Utilizing Large Truck Crash Causation Data to Assess Countermeasure Effectiveness

Presented at the
SAE Government/Industry Meeting, May 2008

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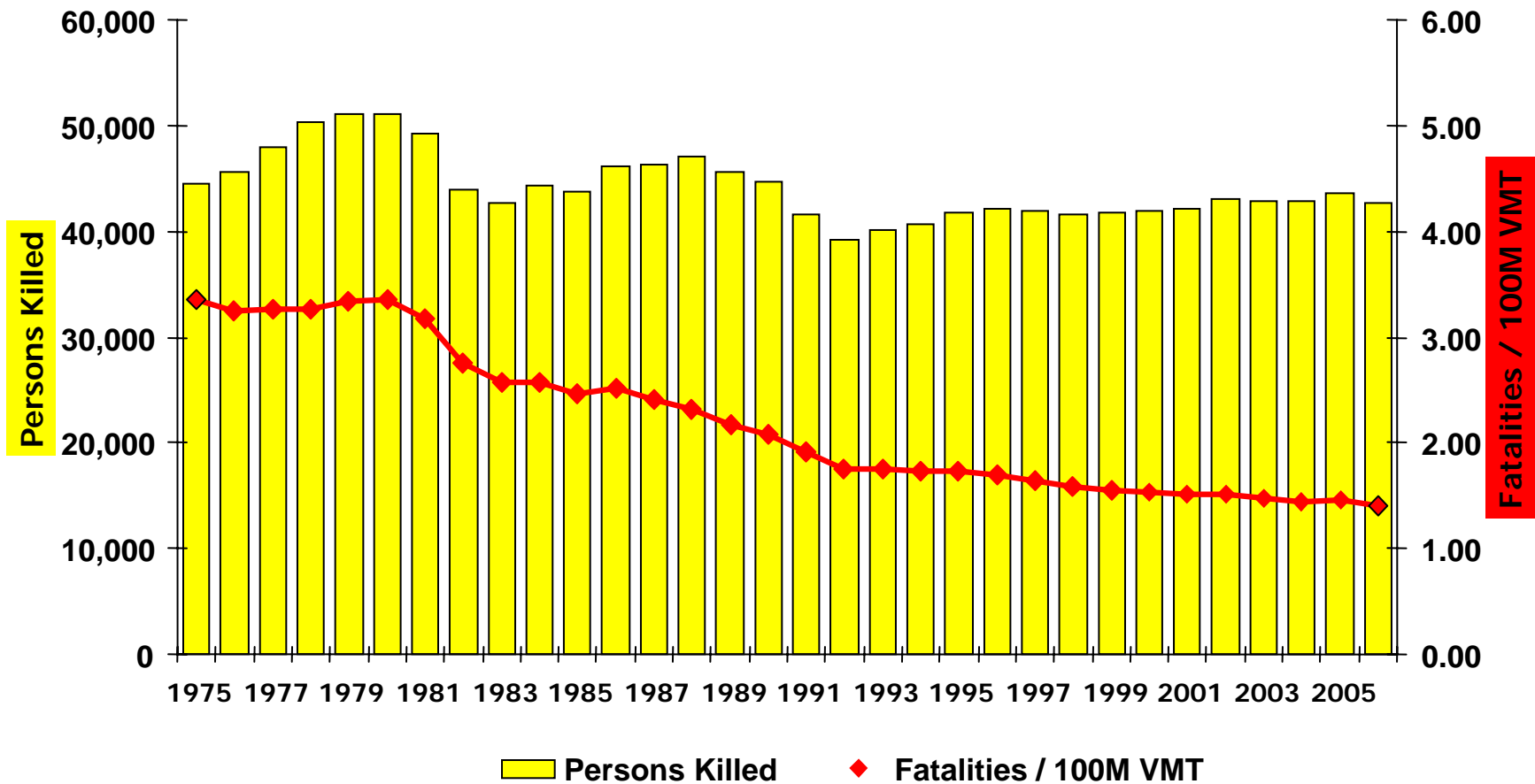Engineer, Vehicle Safety Research

