



Computational Analysis of the Interaction of Q6 ATD and Roof Rail Mounted Side Curtain Airbag in the Second Row Rear Outboard Seating Positions

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Background and Objectives

- Side Impact crashes involving pediatric occupants have a 30% incidence of fatality compared to 17% in frontal impact scenarios.
- Side Airbags (SAB) were introduced in the mid-1990s as a means of injury mitigation for adults.
- Roof rail mounted curtain SAB seen as an effective method for head protection
- 27 per 1000 children ≤15 years in outboard seating positions were exposed to deploying SABs
- Head/torso SABs are standard in 83.9% of 2012 model year vehicles and are optional in an additional 4.5%
- The goal of this study is to gain insight into the injury causation scenarios for children exposed to a deploying side curtain airbag

ASIS Crash Testing

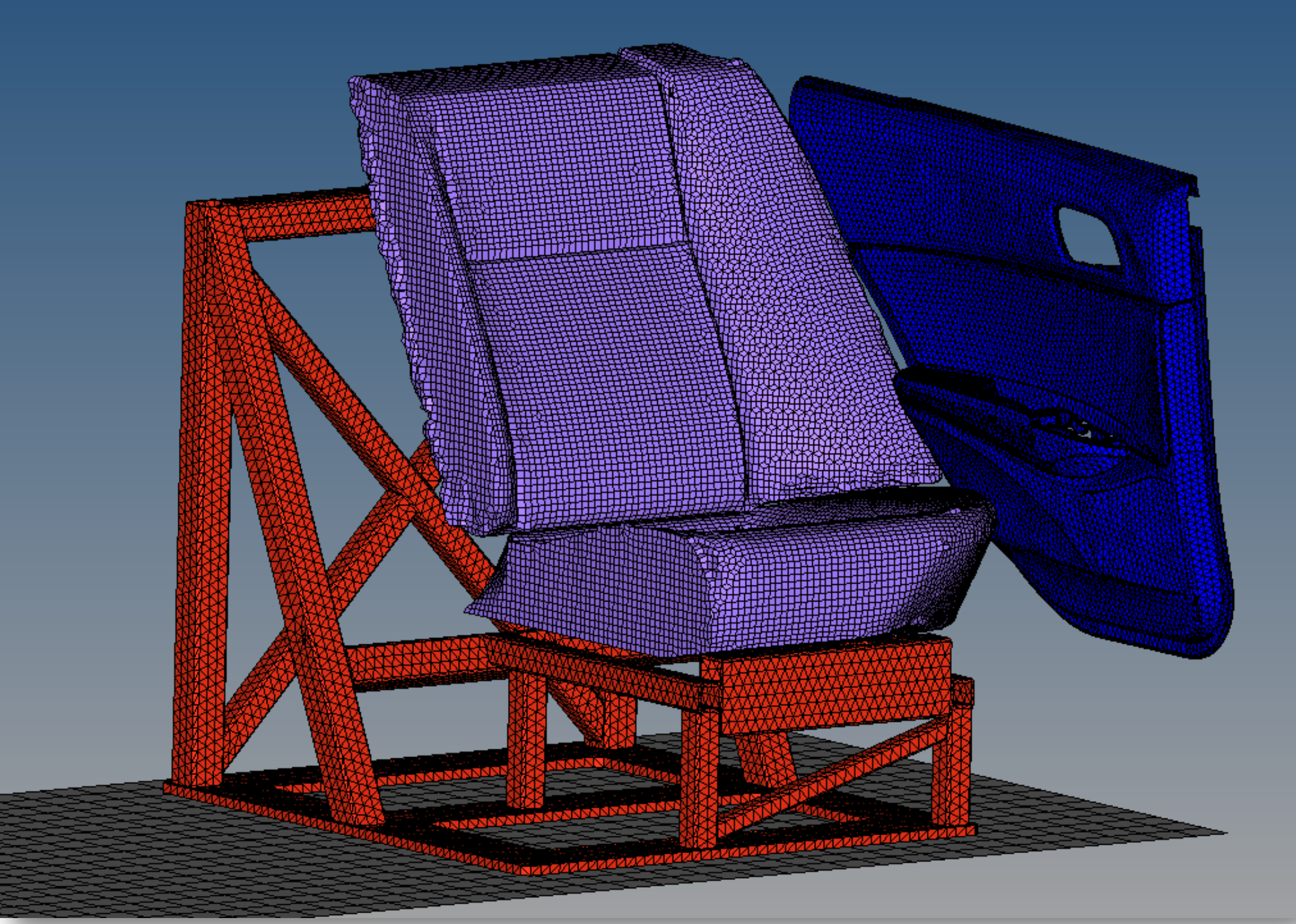
ASIS, or Advanced Side Impact System, is a crash test mechanism designed to simulate car crashes of varying angles and speeds without the use of a full car by moving 4 separate components in the door structure. The sled consists of a seating position and door structure as shown below.



