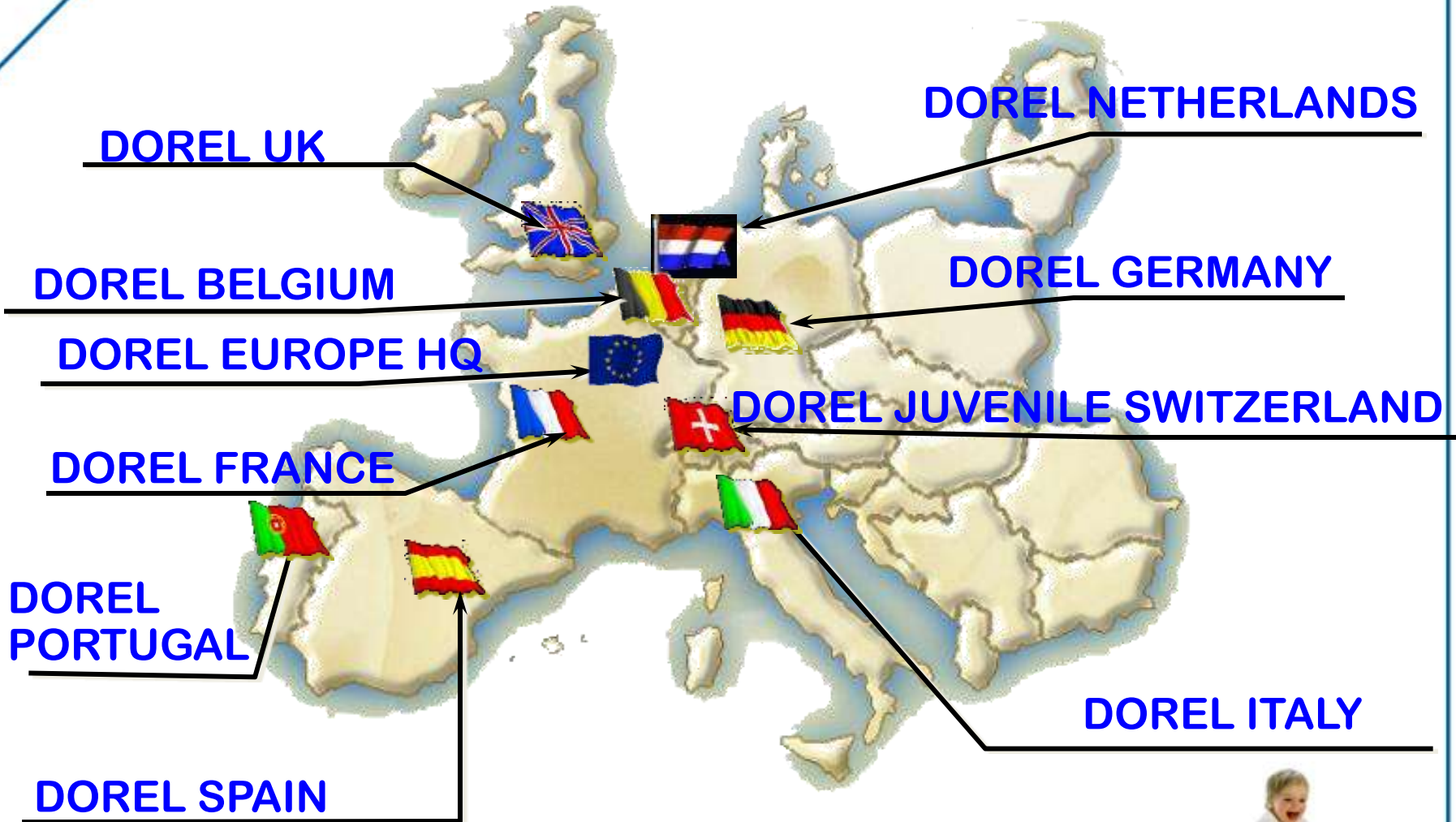


CHILD RESTRAINT DESIGN OPTIMISATION USING SIMULATION TOOLS



DOREL EUROPE



Very strong brand portfolio to cover the market

Quinny[®] Quinny

bébéconfort  Bébé Confort

MAXI-COSI[®] Maxi-Cosi

Safety 1st Safety 1st

babidéal Babidéal

hoppop[®] Hoppop



Photo catalogue BBC 2009



Products



Child Restraint System



Strollers



Equipment



Small Nursery : Nursery Bottle ...

