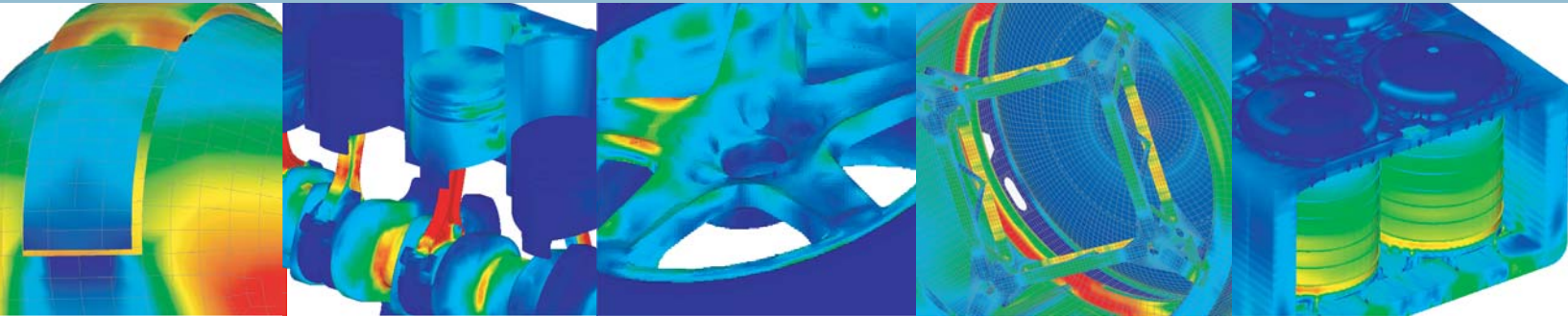


NEiNastran



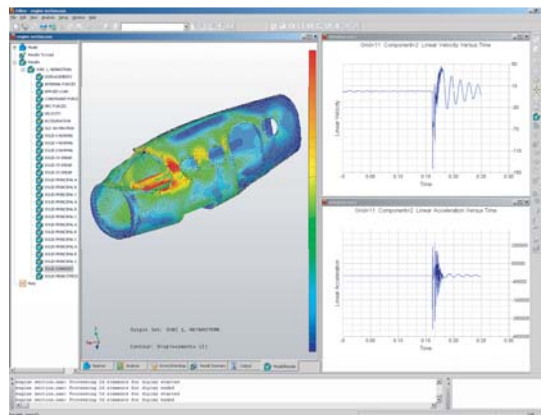
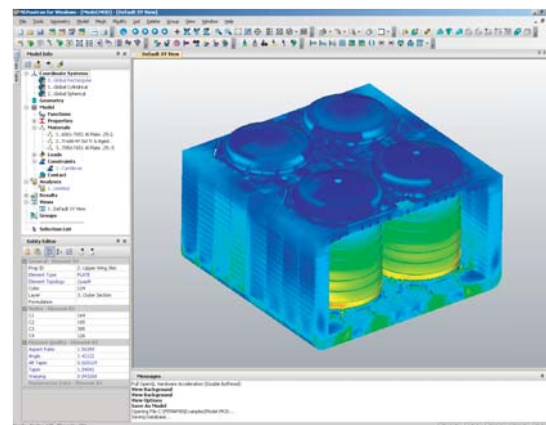
High Performance FEA for Windows, Linux, and UNIX.

NEiNastran

NEiNastran is a powerful, general purpose finite element analysis tool with an integrated graphical user interface and model Editor which is used to analyze linear and nonlinear stress, dynamics, and heat transfer characteristics of structures and mechanical components. It represents the latest in FEA technology with one of the fastest iterative solvers on the market along with accurate solutions that have been trusted for over 15 years by companies in all industries. It is available on a wide variety of platforms including 32-bit and 64-bit Windows, Linux, and Unix operating systems.

Modeler

The NEiNastran Modeler (FEMAP V9) is a Windows-native pre- and post-processor used by engineering organizations world wide to model various products, processes, and systems. It has an optional new graphical user interface that provides streamlined, direct access to all the NEiNastran Modeler functionality. It provides a depth of functionality in geometry import, geometry creation, meshing, materials and properties, loads and boundary conditions, analysis types and visualization options. The NEiNastran Modeler is tightly integrated with NEiNastran and also provides integration to a wide range of industry-standard structural and thermal solvers.

