



U.S. Department of  
Transportation

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# Mishap Analysis Training NTSB Training Center

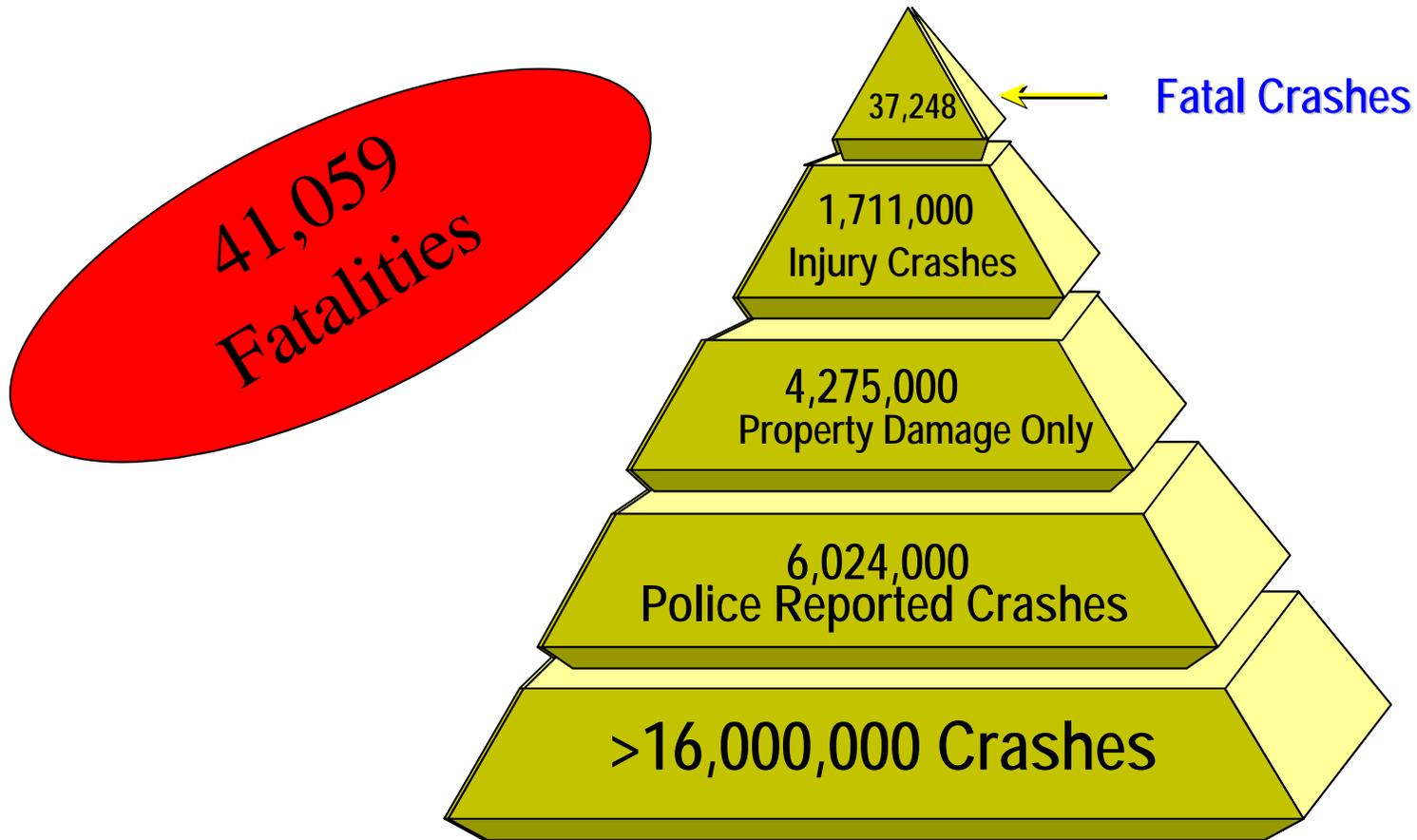
## Motor Vehicle Crash Investigation

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Chief, Crash Investigation Division  
National Highway Traffic Safety  
Administration



# Highway Safety Facts (2007)



**\$230 Billion Societal Cost**



## Crime



**1** murder  
every **31\*** minutes

**1** aggravated assault  
every **37\*** seconds

**1** violent crime  
every **22\*** seconds

**1** property crime  
every **3\*** seconds

# CLOCK



## Crash



**1** fatality  
every **12\*** minutes

**1** injury  
every **12\*** seconds

**1** property damage  
crash  
every **8\*** seconds

**1** law enforcement  
reported crash  
every **5\*** seconds

Source: NHTSA Traffic Safety Facts, 2006 and Uniform Crime Report, 2006 Department of Justice

