Parametric study of FE seats in rear impact

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IWG EqOP

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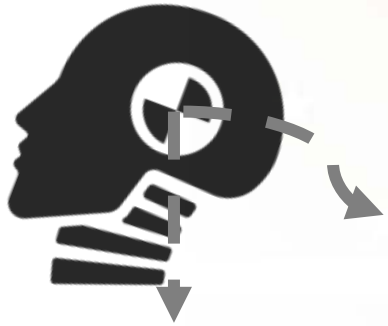
Project overview

Project goals

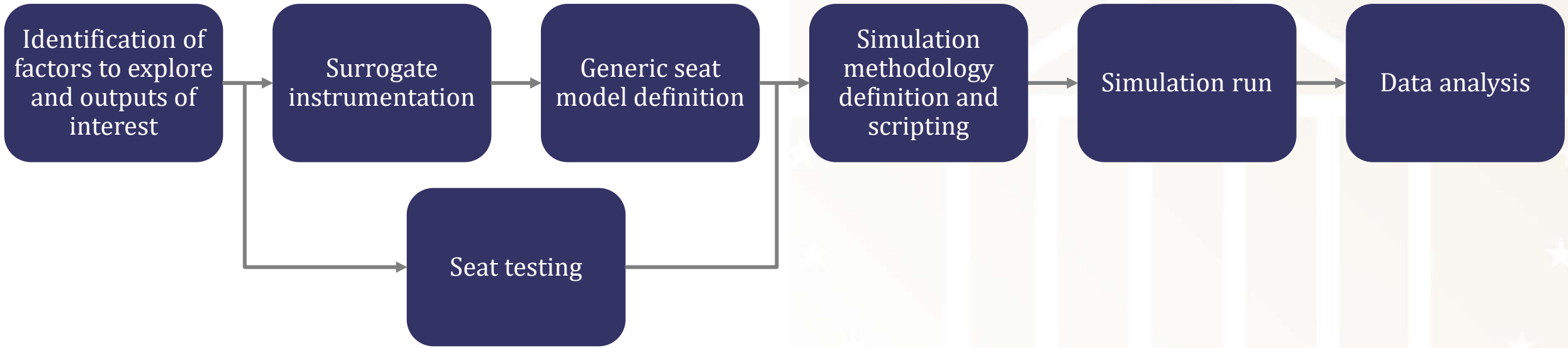
1. Identify which factors and injury metrics have the greatest influence on occupant response and robustness of the safety performance of the seat

2. Find correlations between the injury metrics and make recommendations for their use



General roadmap

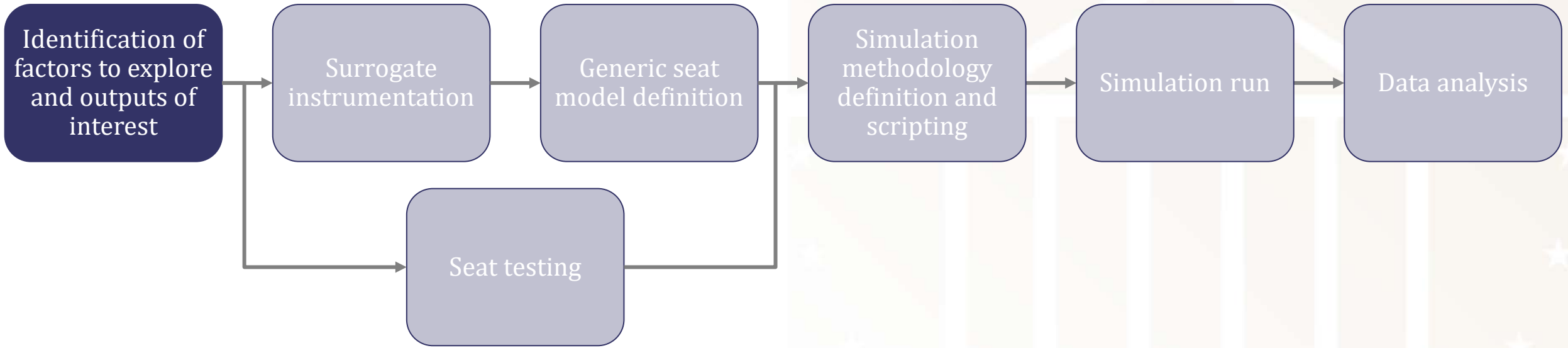
Goal: Perform a sensitivity analysis to identify seat and intrinsic parameters that have the highest influence on rear impact scenarios