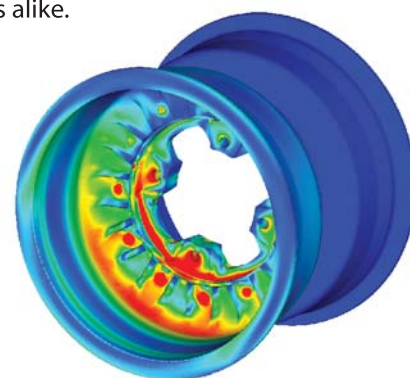


Editor

The NEiNastran Editor™ is an industry unique tool that gives engineers greater control over their Nastran FEA models and results. Features such as advanced editing, context-sensitive input, and dynamic help greatly increase productivity and results reliability from the start. Built-in tools such as the trade study generator, a basic optimization utility, give users quick insight into the effects of design changes. Real-time results are displayed through an integrated post-processor allowing users to visualize results as they are generated during the solution sequence. These features combined make the NEiNastran Editor an indispensable tool for designers and analysts alike.

Solver

NEiNastran uses the latest in solver technology providing fast results for the largest and most complex FEA models. Three linear solvers (PCGLSS, VSS, and VIS) and two eigensolvers (LANCZOS and SUBSPACE) are included. The PCGLSS (Preconditioned Conjugate Gradient Linear System Solver) is an advanced iterative solver licensed from CA&SI and used in many other leading FEA products. The VSS (Vector Sparse Solver) and VIS (Vector Iterative Solver) are based on NASA developed technology and have been enhanced to provide better performance and accuracy.



▲ **Linear Static Analysis of a Wheel with a Curb Impact Load: 2,173,020 DOF. Total solution time: 14.1 minutes. Run on a dual Intel Xeon 3.2 GHz CPU with 3GB of RAM.**

