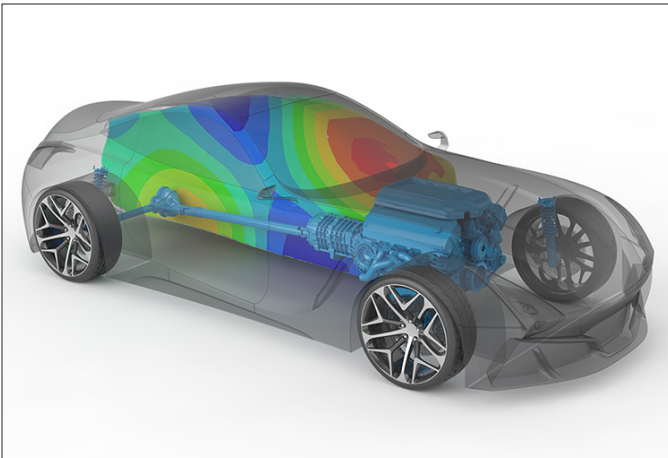
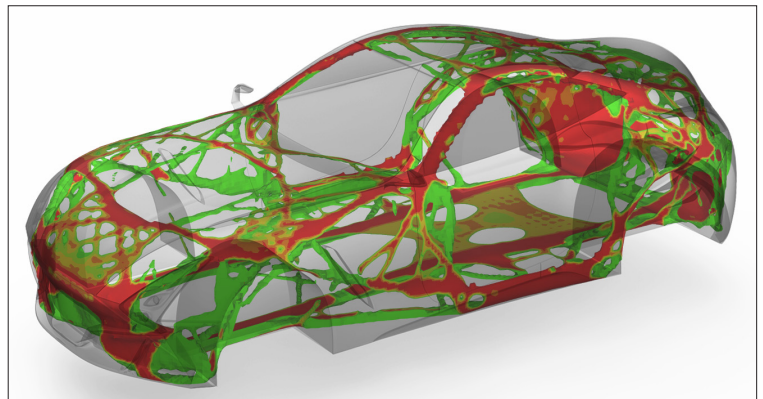
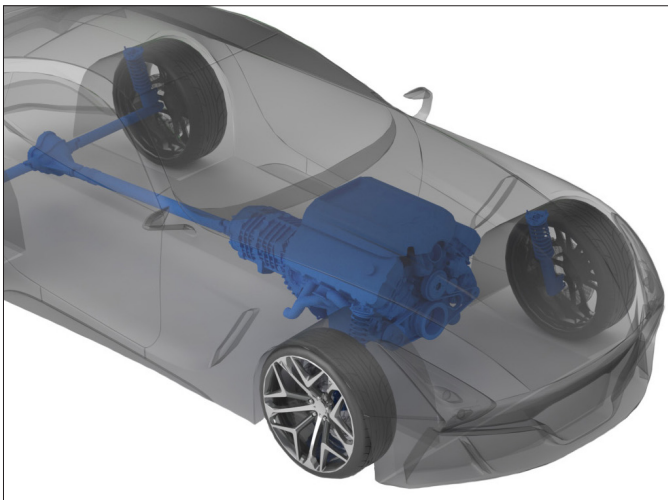


The Altair MDO Director

Streamlining the Multi-Disciplinary Optimization Process for Sheet Metal Structures



Highlights

- Provides a platform for synchronization of simulation models for different attributes
- Enables rapid set up of multi-disciplinary optimization problems
- Facilitates material gauge DOE and optimization studies
- Supports design exploration within product development
- Minimizes computational effort

Ideal for:

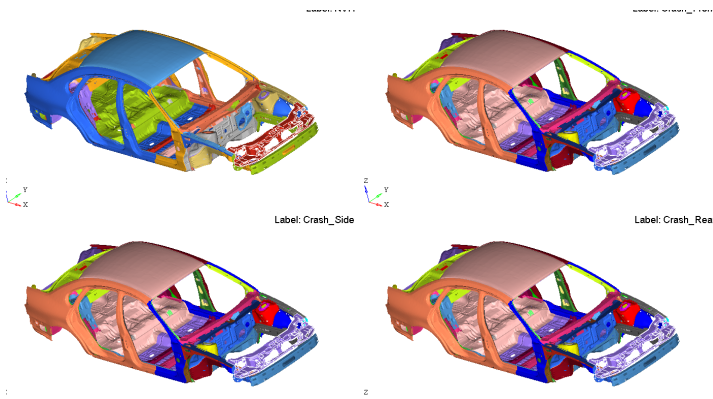
Organizations that design sheet metal or automotive body structures

