Strategies To Utilize In Far Side Impacts

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Between 2000-2008, 30 Different Peer Reviewed Articles On Far Side Impact Injuries Were Published

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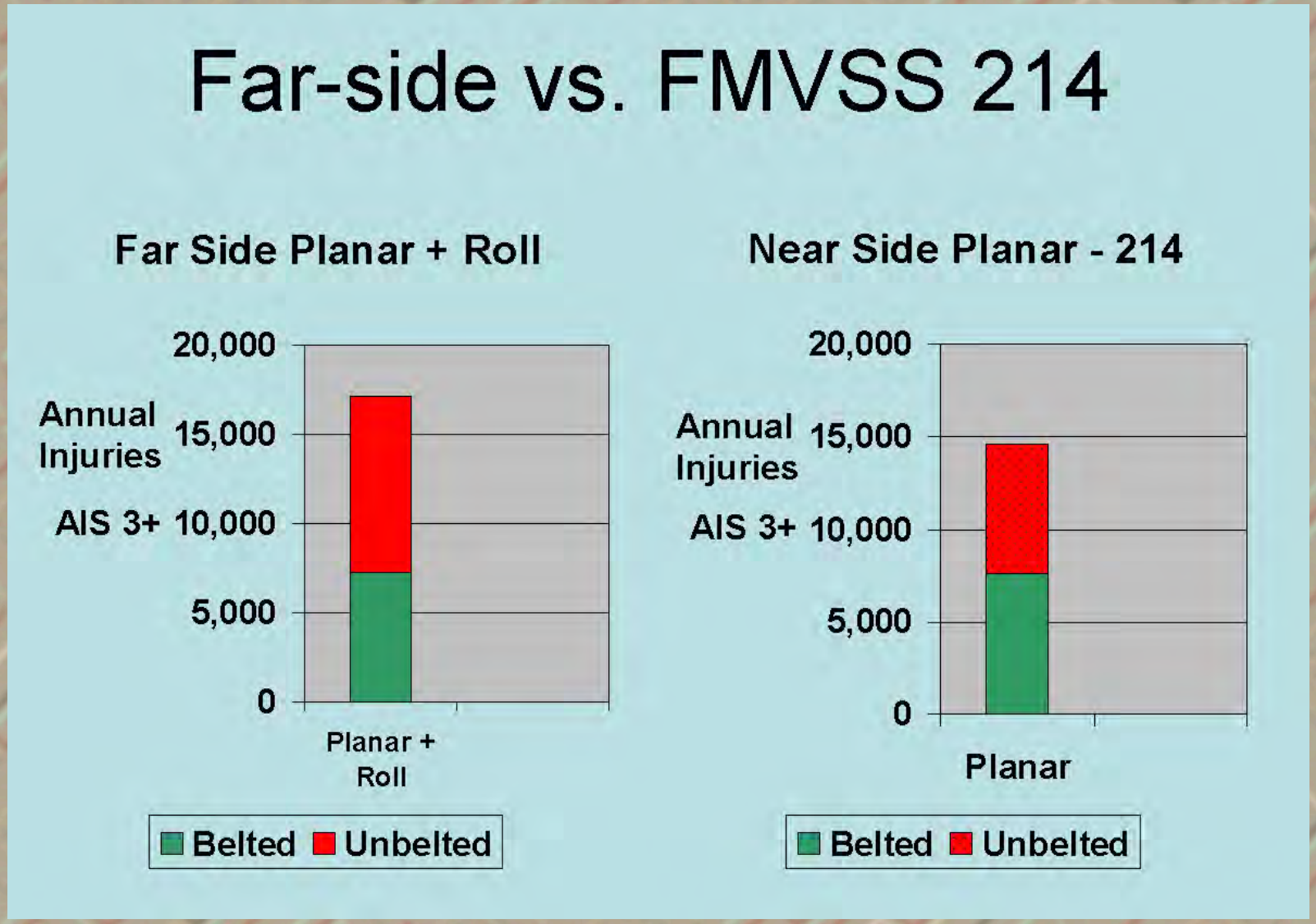
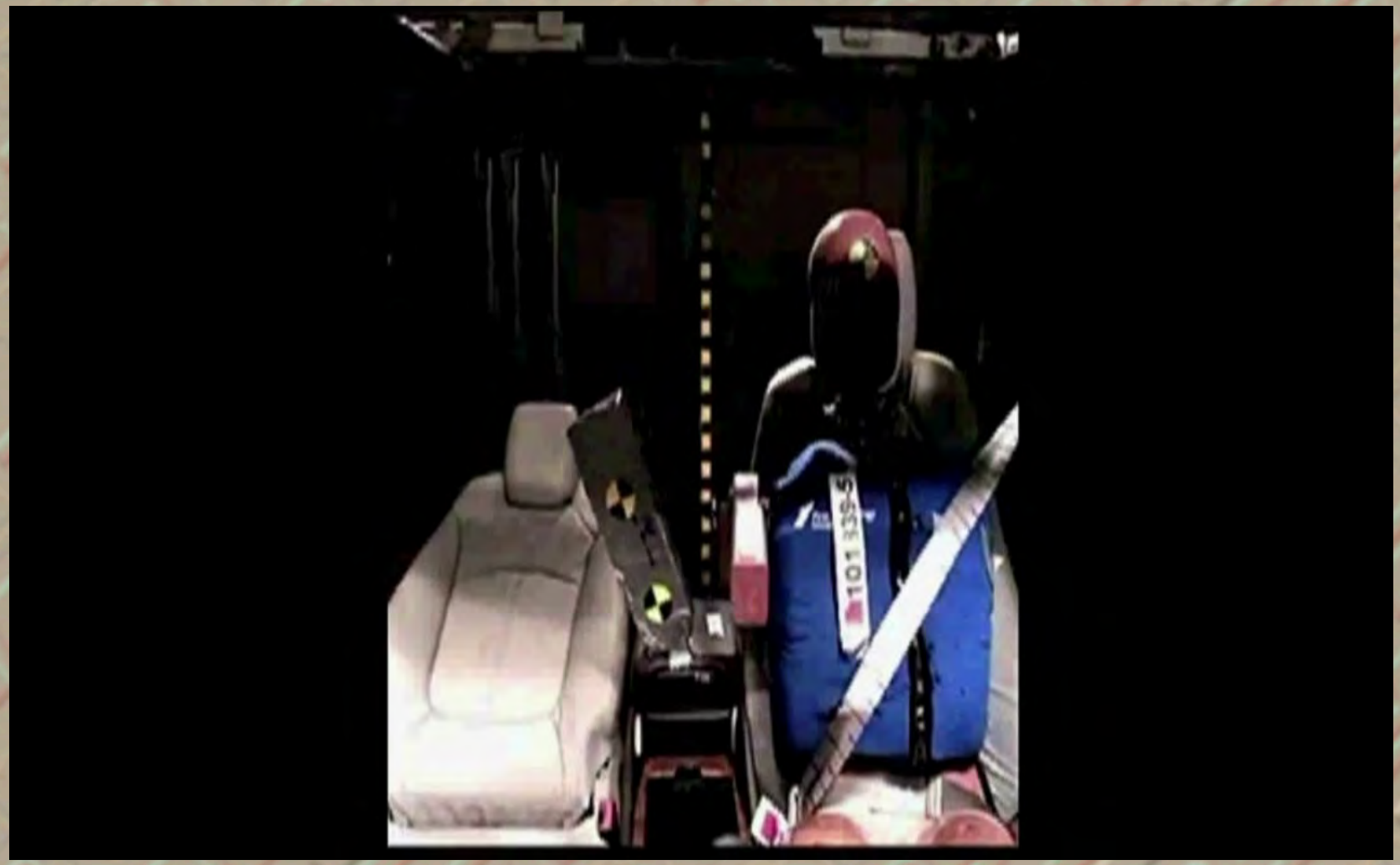
Far Side Impacts Cause More AIS 3 Harm Than Near Side Impacts



If The Far Side Occupant Rolls Out of the Seat Belt, Argue A Violation of Crashworthiness and Crashworthiness Principles



VEHICLE CRASHWORTHINESS

The science of preventing or minimizing serious injuries and death following an accident through the use of the vehicle's safety systems.

VEHICLE CRASHWORTHINESS

Principles

1. Maintain occupant survival space.
2. Manage, distribute and channel collision energy away from survival space.
3. Provide proper restraint throughout the entire accident.
4. Prevent ejection.
5. Prevent post-crash fires.

