

SECTION 1

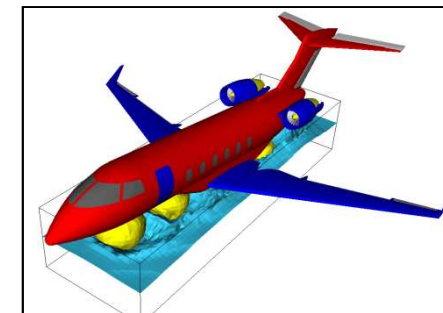
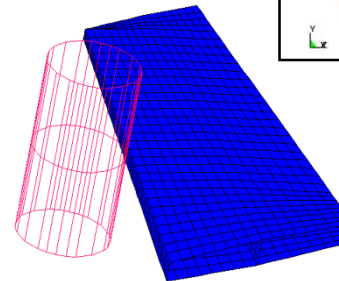
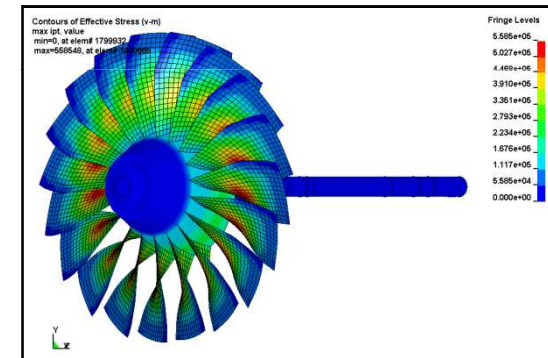
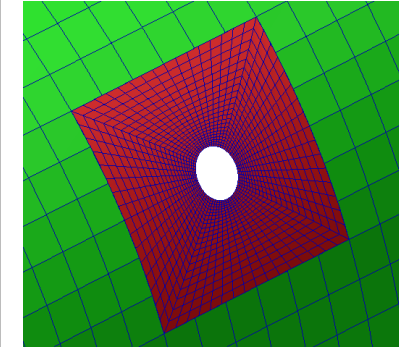
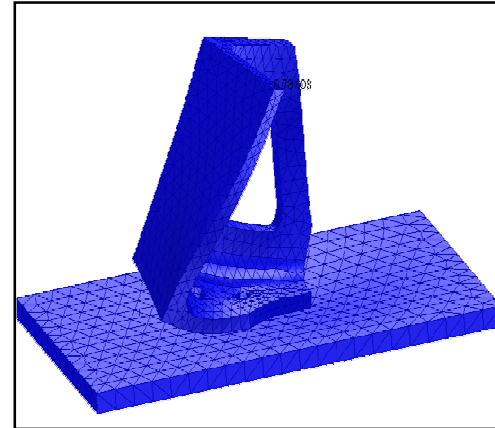
Introduction to MD NASTRAN SOL 400





What is "MD NASTRAN"?

- Evolution of engineering challenges:
 - Complex systems vs. "just parts"
 - Interacting environments
 - Disparate tools and databases
- Constant engineering challenge:
 - More work in less time
 - Higher fidelity solutions
- MD answers these challenges



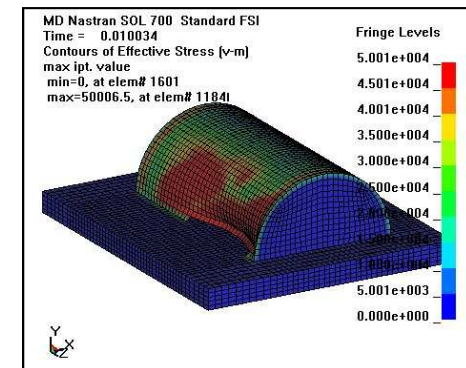
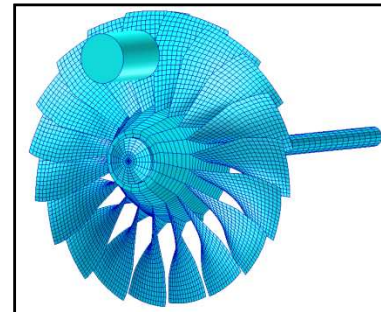
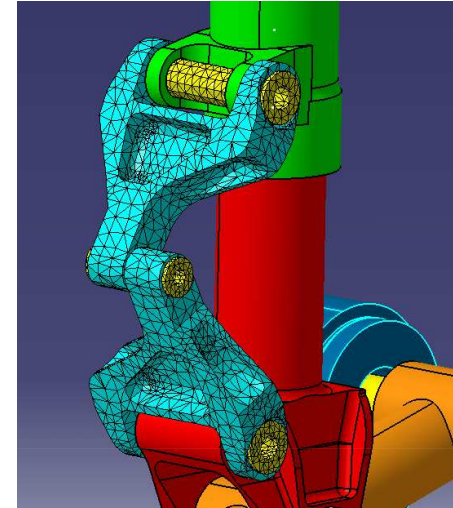
MD Nastran 100% compatible with MSC.Nastran

