MSC Software

Virtual Test Solutions for Aircraft Equipment & Systems

SOLUTION BRIEF

Software & Services Offerings

- **How we Help**
  Engineering simulation software, implementation & support, modeling & analysis projects, methods development, and training
- **Who we Help**
  OEMs, suppliers, engineering services companies, universities and research labs
- **How to Reach Us**
  www.mscsoftware.com

MSC Software provides a comprehensive set of engineering solutions for manufacturers specializing in aerospace equipment and systems. MSC Solutions may be used to improve the performance of current and future products, such as reducing weight, and can help reduce the product development cycle.

Our solutions are applicable to many areas, including:

- Aerosafety
- Aircraft Systems
- Cabin, Galleys & Equipment
- Seats

Load Prediction, Motion Analysis, and Controls Simulation of Aircraft Systems

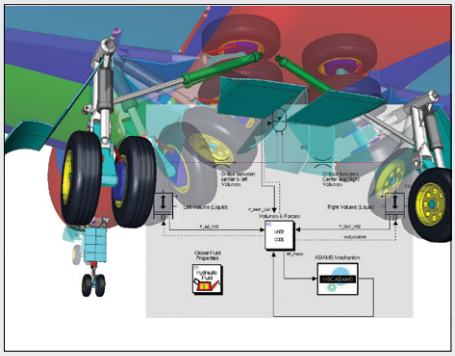
Mechanical systems such as lift systems, cargo equipment, arresting systems, etc. have large loads that are difficult and expensive to determine via physical testing. Multibody Dynamic (MBD) analysis enables you to determine loads and improve the motion of such mechanical systems. Traditional MBD assumes that structural members are fully rigid, but with MSC Software's MBD solution Adams, the structural members may be modeled with flexibility and improves the accuracy of MBD. Adams may be used to: supply loads for a subsequent structural analysis; provide load histories for fatigue analysis; couple with controls simulation to further improve the performance of mechanical systems while complementing and even reducing the number of physical prototypes.

Controls are essential to operating systems such as air management systems, flight controls, and landing gear extension/retraction systems. Controls simulation from MSC Software allows one to predict the performance of controls subjected to numerous configurations. With controls simulation, the complexity of a controls system can be expressed in an easy to understand schematic form and the necessary differential equations used to define the system can be solved.

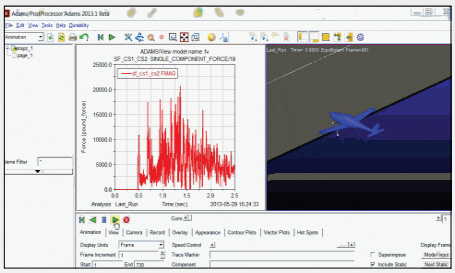
What is Adams and Easy 5?

Adams is a Multibody Dynamics analysis application used to determine the forces, inertial loadings, motion, velocity, and accelerations of dynamic systems. Adams automatically formulates and solves the equations of motion for kinematic, static, quasi-static, or dynamic simulations.

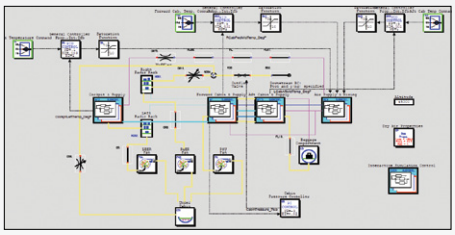
Easy 5 is a controls solution used to simulate the behavior of control systems. Control systems are typically defined using first-order differential equations. Easy5 allows engineers to conceptualize, construct, and analyze control systems by means of a graphical, schematic-based application.