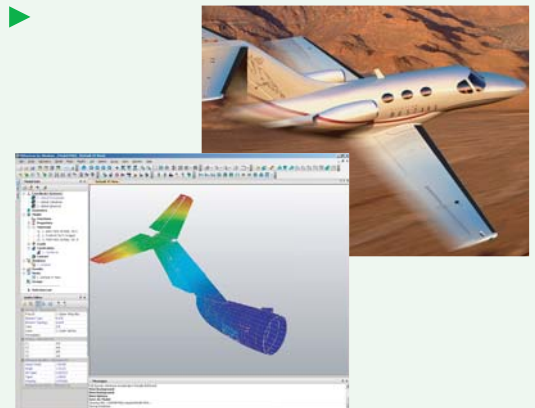
NEiNastran Product Suite Key Features

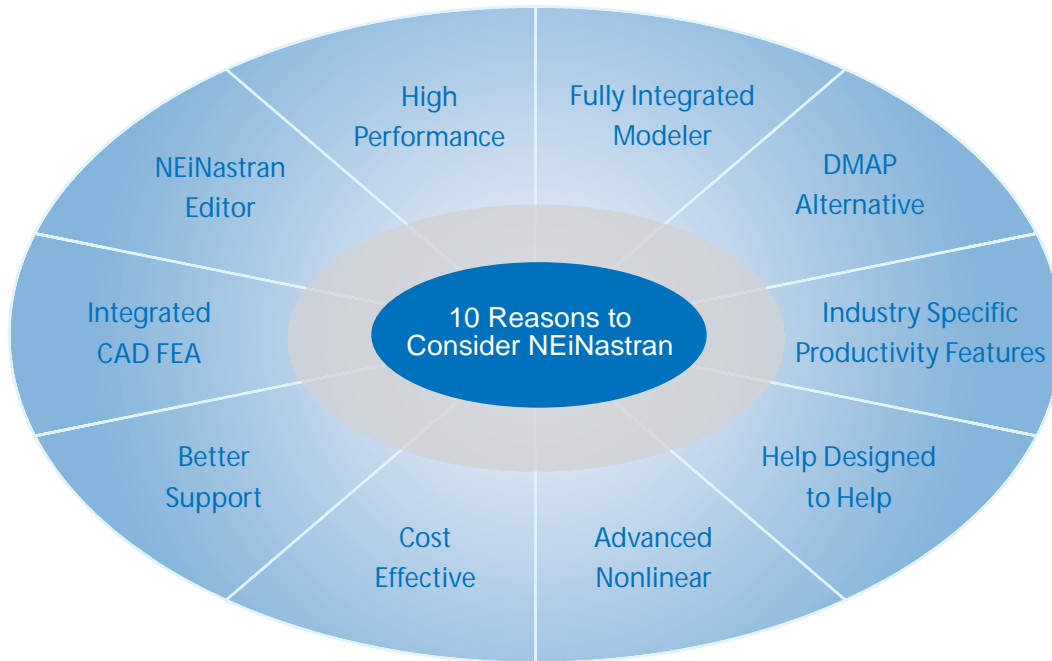
- ▶ Comprehensive interactive tools necessary for model creation, analysis monitoring, and results evaluation including a state-of-the-art analysis Editor.
- ▶ Uses the world's leading Windows-based pre- and post-processor for advanced engineering finite element analysis (NEiNastran Modeler), which is easy to use and has the power to model very difficult analyses.
- ▶ Specialized industry-proven element technologies, including hybrid quad and hex elements, advanced tension-only shell and cable elements, surface and spot weld elements, dissimilar mesh interpolation elements, and heat transfer elements.
- ▶ High performance processing including advanced parallel PCGLSS iterative, sparse direct, and block Lanczos solvers which allow solutions to large-scale models over 10 million degrees of freedom on inexpensive 32-bit Windows workstations with support for even larger model sizes on high end 64-bit Linux workstations.
- ▶ Advanced solution sequences such as linear and nonlinear static, transient dynamic, steady state dynamic, frequency extraction, heat transfer, and other analysis types provide a choice of appropriate analysis types for different types of simulations.
- ▶ Robust contact capability using a 3D surface contact method which easily handles dissimilar meshes between components including frictional effects.
- ▶ Extensive composite material support including 2D orthotropic, 3D orthotropic, general anisotropic, laminate lay-up definitions, and a wide range of failure criteria.
- ▶ Load and boundary condition interpolation allows mapping of thermal and CFD output from specialized heat transfer and fluid dynamic models to the structural model for load and boundary condition definition.
- ▶ Advanced modeling capability features robust CAD import, advanced beam modeling, mid-surface extraction, hex and tet meshing, and a broad range of loads, materials, analyses types, and visualization options.
- ▶ Used to model virtually anything including aircraft, satellites, marine vessels, heavy construction equipment, and medical devices by engineering organizations and consultants world-wide.
- ▶ Proven track record demonstrating that NEiNastran is one of the most trusted products for structural analysis in all industries.

"Cessna Aircraft is using NEiNastran to analyze airframe components on the Citation CJ3 and the Citation Mustang. Cessna Engineers have been very impressed with the customer service received from Noran Engineering. The development of Tension-Only Quad Elements eliminates redundant models and repetitive work functions, resulting in reduced analysis cycle time."

*Gene Paulsen
- Cessna Aircraft*

Cessna Aircraft Company of Wichita, Kansas used NEiNastran to perform finite element analysis on the new Citation CJ3 and Citation Mustang business jets. Customer driven enhancements like the Tension-Only Quad Element allowed Cessna to avoid redundant models and repetitive work function resulting in reduced analysis cycle time.





High Performance

NEiNastran has multiple high-performance sparse direct and iterative solvers built in. The PCGLSS solver is one of the fastest solvers on the market and is especially fast for large parabolic tetrahedron element (CTETRA) models which are common with most solid meshing modelers.

NEiNastran Editor

NEiNastran includes a fully integrated and customizable Nastran Editor for controlling program operation, model editing, trade study generation, and results analysis. It is designed to increase productivity through easy access to model input data and results output, both graphical and tabular.

Integrated CAD FEA

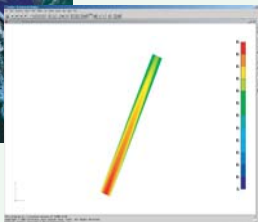
NEiWorks provides SolidWorks users with an embedded, state-of-the-art finite element modeling tool. It features the familiar SolidWorks look and feel for all menus and functions, as well as an automatic mesh updating feature and FEA entity to geometry associativity.

Better Support

At Noran Engineering support is geared toward the individual engineer with quick turnaround on all requests. Whether your preference is to attend a training class at our facility, do a WebEx online course, or obtain custom on site training for the staff at your facility, Noran Engineering makes your software investment work for you by backing it up with the help you need when you need it.

