

# MSC Software Solutions

Expanding the Horizon  
of Engineering Simulation



# Table of Contents

## MSC Software

<b>About MSC Software</b>	<b>4</b>
<b>Message from the CEO</b>	<b>5</b>
<b>Solution Portfolio</b>	<b>6</b>
<b>MSC Products</b>	<b>6</b>

## Integrated Solutions

<b>Adams</b>	<b>7</b>
Multibody Dynamics Simulation DISCIPLINE: MECHANISMS & MULTIBODY DYNAMICS	

<b>Actran</b>	<b>8</b>
Powerful Acoustic Simulation DISCIPLINE: ACOUSTICS	

<b>Digmat</b>	<b>9</b>
Advanced Materials DISCIPLINE: MATERIALS	

<b>Easy5</b>	<b>10</b>
Advanced Controls Simulation DISCIPLINE: SYSTEMS	

<b>Marc</b>	<b>11</b>
Advanced Nonlinear & Multiphysics DISCIPLINE: STRUCTURES & MULTI-PHYSICS	

<b>SimXpert</b>	<b>12</b>
Multidiscipline Simulation DISCIPLINE: MULTIDISCIPLINE ENGINEERING	

## Solver Solutions

<b>MSC Nastran</b>	<b>13</b>
Structural & Multidiscipline DISCIPLINE: STRUCTURES & MULTI-PHYSICS	

**Dytran** 14  
Explicit Nonlinear & Fluid Structure Interaction  
DISCIPLINE: STRUCTURES & MULTI-PHYSICS

**MSC Fatigue** 15  
Fatigue Life Prediction  
DISCIPLINE: DURABILITY

**Sinda** 16  
Advanced Thermal  
DISCIPLINE: STRUCTURES & MULTI-PHYSICS

### Mid-Sized Business Solutions

**MSC Nastran Desktop** 17  
Multidiscipline Simulation for the Desktop  
DISCIPLINE: STRUCTURES & MULTI-PHYSICS

**SimDesigner** 18  
CAD-Embedded Simulation  
DISCIPLINE: MULTIDISCIPLINE ENGINEERING

### Modeling Solutions

**Patran** 19  
FE Modeling and Pre/Post Processing  
DISCIPLINE: STRUCTURES & MULTI-PHYSICS

**SimXpert** 12  
Multidiscipline Simulation Environment  
DISCIPLINE: MULTIDISCIPLINE ENGINEERING

### Simulation Process & Data Management

**SimManager** 20  
Simulation Process and Data Management  
DISCIPLINE: SIMULATION PROCESS & DATA MANAGEMENT

### Services

**Global Engineering Services** 21

**Training** 22



**Our products and services are used by 900 of the top 1000 manufacturers in the world, including:**

- Aerospace & Defense
- Automotive & Transportation
- Agricultural Equipment
- Heavy Machinery
- Medical Devices
- Oil and Gas
- Nuclear
- Renewable Energy
- Consumer Products
- Packaging
- Electronics

## About MSC Software

Simulating Reality, Delivering Certainty

MSC Software is one of the ten original software companies and the worldwide leader in multidiscipline simulation. As a trusted partner, MSC Software helps companies improve quality, save time and reduce costs associated with design and test of manufactured products. Academic institutions, researchers, and students employ MSC technology to expand individual knowledge as well as expand the horizon of simulation.

MSC Software's engineering simulation technology is used by leading manufacturers for linear and nonlinear finite element analysis (FEA), acoustics, fluid-structure interaction (FSI), multi-physics, optimization, fatigue and durability, multi-body dynamics, and control systems simulation. The company's products accurately and reliably predict how products will behave in the real world to help engineers design more innovative products - quickly and cost effectively.

### Company Profile

MSC Software Corporation was formed in 1963 and was awarded the original contract from NASA to commercialize the finite element analysis (FEA) software known as Nastran (NASA Structural Analysis). MSC pioneered many of the technologies that are now relied upon by industry to analyze and predict stress and strain, vibration & dynamics, acoustics, and thermal analysis in our flagship product, MSC Nastran.

Over our rich history, MSC has developed or acquired many other well known CAE applications including Patran, Adams, Marc, Dytran, Fatigue, SimXpert, SimDesigner, SimManager, Easy5, Sinda, and Actran. We are committed to the continued development of new CAE technology that integrates disciplines and technologies from standalone CAE tools into unified multi-discipline solvers and user environments. These "next generation" products enable engineers to improve the reliability and accuracy of their virtual prototypes by including multi-physics and multi-discipline interactions.

MSC is also the CAE industry's leader in extending simulation to the engineering enterprise. Our customers recognize the need to scale the benefits of virtual prototyping and testing from pockets of experts to mainstream engineering and product development, and MSC offers the only Simulation Data and Process Management platform in the world that has been successfully deployed in industries including automotive, aerospace, shipbuilding, electronics, and more. MSC Software employs 1,000 professionals in 20 countries.

## Message from the CEO

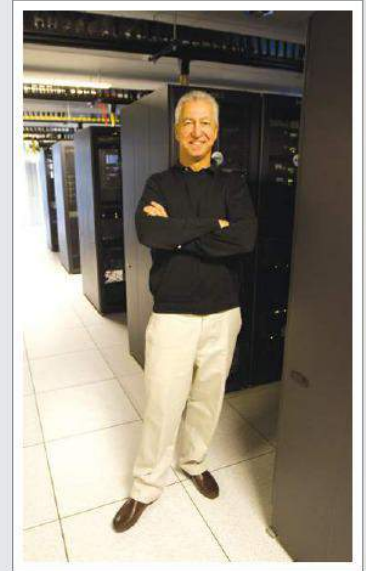
Dominic Gallelo

For half a century, MSC has been delivering certainty to our customers. By simulating the reality of complex manufactured systems through our software, we deliver certainty... so our users can delight their customers with great products, and certainty in business results by reducing time to bring the right products to market, reduce physical testing and warranty claims long after product design is over.

We do this by pushing the edge of physics and the latest computing technology to simulate real world behaviors. These principles that MSC was founded upon continue as our guiding light. We help to make cars safer and more efficient, airplanes more aerodynamic and more comfortable for passengers, ships stronger and able to travel longer distances, machinery run more efficiently and with less maintenance, and medical devices more effective to help us to live longer.

Our customers are faced with difficult questions every day; can I reduce the time it takes to develop? Will it work? Will it be innovative? Will it be safe? Will it be fuel efficient? Will it provide a new standard of passenger comfort? Will it last longer? Will it beat my competition? By knowing exactly how products will behave before they are built, manufacturers can deliver better products faster and with more reliability.

The first adopter of simulation technology was the aerospace industry. The challenge of safe flight from the very first test drove an industry to push the state of the art in simulation technology, long before any other industry. MSC became a trusted partner with the world's leading aerospace companies, delivering certainty every step of the way. In 2003, NASA put a value to society in excess of 10 billion dollars on the NASTRAN structural analysis simulation software delivered by MSC. Eventually, this kind of simulation technology became broadly adopted in nearly every industry from automotive to machinery, energy, infrastructure, consumer products and medical devices. Virtually every major OEM and manufacturer in the world is an MSC customer.



*Dominic Gallelo*  
President & CEO  
MSC Software



## Solution Portfolio

MSC Software makes products that enable engineers to validate and optimize their designs using virtual prototypes. Customers in almost every part of manufacturing use our software to complement, and in some cases even replace the physical prototype “build and test” process that has traditionally been used in product design.



## MSC Products

Simulating Reality, Delivering Certainty

### Integrated Solutions

#### Adams

Multibody Dynamics Simulation

#### Actran

Powerful Acoustic Simulation Software

#### Digmat

Advanced Materials

#### Easy5

Advanced Controls Simulation

#### Marc

Advanced Nonlinear & Multiphysics

#### SimXpert

Multidiscipline Simulation

### Solver Solutions

#### MSC Nastran

Structural & Multidiscipline

#### Dytran

Explicit Nonlinear & Fluid Structure Interaction

#### MSC Fatigue

Fatigue Life Prediction

#### Sinda

Advanced Thermal

### Mid-Sized Business Solutions

#### MSC Nastran Desktop

Multidiscipline Simulation for the Desktop

#### SimDesigner

CAD-Embedded Multidiscipline Simulation

### Modeling Solutions

#### Patran

FE Modeling and Pre/Post Processing

#### SimXpert

Multidiscipline Simulation Environment

### Simulation Process & Data Management

#### SimManager

Simulation Process & Data Management



## INTEGRATED SOLUTIONS

**Adams™**

## Multibody Dynamics Simulation Solution

Adams is the world's most widely used multibody dynamics simulation software. It lets you build and test functional virtual prototypes, realistically simulating on your computer, both visually and mathematically, the full-motion behavior of your complex mechanical system designs.

