

eta/VPG

Mechanical System Simulation



version 3.4

eta/VPG is a powerful tool which allows the user to **quickly & efficiently create finite element models & define models for mechanical system analyses**. In addition, eta/VPG can accurately simulate common automotive safety test conditions, drop tests and fluid-structure interaction.

Now available with an integrated linear static and dynamic solver, NISA, which allows the user to easily create and visualize advanced simulations within the eta/VPG environment.

Modules:

PrePost, Structure, Safety, Drop Test & ALE-FSI

VPG/PrePost

Developed for fast, efficient meshing and model creation for LS-DYNA, NASTRAN and other MCAE software.

VPG/Structure

Define LS-DYNA models used for mechanical system analyses. Includes suspension, tire and road modeling tools, fatigue post-processor, and NVH signal processing tools. Performs Adams to LS-DYNA conversion.

VPG/Safety

Special purpose tools designed to speed up and simplify the simulation of common automotive safety test procedures.

VPG/Drop Test

Automatically define all boundary conditions for a drop test with consistent and accurate simulation results.

VPG/ALE-FSI

Create advanced ALE and SPH simulations and automatically create ALE mesh zones and explosive pressure sources.

ETA is an EEO/AAP Employer

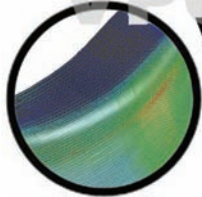
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The logo for eta, consisting of the lowercase letters 'eta' in a bold, dark red, sans-serif font.

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VPG/PrePost

Use the advanced modeling tools in the PrePost module to create complex finite element models with ease.

Complete Meshing & FE Model Assembly Toolset

- NEW!—NISA Interface Available.
- NEW!—Import & export basic ANSYS model formats.
- NEW!—Mesh to surface feature.
- Enhanced advanced meshing features for meshing complex surfaces.
- CAD data interfaces with UG, CATIA, Pro/E, IGES, VDA
- Advanced auto-meshing and auto-welding features
- Complete interfaces with NISA, LS-DYNA, Nastran, MD/Nastran, Radioss, PAMCRASH and ABAQUS solvers

Mesh Quality Enhancement Tools

- Mesh refinement via mouse clicks.
- Rearrangement of nodes in failed elements.
- Simultaneously checks and repairs warpage, taper, jacobian, interior angles, aspect ratio, element Size.
- Penetration checking & repair.
- Quality statistics.

Topology Automeshing

- Automatically repairs any surface gaps/overlaps.
- No user intervention or preparation of surface data.

Solid Element Meshing

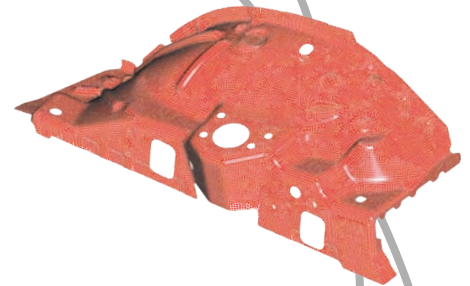
- Generate hundreds of thousands of elements in minutes.
- Reliable, proven results.
- Basic hexa and tetra meshing capabilities.
- Supports 4 or 10 noded tetra elements and 8 or 20 noded hex elements.

Complete Material Library

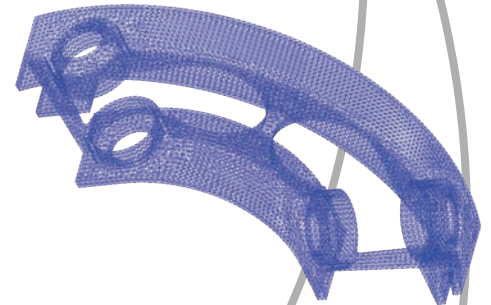
- Select from a variety of materials and create a customized database.

Material Thickness Calculation Tool

- Uses an efficient one step metal forming analysis to predict sheet metal thinning based on final part shape.
- Visualize and map predicted thickness profile onto FE mesh to approximately account for manufacturing effects without performing complete metal-forming analysis.



Topology Automeshing



Tetra Solid Meshing



Thickness Mapping

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Mechanical System Simulation



VPG/Structure VPG/Structure

VPG Structure allows the user to define LS-DYNA models which can be used for mechanical system analysis including tire model, suspension model and road surfaces. VPG uses an analysis approach consistent with test environments dynamic non-linear analysis using real-time boundary conditions.

Road Surface Models

- Digitized from MGA proving ground roads.
- Any 3-D data can be used to generate road surfaces.

