

Evaluation of Small Overlap / Oblique Test Procedures

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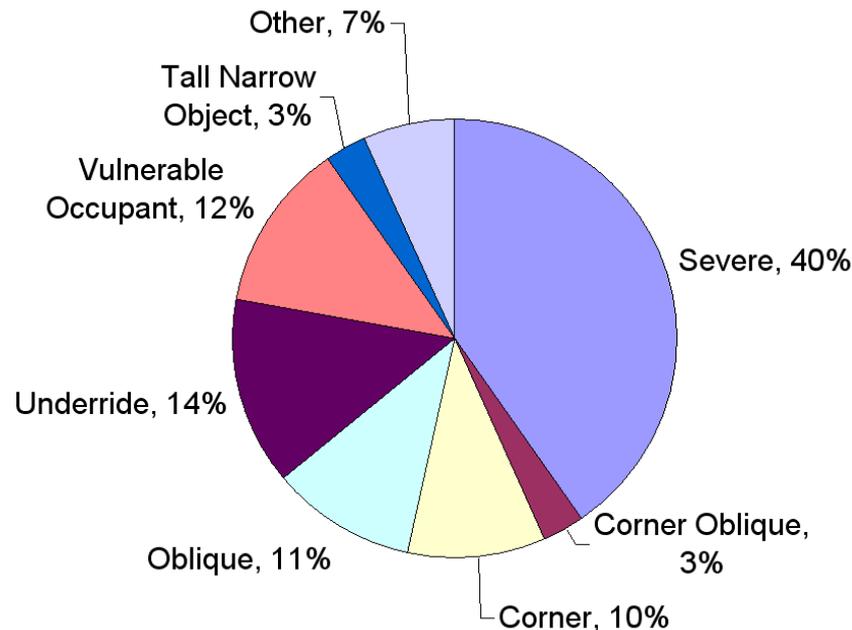


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Fatalities in Frontal Crashes Despite Seat Belts and Air Bags

□ 2000-2007 NASS fatalities for model year vehicles 2000+ where occupant was restrained



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Develop Test Procedures

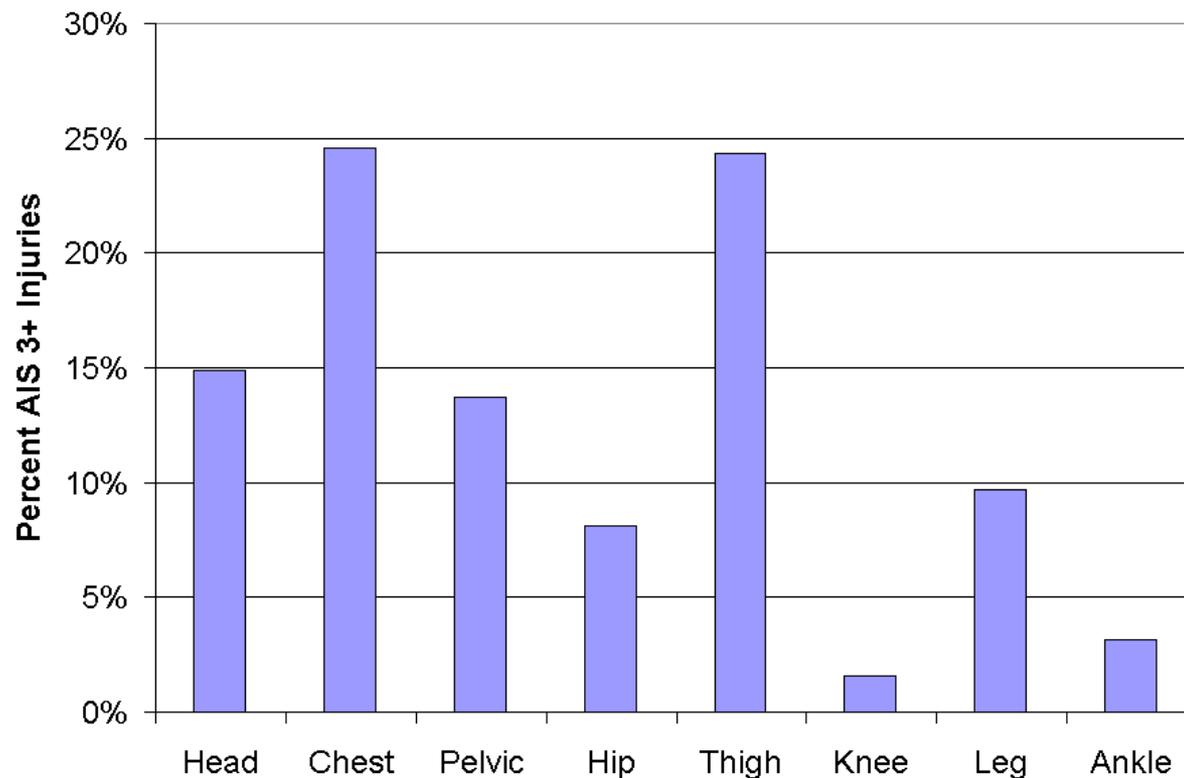
- Real world analysis
- Vehicle-to-Vehicle
- MDB-to-Vehicle
- Vehicle-to-Pole