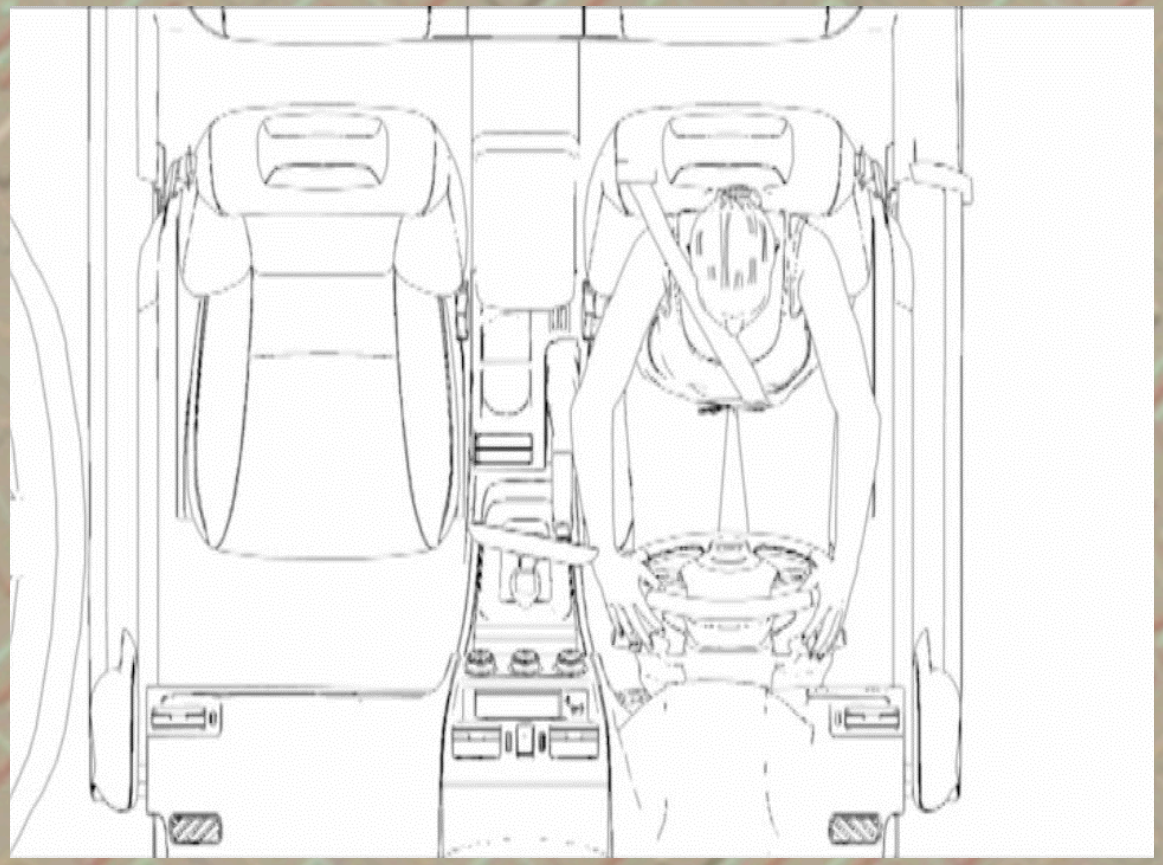
If the Far Side Occupant Rolls Out of the Seat Belt, Then Argue A Violation of the Very Purpose Of A Seatbelt

Purpose of a Seat Belt

A seat belt system cannot prevent accidents.

A seat belt is designed to minimize injuries and deaths following an accident by minimizing injurious vehicle contacts, applying loads to strong parts of the body and by preventing ejection.

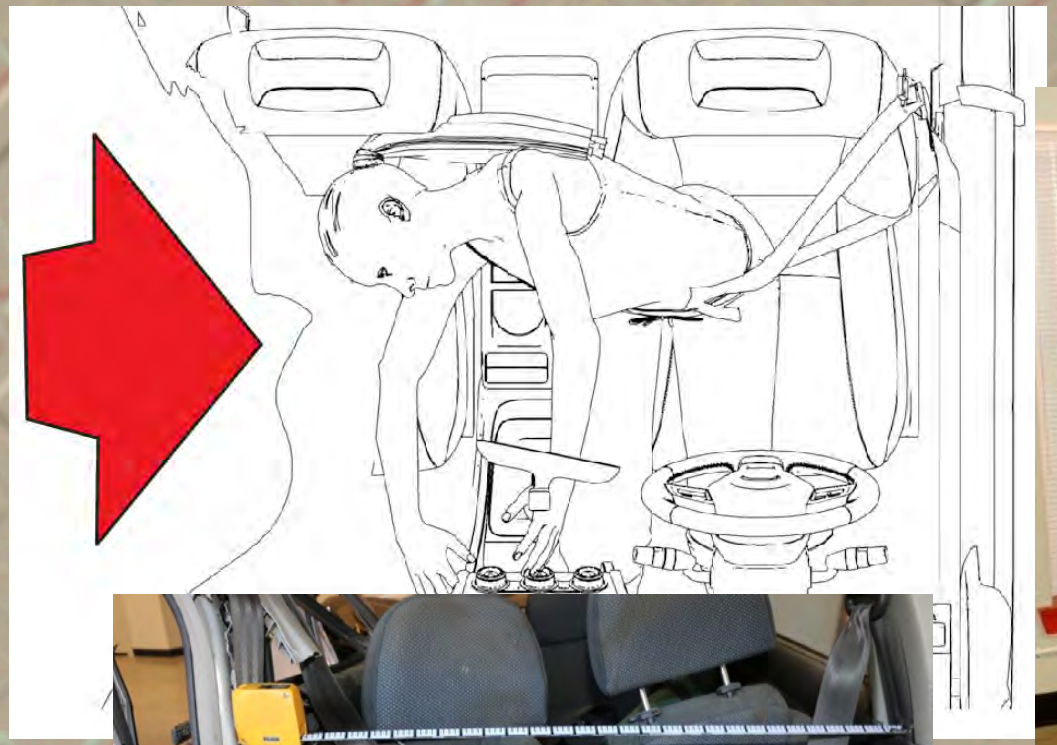
Safer Alternative Designs- Reverse Geometry Seatbelts

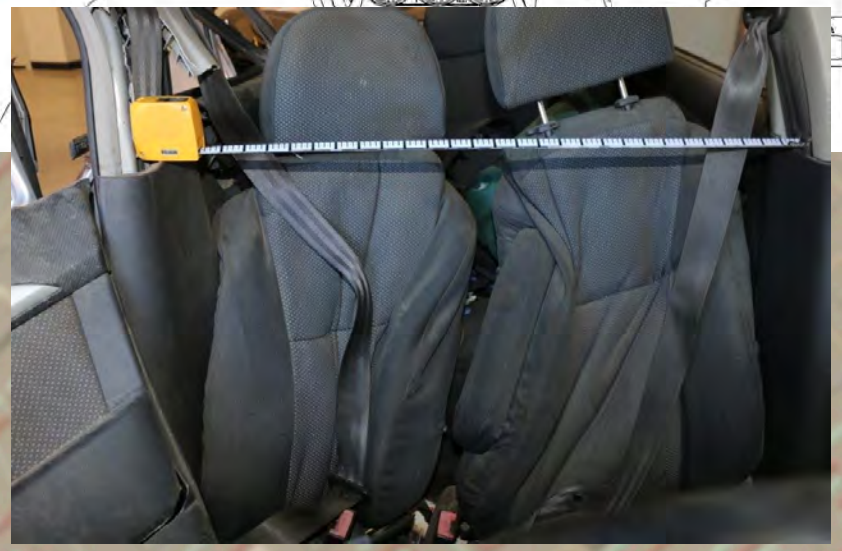


Safer Alternative Designs -
Ford's V Belt and X Belt Circa 2001

Safer Alternative Design- Center Mounted Airbag

If the Far Side Occupant Rolls Out of Her Seatbelt and Strikes the Intruding Structure, Argue A Violation of Crashworthiness Principles





Purpose of a Vehicle Structure

The passenger compartments in GM vehicles are designed as a “safety Cage,” surrounded by body structures that deform in a crash to absorb energy that might otherwise be transmitted to the occupants.

Argue That Excessive Vehicle Intrusion Violates the Purpose of a Vehicle Structure