Tire Models

- 3-D FEA models including the tire air pressure.
- Frictional contact interface with road.
- Validated versus test data.

Vehicle Dynamics

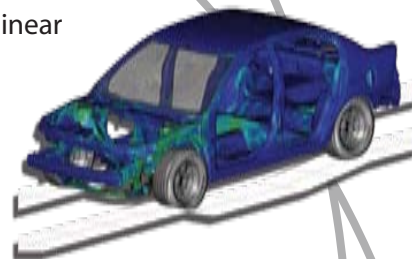
- Road load generation.
- Use of simplified models for event-based loads.
- Rigid and flexible members.
- Component or sub-system studies.

Full System & Component Durability / Fatigue Assessment

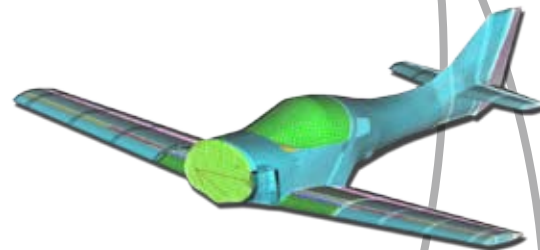
- Time-domain transient stress and strain prediction.
- VPG fatigue analysis tool included.
- Allows multiple material assignment.
- Provides a way to create user defined materials.
- Users can output files useful in other fatigue codes.
- Simulation of durability critical proving ground events.
- Calculate material damage of each event.
- Calculate the "occurrence" cycles.
- Accumulate damages per cycle to predict fatigue life.

Noise, Vibration & Harshness

- Simulate dynamic rough road events including cobbles, potholes and ditches.
- Simulate vehicle limit handling events including rollover and emergency lane changes.



Vehicle Dynamics



Dynamic Stress



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VPG/Safety

The VPG/Safety Module delivers a set of tools that speed the modeling of vehicle impact analyses including comprehensive crash tool, dummy and barrier libraries and offers "Process Guidance" for 21 FMVSS, ECE and Insurance Institute test scenarios.

VPG/Safety Facilitates:

- Streamlined model development.
- Consistent modeling and analysis processes.
- The reduction of modeling effort and time.
- The implementation of many common impact & occupant safety test conditions.

Crash Tool Library

- Dummy Models—SID and EUROSID, Hybrid II, Hybrid III, FAA Hybrid III, LSTC/NCAC
- Barriers—FMVSS/ECE side impact barrier, 0-degree front rigid barrier, 30-degree rigid front barrier, front offset deformable barrier, rear impact barrier
- Impactors, rams, pendulums, head forms

Vehicle Impact Processes

- FMVSS regulations—side door intrusion, US dynamic, rigid wall 0 degree/30 degree, roof crush resistance, flat rigid wall rear impact, 70% overlap deformable barrier rear impact
- ECE regulations—deformable 40% offset, frontal impact, rear impact, euro dynamic side impact)
- Insurance/consumer requirements
- Front rigid pole impact, side pole impact
- IIHS 40% offset deformable barrier front crash
- AMS (rigid 15 degree, ASD 50% overlap anti-sliding device)
- Bumper impact FMVSS581 (flat, offset, pendulum)

Occupant Safety Processes

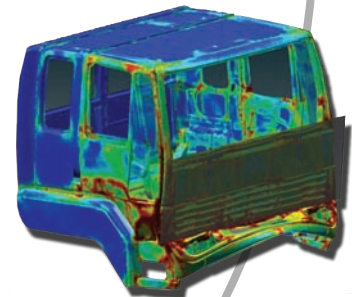
- FMVSS—Free motion head impact, seatbelt anchorage, child restraints anchorage system, sled test occupant simulation, knee bolster simulation, steering control system
- ECE—luggage intrusion, steering control system

Airbag Folder

- Provides a toolset for typical fold patterns
- Tuck, roll and fold
- Fold pattern can be saved and bag re-folded with same fold pattern



Extensive Dummy Library



Vehicle Impact Processes



Occupant Safety Processes

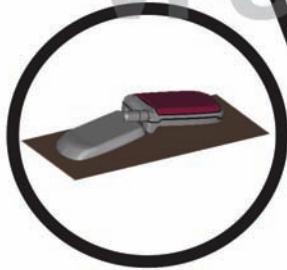
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VPG/Drop Test

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VPG's Drop Test feature is used to automatically define all boundary conditions for a drop test, which is ideal for packaging design, cell phone development, laptop computer development and many other consumer products. DTM can be accessed from VPG's main menu by selecting DTM.

