Femap Version 10.2 What's New

October 2010

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Femap 10.2

What's New Overview

- Meshing Toolbox
- Postprocessing
- Topology Optimization
- NX Nastran 7.1
- General Nastran
- Customer Driven Updates
- Thermal and Flow Solver Updates

Meshing Toolbox

More Efficient Interactive Workflow

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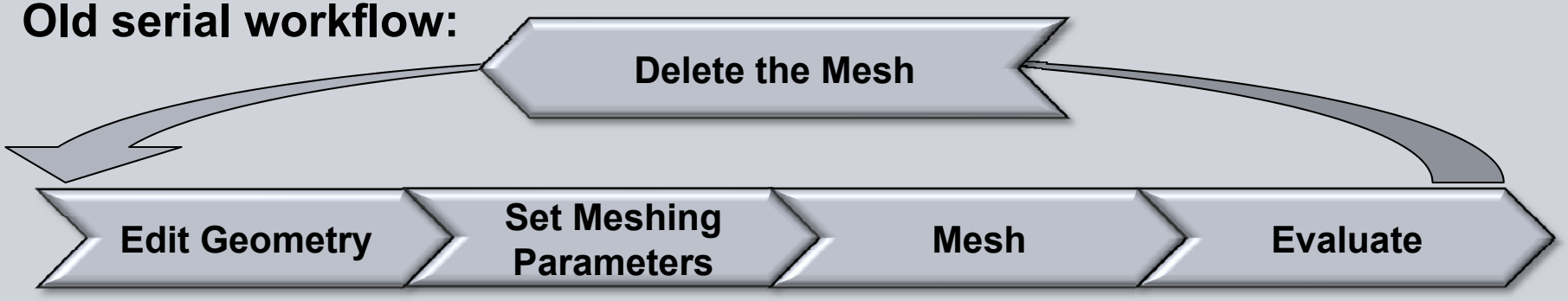
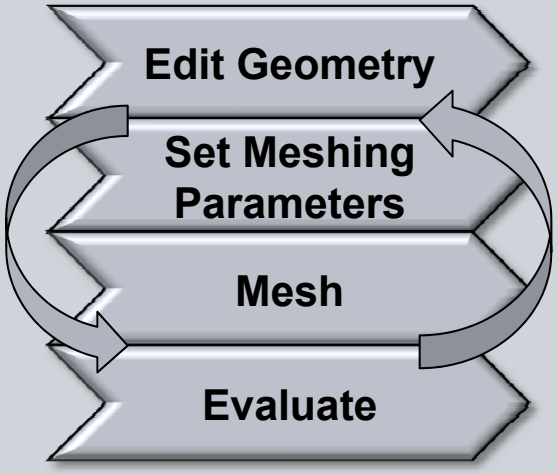
Old serial workflow:



New interactive workflow:

- Interoperable tools – more efficient modeling and meshing process
- Immediate visual feedback on mesh and model quality
- Improves productivity
- Generates models faster
- Creates more accurate models



Meshing Toolbox

Mesh Surface Toolbox

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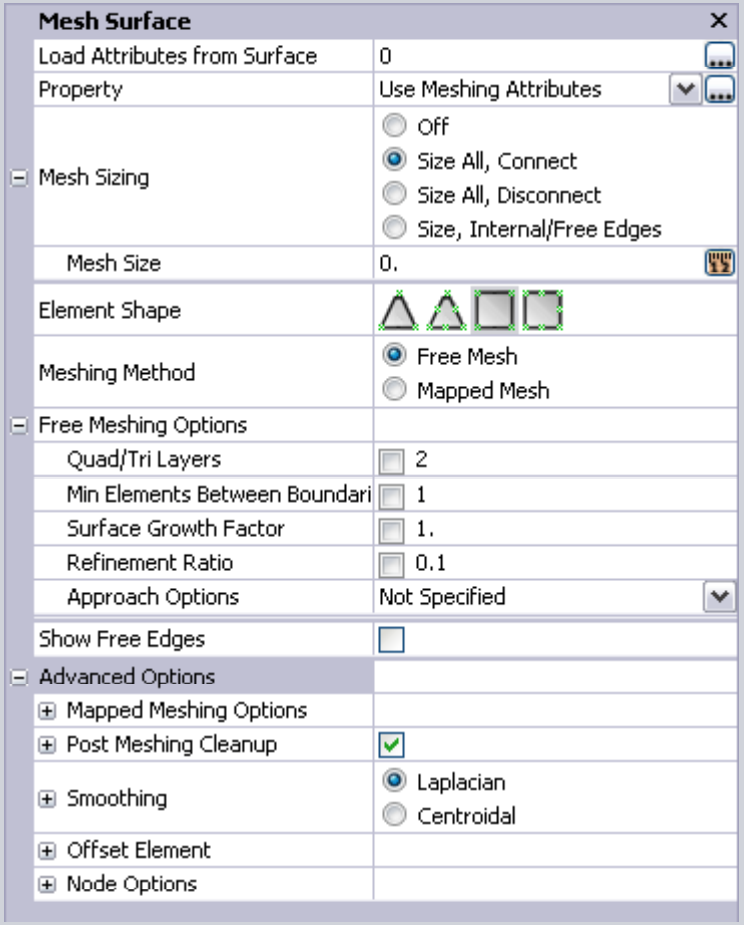
New Mesh Surface Toolbox

- Used for Shell Meshing only
- Will apply Mesh Sizing, and mesh attributes on the fly then mesh the surfaces
- Method for automatically applying 3 Corner / 4 Corner mapped meshing attributes based on the surface geometry
- Surface meshing options such as Quad Layers around boundary and number of elements between boundaries can also be set



Meshing Toolbox

Geometry Editing Toolbox

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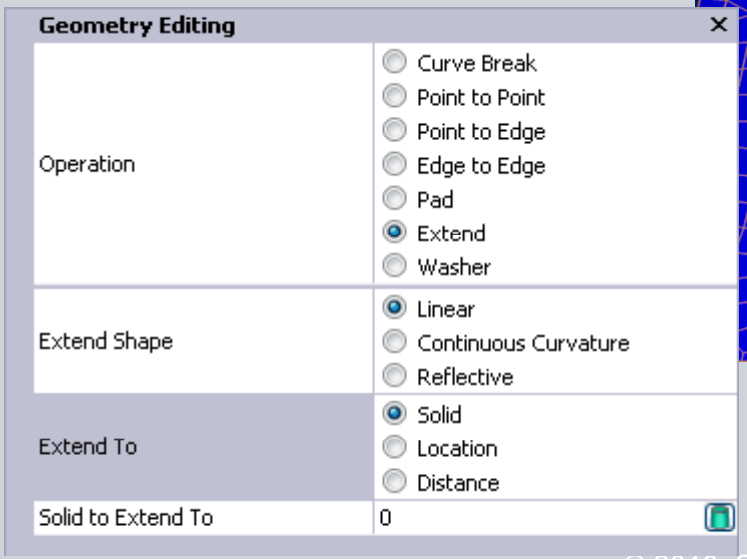
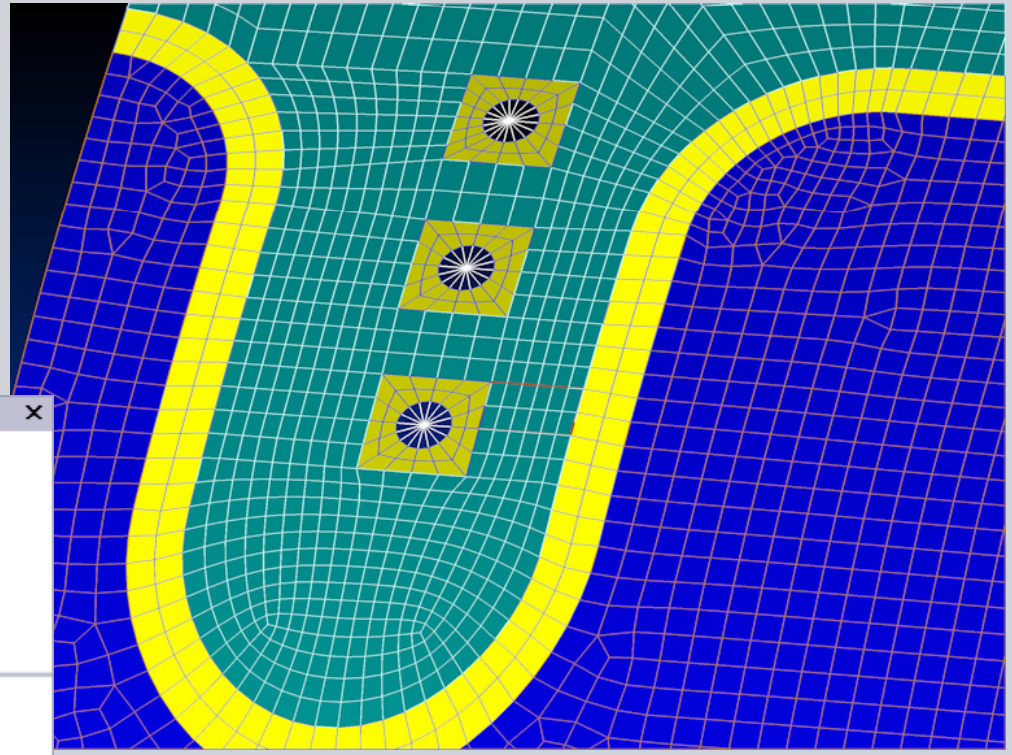
Geometry Editing Toolbox

