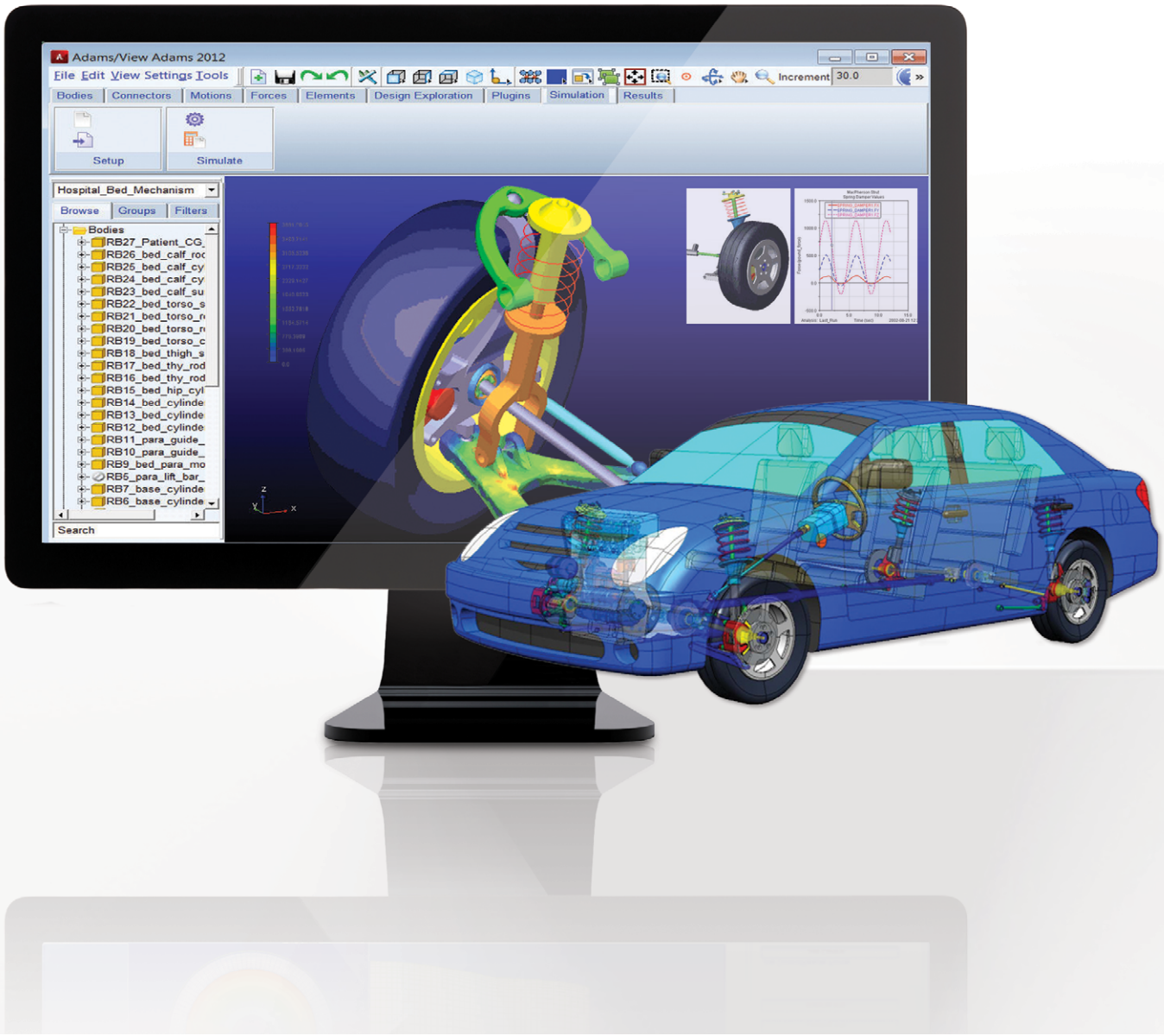
Adams™

Multibody Dynamics for Functional Virtual Prototyping

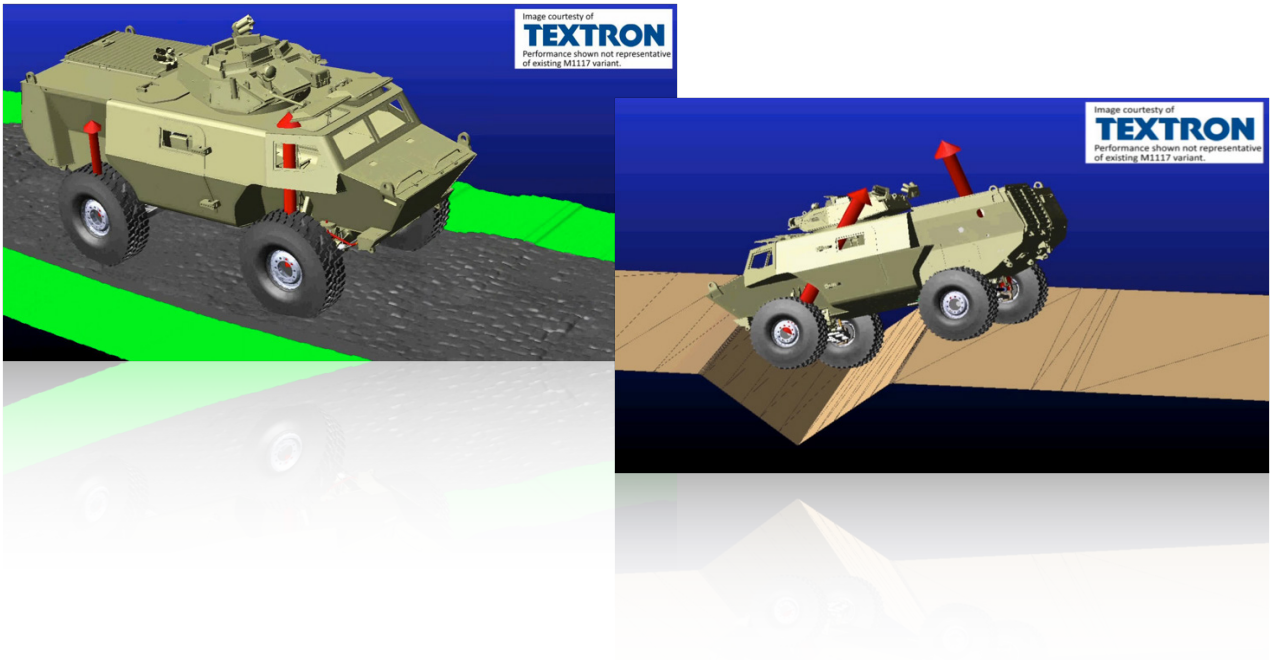


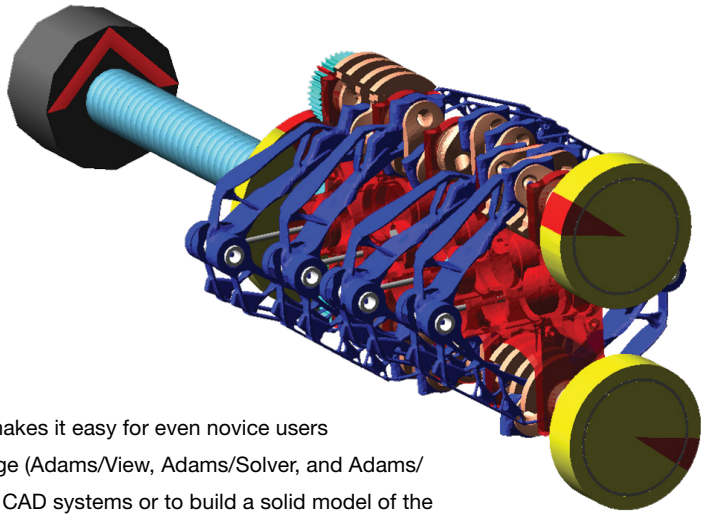
MSC Software®

Multibody Dynamics Analysis for Better System Simulations

Product manufacturers often struggle to understand true system performance until very late in the design process. Mechanical, electrical, and other subsystems are validated against their specific requirements within the systems engineering process, but full-system testing and validation comes late, leading to rework and design changes that are riskier and more costly than those made early on.

As the world's most famous and widely used Multibody Dynamics (MBD) software, Adams improves engineering efficiency and reduces product development costs by enabling early system-level design validation. Engineers can evaluate and manage the complex interactions between disciplines including motion, structures, actuation, and controls to better optimize product designs for performance, safety, and comfort. Along with extensive analysis capabilities, Adams is optimized for large-scale problems, taking advantage of high performance computing environments.





Why Adams for MBD

Modeling

The Adams intuitive ribbon-style interface and model browser makes it easy for even novice users to create complete, accurate mechanical models. A core package (Adams/View, Adams/Solver, and Adams/PostProcessor) allows you to import geometry from most major CAD systems or to build a solid model of the mechanical system from scratch. You build a system the same way you build a physical system – by creating and assembling parts, connecting them with joints and driving them with motion generators and forces. You can also give your Adams model parametric properties and initiate a set of parametric simulations to study design sensitivities.

Multidiscipline Mechanical System Simulation

With functionalities like Adams2Nastran export and ViewFlex, Adams introduces bi-directional integration with MSC Nastran that allows re-use of validated Adams models in Nastran to perform modal and frequency response analysis. Adams/Mechatronics easily incorporates control systems into mechanical models by dynamically linking an external system library from a controls application, such as Easy5 and MATLAB. Control system parameters can be quickly adjusted for evaluation and included in a design study for simultaneous optimization of both control system and mechanical system

Flexible Body Integration

Adams/Flex provides the technology to correctly include a component's flexibility even in presence of large overall motion and complex interaction with other modeling elements. Greater emphasis has been placed these days on high-speed, lightweight, precise mechanical systems. Often these systems will contain one or more structural components where deformation effects are paramount for design analyses and the rigid body assumption is no longer valid. Adams/Flex allows importing finite element models from most major FEA software packages and is fully integrated with Adams package providing access to convenient modeling and powerful post-processing capabilities.

