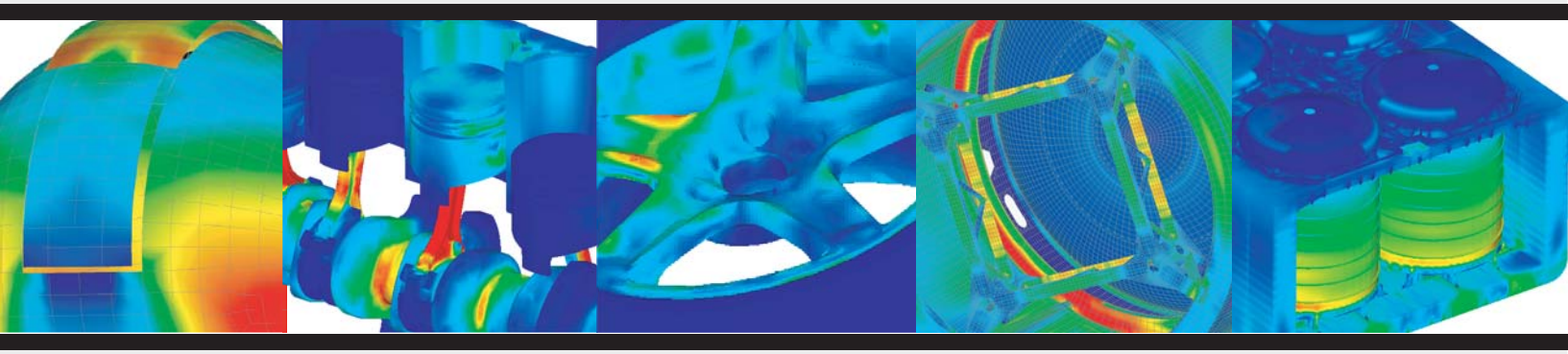
NEiFusion



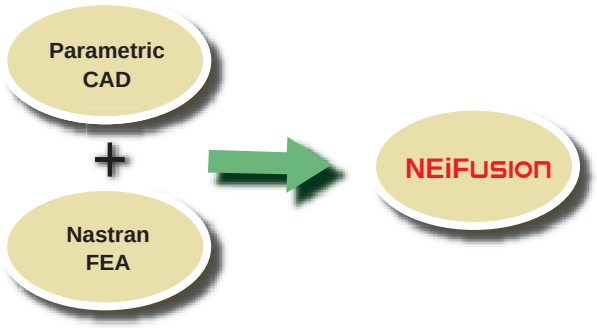
A fusion of Nastran FEA with the best in class 3D solid parametric modeler

NEi Nastran
Innovators in CAE Technology

NEiFusion: Parametric Modeling + Nastran FEA

NEiFusion

A New Approach to Analysis & Simulation



NEiFusion represents a new approach to engineering analysis and simulation software. NEiFusion joins two powerful technologies --3D feature based, parametric CAD for model creation, and high accuracy, industry proven Nastran solvers for solution generation. This combination provides a modeling environment that is familiar and user friendly to your entire product development team and gives professional level results acceptable to the community of Nastran analysts as well as your customers, vendors, and design partners. NEiFusion combines a parametric FEA Modeler, comprehensive pre and post processing capabilities, and Nastran solvers to create an analysis package for small and medium size companies, consultants, and any engineer who needs affordable, professional level simulation for product development, virtual testing, design validation, and quality assurance. NEiFusion can virtually test parts for a wide range of static and dynamic structural and thermal conditions quickly in a CAD environment that is friendly to changes and exploring design alternatives. The combination of parametric CAD and Nastran is a first in the industry and at its precedent setting price point will enable wide use throughout your organization. In addition, NEiFusion includes a comprehensive suite of features for evaluation, presentation, and reporting of simulation results and the Nastran foundation insures you will have a continuous consistent migration path to higher end analysis if needed.

Can You Afford To Omit Simulation from Your Development Process?