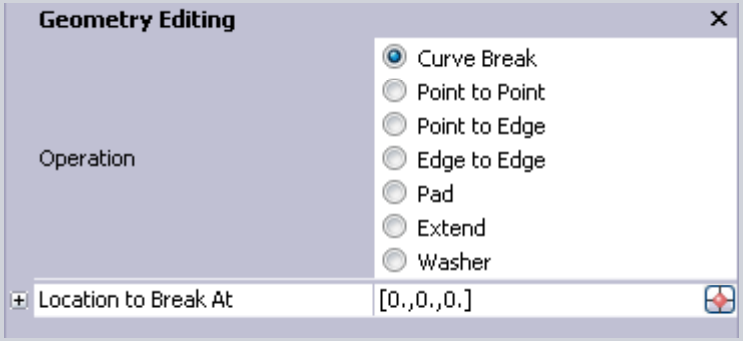
- Point to Point
- Point to Edge
- Edge to Edge
- Pad
- Washer
- Extend Surface



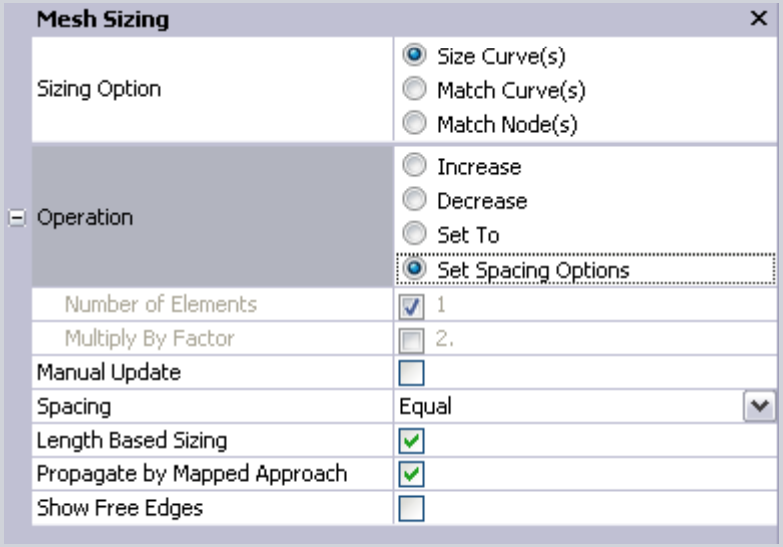


Meshing Toolbox

Geometry Editing
- Curve Break



Mesh Sizing toolbox additions
- Match nodes
- Match multi-curves
- Increase or decrease node count by factor in addition to a number



Meshing Toolbox
Feature Editing

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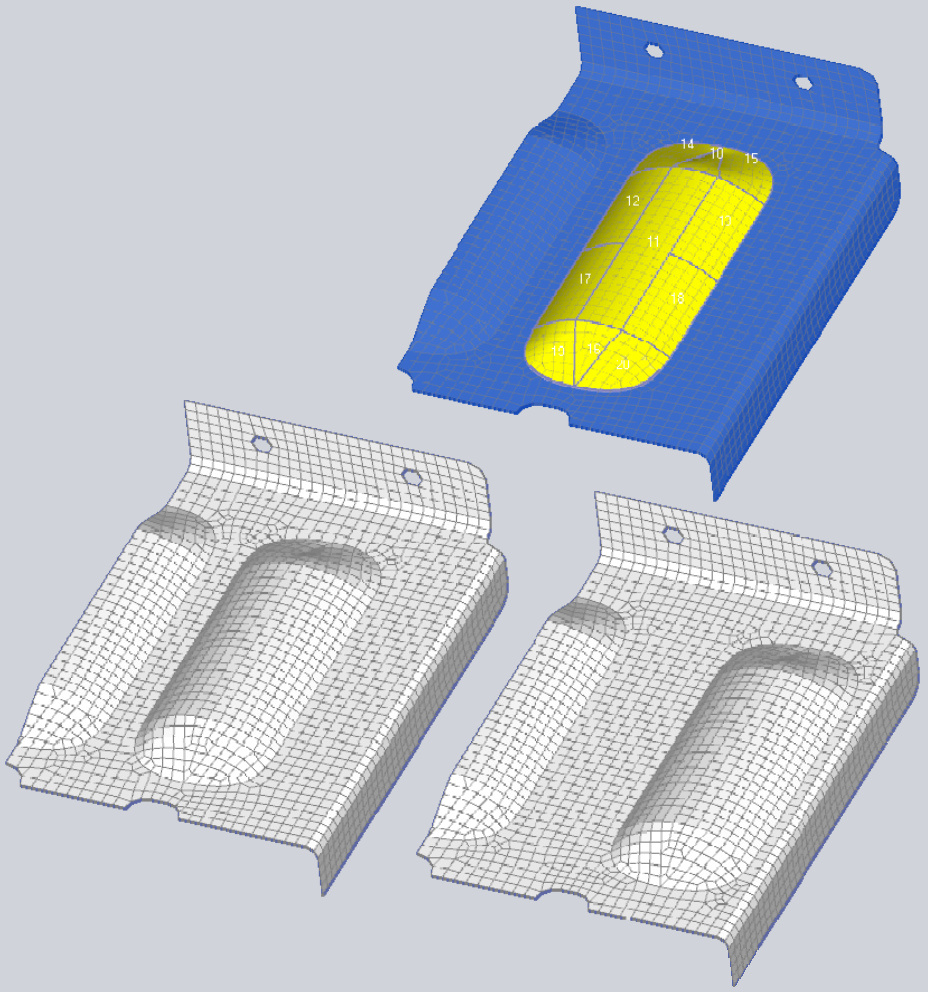
Move and Rotate Surfaces to update Geometry and Mesh

- Selected Surfaces can be moved or rotated
- Mesh is updated automatically
- Overall topology must be maintained
- In this example, a group of 9 surfaces is translated

- Note – this is not Synchronous Technology – user chooses the surfaces to be moved



Meshing Toolbox
Feature Editing

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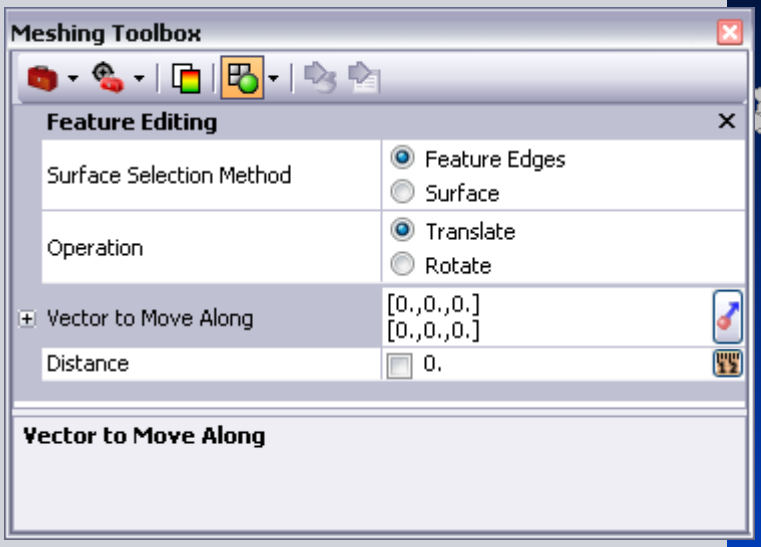
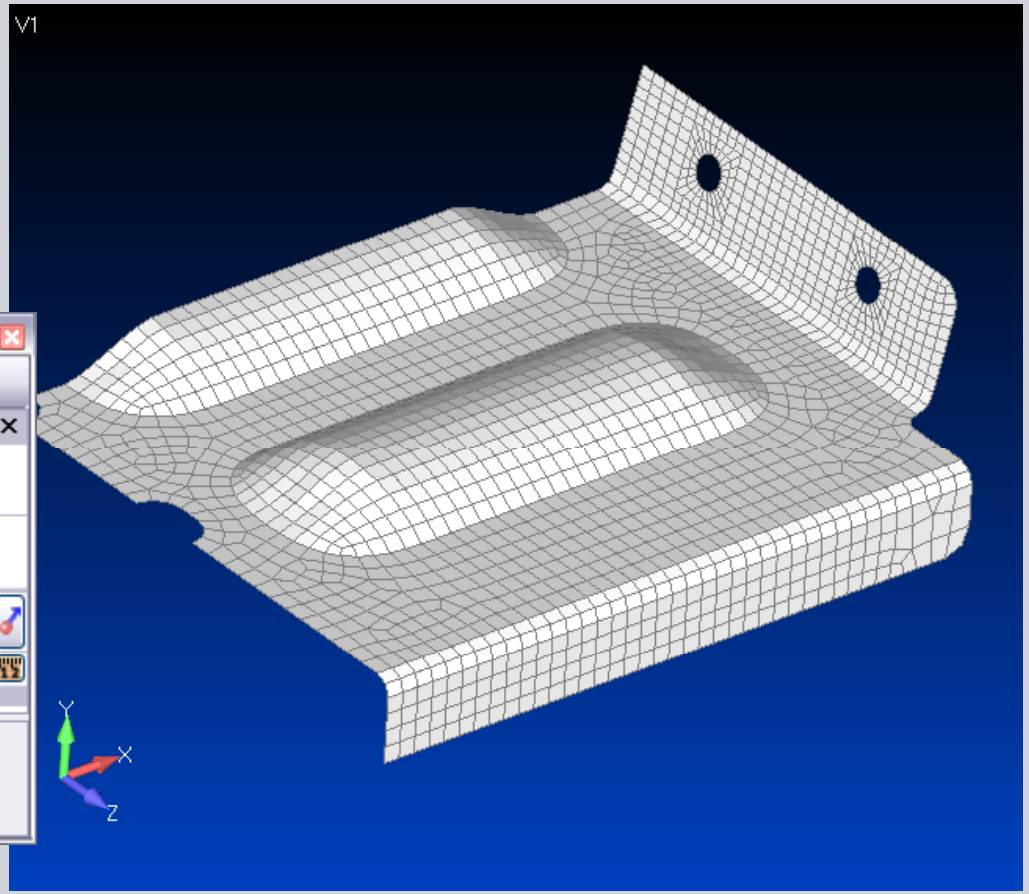
On the same model:

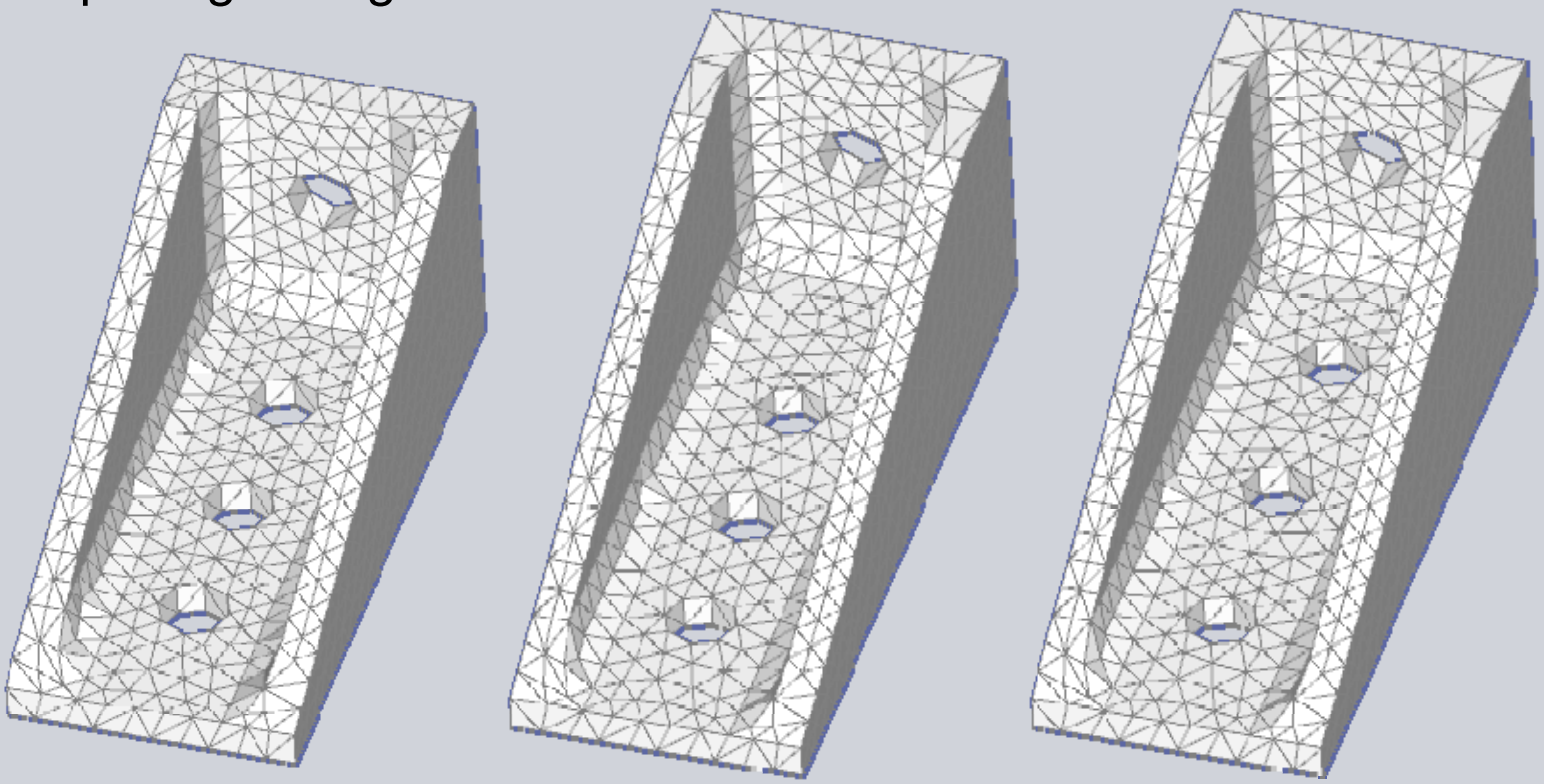
- One flange is translated
- The other flange is rotated through15 degrees





Solids example

- Part stretched
- Hole spacing changed



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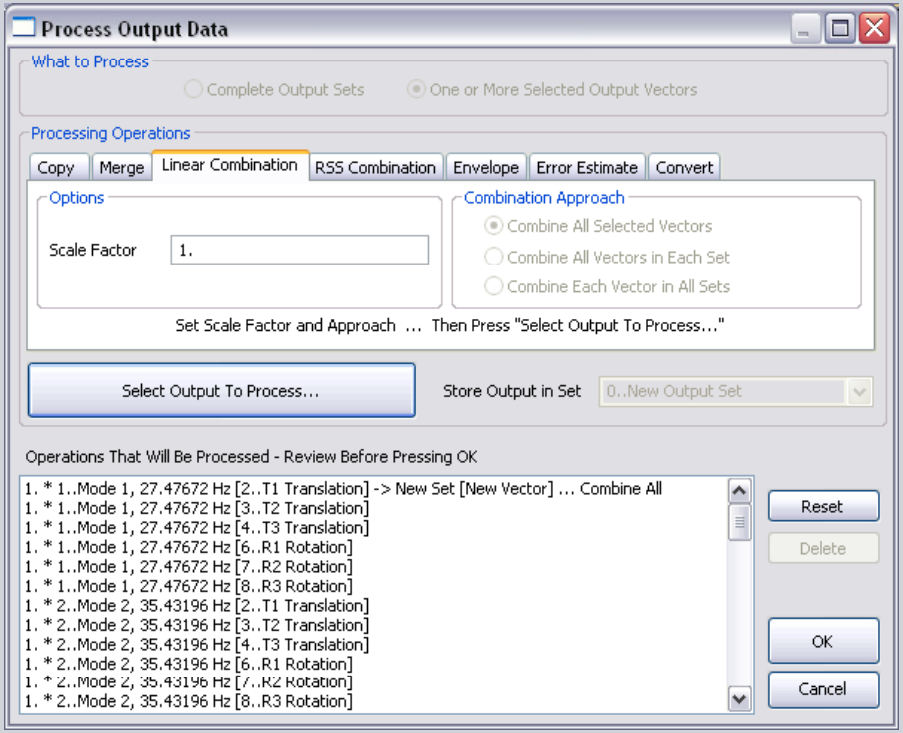
Processing of Output Data

Complete overhaul of the Output Processing Function

- New user-interface
- Expanded options
- Significant performance improvement

- Considerable speed increase in Model – Output – Process
  - up to 100x faster
- New Model Output Delete functionality
- Algorithm improvement with Undo
- Instantaneous without Undo



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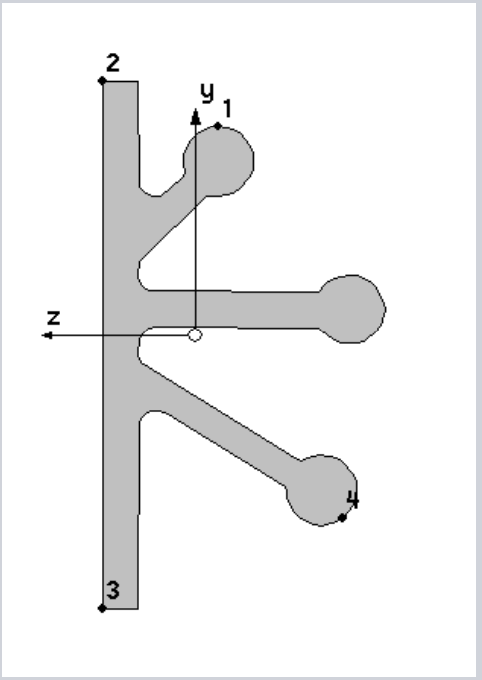
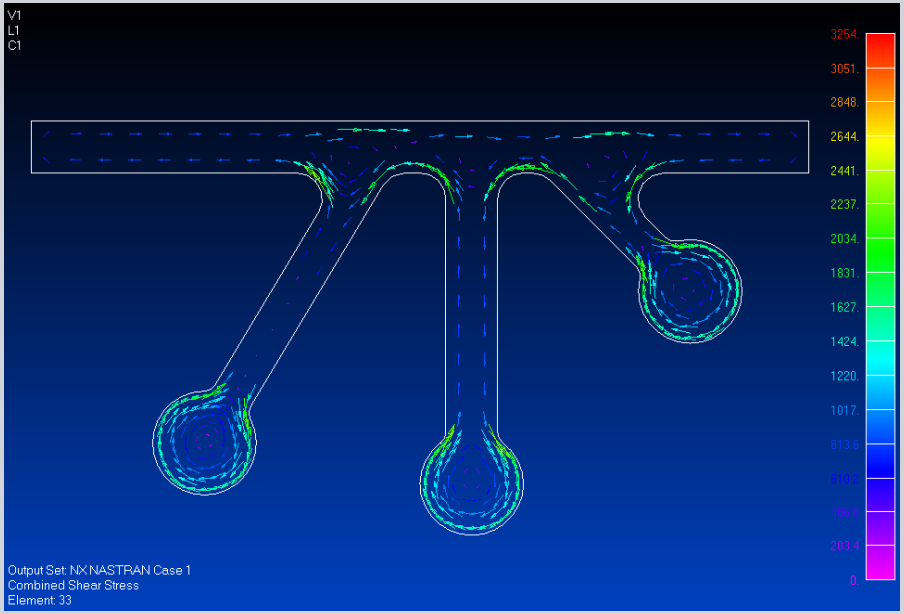
Beam Postprocessing

- Nastran provides four stress recovery locations – fully configurable in Femap
- Drawback, the highest stress, as well as details about shear distribution, cannot be readily determined or visualized and the points must be defined ahead of the analysis





