



ALTAIR SIMSOLID® FOR HEAVY EQUIPMENT: 25 TO 100 TIMES FASTER THAN TRADITIONAL FEA

In today's fast-paced commercial vehicle and heavy equipment industry, faster design iterations and quicker assessments of CAD variants are essential for achieving design maturity and staying ahead of the curve. Traditional finite-element analysis (FEA) tools for multidisciplinary, structural, and thermal analysis can take days or even weeks to deliver results. Altair SimSolid revolutionizes this process, delivering highly accurate results in just seconds to minutes. With no need for special training, CAD cleanup, simplification, meshing, or high-end GPUs, SimSolid streamlines workflows and empowers you to make faster, more informed decisions, helping you stay ahead of the competition.

FEA Too Slow for Design

Simulation for multidisciplinary, structural, and thermal analysis has traditionally been used only for validation, not design. The reason is speed... or rather, a lack thereof.

Over the years, many vendors have sought to implement simulation earlier in the development process. Solutions like Ansys Discovery and the various CAD embedded structural simulation tools automate some elements of the simulation workflow, but most have severe drawbacks.

Almost all these tools are based on finite element analysis (FEA), a method that has long been used for structural analysis. Unfortunately, FEA methods are difficult to learn, and you need to understand the methodology to use the tools effectively. Gaining that knowledge requires extensive training and practice.

Even after you've acquired the expertise, setting up an FE model is a tedious, time-consuming process. The CAD assembly must be significantly simplified, with substitute load cases defined at interfaces. Individual CAD geometries often require modification before meshing. Mesh size and quality must be carefully considered to achieve an acceptable balance between accuracy and runtime. Even then, calculation runs can take hours.

Moreover, it's difficult to apply FEA solutions to complex systems. Due to the amount of time required for CAD preparation, meshing, and runtime calculations, it's time consuming to apply FEA to large assemblies, particularly in the early stages of design.

Nearly every structural analysis solution available today shares these drawbacks... with one exception.



The team's first impression of Altair SimSolid was disbelief.

It was staggeringly fast, both in terms of set-up and in terms of processing.

Richard Owens, Don-Bur Ltd.



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Altair SimSolid®: A Simpler, Uniquely Efficient Solution

That exception is Altair SimSolid. Unlike traditional tools, Altair SimSolid is built on a powerful generalization of the finite element method. It leverages a cutting-edge formulation based on deep mathematical research developed over many years, which at its core is a breakthrough extension of the theory of external approximations. This allows Altair SimSolid to use arbitrary geometrical shapes as “finite elements,” with shape functions that are independent of the geometry and can be of any class. Solution accuracy is controlled by a multi-pass adaptive solver.

This allows the CAD assembly to be used as it is for simulation and eliminates the need for traditional geometry cleanup and meshing.

Altair SimSolid delivers industry-trusted accuracy while being significantly faster and easier to use than traditional simulation tools. Unlike conventional FEA, Altair SimSolid produces results in seconds to minutes – not hours or days – empowering engineers with rapid design insights when they matter most. Combined with dramatically reduced model preparation time, Altair SimSolid delivers simulation workflows **up to 25 to 100 times faster** than traditional FEA, without compromising accuracy. Users consistently report improved prediction quality, thanks to the ability to simulate more complete assemblies and apply realistic load cases, eliminating much of the guesswork involved with simplified boundary conditions. The result: better designs, shorter development cycles, improved performance, and lower costs.

Altair SimSolid enables simulation driven design.

Numerous Advantages Over Traditional FEA Tools

Altair SimSolid offers several advantages over conventional FEA-based tools, like Ansys Discovery and CAD-embedded tools.

No CAD Assembly Reduction, Geometry Cleanup, or Simplification: Building a reliable FE model requires both time and expertise. Manufacturing-ready CAD assemblies are often far too detailed for simulation, requiring extensive manual simplification – like removing holes, fillets, or small features; combining parts; or reducing assemblies. These tasks are not only time-consuming but often require separate tools, such as Ansys SpaceClaim.

Altair SimSolid eliminates these bottlenecks. There’s no need to simplify geometry, manually prepare assemblies, or worry about meshing errors. You can work directly with full-featured CAD models – no cleanup required.

No More Meshing Around: FEA tools rely on meshing. But meshing presents several obstacles to achieving satisfactory results.