Car seats: Strengthen Leadership via innovation

FamilyFix

Maxi-Cosi Pebble
Group 0+ (0-13 kg)

Maxi-Cosi Pearl
Group 1 (9-18 kg)



One IsoFix base

Two car seats

Three years and more
of fun together

Introduction date :
Beginning 2010

Opal

Gr 0+/1 carseat
(forward /rearward facing)

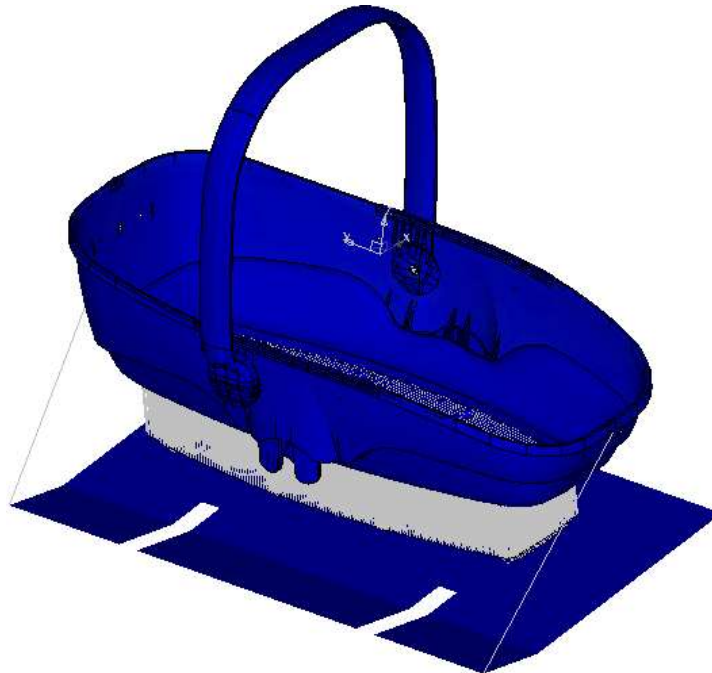


Introduction date :
Summer 2010



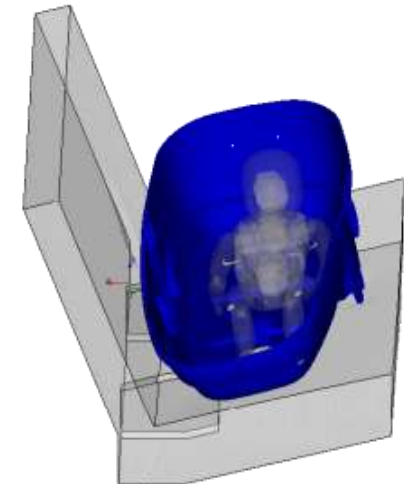
Target of the study

Starting from a very simple shape, design a safe lateral facing CRS reducing its mass