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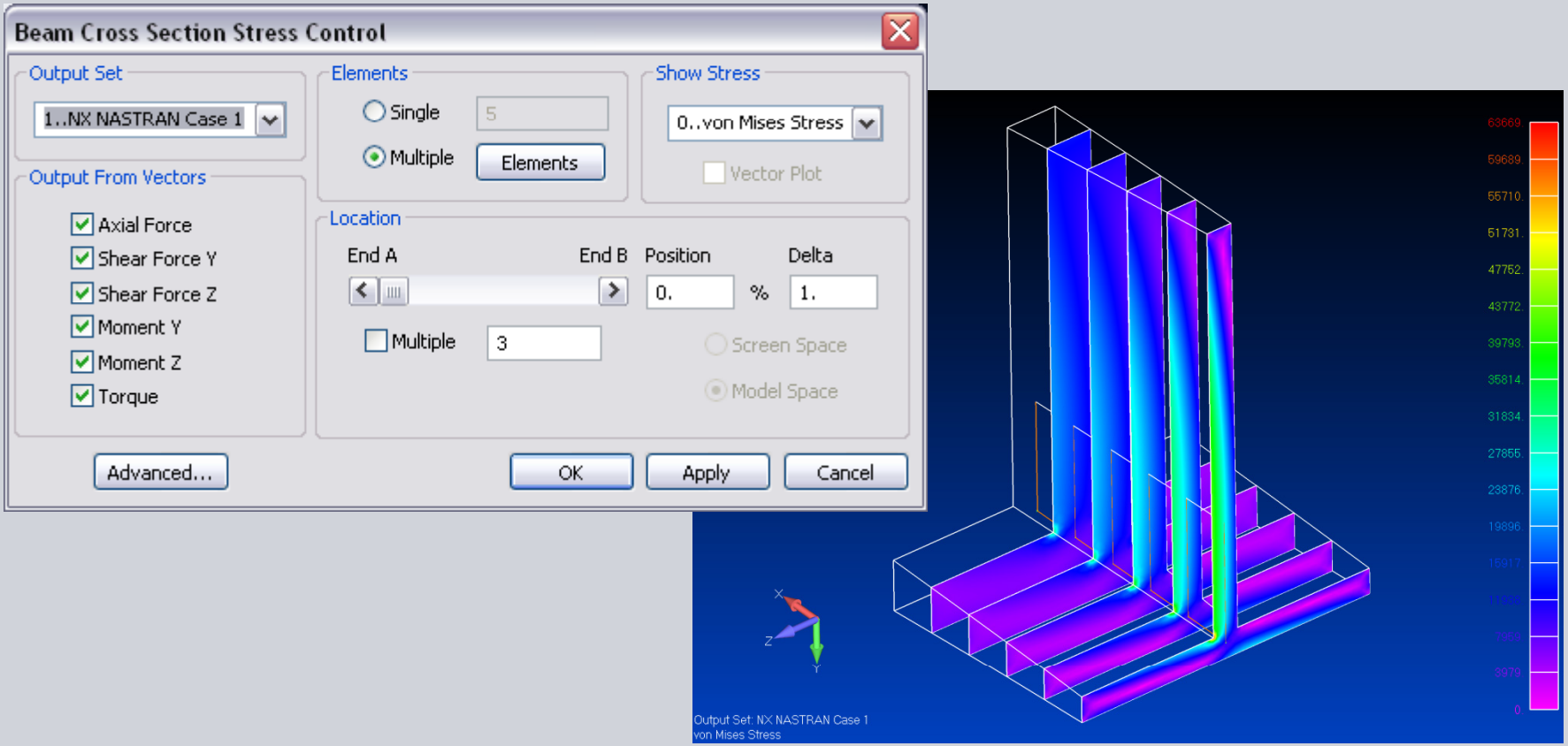
Beam Postprocessing

Using forces recovered from any FEA solver – axial, shear, bending



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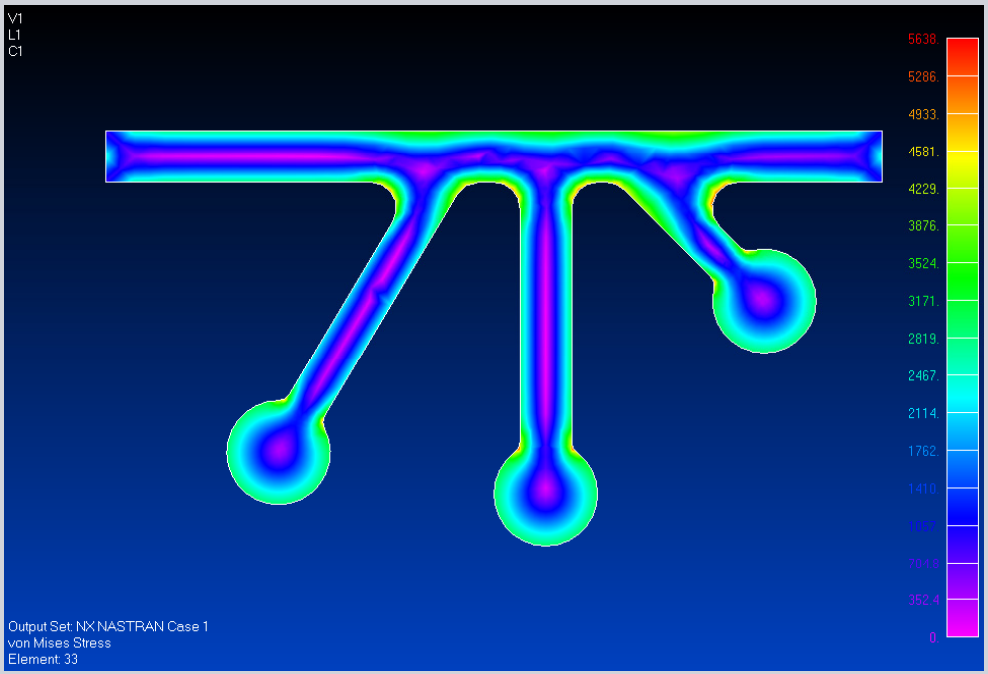
Beam Postprocessing

Beam postprocessing flexibility

- Calculate stresses such as von Mises
- Visualize complete distribution of stress
- Visualize shear flows
- Analyst control over force components used to calculate stress, i.e. visualize stresses due to axial loading only, bending only, shear only, etc.



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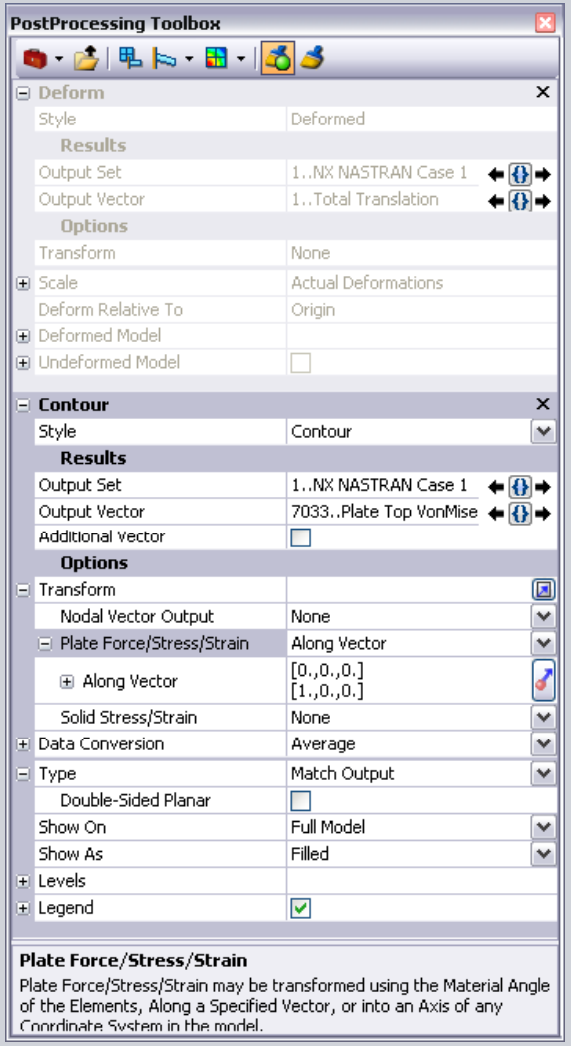
Postprocessing Toolbox

Consolidated access to the most popular postprocessing View Options in a single Femap toolbox

- Quickly change postprocessing options interactively
- Reduce training and learning time by providing high-level, highly visible access to detailed postprocessing options



Topology Optimization

Femap with NX Nastran Add-On Module

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Add-on module on top of Femap with NX Nastran

- Mass reduction
- Maximize and tunes stiffness
- Minimize weight
- Based on TOSCA Structure by FE DESIGN, Germany