The ViewFlex module in Adams/View enables users to transform a rigid part to an MNF-based flexible body using embedded finite element analysis where a meshing step and linear modes analysis will be performed.It is our new product module powered by MSC Nastran, allowing one to create flexible bodies without leaving Adams/View and without reliance on 3rd party Finite Element Analysis software. Also, it's a streamlined process with much higher efficiency than the way users have traditionally generated flexible bodies for Adams in the past.

Controls Integration with Different Level of Complexity

Adams/Mechatronics is a plug-in to Adams which can be used to easily incorporate control systems into mechanical models. Adams/Mechatronics has been developed based on the Adams/Control functionality and contains modeling elements which transfer information to/from the control system. For example, using Adams/Mechatronics in Adams/Car, you can quickly create assemblies of vehicle systems including control systems, and then analyze them to understand their performance and behavior.

Vibration Analysis Made Easy

With Adams/Vibration, engineers replace physical tests on shaker devices with virtual prototypes. Noise, vibration, and harshness (NVH) are critical factors in the performance of many mechanical designs but designing for optimum NVH can be difficult. Adams/Vibration allows engineers to easily study forced vibration of mechanical systems using frequency domain analysis.

Durability Analysis Improves Product Quality

Durability testing is a critical aspect of product development and issues discovered late in the development cycle lead to project delays and budget overruns. Worse yet, “in service” failures lead to dissatisfied customers, safety issues, and warranty costs. Adams/Durability allows engineers to assess stress, strain or life of components within mechanical systems to design products to last. Direct access to physical test data in industry-standard file formats enables engineers to use loads data captured during tests, and to easily correlate simulation and testing results.

Vehicle Design & Testing

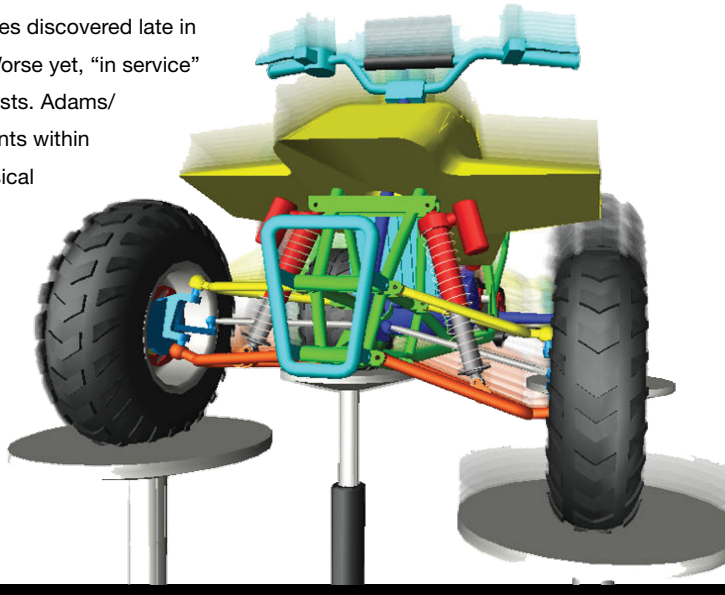
Adams/Mechatronics is a plug-in to Adams which can be used to easily incorporate control systems into mechanical models. Adams/Mechatronics has been developed based on the Adams/Control functionality and contains modeling elements which transfer information to/from the control system. For example, using Adams/Mechatronics in Adams/Car, you can quickly create assemblies of vehicle systems including control systems, and then analyze them to understand their performance and behavior.