Initial Behaviour

- Structure too soft
- Buckling issue of the bottom part



Process chosen

Step by step approach

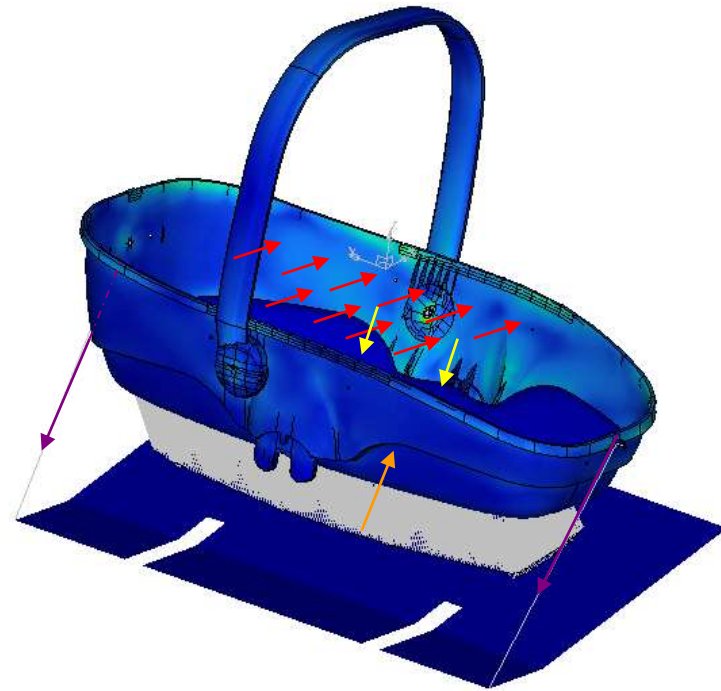
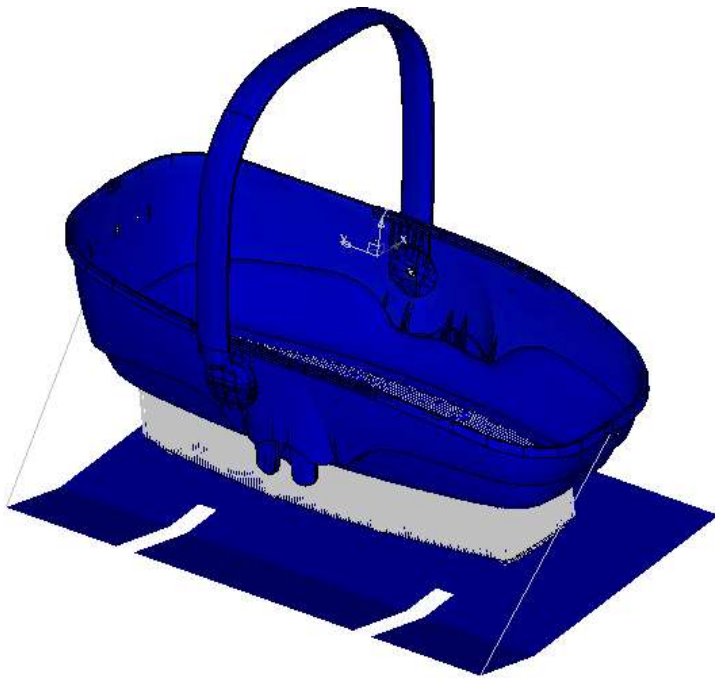
- With a rigid upper frame (steel bar) fix buckling issue by modifying the bottom part
- Optimize the upper frame



Bottom Part

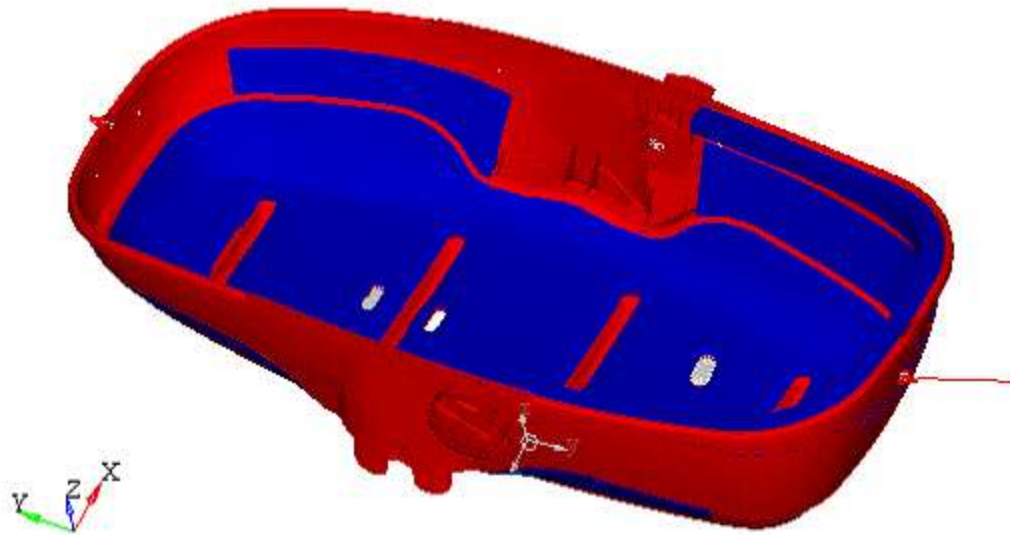
Linearization of crash loading case :