Topology Optimization
Torque Link Example

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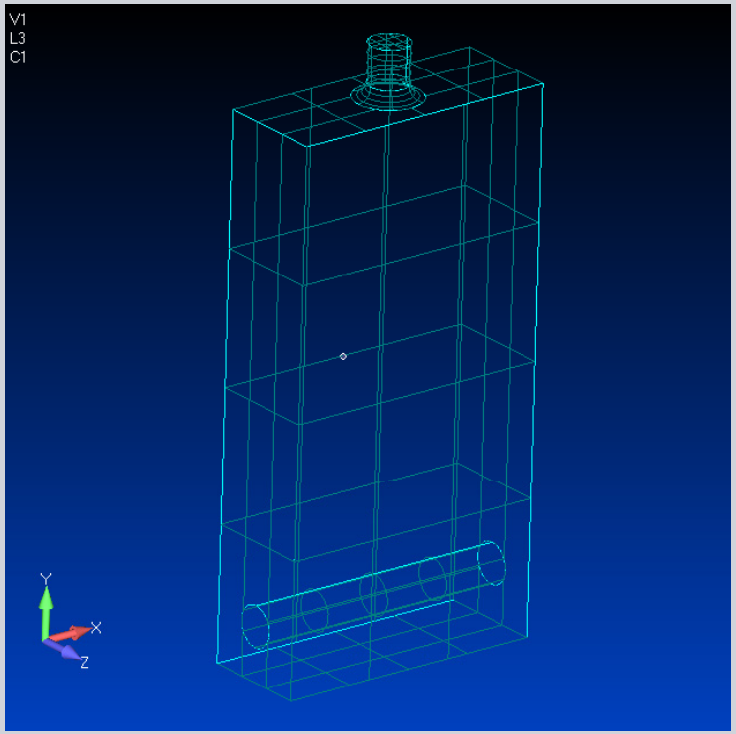
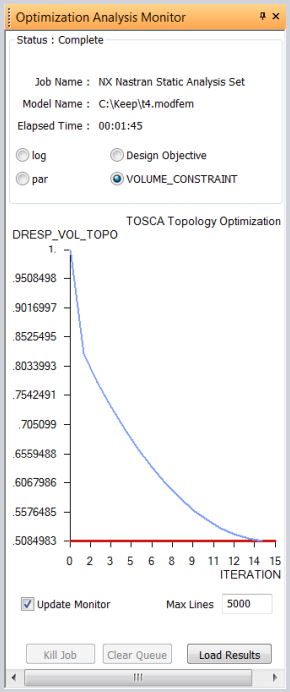
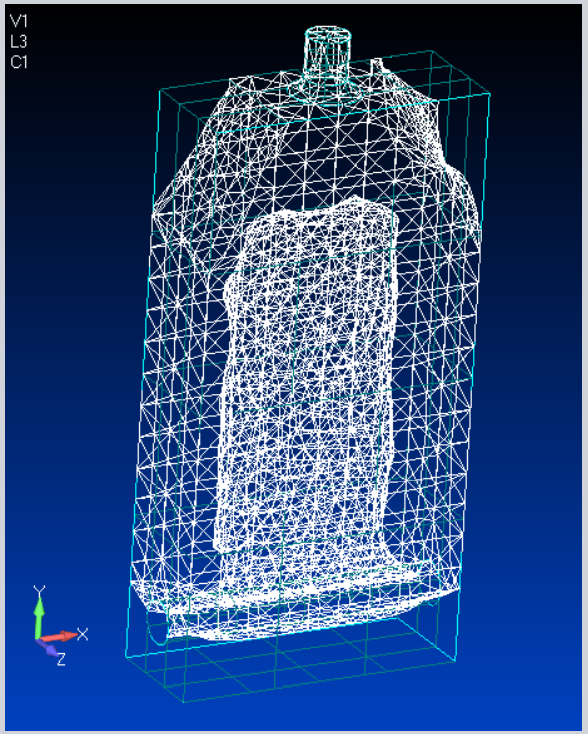
Basic geometry run through topology optimization. Axial Loading, +/-Y Torque Loading







Topology Optimization
Torque Link Example

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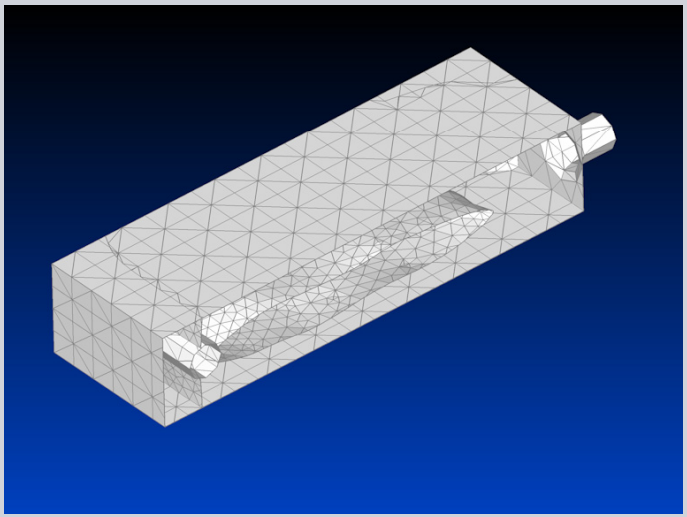
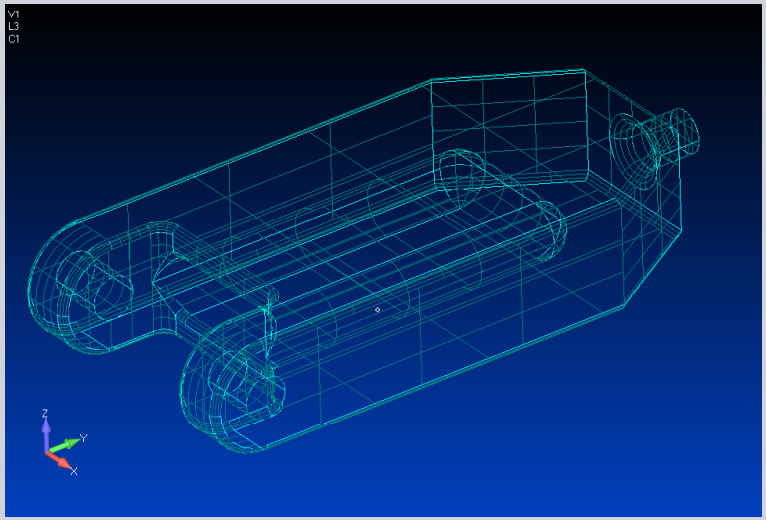
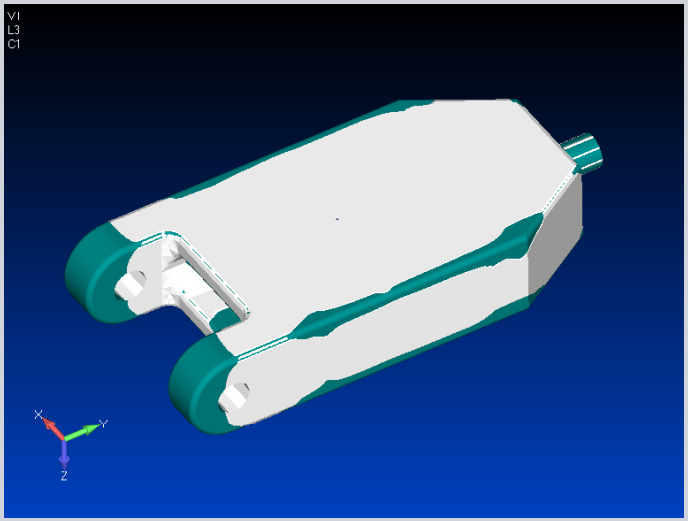
Using this information, the design is updated as shown

- Initial Weight: 27.8 pounds
- First Pass: 18.5 pounds
- Another run on the optimized design shows where some more material can still be removed







NX Nastran 7.1

Edge to Face Glue

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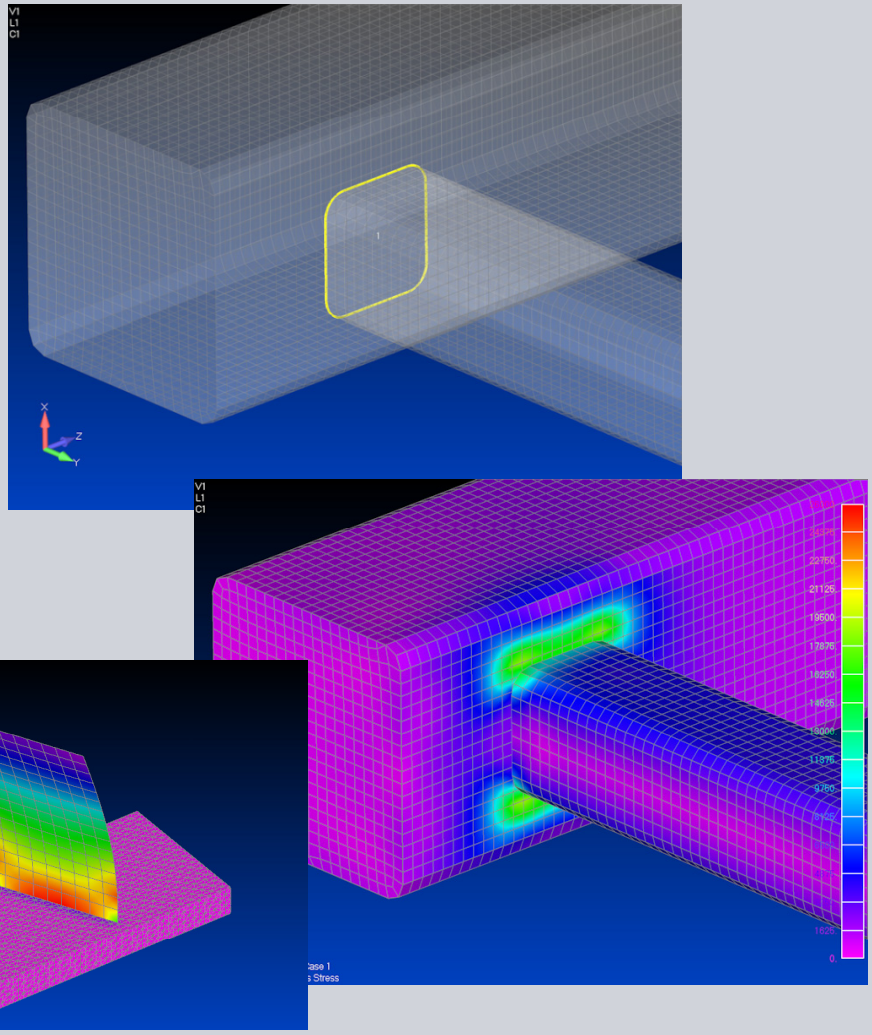
Edge to Face Glued Connection

