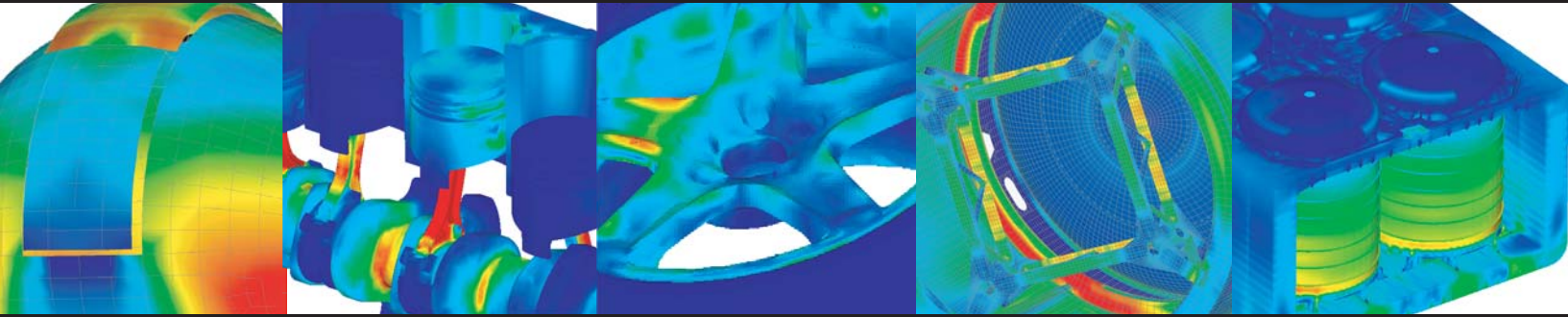


NEiWorks



Embedded Nastran FEA for SolidWorks

NEiWorks - Nastran FEA in SolidWorks

NEiWorks Embedded Nastran Finite Element Analysis with Certified Gold Product Status



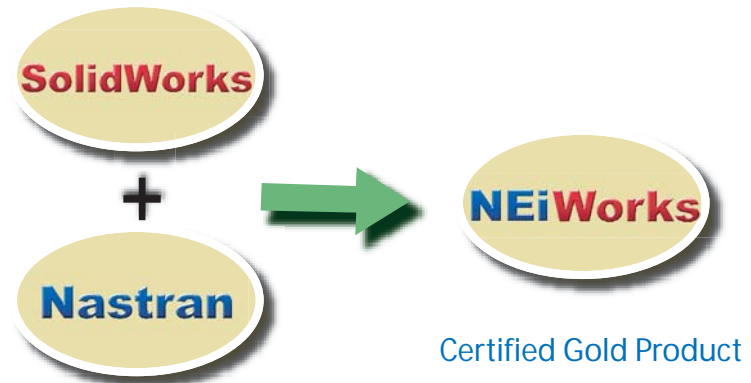
As a SolidWorks® user, you appreciate the ease-of-use, integration, productivity and communication tools that let you produce high quality, accurate designs and get them to market faster. Similarly, you want your FEA software to provide the same benefits for your work in engineering analysis and simulation. NEiWorks with NEi Nastran delivers on that benefit. NEiWorks is embedded in SolidWorks so you work within an environment that is familiar, effective and proven. Plus, NEiWorks has earned SolidWorks' Gold Product Status so you know it has been tested for quality, compatibility, and integration. With NEiWorks you get the same look-and-feel, menu, and tree type structures of SolidWorks.

NEiWorks, The Nastran Difference

You want to gain insight into different aspects of your design -- structural, thermal, dynamic, and verify critical design elements on your desktop before you commit resources to expensive and time consuming prototypes and test programs. Nastran is the most widely used FEA software in the world. It has been proven over several decades and has become the established standard in aerospace, automotive and maritime industries. Nastran has achieved this level of acceptance because of its accuracy, precision, and the fidelity of its analysis results. However, for most of its history, Nastran FEA has been a tool confined to high end analysis in very large corporations because of the cost and sophistication of the hardware and software. Now Noran Engineering, Inc. (NEi) has developed a product that allows Nastran FEA technology to move in a different direction making it affordable, easier to use, and accessible to a much wider engineering and design community.