Outline

- **Define the Crash Problem**

- **Discuss Countermeasures**

- **Crash Causation Philosophies**

- **LTCCS Methodology**

- **LTCCS Analysis**

- **Case Examples**

- **Where to Go from Here**
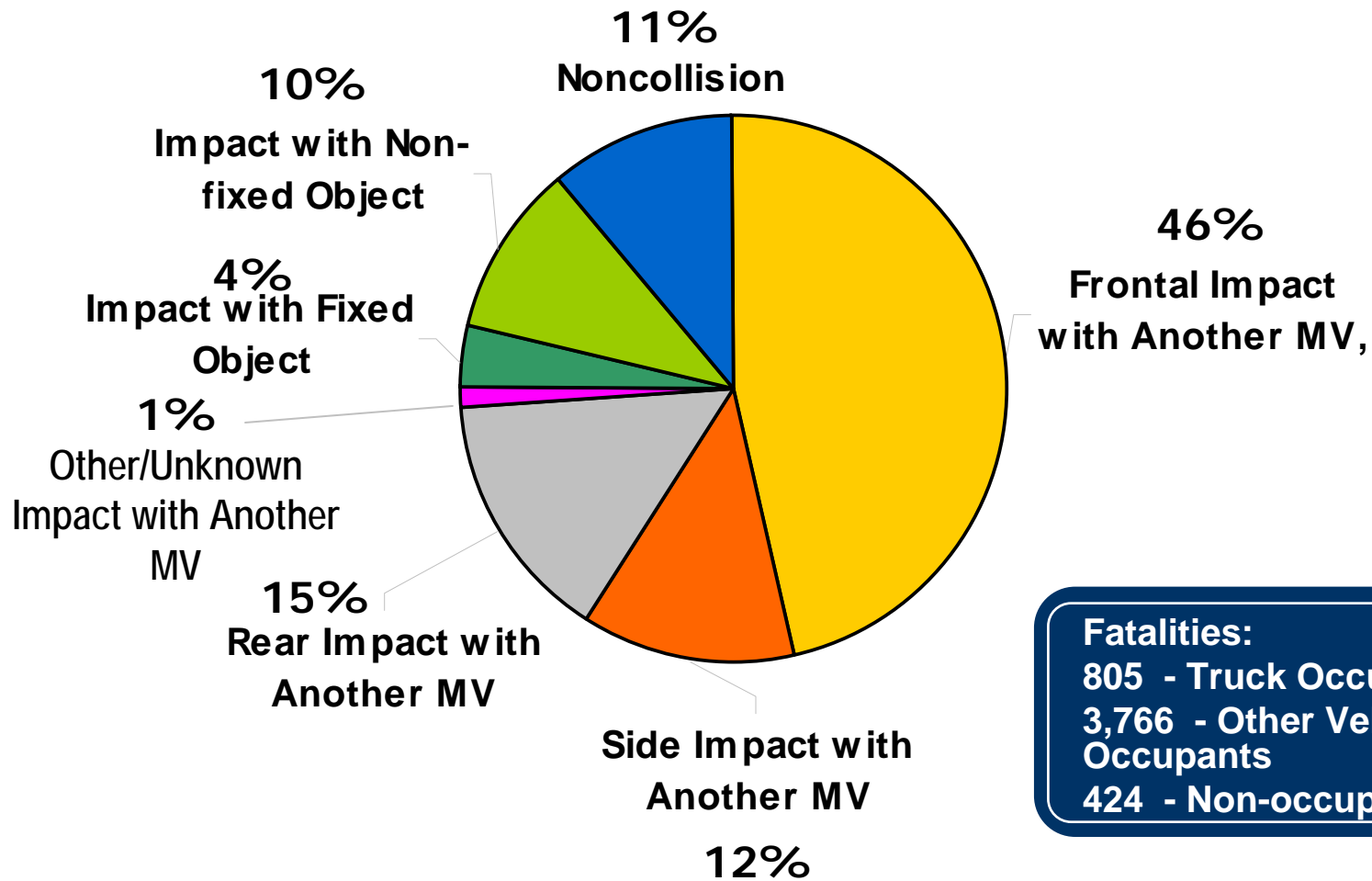
Persons Killed and Rate

Source: FARS and FHWA

Heavy Truck Fatalities
2006 FARS

NHTSA
www.nhtsa.gov

11%
Noncollision

10%
Impact with Non-fixed Object

4%
Impact with Fixed Object

1%
Other/Unknown Impact with Another MV

15%
Rear Impact with Another MV

Side Impact with Another MV

12%

46%
Frontal Impact with Another MV,

Fatalities:
805 - Truck Occupants
3,766 - Other Vehicle Occupants
424 - Non-occupants

Crash Prevention
What Can Advanced Technologies Do to Help Prevent Crashes?