- Maximum 3 point harness forces
- Dummy contact forces



Bottom Part

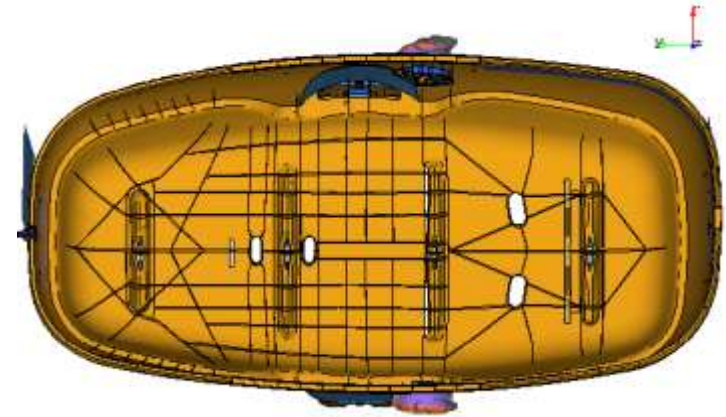
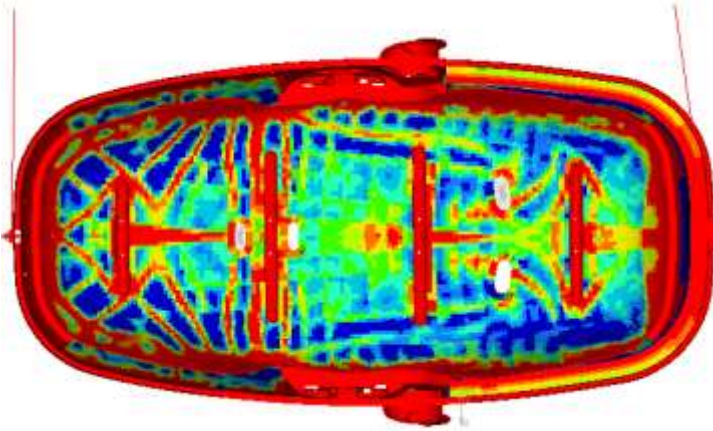
Topologic optimization :



Bottom Part

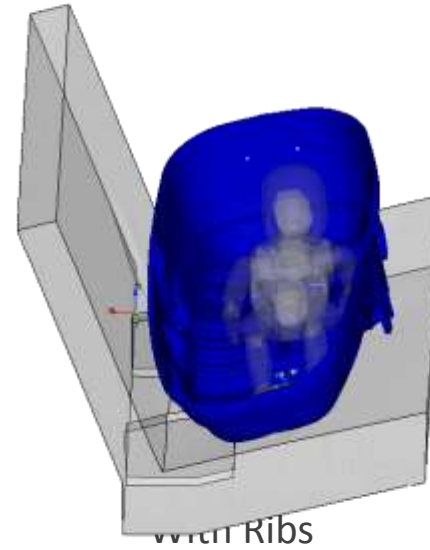
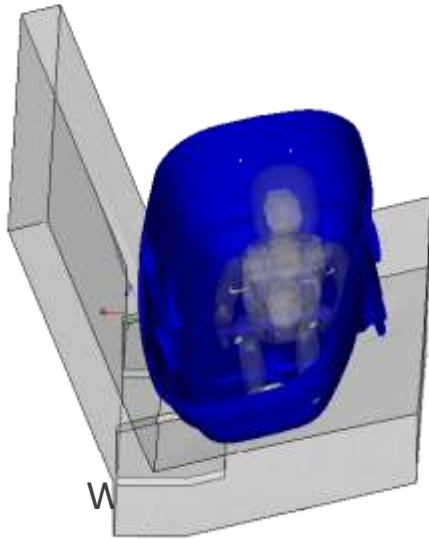
Interpretation :

