

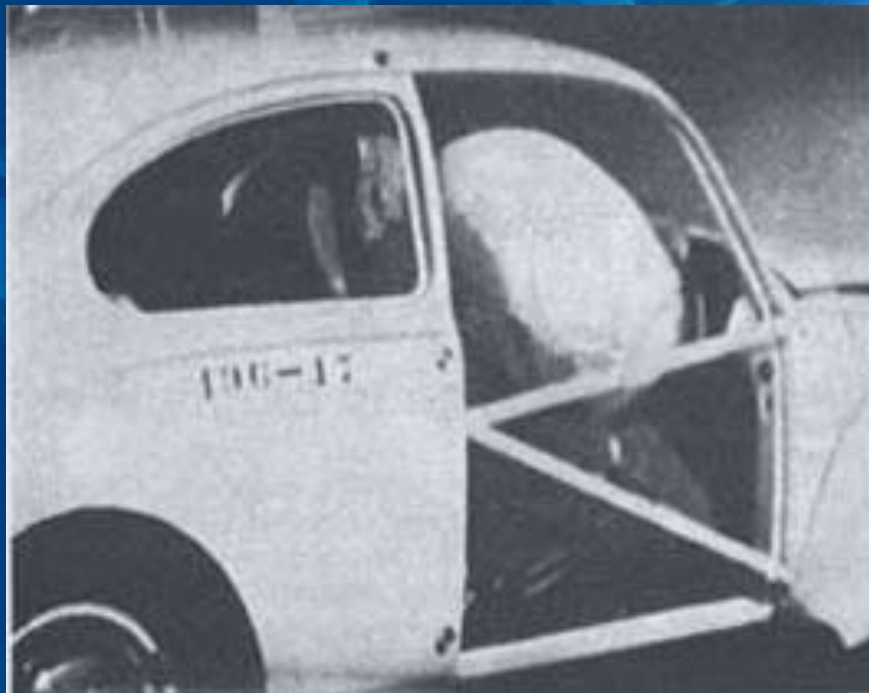
Advanced Occupant Protection Systems

May 7, 2007

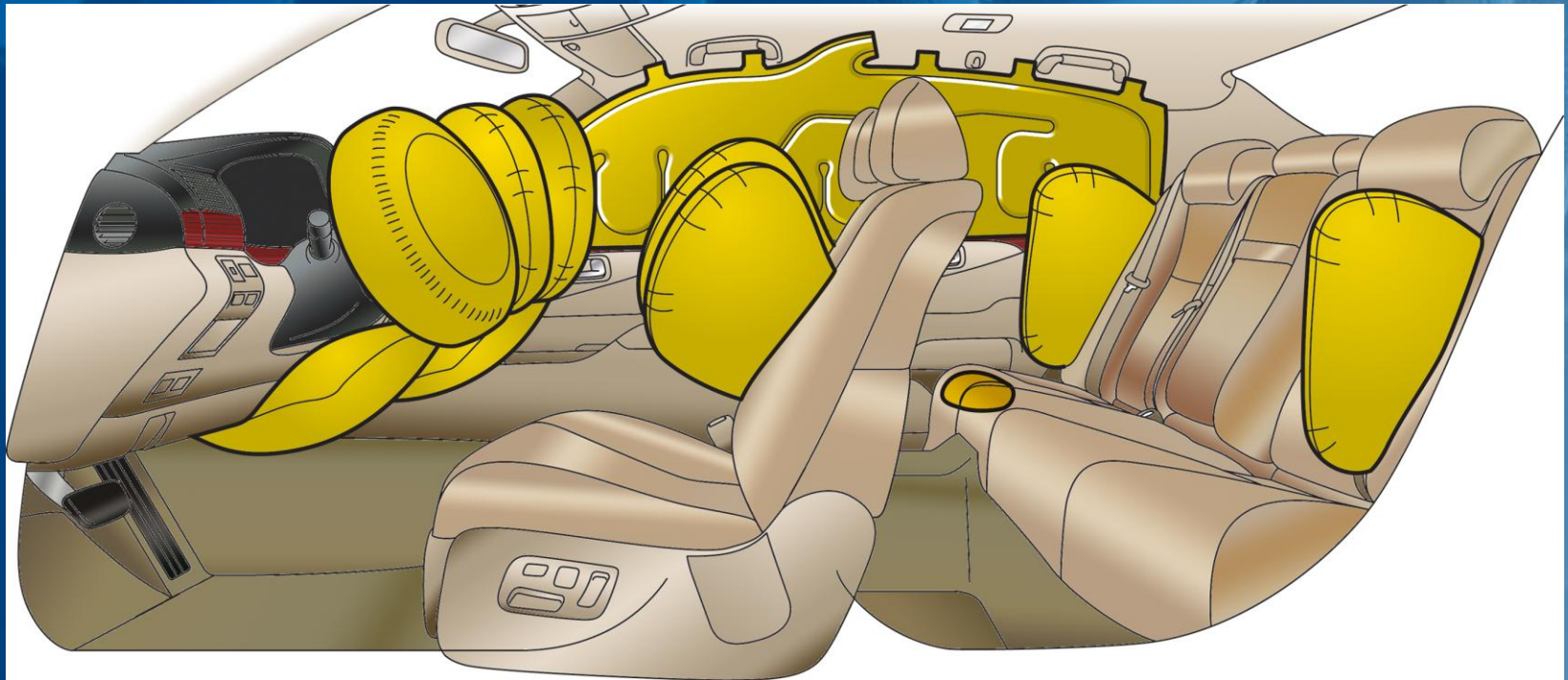
Chris Mullen

Toyota Motor North America

That was then...



...this is now