- **Augment Driver Performance**
  - Forward Collision Warning
  - Automatic Braking
  - Drowsy-driver monitoring
  - Vision Enhancement (Night Vision)
  - Lane Departure Warning

- **Augment Vehicle Performance**
  - Intervene when driver action would be insufficient to prevent a crash (Stability Control Systems - ESC and RSC)

- **Augment Other Vehicle Systems**
  - Vehicle to vehicle communications

NHTSA's Role

- **Continue to Encourage the Refinement and Integration of Advanced Technologies**

- **Evaluate Technology Effectiveness**

- **Set Minimum Performance Criteria**

- **Educate Consumers**

- **Encourage the Market Where Appropriate**

- **Regulate Where Appropriate**

Crash Causal Factors

Vehicle Related
2%

Driver Related
Factors
90%

Road
Surface
8%
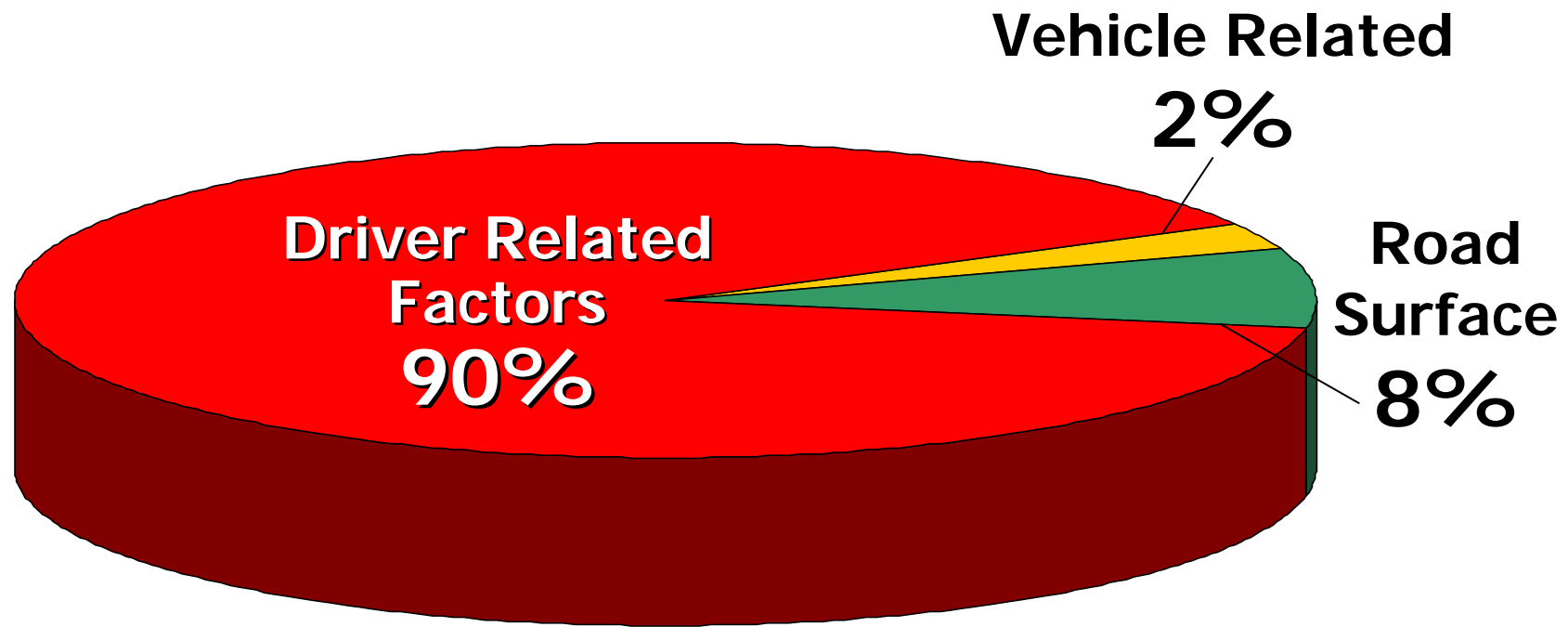
Source: Syntheses Report: Examination of Target Vehicular Crashes and Potential ITS Countermeasures, Wassim Najm, et al, DOT HS 808 263, 1995, Section 3