Taking into account process constraint rib definition



Bottom Part

Crash simulation



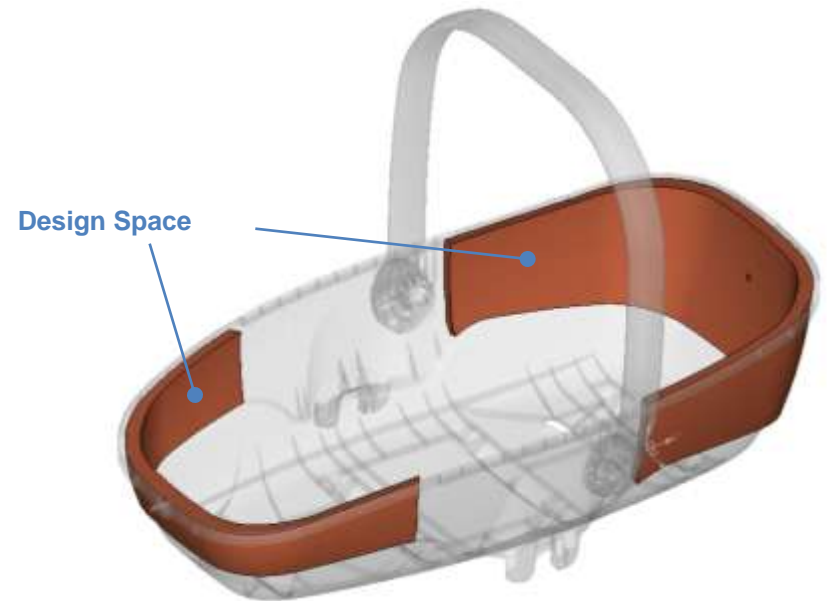
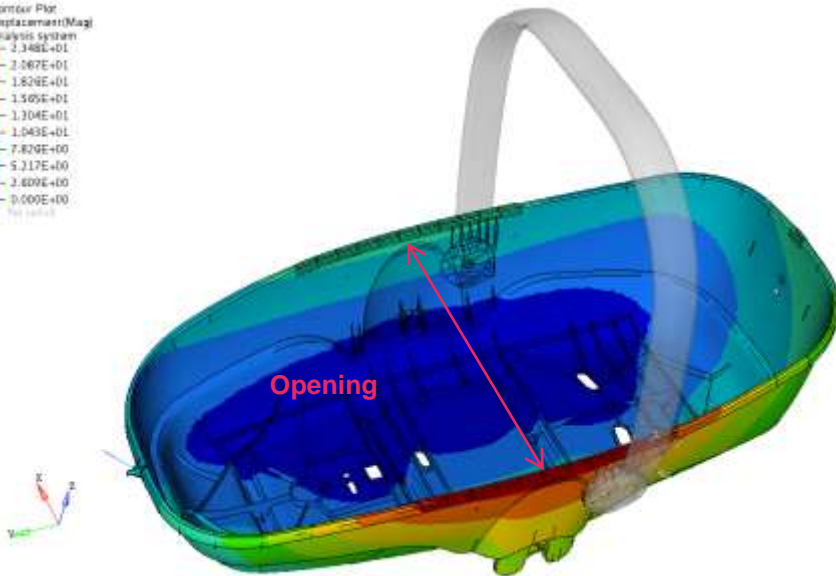
Upper Part

Topologic Optimization based on the following design space

Optimization constraints :

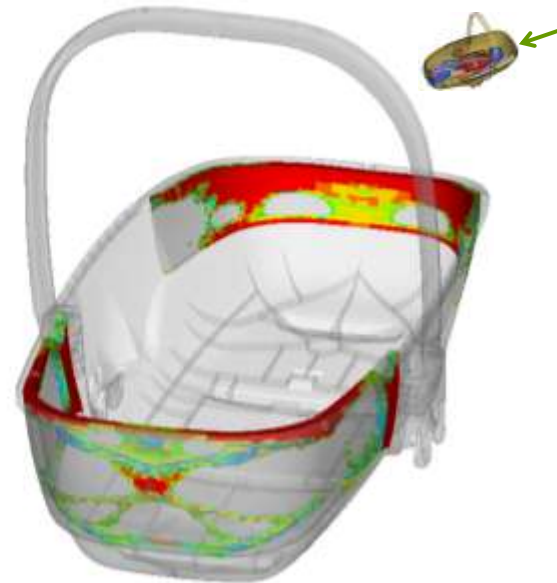
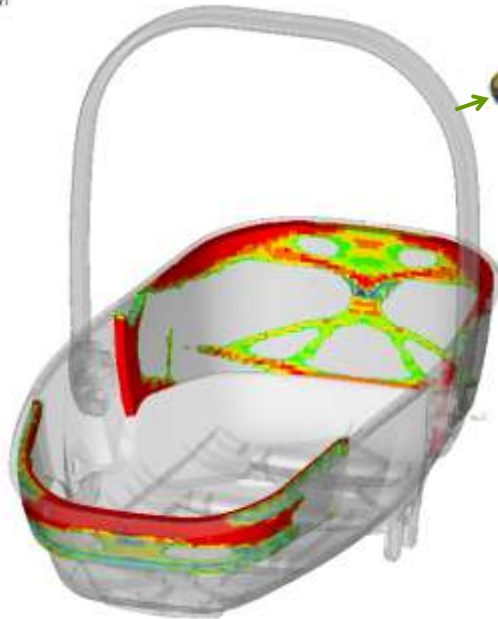
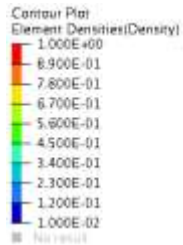
- Carry cot opening