Why wait until prototypes are built, expensive test fixtures developed or actual field usage to find out how your design will perform? NEiFusion lets you apply forces, pressure, thermal conditions, temperature, vibration, and impact loads and more. You see the deformation, stresses, strains, heat transfer, and modal shapes that your design will experience. Through a variety of highly visual images, contour plots, animations, graphs, and output data, you get the engineering insight you need to innovate and optimize, so you can achieve the best quality, lowest manufacturing costs, and fastest time to market in today's hyper competitive global marketplace.

NEiFusion-- Ease in Exploring Design Alternatives, Confidence in Results

NEiFusion combines an FEA Modeler, comprehensive pre and post processing capabilities, and Nastran solvers to create an analysis package for small and medium size companies, consultants, and any engineer who needs affordable, professional level simulation for product development, virtual testing, design validation, and quality assurance. Parts and assemblies can be analyzed for a wide spectrum of static and dynamic structural and thermal loading.

NEiFusion Modeler. The NEiFusion Modeler is built on an industry proven, Windows based, fully associative, parameterized, feature based, solid modeling engine that provides a full set of advanced and powerful tools for fast, easy, intuitive, and robust model creation. A wide range of CAD data import capabilities complements the 3D modeling tools to help you build your models quickly when existing CAD files are available.

NEiFusion Pre Processor. A comprehensive element library, sophisticated meshing capabilities, and extensive material library insure you get real world fidelity and professional level simulation.

NEiFusion Nastran Solvers. NEiFusion employs the same industry regarded NEiNastran Solvers found in all of our analysis products. That means you can expect solutions that are accurate, precise, and reliable. Nastran assures that you achieve the best possible real world representation along with extremely fast turn around time on solutions.

NEiFusion Post Processor. NEiFusion post processing not only provides a wide variety images, graphs and data by which to view your simulation results but also is equipped with wide file sharing and import/export capabilities so you can easily share your FEA models and results with vendors, design partners, suppliers, customers, and other segments of your organization - an important consideration in today's highly collaborative work environment.

NEiFusion

General Capabilities
- Full single-window integration between solid modeling and analysis
- Direct use of CAD geometry for analysis
- Direct application of analysis input data to CAD geometry
- 3D visualization of analysis results on original CAD geometry
- FeatureManager™ for geometry, analysis and result visualization data
- Customizable analysis tree
- Dynamic editing of all geometric and analysis features
- Powerful configuration management for easy “what if”design variations (geometrical and physical)
- Comprehensive support for bi-directional CAD data exchange with most major CAD packages
- Comprehensive, context-sensitive HTML-based help system and tutorials

CAD Interoperability
- Native file translators to and from nearly all mechanical CAD products on the market today: Pro/ENGINEER®, IPT (Autodesk Inventor®), Mechanical Desktop®, Unigraphics®, PAR (Solid Edge®), CADKEY®, IGES, STEP, Parasolid®, SAT (ACIS®), VDA-FS, VRML, STL, DWG, DXF™, TIFF, JPG, Viewpoint, RealityWave, HSF (Hoops)
- Supported standards: ANSI, DIN, ISO,GOSJIS, GB and BSI

Part Modeling
- Feature based, fully associative, parameterized solid modeling
- FeatureManager™ dynamic design tree (e.g. re-order, drag & drop, etc.)
- Integrated sketching (dynamic referencing)
- Extrudes, revolves, feature patterns, holes, etc.
- Advanced 3D operations, e.g. lofting, sweeping, complex blending, filleting, etc.
- Advanced shelling, midsurfaces
- Multi-body support
- Advanced surface modeling: lofts and sweeps with guide curves, fill-in holes, drag-handles for tangency control, etc.
- Trimming, extending, filleting, and knitting surfaces
- Translating, rotating, copying, and mirroring surfaces
- Support for creating 3D models from existing 2D data, e.g. 2D-to-3D extrusion, etc.
- Multiple design variations with Configuration Management, DesignTables

Assembly Modeling
- Fully associative: referencing of other parts and maintaining relationships when creating new parts
- Complete range of mating conditions, snap-to-fit SmartMates™
- Locating conflicting mate relationships with Mate Diagnostics
- Dynamic assembly visualization
- Real-time previewing of components, parts
- Easy designing and changing of parts and subassemblies from within an assembly
- Mirrored components to create new parts and assemblies based on existing designs
- Multiple assembly design variations with Configuration Management for easy “what if” design scenarios