- Connect edges of shells to faces of other shells or solid models
- Auto Connection and Setup just like solid connections in Femap
- Stiffness of the connection can be tuned for dynamic model correlation
- Handles moment transfer between shell and solid elements



NX Nastran 7.1

Bolt Preload with Contact Performance

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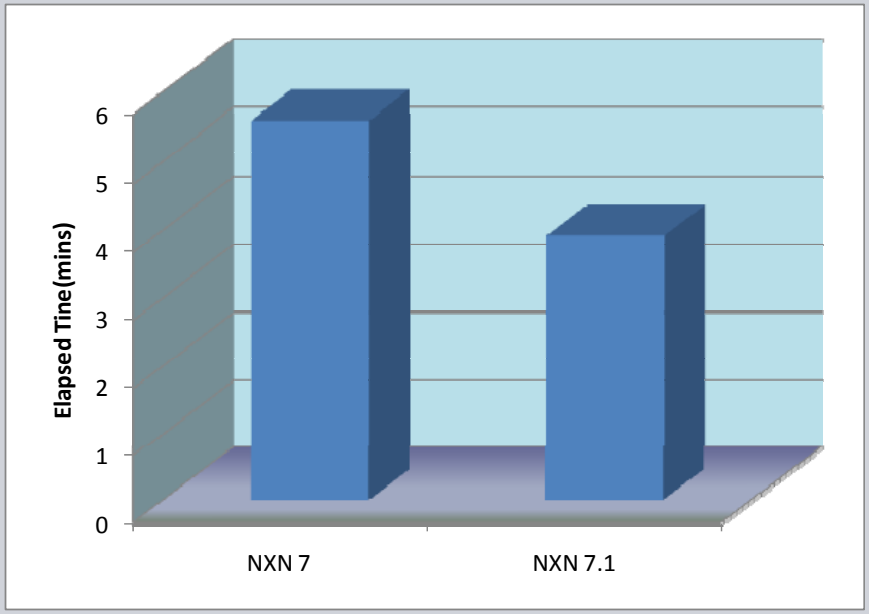
Bolt preload with contact performance improvement

- Bolt preload solution steps:
  1. Solve for strains from preload
  2. Solve for applied load + preload strains
- Previously, if contact present both steps started with all elements in contact
- Now step 2 starts with elements in contact at the end of step 1 – bolt preload converges much faster



NX Nastran 7.1

Connectivity Improvements

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Glued contact definition by property ID

- Solid element glued contact regions can now be defined by property ID
- More flexible contact region creation

Performance improvement

- Models with a large number of contact and/or glued faces run more efficiently

Contact support for linear buckling

- Contact now extends to buckling solutions
- Expanded range of buckling solutions

Orthotropic materials for solids

- New material property for solid elements – MAT11 & MATT11
- More flexibility for defining orthotropic materials

Solid element support in SOL 106 nonlinear solution sequence

- Penta and Hexa large displacement effects (Tetra already supported)
- Previously treated as small displacements

Report best design

- Best optimized design is usually, but not always, the last iteration
- New messaging in F06 identifies the best design

Optimum solution bulk model data export

- Complete bulk data model file with updated design variables exported to the punch file

New elements in Advanced Nonlinear

- Plane stress elements
  - CPLSTS3, CPLSTS4, CPLSTS6 connectivity entries
  - PPLANE property entry
- Plane strain elements
  - CPLSTN3, CPLSTN4, CPLSTN6 connectivity entries
  - PPLANE property entry
- 2D edge-to-edge contact

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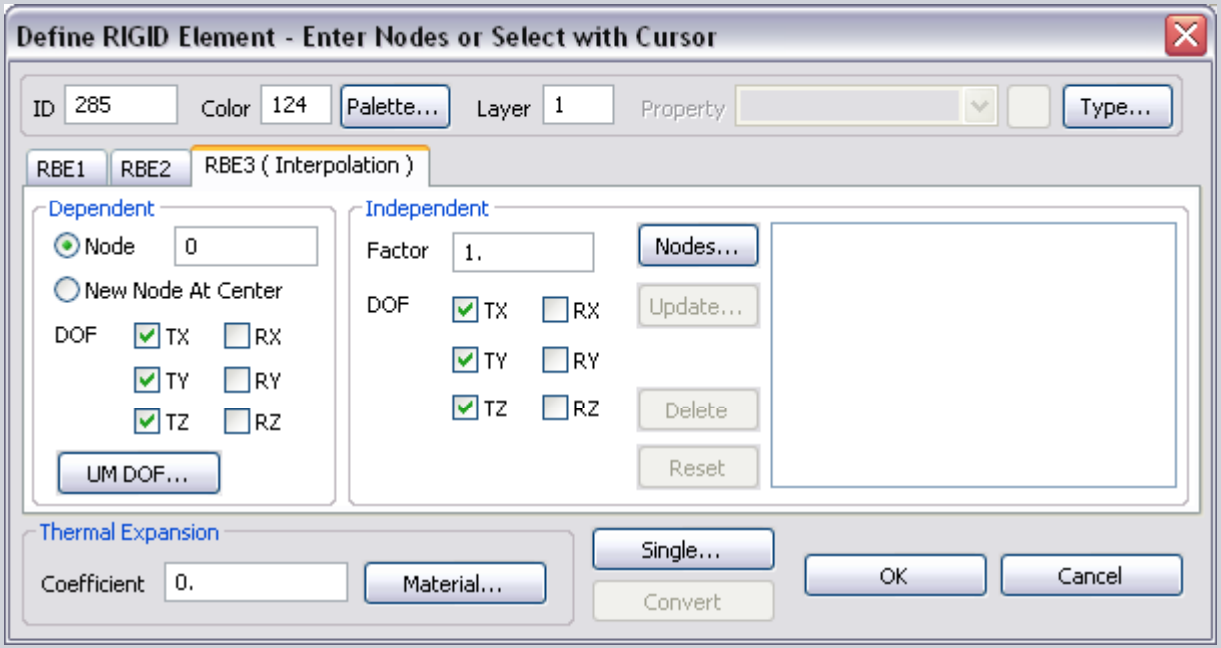
General NASTRAN Enhancements

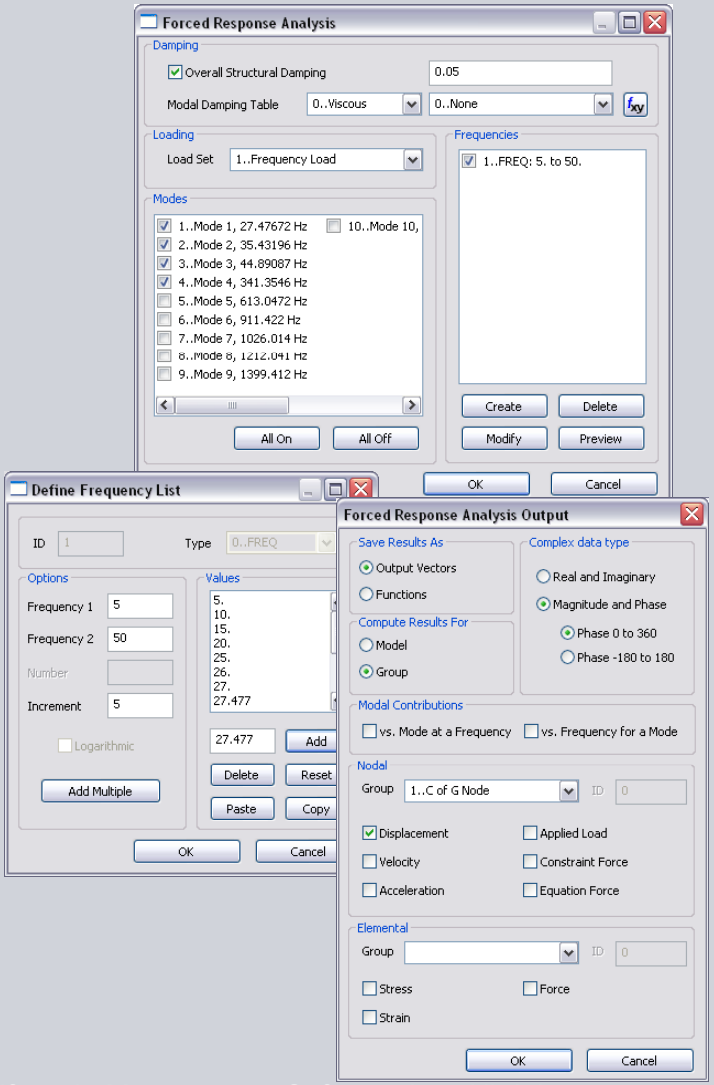
- Added read support for GROUNDCHECK, WEIGHTCHECK
- Added support for reading FREQ1, FREQ2, FREQ3, FREQ4 cards
- Added r/w support for RBE1
- Added support for RBE3 UM DOF



Femap Forced Frequency Response Analysis

- Fast, easy to use, interactive frequency response analysis right inside Femap

- Run a modal analysis using any solver and recover mode shapes, stresses, etc.
- Apply load and load function
  - Nodal and elemental loads
- Specify output area of interest
  - Group of entities or whole model
- Specify modes of interest to be included in analysis
- Specify frequency range of interest
- Submit analysis – Femap calculates sinusoidal response to forces, moments, and elemental pressure loads directly