Lightweighting Sheet Metal Structures

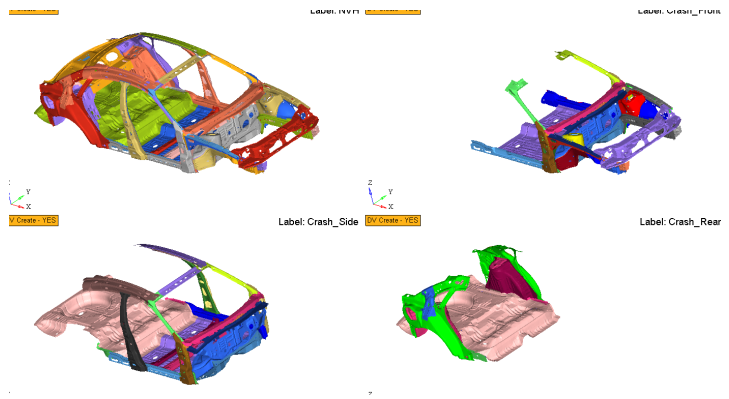
The increasing pressure to lightweight automotive body structures, coupled with tighter design and development cycles, has led to the need for methods that can rapidly explore potential to improve the design balance between weight and product attribute performance. In order to find the desired optimum balance between design attributes, all relevant design requirements and targets need to be taken into account. A multi-disciplinary optimization (MDO) approach can achieve this by exploring these requirements simultaneously. However, historically it has not been feasible to apply this approach on live vehicle programs due to the volume and complexity of data and the inherent incompatibility of design attributes.

Altair's MDO Director is a novel set of software tools that provides a process to enable the rapid set up, execution, post-processing and design exploration of MDO problems with gauge variables. Designed to ensure that your existing CAE processes can remain unchanged, the MDO Director can be tailored to be fully compatible with your design processes and environment and thus tailored to be integrated in a simulation-driven product design environment. Fully integrated into the HyperWorks software suite, the MDO Director provides a semi-automated process to reduce the complexity of MDO set up, enabling teams to drive the design to program timescales within a user-friendly environment.

1. Model Synchronization



2. Optimization Problem Set Up



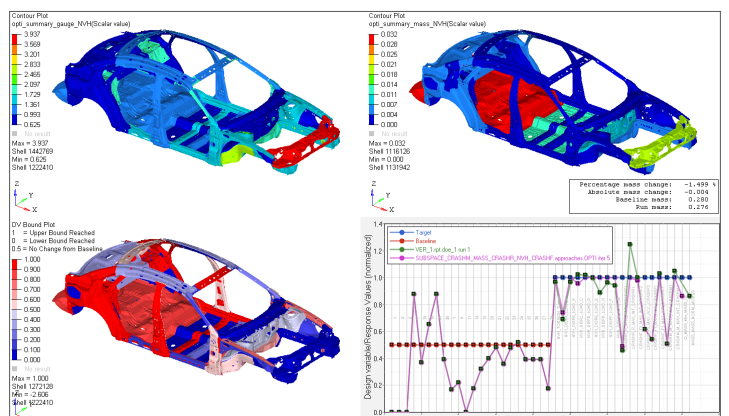
- Import run-ready CAE models from Altair OptiStruct, Altair RADIOSS, Nastran, LS Dyna or ABAQUS.
- MDO Director automatically links models to facilitate fast model synchronization and fast setup of gauge design variables, regardless of element, nodal and part numbering.

- Efficient process for setting up gauge design variables, automatically mapped to desired models and load cases.
- Guided process to set up responses and targets for load cases using user interface and templates.

