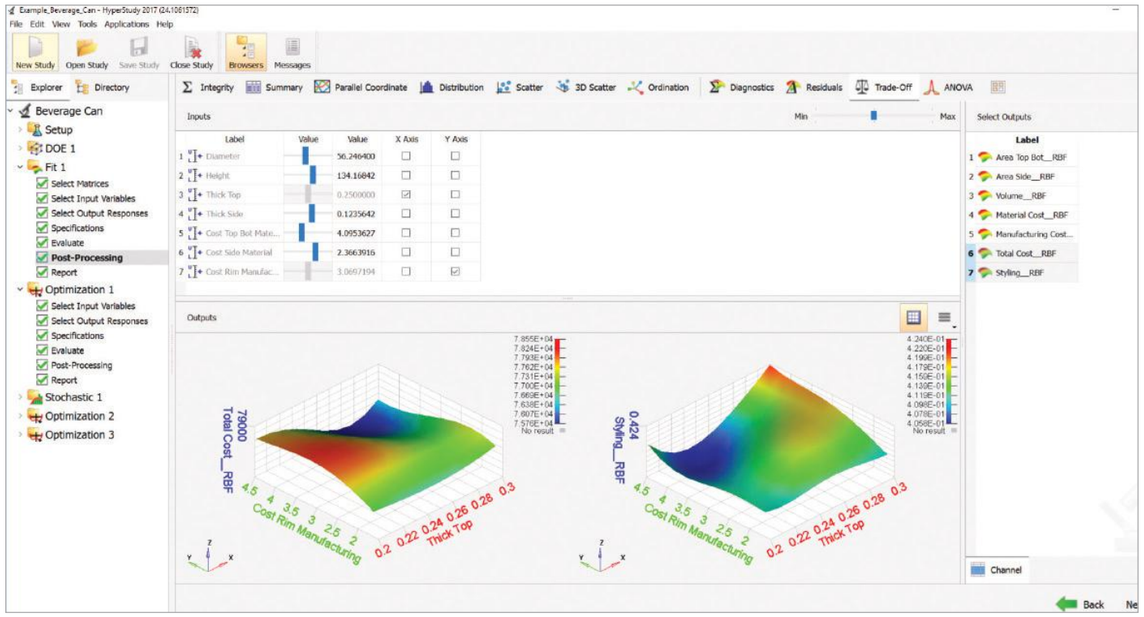
Altair® HyperStudy™

Multi-disciplinary Design Exploration & Optimization



Altair® HyperStudy is a multi-disciplinary design exploration, study, and optimization software for engineers and designers. Using design-of-experiments, metamodeling, and optimization methods, Altair® HyperStudy creates intelligent design variants, manages runs, and collects data. Users are guided to understand data trends, perform trade-off studies, and optimize design performance and reliability. Altair® HyperStudy's intuitive user interface combined with its seamless integration to Altair® HyperWorks™ makes design exploration technology accessible to non-experts.

Product Highlights:

- State-of-the-art design exploration, metamodeling, and optimization methods
- Data mining tools that are easy to understand and interpret
- Direct interface to the most popular CAE solvers
- Fully integrated with Altair® HyperWorks, seamless shape optimization via Altair® HyperMorph®

Learn more:
Altair.com/hyperstudy

Benefits

Altair® HyperStudy provides engineers and designers a user-friendly environment with state-of-the-art design exploration methods and data mining tools to:

- Efficiently understand the relationships between design parameters and design requirements
- Easily sort, analyze, and explore large design data sets
- Perform quick trade-offs between conflicting designs requirements
- Quickly calibrate simulation models to correlate with test data
- Increase product life and robustness
- Reduce design development cycles
- Increase the return on their CAE solver investments

Capabilities

Design of Experiments (DOE)

DOE helps engineers to clearly understand the relationships between design variables and overall system performance. DOE methods in Altair® HyperStudy include:

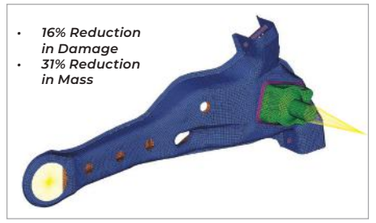
- Box-Behnken
- Central composite design
- D-Optimal
- Direct input of external run-matrix
- Fractional factorial
- Full factorial
- Hammersley
- Modified Extensible Lattice Sequences (MELS)
- Latin HyperCube
- Plackett-Burman
- Taguchi
- User defined

Fit Approach

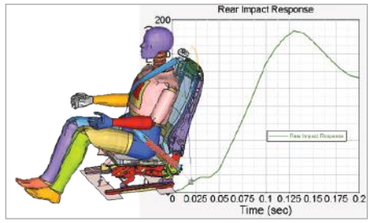
Fit approach is used to create meta-models to replace computationally intensive simulations. They are also used to smooth noisy functions to enable optimization algorithms to work more effectively.