NEiWorks: SolidWorks Ease of Use with Nastran Accuracy

NEiWorks is a breakthrough product. Embedded in SolidWorks, NEiWorks integrates highly accurate Nastran FE analysis with SolidWorks' easy to use 3D solid modeling. Users experience the familiar environment and ease of use they have come to expect while getting high accuracy analysis capabilities.



NEiWorks can provide a wide spectrum of analysis and simulation tasks depending on the solvers selected and the configuration package. You can start with basic linear statics or move up to the most sophisticated configuration which allows access to the full power of the Nastran solvers through other pre- and post-processors for high level virtual simulation of nonlinear transient analysis of structural, thermal, and dynamics problems. In this age of collaborative design, NEiWorks provides you with another important advantage. If you work in an industry where Nastran is an accepted standard, NEiWorks lets you share results with the entire community of Nastran users, like NEi, NX and MSC using text files for input data and results via standard OP2 format - an important consideration for communicating with customers, suppliers or design partners.

NEiWorks: Recognized, Powerful, Affordable Nastran FEA

Introduced in December 2004, NEiWorks received recognition from NASA Tech Briefs magazine, being named as a finalist in its Product of the Year Competition. Desktop Engineering magazine also picked NEiWorks in its Editor's choice. NEiWorks has SolidWorks Corporation's Gold Product status. This certification represents the highest level integration providing full associativity, sharing the same design data, and automatic updating across applications. Most importantly, SolidWorks users will find NEiWorks extremely affordable because it can be purchased in a configuration that matches their work environment. For example, network installations can benefit from sharing solvers over multiple users with multi seat pricing. NEiWorks comes in Basic or Expert versions with affordable maintenance and upgrade options.



NEiWorks Highlights of Features and Benefits

How Far Do You Need to Take Analysis?

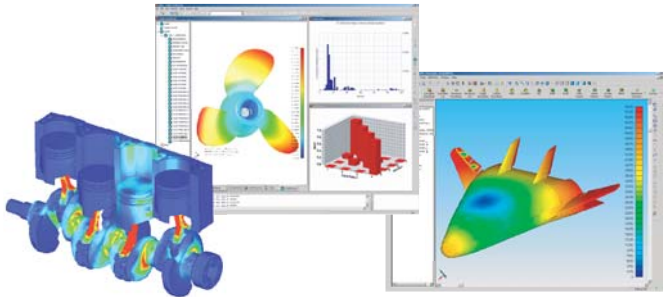
NEiWorks gives you more than a solution to your most immediate design problem. NEiWorks can offer a continuous path from design validation to high end analysis. NEiWorks is completely scalable and expandable. There is no need to learn and adopt a whole new FEA platform as your analysis and simulation needs grow more sophisticated. The NEiNastran platform can connect designers and analysts by sharing Nastran files and allowing the use of a variety of other analysis oriented pre/post processors with the NEiNastran solvers. You can start with NEiWorks Designer for exploring the viability of design alternatives and concept validation and move to NEiWorks Analyst if and when the need for powerful, highly focused analyst tools are needed.

Benefits: Continuous scalable path from design validation to high end analysis.

NEiWorks: Nastran FEA

Nastran is the most widely used FEA software in the world. It has been proven over several decades and has become the established standard in aerospace, automotive and maritime industries. Nastran has achieved this level of acceptance because of its accuracy, precision, and the fidelity of its analysis results.