Adams provides a robust solution engine to solve your mechanical system model. The software checks your model and automatically formulates and solves the equations of motion for kinematic, static, quasi-static, or dynamic simulations.

With Adams, you don't have to wait until the computations are complete to begin seeing the results of your simulation. You can view animations and plots – and continue to refine your design – even as your simulation is running, saving valuable time.

For design optimization, you can define your variables, constraints, and design objectives, then have Adams iterate automatically to the design, providing optimal system performance.

**Business Value**

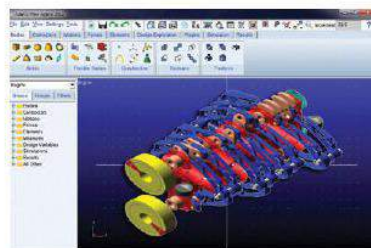
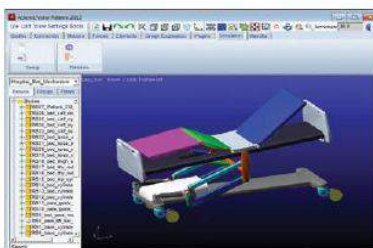
- **Improve Engineering Productivity:** Enable efficient communication between various groups of expertise, reduce your dependency on disconnected point solutions, and improve analyst efficiency.
- **Accelerate Time-To-Market:** Gain faster, better insight into overall system design performance.
- **Reduce Manufacturing Costs:** Accurately predict and correct the design behavior much earlier in the design cycle. Achieve an optimal design by analyzing multiple design variations faster.
- **Achieve Lower Warranty Costs:** Predict system-level functional performance, and accurately assess lifecycle service (safety, fatigue, durability). Reduce risk by having better information at every state of vehicle design and development.
- **Drive Innovation:** Explore several design concepts quickly and efficiently.

**Capabilities**

- Import of CAD geometry formats including STEP, IGES, DXF, DWG or Parasolid
- Extensive library of joints and constraints to define part connectivity
- Definition of internal and external forces on the assembly to define your product's operating environment
- Model refinement with part flexibility, automatic control systems, joint friction and slip, hydraulic and pneumatic actuators, and parametric design relationships
- Ability to generate flexible parts without the need to import MNF file from FEA software
- Ability to iterate to optimal design through definition of objectives, constraints, and variables
- Automatic generation of linear models and complex loads for export to structural analyses
- Comprehensive and easy to use contact capabilities supporting 2D and 3D contact between any combination of modal flexible bodies and rigid body geometry
- Comprehensive linear and nonlinear results for complex, large-motion designs

**High Performance Computing (HPC)**

- 64-bit support on Windows and Linux platforms
- Parallel processing support for Adams/Tire results
- Shared Memory Parallel solver
- State of the art Linear analysis capabilities
- High fidelity Adams-to-Nastran translation utilities to replace manual translation
- HHT integrators for a faster numerical integration of the equations of motion for a dynamic analysis

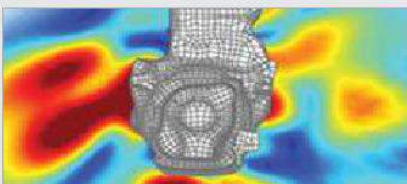


### Capabilities

- Analyze acoustic propagation and radiation
- Perform 2D, 3D and axisymmetric analyses with linear and quadratic elements
- Simulate acoustic radiation in free field with conjugate infinite elements
- Apply boundary conditions of pressure, velocity, acceleration, admittance and more
- Simulate acoustic and viscothermal fluids
- Predict noise due to turbulent flows
- Translate results from time to frequency domain
- Interface with leading CFD codes using native CFD file format
- Analyze absorption in foams or rock wools
- Recover vibration results from MSC Nastran for radiation analysis
- Solve your models faster with shared and distributed parallel solution
- Analyze piezoelectric, active structures
- Simulate multilayered composite structures
- Merge Actran models of trim components with MSC Nastran body-in-white model
- Import MSC Nastran superelements
- Perform coupled and uncoupled analysis in physical and modal coordinates, in frequency or time domain
- Import modal basis from structural FEA codes for representation of structural model

### Benefits

- Optimize acoustic performance of your products
- Obtain accurate results through multidisciplinary coupling with CFD solutions
- Improve vehicle designs through better understanding of trimmed body vehicle response
- Achieve faster results with infinite elements
- Improve productivity with parallel solvers



## INTEGRATED SOLUTIONS

# Actran™

## Powerful Acoustic Simulation

Actran is a premier acoustics software solution for simulating acoustics, vibro-acoustics, and aero-acoustics quickly, easily, and accurately. Under a common technological umbrella provided by the finite and infinite element method, Actran has a rich library of elements, material properties, boundary conditions, solution schemes and solvers. With the high performance solution coupled with easy to use modeling environment, engineers can gain insight into the acoustic behavior of their products and improve designs early in the product development cycle.

### Broad Range of Applications

With its broad range of acoustic analysis capabilities, Actran is used by diverse customers like automotive manufacturers and suppliers, civil and military aircraft and aircraft engine manufacturers, and consumer product manufacturers including loudspeakers and audio device producers. With its special elements and analysis capabilities, users can also analyze sound wave propagation in narrow ducts or thin cavities, which can be beneficial in developing products like hearing aids and solar array panels.

- **Acoustic Radiation of a Vibrating Structure:** Analysis of noise radiated by structures that vibrate in an open environment such as an engine, gearbox or turbo compressor.
- **Acoustic and Vibro-Acoustic Performance of Ducted Systems:** Assessing the acoustic and vibro-acoustics performance of an exhaust (or intake) line by computing the pipe and shell noises accounting for porous materials (rockwool, glasswool), porous plates and temperature gradients.
- **Aero-Acoustic Analysis in Vehicle Interiors:** Predicting the aero-acoustic noise generated by automotive climate control systems to reduce noise in a vehicle interior. Actran's unique aero-acoustic features are used to compute the acoustic source terms from unsteady CFD results and propagate them in the environment.
- **Aero-Vibro-Acoustic Analysis:** Computing the interior noise levels generated by turbulent air flow created by external fixtures such as side mirrors.
- **Acoustic Transparency of Flexible Panels:** Evaluating the acoustic transmission through flexible structural components like floor panels, dash boards, door panels and windshields.
- **Noise Transmission due to Turbulent Boundary Layer (TBL):** Study of the performance of acoustic insulation in an aircraft fuselage panel subjected to a TBL during flight.
- **Environmental Control Systems (ECS) Noise:** Understanding the effect of duct shapes, materials and acoustic treatments on noise propagation through ECS ducts.



## INTEGRATED SOLUTIONS

# Digmat™

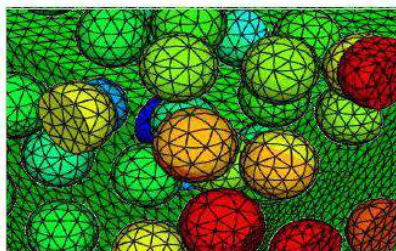
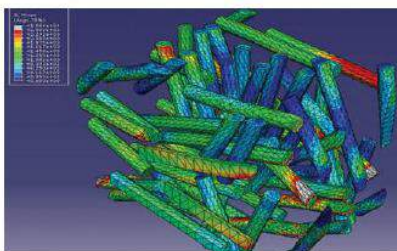
## Advanced Materials

Digmat enables engineers perform both micro- and macro-scale analyses of composites, predicting their performance and calculating their mechanical, thermal and electrical properties.

