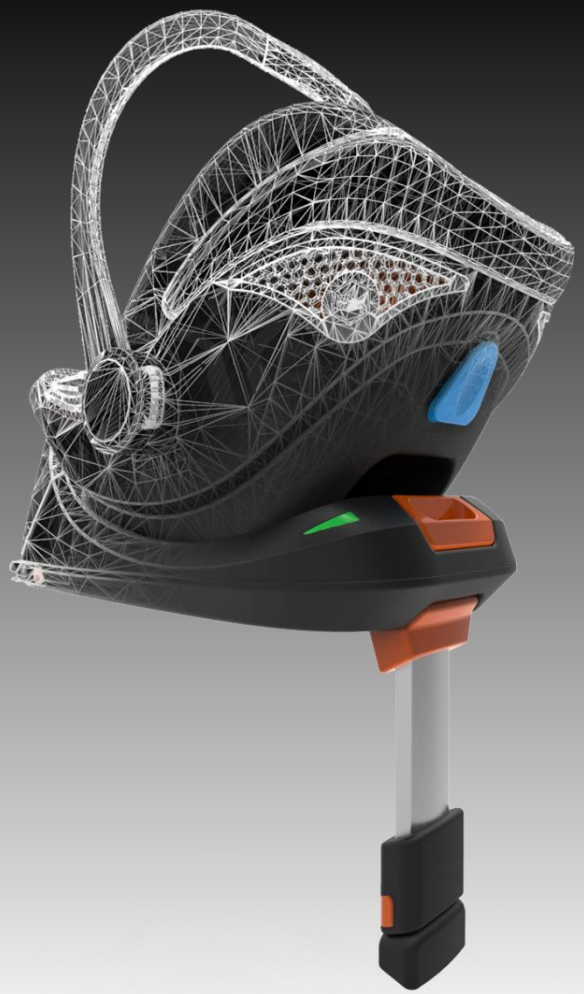

Design and Development of Child Car Seat using simulation

jmda
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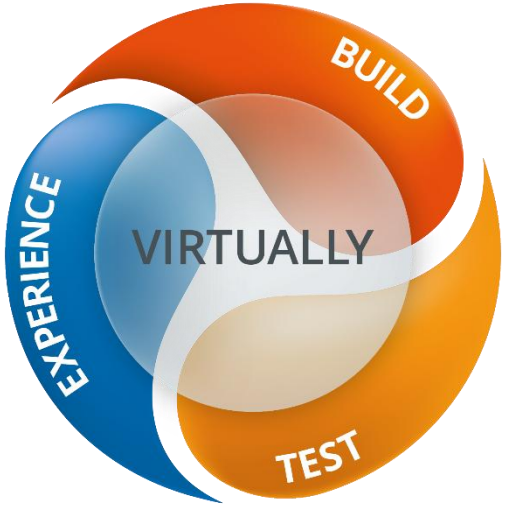
esi | VIRTUAL SEAT SOLUTION

VIRTUAL SEAT SOLUTION



ESI Group is a leading innovator in Virtual Prototyping software and services, established in more than 40 countries worldwide. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtually replicating the fabrication, assembly and testing of products in different environments

AN EXPERTISE BASED ON OVER 40 YEARS OF R&D

30%

R&D INVESTMENTS / LICENSES REVENUE in FY15

More than **40** countries

34 subsidiaries

1100 people

Key Figures Fiscal Year 2015 :

REVENUE

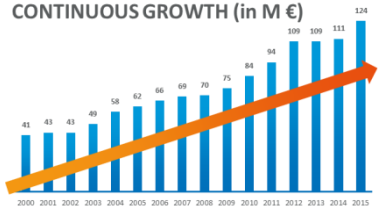
€124M

TOTAL REVENUE

GLOBAL PRESENCE

EMEA 46%
ASIA 36%
AMERICAS 19%

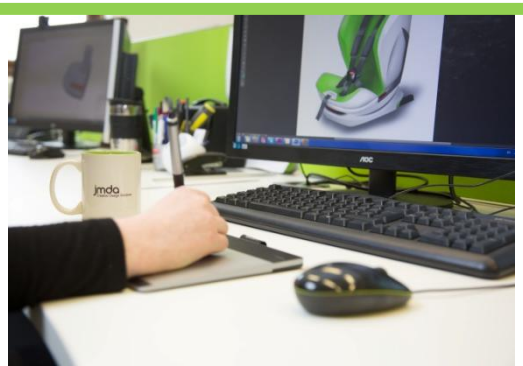
CONTINUOUS GROWTH (in M €)

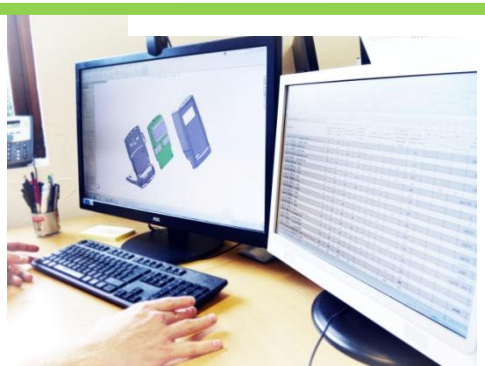


jmda
Creative Design Solutions

JMDA have 25 years' of experience within the industry of design engineering for child car seats and our unique blend of services provide a holistic and practical view of delivering products to the market.

With our Head Office in Worcestershire, UK and a second office in Shanghai, China, our global reach allows us to fully embrace opportunities and maximise efficient routes to the market.