- MSC.Nastran element code base is a subset of MD Nastran
- All MSC.Nastran input files run on MD Nastran exactly how they would run on MSC.Nastran
- All Partner MSC.Nastran models will run on MD Nastran and give consistent solutions
- Not all MD Nastran models will run on MSC Nastran
 - MD models using specific features will not execute on MSC Nastran



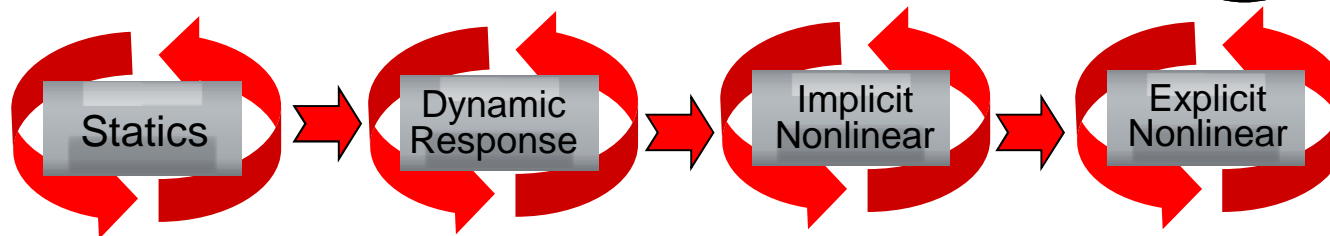
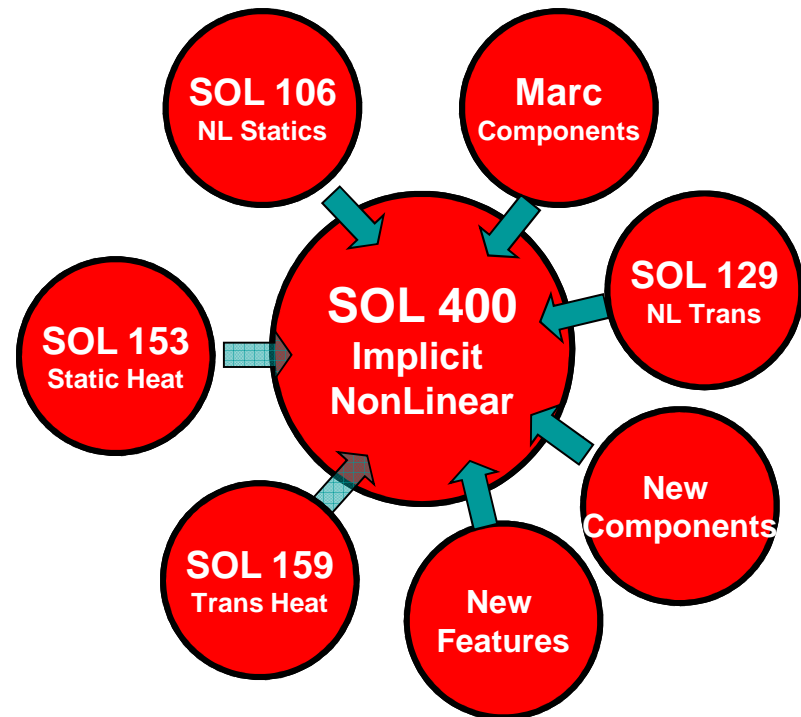
MD Nastran Summary

- MD Nastran brings powerful multidiscipline capabilities
 - Advanced Linear Solution Library
 - Full 3D Contact in Linear Static
 - Glued 3D Contact in All Linear Solutions
 - Advanced Nonlinear Solution Library
 - Full Nonlinear Contact Algorithms
 - Advanced Nonlinear Elements
 - Analysis Chaining
 - Integrated Explicit Capabilities
 - LS-Dyna and Dytran Components
 - Crash Analysis, Drop Test, Impact
 - Supported from Nastran Input File
 - Fluid-Structure Interaction
 - Advanced Composite Capabilities
 - Connector Elements
 - Advanced Acoustic Options



What is SOL 400 ?

- New advanced nonlinear solution process
 - Combines capabilities of multiple solution sequences and software components into a common solution
 - Allows for analysis Chaining
 - Automatically chaining together sequences of analyses with output state of one used as input state for another
 - Model complete processes in a single simulation through analysis chaining



Advanced Nonlinear

- Advanced Integrated Nonlinear
 - **Utilize "native" Nastran elements**
 - No translation required
 - **Combine static & transient in one analysis**
 - Pre-stress, transient, steady-state analysis chaining
 - Thermal-Structural analysis chaining
 - Multiple, independent loadcases in 1 run
 - Linear Perturbation
 - **Use general contact capability**
 - Solid-to-solid, surface-to-surface, edge-to-edge, beam-to-beam, etc.
 - **Go beyond small-strain element limitations**
 - Large strain elements / materials (shells, solids)

