NHTSA Offset Frontal Program

Government/Industry Meeting
5/10/2007

James Saunders

Contents

- Objectives
- Lower extremity injuries
- Seating procedure
- Results of crash tests
- Injury mechanisms
- Observations

2

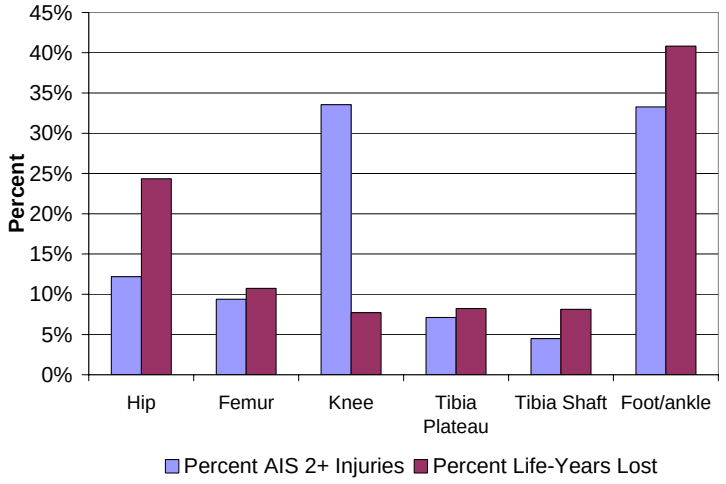
Objective

- Develop an objective test procedure to improve offset frontal crash performance
  - Reduce long term impairment, pain and suffering (especially lower extremities)
  - Reduce costs of recovery and rehabilitation

3

Lower Extremity Injuries in Frontal Crashes

(NASS/CDS 1993-1999)

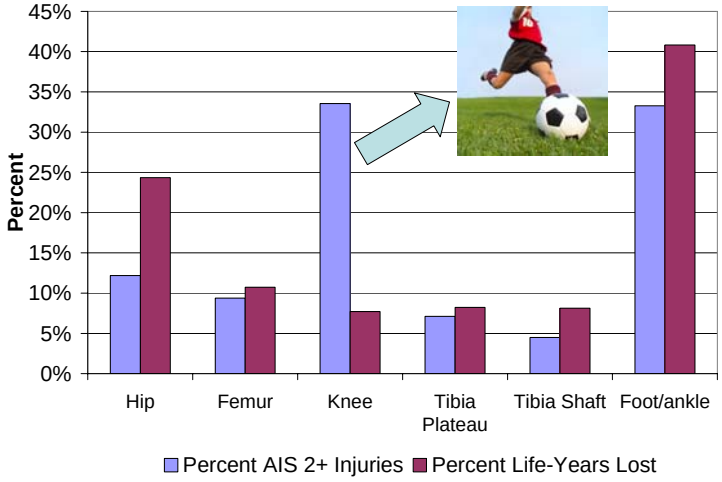


4

Kuppa et. al. ESV 2001

Lower Extremity Injuries in Frontal Crashes

(NASS/CDS 1993-1999)

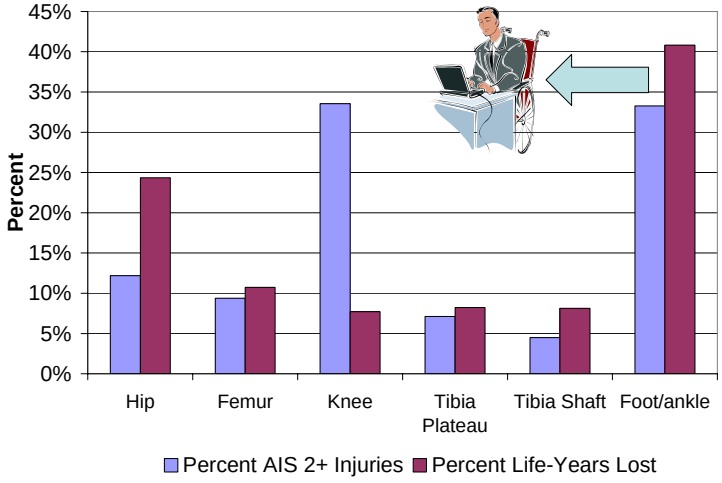


Kuppa et. al. ESV 2001

5

Lower Extremity Injuries in Frontal Crashes

(NASS/CDS 1993-1999)