The Challenges of Child Car Seat Development

Innovation

Standing out in the market

Changing regulation compliance

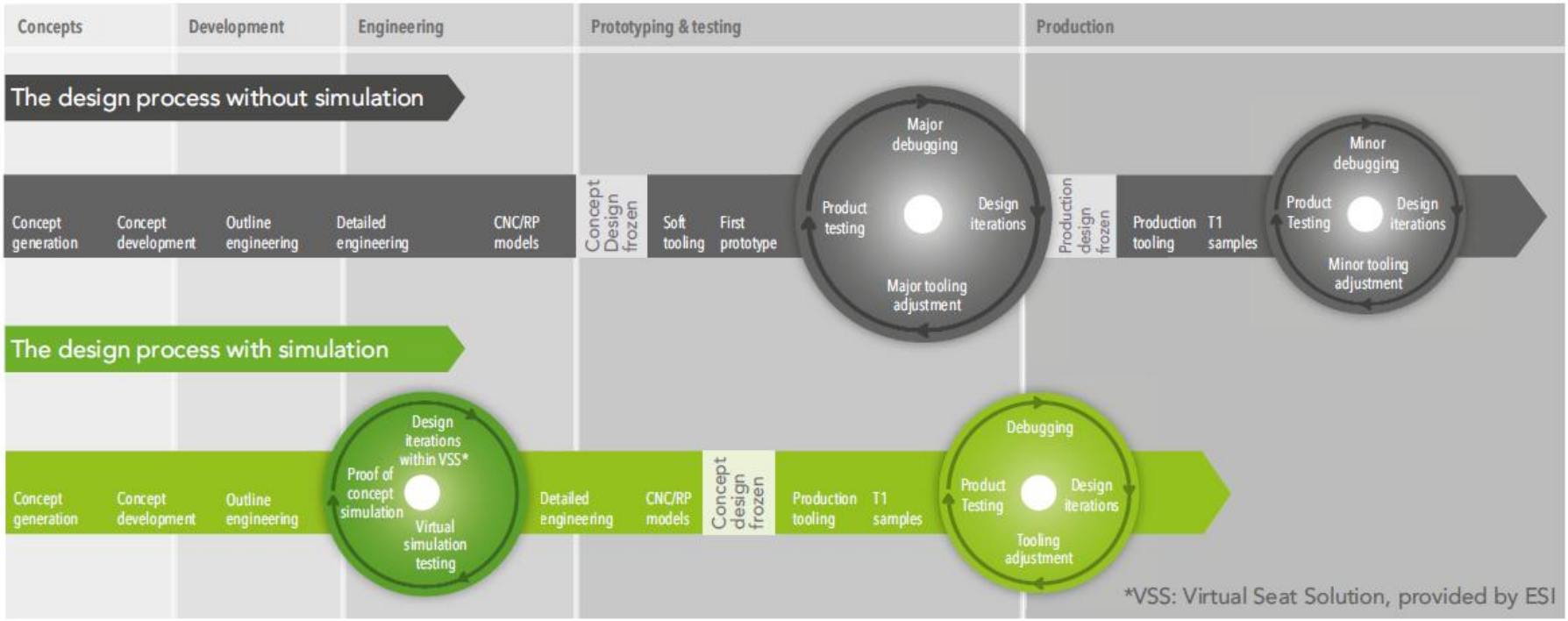
Reduction in weight and cost

Speed to market

Design confidence

Simplicity and reliability

Using virtual prototyping software in the development process



- Reduce the product development time, production cost and product weight.
- Improve product safety and mitigate unforeseeable problems late on in the development process.
- Test the limits by simulating innovative new ideas to determine their feasibility early on in the design process.

Why Virtual Seat Solution is unique ?

- Support seat design & development with Virtual Seat prototyping

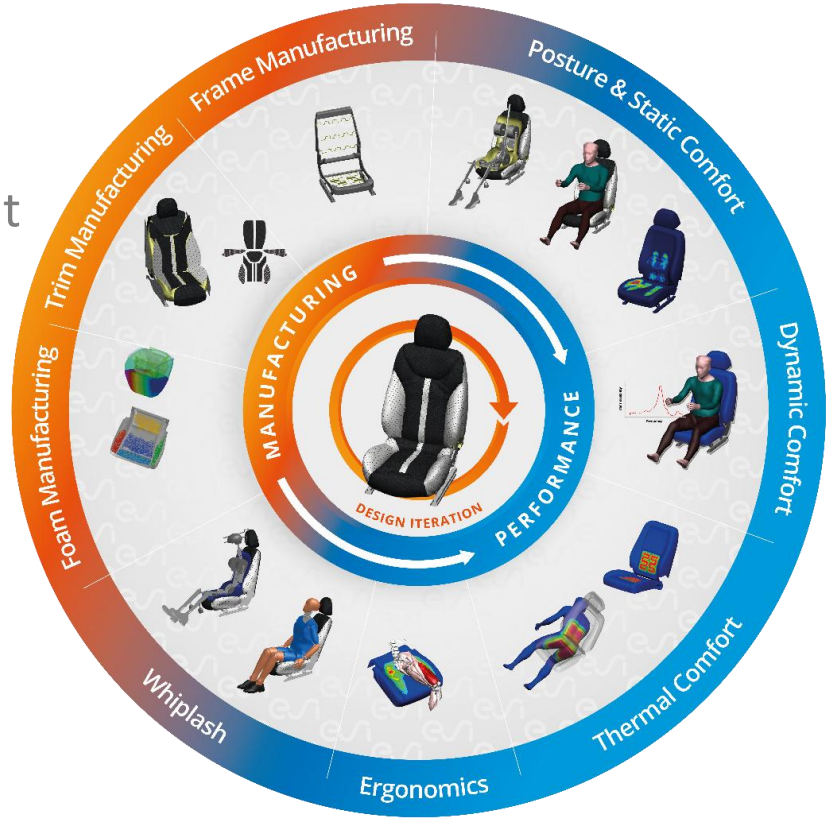
✓**Accurate & predictive** enough
to replace real prototypes