Overview of Advanced Systems

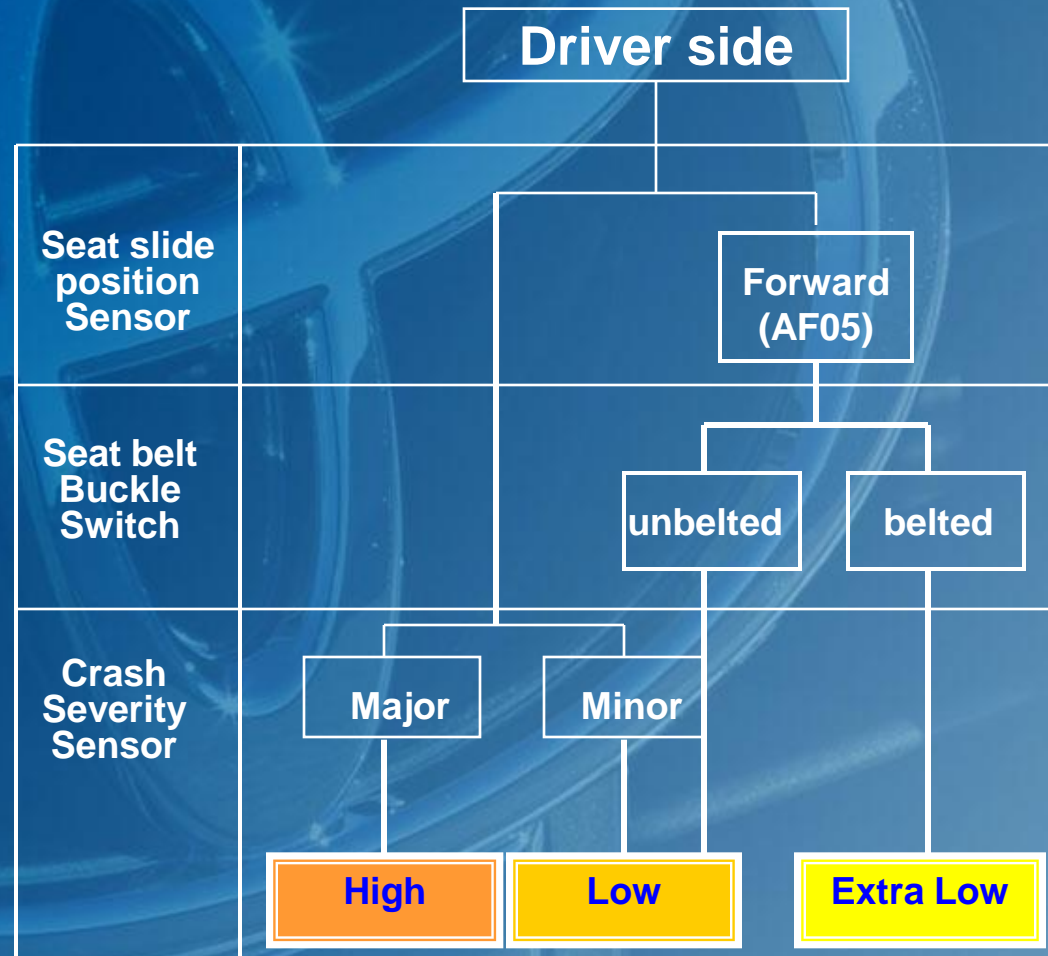
- Air Bags
 - Frontal Impact
 - Side Impact
 - Control
- Seat Belts
 - Pretensioners
 - Load Limiters
- Occupant Classification Systems
- Pre-Crash