Contour Plot
Displacement(Mag)
Analysis System
2.348E+01
2.067E+01
1.826E+01
1.505E+01
1.204E+01
1.043E+01
7.829E+00
5.217E+00
2.609E+00
0.000E+00



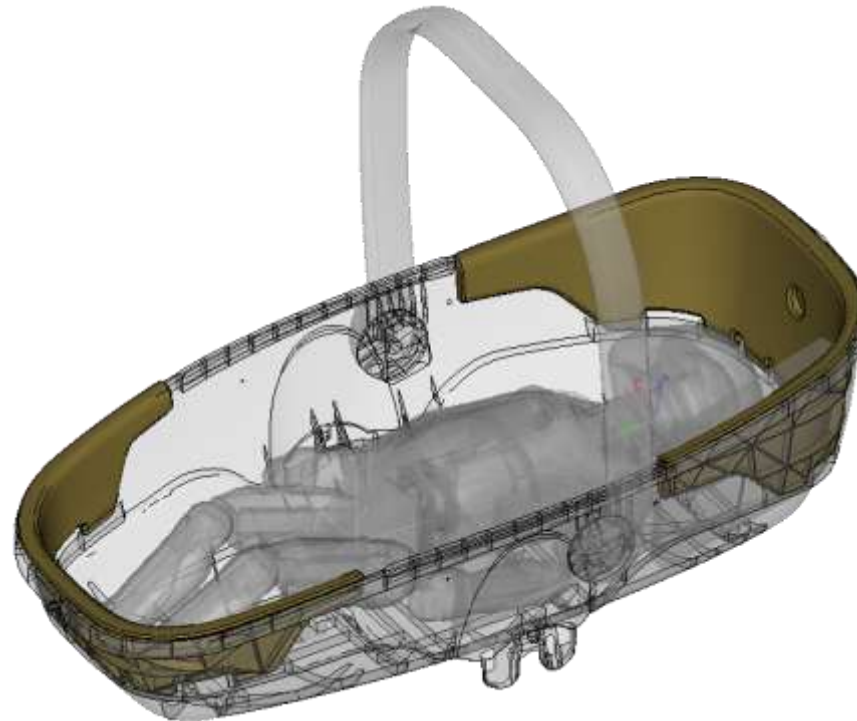
Upper Part

Optimization results



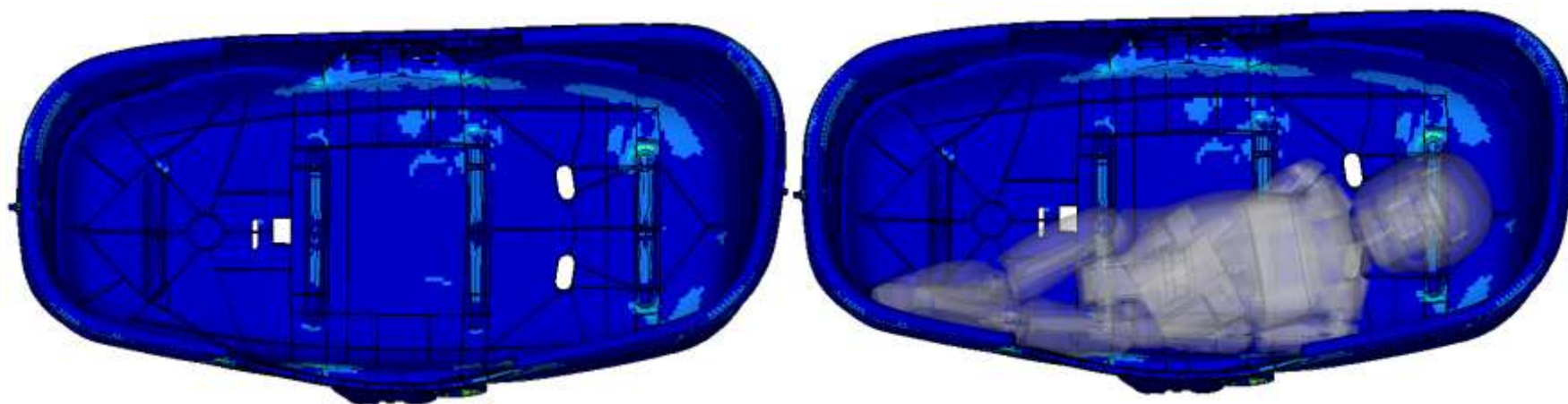
Upper Part

Design



Upper Part

Final Simulation



Conclusion and Discussion

In this special case, 2 steps process has been chosen to simplify the study.