✓**Virtual Prototyping** early in development cycle, in a global solution

- ➢ to anticipate the issues
- ➢ for more flexibility to solve them

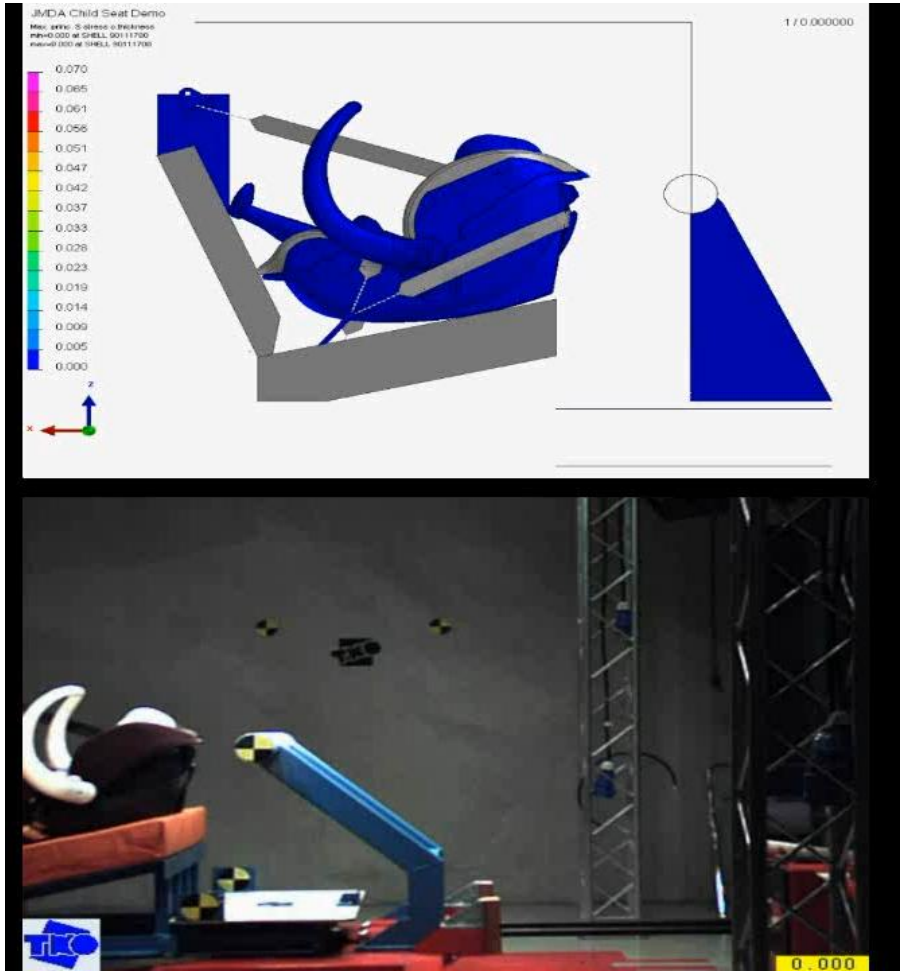
✓**A Single Core Model in a solution dedicated for virtual seat prototyping**

- ➢Easy iterations
- ➢Trade-offs between performances
- ➢No silos
- ➢Synchronization



VIRTUAL SEAT SOLUTION

Comparison of Real testing vs Virtual testing

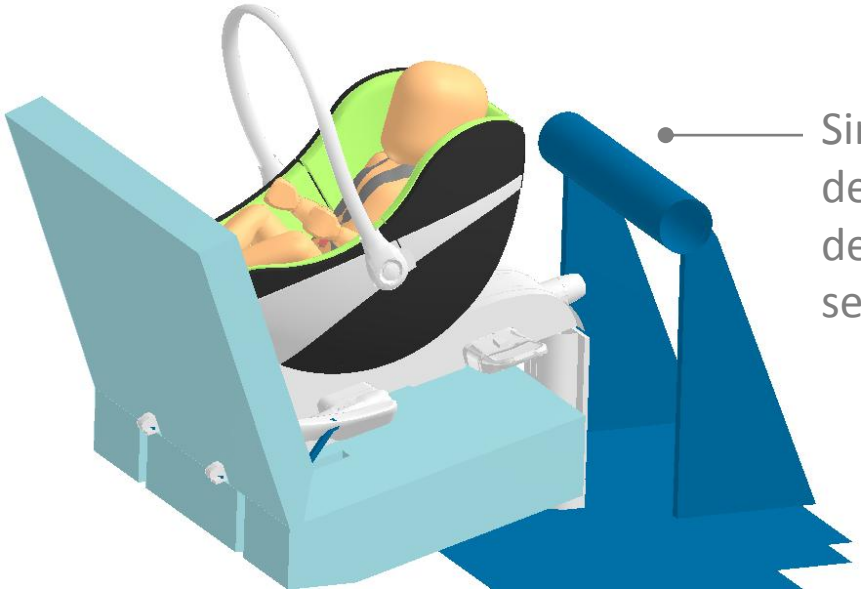


The video shows the accuracy of an R44 seat crash test using VSS and a real R44 crash test.

VSS is a trusted tool used by the automotive and aerospace industries.