Overview of Advanced Systems

- **Air Bags**
 - **Frontal Impact**
 - **Side Impact**
 - **Control**
- Seat Belts
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Airbags – Frontal Impact

- Front
 - Driver
 - Front Passenger



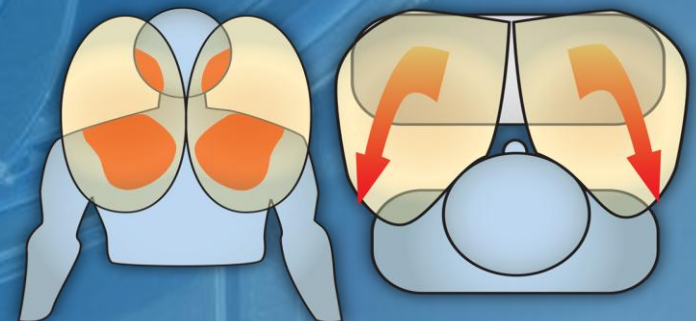
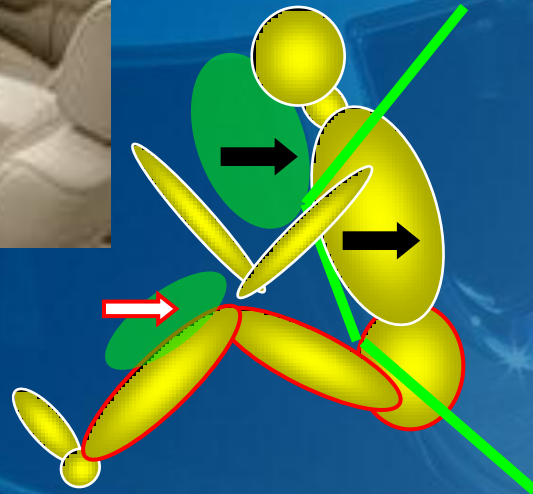
Airbags – Frontal Impact