Inputs and outputs

General roadmap

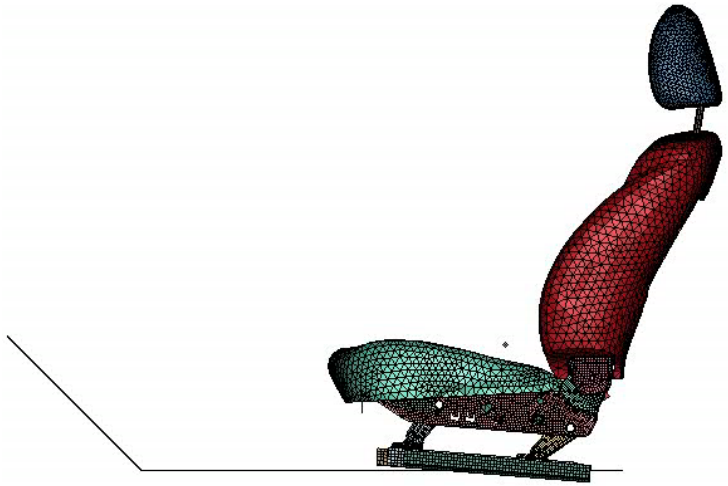
Goal: Perform a sensitivity analysis to identify seat and intrinsic parameters that have the highest influence on rear impact scenarios