Meshing
- Global and local controls for part geometry with default sizing
- Mesh control on arbitrary user defined regions
- Free surface meshing: quads or triangles
- Auto mesh, loads and constraints update with geometry changes
- Mesher Status Window

Element Library
- 3D solid: tetrahedron both linear or parabolic
- 2D shell: quadrilateral and triangular plates, membranes using faces of solids
- Rigid elements

Loads and Boundary Conditions
- Uniform pressure and force on faces, edges and vertices
- Directional and non-uniform pressure and force
- Acceleration loads
- Enforced displacement and rotations
- Temperature, default temperature and heat flux
- Symmetric, antisymmetric, axisymmetric, cyclic symmetric boundary conditions
- Fixed constraints on faces, edges and vertices
- Directional and prescribed constraints
- Thermal constraints

Material Types
- Isotropic
- Orthotropic
- Nonlinear materials
  - Nonlinear elastic
  - Elasto-plastic
  - Plastic
- Hardening
  - Isotropic
  - Kinematic
  - Combined
- Yield
  - Von Mises
  - Tresca
  - Mohr-Coulomb
  - Drucker-Prager
- Custom stress-strain data

Material Orientation
- Vector projection
- Curve tangent
- Rotated curve tangent
- Translated curve tangent
- Surface U and V directions

Surface Contact
- Automatic mate dependent contact pair generation
- Free and welded contact types
- Static friction

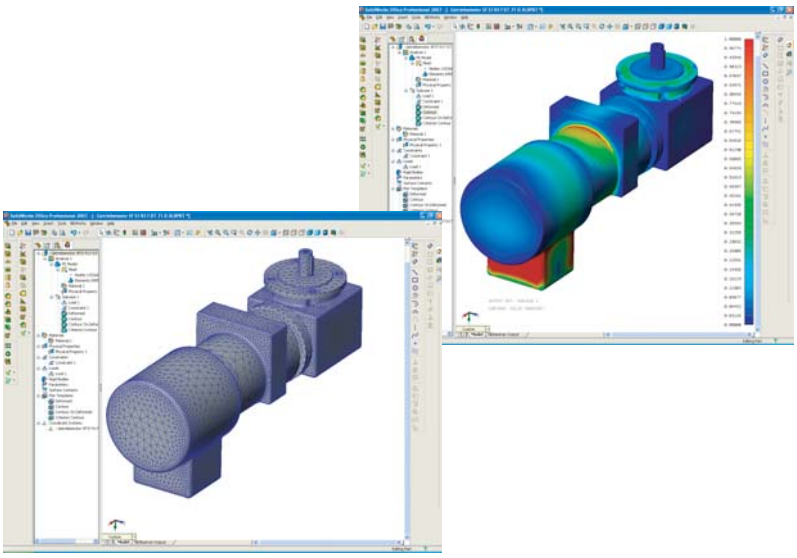
Coordinate Systems
- Cartesian, cylindrical and spherical coordinate systems
- Referencing global assembly, part or custom coordinate systems for loads and constraints

Post-Processing
- Stress, deformation plots
- Principal and directional stress plot
- Strain plot
- Resonant frequencies, mode shape plots
- Temperature, heat flux plots
- Iso-surfaces
- Results across composite laminates
- Export Nastran input deck to other FEA systems
- Customizable material library

Graphics
- OpenGL graphics taking advantage of the latest Computer Graphics chips
- 3D dynamic pan, zoom and rotation
- Hidden line and wireframe display
- Light source shading and transparency

Compatibilities
- Nastran input file can be sent to any Nastran FE Solver including NEiNastran, NX Nastran, or MSC.Nastran.
- Binary results file in OP2 format usable by all Nastran solvers and wide variety of post-processors

