Evaluation of Extrication After Motor Vehicle Crash

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Goals of Extrication after Motor Vehicle Crash (MVC)

- Patient management
- Optimize / minimize time
- Rescue personnel safety

First Responders

“Golden Hour”

is the golden rule

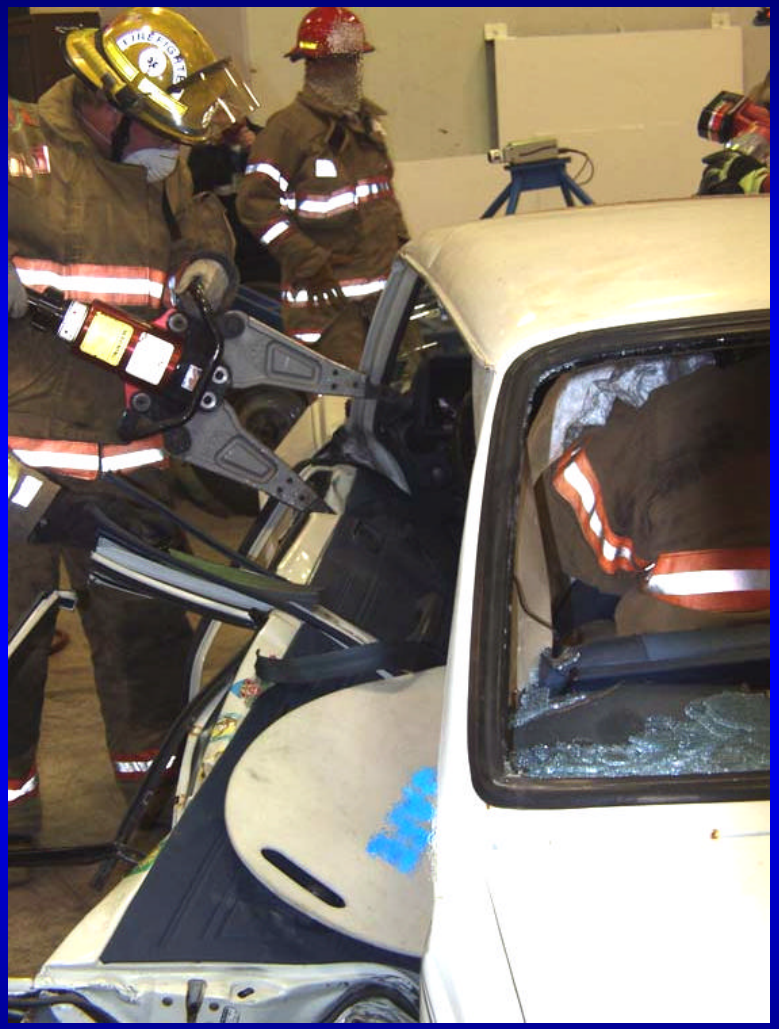
‘Sizing-up’ the scene

First Responders

Move or remove metal to release victim

Using hydraulic spreaders to open the doors

Extrication after MVC



Using hydraulic spreaders to do a ‘Noah’s Ark’ to open jammed doors

First Responders

Extricate as fast as possible

Removing the roof to facilitate placement on backboard

First Responders

Removal of patient from crashed vehicle

Positioning backboard

First Responders

“Prolonged” extrication is

> 20 minutes

Placing driver on backboard

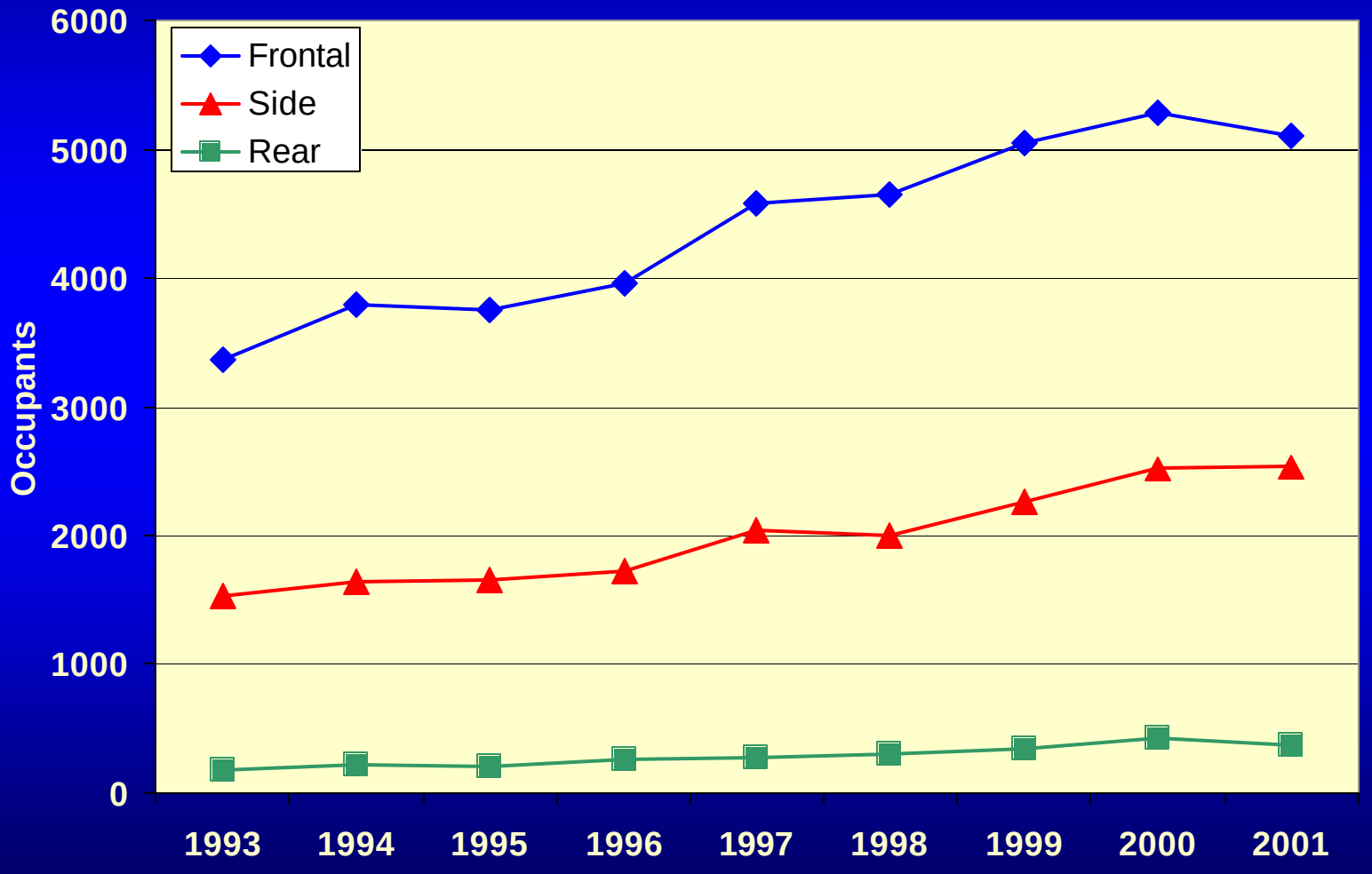
Questions for Study

- What crash characteristics are associated with need for extrication?
- What part of extrication procedure is associated with highest risk of secondary injury to the occupant?