NASS/CIREN Case Selection

- NASS/CDS 1997-2007, CIREN
- Frontal definition from Kuppa's ESV
- No rollover
- No fatalities
- Belted drivers
- AIS 3+ injury for the head, chest, and/or knee-thigh-hip (KTH)
- Vehicle model years 1998 and above

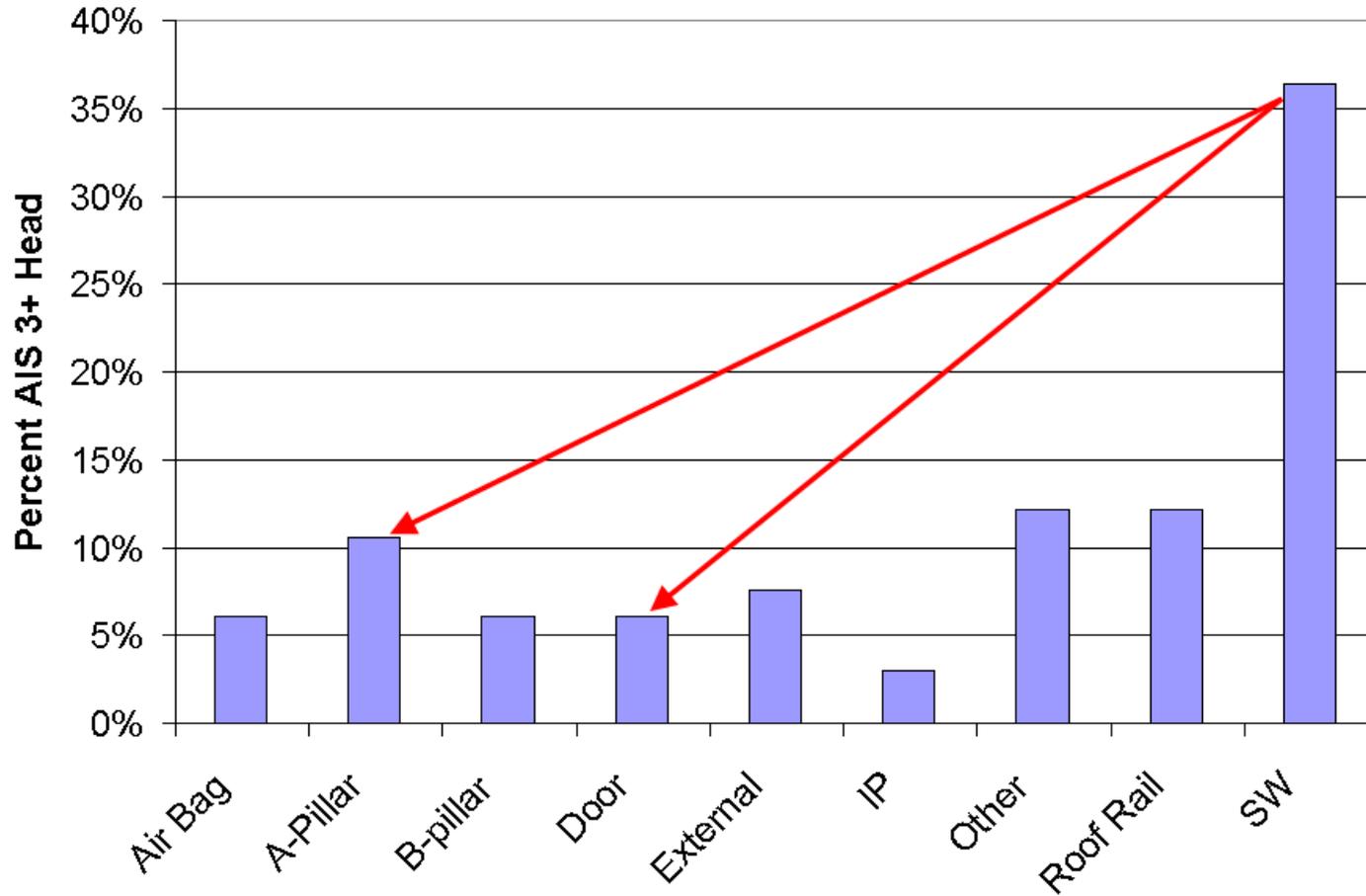
NASS/CIREN Case Reviews

Percent AIS 3+ Injuries by Body Region



211 cases with 444
AIS 3+ injuries