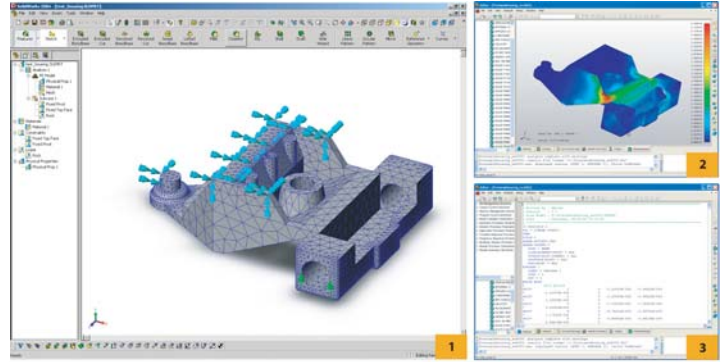
Benefits: Precise, proven results you can rely on.



NEiWorks: Continuity and Connection between Design and Analysis

NEiWorks is a breakthrough product because it can provide a smooth continuous path from design to analysis and remove the barriers between these functional groups. Designers can explore "what-if" scenarios easily with full associativity of FEA and CAD data and validate concepts. Models can be shared or passed off to analysts for more intensive examination using a portfolio of pre/post processors if necessary. The Nastran bulk data file and option for unbundled solver use provides maximum sharing of adapt and software resources.

Benefits: Capabilities that grow with needs, scalable for your organization, the right tools for each functional group.



NEiWorks gives SolidWorks designers easy-to-use embedded Finite Element Analysis (1 and 2), highly accurate simulation results, and is unique and forward looking in its ability to share this data with the world of NASTRAN analysts (e.g. NEi, NX, MSC) via the Bulk Data File (3).

NEiWorks: Tailor Your FEA to Fit Your Analysis Needs

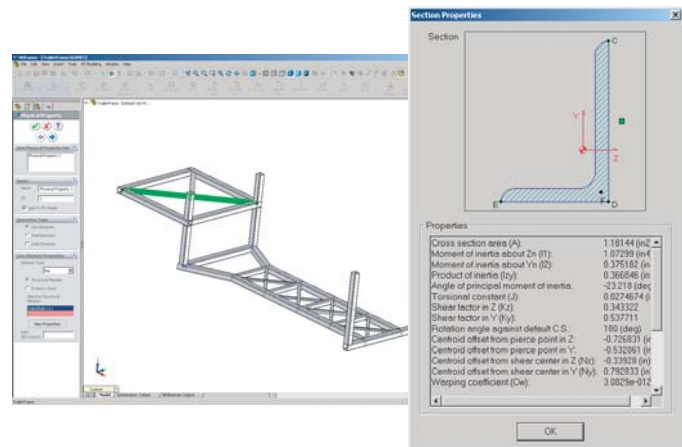
NEiWorks comes in Designer and Analyst versions with choice of solver packages. Designer gives you the main design validation tools at a low cost entry point. Analyst provides the power and flexibility to take the analysis and simulation to the most professional levels of fidelity and accuracy with the option of using unbundled solvers with other pre/post-processors and tools.

Benefits: Low entry cost, pay for what you need.

NEiWorks: Element Library

NEiWorks has a complement of elements for solid, shells and beams that allow professional modeling of a wide variety of structures. Composites with plates and shells. Surface to surface contact with manual or automated recognition of surfaces.

Benefits: Ability to model a variety of structures.

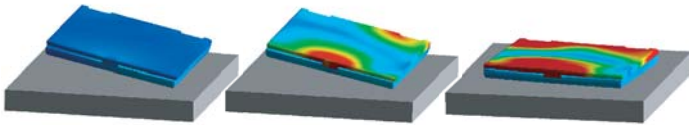


NEiWorks Unique Capabilities

Automated Impact Analysis Wizard and Drop Test

Impact analysis is an important consideration for a wide variety of product development projects from drop testing portable electronic products like laptop computers to assessing product packaging effectiveness. Automated Impact Analysis (AIA™) in NEiWorks is an exceptional simulation tool because it makes a complex analysis easy to do while retaining the complexity of the underlying physical phenomena that are present in impacts. The input is simple -- define projectile initial velocity and acceleration. Complexity is handled by NEiNastran solvers as they automatically setup surface contact between the projectile and part, determine the contact surface between the two, calculate the contact duration and time steps needed to capture an accurate nonlinear transient event, and determine the vibration characteristics of the colliding bodies. NEiNastran AIA can provide a thorough and physically realistic simulation of impact because it takes into account surface contact, time duration of impact, and the vibration characteristics of the colliding bodies. This is much more comprehensive and useful than a simplistic imposition of force at a point found in other impact or drop tests.