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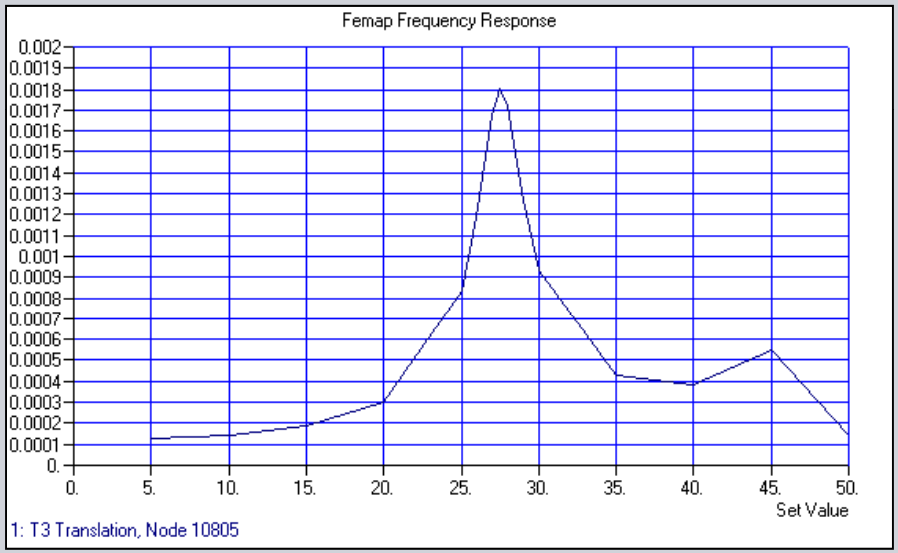
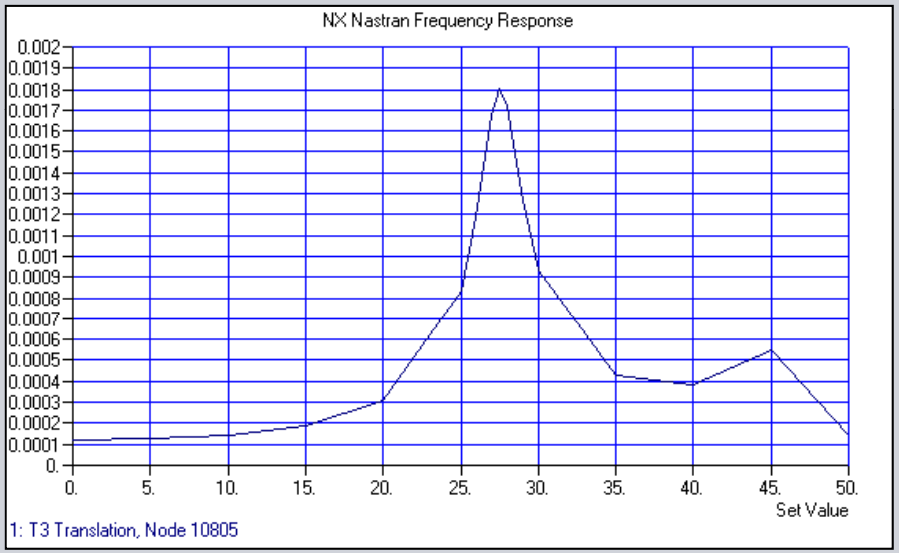
Femap Forced Frequency Response Analysis

Frequency response analysis calculated by Femap



Frequency response analysis calculated by NX Nastran



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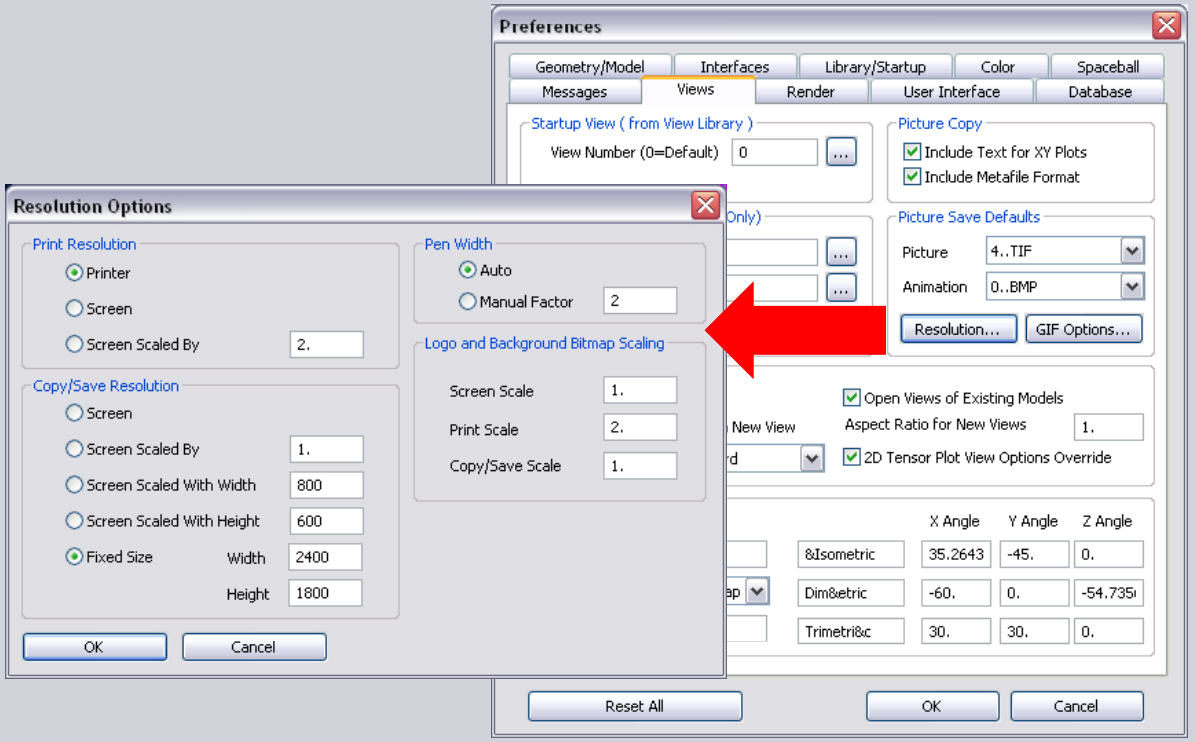
Graphical Output

More control over Femap graphics screen capture image allows much higher image resolution and greatly improved picture quality

- Printing can now query the printer and send a full resolution image
- Copying / Saving you can specify the required resolution or scale



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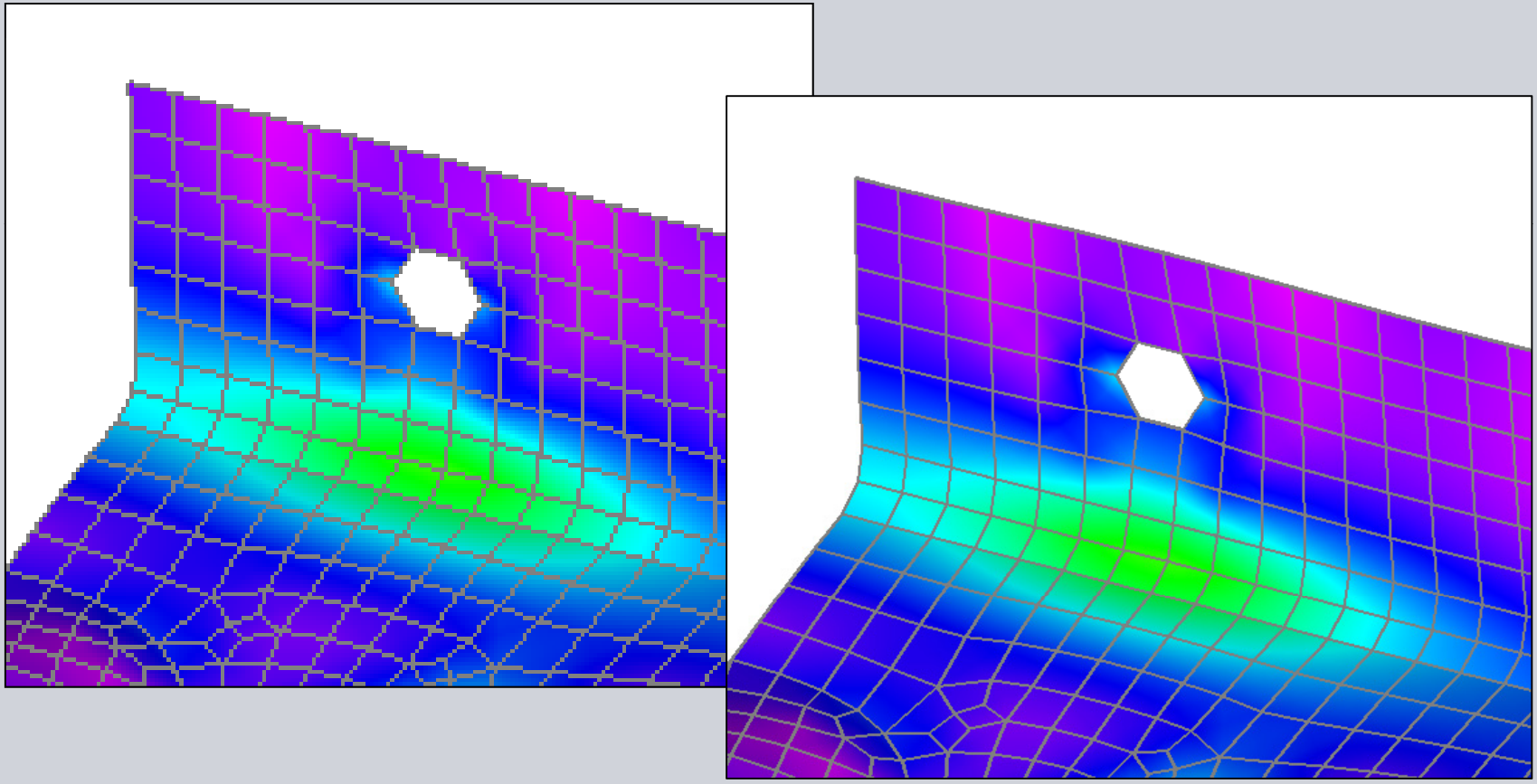
Graphical Output