Landing gear extension simulation for loads, motion, and controls

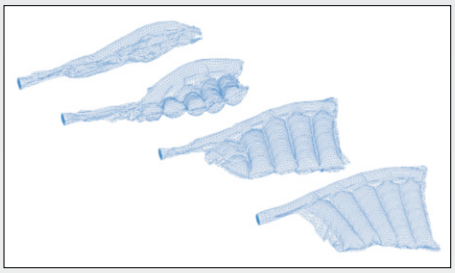


Arresting Cable Simulation

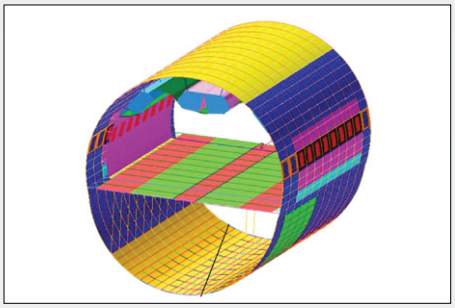


Schematic of an air distribution subsystem of an aircraft environmental control system

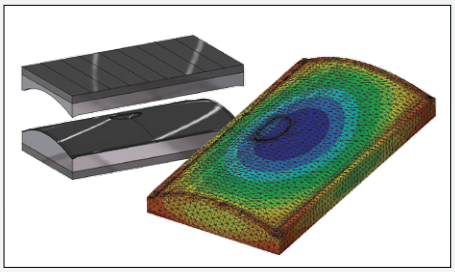
Structural Analysis for Aerosafety, Cabin & Structures, Galleys & Equipment, and Seats



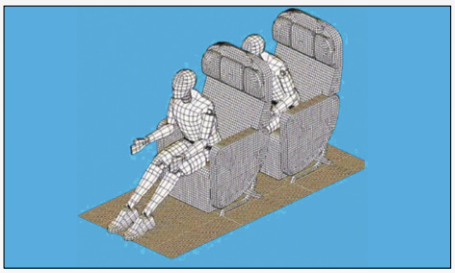
Multi-compartment airbag deployment



Dynamic analysis of an aircraft fuselage and interior structures including ceiling trims, overhead stowbins, and side walls



Prediction of forming tools heating process



Analysis of Hybrid III dummies under deceleration

Aerosafety

The successful deployment of safety systems such as life vests, life rafts, and evacuation slides is dependent on adequate inflation. A fluid-structure interaction analysis enables you to simulate such deployments. In order to perform fluid-structure interaction analysis effectively, a structural analysis application must be capable of simulating the structure and fluid concurrently. This is achievable with MSC Nastran, which includes both Lagrangian and Eulerian methods that accurately model fluid-structure interaction.

Cabin, Galleys & Equipment

Composite materials are increasingly used for interiors, but require an extensive amount of analysis and testing to ensure its performance. Composite laminates must not only perform well at first ply failure, but must reliably perform up to ultimate ply failure. Injection molded composites must not only be modeled as anisotropic, but also as non-homogenous. MSC Nastran includes a Progressive Ply Failure capability that allows you to gauge the ultimate load that can be carried by composite laminates. MSC Nastran may be coupled with Digimat to improve FEA accuracy of injection molded composites from 20-60% to 90%.

Seats

Seats must perform adequately under emergency loading conditions in order to be certified. Things such as load paths, loads acting on passengers, and a number of other results must be carefully understood. Explicit Nonlinear FEA enables engineers to perform such tests virtually, but often requires a separate structural analysis program. MSC Nastran, in addition to linear FEA, includes trusted Explicit Nonlinear FEA capabilities that allow engineers to perform crash analysis of seats. With MSC Nastran, a common data model can be used for linear and nonlinear analysis without the need to translate models across different FEA solvers.

What is MSC Nastran?

MSC Nastran is a multidisciplinary structural analysis application used by engineers to perform static, dynamic, and thermal analysis across the linear and nonlinear domains, complemented with automated structural optimization and award winning embedded fatigue analysis technologies, all enabled by high performance computing.

Engineers use MSC Nastran to ensure structural systems have the necessary strength, stiffness, and life to preclude failure (excess stresses, resonance, buckling, or detrimental deformations) that may compromise structural function and safety. MSC Nastran is also used to improve the economy and passenger comfort of structural designs.

MSC Nastran is based on sophisticated numerical methods, the most prominent being the Finite Element Method. Nonlinear FE problems may be solved either with built-in implicit or explicit numerical techniques. A number of optimization algorithms are available, including MSCADS and IPOPT. The fatigue capability in MSC Nastran has been developed jointly by nCode International Ltd. and MSC Software.

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