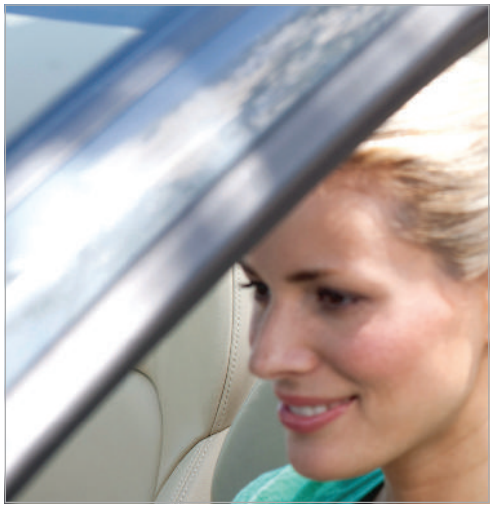
Using Simulation Technology to Reduce Weight and Improve Safety of Child Restraint Systems



Britax

Key Highlights

Industry
Child Restraint Systems

Challenge
Improve safety performance while minimizing weight

Altair Solution
Simulation technology used to optimize key components of the child seat structure

Benefits
- Weight reduced by 1.8kg (3.97lbs)
- Improvement in side impact

Since their introduction in the 1960s, child safety systems for passenger vehicles have become increasingly effective at protecting young children from crashes and have been responsible for saving countless lives. While safety remains the primary focus for all child seat manufacturers, consumers also look for other desirable attributes when making their purchasing decision such as styling, ease of use and carrying weight. Manufacturers need to take these considerations into account and produce products which meet these demands while keeping costs down to remain competitive in a crowded marketplace.

Britax-Römer is a world leader in child restraint systems, push chairs, cycle seats, infant carriers and accessories and distributes its products throughout Europe, USA, Australia, New Zealand and the Far East. The company has been making car safety products since the 1930s and has grown to operate factories in every part of the world.

Maximizing the Benefit of Simulation Technology

In 2007, during the development of a new safety carrier called the 'Baby Safe Sleeper', Britax-Römer was looking for ways to improve the safety performance and accelerate the development cycle, while reducing manufacturing complexity and costs.

The company had been using computer aided engineering (CAE) solutions to assist in the development process, building virtual

Keywords: Topology optimization, weight reduction

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Iain Powell, European Advanced Engineering Manager, Britax-Römer

models and validating designs but required additional support to get the most out of the technology. As existing users of Altair's HyperWorks simulation suite, Altair ProductDesign was approached to support this activity and utilize simulation technology to improve safety performance while experimenting with alternative structural layouts to reduce part count.

"It was a great success for us and the Baby Safe Sleeper went on to win an innovation award at the Kind + Jugend Messe in Cologne, Germany."

"This was our first major step into CAE and it allowed us to remove unnecessary components, reduce weight, complexity and manufacturing time," said Iain Powell, European Advanced Engineering Manager at Britax-Römer. "It was a great success for us and the Baby Safe Sleeper went on to win an innovation award at the Kind + Jugend Messe in Cologne, Germany."

Optimizing Components to Minimize Product Weight

With greater confidence in the use of simulation technology and the benefit it could bring to the performance of the end product, Britax-Römer and Altair ProductDesign continued the relationship and started work on the development of a group 1 Isofix child seat, the 'Trifix'.

Along with improved safety performance, a major challenge of this project was to minimize weight. A lighter seat allows it to be carried and moved between vehicles more easily and has become a key purchasing consideration for consumers.