Cost Effective

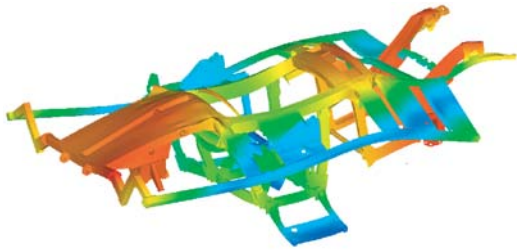
Controlling software costs is a major concern for all companies. Managers are under constant pressure to get the most out of their software budget. NEiNastran provides better functionality and performance for significantly less cost when compared to other leading FEA products.



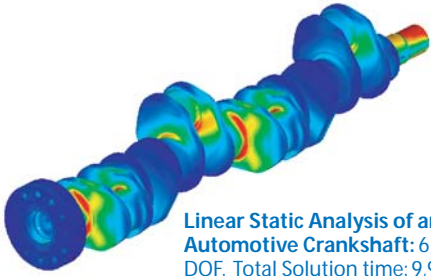
NEiNastran users design, analyze and optimize their designs early in the development cycle. Noran Engineering technical support is there also to help them get the most out of structural, fluid dynamic and advanced composite modules. They get things right when it's time to build. They push the envelope...without breaking.

"Composites analysis is inherently complex and challenging. Choosing the right FEA software provider becomes that much more important. Six years of experience with NEiNastran advanced software features coupled with superb service and support has confirmed my choice."

*Phil Craven
- America's Cup Composites Analyst*



Modal Transient Response Analysis of an Automotive Frame: 3,163,596 DOF. Total Solution time: 5.7 hr. (75 modes) and 19.3 hr. (150 modes). Run on a dual Intel Xeon + 2.66 GHz CPU with 3GB of RAM.



Linear Static Analysis of an Automotive Crankshaft: 6,858,000 DOF. Total Solution time: 9,925 sec. Run on an Intel Xeon 2.4 GHz CPU with 2GB of RAM.

Industry Specific Productivity Features

Aerospace.

- >> Specialized nonlinear elements such as tension-only shell and cable elements.
- Load and boundary condition interpolation for mapping thermal and CFD output from heat transfer and fluid dynamic models to structural models for load and boundary condition definition.
- >> Extensive composite material support including, 2D orthotropic, 3D orthotropic, general anisotropic, laminate lay-up definitions, and a wide range of failure criteria including the new NASA LaRC02 criteria and sandwich facesheet stability analysis.

Automotive.

- >> Specialized industry-proven element technologies including hybrid quad and hex elements, surface and spot weld elements, and dissimilar mesh interpolation elements.
- >> Support for standard manufacturing process effects such as casting induced warpage and residual stress and strain.

Maritime.

- >> Specialized solution sequences that do not require tedious DMAP programming including Design Dynamic Analysis Method (DDAM), integration with Anteon's Underwater Shock Analysis (USA) program, and compatibility with MAESTRO from Proteus Engineering.
- >> Special modal filtering and database restart tools for performing DDAM and dynamic response solutions increase productivity by allowing a modal database to be altered and reused with rerunning an eigenvalue extraction analysis.

Advanced Nonlinear

NEiNastran has many of the advanced features found in dedicated nonlinear analysis tools such as ABAQUS. One such feature is support for true 3D surface contact which is not only very easy to setup but extremely robust.

Help Designed to Help

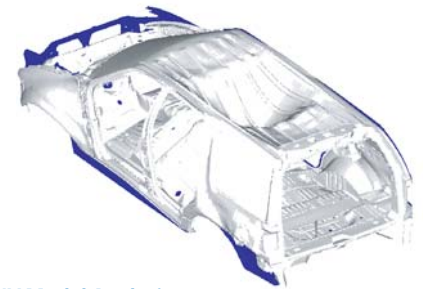
NEiNastran's Cause, Action, Remarks formatted error and warning message help is designed to make it easy to diagnose and correct model errors quickly. All Nastran documentation is easily accessed through both context sensitive Windows help and Adobe .pdf file formats.

DMAP Alternative

With NEiNastran there is no need for tedious DMAP programming as most of the functionality traditionally reserved for DMAP is directly embedded and easy to use. Examples include a user accessible modal database and special productivity features for viewing, editing, and storing modal data.

