Design and Development of Child Car Seat using simulation
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:

€124M

Total revenue

Global presence

CONTINUOUS GROWTH (in M €)
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
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
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

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

Orb Seat Development by JMDA
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
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

Rear impact, low pulse,
deformed shell & headrest

Lateral impact, low pulse
deformed shell & headrest

Original - 42.57g
Modifications - 58.64g

Original – 46.38g
Modifications – 39.62g

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