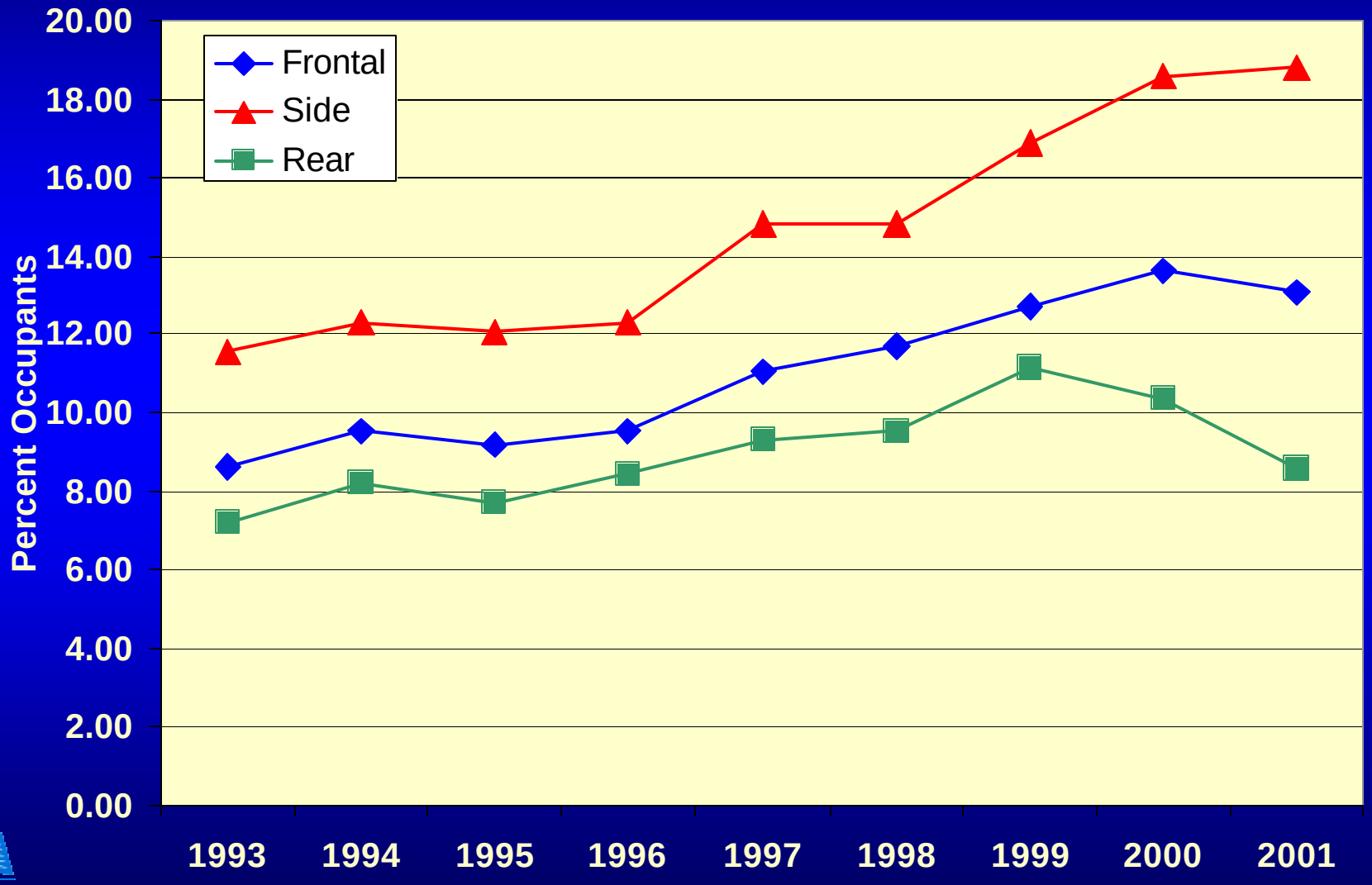
Methods

- Survey US DOT NHTSA databases
- Fatality Analysis Reporting System (FARS)
  - ➔ approx. 37,000 fatal crashes yearly
- National Automotive Sampling System (entrapment)
- Crash Injury Research and Engineering Network (CIREN)
- Conduct full-scale vehicle crash and extrication procedures with sensor monitoring

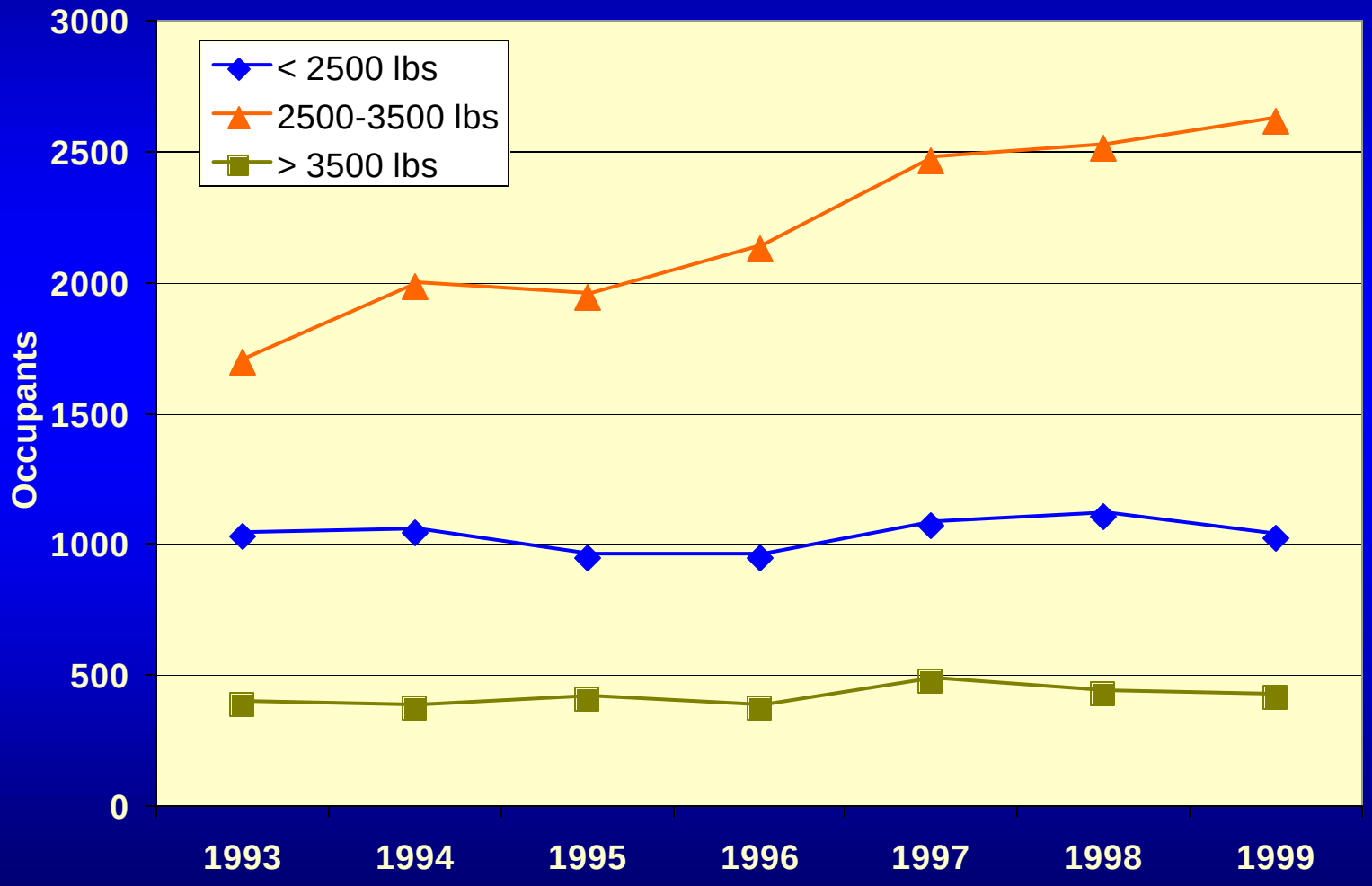
Total Extrications from Fatal Vehicle Crashes by PDOF, FARS data