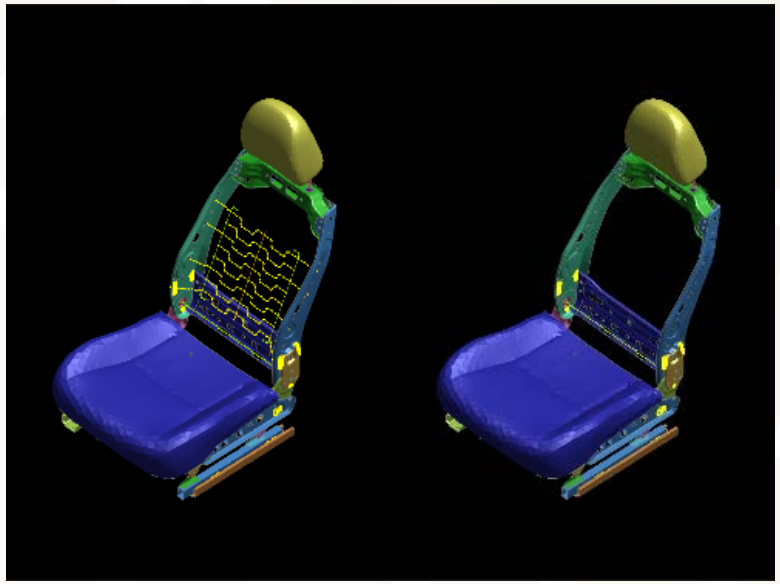
Inputs: Seat

Geometry

Stiffness



Components



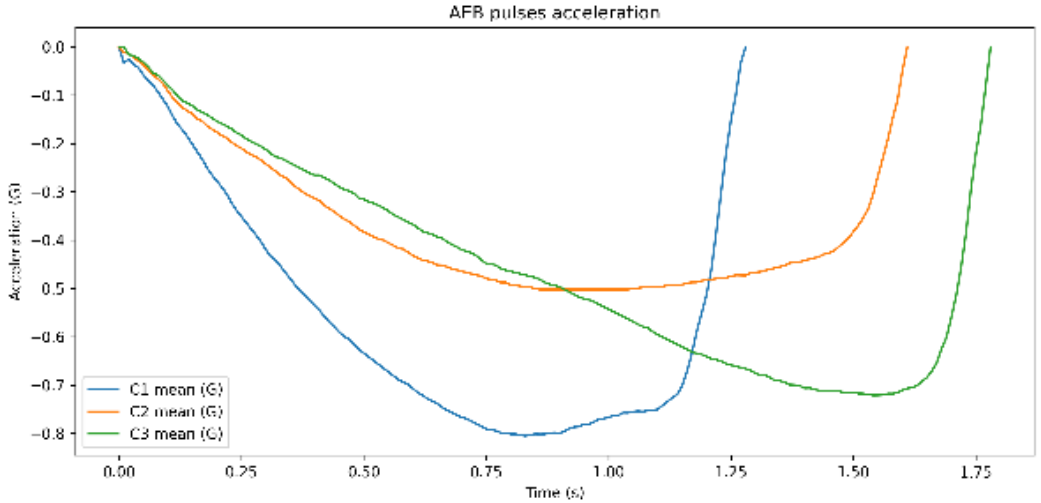
Inputs: Occupant

EvaRID

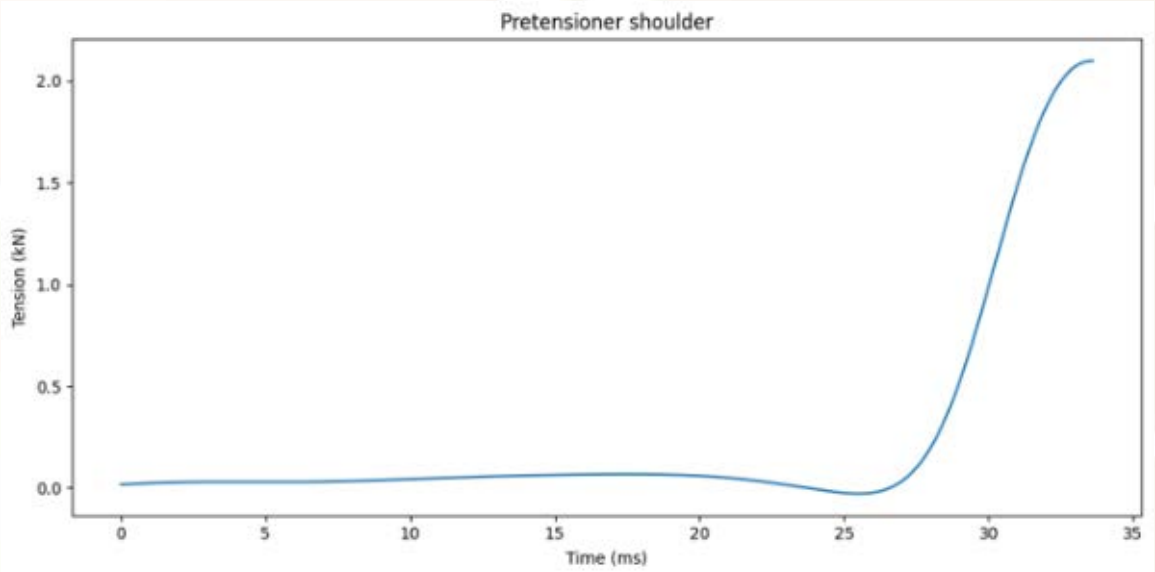
BioRID

Inputs: Scenario

Braking and crash pulse



Pre/pretensioner performance



Sources:
AEB: Graci 2021 - Quantitative characterization of AEB pulses across the modern fleet
Pretensioner: IIHS TechData

Outputs

Raw channels

+

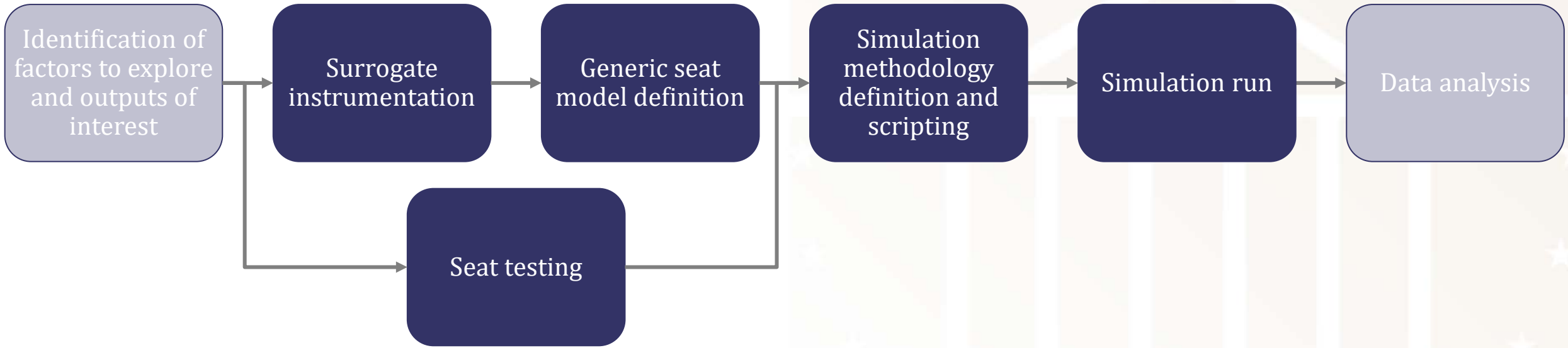
Injury metrics

- HIC
- NIC
- Nij
- Nkm

Methods and tools

General roadmap

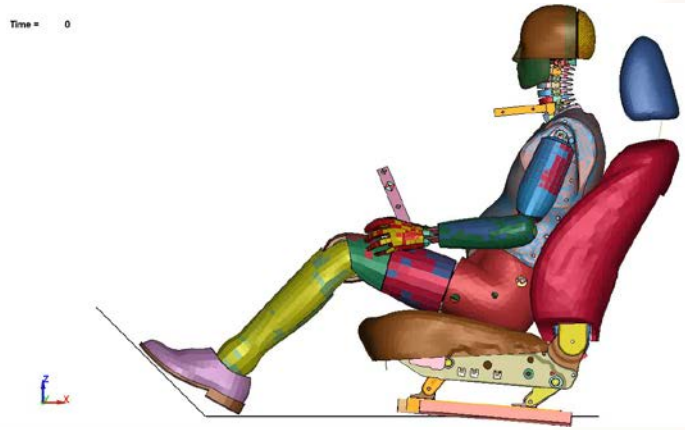
Goal: Perform a sensitivity analysis to identify seat and intrinsic parameters that have the highest influence on rear impact scenarios