Safety Isn't One Thing.
It's Everything

AUTOMOTIVE NEWS World Congress
January 11, 1993

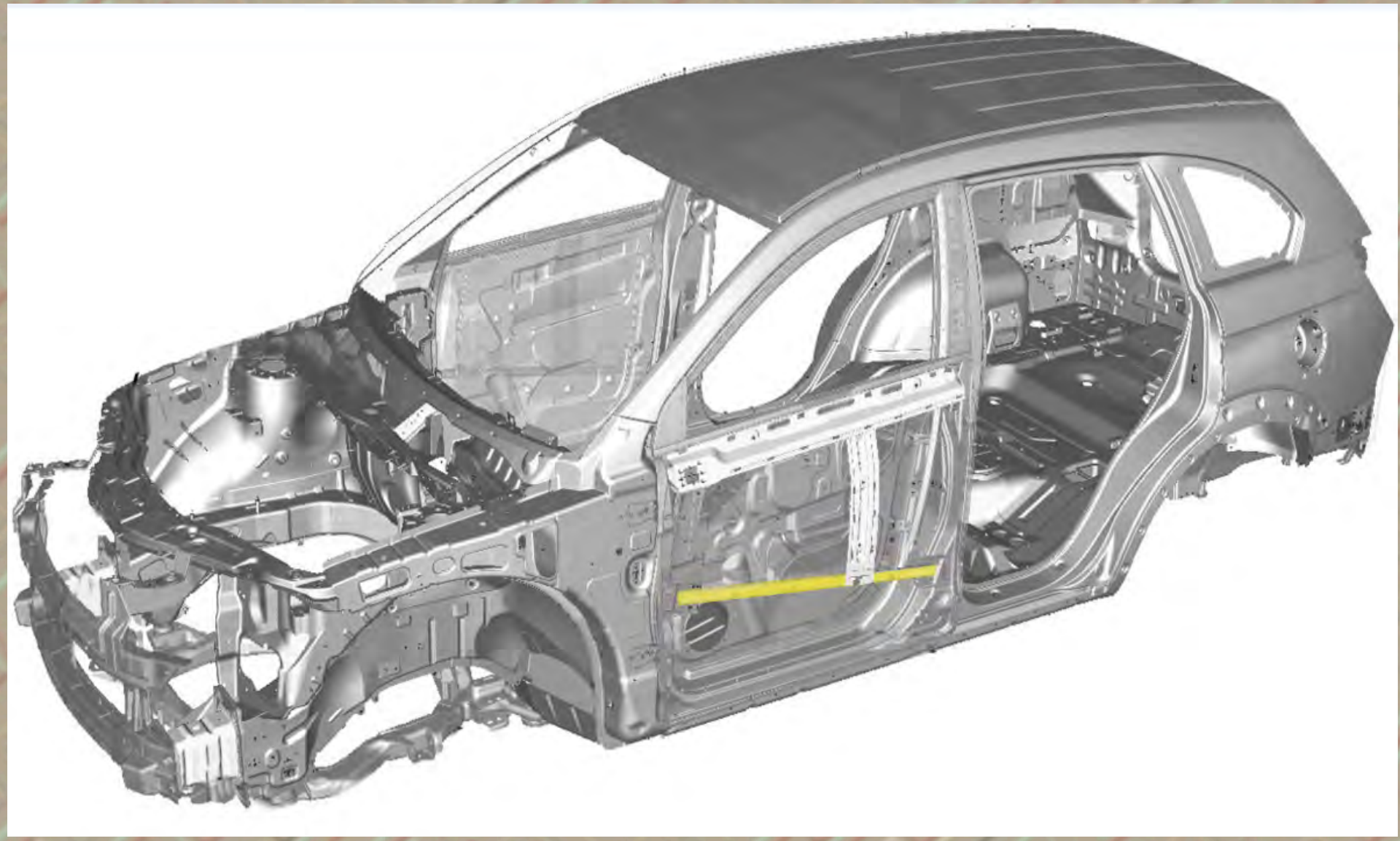
Mitchel C. Scherba
Manager
Safety & Crashworthiness Systems
General Motors Proving Ground

David C. Viano, Ph.D.
Principal Research Scientist
Biomedical Science Department
GM Research Laboratories

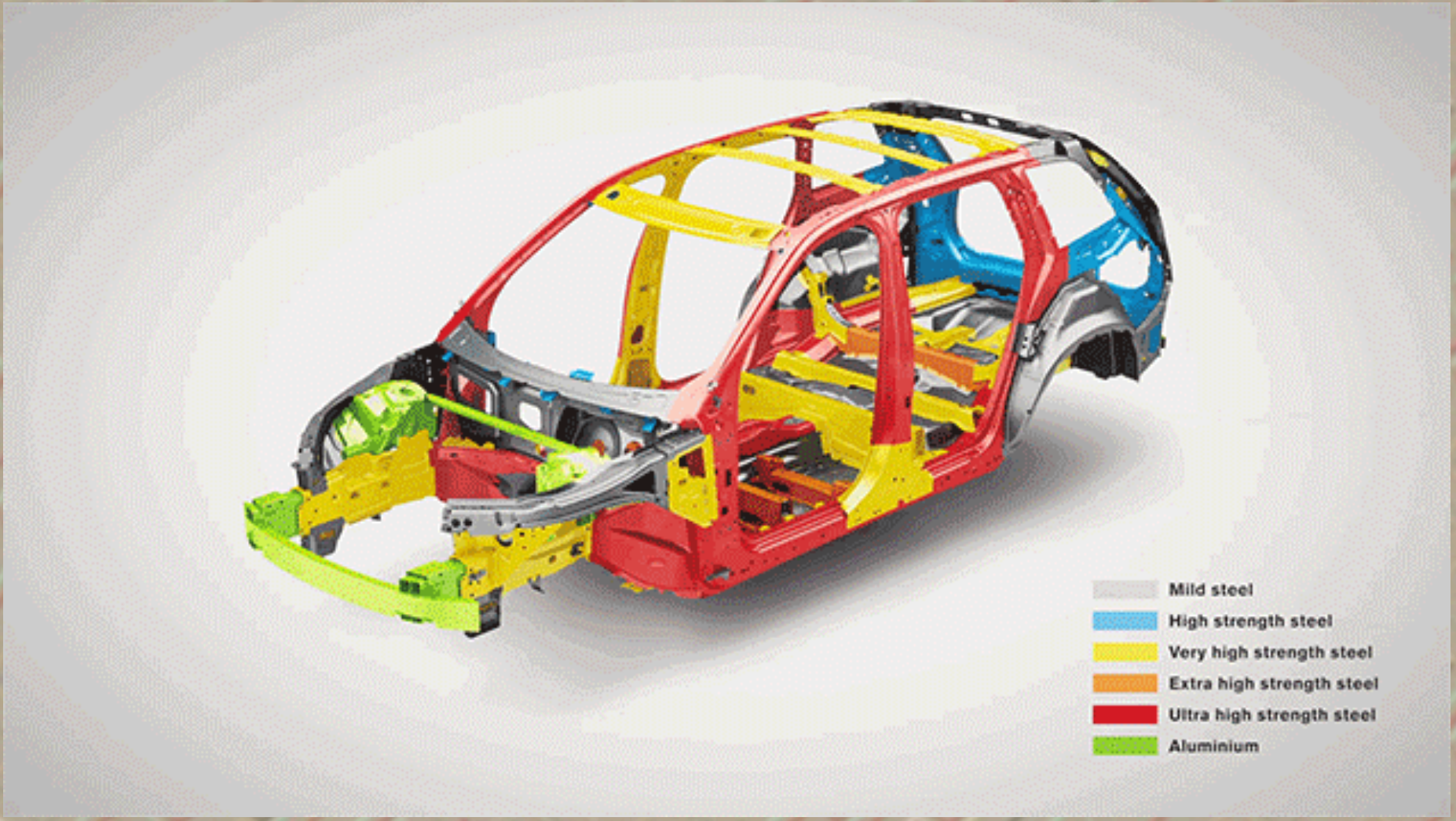
Safety Testing: Comprehensive crash testing is important in developing how a vehicle's overall body structure behaves in a collision. The passenger compartments in GM vehicles are designed as a "safety cage," surrounded by body structures that deform in a crash to absorb energy that might otherwise be transmitted to the occupants.

Far Side Occupant Protection In A Side Impact Begins With a Robust Structure

Using One, Lonely Piece of UHSS Attached To Conventional Steel Is Not a Robust Design

