

MD Nastran

Multidiscipline Simulation System for Advanced Engineering Analysis



MD Nastran

Leading manufacturers around the globe have relied on MSC Nastran's core technology to bring new products to market for over four decades. Now, MD Nastran (MD for "multidiscipline") brings engineers even more powerful analysis capabilities founded on MSC's legacy of technical leadership and field-proven reliability. MD Nastran delivers the most complete portfolio of integrated simulation technologies for advanced engineering analysis.

The value of a multidisciplinary approach in MD Nastran goes far beyond an extensive set of analysis capabilities. MD Nastran is optimized across multiple, integrated disciplines with the power to handle large-scale problems and take maximum advantage of current high performance computing environments. MD Nastran's multidisciplinary focus accelerates across-the-board efficiency improvement by driving early design validation, improved product performance, and rapid insight into product lifecycle performance.

Business Value

- **Improve Engineering Productivity:** Enable efficient communication between various groups of expertise, reduce your dependency on disconnected point solutions, and improve analyst efficiency through use of common data model
- **Accelerate Time-To-Market:** Gain faster, better insight into overall system design performance through multidisciplinary analysis
- **Reduce Manufacturing Costs:** Accurately predict and correct the design behavior much earlier in the design cycle. Achieve an optimal solution through MD Nastran's powerful multidisciplinary optimization capabilities
- **Achieve Lower Warranty Costs:** With precise representation of complex interactions between disciplines, make better design decision and avoid unexpected operational faults during use

System Analysis

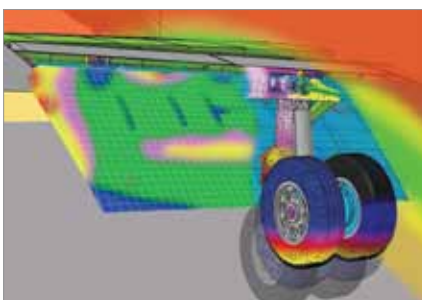
- Easily handles a multitude of increasingly complex simulations from linear to nonlinear to post-failure, and more in a common usage environment
- Multidisciplinary and linear/nonlinear analysis accounts for critical interactions when multiple environmental effects occur simultaneously or over time
- Readily handles large, interconnected assemblies with an array of specialty connectors, advanced 3D contact with friction, flexible and rigid component support, and superelements
- Scalable performance for large systems, assemblies, dynamics and NVH simulations
- Coupling with computational fluid dynamics for evaluating fluid structural interactions
- Shortens design cycle by enabling flexible multiphysics, implicit non-linear and explicit simulations built on proven solver technology
- New, highly-tuned, state-of-the art solvers save time and enable exploration of a broader range of design alternatives

Optimization

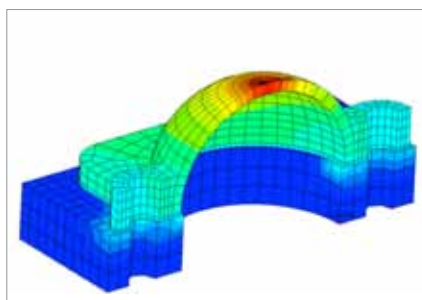
- Efficient optimization technologies – sizing, shape, topology, topography, topometry and non-linear response.
- Multi-model optimization to simultaneously optimize two or more structural models
- Stochastic simulation capabilities
- Superior system optimization with simultaneous access to sizing, shape and topology optimization with respect to design responses across multiple disciplines

High Performance Computing (HPC)

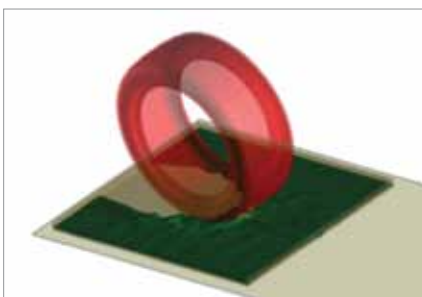
- ILP 64-bit support eliminates model size constraints due to physical memory addressability limits that continue to handicap other systems
- Parallel computing/multi-processor enabled, new high-performance sparse and iterative solvers, and large model support capabilities
- Supports the Microsoft Compute Cluster and other high performance computer architecture