Adams/Machinery for Mechanical Drive System Design and Analysis

Adams/Machinery is a new Adams software solution that allows a machinery manufacturer to efficiently build functional virtual prototypes of their machinery components and systems early in the design cycle, so they can perform a series of virtual tests before committing to building a physical prototype. With this new solution, machinery manufacturers will reduce the number of prototypes, decrease the design cycle and meet their functional specifications in less time.

High Performance for Improved Productivity

Durability testing is a critical aspect of product development and issues discovered late in the development cycle lead to project delays and budget overruns. Worse yet, “in service” failures lead to dissatisfied customers, safety issues, and warranty costs. Adams/Durability allows engineers to assess stress, strain or life of components within mechanical systems to design products to last. Direct access to physical test data in industry-standard file formats enables engineers to use loads data captured during tests, and to easily correlate simulation and testing results.



Easy to Use, Integrated Adams/View User Interface

Tightly integrated user interface to help you build, analyze and post-process functional virtual prototype models with ease. Designed with a focus on system level analysis, Adams/View lets you build models of mechanical systems and simulate the full-motion behavior. You can also use Adams/View to quickly analyze multiple design variations until you find the optimal design.

"The Adams model has subsequently been used to perform an extensive parameter study to find the root cause and solutions to the observed gear resonance"

Christina Exner, Achates Power

Building Models

- Import CAD neutral geometry formats including STEP, IGES, DXF, DWG or Parasolid
- Import native CAD geometry formats including CatiaV4, CatiaV5, Inventor, STEP, IGES, Acis, ProE, Creo, SolidWorks, Unigraphics, VDA
- Create rigid and flexible bodies representing the system's moving parts
- Apply constraints to define how bodies are attached and move relative to each other
- Apply motions to specifically prescribe the movement of bodies within the model
- Apply forces to define loads and contacts between bodies, and compliance and friction within connections
- Use the model browser to search the objects in the database as well as to create and manage filters and object groups
- Parameterize key model quantities to enable design exploration and easy modification
- Configure and customize the interface to suit your preferences and increase productivity

Testing Models

- Run a simulation to test the model's performance characteristics and response to a set of operating conditions
- Use solver parameters to refine simulation performance and accuracy
- Create measures to chart key characteristics of your model during or after a simulation
- Instrument your model with detailed output requests to investigate nearly any aspect of the simulated model

Reviewing results

- Interrogate important output channels via plot strip charts
- Animate simulation results to fully visualize model behavior
- View your system model oscillating at one of its natural frequencies by animating linear analysis results

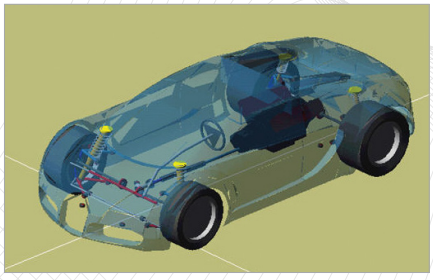


*Image courtesy of Bugatti

Adams/PostProcessor

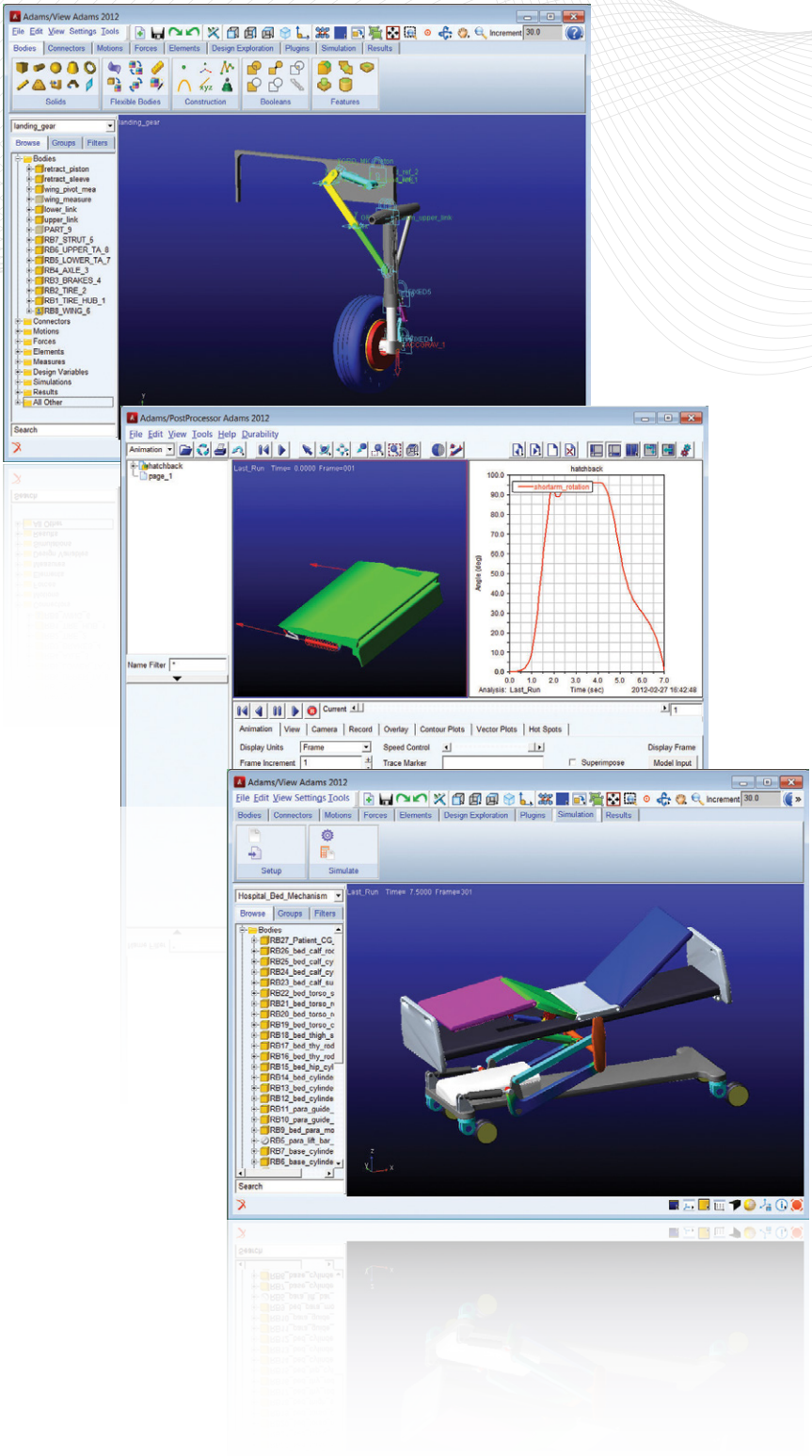
- View results in tabular and plotted formats
- Import physical test data for comparison with analysis results to correlate your models
- Compare plots and animations from multiple simulations
- Perform collision and clearance studies
- Use broad animation controls to enhance the quality and realism of your animations
- Import CAD geometry to enhance the presentation of animations
- Create movies from animations and add movies to your presentation
- Show synchronized animations of your three-dimensional geometry along with plots and publish the results to the web