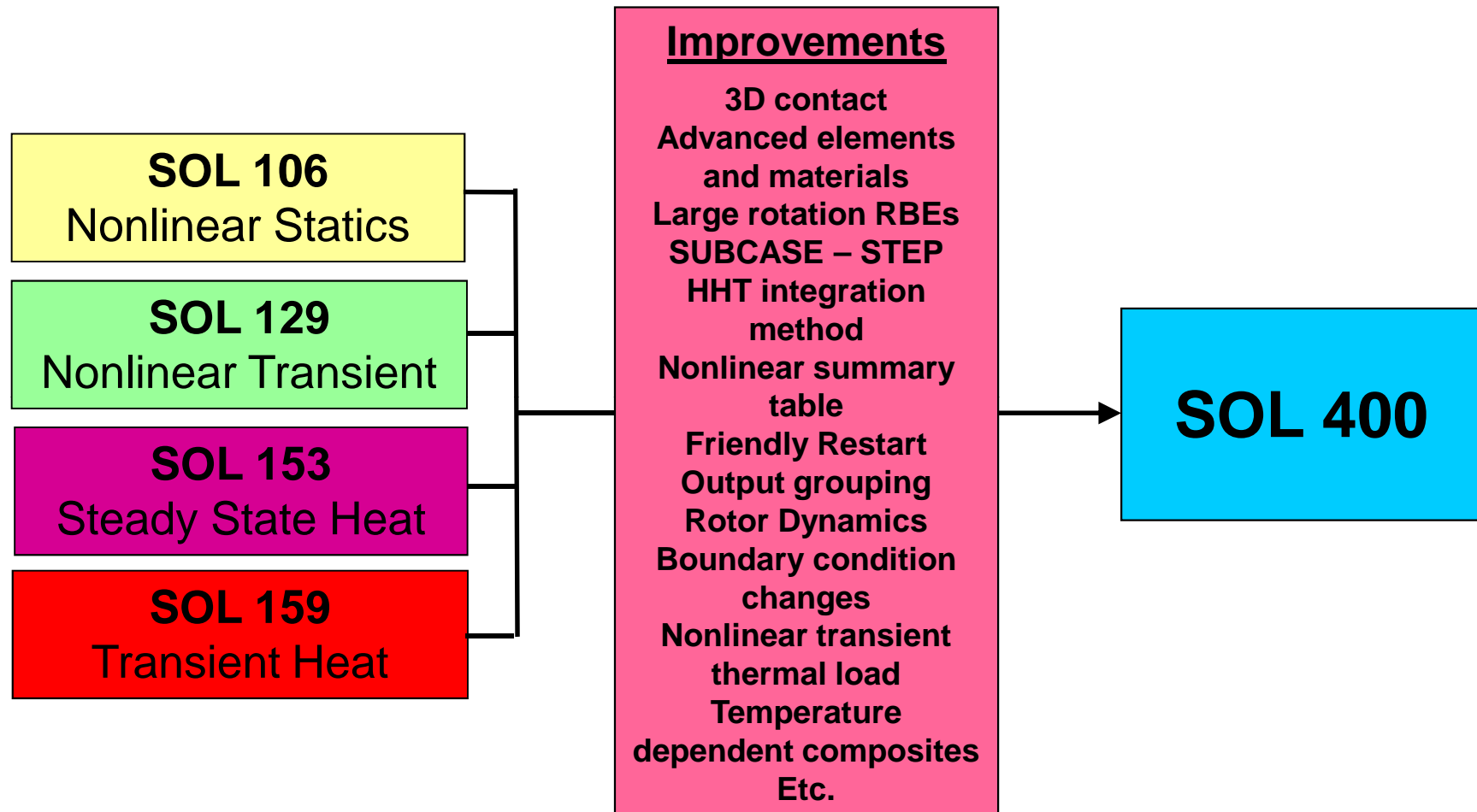


Advanced Nonlinear

- Advanced Integrated Nonlinear
 - **Model large displacement / rotation rigid elements**
 - Kinematic RBEi elements
 - **Nonlinear Connectors**
 - Large displacement / rotation CFAST, CBUSH, and CWELD elements
 - “Fuse” capability of CBUSH element
 - **Simulate Composite Progressive Failure**
 - Virtual Crack Closure Technique (VCCT)
 - Cohesive Zone Modeling
 - Progressive Failure Analysis (PFA)
 - Genoa Micromechanical modeling
 - Composite Beam



History of SOL 400



Integration of Marc

- As an enhancement to SOL 400, Marc has partly been integrated by new DMAP modules
- DMAP stands for Direct Matrix Abstraction Programming
 - All Solution sequences are written in DMAP
 - The DMAP modules IO to the Nastran Database
- Existing Solution Sequences can be modified using DMAP ALTERs and users can even build their own Solution Sequences
- In contrast SOL 600 is not really part of Nastran. It is a Nastran input translator for Marc.



WHAT IS MARC?

- First commercially available general-purpose non-linear FEA code
- Used in many industries for over 30 years
- Global and Local Adaptive Re-meshing
- Coupled-thermal structural analysis
- User-subroutines to create new material models, apply new boundary conditions