Create a Series of Simulations in One Command

- Drop, shock, vibration and pressure simulations
- Different angles
- Different drop heights
- Automatically calculate parameters and define related LS-DYNA cards

Define Drop Direction

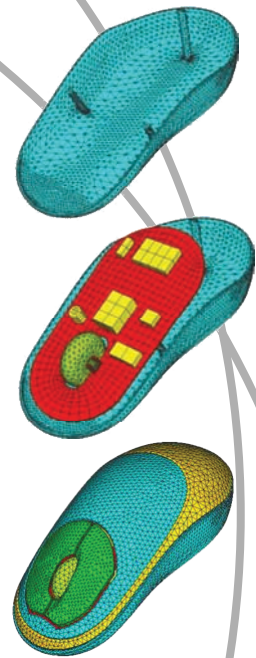
- Specify G & Drop Height-determines initial velocity
- CG is calculated and displayed once the DTM is entered
- Easily define the Drop Direction
- Automatically orient the model so that the drop direction points to the -Z axis after it is defined

G Value

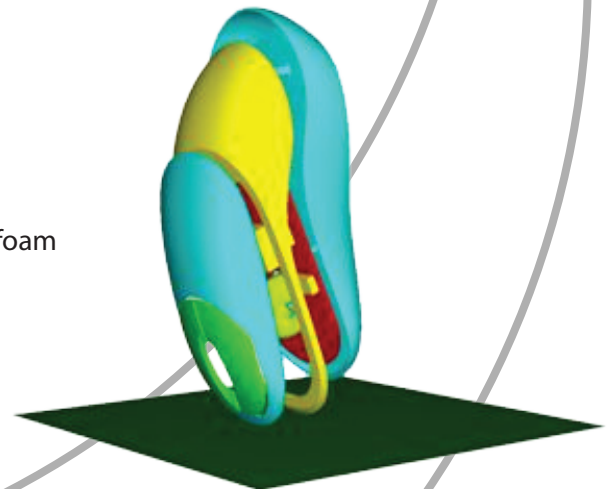
- DTM provides the default G value in current unit system
- DTM also gives an option for other value

Analysis Control

- Material library includes steel, aluminum, plastic, PCB and foam
- Simulation Start Height
- Duration time and steps in output
- Time history output, damping
- Batch Output
- Output a series input decks in similar conditions with different drop heights or angles
- Generate hundreds of thousands of elements in minutes.
- Reliable, proven results.



Mouse Components Modeled,
Materials, Contacts & Connectivity Defined



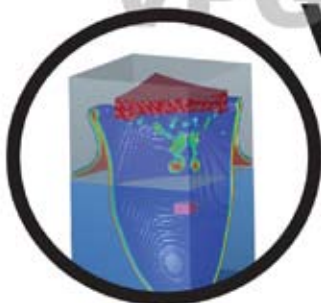
Mouse Drop Test

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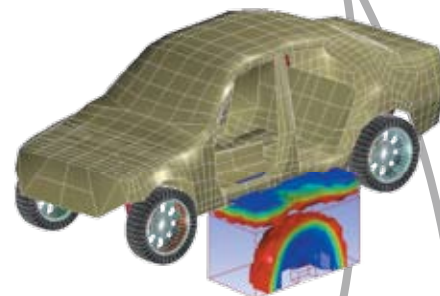
VPG/ALE-FSI VPG/ALE-FSI



VPG's ALE-FSI allows the engineer to create advanced ALE and fluid-structure interaction simulations using LS-DYNA and to automatically create ALE mesh zones and explosive pressure sources, saving time and increasing productivity.

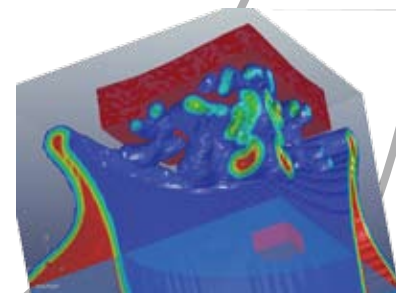
Parametric Model Definition

The ALE-FSI Blast Module quickly sets up LS-DYNA ALE meshes with multiple fluid zones and variable charge shapes using a simple parametric model definition. Users have complete control over mesh density and charge shapes.



Simulate Fluid & Structure Interaction

Fluid and structural interactions are quickly and accurately defined using VPG/ALE-FSI. The user can take advantage of VPG's complete LS-DYNA element and material library to create Lagrangian structure models which interact realistically with Eulerian fluid models.



Generate Graphical Data for Evaluation

VPG's post processing capabilities allow the user to visualize all simulation results, animating the pressure, velocity and motion of the results. Graphical data may also be displayed to provide an in-depth evaluation of the simulation results.