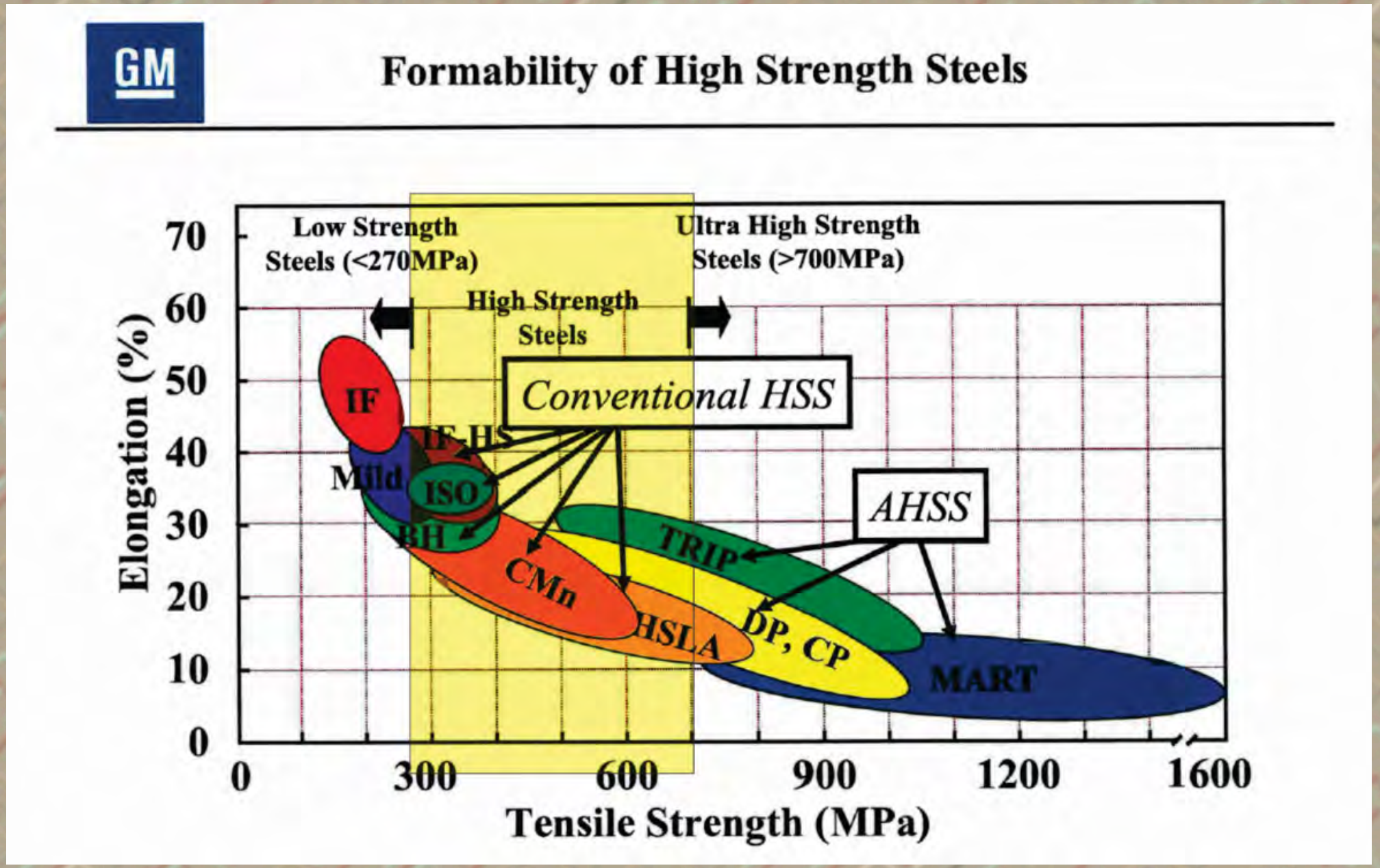


Safer Alternative Side Structure Designs Use UHSS Throughout The Cant Rail, A, B and C Pillars, Rocker Panels, Side Rails and Cross Members



Safer Alternative Side Structure Designs Use UHSS Side Door Beams Attached to UHSS Pillars And Surrounded By UHSS Rocker Panels And Side Rails

What Constitutes UHSS in Vehicles?

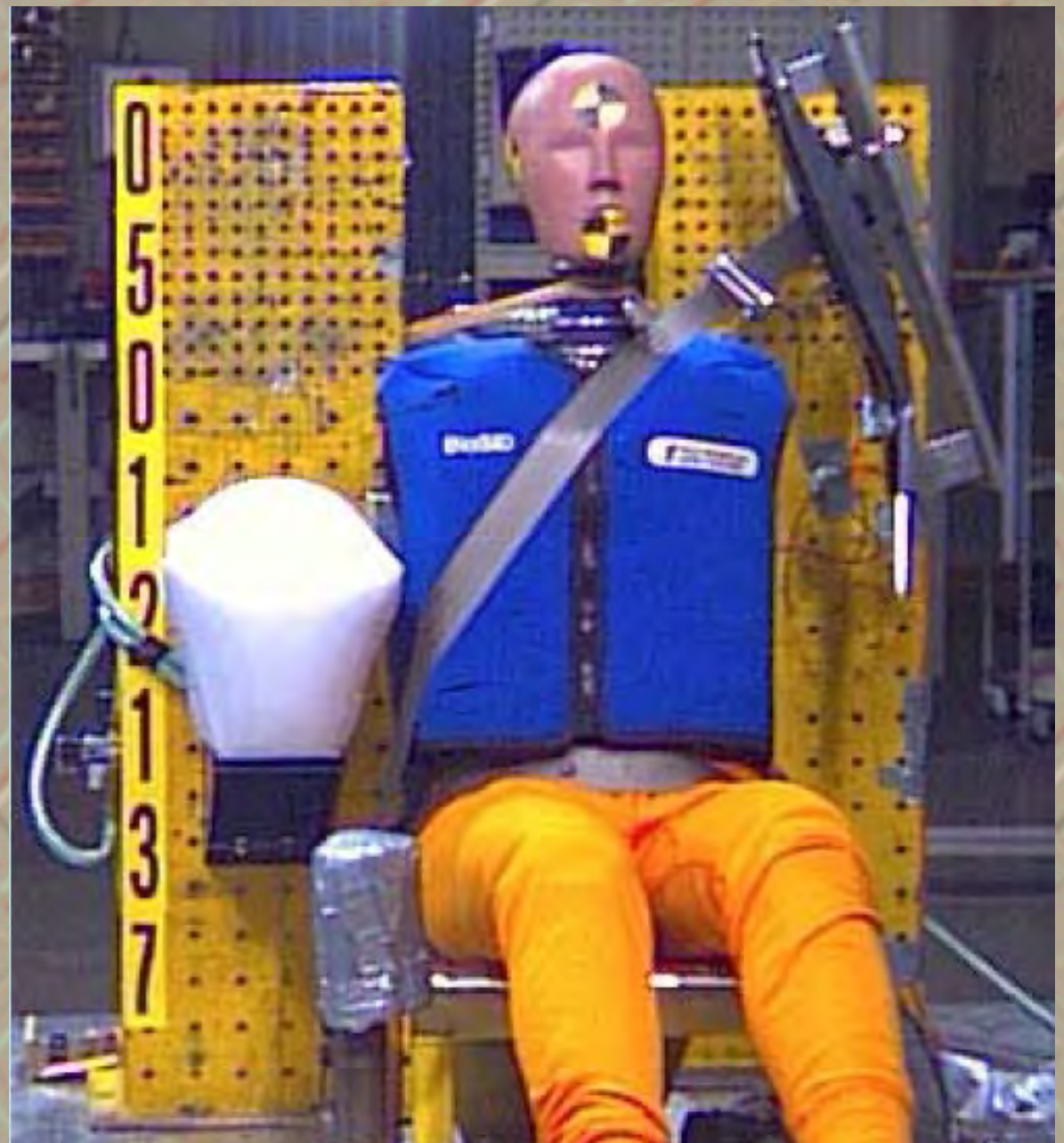


Safer Alternative Design – Long Duration/Complete Coverage Curtains

If the Far Side Occupant Strikes the Near Side Occupant, Argue Violation of Crashworthiness Principles

Safer Alternative Design – Center Mounted Airbag

Safer Alternative Design- Center Mounted Airbag

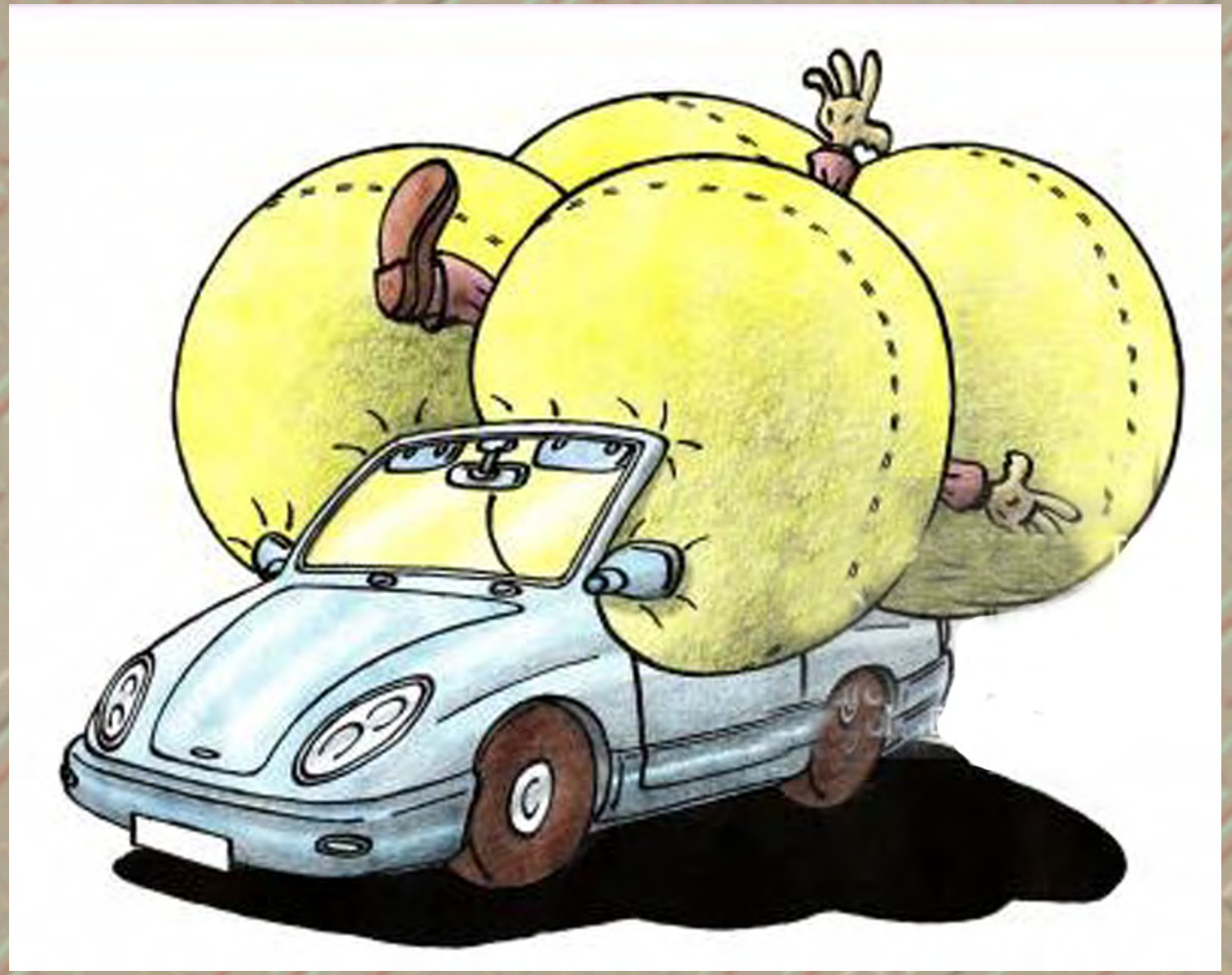


Safer Alternative Design – Ford Tubular Seat Bags

Safer Alternative Design- Rear Seat Center Mounted Airbag Toyota Circa 2003

If the Far Side Occupant Rolls Out Of His Seat Belt, Rebounds and Then Strikes the B-Pillar Or Side Rail Next to Him, Argue Violation of Crashworthiness Principles