Kuppa et. al. ESV 2001

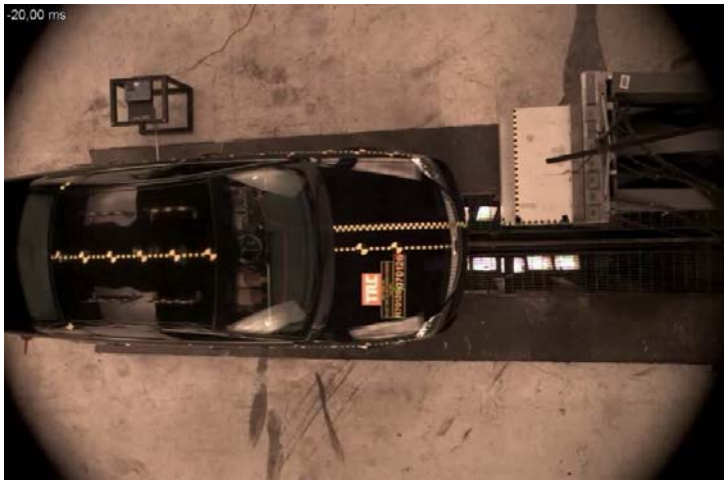
6

Seating Procedure

- 50th Male HIII seating procedure with Thor-Lx lower leg - completed
  - Driver
    - Right foot on accelerator pedal
    - Left foot placed symmetrically to the right foot
    - Left foot clear of brake/clutch pedal or foot-well wall
    - Both feet in neutral position (Lx legs)
  - Passenger
    - Both feet full forward on/near toe-pan
    - Both feet neutral
- 5th Female HIII seating procedure with Thor-FLx lower leg is being developed

7

Offset Test Procedure



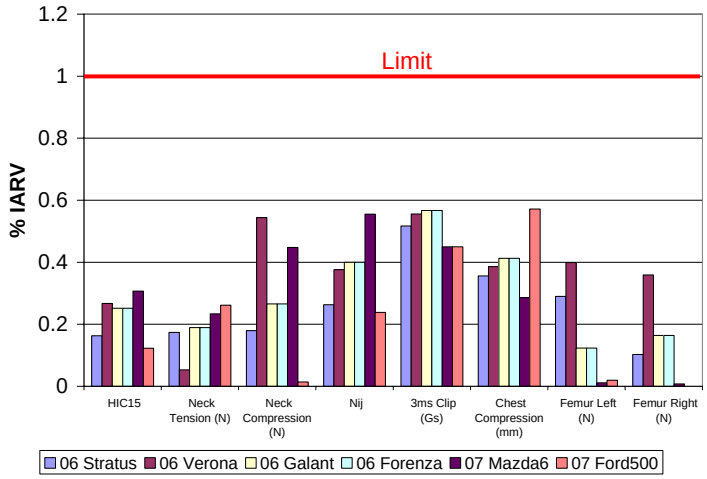
8

Injury Assessment Reference Values (IARVs)

	Injury Criteria	IARV
FMVSS No. 208	HIC 15	700
	Nij	1.0
	Neck tension	4170 N
	Neck compression	4000 N
	Clip 3ms	60
	Chest compression	63 mm
	Femur load	10008 N
New below the knee	Upper tibia axial force	5600 N
	Lower tibia axial force	5200 N
	Upper tibia index	0.91
	Lower tibia index	0.91
	Dorsiflexion	35 degrees
	Inversion/eversion	35 degrees