Digmat composites modeling technology relies on micromechanical approaches to accurately predict the behavior of multi-phase material and bridges the gap between manufacturing process, material design and structural FEA. With Digmat as part of your CAE suite, your product development becomes more predictive, enabling you to optimize your composite structure design with confidence saving you both time and resources.

Structural analysis of composites often requires integration of data from multiple sources, which could include material data, strand information that may be obtained from molding simulations. Digmat-MAP calculates residual stresses and temperature from the injection molding mesh and defines a higher quality structural FEA mesh. They may also use Digmat's MF, MX, FE modules to look at test data for the composite and its constituents and look at promising material candidates. Equipped with better knowledge of the material, engineers can improve their products for performance and cost.

- **Digmat-MF:** For a fast & accurate prediction of the nonlinear behavior of multi-phase materials using Mean-Field homogenization technology.
- **Digmat-FE:** For an accurate prediction of the local/global nonlinear behavior of multiphase materials using FEA of realistic Representative Volume Element (RVE).
- **Digmat-MX:** For the preparation, storage, retrieval and secure exchange of DIGIMAT material models between material suppliers and users.
- **Digmat-CAE:** Interfaces to process and structural FEA codes for an accurate prediction of composite materials and reinforced plastics parts performance using nonlinear multi-scale modeling approach.
- **Digmat-MAP:** For an efficient mapping of scalar & tensorial data between dissimilar shell and solid FE meshes.
- **Micross:** For an easy and efficient design of honeycomb sandwich panels using state-of-the-art micromechanical material modeling technology.



### Capabilities

- Holistic approach to model composite materials (materials, physics, CAE technology)
- Multi-scale modeling from the microscopic to the macroscopic scale, with representative volume elements, homogenization technology
- Material exchange platform to prepare, store, retrieve and securely exchange Digmat material models between material experts & structural engineers
- Virtual testing of composite materials with flexible loading definitions – monotonic & cyclic
- Support for broad range of composite materials, including fiber reinforced plastics, hard metals, ceramics, nano, and sandwich panels
- Complex material morphologies (multi-phase, multi-layer)
- Support for linear/nonlinear, temperature & strain rate dependent behaviors
- Analysis of failure, creep, and fatigue
- Interfaces to all major FEA and processing simulation software

### Benefits

- Improve fidelity in simulations through better material modeling
- Characterize multi-phase composite materials with ease
- Improve accuracy by bridging the gap between FEA and processing simulation
- Improve communication and standardize material library to reduce errors

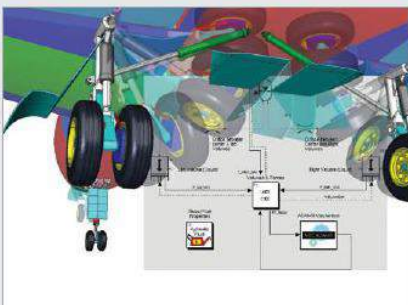


### Capabilities

- Assemble models easily from hundreds of pre-built system components
- Easy to use schematic based system-level modeling, simulation and analysis
- Complete system virtual prototyping by linking Easy5 to other MSC applications
- 64-bit support for Windows and Linux
- Integration with SimManager for easy sharing of models and results (Windows only)
- Customizable libraries of components
- Easy to use GUI with Windows style functionalities
- Integration with other CAE software packages like Adams®, Nastran® and Simulink®

### Benefits

- Asses complex multi-domain systems quickly and accurately
- Improve products early in the design process
- Understand problems and design countermeasures effectively
- Reduce CAE cost with shareable libraries
- Improve CAE effectiveness by integrating with other tools



## INTEGRATED SOLUTIONS

# Easy5®

## Advanced Controls Simulation

Engineering aircraft, vehicles, agricultural equipment, and other complex systems requires a systems-engineering approach in which not only the components and subsystems but the entire system as a whole is tested. Traditional build and test methodologies are time-consuming and expensive; and now more than ever, every industry is challenged to meet the conflicting requirements of increasing innovation while reducing cost and time to market.

Easy5 provides accurate, reliable multi-domain modeling and simulation of dynamic physical systems. Using Easy5, some of the most respected companies in the world are evaluating system level performance with CAE to reduce physical prototypes, cut cost, and accelerate their product development process.

Dynamic systems, those systems whose behavior as a function of time is important, are typically defined using first-order differential (or difference) equations. Easy5 simplifies the construction and analysis of such systems by means of a graphical, schematic-based application, offering a comprehensive set of pre-packaged “components”, stored in application-specific libraries, to simplify the assembly and simulation of such systems. Systems engineers work within a familiar schematic drawing environment to add and specify simple, yet complex, connections between components in an intuitive, simple-to-use, multi-level hierarchical modeling environment.

Typical applications of Easy5 include control systems, hydraulics (including thermal effects), pneumatics, gaseous flow, thermal, electrical, mechanical, refrigeration, environment control, lubrication or fuel systems, and sampled-data/discrete-time behavior.



## INTEGRATED SOLUTIONS

**Marc®**

## Advanced Nonlinear Simulation

Marc is a powerful, general-purpose, implicit nonlinear finite element analysis (FEA) software program that accurately simulates static, dynamic and coupled physics problems for a wide range of design and manufacturing applications. Unlike linear FEA methods that rely upon making simplifying assumptions, Marc enables you to emulate the complex nature of real-world behavior and mechanical processes to ensure highest design confidence and product performance under realistic environments and operating conditions. Recognized as the world's first commercial nonlinear FEA software, Marc has, since 1971, delivered innovative, easy-to-use and robust solutions that are well-suited for analyzing the structural integrity and performance of parts experiencing geometric, material, and/or boundary nonlinearities.

**Powerful Auto-Remeshing**

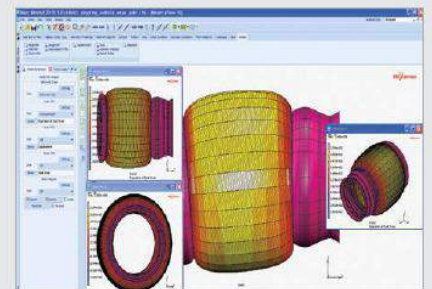
In applications involving materials experiencing extreme deformations, the finite element mesh may become highly distorted, usually leading to a loss in accuracy or analysis failure. However, Marc overcomes this problem by automatically generating a new global mesh ("remeshing") and transferring the solution from the old mesh to the new mesh ("rezoning"). Marc's robust global adaptive remeshing and rezoning capability creates high-quality meshes on individual bodies during the deformation process and automatically reapplies the contact boundary conditions to achieve accurate and fast solutions to highly non linear problems. Selective enrichment of the mesh in areas where material nonlinearity occurs helps to minimize computational costs and achieve high precision where it is needed.

**Capabilities**

- Advanced nonlinear materials
- Industry proven contact to accurately simulate product performance and manufacturing
- Coupled solutions of nonlinear structural, thermal, electromagnetics.
- Advanced heat transfer analysis capabilities
- Special purpose material models including Shape Memory Alloy and Solder models
- Comprehensive connector and fastener models to simulate commonly found connections
- State-of-the-art iterative solvers and parallel processing on shared and distributed memory machines
- Automated remeshing and adaptive meshing to increase solution robustness and accuracy
- Motion and suspension analysis powered by Adams
- Advanced damage and fatigue analysis of metals and composite structures
- Predict crack initiation and propagation under realistic load conditions

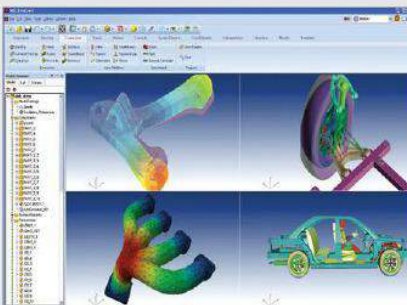
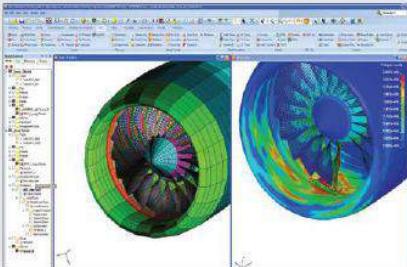
**Benefits**