Crash Causation

- **Too Fast for Curve**

- **Decreasing Radius**

- **Negative Superelevation**

- **Cargo Shift**

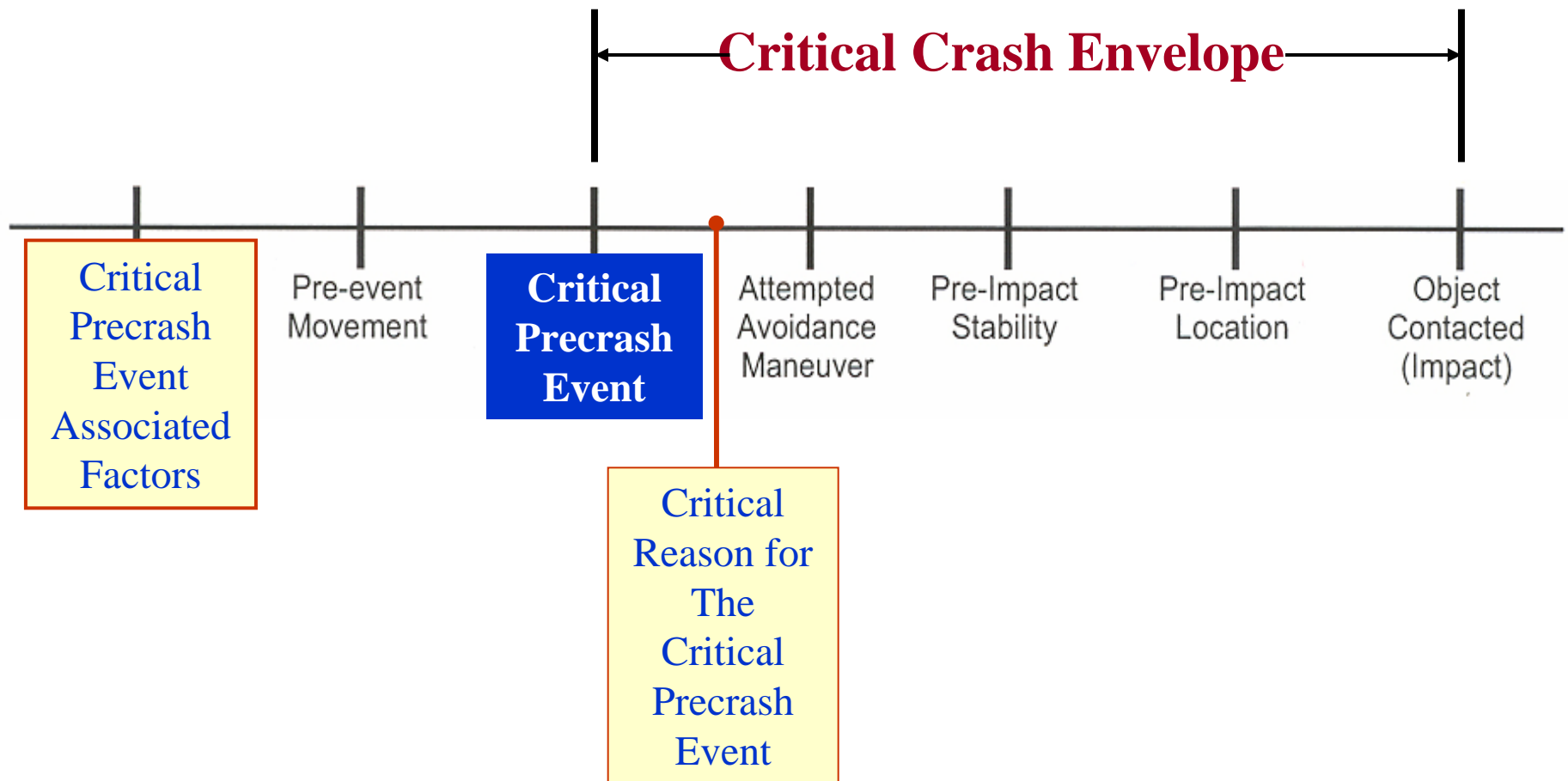- **Defective Leaf Spring Assembly**

Crash Causation

- **Network of Causes**

- **Perchonok's Accident Cause Analysis**
  - Systematic framework of crash factors
  - Interrelated events and conditions