Extrication Risk in Fatal Vehicle Crashes by PDOF, FARS data



Total Extrications from Fatal Vehicle Crashes by Car Vehicle Weight, FARS data



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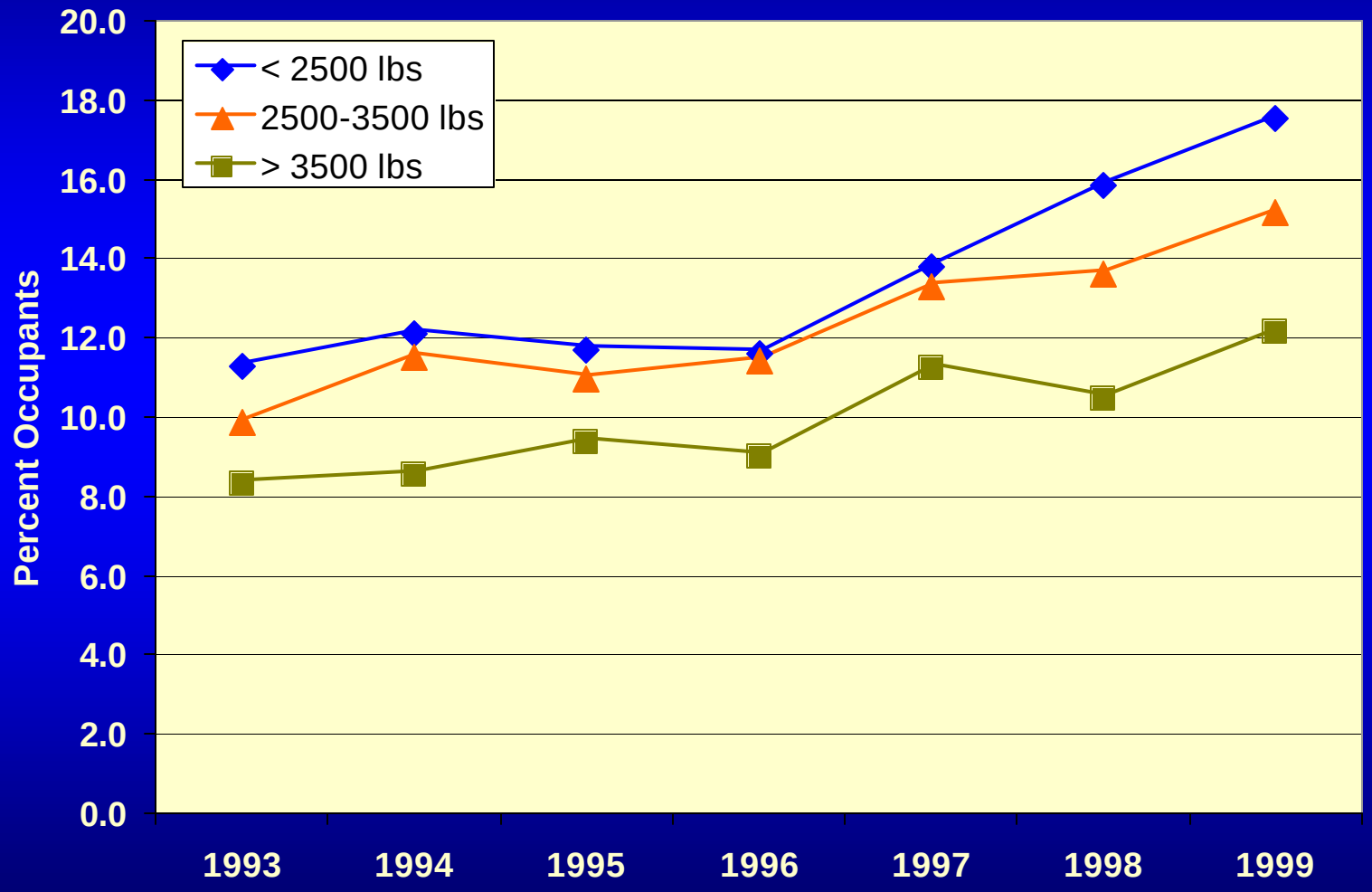
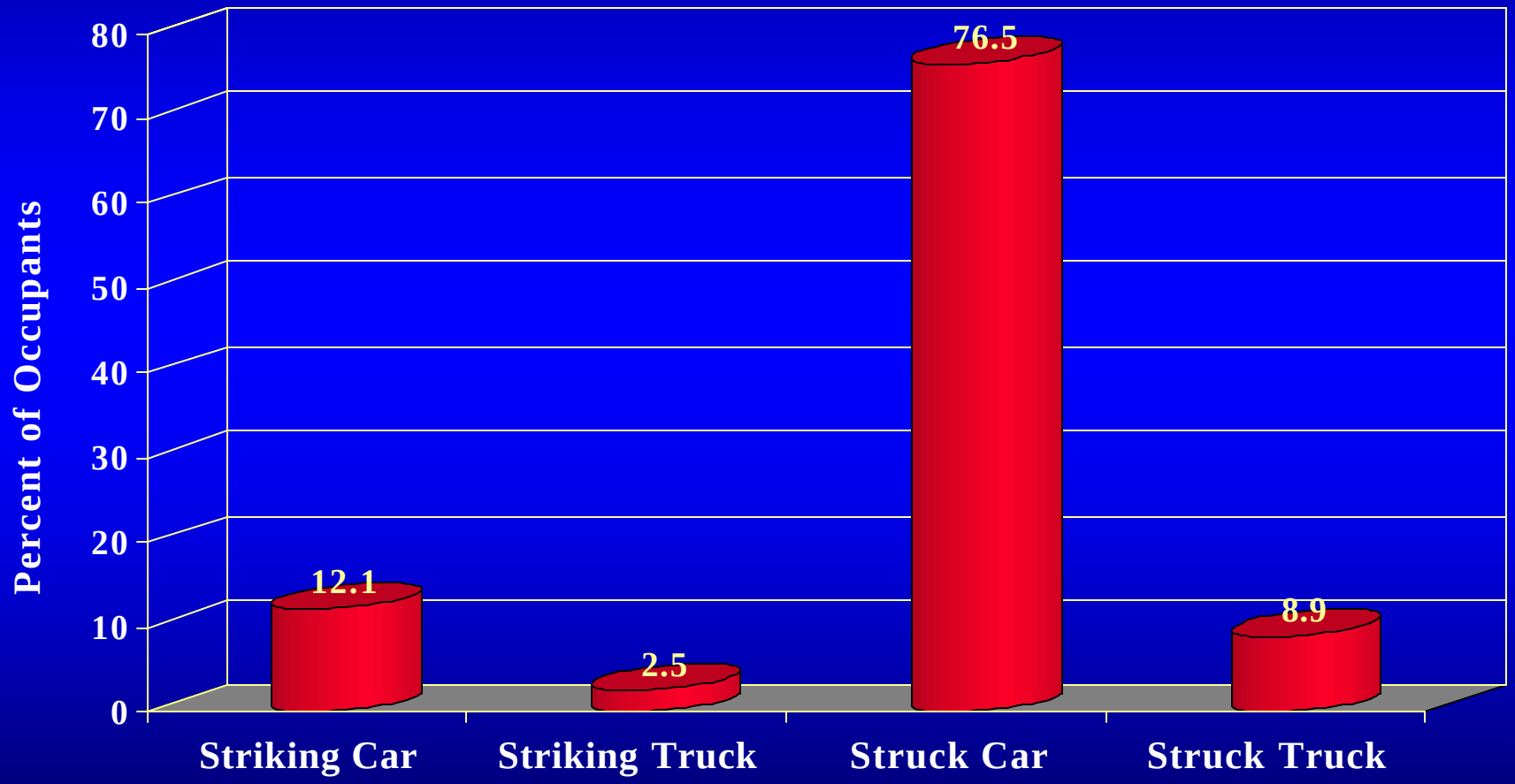