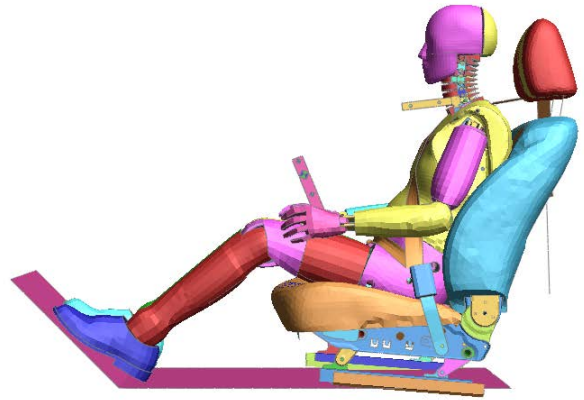
IIHS tests simulation

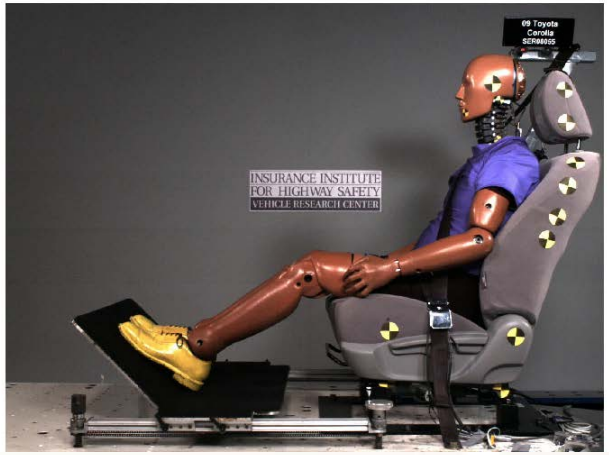
Pre-position → **Position** → **Crash**

- Adapt to every occupant and seat shape
- Minimize simulation time (High computational cost)