3. MDO Execution & Monitoring

Response	Label	DOE	Runs	Range	Integrity	Quality	MSM Relative error (%)	HC Relative error (%)	RF Relative error (%)	LSR Relative error (%)
SURFACE_14	WVLSURFACE_LOAD_1	2	32	0.141626	111	18.95	18.95	13.43	18.90	
WVLSURFACE_LOAD_2	2	44	0.141699	112.21	7.30	7.30	7.63	7.30		
WVLSURFACE_LOAD_3	2	32	1.84366	15.34	15.34	15.33	15.43	15.43		
WVLSURFACE_LOAD_4	2	44	1.84366	3.81	3.81	3.81	3.81	3.81		
WVLSURFACE_LOAD_5	1	32	0.62342	13.25	13.25	13.25	13.17	13.17		
WVLSURFACE_LOAD_6	2	44	0.62336	6.56	6.52	7.40	6.95	6.95		
WVLSURFACE_LOAD_7	1	32	0.540311	12	16.38	16.38	13.05	15.43		
WVLSURFACE_LOAD_8	2	44	0.550231	12	8.95	8.95	8.96	8.97		
WVLSURFACE_LOAD_9	1	32	0.397195	23.37	14.06	14.06	20.01	20.01		
WVLSURFACE_LOAD_10	2	44	0.397195	8.63	4.63	7.28	6.95	6.95		
WVLSURFACE_LOAD_11	1	32	0.33389	16.45	16.45	12.44	15.84	15.84		
WVLSURFACE_LOAD_12	2	44	0.40824	5.98	5.98	6.93	6.96	6.96		
WVLSURFACE_LOAD_13	1	32	0.264915	18.51	18.51	15.11	17.96	17.96		
WVLSURFACE_LOAD_14	2	44	0.302897	8.38	5.38	6.33	6.34	6.34		
WVLSURFACE_LOAD_15	1	32	0.236237	11.81	11.81	14.34	11.72	11.72		
WVLSURFACE_LOAD_16	2	44	0.242497	7.46	7.46	8.34	7.63	7.63		
WVLSURFACE_LOAD_17	1	32	0.450197	15.90	15.90	18.38	15.82	15.82		
WVLSURFACE_LOAD_18	2	44	0.521262	3.61	3.61	11.91	3.61	3.61		

4. Optimization & Design Exploration



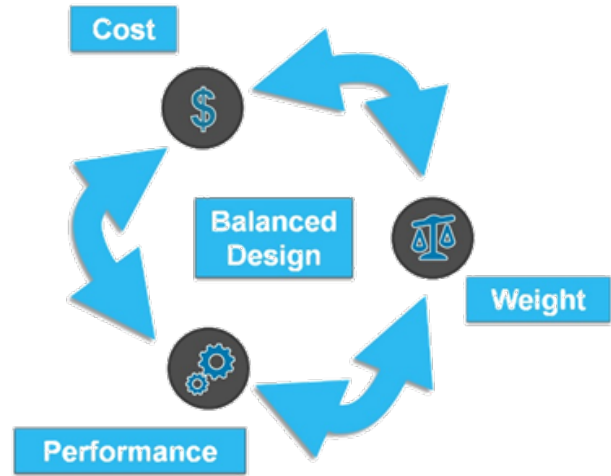
- MDO Director provides methodology to significantly speed up the execution of an MDO study (sub response surface optimization, efficient sampling algorithms, multiple study approaches).
- Supports automatic selection of optimization procedures to reduce computational effort.

- Contextual result displays facilitate an understanding of design drivers and the nature of the optimum solution.
- Optimum solutions automatically mapped to the original baseline models to validate the solution.
- Supports design exploration in the vehicle design process.