Distinguishing Advantage: Physically realistic results because it accounts for inherent vibration in the colliding bodies.

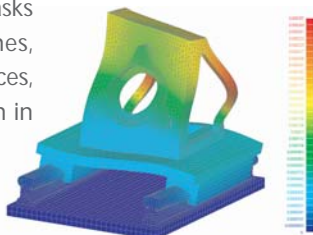


Automated Impact Analysis (AIA) can also be used as a virtual Drop Test. Example shown is for a laptop computer.

Automated Contact Generation

Modeling contact in large complex structures like those that occur in ships, aircraft, and cars is very time consuming, labor intensive and prone to errors. NEiWorks has unique tools not found in traditional preprocessors that dramatically increase productivity for these type of products. Automated Surface Contact Generation (ASCG) and Automated Edge Contact Generation (AECG) simplify and speed up the tasks of connecting dissimilar meshes, unmatched nodes on different surfaces, and joining edges and surfaces, even in the presence of gaps and offsets.

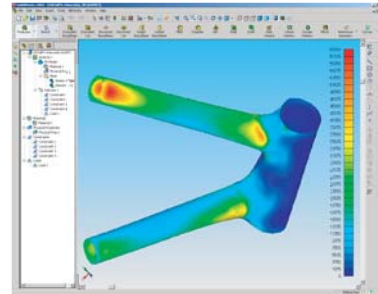
Distinguishing Advantage: Unique tools not found in traditional preprocessors for dramatic productivity improvement in setting up contact in large complex structures.



Composites Capabilities

NEiWorks contains a suite of tools designed to bring engineering insight to the analysis of composites and laminated products and make the process straightforward and less time consuming. These include easy definition of ply lay-ups, plates and shell elements for composites, and an extensive list of supported failure theories.

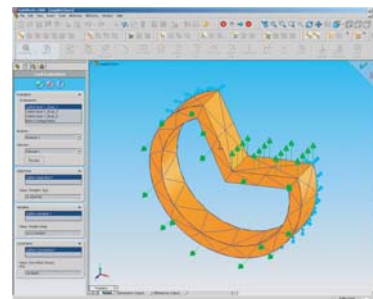
Distinguishing Advantage: Suite of tools for composite part analysis.



Optimization Analysis

Designers need to be equipped with the latest and best technology to meet the demands of global competition. One of the many ways NEiWorks meets this need is with Optimization Analysis. For tough optimization problems that involve a number of complex and opposing parameters, Optimization Analysis developed by Red Cedar Technology is integrated in NEiWorks. NEiWorks users are able to assign design objectives to minimize, maximize or target variables like geometric data values, weight, eigenvalues, von Mises stress and temperature.

Distinguishing Advantage: Professional level Optimization Analysis included in basic software package.



Professional Features for Visualizing and Communicating Results

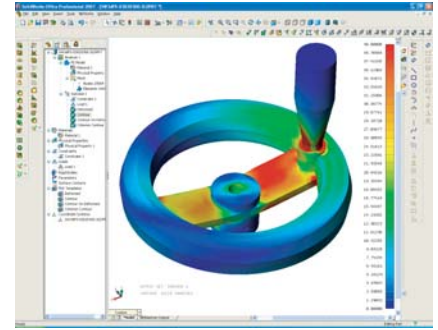
A wide number of features for post-processing, on-screen display enhancements and customizations, and an Analysis Report Writer assure that you can visualize and communicate your results in an effective and powerful manner.

Distinguishing Advantage: Powerful graphic tools for results visualization and easy report writing.