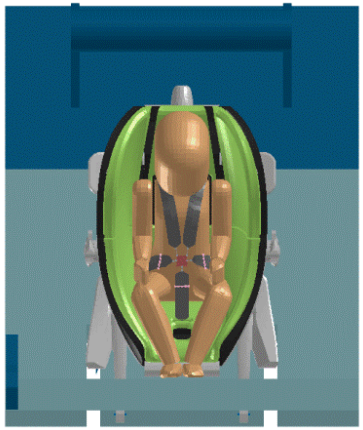
Case Study around Child Car Seat design

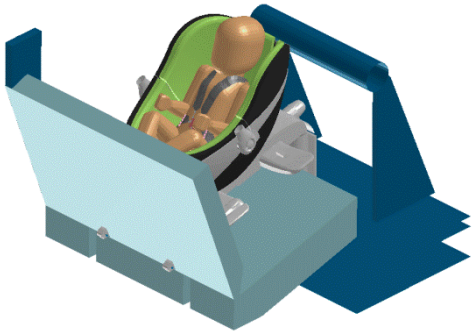
- The orb seat was designed using ESI Virtual Seat Solution to determine its compliance with R44 during the development process

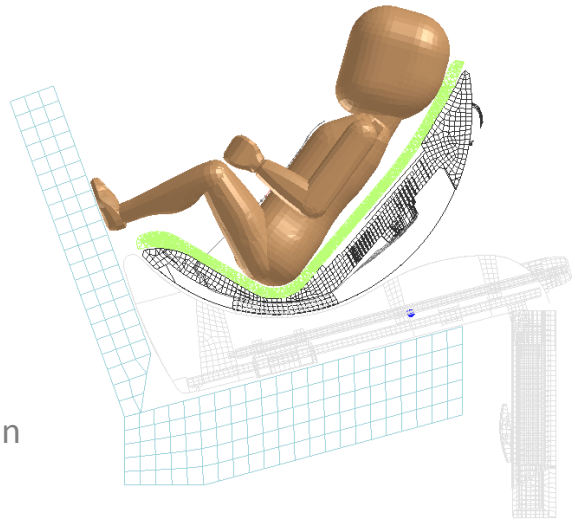


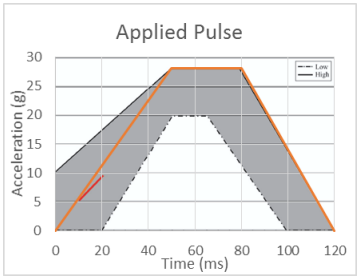
Simulation carried out through the development process to improve the design and understand whether the seat complies with the regulation

Test Results UN R44 – Frontal impact using high pulse

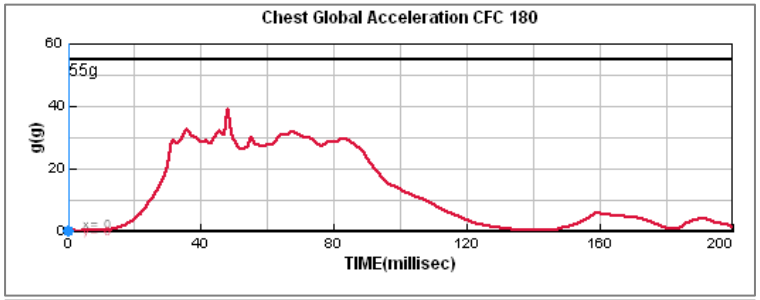


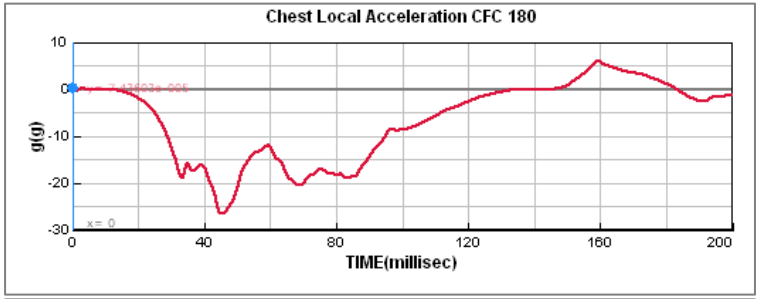


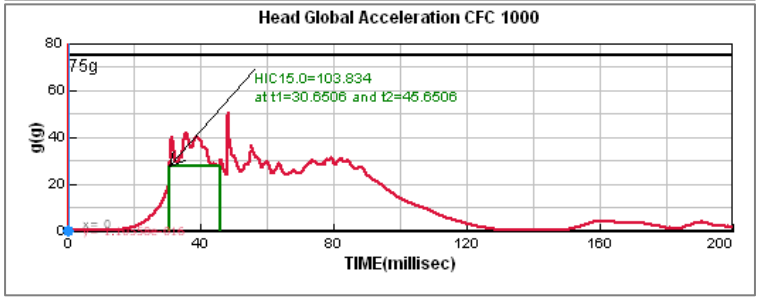




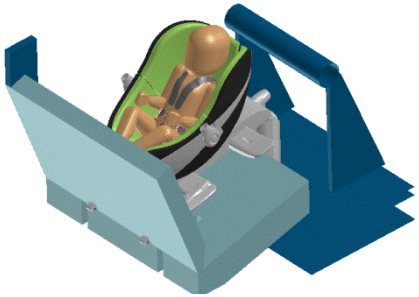
Different rate of pulse can be simulated