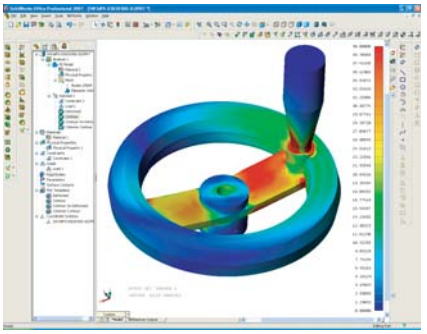
Language Support
- English, Japanese, Italian, French, others upon request



NEiFusion Designer Configuration

NEiFusion Designer

The Designer Configuration is the lowest price option for any NEiFusion software package. The low price is achieved by coupling the NEiFusion Modeler and your choice of either NEiNastran Basic Solver package or Expert Solver package so that they must be used together, that is, the NEiNastran solvers cannot be used with any other pre or post processors. If wider level analysis capabilities are ever needed, an upgrade option exists that enables conversion to the Analyst Configuration for unrestricted use of NEiNastran Solver capabilities with other pre/posts.



NEiFusion Designer Configuration comes with the choice of Basic or Expert solver packages

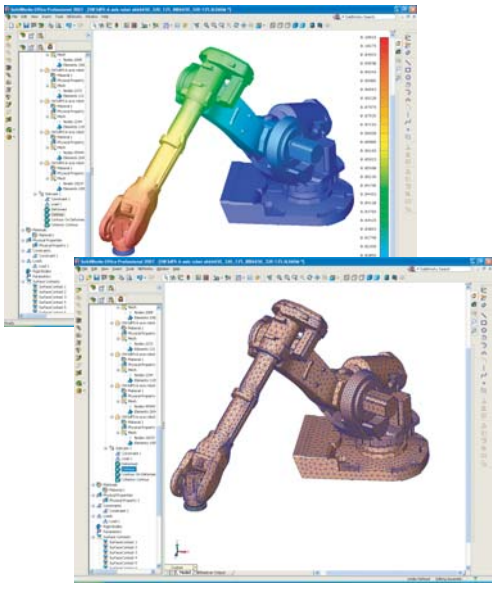
Basic. The Basic Solver suite is built on NEiNastran Solver Engines NE-L1 and NE-L2. Product Datasheets for each of these modules contains a full description. The Basic package provides analysis and simulation of Linear Statics, Modal Analysis, Buckling, Prestress, and Steady State Heat Transfer problems.

- NE-L1 (Linear Static, Steady State Heat Transfer)
- NE-L2 (Modal, Buckling, Prestress)

Expert. The Expert Solver suite is built on NEiNastran Solver Engines NE-L1, NE-L2, NE-L3, NE-L4 and NE-L5. Product Datasheets for each of these modules contains a full description. The Expert package includes all items in the Basic package and adds Advanced Dynamics, Nonlinear Analysis, and Transient Heat Transfer.

- NE-L1 (Linear Static, Steady State Heat Transfer)
- NE-L2 (Modal, Buckling, Prestress)
- NE-L3 (Advanced Dynamics) *
- NE-L4 (Nonlinear Analysis)
- NE-L5 (Nonlinear Transient Heat Transfer) *

*Currently applicable through the Editor in the Analyst version. It will be fully added in NEiFusion V2.0.



NEiNastran Basic Solver Package: Linear Statics, Modal, Buckling, Prestress and Heat Transfer

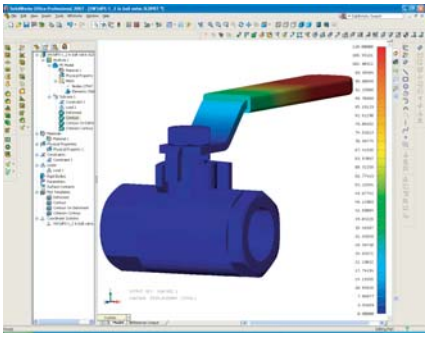
One of the most common types of analysis needed by design engineers is linear static analysis. By far, linear static structural analysis represents the majority of the analyses performed. NEiFusion Basic makes this type of analysis easy. Starting with your parametic part, loads and boundary conditions are applied using a series of pull down menus to define the force or pressure on the structure and the direction. Similarly, constraints are defined. The material is then selected from a material library or you can define a material by entering appropriate properties, including orthotropic materials and composites. The part is meshed automatically with provisions for manual control. Results can be displayed in a wide variety of formats from contour plots of stress, strain and displacement, to graphical outputs, tabular data listings, and animations. Context sensitive Help is available to assist you at every step.