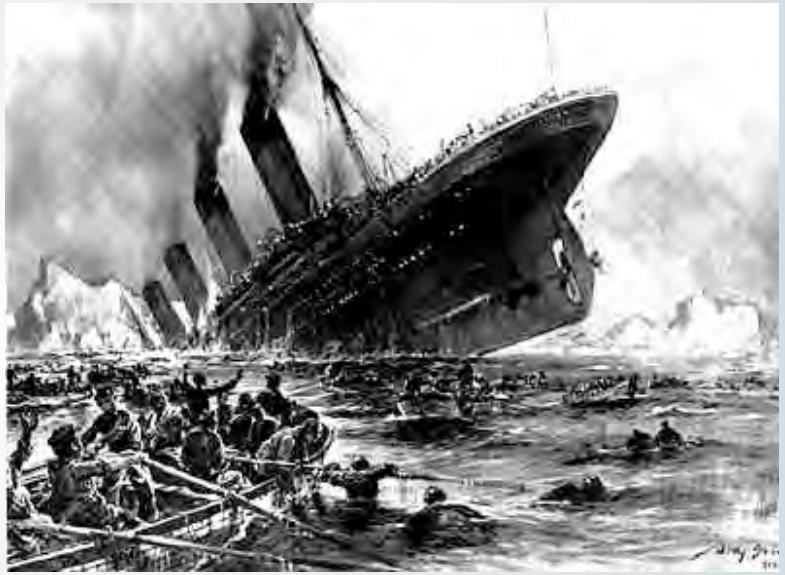
Vehicles Should Contain Long Duration Side Curtain Airbags That Provide Complete Coverage That Deploy In All Accident Modes



Now Many of You May Think My Last Safer Alternative Was a Bit Far Fetched– I Remind You Of The Movie Demolition Man

Now I Know Cary Will Tell You That His Client Did Not Cause The Accident

Distinction Between Cause of Accident and Cause of Injury



When thousands of people died as the Titanic sank on April 15, 1912, whose fault was it: the Captain or the Ship?

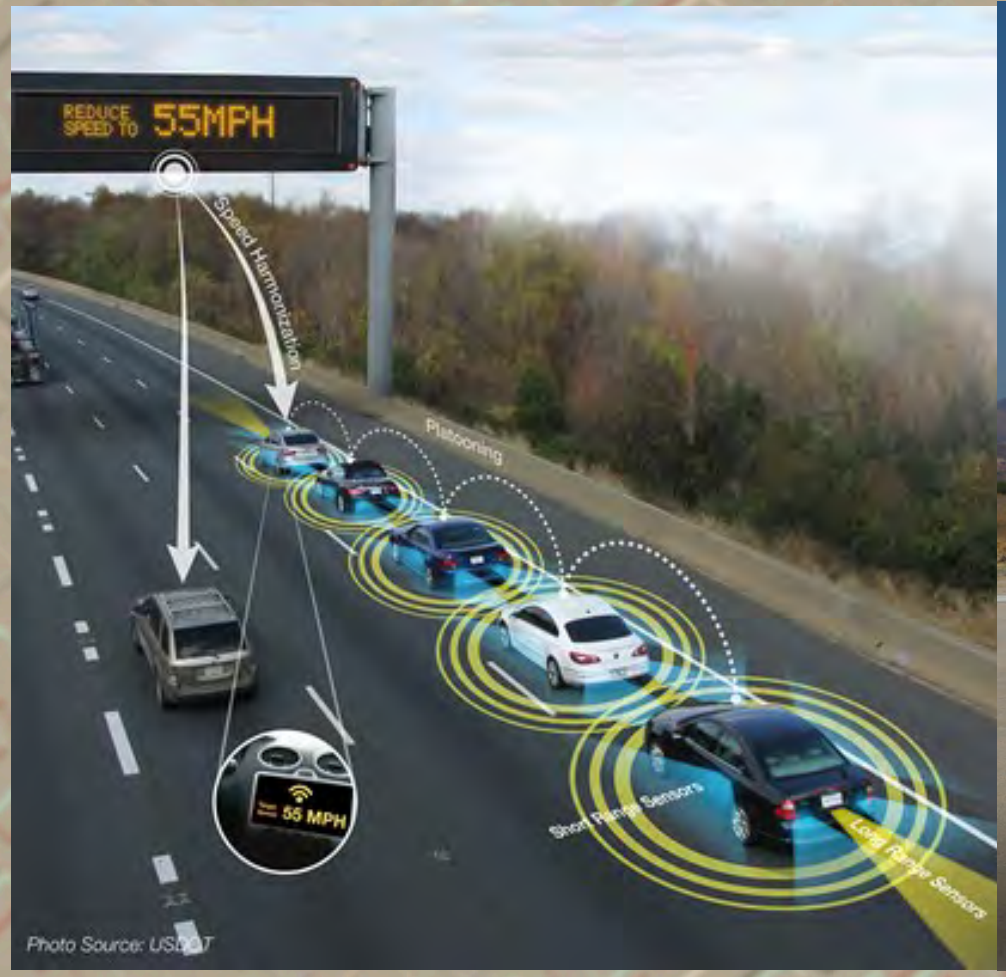
I also know that Cary will say: "This vehicle met and exceeded all FMVSS regulations."

I would remind Cary of the following facts:

	Vehicles Sold	Vehicles Recalled
2012	14,493,226	15,767,192
2013	15,601,148	18,985,960
2014	16,521,352	49,619,905
2015	17,482,841	48,938,224

I Also Know Cary Is Going To Tell You My Safer Alternative Designs Aren't Proven, Cannot Be Utilized In Vehicles Without Decades of Study and Cannot Be Applied Across Vehicle Platforms, Please Keep These Two Words In Mind

“Autonomous Vehicles”



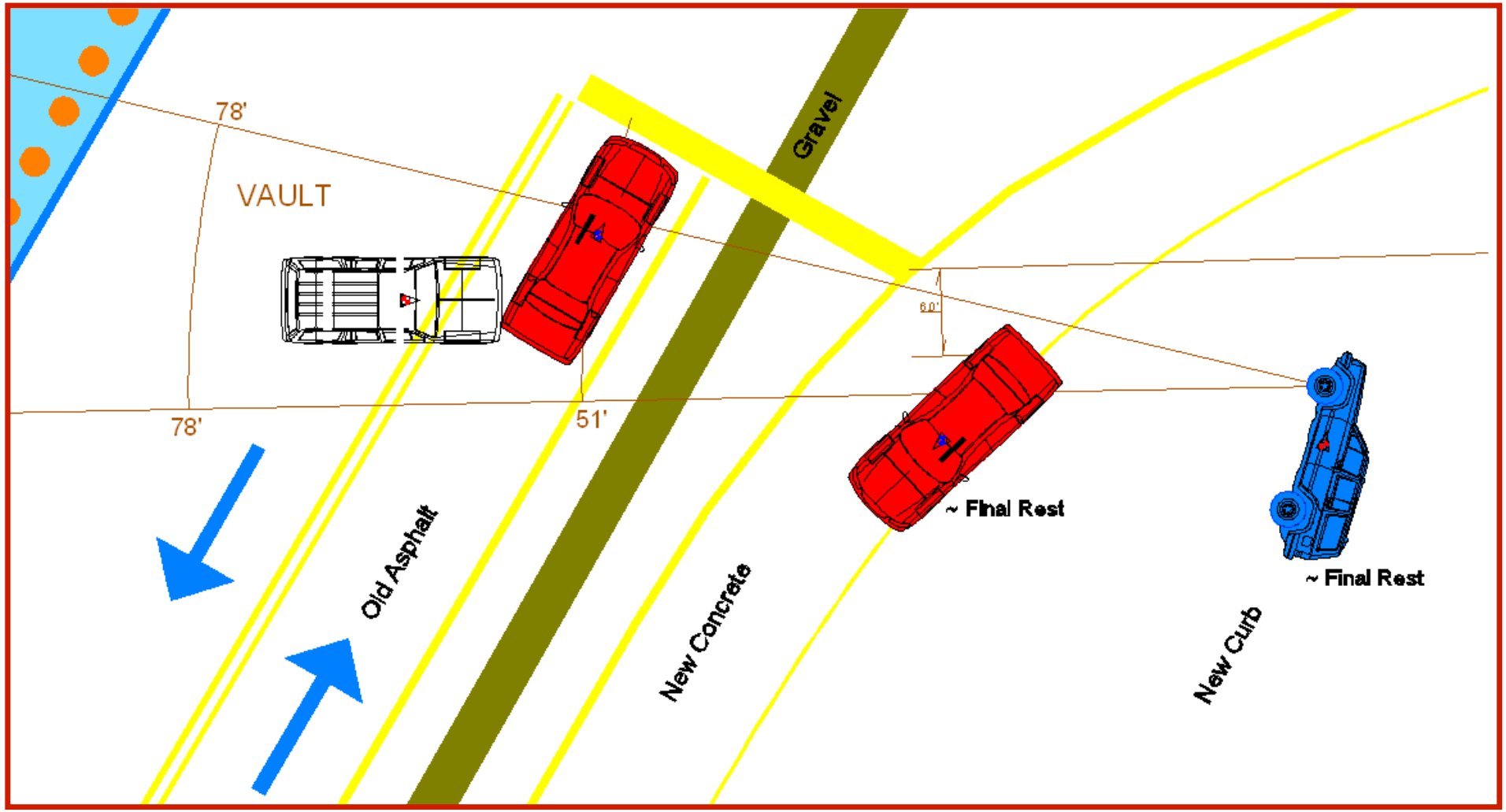
I Want To End With These Pearls of Wisdom From A Great Trial Lawyer and What He Would Say About Cary's Arguments Today