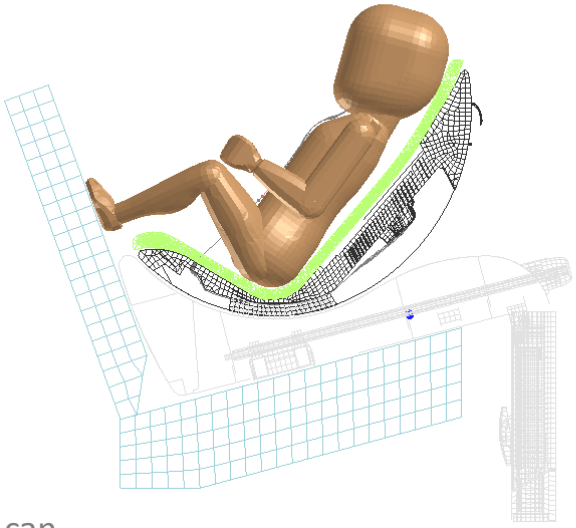


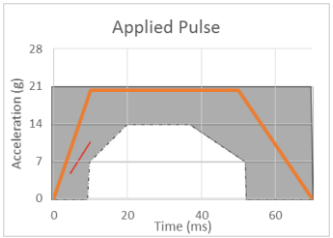




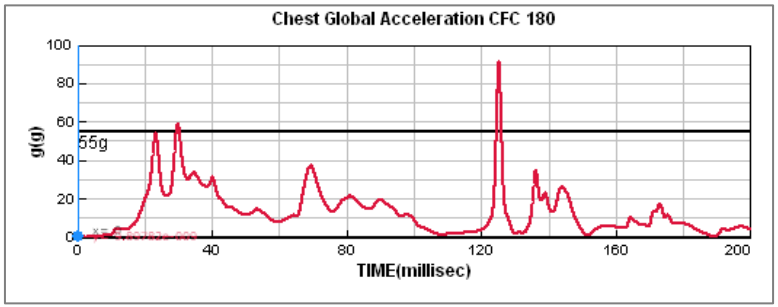
Test Results UN R44 – Rear impact using high pulse

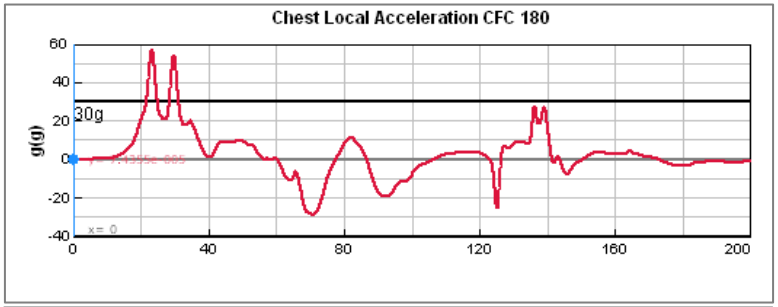


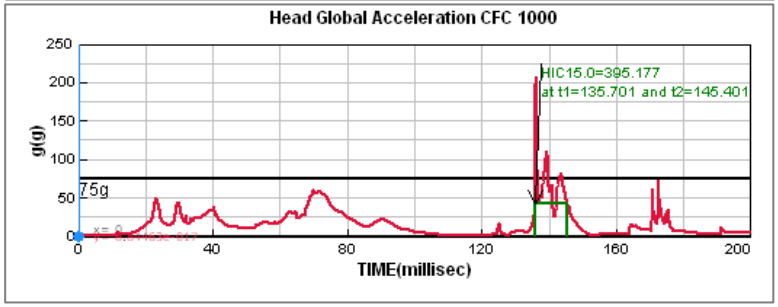




Different rate of pulse can be simulated

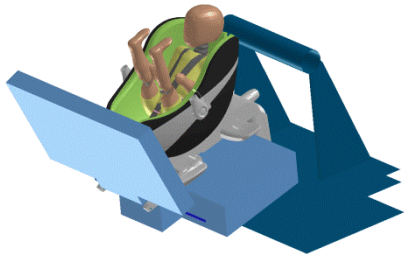




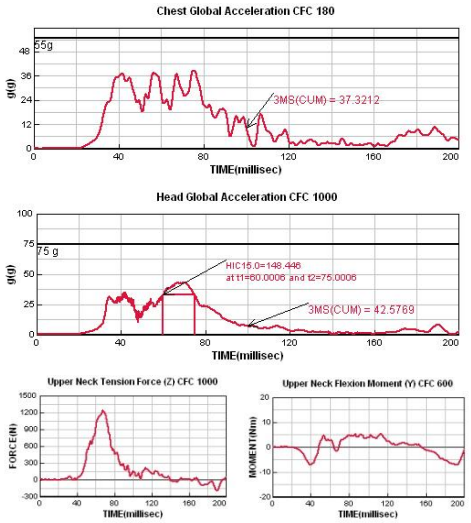


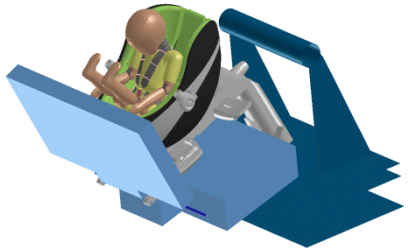
Scenario - Orb R129 Compliance

- The Orb seat was simulated to R129 to see if it would comply and where modifications would need to be made