- Shorten the design optimization process, while improving design and product performance through integrated simulation
- Reliable analysis capabilities to reduce product design, development, manufacturing & warranty costs
- Robust solver technology that greatly enhance the value of nonlinear solutions encountered in many industries



### Capabilities

- Intuitive object based user interface with contextual actions
- View, manipulate, and organize your model with advanced browser functionality
- Native bi-directional CAD access for CATIA, Pro/ENGINEER, and NX
- Import IGES, Parasolid, CATIA V4, CATIA V5, Pro/ENGINEER, ACIS, STEP and STL data for FE modeling
- Interactive CAD cleaning and healing with auto curve, shell, and solid meshing
- Define simulation properties using engineering terms for use across all workspaces
- Contact creation and setup through easy to use and intuitive contact tables
- Visualize and manipulate all CAE entities
- User configurable toolsets and menus to streamline the modeling process



## INTEGRATED SOLUTIONS

# SimXpert®

## Fully Integrated Multidiscipline Simulation

SimXpert is a fully integrated simulation user environment for product simulation. It brings together end-to-end multidiscipline simulation capabilities and best practice methodology capture and deployment technologies in a single unified environment. This approach closes the collaboration gap that exists between analysts and designers, enabling them to share critical information across disciplines without duplicating work and allows them to deploy their best practices to the extended enterprise. This radical change to the traditional analysis process enables manufacturers to accelerate the speed and accuracy of simulation, increase design productivity, and bring better products to market faster.

### Accurate, Robust Analysis for Diverse Applications

SimXpert provides the best platform for expert analysts to complete all stages of the simulation process – from pre-processing and modeling, solving, to post-processing, results manipulation and reporting – within one integrated workspace environment. These workspaces allow the analyst to easily move from one area of expertise to another while sharing data models and results.

- **Structures Workspace** - Perform linear and advanced non-linear, static and dynamic structural analyses based on the very best solutions available in MSC Nastran.
- **Motion Workspace** - Predict loads and analyze system motion based on MSC's leading MD Adams capabilities. Bring in flexible bodies, and pass through nodal loads seamlessly.
- **Explicit Workspace** - Use MSC Nastran to perform large deformation, highly nonlinear, short duration transient dynamic analyses for both structural impact and coupled fluid-structure interaction problems.
- **New Systems and Controls Workspace** - Accurate, reliable multi-domain modeling and simulation of dynamic physical systems including control systems, electrical, thermal, hydraulic, gas dynamics etc. Access full capability of Easy5 within SimXpert and integration with Simulink®.
- **Crash Workspace** - A complete pre- and post- processing environment for vehicle crash and impact analysis based on LS-DYNA™, the most widely used crash solver in the market.
- **Thermal Workspace** - Evaluate and analyze the thermal performance of designs by using the linear and non-linear, steady state and transient analysis capabilities of MSC Nastran.
- **Advanced Solution Extensions** - SimXpert is an open platform enabling easy integration with third party tools as well as the creation of customized workspaces.

## SOLVER SOLUTIONS

**MSC Nastran™**

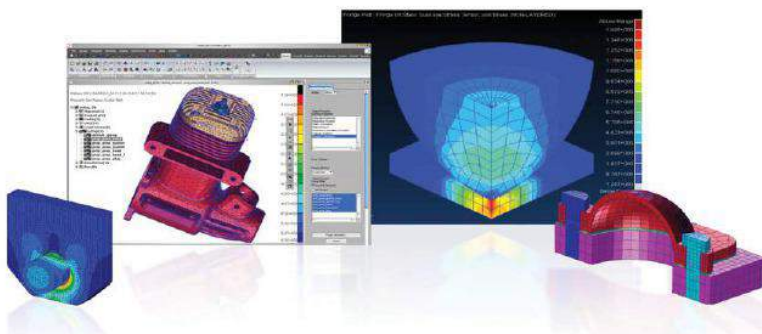
## Structural &amp; Multidiscipline FEA

Manufacturers around the globe have relied on MSC Nastran to bring new products to market for over four decades by using its capabilities to analyze designs ranging from simple components to complex structures and assemblies. MSC Nastran's modular and scalable solution enables you to start to grow your analysis capabilities as your virtual product development needs expand. As part of your development process, you can use MSC Nastran to assess many functional aspects of your product, such as static and dynamic response, frequency response, multi-body contact interaction, nonlinear material response, and impact and crash behavior due to various working loads and boundary conditions that are experienced during the product's life cycle.

In addition to providing the most comprehensive portfolio of simulation technologies for advanced engineering analysis, MSC Nastran is optimized across multiple, integrated disciplines with the power to handle large-scale problems and to take advantage of the latest high performance computing hardware. MSC Nastran's focus on integrated and multidisciplinary solutions helps you achieve across-the-board efficiency by driving early design validation, improved product performance and rapid insight into product lifecycle performance.

**Business Value**

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

**Capabilities**

- Analyze large assemblies with simple to use and robust contact capabilities
- Perform static and transient analysis of structures involving material, geometric and boundary condition nonlinearities
- Execute heat transfer analysis with contact including conduction, convection and radiation
- Predict the failure of structures composed of composite materials
- Simulate and review the behavior of rotating machinery
- Use advanced FEA algorithms optimized for large scale systems, assemblies, dynamics and NVH simulations
- Study the strength, durability and vibrations assessment of structures
- Understand the dynamic response of structures subjected to loads that vary with time or frequency
- Use Automated Component Modal Synthesis (ACMS) for large modal based analyses and NVH solutions
- Analyze the Aeroelastic behavior of structures
- Optimize engineering designs and finished products using sizing, shape and topology optimization with manufacturing constraints
- Optimize large model sections through Automatic External Superelements
- Use enhanced iterative and in-core sparse solvers
- Perform Multi-model optimization to simultaneously optimize two or more structural models
- Consider stochastic behavior in simulations
- Use Graphics Processing Units (GPUs) for improved solver efficiency

**Benefits**

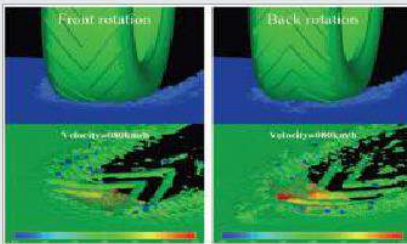
- Accelerate innovation through improved event simulation
- Design optimization to achieve reduced material costs
- Deliver products that meet certification and safety requirements
- Reduce risk by using simulation to save time and cost

### Capabilities

- Advanced, explicit nonlinear solver technology for simulating and analyzing extreme, short duration dynamic events, such as crash, crush, impact, drop, shock, shake, blast, penetration, and sloshing of materials in a variety of industrial and commercial applications.
- Robust and efficient three-dimensional contact and coupling algorithms using Lagrangian finite element method for structural analyses and Eulerian finite volume method for fluids and multi-material flow analyses.
- Complete finite element model library that includes beams, shells, solids, springs, and dampers with large displacement formulation.
- Full range of nonlinear material models for metals, composites, soils, foam rubber, liquids, and gases.
- Distributed Memory Parallel (DMP) support for Eulerian solver and coupling surface computation

### Benefits

- Minimize the costs of physical prototyping and eliminate redundant test cycles through Dytran's streamlined modeling flow and most advanced fluid-structure interaction (FSI) simulation capabilities.
- Quickly obtain detailed insight into the nonlinear, dynamic behavior of real-world problems that cannot be easily solved with other simulation tools.
- Model complex scenarios and perform "what-if" analyses earlier in the design cycle within a single analysis package and simulation environment.
- Apply results from Dytran to improve the quality of your products and minimize the probability of failures and costly redesigns.