Improving results

- Use the model browser to conveniently modify the model to improve simulation results
- Perform parametric analyses to investigate the influence of design variables on system behavior
- Run a design study to adjust a parameter in you model to measure its effect on key design objectives

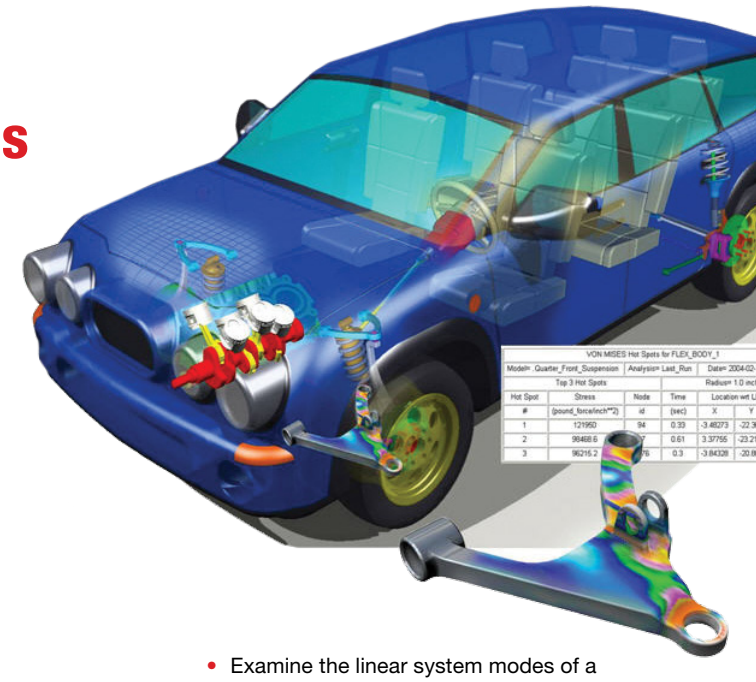
Optimizing Models with Adams/Insight

- Access advanced DOE capability to improve product design by understanding interaction of key parameters and performance goals
- Take advantage of popular statistical methods to define the model set
- Assessments of response surface quality and objective sensitivity to factors guide refinement of the simulation set
- Publish interactive web pages which enable viewers to easily interrogate the model's response to varied factors



Adams Multidiscipline Solutions

Adams enables engineers to evaluate and manage the complex interactions between disciplines including motion, structures, vibrations, and controls to better optimize product designs for performance, safety, and comfort.



"Adams simulations permitted us to get different loading conditions to be studied through an FE analysis, putting to evidence the most critical loading combinations"

Bianchi F., AgustaWestland

Adams/Controls

- Add a sophisticated controls representation to your Adams model
- Connect your Adams model to block diagram models you've developed with control applications such as Easy5® or MATLAB®
- Run co-simulation between Adams and other software that supports the FMI standard
- Experience flexibility in simulation styles to suit your problems' needs: simulate within Adams, within the controls software or co-simulate

Adams/Mechatronics

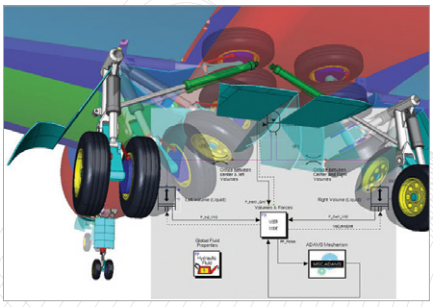
- Access advanced pre-processing for Adams/Controls
- Setup and couple a control system to a mechanical system
- Convert signal units automatically
- Connect transducer and actuator signals to the control systems easily
- Conveniently review and modify the control system input and output specifications
- Ideal for complex integrations

Adams/Flex

- Integrate FEA-based flexible bodies into your model
- Better represent structural compliance
- Predict loads and displacements with greater accuracy
- Examine the linear system modes of a flexible model
- Broad and convenient control over modal participation and damping

Adams/ViewFlex

- Create flexible bodies entirely within Adams/View or Adams/Car
- Reduce reliance on 3rd party FEA software using built in MSC Nastran technology
- Generate a flexible body from existing solid geometry, imported meshes or newly created extrusion geometry
- Obtain detailed control over mesh, modal analysis and flexible body attachment settings for an accurate representation of component flexibility