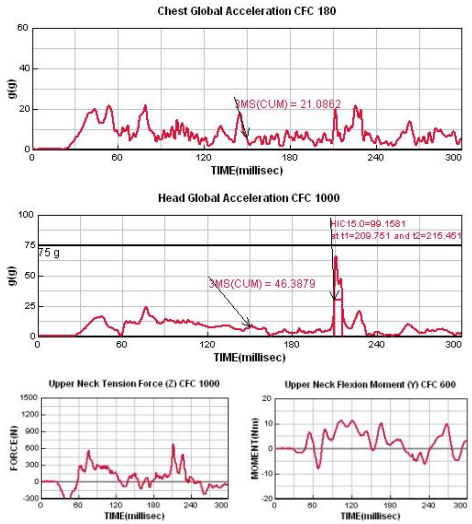


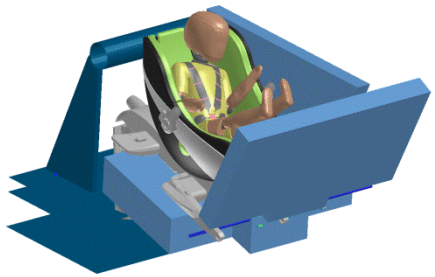
Frontal impact, medium pulse



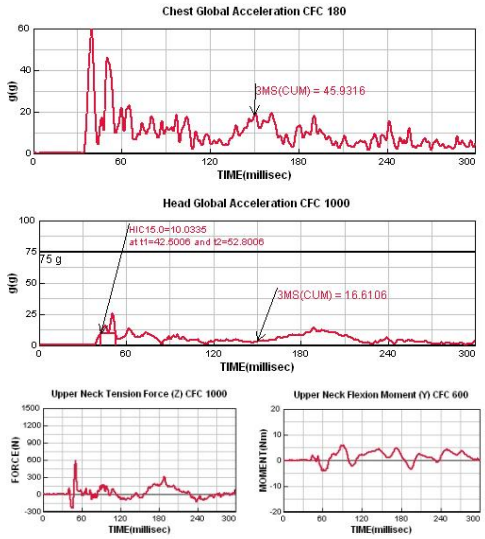


Rear impact, low pulse



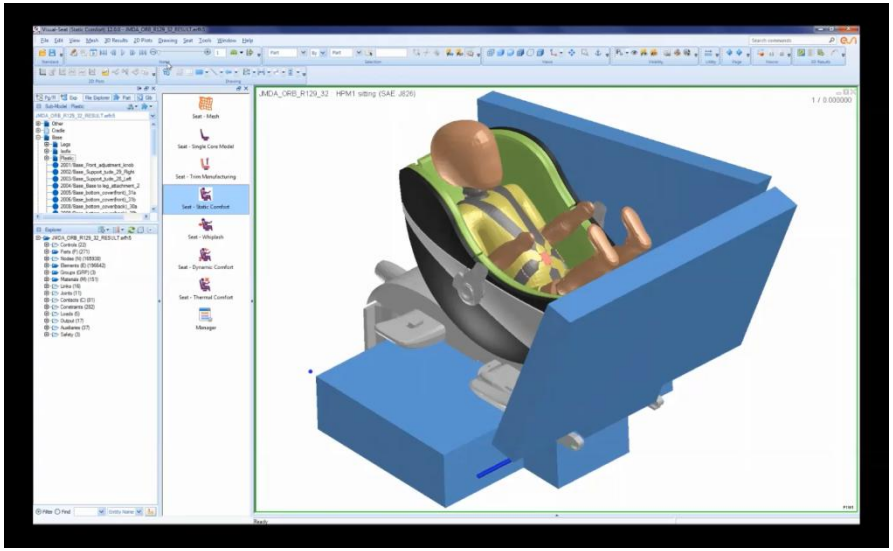


Lateral impact, low pulse

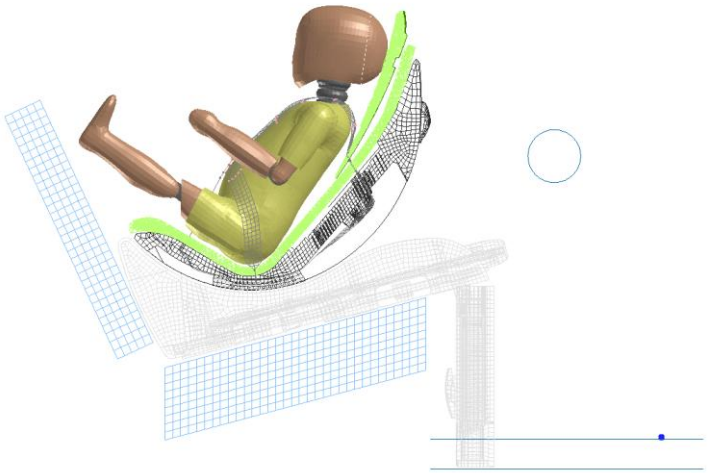


The test results comply with R129

Analysing results



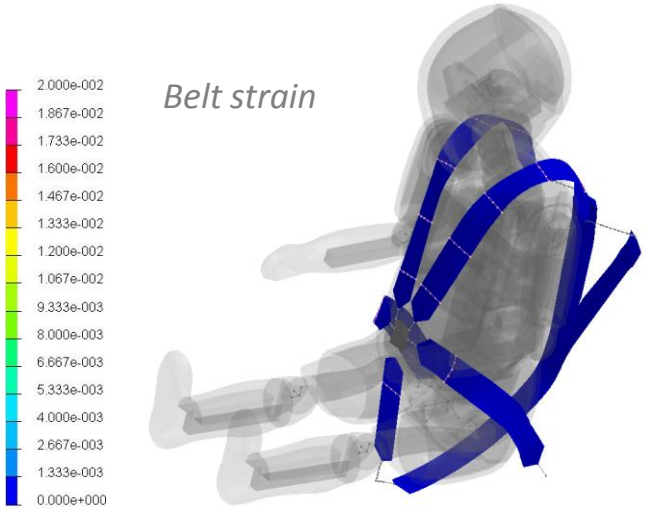
The software allows for a full analysis of the seat to understand where changes need to be made to improve the seat or test the limits of the design whether this is changing or removing material.



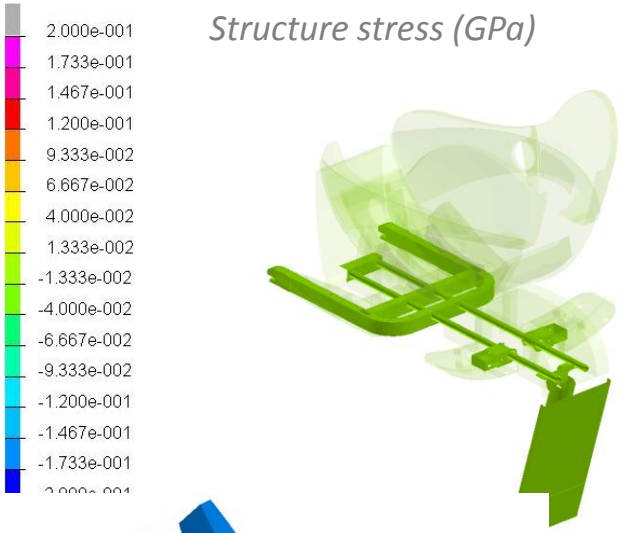
Section views can be taken to understand where the movement is occurring.