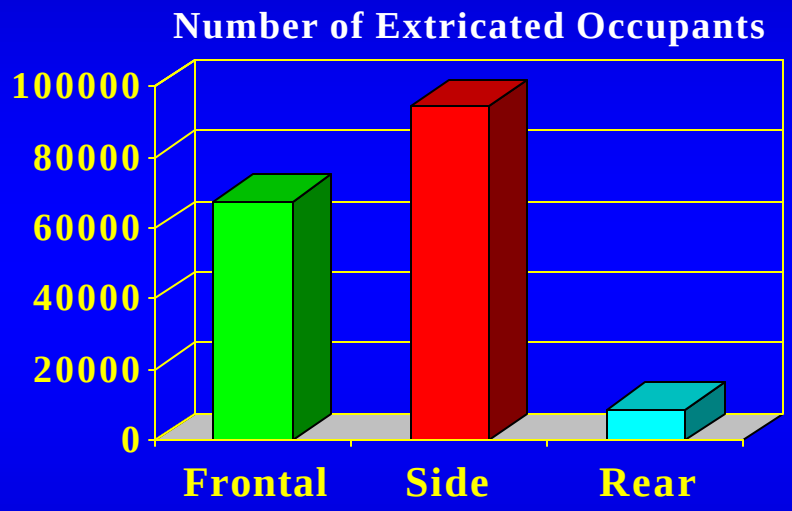
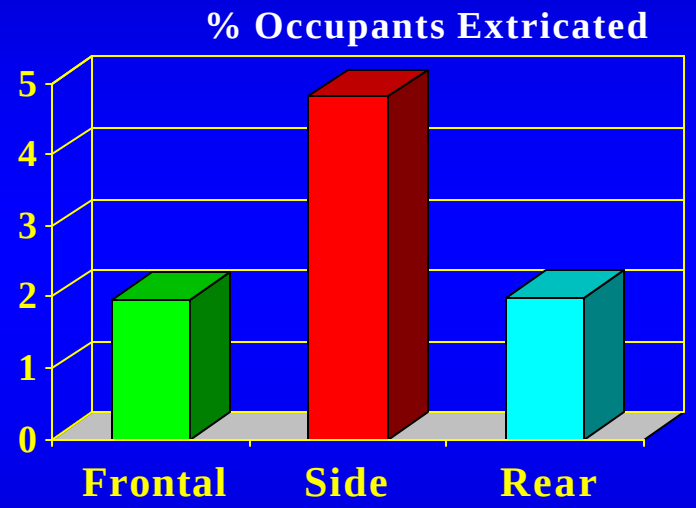


Extricated Occupants in Left-Side Crashes
FARS data '93-'99



Weighted 1993-2001 NASS Data on Extrication





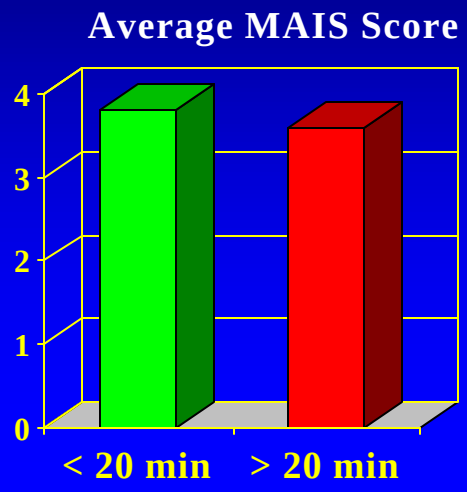
"Entrapment" variable – two vehicle crashes