Modeling

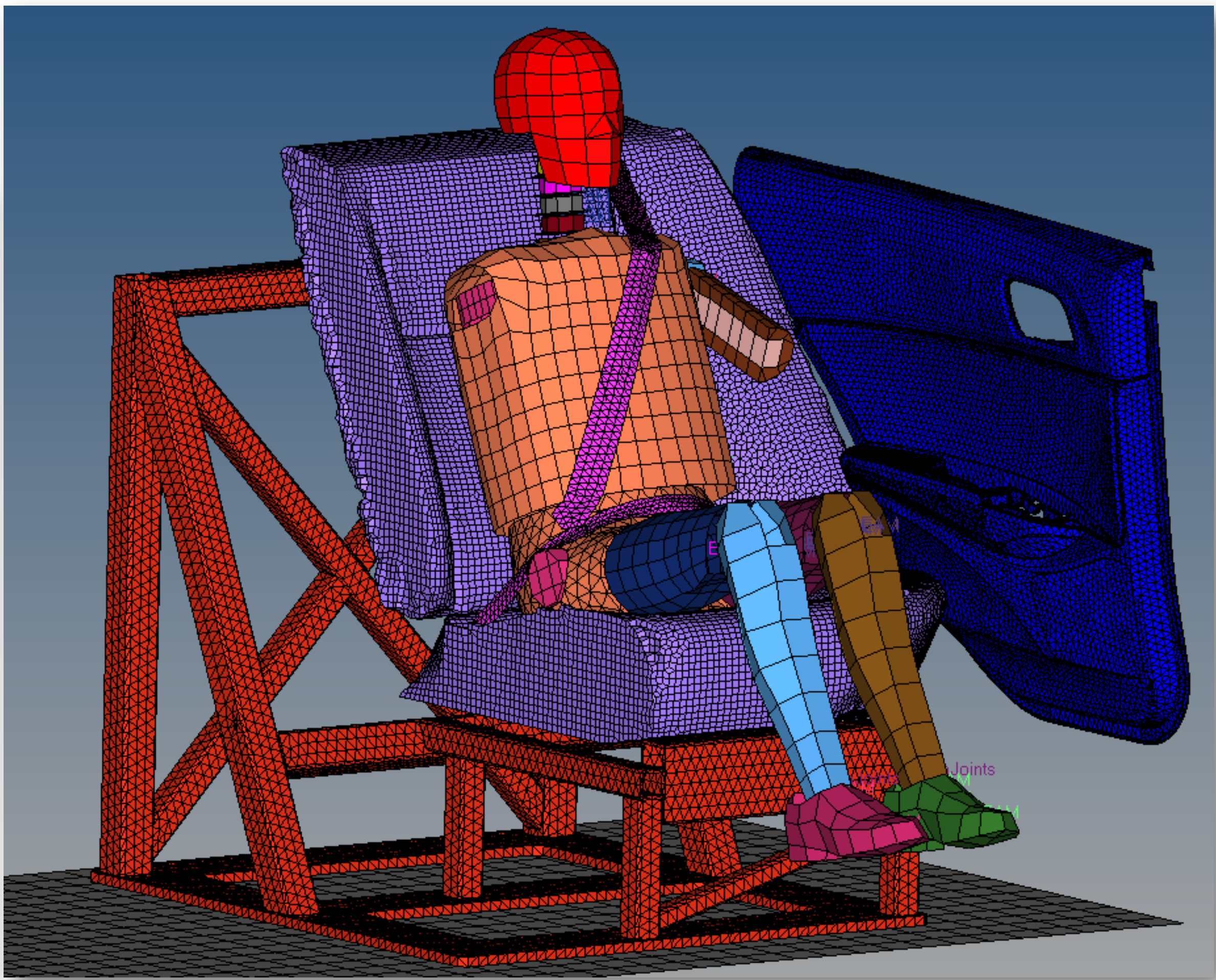
Computational Modeling (Finite Element Analysis)