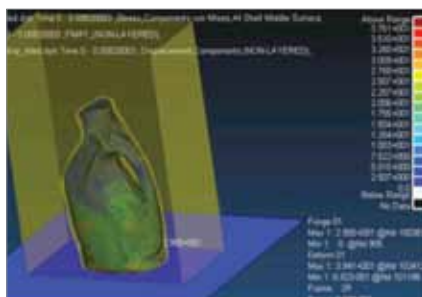
Structure-Motion Integration



Bolt pretension/Gasket Analysis



Tire Hydroplaning



Fluid-filled bottle drop test

MD Nastran is available in the following convenient packages:

MD Nastran Linear Structures Package

- Linear Statics
- Normal Modes
- Buckling
- Connectors
- Dynamics
- Heat Transfer
- Touching Contact for Linear Statics
- Glued Contact for Linear Statics, Normal Modes, Buckling, and Dynamics
- Adams Integration
- Dynamic Design Analysis Method (DDAM)
- Acoustics
- Superelements
- Design Matrix Abstraction Programming (DMAP)
- Shared Memory Parallel (SMP)
- Mesh Refinement

MD Nastran Structures Package

- Linear Statics
- Normal Modes
- Buckling
- Connectors
- Dynamics
- Heat Transfer
- Touching Contact for Linear Statics
- Glued Contact for Linear Statics, Normal Modes, Buckling, Dynamics, and Optimization
- Adams Integration
- Dynamic Design Analysis Method (DDAM)
- Acoustics
- Superelements
- Design Matrix Abstraction Programming (DMAP)
- Shared Memory Parallel (SMP)
- Mesh Refinement
- Implicit Nonlinear
- Optimization
- ACMS

MD Nastran Explicit Package

- Explicit Nonlinear
 - FSI
 - Crash
 - Airbag analysis
 - Composite failure
 - 2-CPU DMP

MD Nastran Expert Package

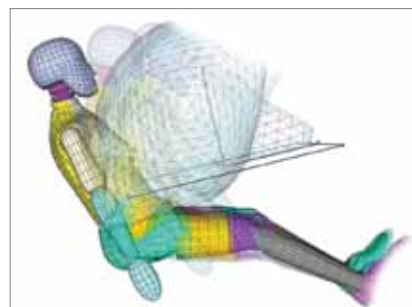
- Advanced Nonlinear
 - Nonlinear materials
 - Contact with Friction
 - Large sliding 2D and 3D contact
 - Line contact (beam to beam, shell edge to edge)
 - Thermal
 - Thermal-structural coupling
 - Thermal-structural chaining
 - Progressive Failure Analysis
 - Crack propagation and failure
 - Composites
 - Nonlinear elements
 - Micromechanical failure
 - Thermal contact
 - Open FSI
 - User Defined Services

MD Nastran Aerospace

- Rotor Dynamics
- Aeroelasticity I

Optional Modules:

- Distributed Memory Parallel (DMP)
- Explicit Solver – Parallel
- Implicit Nonlinear - Parallel
- Krylov Solver
- Exterior Acoustics
- Aeroelasticity II
- Advanced PFA (Progressive Failure Analysis)



Occupant Safety – Airbag Simulation



Geometry access from leading CAD systems

Analysis Types

- Linear statics
 - Contact
- Nonlinear statics
 - Nonlinear materials
 - Large strain, displacement, rotation
 - Large sliding contact
- Dynamics
 - Frequency domain
 - Time domain
- Aeroelasticity and Aerodynamic flutter
- Transient and nonlinear dynamics
 - Nonlinear materials
 - Large strain, displacement, rotation
 - Large sliding contact
- Buckling
- Optimization
 - Sizing
 - Shape
 - Topology
 - Topometry
 - Topography
 - Non-linear response
 - Multi-model optimization
 - Manufacturing constraints
 - Symmetry/cyclic symmetry constraints
- Composite failure
- Perturbation analysis
- Noise and vibration analysis
- Acoustics
- Heat transfer
 - Conduction
 - Convection
 - Radiation
 - Advection
- Thermo-mechanical chaining
- Structural-acoustic
- Fluid structural interaction
- Integrated nonlinear multi-step static and transient analysis