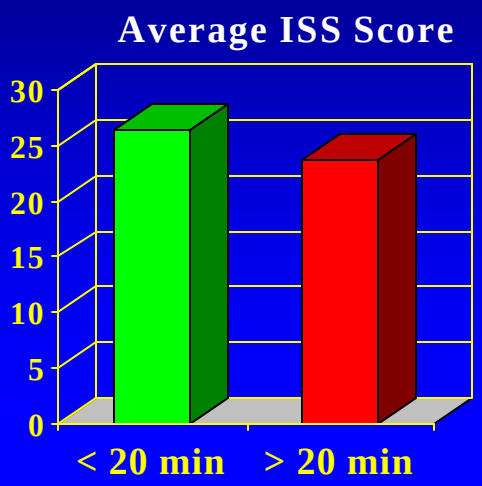
CIREN Database

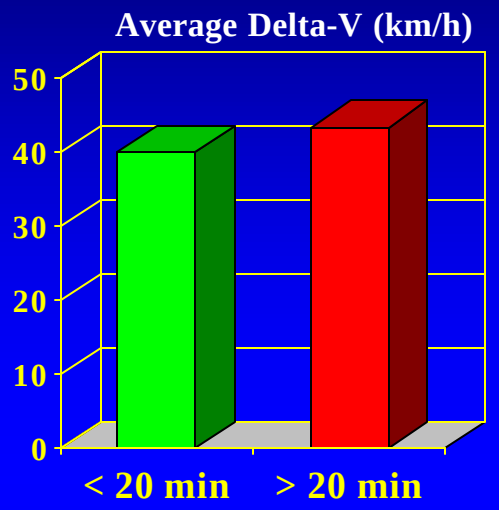
- Medical Data
  - EMS treatment
  - Surgical decisions
  - Recovery process
  - Follow-up
  - 250 entries
- Engineering Data
  - Crash reconstruction
  - Physics of occupants
  - Mechanics of injury
  - Vehicle causation
  - 600 entries