- Front – Specialty

Twin Chamber Airbag

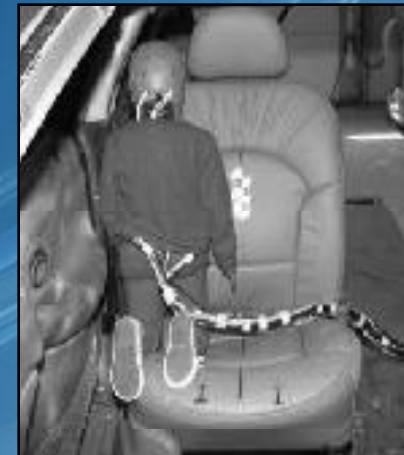


Knee Airbag



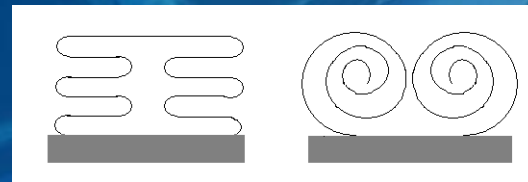
Airbags – Side Impact

- Side
 - Curtains
 - Torso
- OOP Standards

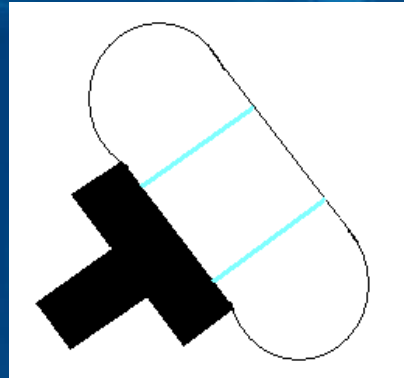


Airbags – Deployment Control

- Effect of Different Folding Patterns

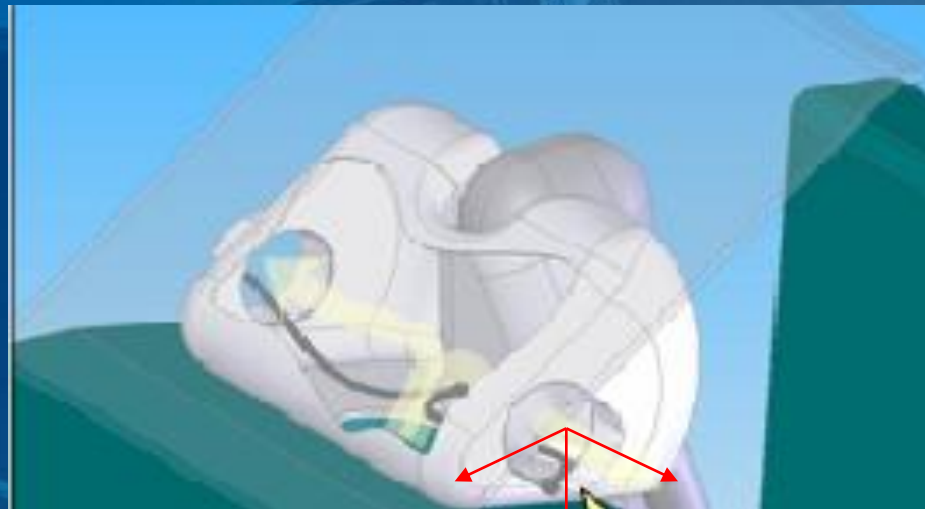


- Tethers



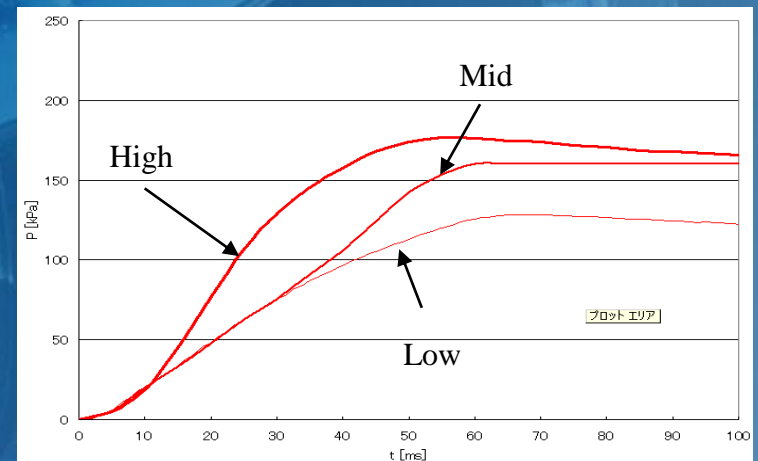
Airbags – Deployment Control

- Venting
 - Conventional
 - Pressure



Airbags – Deployment Control

- Inflation
 - Traditional bags had single stage inflators
 - Advanced air bag systems use dual stage inflators to achieve multiple inflation levels
 - Based on seat position, belt, size, severity, etc.