NEiWorks - Designer Configuration

NEiWorks Designer

The Designer Configuration is the lowest price option for any NEiWorks software package. The low price is achieved by coupling the SolidWorks 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.



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

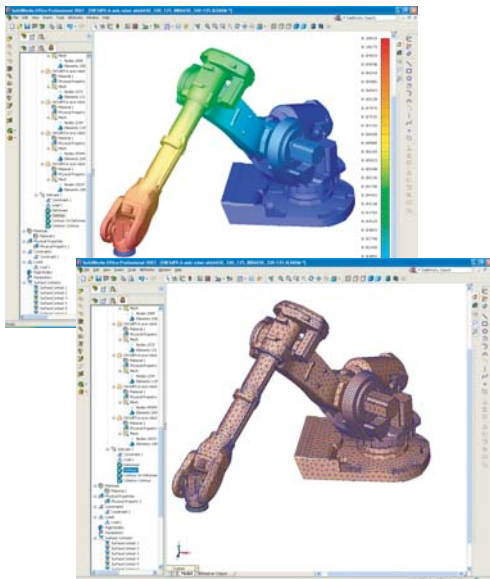
Basic. The Basic Solver suite is built on NEiNastran Solver Engines NE-L1 and NE-L2. Product Datasheets for each of these modules contains a full description. The Basic package provides analysis and simulation of Linear Statics, Modal Analysis, Buckling, Prestress, and Steady State Heat Transfer problems.

- ▶ 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 NEiWorks V2.0.



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

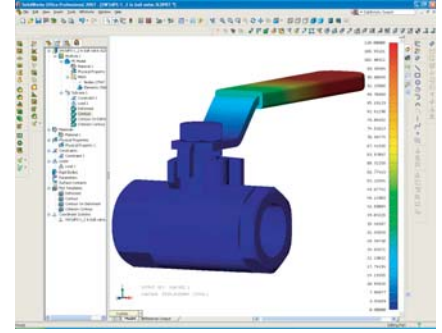
One of the most common types of analysis needed by design engineers is linear static analysis. By far, linear static structural analysis represents the majority of the analyses performed. NEiWorks Basic makes this type of analysis easy. Starting with your parametric part, loads and boundary conditions 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, NEiWorks 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 NEiWorks Product Chart for a complete listing of Analysis Types and Post-Processing capabilities of NEiWorks Basic and NEiWorks Expert.

NEiWorks - Analyst Configuration

NEiWorks Analyst

The Analyst Configuration delivers the NEiNastran Solvers L1-L5 as independent modules from the SolidWorks so they are available to work with any other pre- and 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.



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

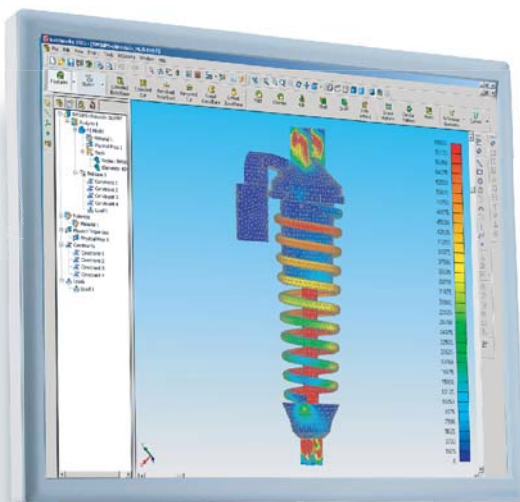
Basic. The Basic Solver suite is built on NEiNastran Solver Engines NE-L1 and NE-L2. Product Datasheets for each of these modules contains a full description. The Basic package provides analysis and simulation of Linear Statics, Modal Analysis, Buckling, Prestress, and Steady State Heat Transfer problems.

- ▶ 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 NEiWorks V2.0.