The FE model is setup to match the major components of the ASIS crash test. The virtual environment consists of the frame and seat that are rigidly attached to one another, a ground component, and the intruding door structure:



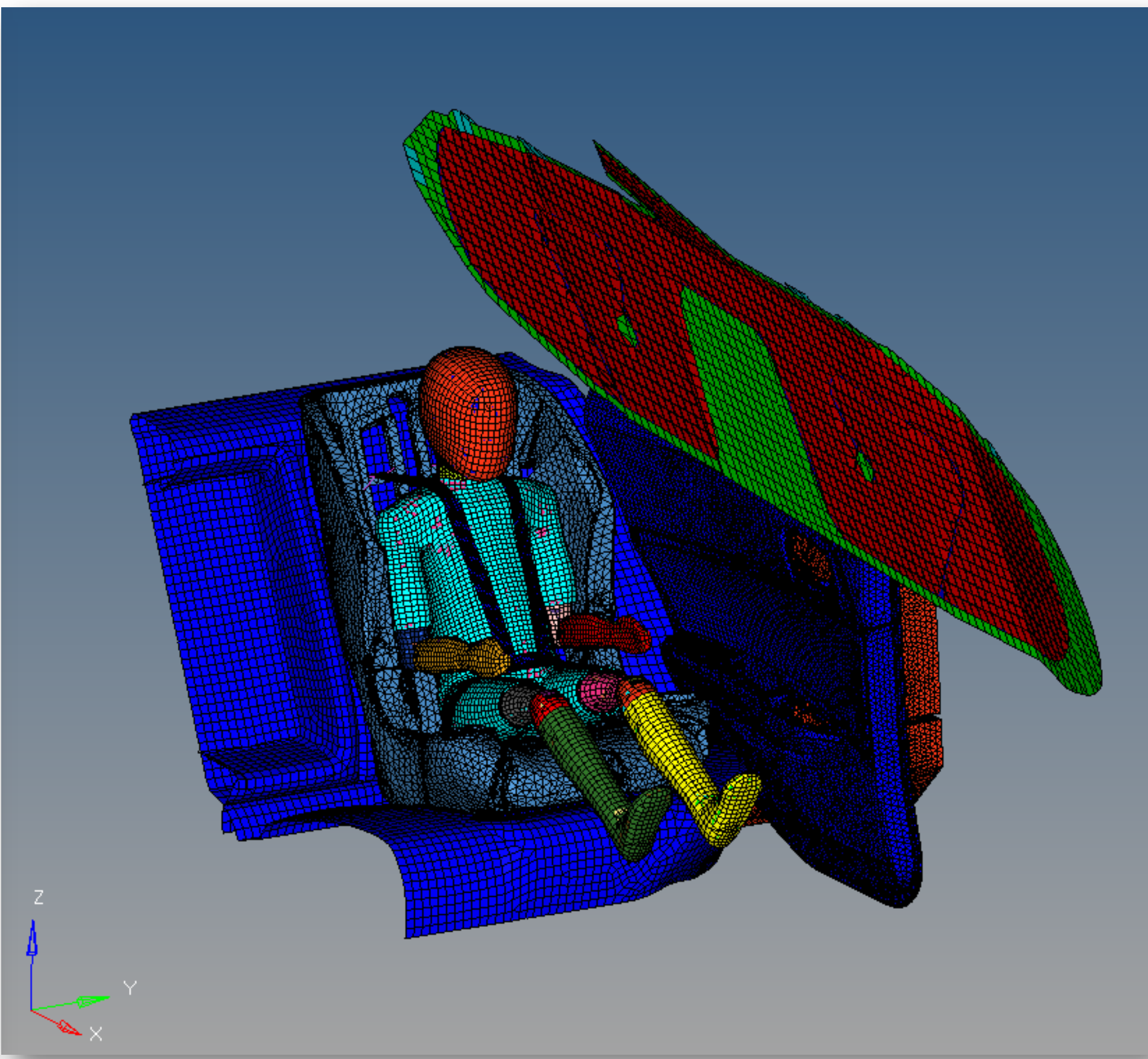
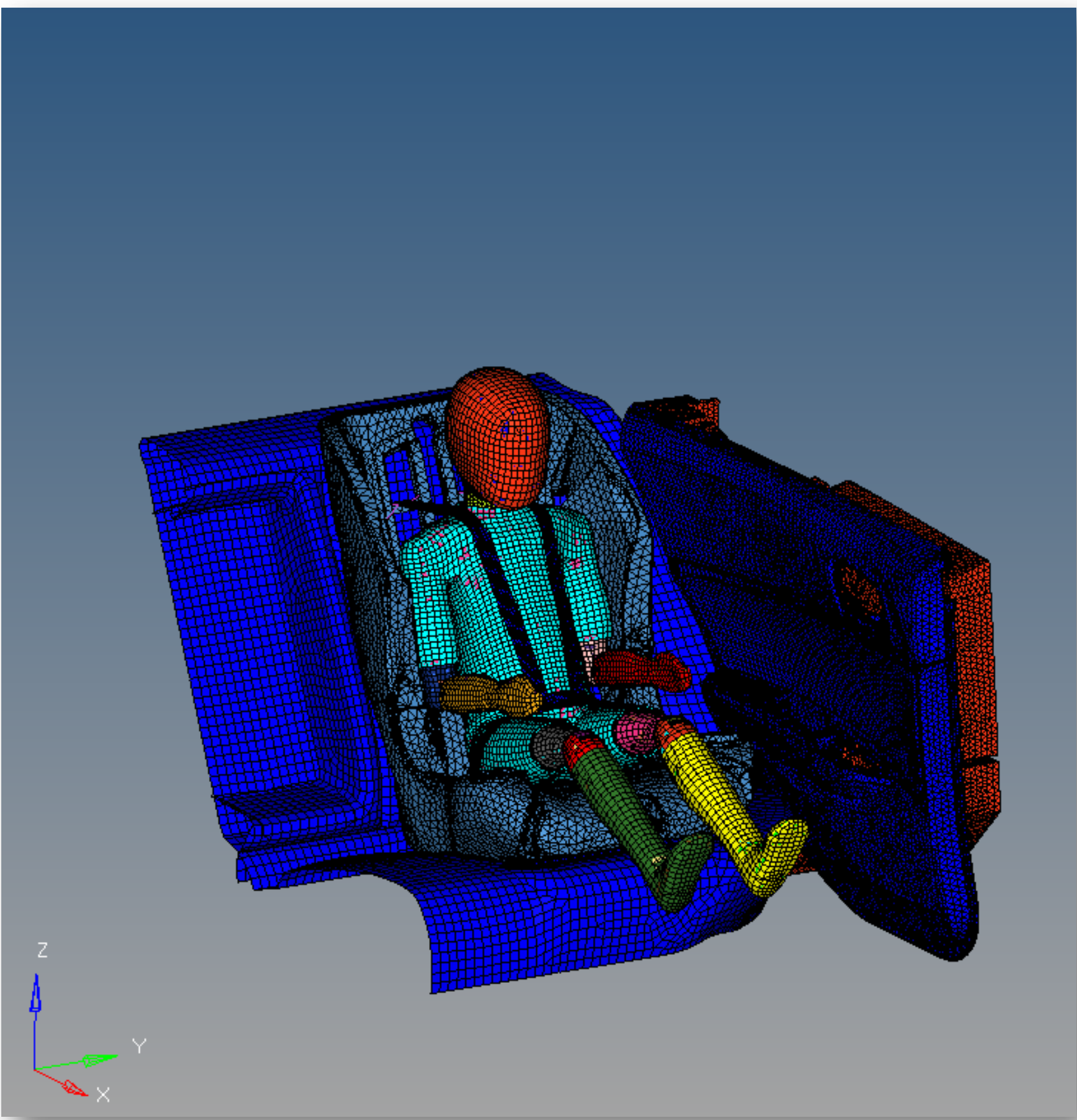
Step 1: Validate the Model

Once the component model of the ASIS crash test is setup, the results are compared to the high speed video taken to validate the kinematic response of the dummy and system as a whole.



Step 2: Add the Q6 and SAB

With the model validated, the SID-II is replaced by the restrained Q6 and run through the test matrix, shown to the right, simulating a number of possible seating scenarios. From these simulations, scenarios that prove interesting may be scaled up for full testing.



Testing Matrix

Design Factors →	CRS	FE ATD	Seating Position	Airbag	Door Intrusion Profile	# of Simulations
Generic Vehicle Rear Seat	FFCRS	Q6	Fore/Aft	Curtain Airbag	Side Impact Angles	2*1*2*2*1=8
Generic Side Door Structure	N=2	N=1	N=2	N=2*	N=1	

Project Status

The model is currently in the validation stage being tweaked for crush profiles and belt routing to better match the high speed video data.

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