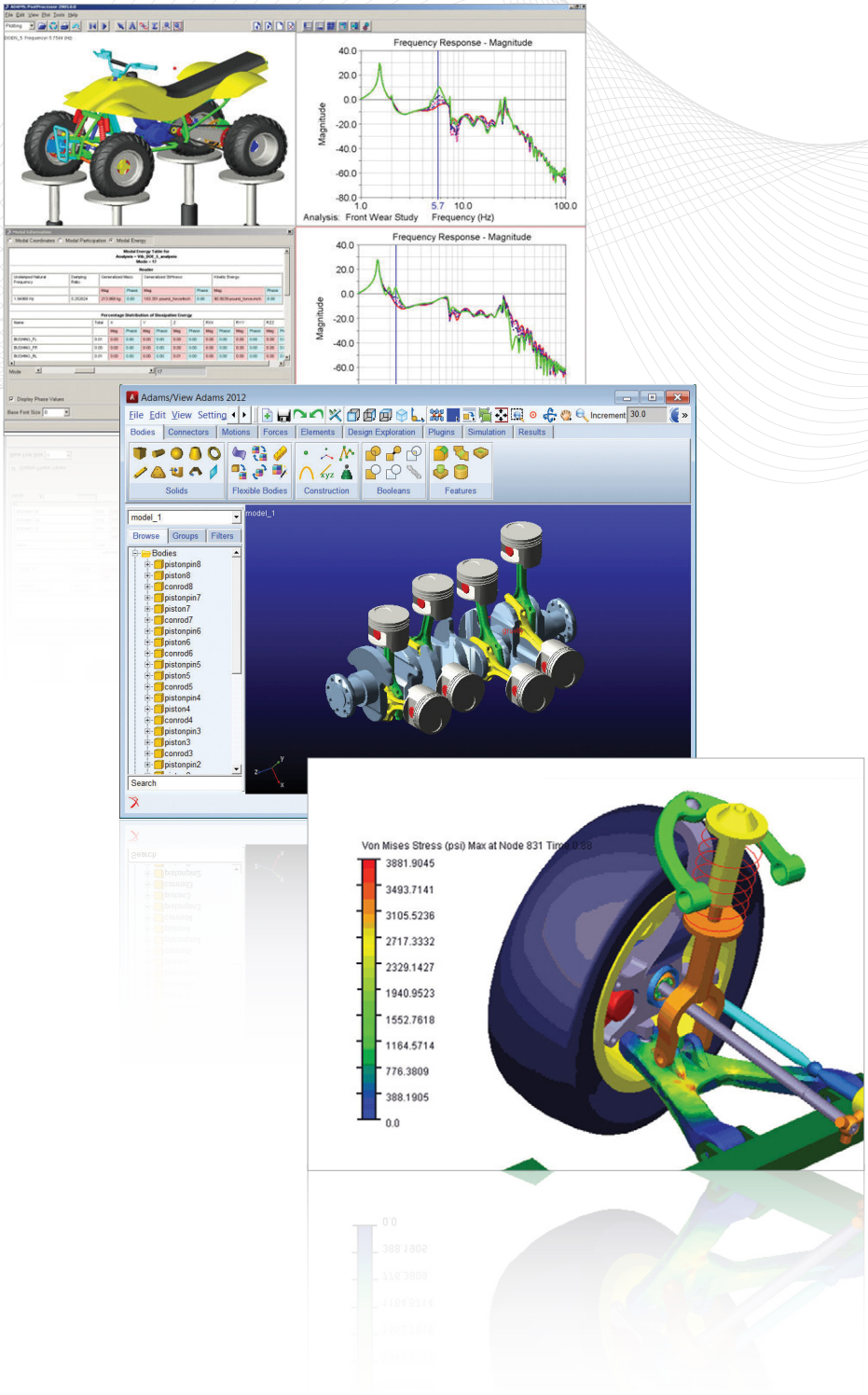


Adams/Durability

- Shorten your development cycle, reducing costly durability testing
- Provide direct file input and output in RPC III and DAC formats to reduce disk space requirements and improve performance
- Perform modal stress recovery of flexible bodies within Adams
- Export loads to popular FEA software including MSC Nastran for detailed stress analysis
- Integrate with MSC Fatigue to do component life prediction

Adams/Vibration

- Analyze the forced response of a model in the frequency domain over different operating points
- Transfer your linearized model from Adams products to Adams/Vibration completely and quickly
- Create input and output channels for vibration analyses
- Specify frequency domain input functions, such as swept sine amplitude/frequency, power spectral density (PSD), and rotational imbalance
- Create frequency-based forces
- Solve for system modes over frequency range of interest
- Evaluate frequency response functions for magnitude and phase characteristics
- Animate forced response and individual mode response
- Tabulate system modal contributions to forced vibration response
- Tabulate contribution of model elements to kinetic, static, and dissipative energy distribution in system modes
- Specify direct kinematic inputs
- Plot Stress/Strain frequency response functions



Adams Vehicle Vertical Solutions

With Adams Car vertical products, engineering teams can quickly build and test functional virtual prototypes of complete vehicles and vehicle subsystems. Working in the Adams vehicle vertical environment, automotive engineering teams can exercise their vehicle designs under various road conditions, performing the same tests they normally run in a test lab or on a test track, but in a fraction of time.

"Adams/Car was instrumental to tune all subsystems at their best before any real prototype was available… Testing several configurations on the virtual prototype required a matter of hours; doing the same on the real prototype would have been impossible"

Dr. Peter Tutzer, Bugatti

Adams/Car

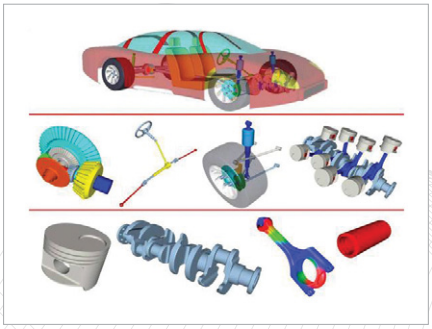
- Explore the performance of your design and refine your design before building and testing a physical prototype
- Analyze design changes much faster and at a lower cost than physical prototype testing would require
- Vary the kinds of analyses faster and more easily
- Work in a more secure environment without the fear of losing data from instrument failure or losing testing time because of poor weather conditions
- Run analyses and what-if scenarios without the dangers associated with physical testing
- Perform a repeatable set of tests on a global basis, ensuring that you work with common data, tests, and, most important, results

Adams/Chassis

- Simulate full vehicle events (such as steady state drift, throttle off in turn, and constant radius)
- Simulate half vehicle events including dynamic load case and static vehicle characteristics
- Use with Adams/Insight to perform systematic experiments on vehicle model
- Study the effect of multiple design variations
- Optimize the design
- Address the robustness issue

Adams/Driveline

- Model and simulate driveline components and study the dynamic behavior of the entire driveline during different operating conditions
- Explore the interaction between driveline and chassis components, such as suspensions, steering system, brakes, and the vehicle body
- Apply a specific torque to your driveline model
- Define a different friction coefficient for different wheels in your model
- Define a slope of your road to study the performance of your driveline model
- Alter the driveline geometry and analyze the driveline again to evaluate the effects of the alterations



Adams/Car Suspension Design

- Learn how a suspension controls the wheel motion and transmits load form the wheels to the chassis
- Use standard suspension analyses to predict roll and vertical forces, static loads, steering characteristics, and wheel travel