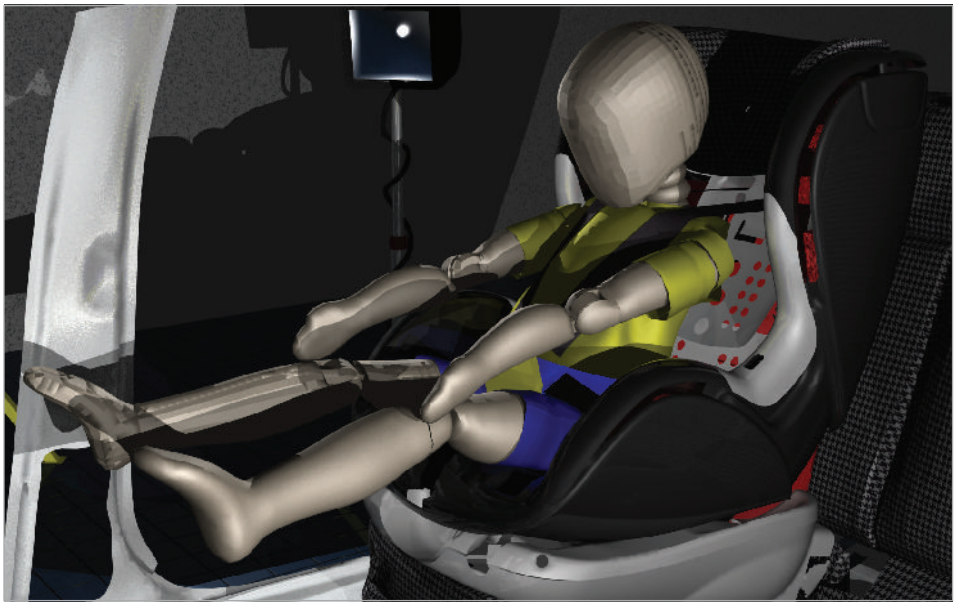
To address this challenge, Altair ProductDesign utilized the HyperWorks

The Britax-Römer Trifix Seat

Using topology optimization to create a weight efficient structural layout

About Britax-Römer

Britax-Römer is a world leader in child restraint systems, push chairs, cycle seats, accessories and infant carriers and distributes its products throughout Europe, USA, Australia, New Zealand and the Far East. The company's main offices are located in Australia, Germany, UK and US.



Performance validated in the virtual world, reducing the need for prototypes

suites' design optimization solution, OptiStruct, to define a new, weight efficient structure for major components of the seat. This included the seat shell, base assembly, leading plates and reinforcement brackets.

Topology optimization was used to suggest a new geometry for the components by using manufacturing constraints and known loading conditions to determine where material could safely be removed while simultaneously meeting performance criteria. The Altair team interpreted the topology results to form a new, optimized layout which could be taken to the validation stage. Iain Powell described the working relationship:

"We used Altair in the UK to do the scanning of a car interior. They then turned this into a cloud model and meshed it before sending it over to Altair in Germany. The team then dropped in the seat model and analyzed the dynamic performance in the virtual world before comparing the results from the physical test bed. The process was seamless and worked really well."

"One of the innovations we have taken on board by using Altair is that we've shifted our engineering development from a later stage in the project to the start."

The new design of the Trifix seat proved to be highly successful for Britax-Römer. The final design was 1.8kg (3.97lbs) lighter than the original, cost targets were met and there was a significant improvement in side impact protection performance. The seat went on the win a prestigious "red dot" product design award in 2012.

Shortening the Development Cycle

The partnership between Britax-Römer and Altair ProductDesign has proved to be an excellent collaboration for both companies. The design team has increased the use of simulation technologies throughout the development of new products and now use CAE up front to get the design right the first time, a considerable change from the traditional method of extensive prototyping and physical testing routines.

"One of the innovations we have taken on board by using Altair is that we've shifted our engineering development from a later stage in the project to the start", said Iain Powell.

"Previously we would design a product and test it as best as we could but the only way to really see if the investment would give you the desired performance return was to tool it and trial it. We can now make these expensive modifications at the beginning of the project and shorten the design cycle."

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About Altair

Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 2,000 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 27-year-plus track record for high-end software and consulting services for engineering, computing and enterprise analytics, Altair consistently delivers a competitive advantage to customers in a broad range of industries. Altair has more than 3,000 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the electronics, architecture engineering and construction, and energy markets.

About Altair ProductDesign

Altair ProductDesign is a global, multi-disciplinary product development consultancy of more than 700 designers, engineers, scientists, and creative thinkers. As a wholly owned subsidiary of Altair Engineering Inc., this organization is best known for its market leadership in combining its engineering expertise with computer aided engineering (CAE) technology to deliver innovation and automate processes. Altair ProductDesign utilizes proprietary simulation and optimization technologies (such as Altair HyperWorks) to help clients bring innovative, profitable products to market on a tighter, more efficient time-scale.

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