Fully Integrated Modeler

With NEiNastran there is no need for tedious DMAP programming as most of the functionality traditionally reserved for DMAP is directly embedded and easy to use. Examples include a user accessible modal database and special productivity features for viewing, editing, and storing modal data.

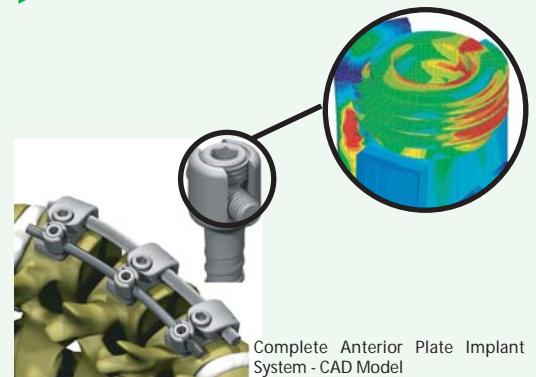


SUV Modal Analysis:
Analysis: 1,230,000 DOF
Solution time: 30.5 min. (20 modes) and 66.6 min. (100 modes). Run on a dual Intel Xeon + 3.2GHz CPU with 3GB of RAM.

"Finite Element Analysis has become an important tool to examine designs for their performance under load before a physical prototype exists. The two main advantages we gain through the use of FEA are: shorter time to market and optimized designs to avoid vibrations or to reduce weight and costs. After an extensive evaluation we decided to use NEiNastran as our solver due to its high accuracy, robustness and productivity."

Thilo Trautwein
- ACES Engineering

Using the power of NEiNastran, ACES was able to analyze not only the complex nonlinear material models, but the complete sliding contact between arbitrary surfaces including friction. Only three design and NEiNastran analysis iterations were required to obtain a fail-safe screw, with adequate strength to withstand the anticipated spinal loads.



Complete Anterior Plate Implant System - CAD Model

NEiNastran provides analysis capability for the following solution types:

Linear Static Analysis

- Linear stress, strain, deflection
- Inertial relief
- Thermal stress and deflection
- Prestress
- Mass properties

Dynamic Response

- Direct transient response
- Direct frequency response
- Modal transient response
- Modal frequency response
- Random vibration
- Modal response/shock spectrum generation
- Modal summation (ABS, SRSS, NRL, CQC, DDAM)
- Linear and nonlinear direct transient response
- Linear and nonlinear prestress support for all modal solutions.

Normal Modes

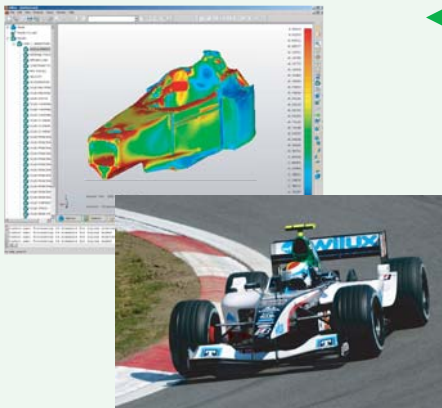
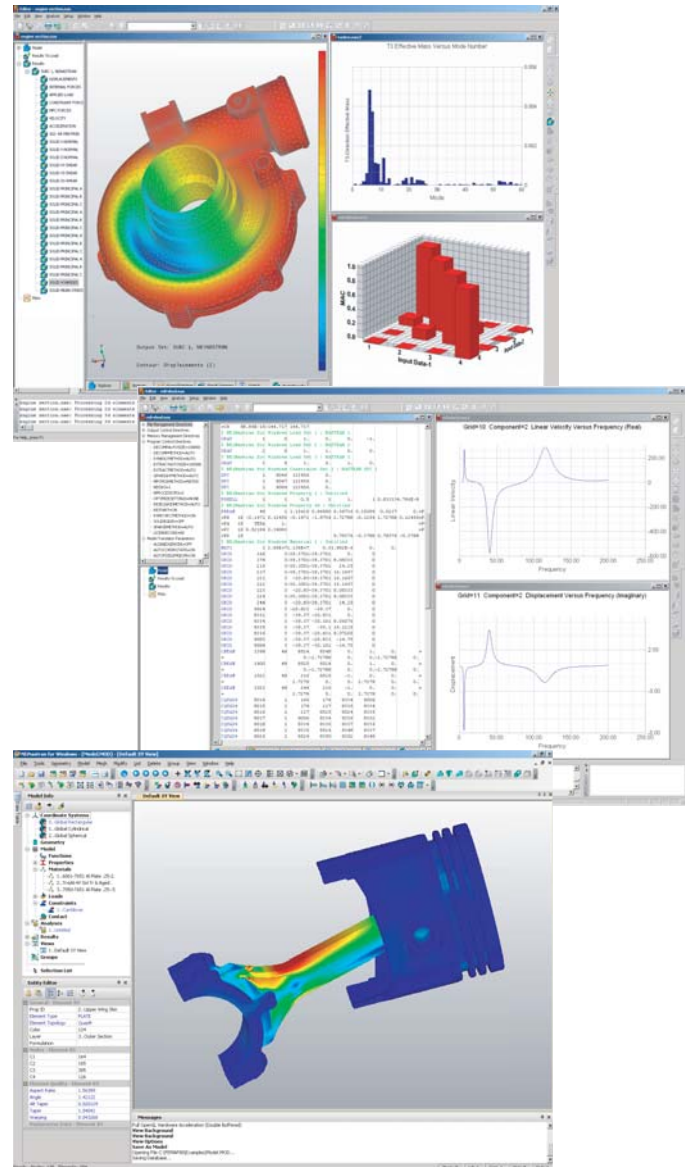
- Natural frequencies and mode shapes
- Flexible and rigid body motion
- Modal participation factors, effective mass/weight, and reaction forces
- Linear and nonlinear prestress (stiffening)