First, there’s the trade-off between accuracy and runtime. Generally, the finer the mesh, the more accurate the results. Of course, the more elements one has, the longer the runtime. Deciding what element size and mesh quality to use requires expert know-how. Particularly for thin solids, tools like Ansys Discovery often rely on an extremely high number of elements, making simulations computationally expensive or even overwhelming system memory – effectively locking up the machine for the duration of the analysis.

Second, the FE model must be simplified to make it computationally practical. For example, experienced simulation engineers often represent thin-walled structures – such as truck frame and its attachments – using mid-surface models with 2D Shell elements. This approach demands time, expertise, and significant prep work. With Altair SimSolid, none of this additional effort is required.



Using Altair SimSolid is a promising approach for any industry looking to remain competitive in today’s business environment, reducing the time of development, and having higher quality in the final product.

[Bruno Mollon, engineer, Suspensys Brazil](#)

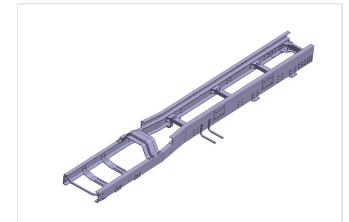


Figure 1: Truck Frame

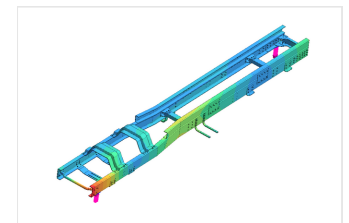


Figure 2: Truck Frame - Crossbeam Twist

Third, meshing is time-consuming. As we'll see in the next section, Altair SimSolid greatly reduces the time required for CAD prep and modeling by factors of 10x or more.

Thanks to its advanced mathematical formulation, no meshing is needed within Altair SimSolid – the manufacturing-ready CAD model is the simulation model. And the solution is computationally lightweight, allowing users to perform other work in parallel during the solve. This cutting-edge formulation makes simulation with Altair SimSolid much faster than Ansys Discovery and similar FEA tools, including CAD-embedded FEA.

Simulate Complex Assemblies Accurately: Building connections between parts is time-consuming and requires expertise. As a result, connections are often idealized, allowing for more approximations in the solution. Tools like Ansys Discovery lack the means to create welds or fasteners between parts, apply tightening, or introduce friction. Their results are therefore inaccurate, since the interactions between parts and the behavior around connections aren't captured correctly.

Altair SimSolid, on the other hand, takes advantage of all the data available in CAD files and uses high-fidelity connections to ensure accurate representation and simulation of real-world behavior. It automatically locates, classifies (holes, fasteners, nuts, bolts, washers, springs, thin sheets, bearings, and welds), and creates connections as defined in the manufacturing-ready CAD model. For connections that may not be present in CAD, such as seam welds, spot welds, laser welds, and adhesives, users can easily create them inside Altair SimSolid.

Drive Early Design Decisions: Altair SimSolid brings simulation to the forefront of the design process, enabling faster design cycles and more informed decision-making. It empowers both designers and analysts to make validated, data-driven changes early in development—when adjustments are less costly and more impactful. With SimSolid, teams can rapidly explore multiple design alternatives without risking project delays. By maximizing first-pass design success and reducing reliance on traditional assumptions, the tool helps achieve robust, high-quality results faster. Traditional workflows often leave designers waiting days or weeks for simulation feedback due to analysis bottlenecks. SimSolid eliminates this delay by placing simulation directly in the hands of the design team, significantly improving design performance, reducing costs, and accelerating time-to-market.

Flexibility to Run on a Standard PC, in the Cloud or on HPC: Ansys Discovery and similar products use your computer's GPU as well as its CPU in making their calculations. They require a high-end GPU that can cost thousands of dollars – a significant investment for every user running Discovery.

Altair SimSolid, on the other hand, runs all calculations on your computer's CPU without the need for expensive GPUs.

As organizational needs change and evolve, you can also leverage cloud and high-performance computing (HPC). While most models can be simulated on a standard PC, Altair SimSolid offers the flexibility to leverage HPC and gain optimal performance for very large models as well.

Simulation for Quick Design Decisions

Because Altair SimSolid is intuitive and easy to use, more people in heavy equipment and commercial vehicle organizations can take full advantage of its capabilities. You don't have to be an analyst with in-depth knowledge of the complex mathematics behind the method; the tool makes it all transparent to the user. Whether you're an engineer, designer, or product developer, you don't need extensive training or prior experience to get accurate, actionable results.

In short, Altair SimSolid delivers world-class simulation to everyone on your team, empowering organizations to accelerate product development and innovation in the heavy equipment and commercial vehicle industry.

 Try SimSolid Today:
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