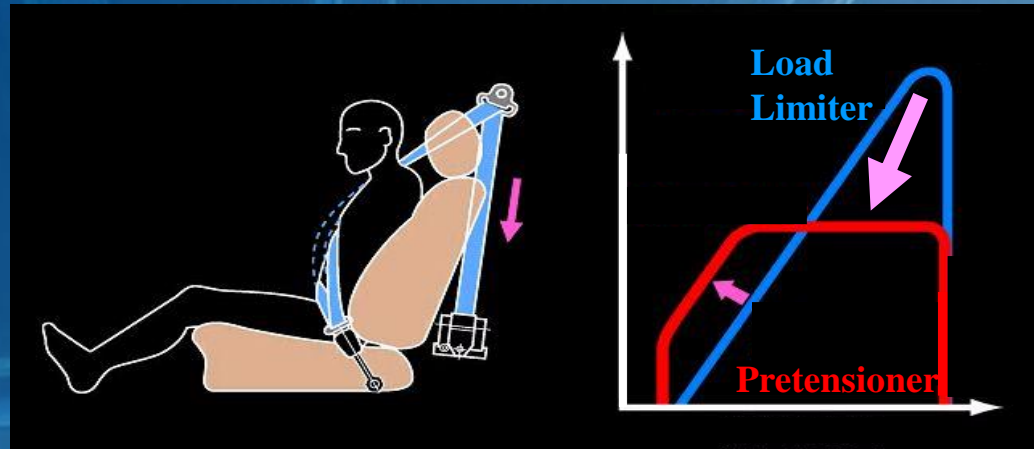
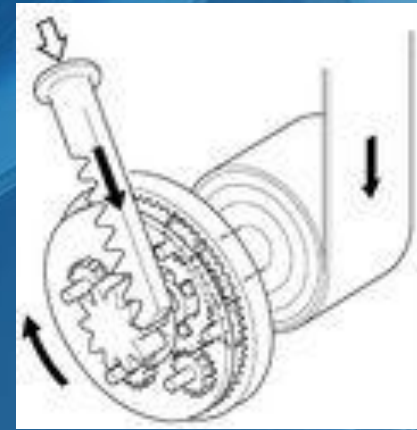


Overview of Advanced Systems

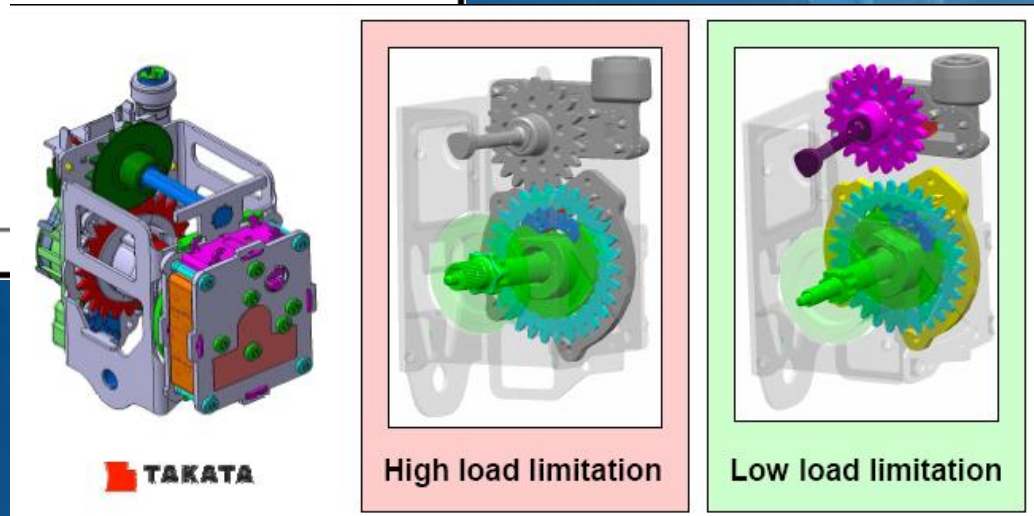
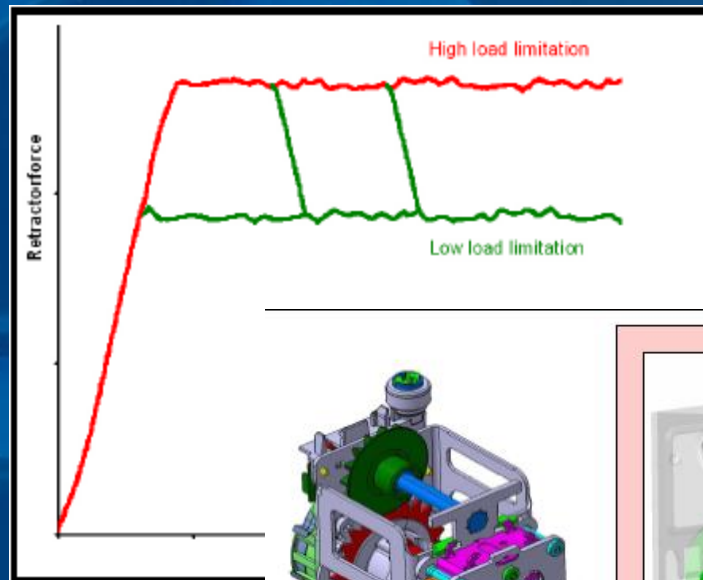
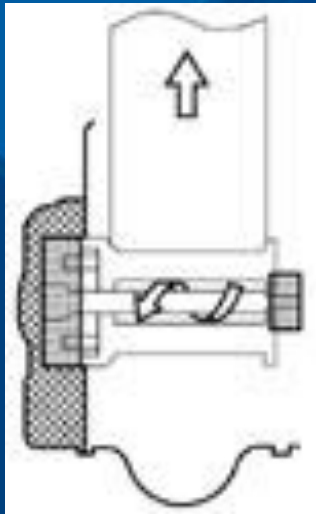
- Air Bags
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 - Side Impact
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- **Seat Belts**
 - **Pretensioners**
 - **Load Limiters**
- Occupant Classification Systems
- Pre-Crash