Transient Heat Transfer

- Linear and nonlinear
- Conduction, convection, and radiation

Steady State Heat Transfer

- Linear and nonlinear
- Conduction, convection, and radiation



◀ Minardi benefited from the use of NEiNastran due to a reduced modeling time, surface contact feature, robustness of the nonlinear analysis setup and solution, accuracy (results compared well with test results), and seamless data access (input-output data generated by NEiNastran and the previous Nastran package were shared without incompatibility issues).

"We have chosen NEiNastran after an extensive and detailed internal benchmark, comparing the results, the performance, and the features of the solver developed by Noran Engineering Inc. with those of our former FEA platform. Full compatibility, accuracy, along with the professionalism and quick turnaround of the tech support from Noran Engineering and SmartCAE were the main reasons why we selected NEiNastran as our FEA software for the future."

Paolo Marabini
- Minardi F1 Team

Buckling Analysis

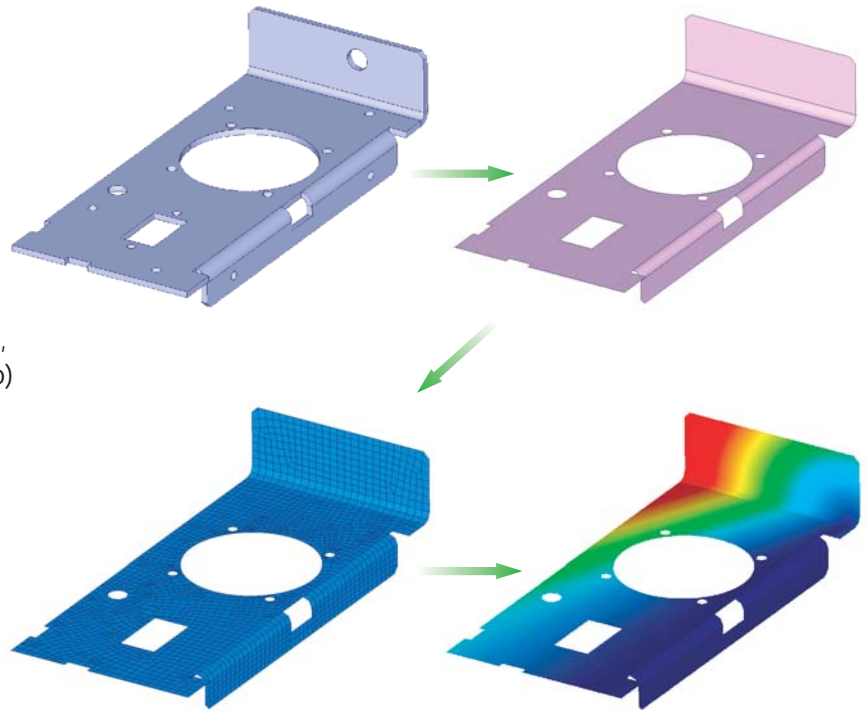
- Critical loads and mode shapes
- Linear and nonlinear initial stress