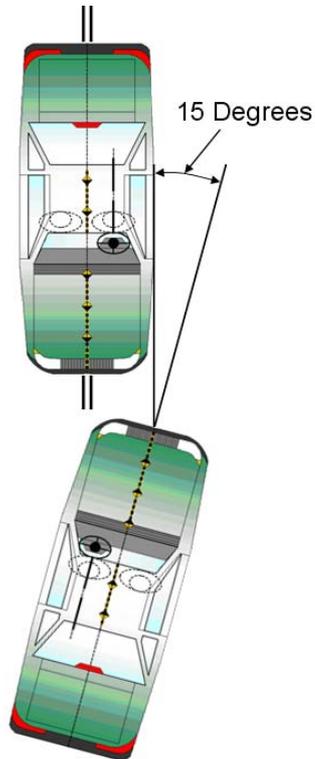
NASS/CIREN Head Injury Source



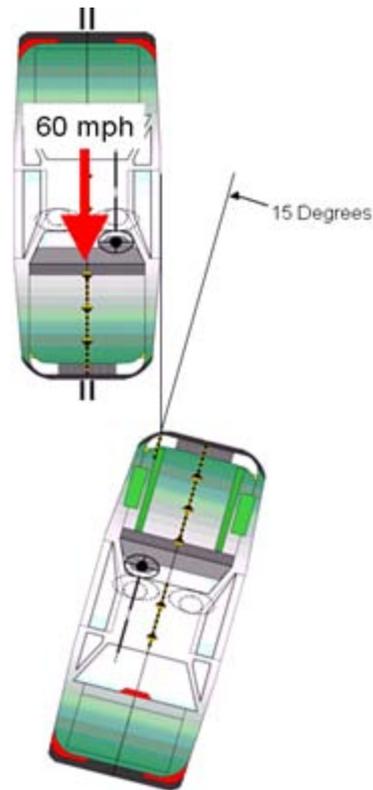
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Test Setup

50 percent overlap



Aligned with Structure



Thor-NT placed
in driver seat of
target vehicle

18 percent
overlap



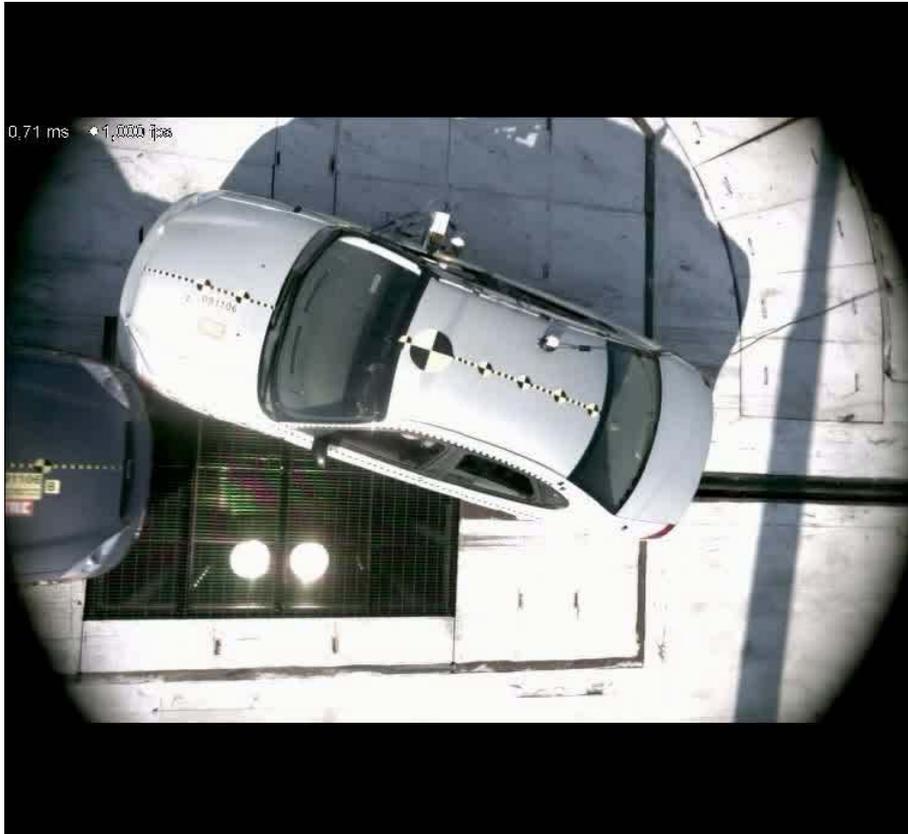
Test conditions determined from real-world analysis and modeling