- Possibility to position the dummy without a known H-Point location



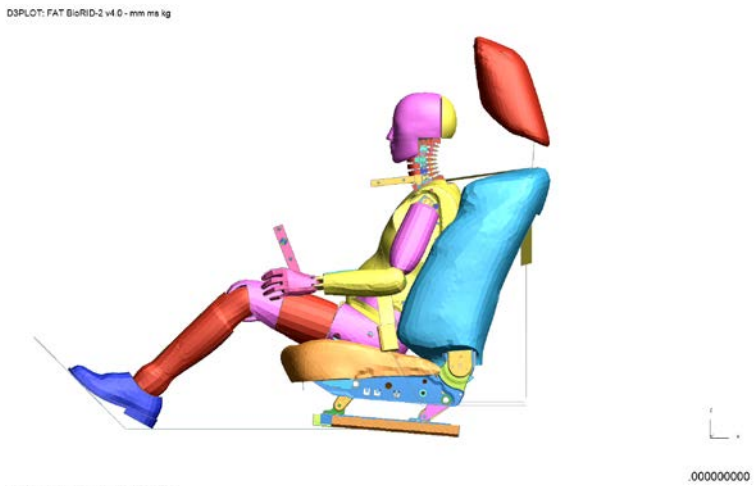


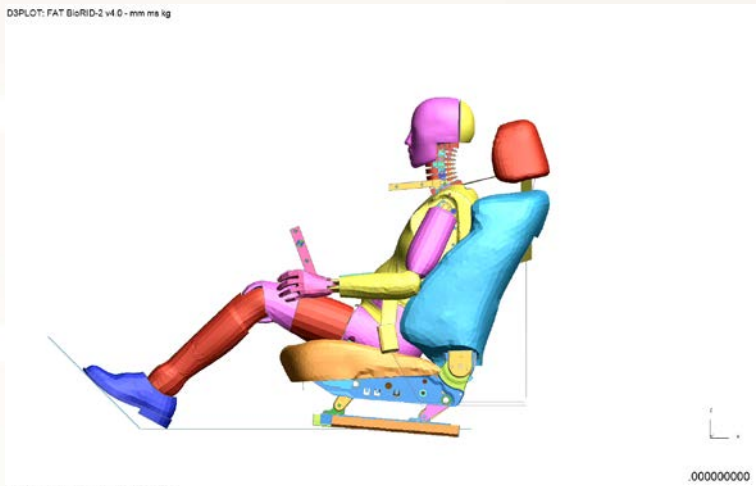
Seat morphing

Head restraint B Large – Seatback F Large

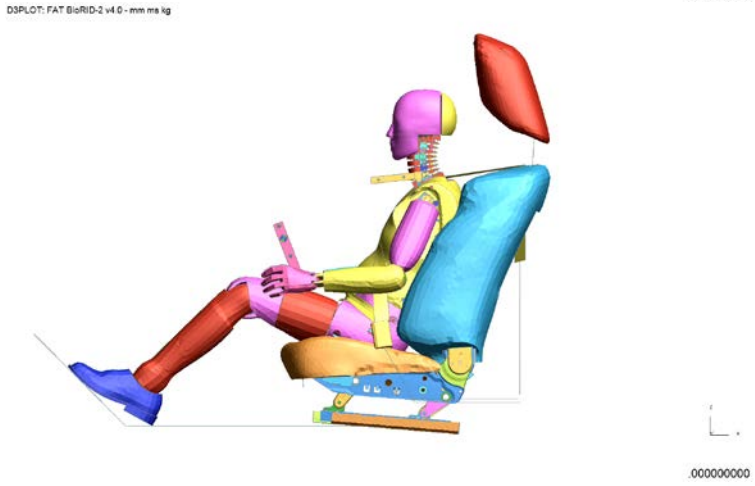
Head restraint X Small – Seatback AA Medium