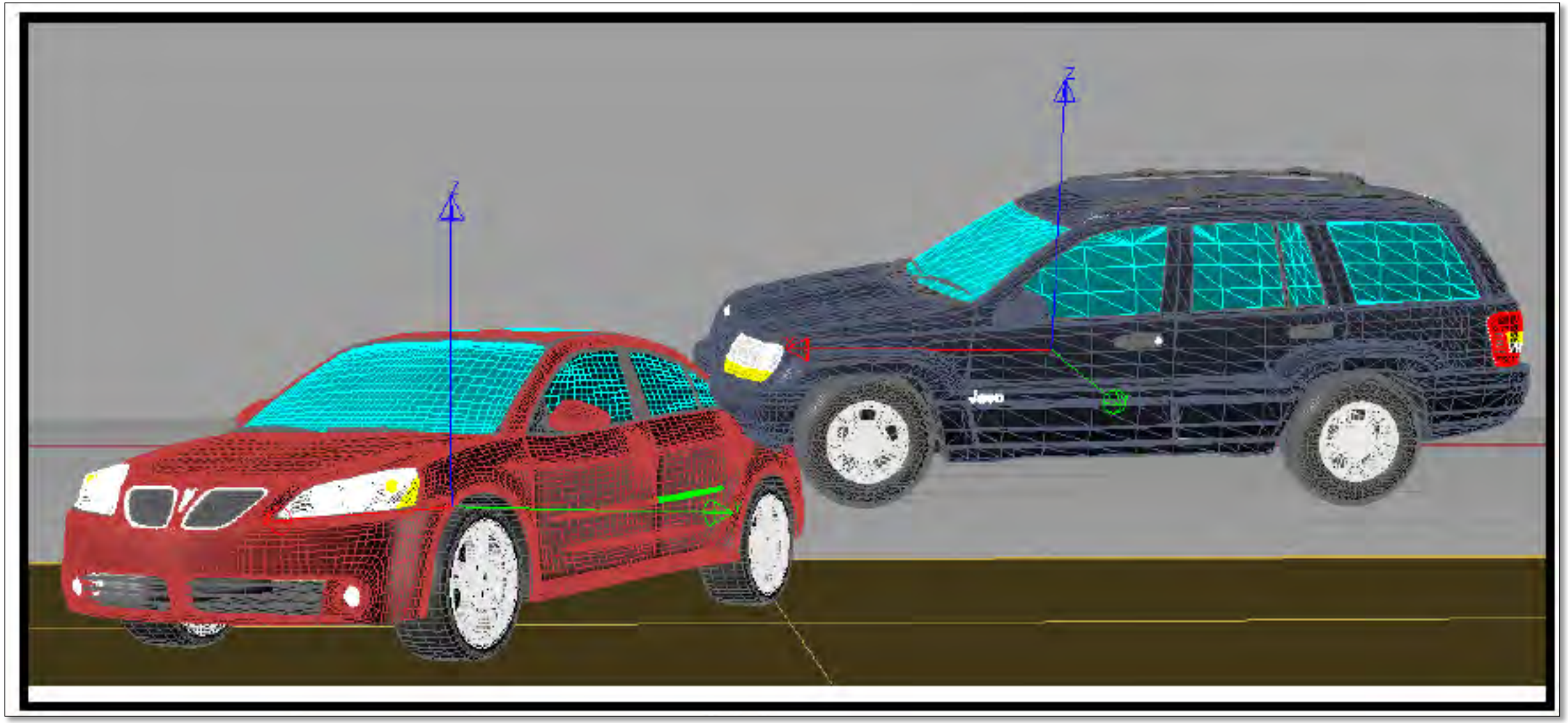
It Ain't BS, it's …

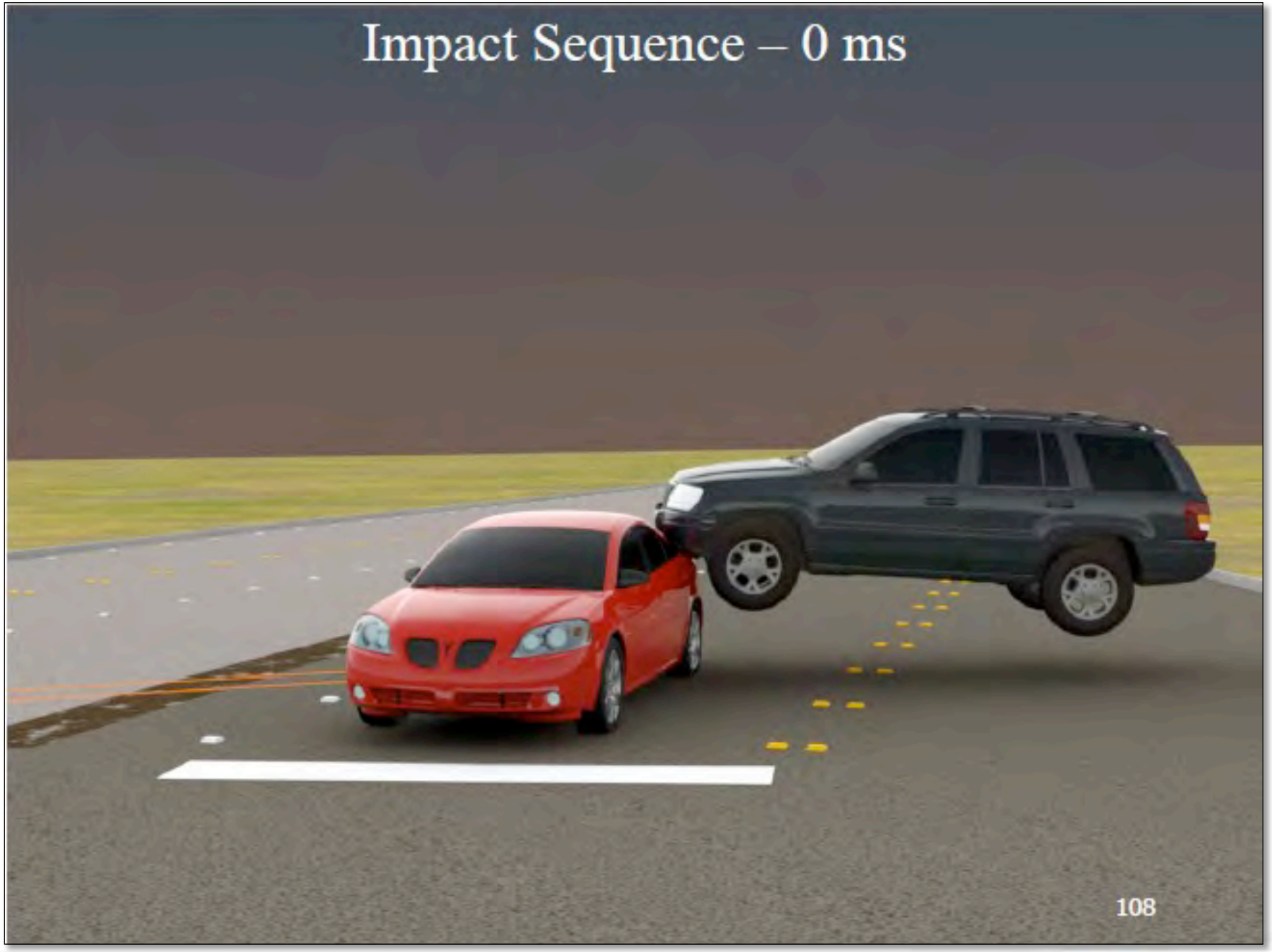
Bowman and Brooke LLP

Typical Defense Outline

- Bob Bullet caused this unfortunate accident and any resulting injuries.
- The 2006 Pontiac G6 was well designed, thoroughly tested, and exceeded the requirements of the FMVSS with or without a side impact airbag.
- The G6 had an optional side impact airbag available for customers that wanted it.
- No side impact airbag system would have prevented the injuries caused by this severe accident.
- It is unfair to blame the G6 for the injuries in this case.