### SOLVER SOLUTIONS

## Dytran™

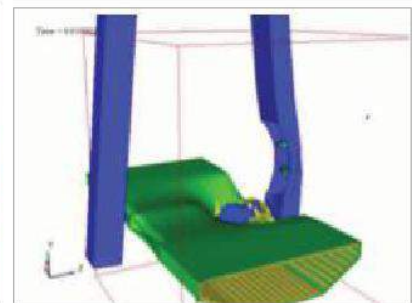
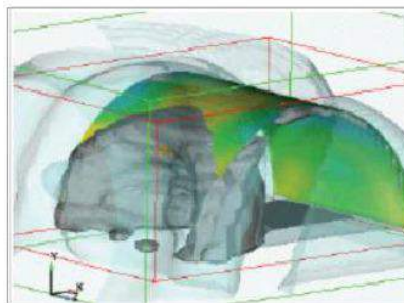
### Explicit Dynamics & Fluid Structure Interaction

Dytran is an explicit finite element analysis (FEA) software program for simulating and analyzing complex, short-duration events involving severe deformation of structural materials and the interaction of fluids and structures. Dytran provides the most comprehensive and robust solution available to simulate impact, crush, penetration, explosion, and other fluid-structure interaction (FSI) applications. A broad range of material models and element types enable users to perform VPD experiments and "what-if" analyses on design concepts before building and testing costly physical prototypes.

### Accurate, Robust Analysis for Diverse Applications

Dytran's accuracy has been proven through correlation with physical experiments. Dytran helps engineers predict how a prototype would respond to a variety of real-world dynamic events and to examine potential causes for product failure. Some examples include:

- **Aerospace Applications:** Aircraft ditching, fuel tank sloshing and rupture, bird strike simulation, engine blade containment, aircraft crashworthiness, seat design and safety, aircraft and cargo containment hardening.
- **Automotive Applications:** Airbag design and occupant safety (out of position studies), dummy modeling and seat design, vehicle impact and crash testing, tire hydroplaning, fuel tank sloshing and rupture.
- **Military and Defense Applications:** Shaped charge simulation and weapons design, projectile penetration and perforation of targets, hydrodynamic ram (HRAM), ship collision, underwater shock explosion (UNDEX), blast resistance and survivability.
- **Other Industrial Applications:** Bottle and container design, paper feeding, drop testing, sports equipment impact analysis, packaging design.



## SOLVER SOLUTIONS

**MSC Fatigue™**

## FE Based Durability Simulation

MSC Fatigue is a Finite Element (FE) based durability and damage tolerance solver that enables users with minimal knowledge of fatigue to perform comprehensive durability analysis. High-cycle fatigue, low-cycle fatigue and crack growth problems can all be addressed. All MSC Fatigue pre and post-processing is done within the Patran environment. This provides easy access to all analysis options of MSC Fatigue. Job setup and submittal is done through an easy-to-use graphical interface creating a single environment for durability analysis. Results post-processing gives insight into, and identification of, fatigue problem areas allowing for in-depth understanding of model response to changes in fatigue design parameters.

**Business Value**

The Problem: Some estimates put annual costs due to premature fatigue fractures in structural components at well over \$100 billion. Issues that drive this statistic include:

- **Test Too Expensive:** Testing against repeated loading cycles, sometimes millions of times over, is often too expensive and time consuming to be practical
- **FEA Alone Not Enough:** Finite element analysis can tell you where stress “hot spots” exist, but on their own can’t tell you whether those hot spots are critical areas for fatigue failure, or when fatigue might become a problem
- **Settling for Less:** Many manufacturers simply accept long prototype development cycles, overweight components, unpredictable warranty claims and loss of customer confidence

The Solution: MSC Fatigue enables durability engineers to quickly and accurately predict how long products will last under any combination of time-dependent or frequency-dependent loading conditions. Benefits include:

- Reduced prototype testing
- Fewer product recalls
- Lower warranty costs
- Increased confidence designs will pass required test schedules

**Capabilities**

- High-cycle fatigue, low-cycle fatigue and crack growth analysis
- Stress life (S-N), strain life (e-N) and linear elastic fracture mechanics (LEFM) methods
- No limit on number of nodes or elements analyzed
- Modifiable materials database with comprehensive set of S-N, E-N, Cyclic and Component curves
- Static, transient and quasi-static loading
- Supports simultaneous application of up to 500 load cases
- Modifiable loads database with standard time histories
- Support for RPC, DAC and ASCII load files
- Non-proportional, multiaxial stress states
- Frequency-domain analysis via PSD
- Compliance function library including numerous crack geometries
- Spot and seam weld analysis

**Prerequisites**

- Patran

**MSC Fatigue Basic Package includes:**

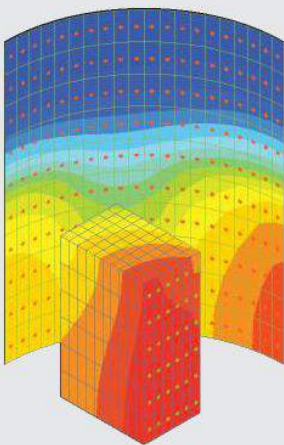
- Basic Stress Life and Strain Life
- Strain Gauge

**MSC Fatigue Advanced Package includes:**

- Multiaxial
- Vibration Fatigue
- Fracture
- Spot Weld
- Wheels
- Utilities

### Capabilities

- Use an intuitive RC network approach to build thermal models
- Set up advanced thermal problems involving nonlinear materials, radiation, and other complex boundary conditions
- Integrate with a variety of pre-post processors and radiation codes to utilize existing models, reduce learning time, and increase total project cohesion
- Provide unique programming logic to analyze any number of "what-if" situations
- Easily set up parametric analysis such as sensitivity, optimization, and test correlation to increase understanding of thermal consequences to design changes
- Use a proven tool in the aerospace and high tech industries with a quarter century track record
- Select from 25 steady state and transient solvers to converge almost any solution quickly and accurately
- Use the available 64-bit version that not only has more precision with computations, but improved memory efficiency for large models
- Includes Thermal Studio; a Windows based GUI for creating and running models and reviewing the results in tabular reports of x-y plots
- Integrate into Patran, THERMICA, Visio or Excel



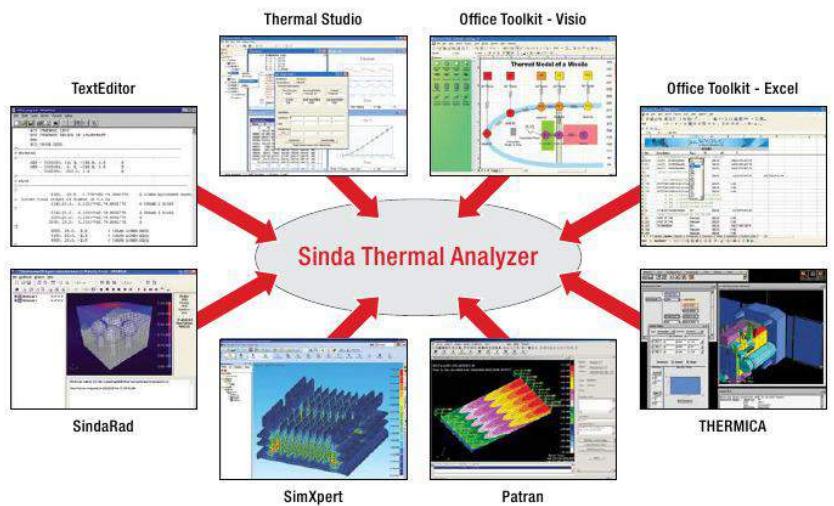
### SOLVER SOLUTIONS

## Sinda™

### Advanced Thermal Simulation

Sinda is a world class advanced thermal solution with a proven track record in the aerospace and high tech markets. Sinda technology is well suited to solve large thermal problems that may include various material and boundary condition nonlinearities. Iterative schemes make Sinda more efficient in time and memory requirements than traditional finite element solvers. With industry proven efficient solver technology, users can simulate complex thermal models that may include conduction, convection, advection and radiation along with thermal contacts.

Sinda goes beyond other generic thermal solvers; it is a thermal programming language allowing you to continuously add customized capabilities to your thermal model. Any degree of logic from simple convection equations to entire subroutines can be added to your Sinda model. In addition, parameters, loads, and materials can be changed "on the fly" from various user interfaces.





MID-SIZED BUSINESS SOLUTIONS

## MSC Nastran Desktop™

### Multidiscipline Simulation for your Desktop

MSC Nastran Desktop makes MSC Nastran, the leading structural FEA solution, accessible to worldwide innovative industries and engineers with diverse high-end simulation technology needs and increasing cost pressure challenges. Designed specifically for suppliers and medium-sized manufacturers, MSC Nastran Desktop provides flexible, low-cost access to MSC Nastran's extensive and powerful solution capabilities through SimXpert's scalable and integrated easy to use interface. Any industry or company, independent of its size, can benefit from modular access to the most powerful multidiscipline simulation technology in the world through tailored solutions. Engineers can start with the MSC Nastran capabilities that fit their current FEA needs and easily move up to more advanced functionality while remaining in the same user environment, leading to accelerated productivity and shorter learning curve. Each MSC Nastran Desktop solution is available at affordable prices, and backed by MSC Software's best-in-class technical support and engineering partnership.

