
- Add support for *DATABASE_RCFORC_MOMENT in implicit mechanics.
- Fix Lagrange Multiplier formulation of joints output to bndout database for MPP.
- Add, after the first implicit time step, the output of projected cpu and wall clock times. This was already in place for explicit. Also echo the termination time.
- Include upgrades to the output to the *DATABASE_MASSOUT file.
- optionally add mass for nodes belonging to rigid bodies
- add summary table at end of file.

- Add generation and storage of resultant forces for the LaGrange Multiplier Treatment of Joints for Explicit. This gets the correct output for this capability to file jntforc (*DATABASE_JNTFORC).
- Fixed bug in d3plot if a solid part is removed.
- Fixed naming convention for intfor files (*DATABASE_BINARY_INTFOR) produced by restarts so data is not overwritten and all data can be read by LS-PrePost.
- Fixed IEVERP option for *DATABASE_EXTENT_INTFOR in SMP.
- Control the number of messages for deleted and failed elements by MSGMAX in *CONTROL_OUTPUT.
- Fix bug in writing binary plot file d3ssd (*DATABASE_FREQUENCY_BINARY_D3SSD).
- Implement ASCII database nodfor for nodal and resultant force for nodes defined in *DATABASE_NODAL_FORCE_GROUP in *FREQUENCY_DOMAIN_SSD analysis (SMP only for now.)
- Fix bug in writing frequency binary plot files in MPP
- Don't reset d3dump interval in small deck restart if in fact the user did not input a new value (*DATABASE_BINARY_D3DUMP).
- Fix bug in MPP where frictional contact energy was not computed and reported to intfor database (FRCENG set to 1 in *CONTROL_CONTACT, *DATABASE_BINARY_INTFOR)
- Fix d3plot problem in MPP if user turns on thermal output when there is no thermal in the problem.
- Add MPP support for output of guided cable (*CONTACT_GUIDED_CABLE) data in ncforc file.
- Improvement to jobid handling in l2a utility so that binout files from multiple jobs, with or without a jobid-prefix, can be converted with the single command "l2a -j *binout*". You get all the right output, with the correct prefix according to the job id.
- Add ALE_MULTI-MATERIAL_GROUP (AMMG) info into matsum output (both ASCII and binout).
- Fix bug in writing out rcforc in MPP implicit

*ELEMENT

- Switch shell formulation 14 to 15 (*SECTION_SHELL) in models that include axisymmetric SPH.
- Correct a bug for shell-type seatbelt that occurs when nodes in EDGSET of *SECTION_SHELL are transformed by *NODE_TRANSFORM.
- Fixed error in reading *ELEMENT_SHELL_COMPOSITE.
- Fix several problems with *ELEMENT_BEAM_PULLEY.

- Fix bug for tetrahedral formulation 13 when used together with *MAT_024 in implicit: The check to see if rate effects are active for implicit was missing. Avoid division by zero in the initialization step.
- Add option to use *ELEMENT_BEAM_PULLEY with *MAT_CABLE_DISCRETE_BEAM.
- Fix bug in consistency option for ELFORM 20 solid cohesive elements for SMP (ncpu<0).
- Separate material and geometric stiffness to account for linear buckling analysis in beam formulation 12.
- Fix solid ELFORM 15 (2 point prism) so that rigid body motion does not generate strain, and the element time step is not affected by rigid body motion (*SECTION_SOLID).
- Fix *MAT_024 element failure for ELFORM 12 shell (2D plane stress). Elements were not failing.
- Fix an error with initializing element data of shell ELFORM 3 or 4 triangles when ESORT=2 on *CONTROL_SHELL. The error showed up as incorrect initial strain energy in some elements, but it could have taken on other symptoms.
- Add a warning during initialization if a user creates thick DKT triangles either by ELFORM=17 on *SECTION_SHELL or ESORT=2 on *CONTROL_SHELL. The warning is written if the shell thickness is greater than maximum edge length. Also, to prevent stability problems, the time step may be reduced or selective mass scaling (*CONTROL_TIMESTEP) increased.
- Fix 2D plane strain and 2D axisymmetric elements (*SECTION_SHELL) so that spin is correctly considered. Materials that use the Green Lagrange strain were not correctly rotating the deformation gradient (F tensor) and so were producing poor stress and strain in parts that spin. Also, the other materials that calculate strain from the rate-of-deformation have a fix to the objective stress update option (OSU in *CONTROL_ACCURACY) so that they are more accurate.
- Enable orthotropic materials to work with tetrahedral ELFORMs 16 and 17. Prior to this fix, the material directions were not being properly determined so stress values were incorrect. Also, the 4-node tetrahedral ELFORMs 4,10,13 were made to work with orthotropic material even if the element connectivity is not input as n1,n2,n3,n4,n4,n4,n4,n4.
- Enable proper stress and strain output in the material coordinate system of thick shell ELFORMs 3 and 5 (*SECTION_TSHELL) with user-defined anisotropic materials that have IHYPER=-1 (*MAT_USER_DEFINED_...) or that use the vecumat routines.
- Fix spurious introduction of boundary conditions in degenerate acoustic volume elements, ELFORMs 8 and 14.
- Added automatic treatment of degenerate acoustic elements with ELFORM 8, explicitly treating tetrahedrons and pentahedrons as such. Tria and quad faces at acoustic-structure boundary also now separately treated.