In addition to structural analysis, NEiFusion Basic lets you perform heat transfer analysis providing temperature and heat flux plots. Modal analysis is also included which is used to reveal vibrations in structures. See the NEiFusion Product Chart for a complete listing of Analysis Types and Post Processing capabilities of NEiFusion Basic and NEiFusion Expert.

NEiFusion Analyst Configuration

NEiFusion Analyst

The Analyst Configuration delivers the NEiNastran Solvers L1-L5 as independent modules from the NEiFusion Modeler so they are available to work with any other pre/post processor. The Analyst Configuration arrangement is useful in environments where multiple pre/posts may be needed or are in use (e.g. FEMAP, Patran, HyperMesh, ANSA, and others). Also, the Analyst Configuration includes the NEiNastran Editor. The Editor module in NEiNastran enables additional post processing capabilities, model data editing, and access to real time solution data.



NEi Fusion Analyst Configuration comes with the choice of Basic or Expert solver packages

Basic. The Basic Solver suite is built on NEiNastran Solver Engines NE-L1 and NE-L2. Product Datasheets for each of these modules contains a full description. The Basic package provides analysis and simulation of Linear Statics, Modal Analysis, Buckling, Prestress, and Steady State Heat Transfer problems.

- NE-L1 (Linear Static, Steady State Heat Transfer)
- NE-L2 (Modal, Buckling, Prestress)

Expert. The Expert solver suite is built on NEiNastran Solver Engines NE-L1, NE-L2, NE-L3, NE-L4 and NE-L5. Product Datasheets for each of these modules contains a full description. The Expert package includes all items in the Basic package and adds Advanced Dynamics, Nonlinear Analysis, and Transient Heat Transfer.

- NE-L1 (Linear Static, Steady State Heat Transfer)
- NE-L2 (Modal, Buckling, Prestress)
- NE-L3 (Advanced Dynamics) *
- NE-L4 (Nonlinear Analysis)
- NE-L5 (Nonlinear Transient Heat Transfer) *

*Currently applicable through the Editor in the Analyst version. It will be fully added in NEiFusion V2.0.

The Perfect Combination of
Easy-to-Use Parasolids Based Modeler + Industry Preferred Nastran Solvers

NEiFusion Designer

	Basic (L1-L2)	Expert (L1-L5)
Analysis Types		
Linear static	✓	✓
Normal modes	✓	✓
Linear buckling	✓	✓
Nonlinear stress		✓
Nonlinear buckling		✓
Thermal stress	✓	✓
Prestress static	✓	✓
Prestress normal modes	✓	✓
Composites	✓	✓
Contact analysis in assemblies	✓	✓
Linear steady state heat transfer	✓	✓
Loads and Boundary Conditions		
Uniform pressure and force on faces, edges and vertices	✓	✓
Directional pressure and force	✓	✓
Acceleration loads (gravity)	✓	✓
Enforced displacements and rotations	✓	✓
Temperature, default temperature and heat flux	✓	✓
Symmetric, antisymmetric, axisymmetric boundary conditions	✓	✓
Fixed constraints on faces, edges and vertices	✓	✓
Directional and prescribed constraints	✓	✓
Thermal constraints	✓	✓
Assembly Connectors		
True surface contact		✓
Thermal contact resistance	✓	✓
Element Library		
3D Solid: tetrahedron both linear or parabolic	✓	✓
2D Shell: quadrilateral and triangular plates	✓	✓
Rigid elements	✓	✓
Materials		
Isotropic	✓	✓
Orthotropic	✓	✓
Nonlinear materials: nonlinear elastic, elasto-plastic, plastic		✓
Hardening: isotropic, kinematic, combined		✓
Yield: Von Mises, Tresca, Mohr-Coulomb, Drucker-Prager		✓
Custom stress-strain curve		✓
Material Orientation		
Vector projection	✓	✓
Curve tangent	✓	✓
Rotated curve tangent	✓	✓
Translated curve tangent	✓	✓
Surface U and V directions	✓	✓
Properties		
Solid and plane	✓	✓
Different plane property for each face	✓	✓
Composite laminate with various failure theories: Hill, Hoffman, Tsai-Wu, Max Stress and Strain, NASA LARC02	✓	✓
Surface Contact		
Automatic mate dependent contact pair generation	✓	✓
Free and welded contact types		✓
Static friction		✓
Coordinate Systems		
Cartesian, cylindrical and spherical coordinate systems	✓	✓
Referencing global assembly, part or custom coordinate systems	✓	✓
Display toggles	✓	✓
Post-Processing		
Stress, deformation plots	✓	✓
Principal and directional stress plot	✓	✓
Strain plot	✓	✓
Resonant frequencies, mode shape plots	✓	✓
Temperature, heat flux plots	✓	✓
Iso-surfaces	✓	✓
Results across composite laminates	✓	✓
Export Nastran input deck to other FEA systems	✓	✓
Customizable material library	✓	✓
Output within the NEiFEA Modeler view with sensitive Help and Analysis Control (pausing and solution termination)	✓	✓