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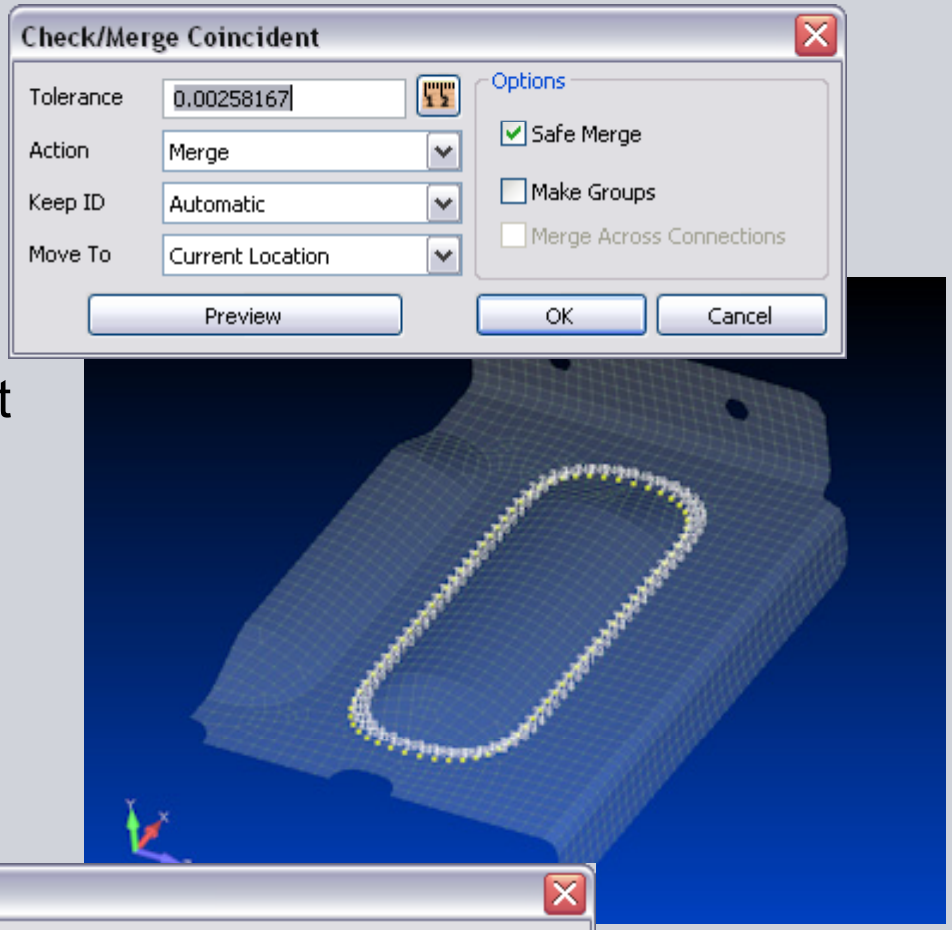
Updated Node Merge

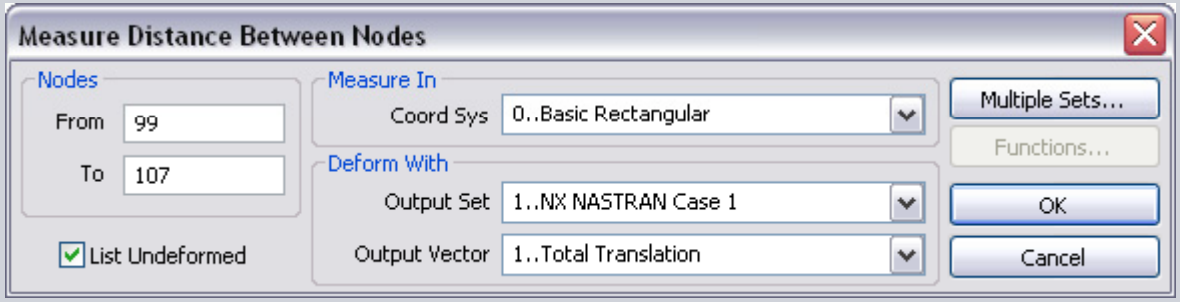
- Simplified User Interface
- Options for Merged Node Location (at Lower ID, at Higher ID, at MidPoint) or original location
- Prevents Over-Merging/Element Corruption with Large Merge Tolerances
- Preview now Interactive, can change tolerance and preview again
- Simplified Listing

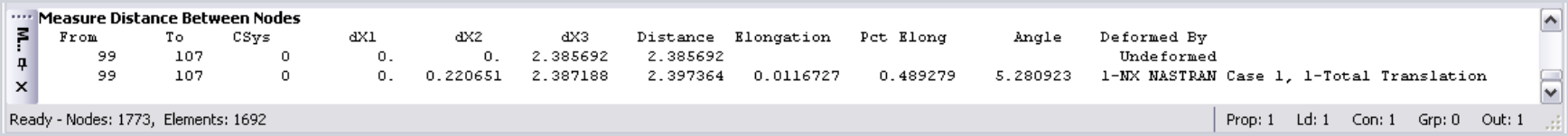


New Distance Measuring Tools

Measure distances between nodes in your FEA model

- User Selected Coordinate System
- Includes the effects of deformation





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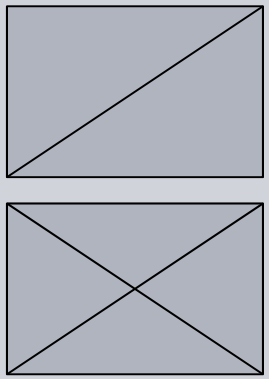
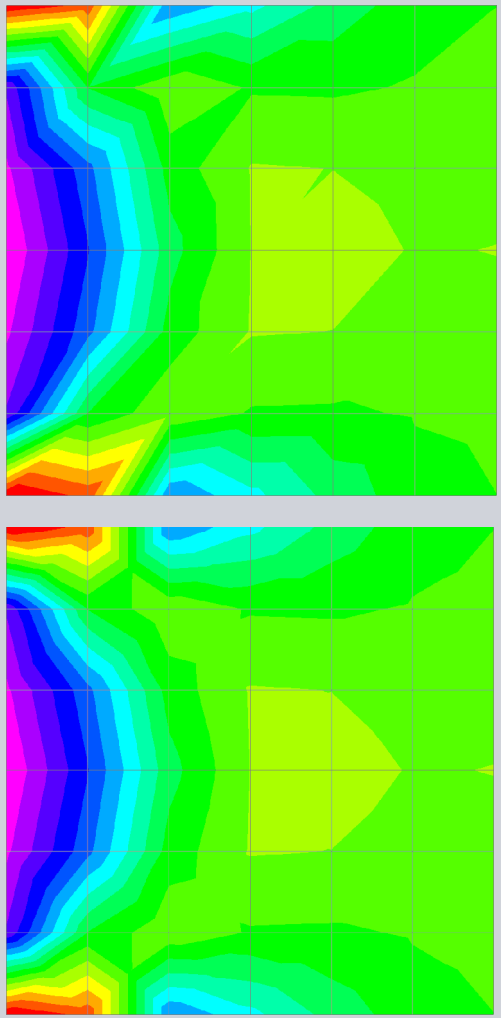
New Contour Algorithm

- Previously quad elements were split into two triangles for contouring
  - Symmetry not guaranteed and dependent on the way quads are split
- New algorithm splits quads into four triangles
  - Higher quality contour plot that assures symmetry





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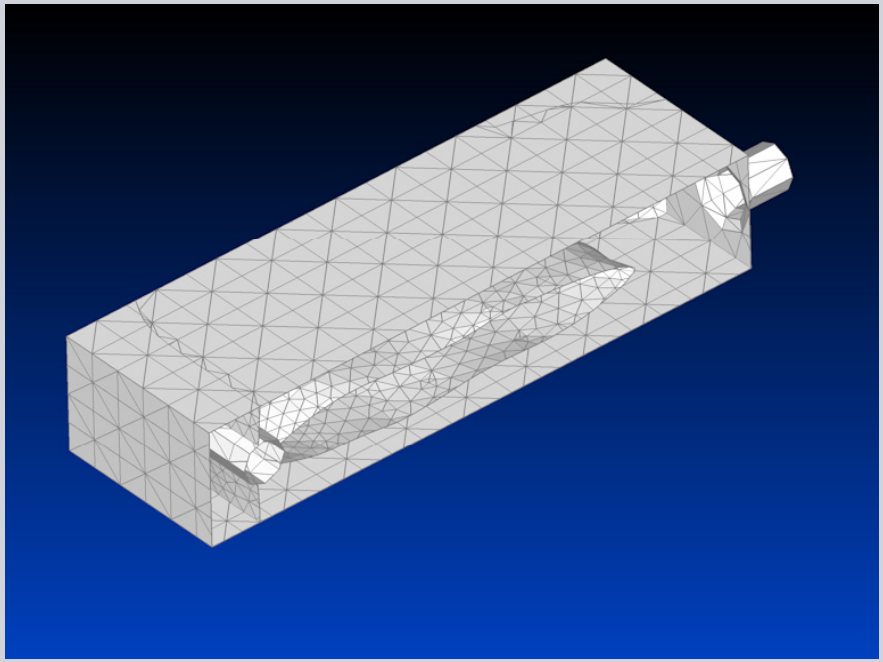
Quick Model Clipping Plane

- Geometry or FEA model can be clipped using OpenGL
- Dynamic control (Alt-Mouse Wheel)
- Change side (+/-)
- Standard Femap Plane dialog box



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Thermal and Flow Solver Updates

- Consistent model unit systems
  - Model Units Standard option defines the unit system that applies consistent units for all unit types
  - Nine unit systems are available based on SI or Imperial units
- New flow results
  - Acoustic power density: acoustic noise generated by the simulated turbulent flow
  - Vorticity: vector data equal to the curl (rotor) of the velocity field
- Satellite-sun/planet vector display
  - Satellite-sun and satellite-planet vectors are now displayed in the Orbit Visualizer as well as the spacecraft triad

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Q and A