*FREQUENCY_DOMAIN

- Fix bug in random vibration (*FREQUENCY_DOMAIN_RANDOM_VIBRATION) with random pressure in MPP.
- Implement half space treatment to collocation BEM acoustics with low rank approximations (*FREQUENCY_DOMAIN_ACOUSTIC_BEM).
- Fix minor problem for reading keyword *DEFINE_PLANE.

*INITIAL

- When *INITIAL_VELOCITY_GENERATION refers to a *SET_PART, if any part in the set is also the PID of a nodal rigid body (*CONSTRAINED_NODAL_RIGID_BODY), LS-DYNA was failing to initialize the velocity of the nodal rigid body. This has now been fixed, but it is still strongly advised to assign a unique PID, unused by any other part, to each nodal rigid body.

*LOAD

- Fix a problem with the non-reflecting ambient boundary condition in 2D ALE blast coupling (*LOAD_BLAST_ENHANCED). Incorrect cell pressures were retrieved due to a mem ory pointer error.
- Correct a bug in *USER_LOADING_SET that occurred only when the user requested large structure format by setting long=s on the execution line.
- Fix incorrect behaviour when the applicable dof for node2 for *LOAD_MOTION_NODE is a rotational dof.
- Check for eroded elements when applying load with *LOAD_ERODING_PART_SET to ensure that the load is applied to the exposed element surfaces.
- Fix for MPP follower force (*LOAD_NODE) which was broken in r65171.
- Fix MPP decomposition error for *LOAD_BODY_GENERALIZED that could result in these forces being applied incorrectly in some cases.
- Fix bug in *LOAD_BODY_POROUS. The check for wedge and tetra elements was incorrect.

*MAT

- Fix incorrect plastic behaviour of discrete beam with *MAT_NONLINEAR_PLASTIC_DISCRETE BEAM.
- Improve the compression elimination algorithm for 2D seatbelts, CSE=2 in *MAT_SEATBELT.
- Suppress the detailed material failure (*MAT_ADD_EROSION) messages in messag and d3hsp when number of messages > MSGMAX.