78'
VAULT
78'
51'
Gravel
6.0'
~ Final Rest
~ Final Rest
Old Asphalt
New Concrete
New Curb


Z
Z
Jeep


Impact Sequence – 0 ms
108

Jeep Tire Imprint on Pontiac Door

18 mph Rigid Pole Impact

Subject Vehicle

LINCAP/SNCAP

- Dynamic 214
  - Crabbed 3000# MDB at 33.5 mph
- LINCAP
  - Increase impact speed to 38.5 mph
  - Increases kinetic energy 32 %

LINCAP
&
FMVSS 214D

Subject
Vehicle

IIHS Side Impact Test

- 3300 SUV barrier 31 mph
- SID-IIs dummies on near side

The Institute's side test is severe. It's unlikely that people in comparable real-world crashes would emerge uninjured. With good side protection, however, people should be able to survive a crash of this severity without serious injuries.


Exponent®
Failure Analysis Associates®

Big Hit Comparison

- Impact speed
- Impact angle
- Intrusion level
- Override/Underride
- Vehicle size
- Delta V

Technology Insertion

- Factors that influence phase in of (side curtain airbags) technology include:
- Consumer acceptance or demand for new technologies
- Balancing the perceived value of a new technology
- Uncertainty regarding safety improvements levels

Far Side International Collaborative Research Project - 2009

- OEMs, suppliers, academia
- 30 technical papers from 2005-2009
- Notes Far Side annual injury levels
- Concept countermeasures described
- Claims THOR or WorldSID are suitable dummies
- Recommendation
  - Far side Dummy for NCAP side
  - Far side ratings

2016 – NASS Review

Belted Driver Injury in Near-Side and Far-Side Impacts, Past and Present

2016-01-1530

Published 04/05/2016

Yury Chudnovsky, Justin Stocks-Smith, and Jeya Padmanaban
JP Research, Inc.

Joe Marsh
Ivy Consultancy, LLC

CITATION: Chudnovsky, Y., Stocks-Smith, J., Padmanaban, J., and Marsh, J., "Belted Driver Injury in Near-Side and Far-Side Impacts, Past and Present," SAE Technical Paper 2016-01-1530, 2016, doi:10.4271/2016-01-1530.

NASS Review – Delta V Chart

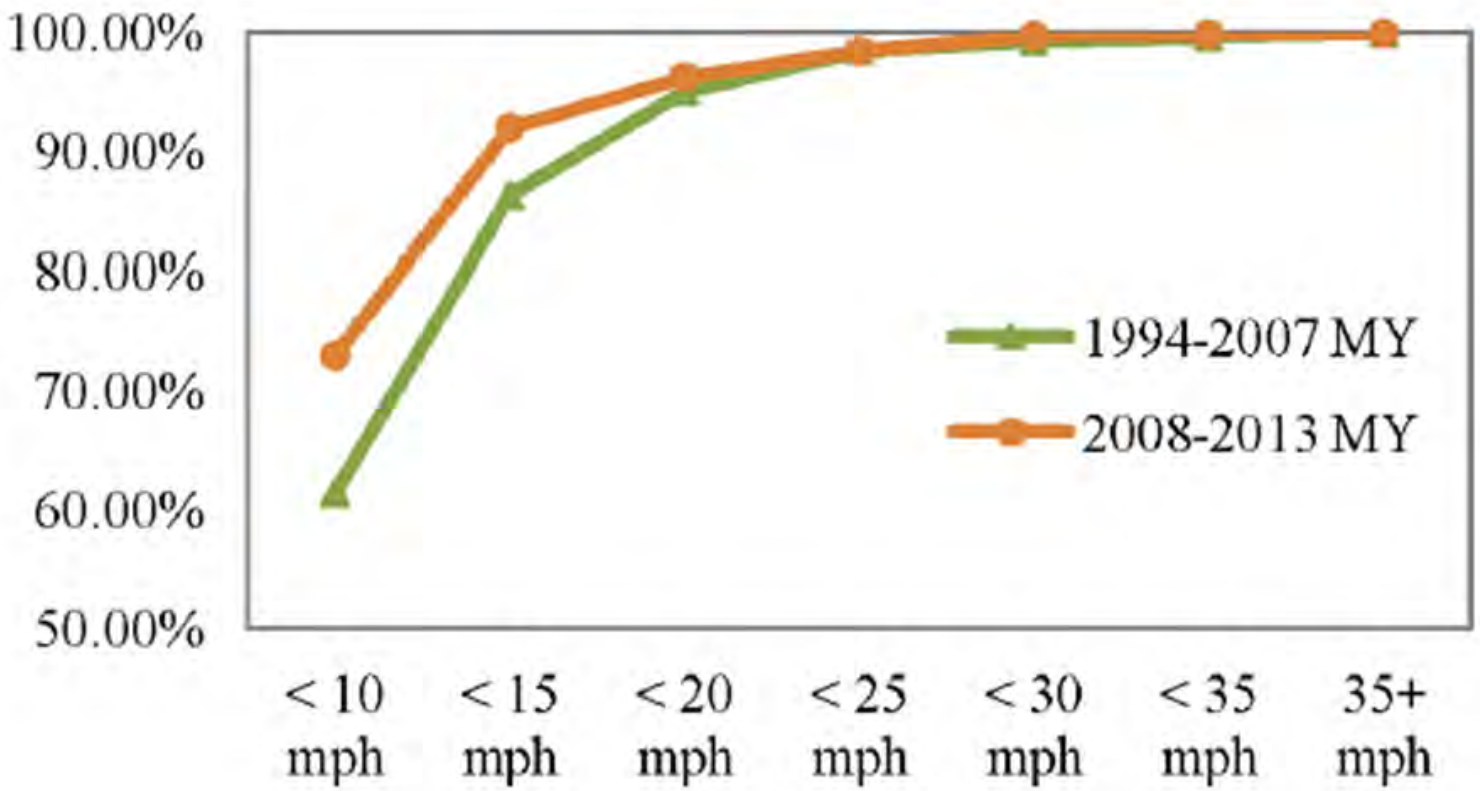


Figure 1. Cumulative Distribution of Side Impacts by Delta-V for Older and Newer Model Year Cars.

NASS Review – Injury Rates

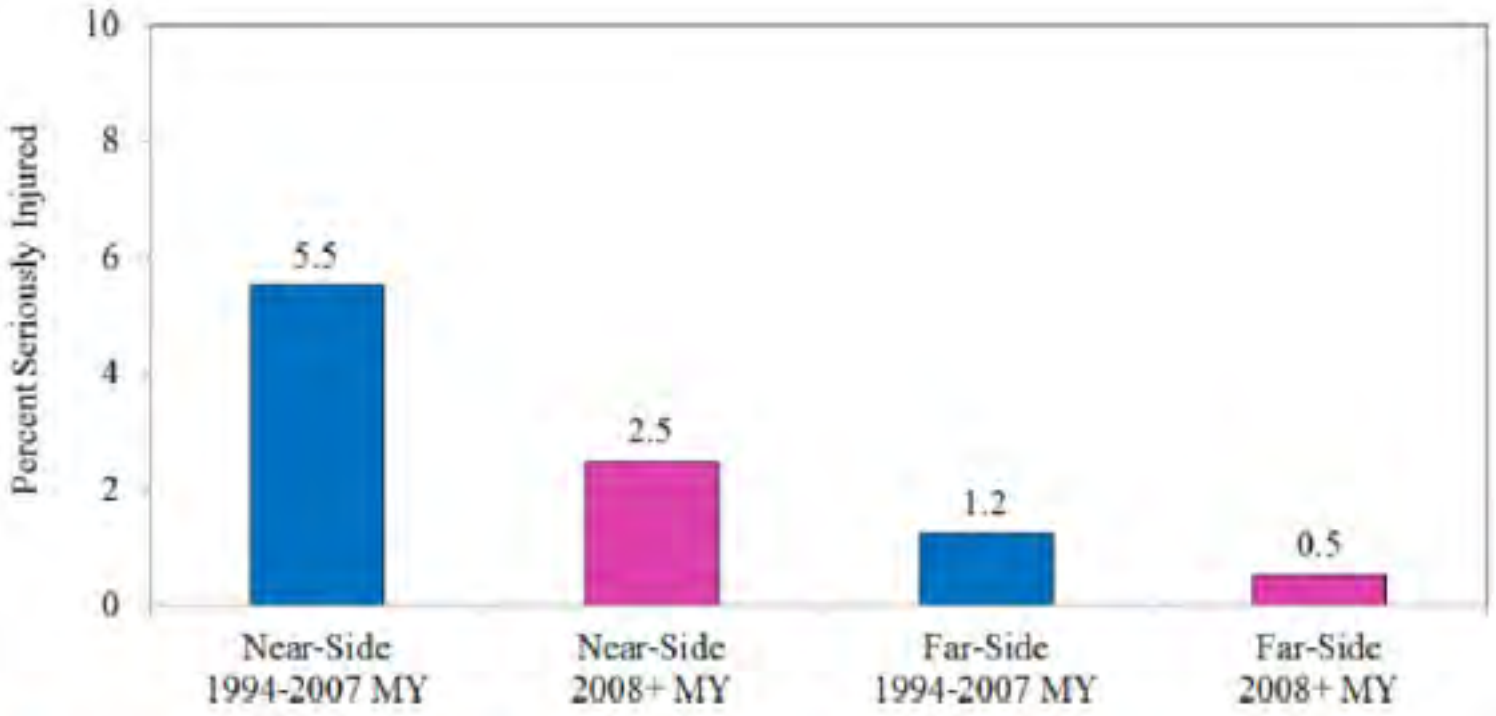


Figure 2. Serious Injury Rate (MAIS 3+/Fatal) to Belted Drivers in Side Impacts.