NEiFusion Analyst

	Basic (L1-L2)	Expert (L1-L5)
Analysis Types		
Linear static	✓	✓
Normal modes	✓	✓
Linear buckling	✓	✓
Dynamic frequency response*		✓
Dynamic transient response*		✓
Random vibration*		✓
Response/Shock spectrum generation*		✓
Modal summation*		✓
Nonlinear stress		✓
Nonlinear buckling		✓
Nonlinear transient response*		✓
Thermal stress	✓	✓
Prestress static	✓	✓
Prestress normal modes	✓	✓
Prestress nonlinear*		✓
Composites	✓	✓
Contact analysis in assemblies	✓	✓
Linear steady state heat transfer	✓	✓
Inertial relief*	✓	✓
Snap-through analysis*		✓
Aeroelastic	✓	✓
Drop test		✓
Fluid flow	+	+
Motion simulation	+	+
Optimization	+	+
Loads and Boundary Conditions		
Uniform pressure and force on faces, edges and vertices	✓	✓
Directional and non-uniform* pressure and force	✓	✓
Acceleration loads (gravity)	✓	✓
Rotational acceleration and velocity*	✓	✓
Enforced displacements and rotations	✓	✓
Temperature, default temperature and heat flux	✓	✓
Centrifugal loads*	✓	✓
Radiation and convections loads*	✓	✓
2D or 3D Interpolation of input temperature, displacements, forces, moments and pressure loads*	✓	✓
Symmetric, antisymmetric, axisymmetric, cyclic symmetric* boundary conditions	✓	✓
Fixed constraints on faces, edges and vertices	✓	✓
Directional and prescribed constraints	✓	✓
Thermal constraints	✓	✓
Assembly Connectors		
True surface contact		✓
Thermal contact resistance	✓	✓
Element Library		
3D Solid: tetrahedron both linear or parabolic	✓	✓
2D Shell: quadrilateral and triangular plates, membranes*, shear panels*	✓	✓
1D: rod, tube, bar, pipe, tapered beam*	✓	✓
Rigid elements	✓	✓
Tension-only plate and cable*		✓
Laminated solids (CHEXA, CPENTA)*	✓	✓
Spot weld (CWELD)*	✓	✓
Spring mass and damper*	✓	✓
Coupled spring and damper*	✓	✓
Gap, slideline and surface contact*	✓	✓
Conduction	✓	✓
Capacitance*	✓	✓
Materials		
Isotropic	✓	✓
Orthotropic	✓	✓
Anisotropic*		✓
Nonlinear materials: nonlinear elastic, elasto-plastic, plastic		✓
Hardening: isotropic, kinematic, combined		✓
Yield: Von Mises, Tresca, Mohr-Coulomb, Drucker-Prager		✓
Custom stress-strain curve		✓
Temperature dependent*	✓	✓
Thermo-elasticity*		✓
Creep*		✓