- **Clinical Method**

- **Relative Risk Analysis**

LTCCS Philosophy and Methodology

- **1070 Heavy Vehicle Crashes**

- **Capture all Contributing Factors**

- **On-Scene Investigations**

- **Data Collected**
  - Interviews
  - Vehicle Inspections
 - Scene Documentation

Crash Assessment

Critical Crash Envelope

| Critical Precrash Event Associated Factors | Pre-event Movement | **Critical Precrash Event** | Attempted Avoidance Maneuver | Pre-Impact Stability | Pre-Impact Location | Object Contacted (Impact) |

Critical Reason for The Critical Precrash Event

Why Did We Collect LTCCS Data?

- **To Determine Cause (As in Fault)?**

- **Who Caused the LTCCS Crashes?**
  - Critical Reason was assigned to the passenger vehicle in 56% of the truck vs. light vehicle crashes

Critical Reason <> Cause
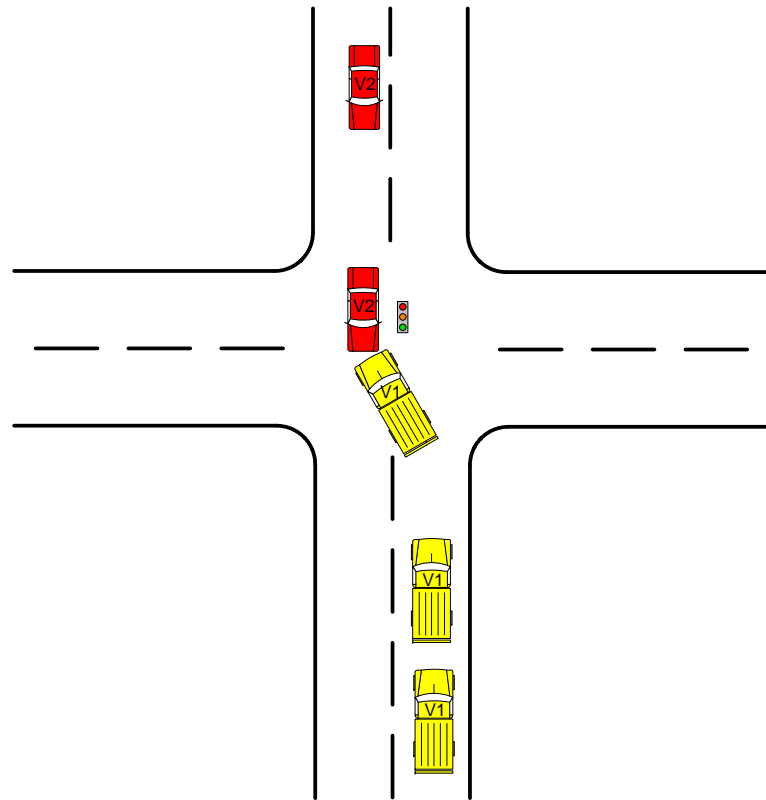
Culpability plays <u>NO</u> role in determining the critical precrash event

Why Did We Collect LTCCS Data?

NHTSA
www.nhtsa.gov

- **In 41%* of truck vs. light vehicle crashes, the truck contributed more to the crash**

  - In 52%* of truck vs. light vehicle crashes, countermeasures on the truck may have helped to prevent the crash

- **In 40%* of the truck vs. nonmotorist crashes, the truck contributed more to the crash**

  - In 70%* of truck vs. nonmotorist crashes, countermeasures on the truck may have the potential to help prevent the crash

*Preliminary Results based on engineering analysis of LTCCS cases

Why Did We Collect LTCCS Data?