Adams/Car Vehicle Dynamics

- Test the design of the different subsystems and see how they influence the overall vehicle dynamics
- Examine the influence of component modifications, including changes in spring rates, damper rates, bushing rates, and anti-roll bar rates, on the vehicle dynamics
- Apply standard testing procedures for cornering, courses, steering, quasi-static, and straight-line analyses

Adams/SmartDriver

- Bring a vehicle to its dynamic limits or near targets you define
- Improve handling, durability, or ride performance of the vehicle model based on predicted performance Adams/SmartDriver computes
- Investigate system-level dynamics of the vehicle model, while requiring minimal setup
- Calculate a limit (maximum performance) speed profile over the reference path
- Check the speed profile using a fast, simplified vehicle model
- Perform an analysis of vehicle states over the trajectory, searching for path locations that cannot be traveled with the current target speed during the full dynamic simulation
- Calculate four additional limits using the parameters specified and theoretical limits of the vehicle
- Creates a speed profile that brings the vehicle to both vehicle limits and user-defined ones

Adams/Tire

- Use with Adams/Car, Adams/Chassis, Adams/Solver, or Adams/View for adding tires to your mechanical model in order to simulate maneuvers such as braking, steering, acceleration, free-rolling, or skidding
- Model the forces and torques that act on a tire as it moves over roadways or irregular terrain
- Calculate the forces and moments that tires exert on a vehicle as a result of interaction between the tires and the road surface
- Apply handling analyses to study vehicle dynamic responses to steering, braking, and throttle inputs
- Apply ride and comfort analyses to assess the vehicle's vibrations due to uneven roads with short wavelength obstacles, such as level crossings, grooves, or brick roads
- Apply 3D contact analyses to generate road load histories and stress and fatigue studies that require component force and acceleration calculation

Adams/3D Road

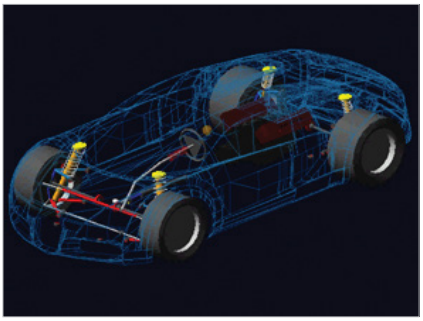
- Simulate many types of three-dimensional smooth roads such as highways, race tracks, test tracks, and parking structures
- Study various effects of smooth roads, such as bank angle and slope, on vehicle dynamics
- Simulate particular roads including your company's own closed-circuit test track

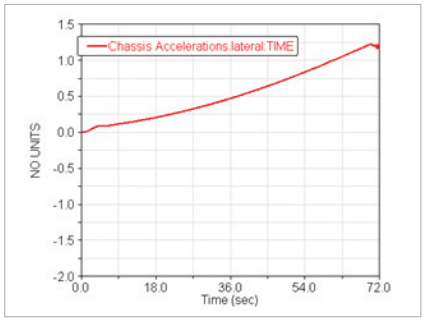
Adams/Car Ride

- Model and simulate the ride quality of ground vehicles
- Create Adams/Car assemblies of suspensions and full vehicles
- Analyze model to understand their performance and behavior
- Use modeling elements important for ride quality as in Adams/Car models
- Analyze the modeling elements independently from other systems using a modeling element test rig
- Use four-post test rig to support a variety of time-domain analyses

Adams/Car Truck

- Apply component, suspension and full-vehicle templates specifically for heavy truck and bus
- Model multi-axle, multi-subsystem assemblies that are common in the trucking industry
- Perform component, subsystem, and full-vehicle analyses in one single environment
- Explore multiple what if design scenarios with the template-based parametric modeling approach
- Animate vehicle or subsystem motion onscreen
- Display graphs of key parameters
- Produce standardized test reports





*Images courtesy of Bugatti

Adams/Machinery Solution

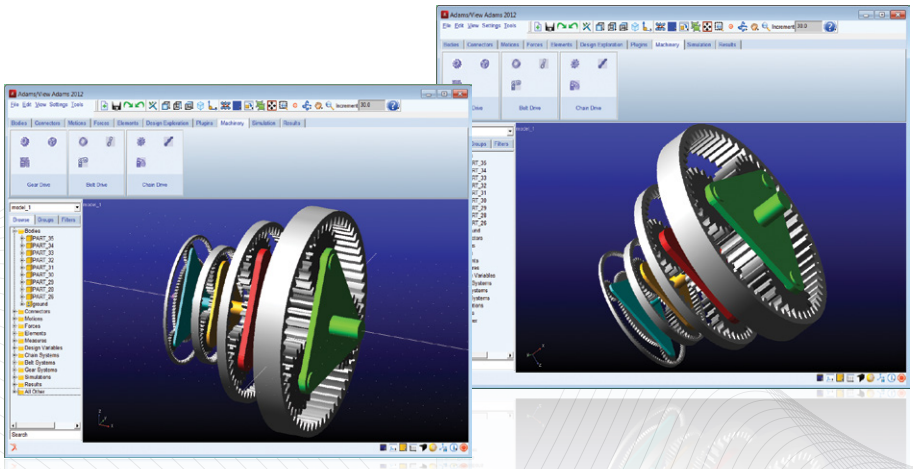
Adams/Machinery is a new Adams product fully incorporated inside the Adams/View environment. It contains multiple modeling productivity modules which enable users to create common machinery components more efficiently than by using the more generic standard Adams/View model construction functionality alone.

"Adams simulations permitted us to get different loading conditions to be studied through an FE analysis, putting to evidence the most critical loading combinations"

Bianchi F., AgustaWestland

Benefits to Engineers

- High-fidelity simulation of common mechanical parts, such as gears, belts, and chains
- Enhanced productivity with incredibly quick model-solve-evaluate process times
- An automated, wizard-driven model creation process for ease-of-use
- Straightforward evaluation of results in Adams/Postprocessor



Gears

This module is for engineers who need to predict the impact of the design and behavior of gear pairs, such as Gear ratio, backlash prediction, on the overall system performance.