	Basic (L1-L2)	Expert (L1-L5)
Surface Contact		
Automatic mate dependent contact pair generation	✓	✓
Free and welded contact types		✓
Static friction		✓
Automated Solution Tools		
Adaptive: correction for path reversal*		✓
Arc-length methods: Crisfield, Riks, Modified Riks*		✓
Direct Matrix Input Grid (DMIG) Support		
Stiffness matrix import and export*	✓	✓
Conductivity matrix import and export*	✓	✓
Mass matrix import and export*	✓	✓
Load vector import and export*	✓	✓
Global Matrix Output		
Stiffness matrix*	✓	✓
Conductivity matrix*	✓	✓
Mass matrix*	✓	✓
Model Reduction		
Static condensation*	✓	✓
Export reduced stiffness matrix using DMIG format*	✓	✓
Automated model reduction tools and correction*	✓	✓
Export reduced mass, stiffness, damping, and load matrices to DMIG or NASTRAN Output2 (.OP2) *	✓	✓
Craig-Bampton reduction (component modes synthesis) *	✓	✓
Modal Correlation		
Modal assurance criterion (MAC) output and 3D plots*	✓	✓
Model cross-orthogonality output and 3D plots*	✓	✓
MS Excel comma separated variable (.CSV) and NEiNastran modal database (.MDB) input formats*	✓	✓
Automatic interpolation of input data to closest grid*	✓	✓
Post-Processing		
Stress, deformation plots	✓	✓
Principal and directional stress plot	✓	✓
Strain plot	✓	✓
Resonant frequencies, mode shape plots	✓	✓
Temperature, heat flux plots	✓	✓
Iso-surfaces	✓	✓
Results across composite laminates	✓	✓
Export to other FEA systems	✓	✓
Customizable material library	✓	✓
Output within the NEiFEA Modeler view with sensitive Help and Analysis Control	✓	✓
Import results using FEMAP Binary Neutral file format (FNO) *	✓	✓
Auto and user defined measurable sorting for handling multiple load case results*	✓	✓
Grid and element set generator for sets that can control output, define measure coordinate systems, generate grid point temperatures, and define measure sort commands*	✓	✓
Stress discontinuity / convergence errors calculation*	✓	✓
Element and grid point stress, strain, heat flux, and thermal gradients output in any coordinate system*	✓	✓
Intermediate bar and beam element output*	✓	✓
Composite sandwich material stability index*	✓	✓
Automatic generation of structural temperatures for direct modeler import or structural analysis*	✓	✓
Heat flow into heat boundary elements*	✓	✓
Editor		
Tabular results listing*	✓	✓
Detailed HTML report customization*	✓	✓
Single and multi-load set animations*	✓	✓
Interactive data query with mouse*	✓	✓
Parameter setup and control*	✓	✓
Real time control of solution parameters*	✓	✓
Real time 2D xy plotting and 3D deformed shape and contour plotting*	✓	✓
Batch job queuing system*	✓	✓
Graphical nonlinear convergence form displays nonlinear work, load, and displacement convergences in percent complete bar format*		✓
Configuration trade study generator automatically generates queued models with user specified design variable changes such as thickness or dimension for design sensitivity analysis*	✓	✓
Real time deformed shape results contour displays with automatic updating for nonlinear static and transient solutions*		✓
Real time results x-y plot support at min/max and user specified models locations with automatic updating for nonlinear static and transient solutions*		✓
Export x-y plots to MS Excel Comma Separated Variable (.CSV) file format*	✓	✓
3D vertical bar plot support for Modal Assurance Criterion (MAC) and Modal Cross Orthogonality (MXO) *	✓	✓
User defined settings can be customized and saved for different solution types*	✓	✓
Special input forms for classified DDAM data allows models to run in an unclassified environment*		✓
Parabolic shell to linear shell element converter*	✓	✓

* = Available only through the NEiNastran Editor + = Add On

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