Analysing results

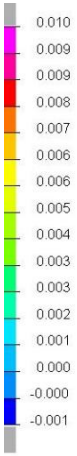
- Understanding stress



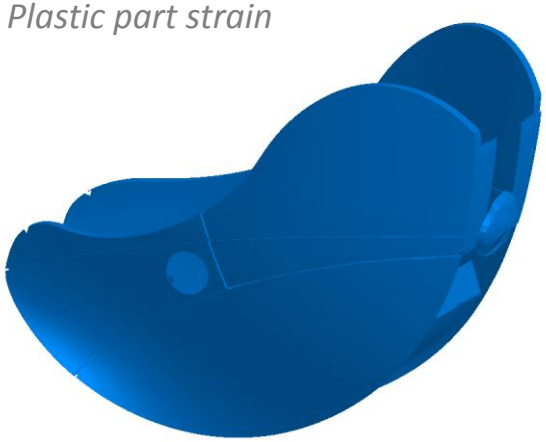
Belt strain

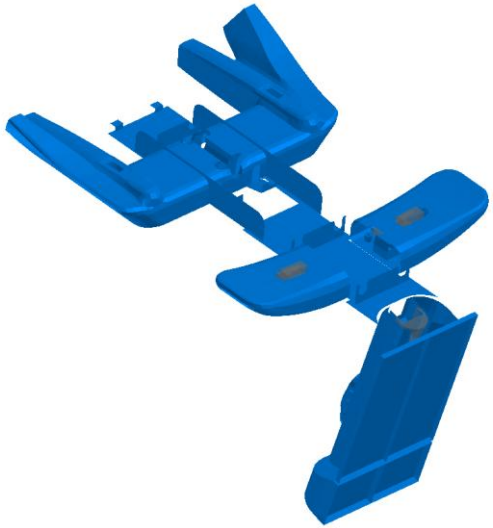


Structure stress (GPa)



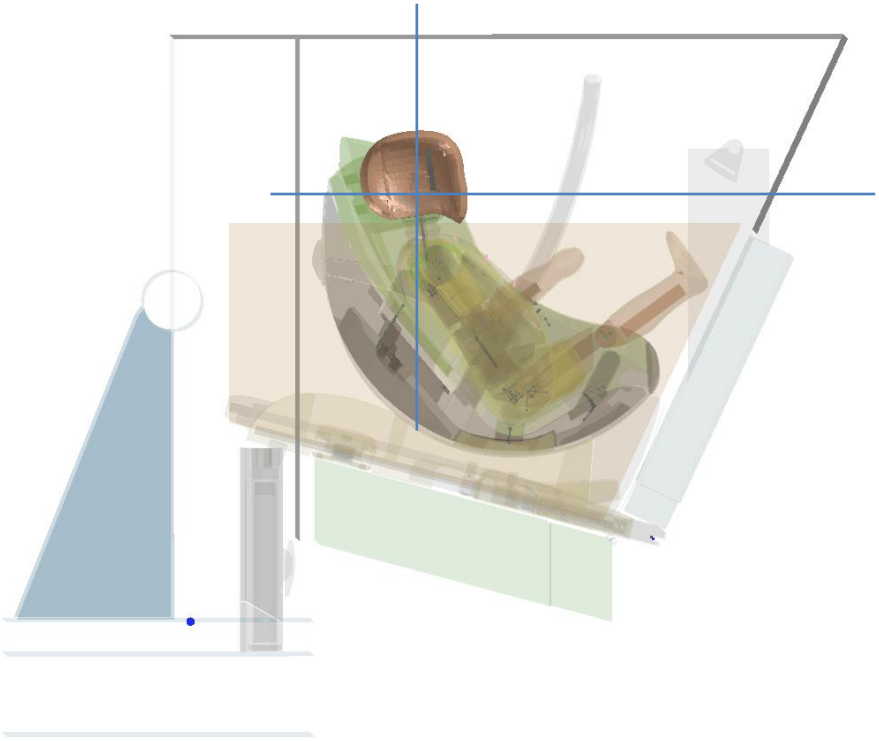
Plastic part strain





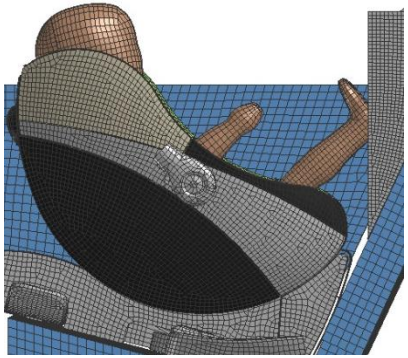
Analysing results

- Head displacement

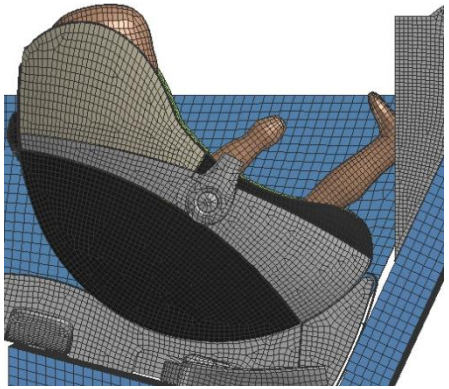


Making changes within the Virtual Seat Solution

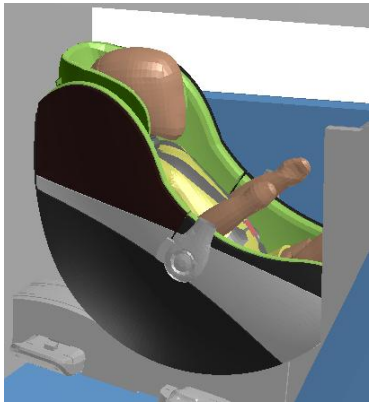
- Design modifications can be made within the VPS software to significantly reduce time spent modifying CAD and understand whether the improvements are improving the performance of the product.