The detailed fidelity options include:

- Choose the gear type with the selection of Spur Gear(Internal/External), Helical Gear(Internal/External), Bevel Gear Straight and Bevel Gear Spiral
- Apply Coupler method when forces and components involved in it are neglected and only speed reduction or multiplication is of interest
- Apply Simplified modeling method when friction is neglected to have a fast calculation of the contact force
- Apply Detailed modeling method when friction is considered and study the backlash based on actual working centre distance and tooth thickness
- Apply Detailed modeling method to capture the effect of variation of loading between 1-3 teeth to calculate contact up to three teeth at the same time
- Apply Contact modeling method to use geometry-based contact and to support shell-to-shell 3D geometry contact
- Apply Contact modeling method to study the backlash based on actual working centre distance and tooth thickness
- Use Geometry settings to define the location and geometric parameters of your gears
- Choose the materials of your gears by defining mass or density
- Choose the connections of your gears to the ground or existing bodies with the selection of Rotational joint, Compliant joint and Fixed joint
- Create the planetary gear set by using the planetary gear wizard
- Generate the gear-specific output in the post-processor
- Use automated model parameterization as reference to perform design exploration

Belts

This module is for engineers who need to predict the impact of the design & dynamic behavior of pulley-belt systems, such as transmission ratio, tension and load prediction, compliance studies, or belt dynamics, on the overall system performance.

The detailed fidelity options include:

- Choose the belt type with the selection of Poly-V Grooved belt, Trapezoidal Toothed belt and Apply Constraint modeling method when forces and components involved are neglected and only speed reduction or multiplication is of interest
- Apply 2D Links modeling method to calculate the contact forces between the segments and pulleys when the axis of rotation is parallel to one of the global axes
- Apply 3D links modeling method to calculate the contact forces when the axis of rotation is not parallel to one of the global axes
- Use Geometry settings to define the location and geometric parameters of your pulleys
- Choose the materials of your pulleys by defining mass or density
- Choose the connections of your pulleys to the ground or existing bodies with the selection of rotational or fixed joint, or a compliant connection
- Apply tensioner pulley to the belt system to take up the extra slack and control the routing of the belt
- Generate the belt-specific output in the post-processor
- Use actuation wizard to apply force or motion to any pulley in the belt system
- Generate the gear-specific output in the post-processor
- Use automated model parameterization as reference to perform design exploration

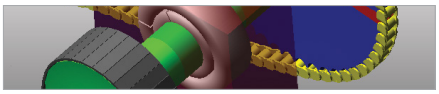
Chains

This module is for engineers who need to predict the impact of the design and behavior of chain systems, such as drive ratio, tension, contact forces or chain dynamics, on the overall system performance.

The detailed fidelity options include:

- Choose the chain type with the selection of roller chain and silent chain
- Apply Constraint modeling method when forces and components involved are neglected and only speed reduction or multiplication is of interest
- Apply 2D Links modeling method to calculate the contact forces between the links and sprockets when the axis of rotation is parallel to one of the global axes
- Apply 3D links modeling method to calculate the contact forces when the axis of rotation is not parallel to one of the global axes
- Apply Linear, Non-linear or Advanced compliance to the roller chain
- Apply Linear compliance to the silent chain
- Use Geometry settings to define the location and geometric parameters of your sprockets
- Choose the materials of your sprockets by defining mass or density
- Choose the connections of your sprockets to the ground or existing bodies with the selection of rotational or fixed joint, or a compliant connection
- Apply Pivot, Translational or Fixed guides to the chain system
- Generate the chain-specific output in the post-processor
- Use actuation wizard to apply force or motion to any sprocket in the chain system

Bearings



This module is for engineers who need to predict the impact of the design and behavior of rolling-element bearings on overall system performance. This includes an accurate representation of the bearing stiffness, sensitive to internal dimensions, offsets, misalignments, and clearances. Engineers can predict more accurately how bearing compliance influences the overall motion and loading of the system, as well as perform basic life predictions based on widely-adopted standards that consider bearing loading, lubrication, and speed. Module highlights are as follows.

The detailed fidelity options include:

- Choose from 14 different rolling-element bearing types
- Look up bearing parameter values from a library of over 24,000 off-the-shelf bearings and/or input values directly
- Calculate bearing reaction forces, optionally leveraging a nonlinear stiffness response from embedded technology delivered by KISSsoft, an MSC Software partner
- Select from over 120 oil- and grease-based bearing lubricants
- Predict the bearing service life (under the specified simulation conditions) based on industry standards sensitive to the loading, lubrication, speed, and bearing geometryprocessor
- Use automated model parameterization as reference to perform design exploration

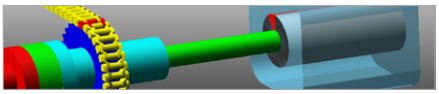
Cables

This module is designed for engineers to easily model and analyze cable based transmission systems.Module highlights are as follows.

The detailed fidelity options include:

- Precisely compute the cable vibration and cable tension
- Predict the load history of pulleys to perform fatigue analysis
- Analyze the impact of cable slippage on system load performance
- Study the effect of cable compliance on the system output speed
- Study the winching effects in terms of the addition and removal of cable length from the system
- Define the pulley properties in terms of dimensions, contact parameters and materials
- Define the preloading, density, Young's Modulus, stiffness coefficient and damping coefficient to get the accurate cable outputs

Electric Motor



The new Adams/Machinery Electric Motor Module enables engineers to represent electric motors with more sophistication and ease than via simple kinematic motions or via potentially complicated self-authored torque functions or subroutines.

The detailed fidelity options include:

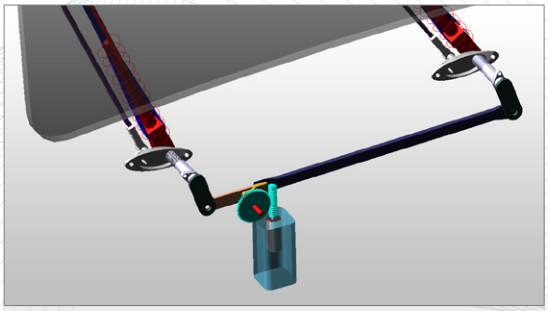
- Choose different modeling method for different applications
- Select from DDC (Shunt or Series), DC Brushless, Stepper and AC Synchronous motors using analytical method
- Apply external method by which the motor torque is defined by either Easy5 or MATLAB Simulink
- Calculate necessary motor sizing
- Predict impact of motor torque on system
- Perform precise position control
- Get a realistic drive signal for the rest of the machine components

Cam Module

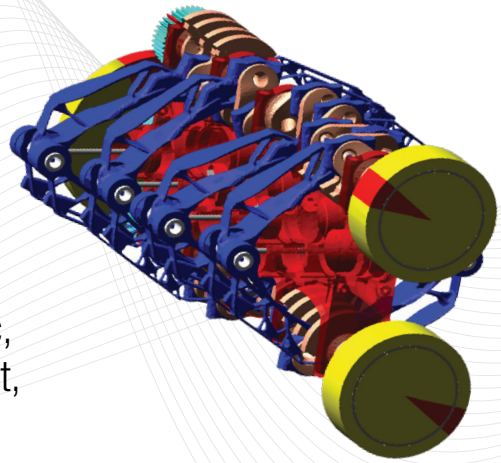
The new Adams/Machinery Cam module contains features to aid the creation of cam-follower systems. These systems may comprise various combinations of cam shapes, follower motions, follower arrangements and follower geometry.