GM 2013 MY Crossovers

SAE International

2013-01-1156
Published 04/08/2013

doi:10.4271/2013-01-1156
saetransaf.saejournals.org

The Front Center Airbag

Scott D. Thomas
General Motors Company

Richard A. Wiik
Takata

Jacqueline E. Brown
General Motors Company

Front Center Airbag – Test Conditions

- FMVSS 214 20 mph oblique pole impact
  - In-position demonstration
  - Most severe regulated side impact for intrusion
- Rollover test
- Side impact sled tests
  - SNCAP, IIHS pulse
- Regulatory and consumer metric test for near side
- Separate paper addresses inflation induced injury

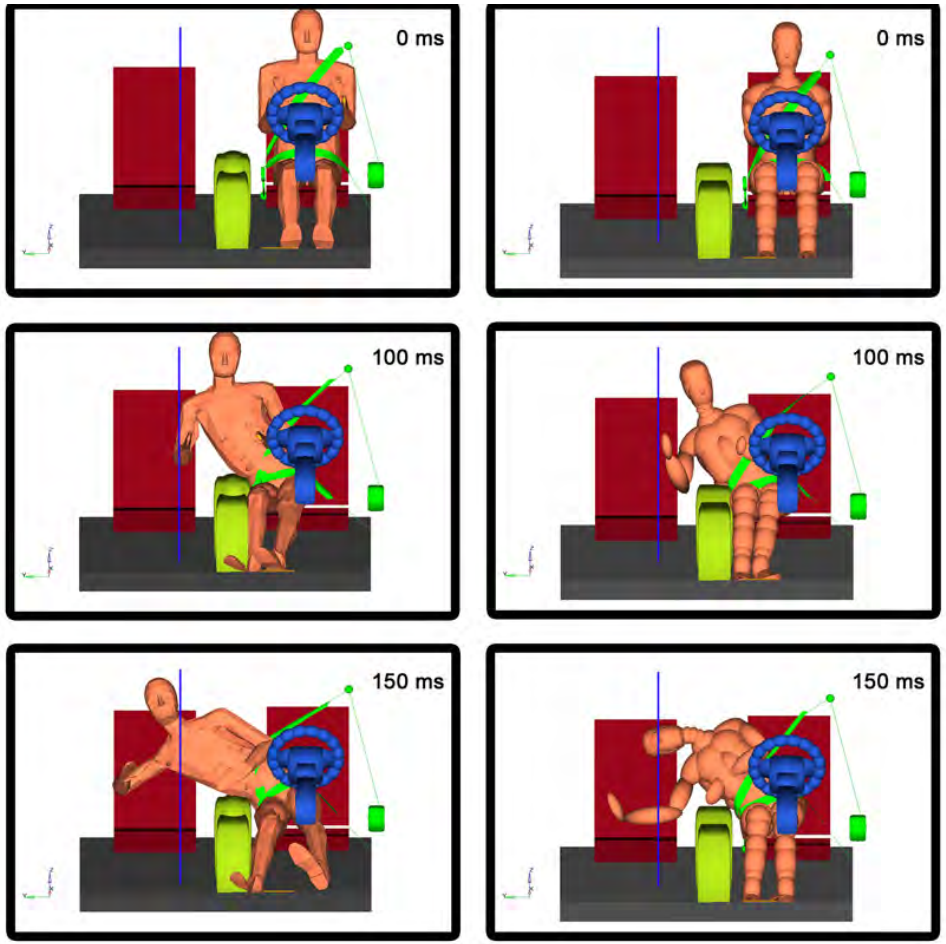
Thomas, Wiik - Conclusions

- A new airbag technology has been developed by General Motors and Takata that provides an inflatable device which **has the potential** to address many of these observed field injuries.
- The General Motors and Takata team spent significant engineering effort developing this technology, and the **laboratory test** results described demonstrated an observable performance benefit.
- Far side occupant lateral excursion was reduced, as was occupant to occupant contact between the front outboard occupants.
- This Front Center Airbag technology is being implemented on the 2013 Buick Enclave, GMC Acadia, and Chevrolet Traverse.

Front Center Airbag - Obstacles

- Feasibility discussion
  - Still no validated far side dummies, accepted test methods, accepted reference values post 2010 recommendations
- Field data deficit
  - Available data shows performance improvement for recent vehicles
- Occupant kinematics specific to crash
- Inflation induced injury concerns
- Additional cost

Front Center Airbag – Obstacles



- Human v HIII from 2009 ESV presentation
- "a suitable dummy is needed"

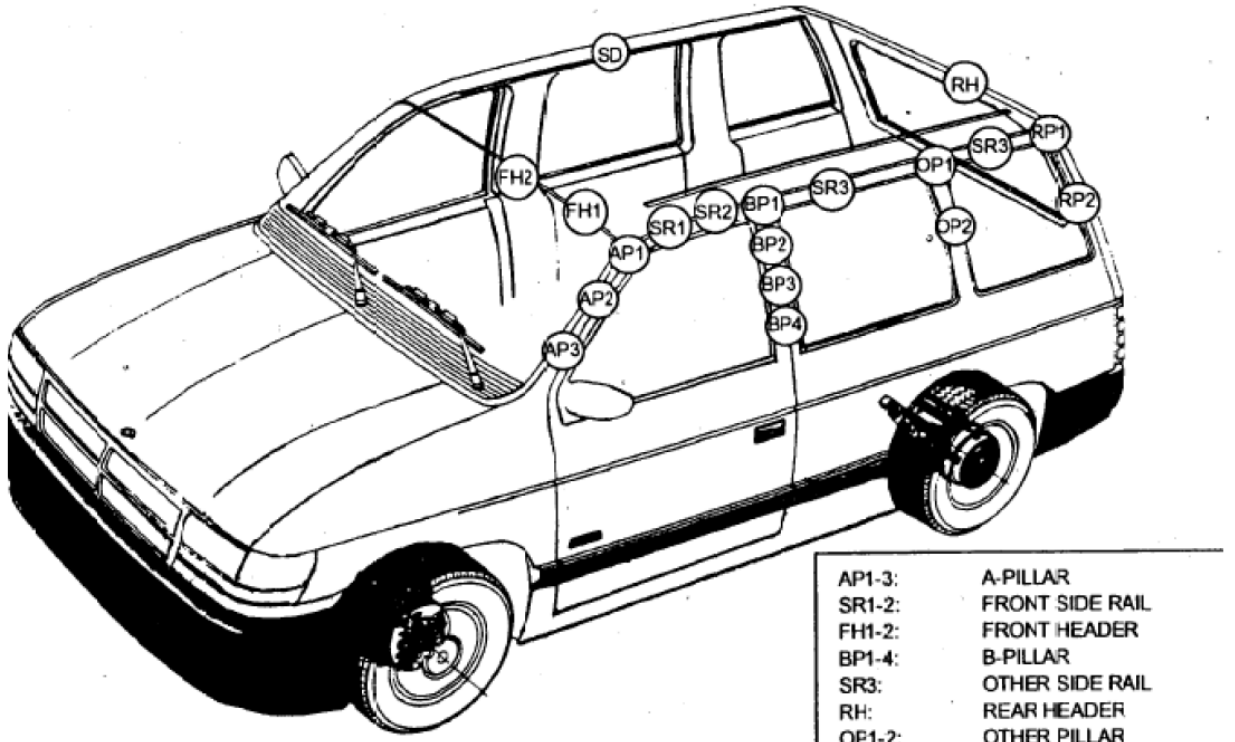
> 700 Mpa

- Just make the side structure stronger!
  - Does not account for peak accelerations experienced by occupants
  - May increase vehicle acceleration
    - Increased injury potential near and far side
  - Deformation is energy absorption

Defect Theories (c) – (f)

- Reverse geometry belt
  - Potential to create other injuries in severe crashes
- Pretensioner deployment
  - Save for frontal impact
  - Little effect on side impact kinematics
- Rollover curtains
  - Feasibility, packaging concerns
  - Reasonable rollout cadence
- Insufficient padding
  - FMVSS 201U compliance
- DEFEND THEM ALL

FMVSS 201U Roof Rail Targets



AP1-3:	A-PILLAR
SR1-2:	FRONT SIDE RAIL
FH1-2:	FRONT HEADER
BP1-4:	B-PILLAR
SR3:	OTHER SIDE RAIL
RH:	REAR HEADER
OP1-2:	OTHER PILLAR
RP1-2:	REAR PILLAR
SD:	SLIDING DOOR TRACK
UR:	UPPER ROOF (NOT SHOWN)

Plaintiff's Impact Location

The Truth…

- Most crashes begin with a crash, caused by Bob Bullet, and he was probably …
- Plaintiff's arguments centered on speculation in un-tested, low validation conditions
- Modern cars and trucks have been engineered to provide safety in a number of crash environments, including various side impacts
  - Stacks of testing, drawings, core engineering documents
- Manufacturers go above and beyond the FMVSS and consumer metric requirements