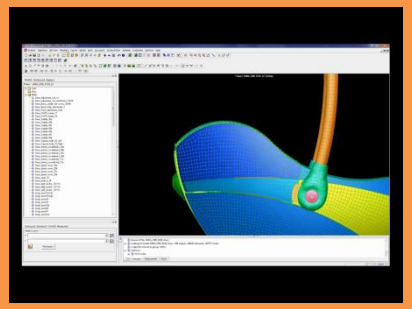
Original design



Head area of the shell modified within the VSS software



Headrest added within the VSS software

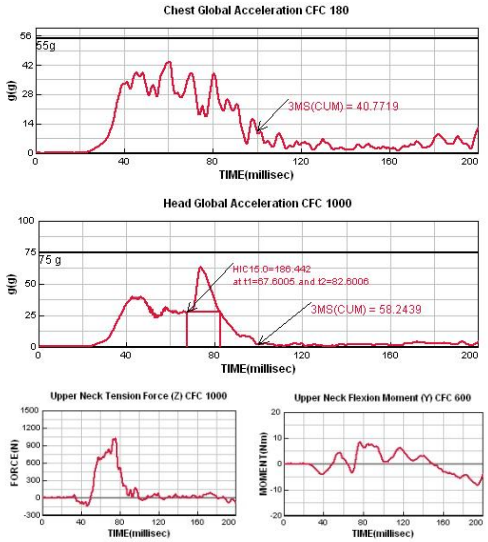


Making modifications within the VSS software

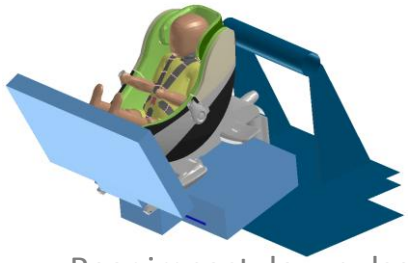
Results after modifications

- The side of the seat shell have been raised and a headrest has been added

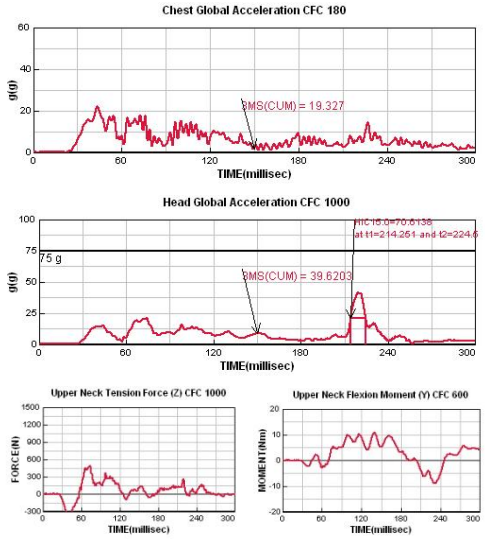
Frontal impact, medium pulse
deformed shell & headrest



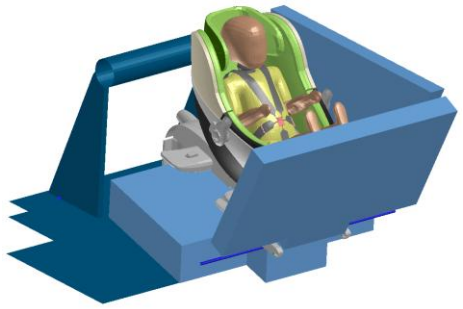
Original - 42.57g
Modifications - 58.64g



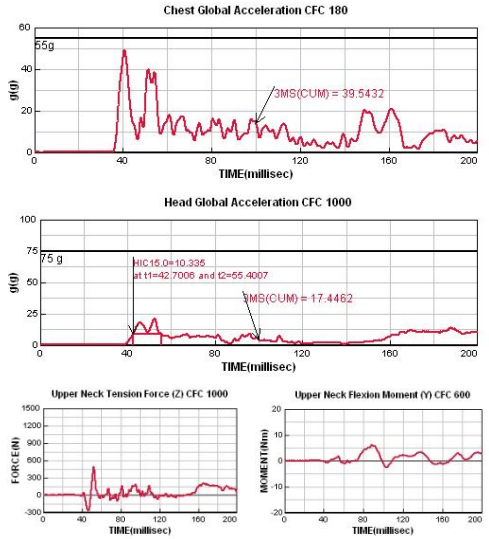
Rear impact, low pulse,
deformed shell & headrest



Original – 46.38g
Modifications – 39.62g



Lateral impact, low pulse
deformed shell & headrest



Original – 16.61g
Modifications – 17.44g

Other applications

- Simulate innovative ideas with new materials to understand how they perform
- Simulate under ADAC or Which test procedures during the design process rather than when the product is launched to market to mitigate risk
- Simulate future amendments to regulations
- Simulate other global regulations – US (FMVS213), Australia, China (R44)

What are ESI & JMDA offering

- Expertise & knowledge on designing CRS products to comply with global regulations using Virtual Seat Solution
- An in house license that allows you to carry out as many simulations as required at a fraction of the cost of tooling and physical testing
- ESI simulation service, if you do not have the resource to have the software in house ESI are able to carry out simulation of the product and provide detailed test results reports