50 Percent 07 Taurus-to-Taurus



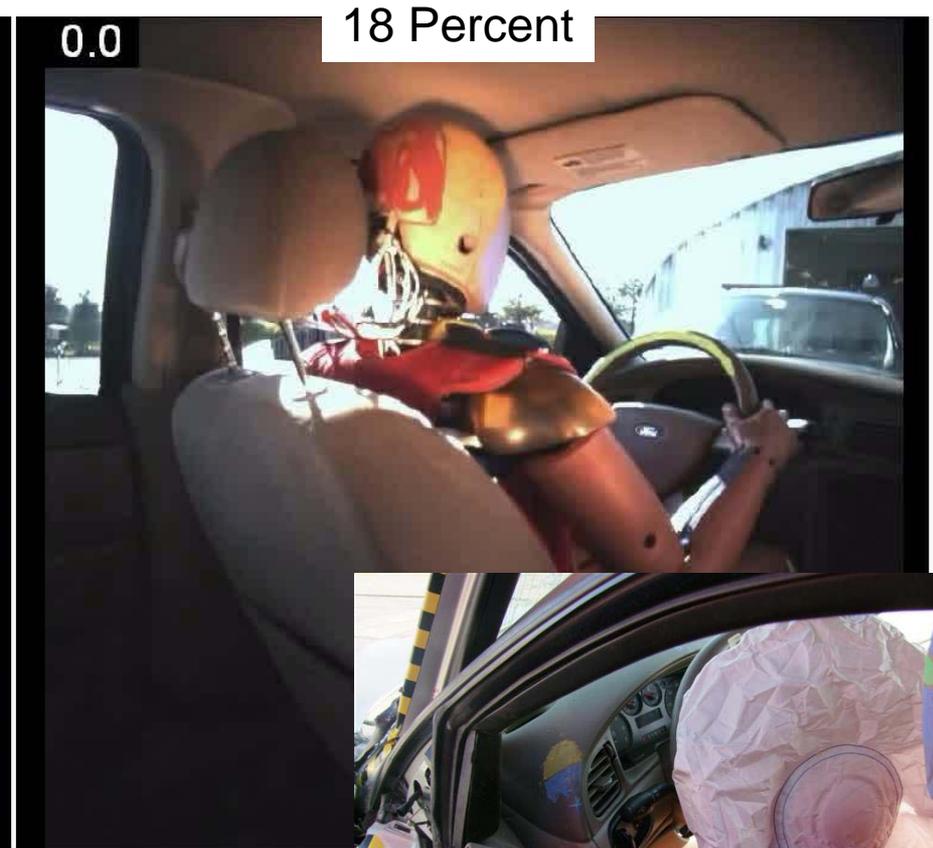
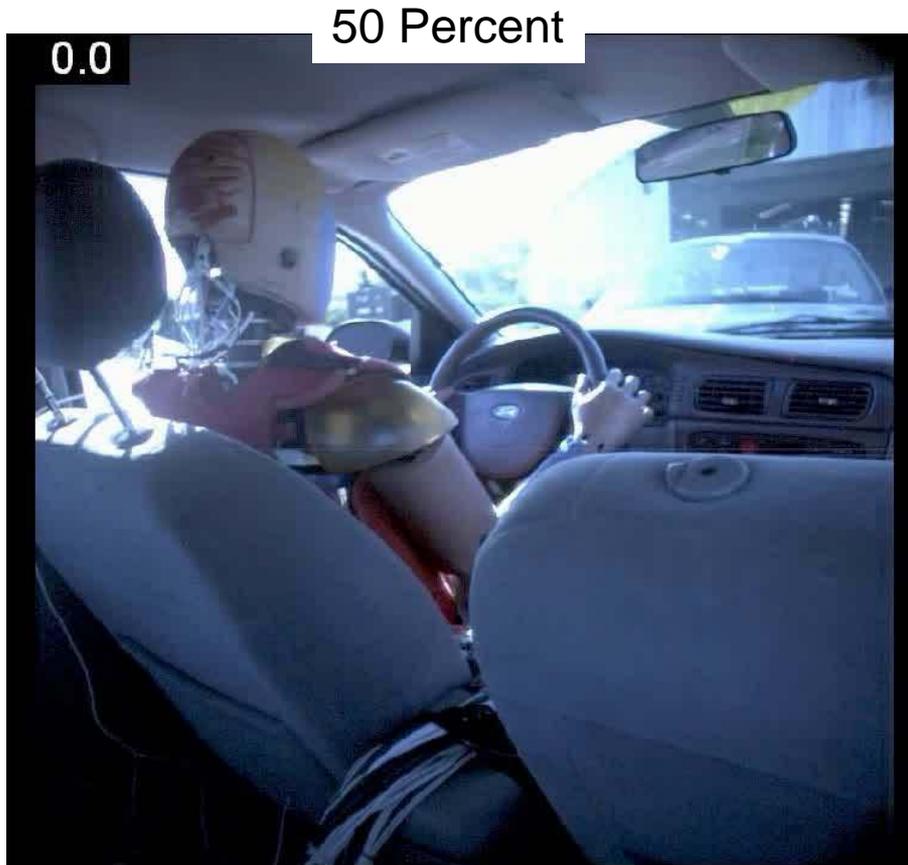
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18 Percent 07 Taurus-to-Taurus