MSC Nastran Desktop delivers the power of MSC Nastran through a modularized approach. Listed below are the various modules:

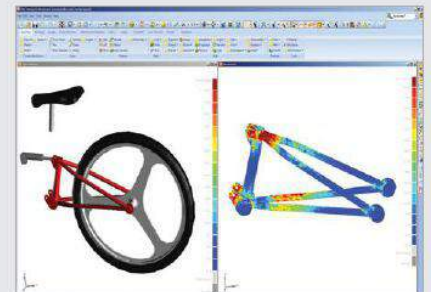
- **MSC Nastran Desktop Structures:** Tailored to stress engineers working on components, assemblies and structures subjected to static and dynamic loads. Engineers can analyze any structural component with ease, determine if the structure is going to buckle or yield, and ensure the design performs within tolerance limits.
- **MSC Nastran Desktop Structures & Motion:** Helps structures and motion engineers study the true functional performance of systems using the multibody dynamics (MBD) and kinematics capabilities engine of Adams together with the power of MSC Nastran.
- **MSC Nastran Desktop Advanced Dynamics:** Helps structural dynamics & acoustics engineers virtually simulate designs that are subjected to advanced dynamic loading conditions.
- **MSC Nastran Desktop Advanced Structures:** Tailored to structural engineers simulating nonlinear and multiphysics problems including nonlinear materials, contact, large strain and displacement behaviors, and thermo-mechanical coupling.
- **MSC Nastran Desktop Advanced Explicit:** Helps structural engineers study explicit nonlinear problems including drop testing, impact, and crash simulations.
- **MSC Nastran Desktop Advanced Structures & Motion:** Helps structural and systems engineers study the true functional performance of systems using the multibody dynamics (MBD) and kinematics capabilities engine of Adams together with the advanced structural and nonlinear capabilities of MSC Nastran.

#### Capabilities

- Use advanced CAD defeaturing and meshing tools
- Analyze the behavior of complex components and assemblies by using an extensive set of finite element analysis capabilities available in MSC Nastran
- Study the interaction of dynamic systems with multibody dynamic and kinematic capabilities available in Adams
- Construct templates to perform multi level automated processes
- Organize numerous virtual prototype iterations for future traceability

#### Benefits

- Increase productivity through a unified and simple user environment
- Reduce physical test costs by maximizing the performance of each virtual prototype
- Save time organizing and managing large FEM assemblies

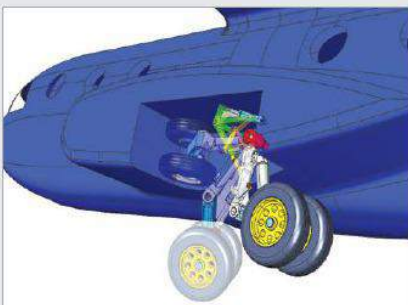


**Capabilities**

- Supports CATIA V5
- Execute SimXpert templates directly from CAD environment enabling designers to perform expert guided structural and motion analyses on CAD geometry.
- Post-process structures and motion simulation template results directly within CAD environment.
- Utilize SimManager to manage simulation template runs, data revision control, release status, and data pedigree and audit trail.

**Benefits**

- Drive simulation earlier in the design process to lower the cost of design changes and improve product quality and manufacturability.
- Increase confidence in early design validation and designs iterations through template-guided simulation
- Enhance collaboration between design teams and expert analysts to promote automation and reuse of CAE best practices across the enterprise.
- Gain greater insight into design performance. Template guided analysis ensures proper modeling, simulation inputs, materials data, and CAE best practices are being followed by CAD users.
- Control data access and share data with other designers, engineers, managers and executives across the enterprise.



## MID-SIZED BUSINESS SOLUTIONS

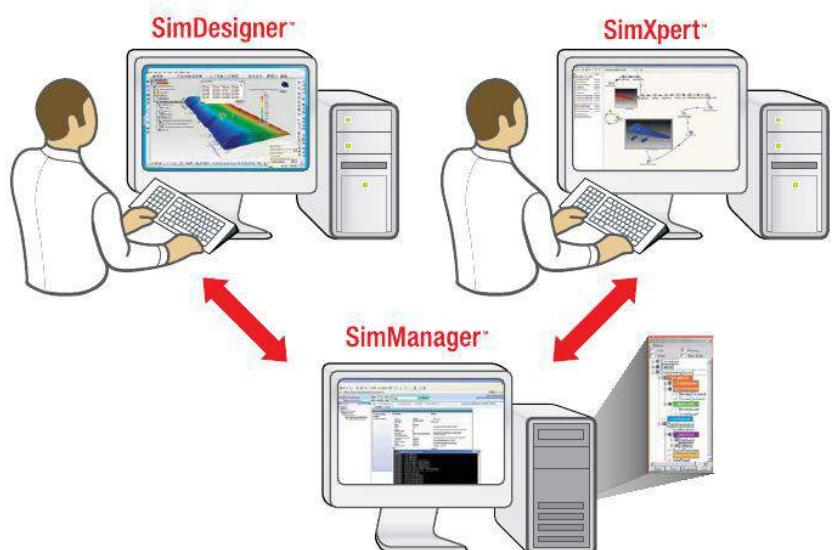
**SimDesigner™**

## CAD-Embedded Multidiscipline Simulation

SimDesigner makes linear and nonlinear FEA, thermal analysis, and motion analysis capabilities from MSC Nastran, Marc, and Adams available within the CATIA V5 CAD environment. Many manufacturers want to bring simulation forward in their product development process to have functional performance analysis lead design, rather than simply validate design. This can be challenging in organizations that cling to an “over the wall” mentality between design and analysis engineers, as CAE engineers wait for detailed drawings to get started on even the most basic analysis, and in turn, design engineers wait for CAE to be completed. Worse yet, changes made late in the design cycle can increase costs by several orders of magnitude and significantly delay time-to-market.

SimDesigner enables designers or analysts to perform analysis early by providing powerful linear FEA, nonlinear FEA, and multi-body dynamics solver technology inside of the CATIA V5 user environment. The benefits of providing easy to use analysis functionality within the familiar CAD environment include elimination of CAD translation & fixing, enabling simulation earlier in the design process, and correcting design flaws before products are ever seen by customers.

SimDesigner capabilities include: Motion Workbench, Structures Workbench, Thermal Workbench, and Enterprise Gateways.



## MODELING SOLUTIONS

**Patran®**

## Complete FEA Modeling Solution

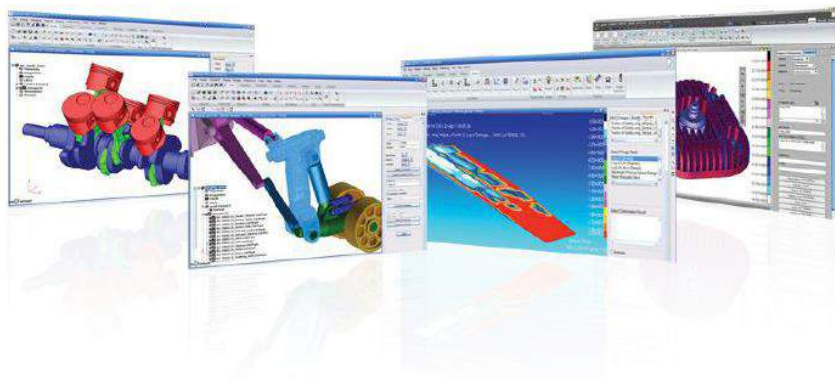
Patran is a comprehensive pre- and post-processing environment for FEA analysis and helps engineers to virtually conceptualize, develop and test product designs. Used by the world's leading manufacturing companies as their standard tool for the creation and analysis of simulation models, Patran links design, analysis, and results evaluation in a single environment.