Seatbelts – Pretensioners

- Traditional (pyrotechnic, mechanical, electric)
- Dual pretensioners
- Rear pretensioners



Seatbelts – Load Limiters



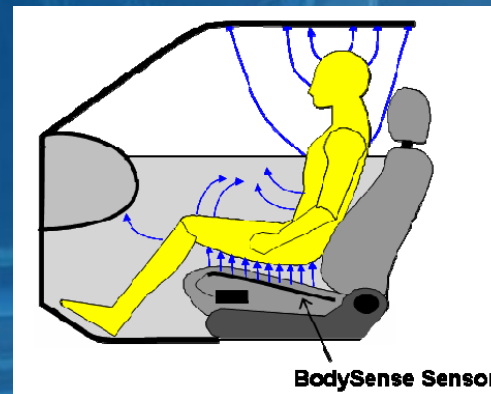
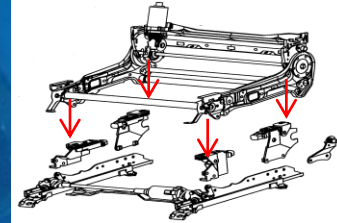
- Traditional
- Dual stage load limiters

Overview of Advanced Systems

- Air Bags
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Occupant Classification Systems

- Weight - Strain gage
- Pattern
- Pressure
- Buckle Switch
- Other



Overview of Advanced Systems

- Air Bags
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- **Pre-Crash**

Pre-Crash Sensing

2006 Lexus LS460
(2004 Crown Majesta in Japan)

Front Camera

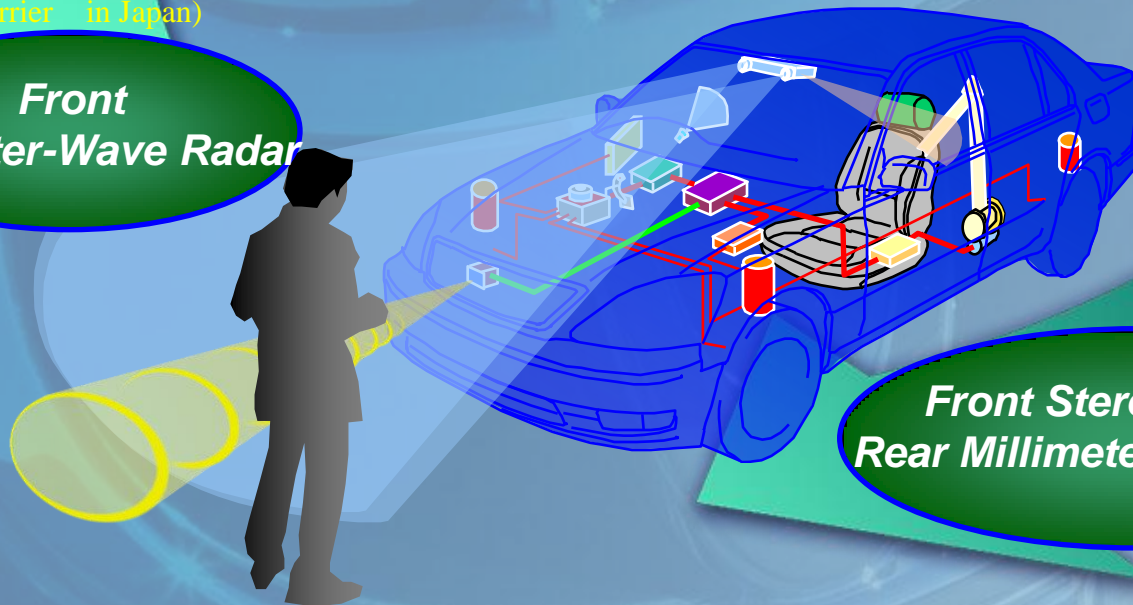
'08 Lexus LS460/600H
(2006 Lexus GS450h in Japan)