- Fix segmentation fault problem when *MAT_SIMPLIFIED_RUBBER/FOAM_WITH_FAILURE (*MAT_181) is used with *PART_COMPOSITE as the first integration point.
- Fix incorrect stresses when using *MAT_PSEUDO_TENSOR (*MAT_016) with fully integrated S/R solid type 2.
- Implement consistency, ncpu<0, for SMP for *MAT_COHESIVE_GENERAL (*MAT_186) solids and shells.
- Allow viscoelastic model in *MAT_077_O to use up to twelve terms in Prony series instead of standard six.
- Correct energy calculation in *MAT_PML_NULL (*MAT_246) to match that in MAT_NULL.
- Fix bug for *MAT_OGDEN_RUBBER and *MAT_HYPERELASTIC_RUBBER (*MAT_077). Initialization of number of history variables was not correct when G=0 or SIGF=0 and Prony terms were used for solid elements.
- Fix *MAT_MODIFIED_PIECEWISE_LINEAR_PLASTICITY (*MAT_123): align behaviour of tetrahedral formulation 13 with other solid elements.
- Fix for GISSMO damage in *MAT_ADD_EROSION to allow large curve IDs and correct element id.
- Fix *INITIAL_FOAM_REFERENCE_GEOMETRY for shell materials *MAT_027 and *MAT_181.
- Add error message for *MAT_187 with more than 12 curves in table LCID-T.
- Enable large curve ID's for friction table (*CONTACT_... with FS=2).
- Speed-up of GISSMO damage in *MAT_ADD_EROSION: damage growth is now only calculated for elements with plastic strain increment > 0 (others don't need it).
- Fix for shell materials MAT_123 and MAT_124 load curve bounds to avoid error termination in very rare cases.
- Fix for shell material *MAT_224. Strain rate dependent failure (input curve LCG) was not working correctly: rate was always zero. Solids were OK.
- Fix for *MAT_240. Set limits for yield stresses T and S to ensure validity of the material model and to avoid unwanted error termination.
- Fix for *MAT_136. It was only working for first part in keyword input.
- Change the formability limit in *MAT_036_NLP from 1. to 1.5, per customer request.
- *MAT_ADD_PERMEABILITY_ORTHOTROPIC is now available for pore pressure analysis (*..._PORE_FLUID).
- Fix bug in which *MAT_ADD_EROSION did not work for the following materials for solid elements when VP=1: *MAT_003, _015, _018, _019, _024, _064, _065.

- For *MAT_224 solids and shells, use damage as the failure variable in *CONSTRAINED_TIED_NODES_FAILURE.
- Fix bug for hyperelastic materials to prevent rotating of stresses after constitutive update.
- Fix the strain output of *MAT_CODAM2 (*MAT_219) for shells. The strain increments are transformed to the material direction during the stress update, and these transformed increments were being summed for strain output.
- For triangular shell elements using *MAT_034 or *MAT_134, distribute the mass equally to the 3 nodes rather than in the proportion 1/4, 1/4, 1/2. 3 nodes rather than 1/4, 1/4, 1/2 which is done currently. (*MAT_FABRIC and *MAT_VISCOELASTIC_FABRIC.)
- Modify the behaviour of *MAT_ACOUSTIC when used in combination with dynamic relaxation (DR). Acoustic domain will now remain unperturbed in the DR phase but hydrostatic pressure from the acoustic domain will be applied to the structure during DR. A flag to control behaviour of the acoustic domain during the DR phase will be added in a future release.

ALE

- Development of the 3D to 2D mapping in *INITIAL_ALE_MAPPING

SPH

- Update that allows *CONTACT_ERODING_NODES_TO_SURFACE contact to be used with SPH elements.
- Add MPP implementation for the Total Lagrangian SPH formulation 7 (*CONTROL_SPH).
- The SPH neighbour search algorithm in SMP was wrong and therefore disabled from R5 to R6.0. Therefore, SPH could not scale on those versions. A new search algorithm is implemented now for SMP which scales properly and gives consistent results.

EFG

- Fix bug in triangular element sorting for EFG shells.

*IMPLICIT

- Fix an implicit, solid formulation 3 bug that was introduced in Rev 70242.
- Fix implicit mechanics for small restart.
- Fix implicit initialization when imflag in *CONTROL_IMPLICIT_GENERAL > 1 and dynamic relaxation flag idrflg is -999.
- Widen output formats for linear equation solver statistics to support very very large problem output.

- Make improvements to LSMTD=3 in *CONTROL_IMPLICIT_SOLUTION to take care of case when energies have the same sign in the line search.

Thermal

- Change structured file format for control card 27. Several input variables used i5 format limiting their value to 99,999. A recent large model exceeded this limit. The format was changed to i10. This change is not backward compatible. Old structured input files will no longer run unless control card 27 is changed to the new i10 format. This change does not affect the KEYWORD file. Therefore, this change should be transparent to the user.
- Fix *BOUNDARY_THERMAL_BULKFLOW to correct double accounting for bulkflow element internal energy change. This affects the temperature rate of change of fluid flow nodes. They will now change temperature faster.
- CONTROL_OUTPUT keyword parameter NPOPT is now applicable to thermal data. If NPOPT=1, then suppress printing of the following input data to d3hsp
- *INITIAL_TEMPERATURE

  *BOUNDARY_TEMPERATURE

  *BOUNDARY_FLUX

  *BOUNDARY_CONVECTION

  *BOUNDARY_RADIATION

  *BOUNDARY_ENCLOSURE_RADIATION
- Added beam energy balance information to TPRINT file.