- **To Gain a Better Understanding of Crash Causation**

- **To Find Countermeasures**

- **10% of crashes in LTCCS were not preventable by crash avoidance technologies, public education, or enforcement**

  - 64% of the crashes in LTCCS may have benefited from countermeasures on the truck

LTCCS Analysis

- **Objective**

- **Methodology**
  - Case Reviews
    - Summary
    - Scene Diagram
    - Crash Event Assessment Form
    - Photos

Case Reviews – Example

Case Reviews – Example
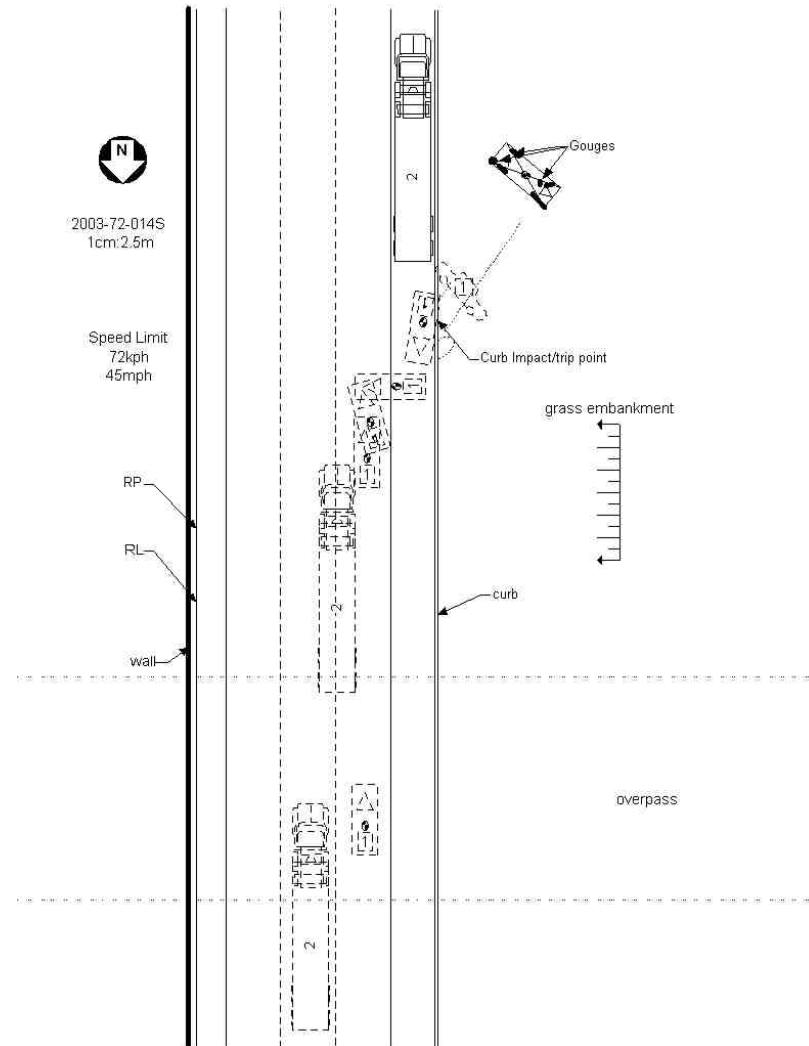
Case Reviews – Example

- **Truck Countermeasures**

- **Light Vehicle Countermeasures**

- **Other Countermeasures**

  - Environment

    - Better Roadway Design
    - Better Signage

- **Who "Caused" the Crash**

What Can We Do With This

- **Focus NHTSA Efforts on Promising Technologies**

- **Use LTCCS Analysis to Inform our GES and FARS Estimates of Countermeasure Effectiveness and Cost/Benefits Analysis**

Disclaimer

- **Subjectivity of Case Reviews**

- **Rich Data Available to All**

- **Good Luck**

Thank you!

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"YEP... GOT MY CELLPHONE, MY PAGER, MY INTERNET LINK, MY WIRELESS FAX, AND THANKS TO THIS NIFTY SATELLITE NAVIGATING SYSTEM, I KNOW PRECISELY WHERE I AM AT ALL TIMES!"

BY LOWE FOR THE SUN-SENTINEL, FLORIDA