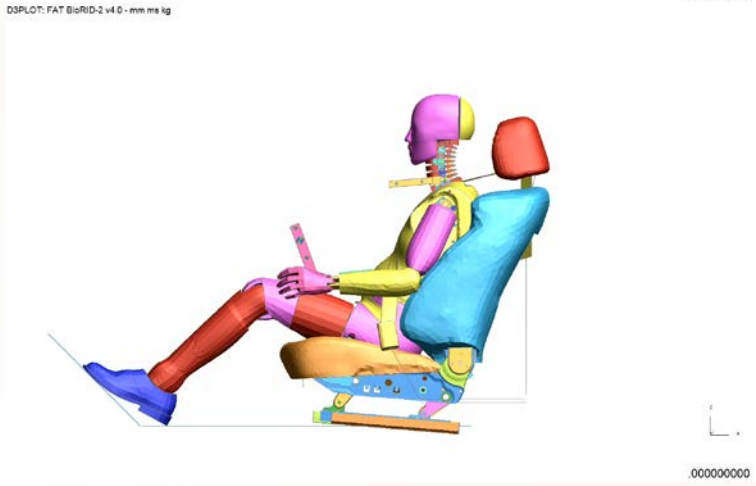
IIWPG



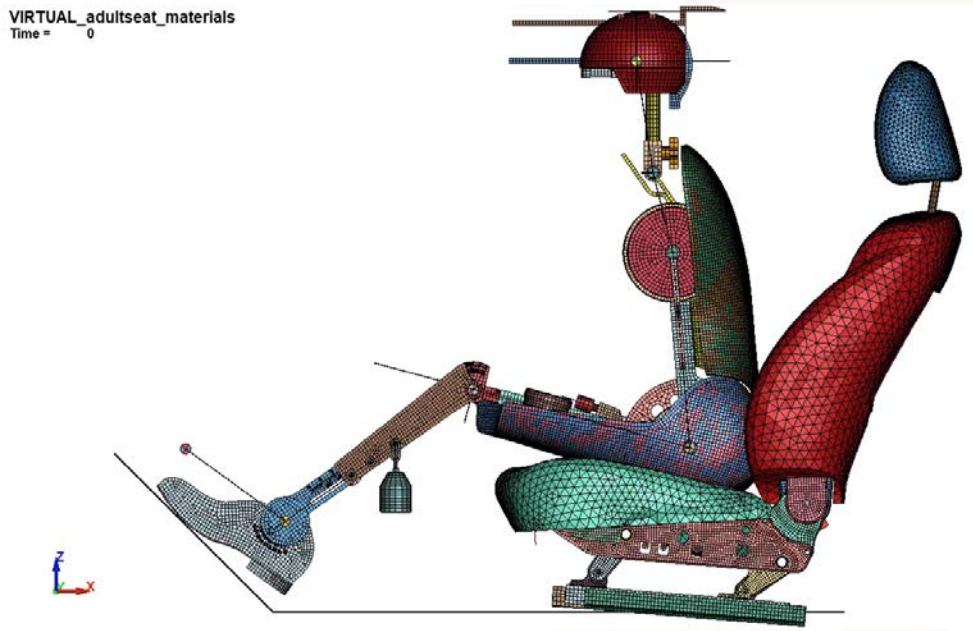


FMVSS301R

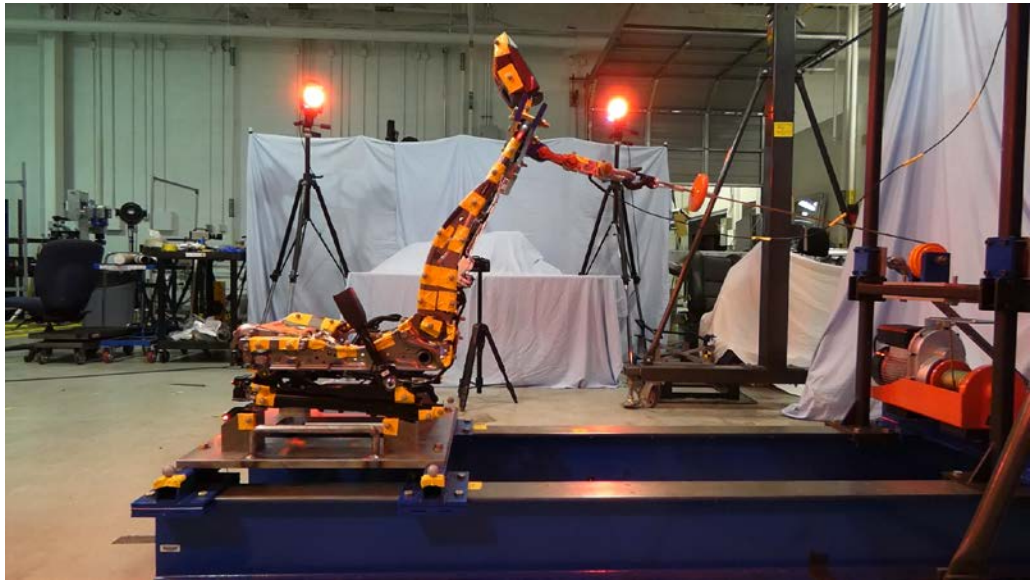


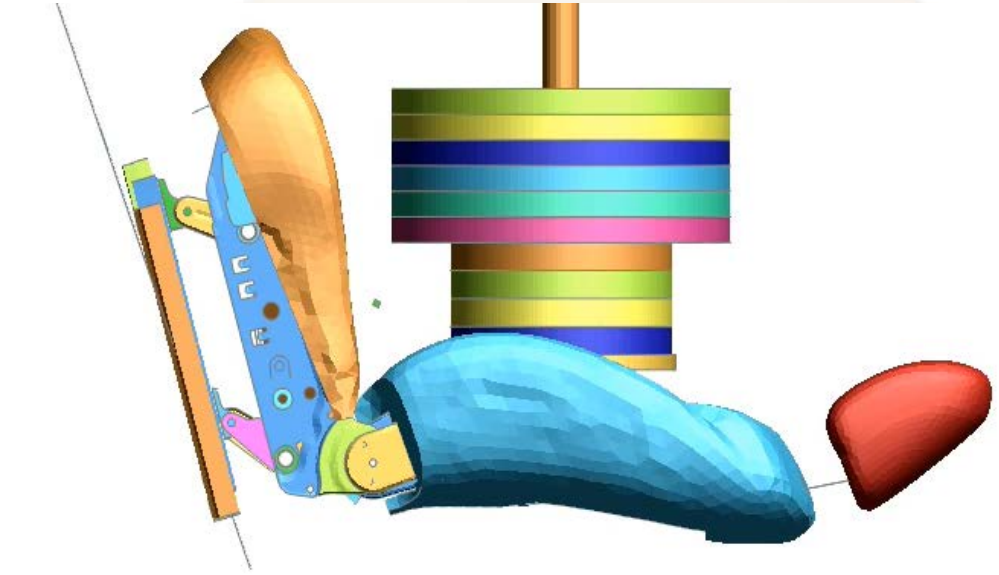


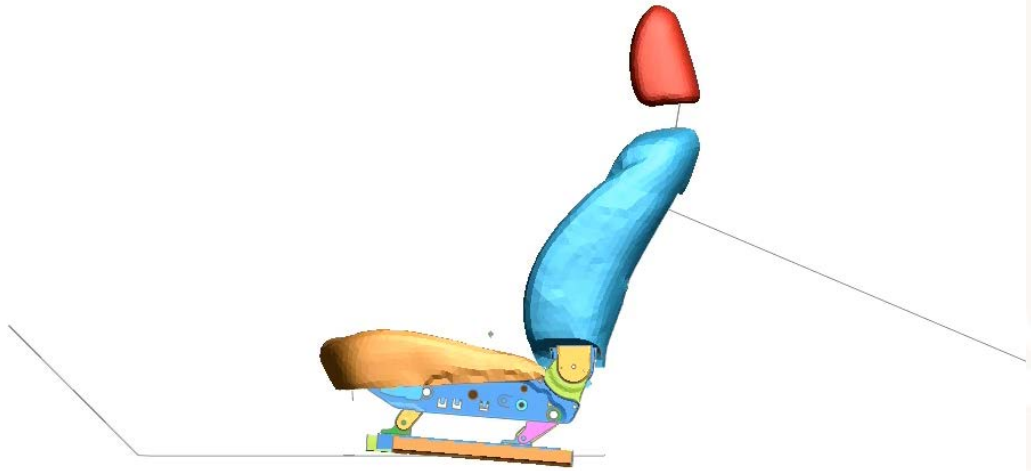
H-point machine positioning



Seat testing

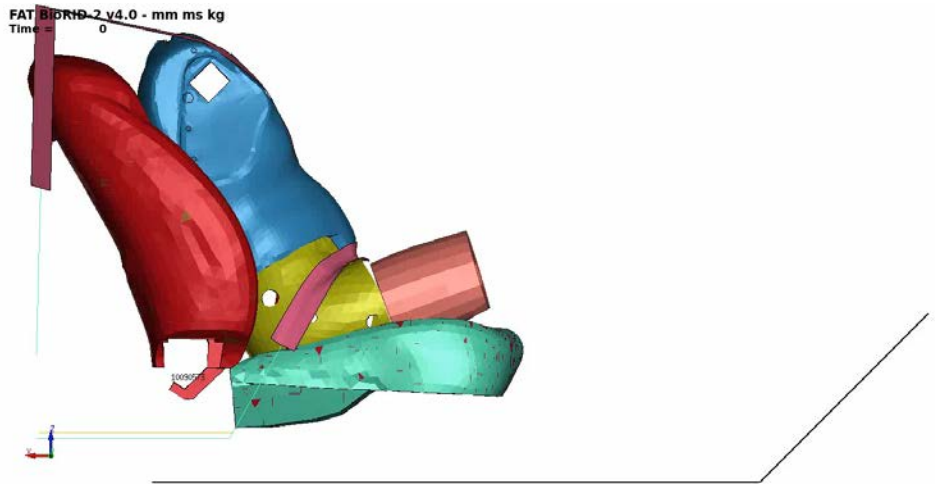


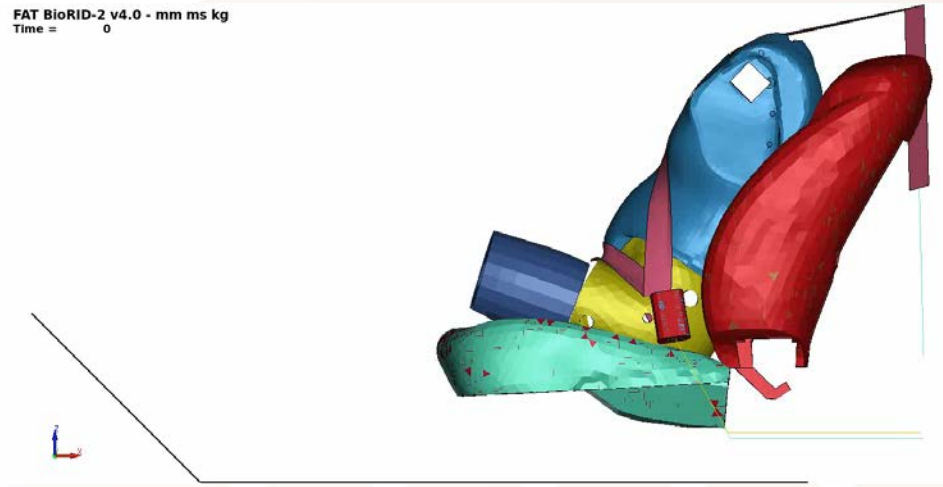