NEiWorks

High Performance Embedded Nastran
FEA for SolidWorks

✓ 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: SolidWorks®, 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

✓ Assembly Connectors

- True surface contact
- Automatic contact

✓ Meshing

- Global and local controls for part geometry with default sizing
- Mesh control on arbitrary user defined regions
- Sketch line or curve meshing
- Free surface meshing: quads or triangles
- Continuous shell (quad or tri) meshing
- Auto mesh, loads and constraints update with geometry changes
- Mesher Status Window

✓ Element Library

- 1D line (CBEAM and CBAR)
- 2D linear shell (CQUAD4 and CTRIA3)
- 2D parabolic shell (CQUAD8 and CTRIA6)
- 3D linear and parabolic tetrahedron (CTETRA)
- Composites with plates and shells
- Surface to surface contact with manual or automatic recognition of surfaces
- Rigid elements
- Conduction

✓ Loads and Boundary Conditions

- Uniform pressure and force on faces, edges and vertices
- Directional pressure and force
- Acceleration loads (gravity)
- Enforced displacement 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
- Thermal body loads
- Initial temperature conditions
- Custom colors and sizes for loads and constraints

✓ Material Properties

- 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 surface contact generation
- Free and welded contact types
- Static friction
- Linear contact

✓ Coordinate Systems

- Cartesian, cylindrical and spherical coordinate systems
- Referencing global assembly, part or custom coordinate systems

✓ Analysis Types

- Linear statics
- Normal modes
- Linear buckling
- Nonlinear stress
- Thermal stress
- Prestress static
- Composite
- Contact analysis in assemblies
- Linear steady state heat transfer
- Optimization
- Modal transient response
- Direct transient response

✓ Composite Analysis

- Various failure theories supported:
 - Hill
 - Hoffman
 - Tsai-Wu
 - Max. stress
 - Max. strain
 - NASA LARC02

✓ Optimization Analysis

- Design objectives to minimize, maximize or reach target values
- Optimize weight, stress, temperature and natural frequency
- Parametrically update geometry dimensions

✓ Drop Testing Analysis

- Automatic impact wizard
- Acceleration and contact direction input
- Time stepping automatically calculated based on natural frequency

✓ 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
- Single and multi-set animations
- Max/min labels

✓ Report Generation

- HTML formatted reports for linear static analysis
- Customizable report format
- Step by step wizard for report generation process
- Includes standard model data

✓ 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

- GUI: English, Japanese, Italian, French, others upon request
- Technical documentation: English

Noran Engineering, Inc.

USA HEADQUARTERS

Noran Engineering, Inc
5555 Garden Grove Blvd., Ste 300,
Westminster, CA 92683-1886, USA
Phone: 1.714.899.1220
Fax: 1.714.899.1369
E-mail: info@noraneng.com
Website: www.nenastran.com

EUROPE

SmartCAE
Piazza della Gualchierina, 9
59100 Prato, ITALY
Phone: +39.0.574.404.642
Fax: +39.0.574.401.265
E-mail: info@smartcae.com
Website: www.smartcae.com

UK/IRELAND

Epsilon Structural Analysis Ltd.
Suite 9, Premier House
Argyle Way, Stevenage
Herts SG1 2AD
UNITED KINGDOM
Phone: +44.0.870.190.9431
Fax: +44.0.870.190.9432
E-mail: info@epsilon-sa.com
Website: www.epsilon-sa.com

ASIA/PACIFIC

Digital Solutions
Kyoei Nakasuji Bldg, 3-7-18
Nakasuji, Asaminami-ku
Hiroshima, 731-0122, JAPAN
Phone: +81.82.831.1190
Fax: +81.82.831.1193
E-mail: post@digital-sol.co.jp
Website: www.digital-sol.co.jp

SOUTH AMERICA

ComCAD
Soluções em CAD / CAE / CAM
Av. Afonso Pena,
578 - 16º andar
Centro - Belo Horizonte - MG
Brasil 30130-001
Phone: +55.31.3271.1840
E-mail: rossano@comcad.com.br
Website: www.comcad.com.br



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