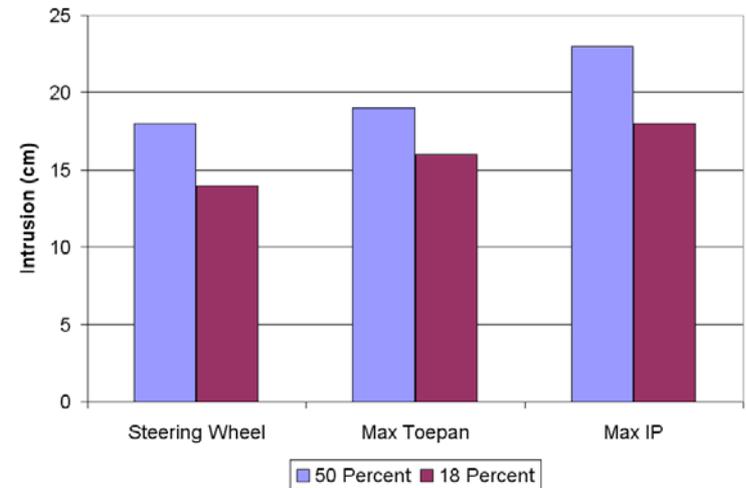
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Thor Kinematics Taurus-to-Taurus



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Taurus-to-Taurus Crush



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Real-World Examples



NASS ID 2002-11-068

2002 Concord into 1988 Jetta
84 yo, Male
Delta V: UN ; PDOF: 350
AIS 5 Head Injury
AIS 3 Femur



CIREN ID 781129518

2005 Taurus into 2007 Mercedes CLK
25 yo, 6', 180 lb, Male
Delta V: 71 kph ; PDOF: 0
AIS 4 Head Injury
AIS 3 Chest Injury
AIS 3 Femur

Conclusion Vehicle-to-Vehicle Tests

- ❑ Thor head contact similar to case reviews
 - A-pillar, door, or IP in all tests
- ❑ 50% overlap
 - Crush pattern similar to case reviews
- ❑ 18% crush pattern not as severe as fatal or injured NASS/CIREN cases due to interaction of the vehicles
 - Occupant Kinematics and intrusion in proper direction

Future Work

- ❑ Evaluation of the Thor data
- ❑ Possibility of evaluating of different barrier faces on a MDB
- ❑ Evaluating crabbed vehicle into pole or fixed structure

□ Test data will be on NHTSA public website
in spring