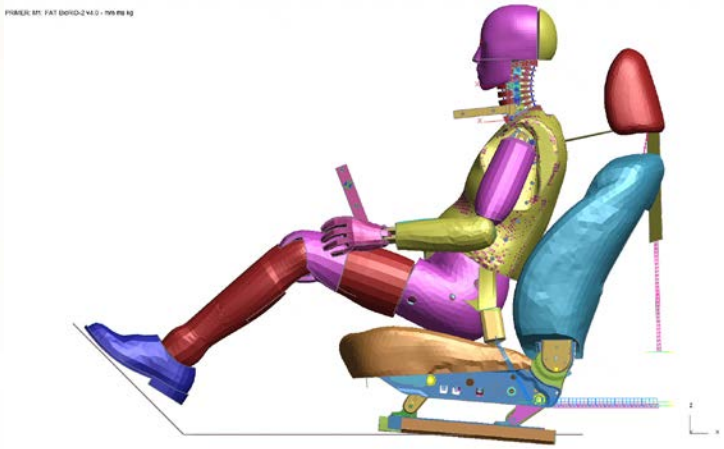
Seatbelt

3 pretensioner seatbelt: Shoulder, buckle and anchor





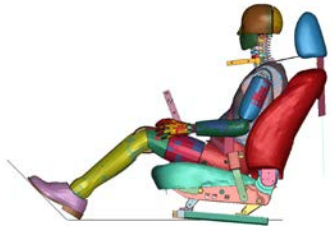
Seatbelt refit



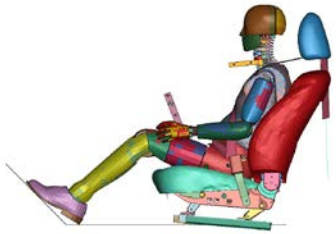
Simulation restart

Pre-Crash
AEB Graci C3

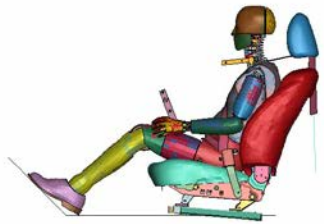
Crash
AEB Graci C3 (0.5s)
+
ENCAP High

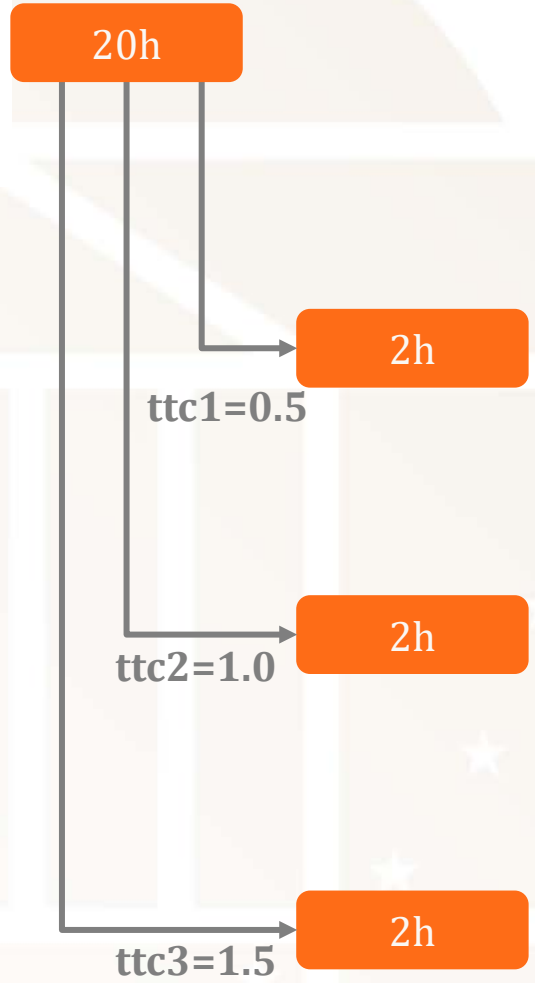