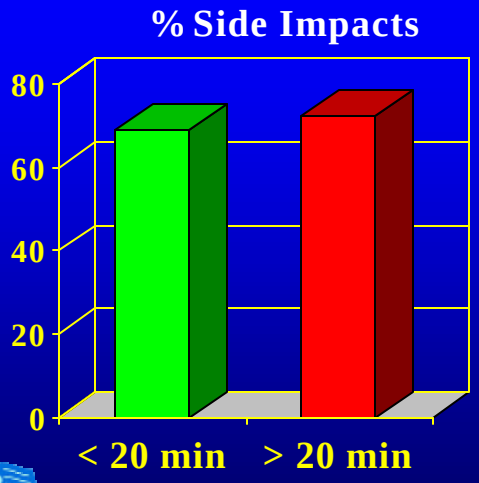
CIREN Data on Extrication

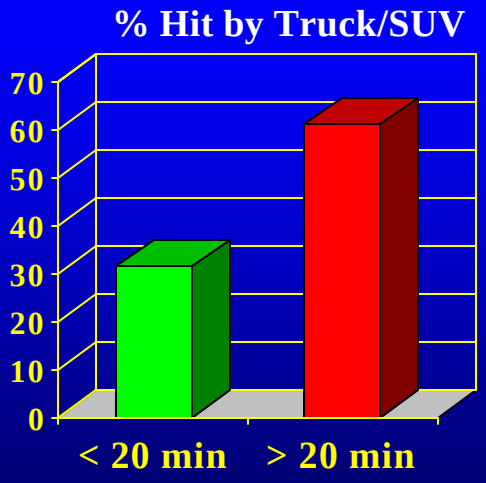
1996 to 2003

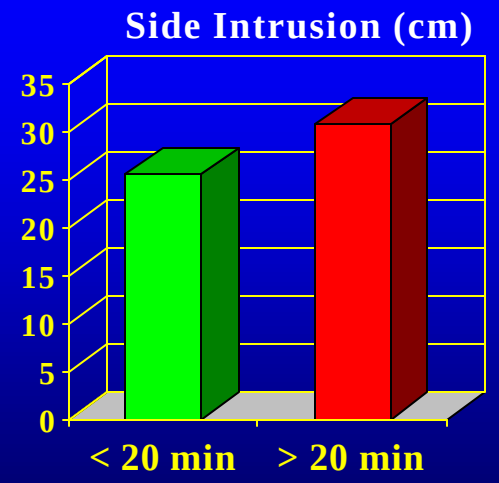




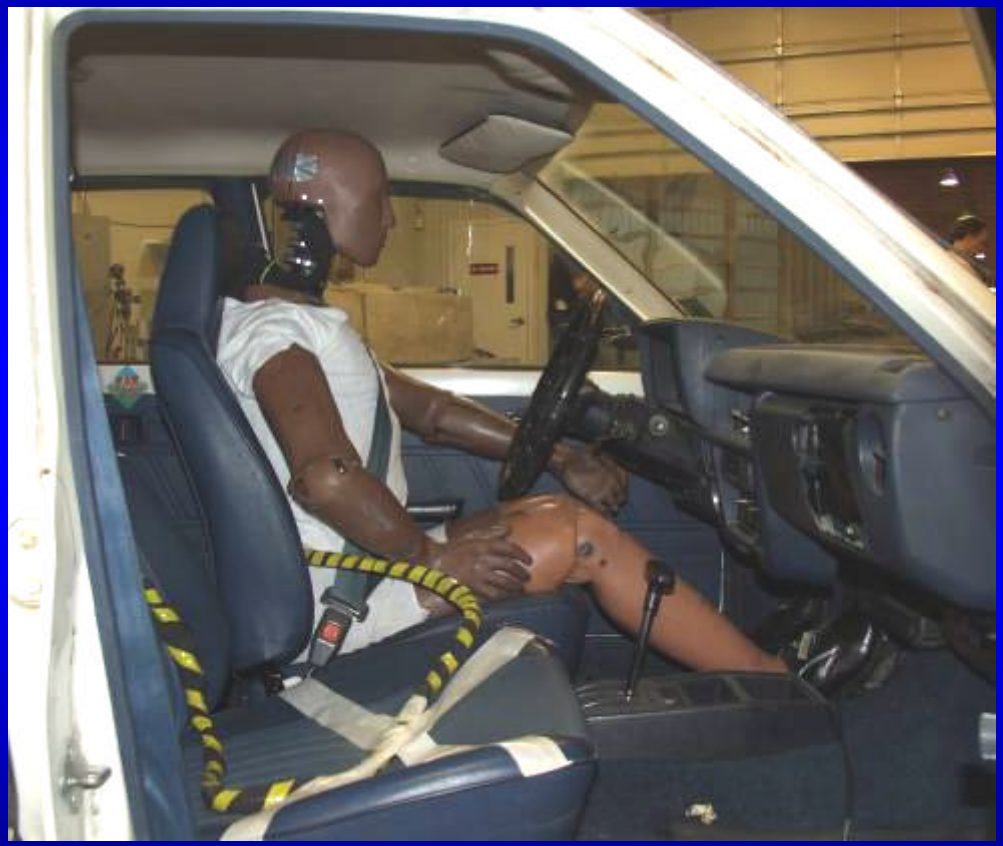


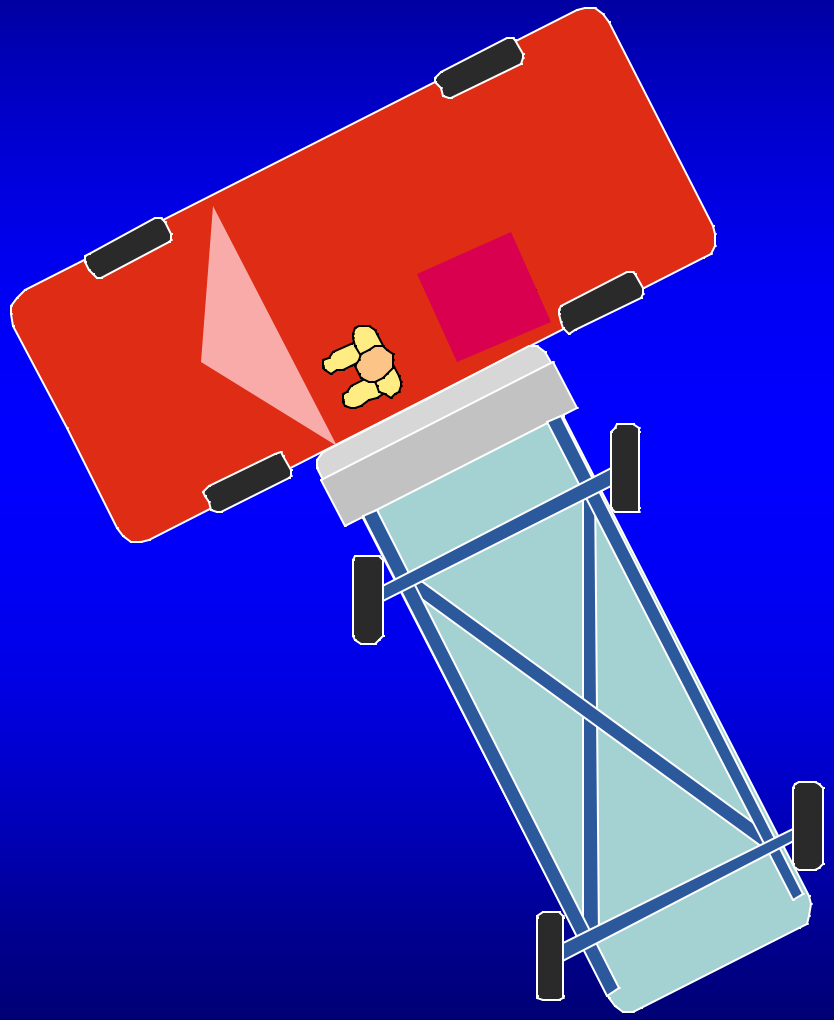




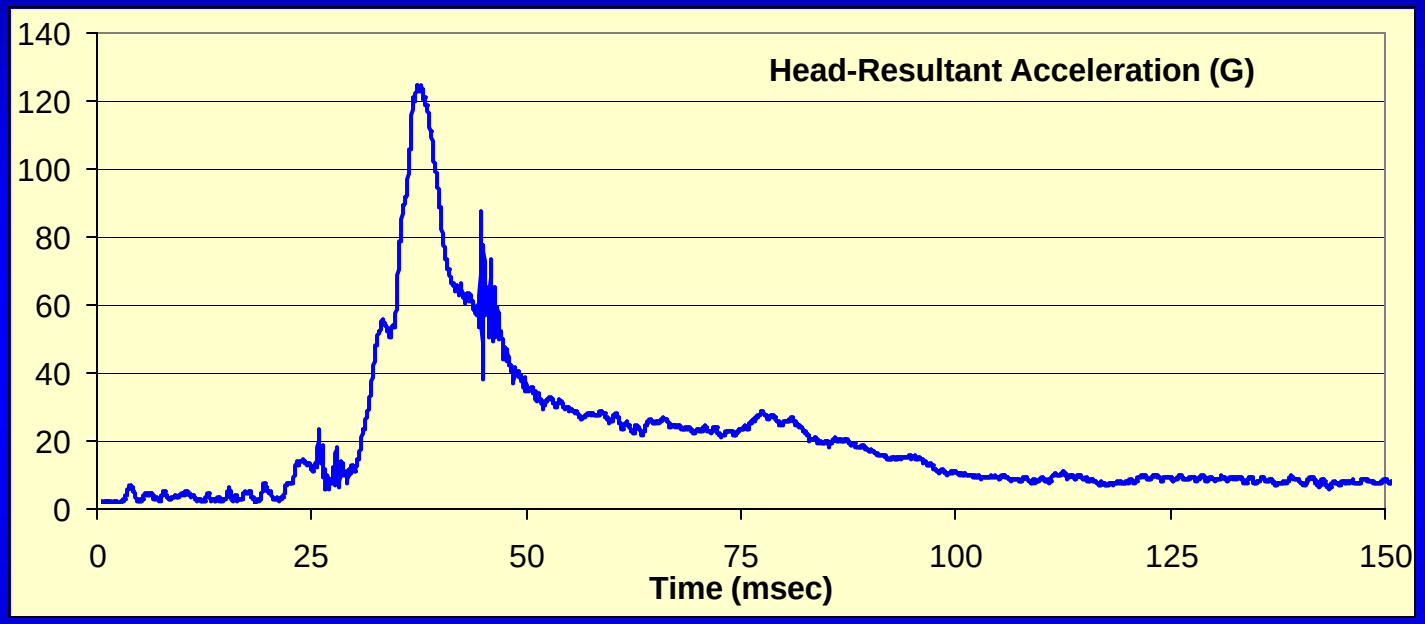