Companies can reduce time and cost of product development process by incorporating Patran into their simulation process. By enabling engineers to access the industry's leading analysis programs, Patran can help organizations reduce the cost and burden of maintaining multiple pre- and post-processing tools in different parts of the organization and improve the time to market.

Through the seamless integration of CAD geometry, pre- and post-processing capabilities and the ability to perform sophisticated simulations on virtual parts, assemblies and structures, Patran is a key part of the design process for companies who rely on fast time to market and extraordinary product quality to drive market share and profits.

Patran enables engineers to directly import geometry from the CAD program of engineer's choice, and then define loads, boundary conditions, and material properties, perform different simulations under different conditions, visualize the results, and ultimately better understand the relationship between design decisions and product performance characteristics such as stress, strain, vibration, heat transfer and many more.

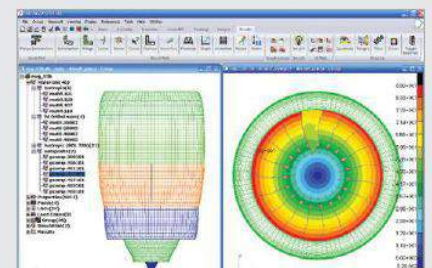
In addition, Patran's graphical interface is built to be fully customizable to your organization's unique engineering processes. With Patran Control Language (PCL), engineers can supplement the powerful modeling and analysis capabilities with their own, customized applications, commands, and menus. Patran users can easily iterate and evaluate different design decisions and reuse existing designs and results without non-value-added manual clean-up and recreation of data.

**Capabilities**

- Use an intuitive graphical interface with direct access of CAD geometry with automatic/interactive feature recognition
- Access multiple MSC Software and third-party solvers
- Utilize robust automatic surface and solid mesh generation with advanced surface mesh-on-mesh capability
- Model connectors and bolts with pre-loads
- Easily define full 3D general contact scenarios for nonlinear analyses
- Optimize your designs by setting up MSC Nastran optimization tasks
- Define superlements to analyze large FE models
- Create coupled analysis cases for Marc
- Use numerous post-processing tools to review your results
- Implement results standardization through results templates
- Customize your user interface through Patran Command Language (PCL)

**Benefits**

- Increase productivity of your design and development process
- Reduce development costs through increased use of simulation technologies
- Improve productivity and accuracy with multidiscipline analysis and optimization performance. Template guided analysis ensures proper modeling, simulation inputs, materials data, and CAE best practices are being followed by CAD users.



## Process Management and Automation

- Automation reduces manual execution of intensive, repetitive simulation tasks and processes
- Work request and workflow notification keep projects on track and enable management oversight
- Dashboards enable quick evaluation of studies and scenarios relative to design targets
- Built-in job queue interface optimizes execution of simulation processes and solver runs
- Simulation processes, input and output are documented via Audit Trail
- Open support of tools and applications, including MSC, 3rd party, and in-house applications
- Leverages existing hardware and software infrastructure
- Web-based configuration enables fast deployment

## Enterprise Integration

- Integrated access to SimManager from MSC applications
- Web-browser access to 3rd party simulation applications and other popular engineering tools
- PDM integration using PROSTEP OpenPDM technology
- Integration with Requirements Management systems
- Fully compatible with job queuing and submission systems including MSC Analysis Manager, LSF, Sun Grid Engine, and PBS Pro
- Test Data integration and comparison



## SIMULATION PROCESS & DATA MANAGEMENT

# SimManager™

## Simulation Process and Data Management

For companies using simulation that need to improve productivity and solution quality, SimManager is a Simulation Data and Process Management system that manages all aspects of performing simulation. SimManager is focused on meeting the sophisticated data management and processing needs specific to the simulation community. Our customers appreciate our deep understanding of their CAE issues and how wisdom gained from our experience can help them in ways that others cannot. We provide a complete solution that brings together your people, process, and technology to streamline simulation operations.

Using SimManager, customer simulation operations become more productive and effective; reducing the cost and time it takes to bring better products to market. Competitive advantages that scale from a small workgroup to company-wide use include:

- Increased Productivity
- Improved Quality
- Standardization and Establishment of Best Practices
- Effective Collaboration
- Integrated Teamwork
- Shorter Product Development Times
- Accelerated Process and Product Innovation



# Global Engineering Services

Delivering Certainty by Helping You Simulate Reality

## Industry Experience

The MSC Global Engineering Services organization is a team of engineers and scientists with expertise across a wide range of engineering disciplines and industries. MSC has a 50 year history of real world hands-on practical experience.

## Engineering Expertise You Can Trust

If you want results you can trust and the flexibility of working with extremely skilled engineers who know Computer Aided Engineering (CAE) and how it's applied to engineering problems like yours, MSC is a team you can rely on to improve your product development process.

The MSC Global Engineering Services team helps companies in a variety of ways:

- Quick Start Projects
- Knowledge Transfer
- Mentoring; on-site or over the web
- Staff Augmentation
- On-site support
- Simulation Projects
- Customization and Process Automation
- Methods Development
- Solution Toolkits
- Simulation Process and Data Management
- Training

## Flexible Services Offerings

We provide consulting support based on your specific needs and requirements. This could range from performing analysis for you on a project basis; one or two times a year, or providing full time staff members to help you create repeatable processes in-house.

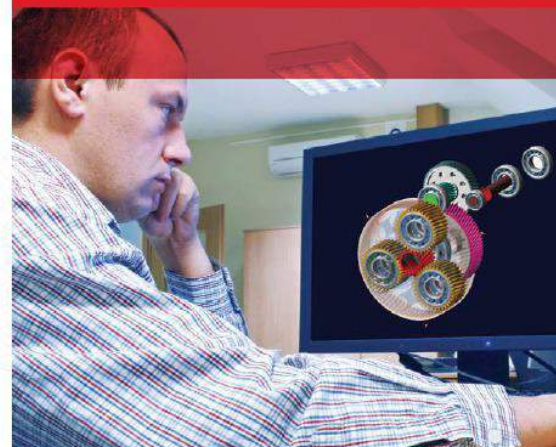
**Request a Quote Today!**

Go to [www.mscsoftware.com/services](http://www.mscsoftware.com/services)



## You can depend on the MSC Global Engineering Services Staff to:

- Save you time
- Automate your CAE processes
- Perform project-based simulations
- Train your staff
- Mentor and support your staff
- Correlate and validate CAE results with test data
- Transfer knowledge





**Our MSC application engineer comes out at least once a month to see how we are doing and help us with any issues. In fact this plane would have been impossible to model without the phone support, on-site visits and consulting services provided by the MSC support team”**

Dana Taylor, AeroVironment



## Training

MSC offers basic and specialized training in the use of our simulation tools to maximize your investments in our software. Whether you need an introduction to our simulation tools or expert instruction in specialized applications, we offer the courses you want, with the expertise you deserve.

### Flexible Training Offerings

To further meet your specific requirements, we offer the following options for live instruction.

- **Public Classroom Training\*** – Choose from our wide selection of courses conveniently offered at sites throughout the world.
- **Public Online Training** - The convenience of on-line learning with the interactivity and depth of a traditional classroom setting – no travel required. The entire instructor-led course is live and online on your own computer. Live Online Training is an efficient, cost effective and convenient way to gain skills in the use of our MSC simulation software.
- **Training at Your Facility** – If you have a number of employees who need training, we offer the cost effective option of bringing our class to your facility. This eliminates employee travel costs, minimizes time away from work, and can be arranged at your convenience.
- **Custom Courses** – If our standard seminar offerings do not meet your training requirements, MSC can develop a course or set of courses tailored to your specific needs. A custom course might include a combination of topics from several standard courses or specialized material not found in any of our standard seminars. MSC will work with your staff to design the course you need.

MSC can deliver custom and private courses live or via the web. We can also help ensure that you have the adequate hardware and software licenses available for private courses.

The following table lists the standard courses offered. Please refer to the MSC Software training website for detailed course descriptions and dates offered at sites throughout the world.