Driver Monitoring camera

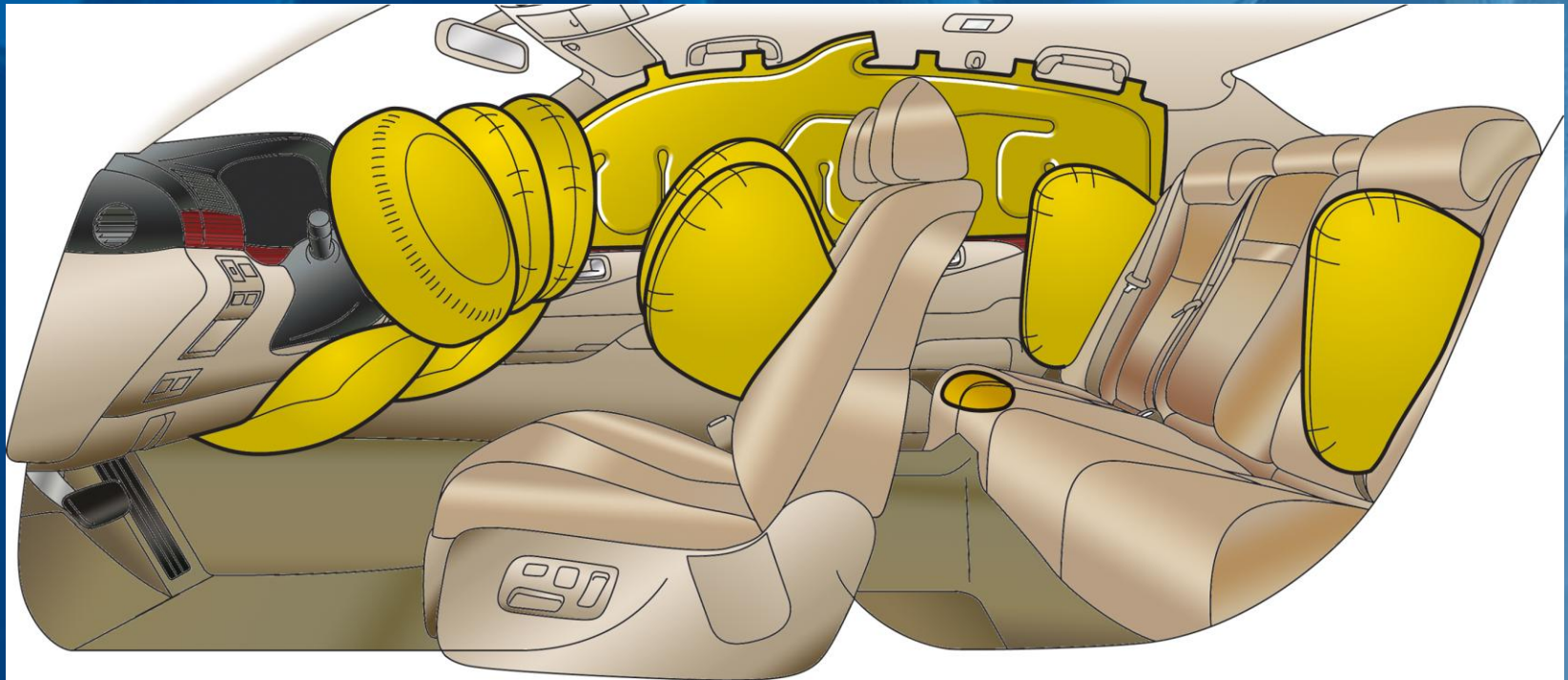
2004 Lexus LS430
(2003 Harrier in Japan)

Front Millimeter-Wave Radar

**Front Stereo Camera
Rear Millimeter-Wave Radar**



Summary



The background of the slide is a blue-tinted image of a car wheel with a Toyota logo. The wheel is centered and occupies most of the frame. The text is overlaid on the wheel.

Thank you.

Questions?