MPP

- Fix problem of temporary decomposition files occasionally being deleted prematurely.
- LS-DYNA and Madymo are now properly coupled in MPP resulting in significant improvement in performance (*MAT_RIGID).

Forming

- Fix bug in contact search for *CONTACT_FORMING_SURFACE_TO_SURFACE to resolve reliability issues when performing implicit analysis for gravity loading.
- Improvements to shell adaptivity (*CONTROL_ADAPTIVITY) to reduce the number of elements along curved areas in forming simulations.
- Improve one-step unfolding (*CONTROL_FORMING_ONESTEP) to accommodate blanks with small initial holes.

Isogeometric Elements

- Fix B matrix bug for FORM 4 isogeometric shell (*ELEMENT_SHELL_NURBS_PATCH).
- Sped up the FORM 3 isogeometric shell and made storage consistent with other FORMs.

Miscellaneous

- Correct a bug that occurs when *DEFINE_VECTOR in an input file included via *INCLUDE_TRANSFORM has a non-zero coordinate system CID.
- Speed up the processing of *SET_XXXX_GENERAL, whenre XXXX could be any element type, like solid, thick shell, etc.
- Fix a bug affecting *SET_SEGMENT_ADD.
- Correct the transformation of *RIGIDWALL_GEOMERIC_PRISM when it is included by *INCLUDE_TRANSFORM. The bug mostly occurred when SCALE was used in *DEFINE_TRANSFORMATION.
- Increase the number of digits for VALUE of *SENSOR_SWITCH in dyna.str so user input values can be more accurately passed to solver.
- Remove the restriction of 0.<FRIC<1.0 for *RIGIDWALL_GEOMETRIC.
- Fix input error when *DEFINE_TABLE_3D s used instead of *DEFINE_LOAD_CURVE for LCY1 to LCY5 of *MAT_UHS_STEEL.
- Fix missing CID in *DEFINE_VECTOR keyword after being transformed by *INCLUDE_TRANSFORM.
- Fix spurious error when using *SET_PART_LIST_GENERATE that includes parts from *PART_COMPOSITE.
- Fix bug which causes spurious warning and subsequent error when v0 in *DEFINE_CURVE_SMOOTH is <0.0001 and nonzero.
- Fixed bug in use of label in *SECTION_SHELL for SECID.
- Fixed status.out file if no glstat or sense switch "sw2" is requested.
- Fix for table ID offset IDFOFF from *INCLUDE_TRANSFORM: It was not accounted for in *CONTACT_... , FS=2.0 and FD=table ID.
- Fix hang during input phase in case there is an include file (*INCLUDE) with an *END statement in the middle of a gpg-encrypted block.
- Add support for *KEYWORD_JOBID when using internal *CASE driver.
- Fix problem with long lines in *DEFINE_CURVE_FUNCTION, where parameter expansion was causing the lines to be truncated.
- Modify behaviour of "version" command line option so that it prints additional information about when, where, and how the LS-DYNA executable was built.
- Fix user-defined loading (*USER_LOADING) which was very likely to be applying the wrong forces to nodes since r62822.

- Fix the warning message that we print when a rigid body has a minimum moment of inertia less that 1/500 of the maximum moment of inertia so that the message will not contradict the numbers that we print. The behaviour of rigid bodies is unchanged by this fix.
- Fix the part mass and total mass reported to the d3hsp file for plane strain shell ELFORMs 13 and 43. The sections are assumed to have a thickness of 1.0, but if the user gave thickness values on the *SECTION_SHELL card, they were used in the part mass calculation.
- Add new capability in small restart to allow repositioning of parts. This is accomplished by including *DEFINE_TRANSFORMATION and *NODE_TRANSFORM in the small restart deck to move nodes of a specified node set prior to continuing the simulation.