Optimization Driven Design Facilitates the Improvement of the Design Balance

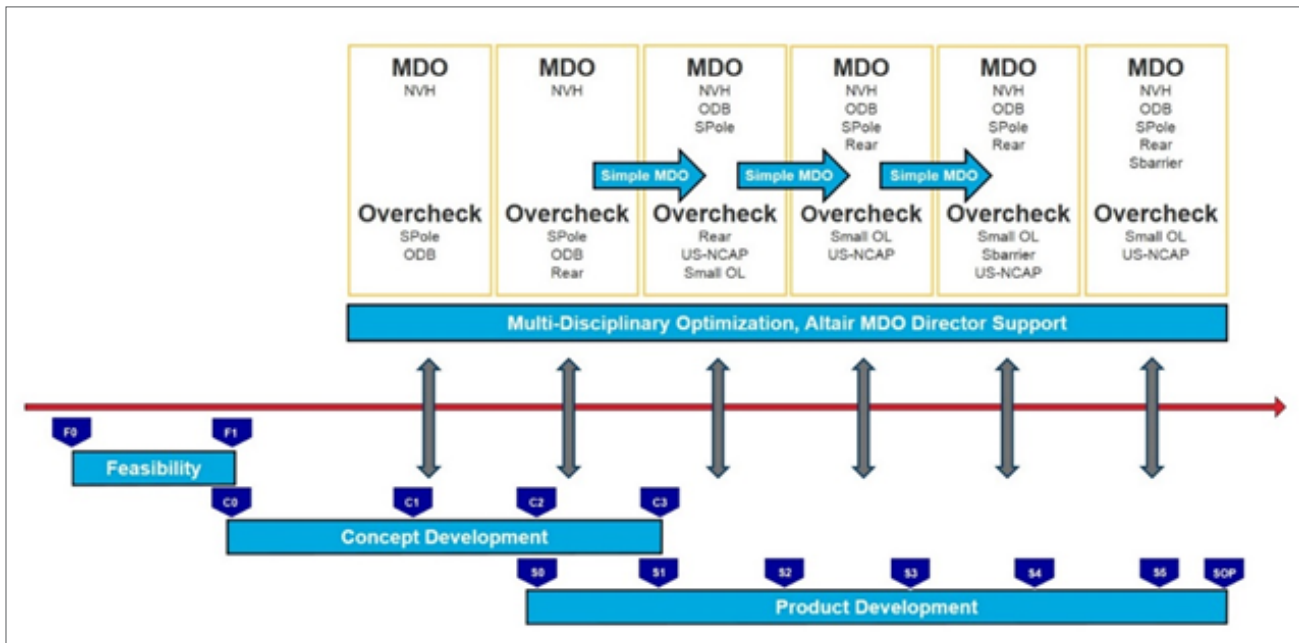
The MDO Director provides design guidance in a timely manner accounting for relevant performance requirements.

- Active management of vehicle design balance
- Increased maturity of design
- More informed design decisions
- Reduction of development risk
- Supports innovation by allowing consideration of larger design changes



Execution Flexibility Assures the Usability of MDO Director as a Design Support Tool

The MDO Director operates in a flexible way, allowing the tool to be used efficiently both in concept development and in series development. Depending on development time constraints, either a full MDO or a more simplistic MDO approach can be used to generate design guidance into product development.



The MDO Director is designed to be used throughout different phases of product development. From early concept development to late series development, the MDO Director will help deliver design input in order to support maturing the structure to be developed. In early stages and between project milestones, the MDO director can be used in a more simplistic and faster manner to deliver design feedback. Here, linear load cases such as NVH and static stiffness are optimized using linear optimization. Crash and other non-linear load cases are then over-checked, and performance recovery takes place if necessary.

At project synchronization points or any other project timepoint, when higher accuracy is needed, a full MDO can be executed including crash and other non-linear load cases. The optimization is now based on metamodels derived from the DOE samples of the load cases to be evaluated. Still, over-checks are normally performed since, from an execution point, it is feasible to minimize the number of crash load cases included in the optimization.

Learn more about Altair's
MDO Director
at www.altairhyperworks.com/MDOD

About Altair

Altair (Nasdaq: ALTR) is focused on the development and broad application of simulation technology to synthesize and optimize designs, processes and decisions for improved business performance. With more than 2,000 employees, Altair is headquartered in Troy, Michigan, USA and operates 69 offices throughout 24 countries. Altair serves more than 5,000 customers across broad industry segments.

www.altair.com

About HyperWorks®

HyperWorks is the most comprehensive open-architecture simulation platform, offering technologies to design and optimize high performance, efficient and innovative products. HyperWorks includes modeling, analysis and optimization for structures, fluids, multi-body dynamics, electromagnetics and antenna placement, model-based development, and multiphysics. Users have full access to a wide suite of design, engineering, visualization, and data management solutions from Altair and its technology partners.

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