Nonlinear Static Analysis

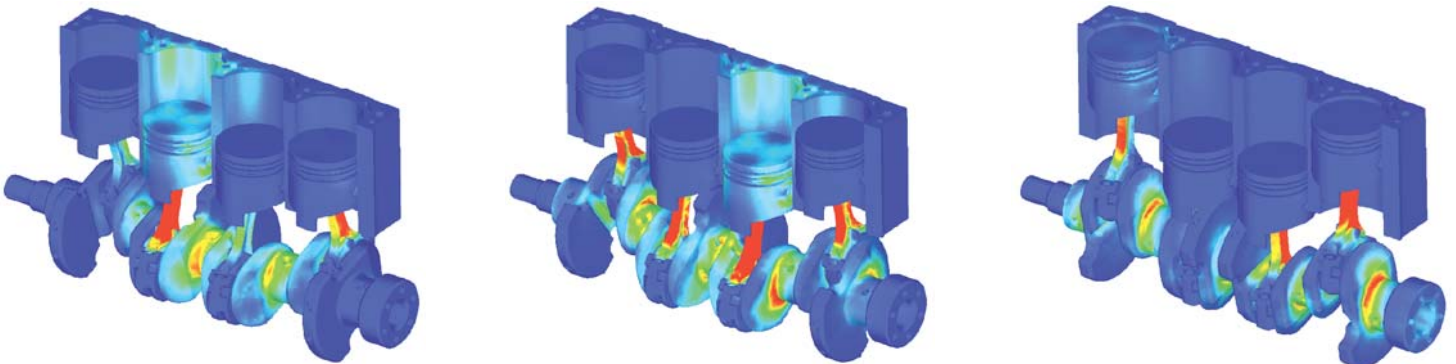
- Large displacement and rotation
- Material nonlinear (nonlinear elastic, elastic-plastic, perfectly plastic thermo-elastic, visco-elastic, creep)
- Tension only (cables and shell elements)
- Contact (gap, slide line, and surface to surface, all with friction)

General (supported in all solutions)

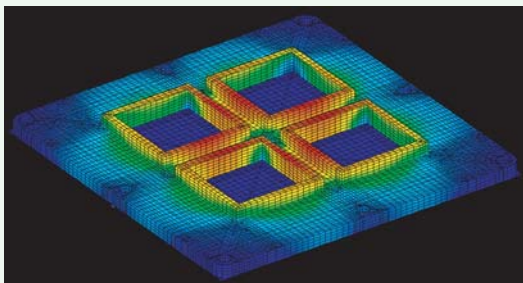
- Composite laminate materials
- Temperature dependent materials
- Direct matrix import and export (DMIG)
- Craig-Bampton and Guyan reduction
- Superelement support
- Displacement, load, and temperature interpolation



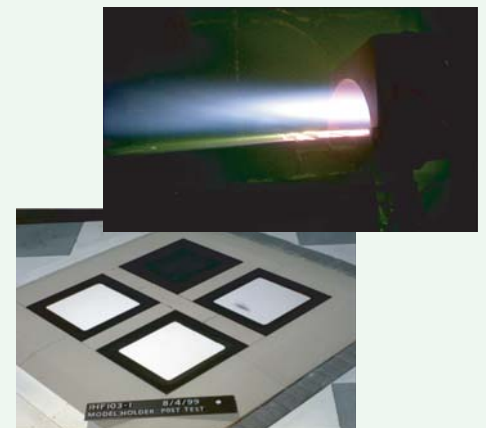
▲ Meshing with defeaturing



A nonlinear transient analysis of an engine assembly with large displacements, rotations and surface contact.



Boeing Space Systems used NEiNastran to design and analyze this high temperature super alloy assembly. The assembly, which will be used to contain flight experiments mounted on the underside of NASA's X-34 Reusable Space Vehicle, is subjected to aero-thermal heating on vehicle re-entry. Temperatures accessed directly from the heat transfer solution were used to perform stress analysis using the same statics and dynamics model. Several critical design changes were made as a result of this coupled analytical approach, which ultimately resulted in the successful arcjet test at NASA Ames Research Center.



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