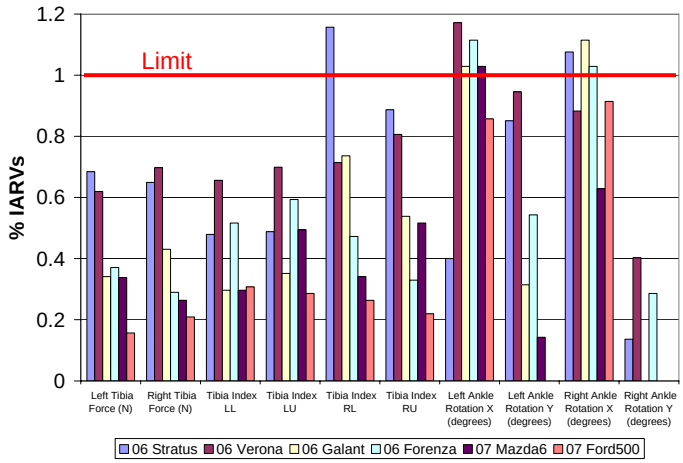
9

208 Injury Assessment Values (% IARVs)



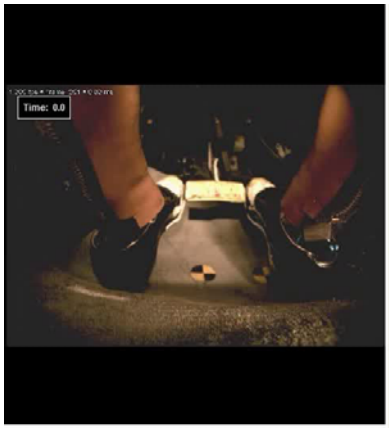
10

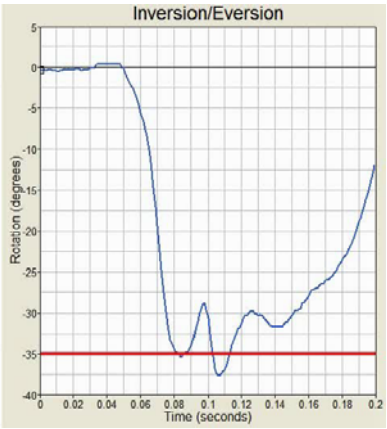
Below the Knee % IARVs



11

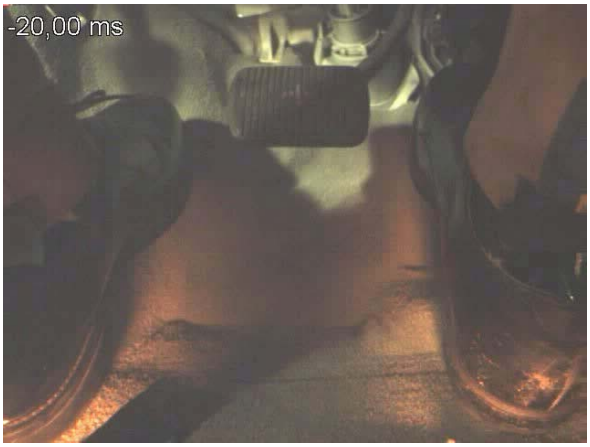
Dodge Stratus
(Right Foot)





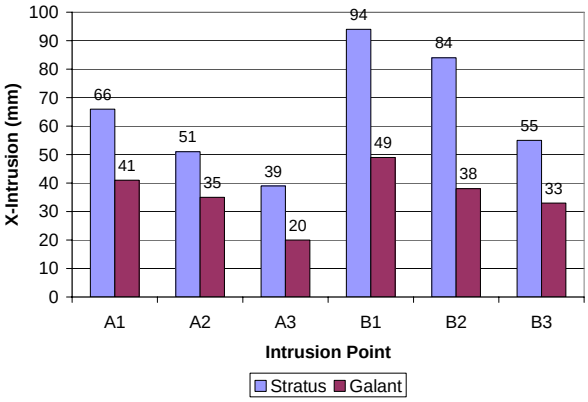
12

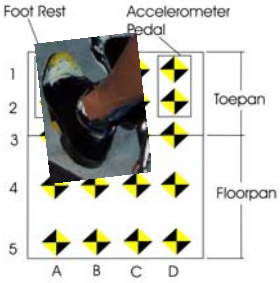
Ford 500



13

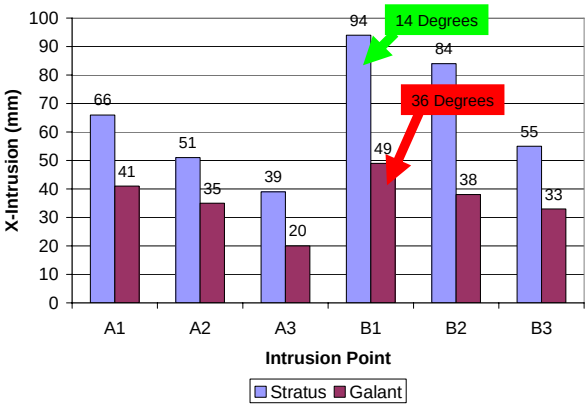
Effects on Intrusion on Inversion/Eversion

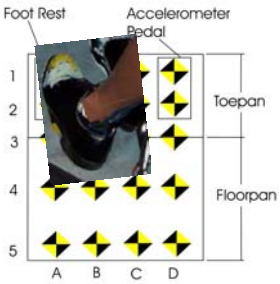




14

Effects on Intrusion on Inversion/Eversion





15

Effect of Geometry on Inversion/Eversion

(Left Foot)

(a)

(b)

06 Stratus
Inversion/Eversion = 14 degress

07 Ford500
Inversion/Eversion = 30 degress

16

Observations

- Inversion/eversion IARV exceeded in 5/6 tests
- Thor-Lx/HIII kinematics similar to the ankle data taken
- Due to variability in the toepan response the exact mechanism for the ankle IARV exceeded inversion/eversion IARV could not be determined – future research is needed
  - Measurements of the toepan
  - Accelerometers on the toepan

17

Thank You

18