The initial target is reached : light lateral facing CRS.

Difficulties with dummy database.

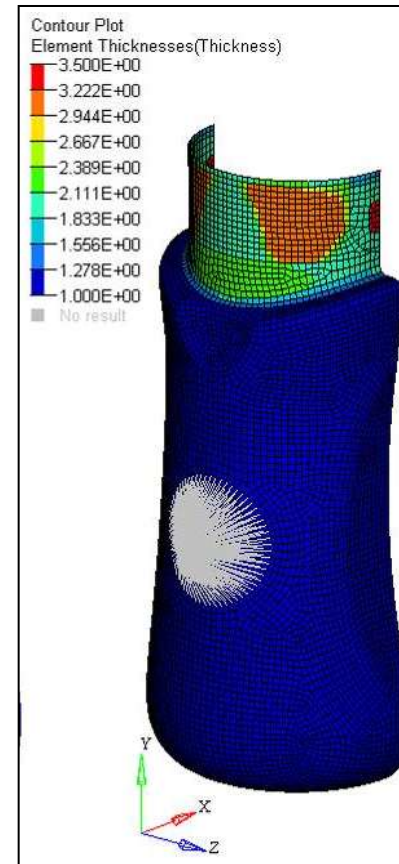
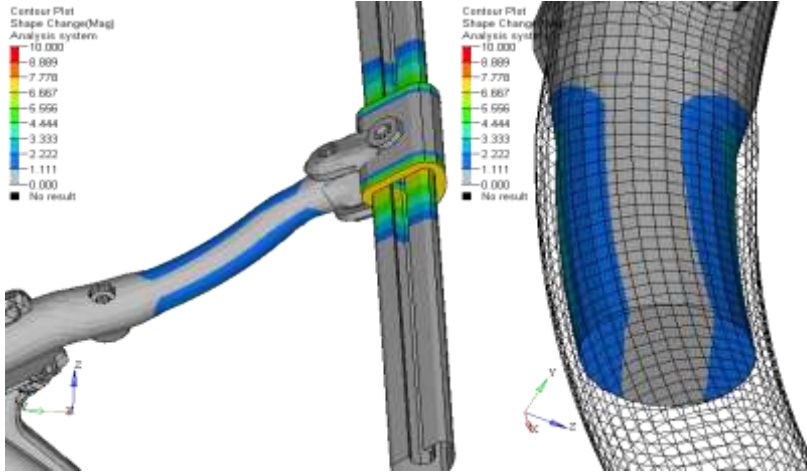
- No Q1 dummy model available.
 - First approach with a scaled P1,5
 - Finally use of Crabi 12 month dummy model



Conclusion and Discussion

Optimization also interesting for other Juvenile products

- Strollers
- Nursery Bottle



Thank You for your attention