Full-Scale Vehicle Crash





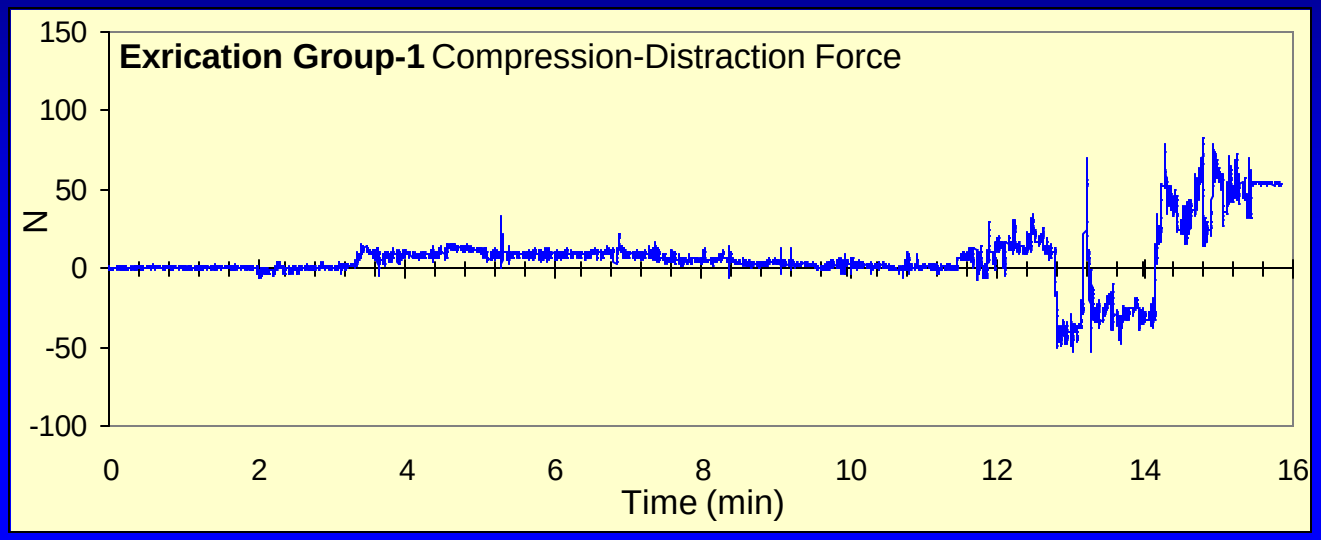
Side Impact Event Data

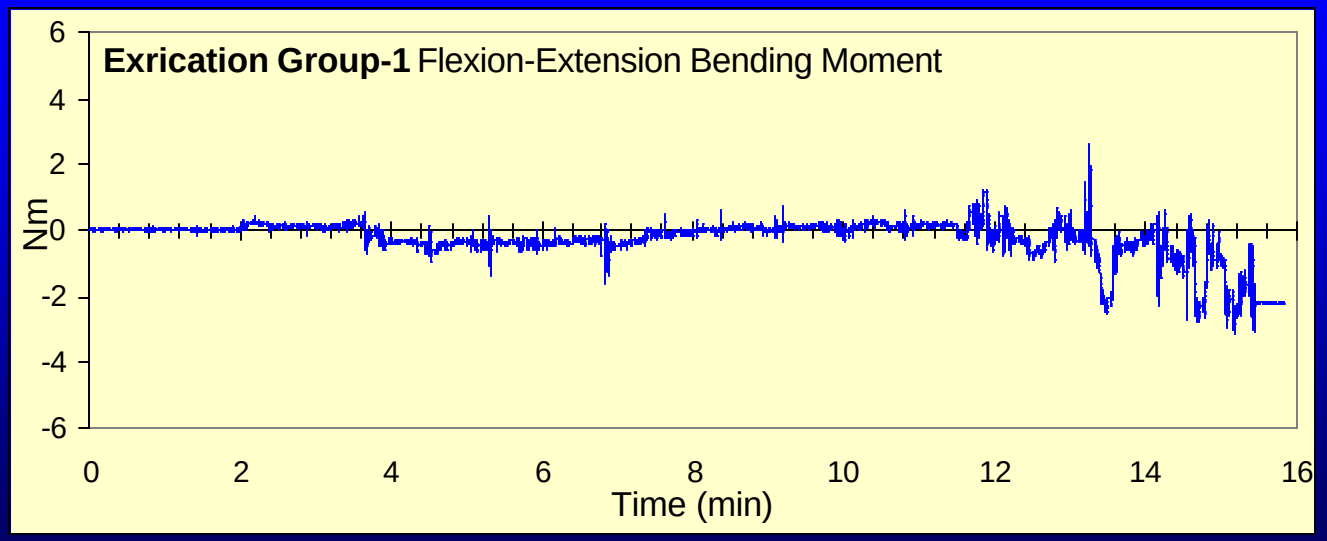


HIC = 698

Extrication Event Data

Upper Neck Load Cell





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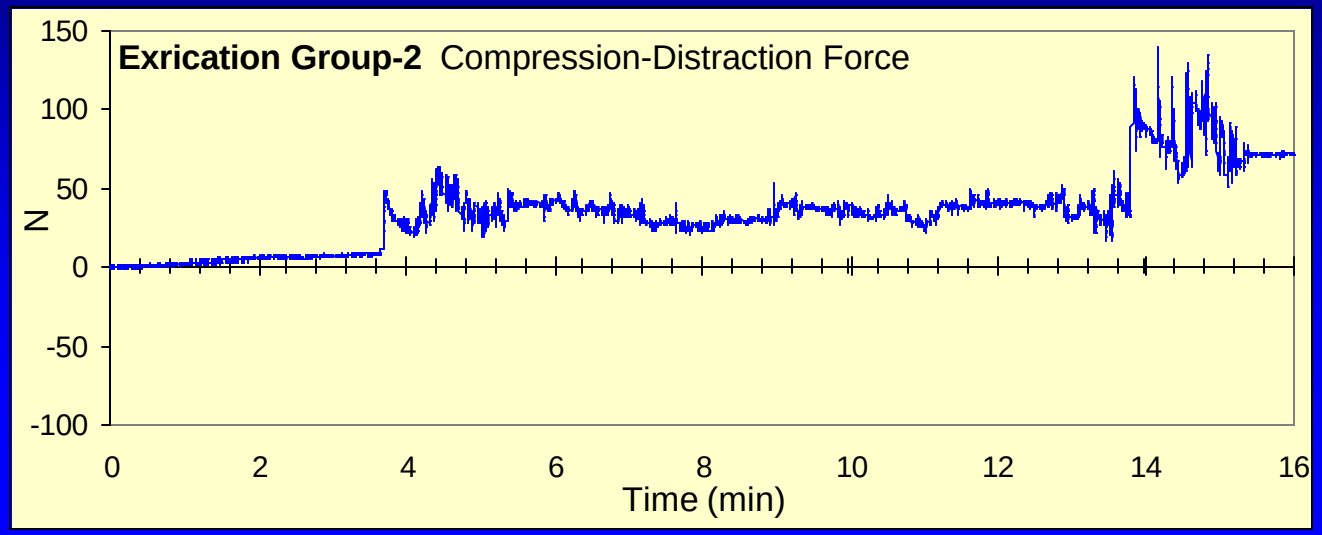