Fit models can be used DOE, optimization, and stochastic studies. Altair® HyperStudy's fit module allows use of different methods for different responses. Available fit methods are:

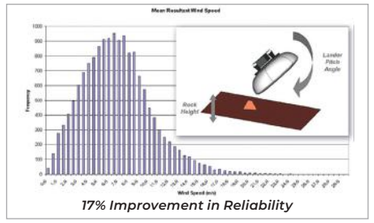
- Least squares regression
- Moving least squares
- Radial basis function
- HyperKriging



Trailing arm design optimized for durability



7% weight reduction of an automotive seat design using Altair® HyperStudy



17% Improvement in Reliability

Reliability optimization of the Mars lander

Optimization

Altair® HyperStudy offers multidisciplinary optimization as well as reliability and robustness optimization. Through multidisciplinary design optimization, engineers can improve the overall design performance. If variations in design and operating environments are critical to design quality, reliability and robustness optimization can be used reduce the sensitivity of designs to these variations.

Altair® HyperStudy contains a comprehensive suite of optimization algorithms that include:

- Altair®'s proprietary optimization algorithm adaptive response surface method and global response surface method (ARSM and GRSM)
- Sequential quadratic programming (SQP)
- Method of feasible directions (MFD)
- Genetic algorithm (GA)
- Multi-objective GA (MOGA)
- Sequential optimization and reliability analyses (SORA).
- Single loop approach (SLA)
- User-defined optimization algorithms (through included API)

Stochastic

The stochastic approach in Altair® HyperStudy allows engineers to assess reliability and robustness of designs and provide qualitative guidance to improve and optimize the design based on these assessments.

Stochastic studies can be performed using either the exact simulation or fit model. Altair® HyperStudy sampling methods include:

- Simple Random
- Latin Hypercube
- Hammersley
- Statistical distribution functions (Normal, Uniform, Triangular, Weibull and Exponential)
- Modified Extensible Lattice Sequences (MELS)

Post-Processing and Data Mining

Altair® HyperStudy helps engineers to gain a deeper understanding of a design through extensive post-processing and data-mining capabilities. This significantly simplifies the task of sorting, analyzing and exploring large design data sets. Some of the available tools are:

- Correlation matrices
- Scatter plots
- Effects and Interactions tables and plots
- Histograms
- Parallel coordinate plots
- Pareto plots
- Ordination plots
- Box plots

Parameterization of Analysis Models

Altair® HyperStudy has a number of models among which are Altair® HyperMesh™, Altair® MotionView™, Spreadsheet, Workbench, Altair® SimLab™, Altair® Feko™ and Altair® Flux™. Altair® HyperMesh, Altair® MotionView and Altair® SimLab™ models are Altair® HyperStudy's direct integration with Altair® pre-processors Altair® HyperMesh, Altair® MotionView and Altair® SimLab. They provide the capability to directly parameterize finite-element, multi-body, and fluid-dynamics-solver input data for CAE solvers, thus making the study parameterization process easy and efficient. Altair® Feko, Altair® Flux, Spreadsheet, and Workbench models simplify the use of these tools with Altair® HyperStudy by direct parameter and response import. For other solvers, Altair® HyperStudy is a powerful parameterization tool with a built-in text and numeric processor.

Shape Parameter Definition Using Morphing Technology

Shape changes can be easily created on complex finite-element models using the powerful morphing technology in Altair® HyperMesh. These morphed shapes can be saved as Altair® HyperStudy shape parameters.

Direct Interfaces to Popular Solvers

To facilitate streamlining the study process without additional data filtering and translation steps, Altair® HyperStudy directly reads the plot and animation data of many solvers, including:

- ABAQUS
- Adams
- ANSYS
- DADS
- Excel
- Fluent
- LS-DYNA
- MADYMO
- MARC
- Matlab/Simulink
- Altair® MotionSolve™
- NASTRAN
- Altair® OptiStruct™
- PAMCRASH
- Altair® Radioss™
- StarCD