Crash
AEB Graci C3 (1s)
+
ENCAP High



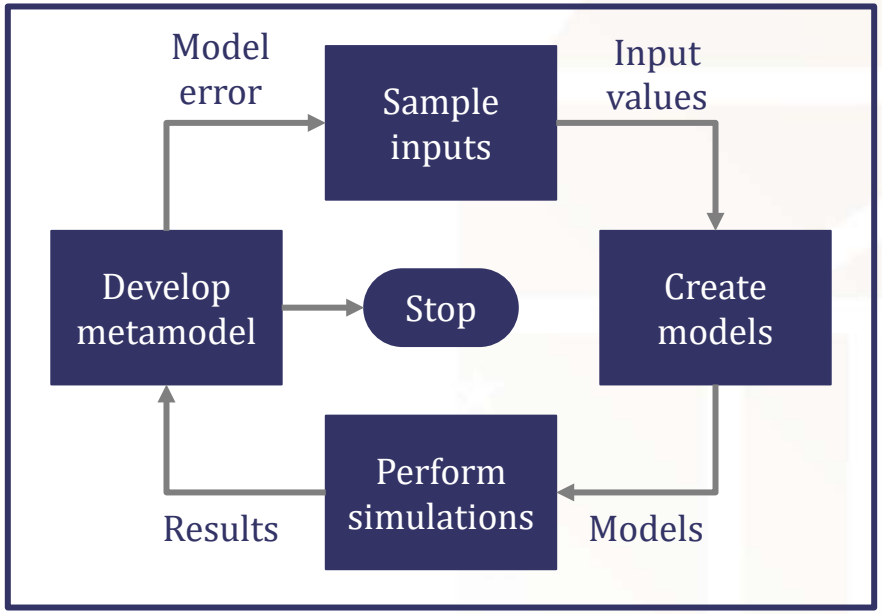
Crash
AEB Graci C3 (1.5s)
+
ENCAP High





Sources: Graci 2021 - Quantitative characterization of AEB pulses across the modern fleet

Simulation automation



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Thank you!

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