The detailed fidelity options include:

- Create cam model much faster than before
- Make mechanism motion and cam profile design changes more easily
- Choose different cam shapes: disk, cylindrical (barrel) and single sided grooved
- Generate cam profile using existing follower motion
- Create a follower motion that is either time based or cam angle based
- Optimize the motion function to minimize or maximize acceleration or jerk in a more automated way.



Efficient Solvers with High Capabilities for Higher Productivity



As a powerful numerical analysis application, Adams/Solver automatically solves the equations of motion for kinematic, static, quasi-static, and dynamic simulations. It is designed to build, test, and refine mechanical system models.

"Adams has provided significant guidance to the design and development effort, reducing the number of expensive trials required and, therefore, the overall cost of the development programme"

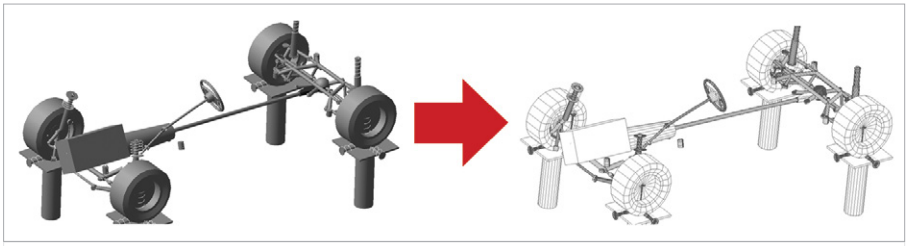
Scott Bradley,
System Design Evaluation, Ltd

High Performance Computation

- Enable parallel evaluation of Jacobian matrix
- Enable parallel thread for results computation
- Enable parallel execution of LU factorizations

Unique Capabilities

- Use state of the art Linear analysis capabilities
- Use high fidelity Adams-to-Nastran translation utilities to replace manual translation
- Use HHT integrators for a faster numerical integration of the equations of motion for a dynamic analysis

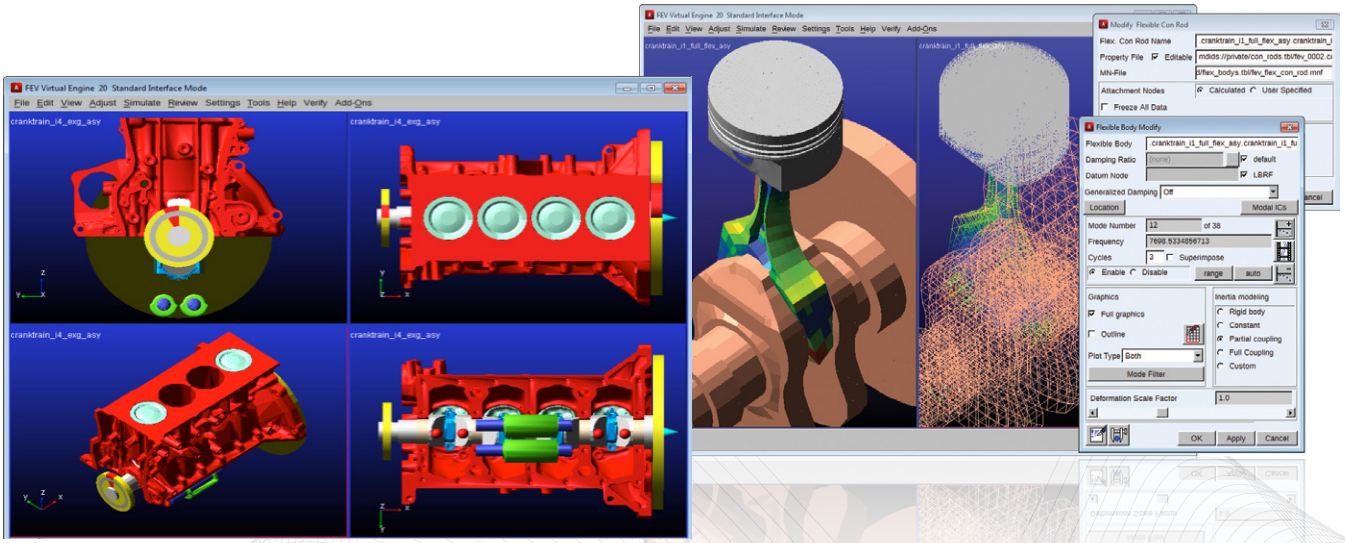


Partner Industry Solutions

Adams has a variety of partners that provide specialized CAE solutions across industries, including automotive, aerospace, biomechanical, medical equipment, defense, and heavy equipment.

Adams is not only well known as the world's leading MBD functional virtual prototyping and test software, but also a platform for other simulation technology providers use to build innovative solutions. Based on Adams technologies, our partners are able to meet all of your requirements, whether it's high performance computing, intensive graphics, or specific engineering applications.

If you want to know more about our partner solutions, please visit:
www.partners.mscsoftware.com



Adams™

Multibody Dynamics Simulation

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 employs professionals in 20 countries.

For additional information about MSC Software's products and services, please visit: **www.mscsoftware.com.**

Corporate
MSC Software Corporation
4675 MacArthur Court
Suite 900
Newport Beach, CA 92660
Telephone 714.540.8900
www.mscsoftware.com

Europe, Middle East, Africa
MSC Software GmbH
Am Moosfeld 13
81829 Munich, Germany
Telephone 49.89.431.98.70

Japan
MSC Software LTD.
Shinjuku First West 8F
23-7 Nishi Shinjuku
1-Chome, Shinjuku-Ku
Tokyo, Japan 160-0023
Telephone 81.3.6911.1200

Asia-Pacific
MSC Software (S) Pte. Ltd.
100 Beach Road
#16-05 Shaw Towers
Singapore 189702
Telephone 65.6272.0082

MSC Software

ADA*2014OCT*BR