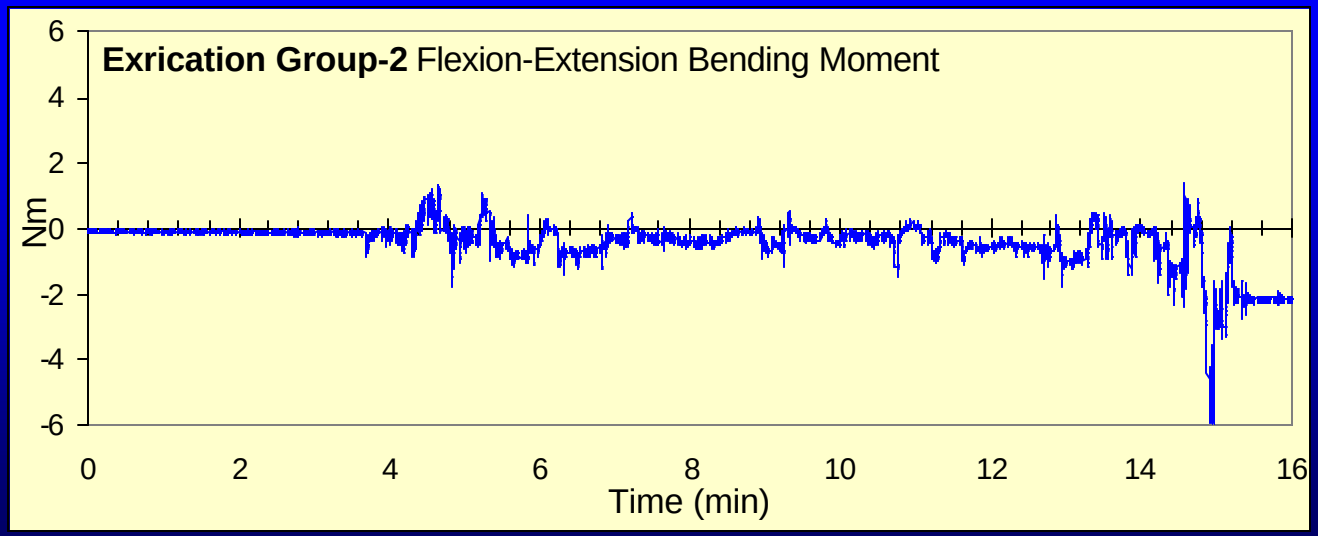

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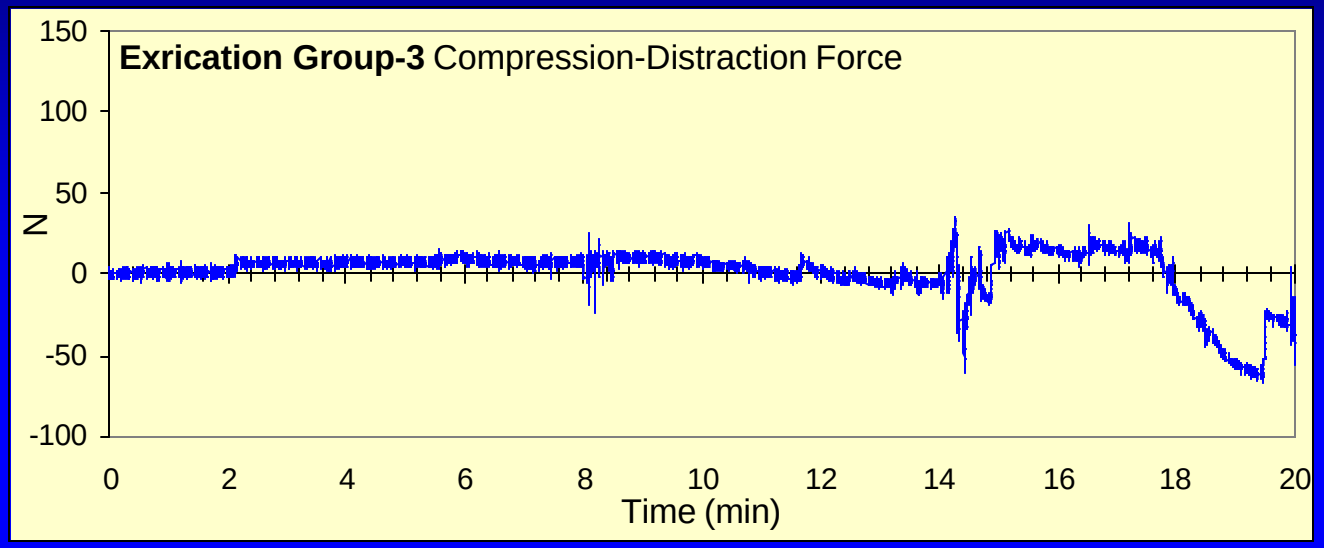

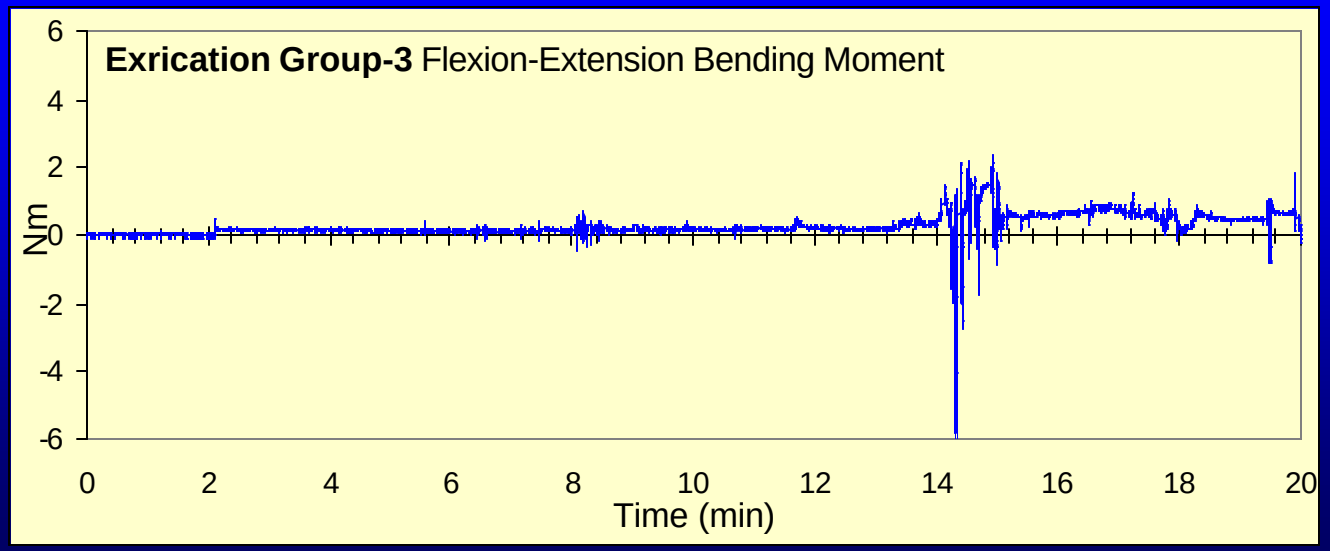

Extrication Protocol

- Incident Commander
- Team approach
- Task approach
- Inner and outer circles
- Multiple options for same task
- Power tools and hand tools

Optimize Extrication Procedures

Summary

- Extrications characterized by
  - ➔Increase over last several years
  - ➔High risk for side crashes
  - ➔Truck into car
  - ➔High risk for small cars
- Relatively low forces during actual occupant extrication procedures
- Variations exist by extent of team training

Acknowledgment

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