**\*Go to [www.mscsoftware.com/training](http://www.mscsoftware.com/training)  
To access our Global Training Schedule.**

# Training Courses

<p><b>Actran</b></p> <ul style="list-style-type: none"> <li>Actran for Trimmed Body Simulation ACT120</li> <li>Actran for Trimmed Body Simulation plus Wind Noise ACT121</li> <li>Simulation of Launch Acoustics with Actran ACT140</li> </ul>	<p><b>Dytran</b></p> <ul style="list-style-type: none"> <li>Introduction to Langrangian Analysis Using Dytran DYT101</li> <li>Introduction to Eulerian and Coupled Analysis Using Dytran DYT102</li> <li>Introduction to Airbag Analysis and Occupant Safety Using Dytran DYT103</li> </ul>	<p><b>Flightloads</b></p> <ul style="list-style-type: none"> <li>Introduction to FlightLoads &amp; MSC Nastran Aeroelastic Analysis FLD120</li> <li>Flightloads and Aeroelasticity - Static Analysis FLD120S</li> </ul>	<p><b>MSC Nastran</b></p> <ul style="list-style-type: none"> <li>Linear Static &amp; Normal Analysis using MSC Nastran NAS101A</li> <li>Advanced Linear Analysis using MSC Nastran NAS101B</li> <li>Dynamic Analysis using MSC Nastran NAS102A</li> <li>Advanced Dynamic Analysis using MSC Nastran NAS102B</li> <li>MSC Nastran Nonlinear Analysis NAS103</li> <li>MSC Nastran Thermal Analysis NAS104</li> <li>Practical Finite Element Analysis Techniques using MSC Nastran NAS105</li> <li>Basic Substructure Analysis using MSC Nastran - Primary NAS106A</li> <li>Advanced Substructure Analysis using MSC Nastran - Secondary Superelements NAS106B</li> <li>Design Sensitivity and Optimization in MSC Nastran NAS107</li> <li>DMAP and Database Application in MSC Nastran NAS110</li> <li>MSC Nastran Aeroelastic Analysis NAS111</li> <li>Analysis of Composite Materials with MSC Nastran NAS113</li> <li>Fluid Structure Analysis in MSC Nastran NAS115</li> <li>Practical Dynamic Analysis in MSC Nastran NAS116</li> <li>Linear Statics Normal Modes and Buckling Analysis MSC Nastran &amp; Patran NAS120</li> <li>Dynamic Analysis Using Patran and MSC Nastran NAS122</li> <li>MSC Nastran Implicit Nonlinear (SOL 600) Analysis NAS123</li> <li>Explicit Nonlinear Analysis using MSC Nastran and Patran NAS126</li> <li>Contact Analysis using MSC Nastran and Patran NAS133</li> <li>Implicit Nonlinear Analysis using MSC Nastran and Patran NAS400</li> </ul>	<p><b>Patran</b></p> <ul style="list-style-type: none"> <li>Computer Based Modeling for Design &amp; Analysis with Patran PAT301</li> <li>Computer Based Modeling for Design and Analysis for Aerospace Application PAT301 AERO</li> <li>Patran for Advanced Users PAT302</li> <li>Automating Tasks and GUI Customization using the Patran Programming Command Language (PCL) PAT304</li> <li>Thermal Analysis using Patran Thermal PAT312</li> <li>Fatigue Analysis of Dynamically Responsive Systems using FEA PAT319</li> <li>Patran Introduction to Laminate Modeler PAT325</li> </ul>	<p><b>SimXpert</b></p> <ul style="list-style-type: none"> <li>Introduction to SimXpert SMX101</li> <li>SimXpert Linear Static Analysis SMX120</li> <li>SimXpert Motion Analysis SMX121</li> <li>SimXpert Dynamic Analysis SMX122</li> <li>SimXpert Thermal Analysis SMX124</li> <li>Introduction to SimXpert MD Explicit Workspace SMX126</li> <li>SimXpert Templates SMX131</li> <li>SimXpert Scripting SMX131</li> <li>Dynamic System Modeling and Simulation using SimXpert SMX140</li> <li>Nonlinear Structural Analysis with SimXpert SMX400</li> </ul>
<p><b>Adams</b></p> <ul style="list-style-type: none"> <li>Adams Basic Full Simulation ADM701</li> <li>Basic Adams/Solver ADM702</li> <li>Advanced Adams/Solver ADM703A</li> <li>Advanced Modeling Elements and Techniques with Adams/Solver ADM703B</li> <li>Advanced Parametrics, Design Sensitivity, and Optimization using Adams/View ADM704A</li> <li>Automating Tasks using Adams/View Scripting, Maros, and GUI Customization ADM704B</li> <li>Flex Body Dynamics and Modal Stress Recovery using Adams ADM710</li> <li>Adams/Controls ADM711</li> <li>Adams/Vibration ADM720</li> <li>Adams/Car ADM740</li> </ul>	<p><b>Easy5</b></p> <ul style="list-style-type: none"> <li>Seminar Class: Easy5 Dynamic System Modeling Simulation and Analysis using Easy5 (Intro Class) EAS101</li> <li>Easy5 Modeling Simulation of Fluid Power Systems Using Easy5 EAS103</li> <li>Modeling Simulation of Gas Systems Using Easy5 EAS105</li> </ul>	<p><b>Marc</b></p> <ul style="list-style-type: none"> <li>Marc Mentat Introduction MAR101</li> <li>Marc Mentat Advanced MAR102</li> <li>Experimental Elastomer Analysis with Marc MAR103</li> <li>Introduction to Engineering Analysis with Marc &amp; Patran MAR120</li> </ul>	<p><b>Mvision</b></p> <ul style="list-style-type: none"> <li>Using MSC Mvision Materials System MVI320</li> </ul>	<p><b>SimDesigner</b></p> <ul style="list-style-type: none"> <li>Structural and Thermal Analysis Using SimDesigner SMD101</li> <li>MSC SimDesigner Motion for CATIA V5 SMD102</li> </ul>	<p><b>Sinda</b></p> <ul style="list-style-type: none"> <li>Network Thermal Analysis Using MSC Sinda SND501</li> <li>Thermal analysis using Patran with MSC Sinda SND502</li> <li>Spacecraft Thermal Analysis Using THERMICA V4 SND503</li> </ul>
<p><b>MSC Fatigue</b></p> <ul style="list-style-type: none"> <li>Durability and Fatigue Life Estimation Using Patran Fatigue PAT318</li> <li>Fatigue &amp; CAE Integration NAS319A</li> <li>Fatigue &amp; Dynamics - The Reliability of Vibrating Systems NAS319B</li> <li>Practical Implementation of Fatigue Methods with MSC Nastran, Patran, and Other Applications NAS319C</li> </ul>	<p><b>MSC Fatigue</b></p> <ul style="list-style-type: none"> <li>Durability and Fatigue Life Estimation Using Patran Fatigue PAT318</li> <li>Fatigue &amp; CAE Integration NAS319A</li> <li>Fatigue &amp; Dynamics - The Reliability of Vibrating Systems NAS319B</li> <li>Practical Implementation of Fatigue Methods with MSC Nastran, Patran, and Other Applications NAS319C</li> </ul>	<p><b>Mvision</b></p> <ul style="list-style-type: none"> <li>Using MSC Mvision Materials System MVI320</li> </ul>	<p><b>SimManager</b></p> <ul style="list-style-type: none"> <li>Introduction to SimManager SMM101</li> <li>SimManager Basic Configuration SMM102</li> <li>SimManager Automotive Solution Class SMM111</li> <li>SimManager Automotive Solution Configuration Class SMM112</li> </ul>	<p><b>SimManager</b></p> <ul style="list-style-type: none"> <li>Introduction to SimManager SMM101</li> <li>SimManager Basic Configuration SMM102</li> <li>SimManager Automotive Solution Class SMM111</li> <li>SimManager Automotive Solution Configuration Class SMM112</li> </ul>	<p><b>SimManager</b></p> <ul style="list-style-type: none"> <li>Introduction to SimManager SMM101</li> <li>SimManager Basic Configuration SMM102</li> <li>SimManager Automotive Solution Class SMM111</li> <li>SimManager Automotive Solution Configuration Class SMM112</li> </ul>

Note that there may be slight variations in courses offered for some regions. Please refer to the MSC Software website at [www.mscsoftware.com](http://www.mscsoftware.com) for regional course curriculum.



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