# NHTSA Activities

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- **Potential Vehicle Defects**
  - ◆ **Report via HOTLINE**
  - ◆ **Imports**
    - Tires
    - Valve Stems
- **Rollover**
  - ◆ **Stability control**
  - ◆ **Roof crush**
  - ◆ **Ejection Mitigation**
- **Occupant Protection**
  - ◆ **Safety belt use**
  - ◆ **Non-deployment**
  - ◆ **Air bag suppression**
  - ◆ **Side curtain Air bags**
  - ◆ **Elderly**
- **Child Safety**
  - ◆ **Safety seat**
  - ◆ **Backover**
  - ◆ **School bus**
    - Safety Belts
- **Alternative fuel systems**
  - ◆ **Hybrid Vehicles**
- **Electronic Stability Control**
- **Motorcoach**
- **Commercial Vehicles**
- **Low Speed Vehicles (LSV)**
- **Motorcycles**
  - ◆ **Helmets**
  - ◆ **ABS**
- **Law Enforcement Deaths**

# NHTSA Data Collection

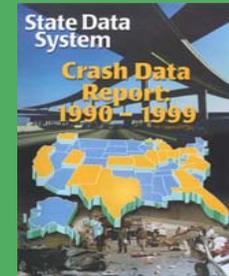
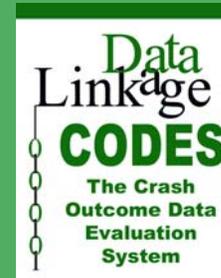
## Investigation Based



## Police Crash Report Based



## State Data Based



# Occupant Protection

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- **Helmeted occupants . . .**
- **Good thing!**

# Occupant Protection

Upon further review . . .

**THIS is NOT  
occupant  
protection (for  
the child)**



# Disclaimer

- Some incidents are best explained without words...



# Field Investigation Programs

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- **NASS – National Automotive Sampling System**

- CDS - Crashworthiness Data System (24 Offices)
- Detailed information on vehicles, scenes, and occupants for crashworthiness

- **NMVCCS – National Motor Vehicle Crash Causation Survey**

- Responded on-scene
- Detailed information on the “factors” involved in the crash (human, vehicle and environmental)

# Field Investigation Programs

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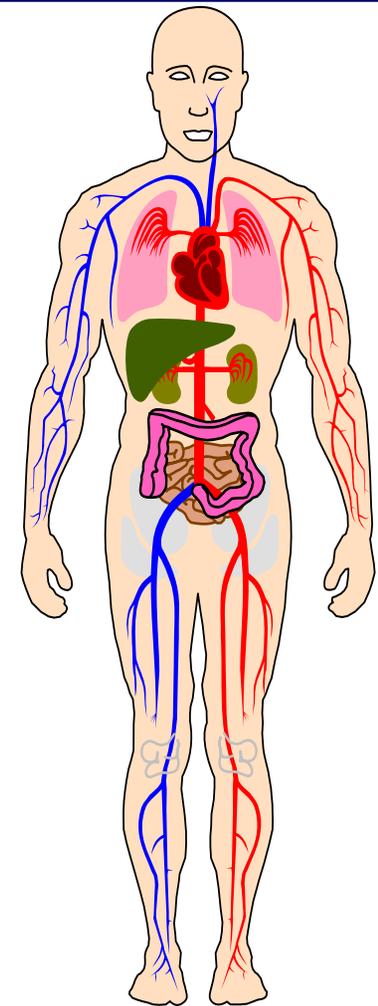
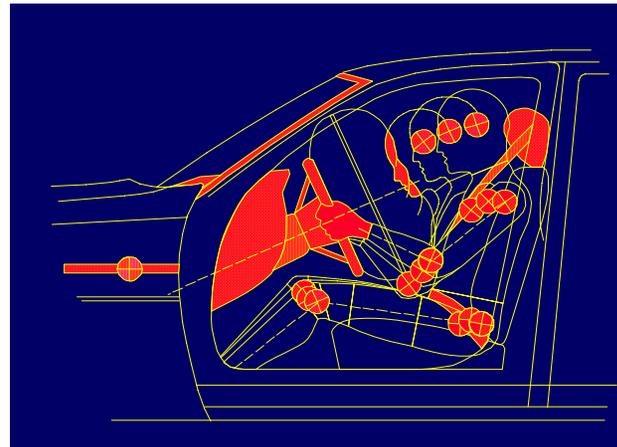
- **SCI – Special Crash Investigations**
  - In-depth detailed investigations on a limited number of crashes
  - Three “go-teams” stationed around the country
  - Focus is new & rapidly changing occupant protection technologies
  - Provide the Agency with early detection of alleged or potential vehicle defects



# Crash Dynamics

## 3- Types of Crash Forces

- Vehicle
- Human
- Internal



# Case Content

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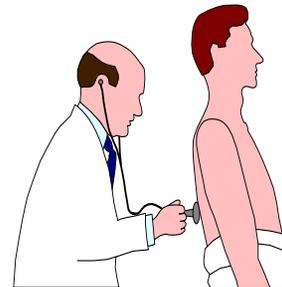
- Over 600 CDS data elements that describe ...
  - Crash events
  - Damage to vehicle
  - Crash forces involved
  - Injuries to victims
  - Injury mechanisms



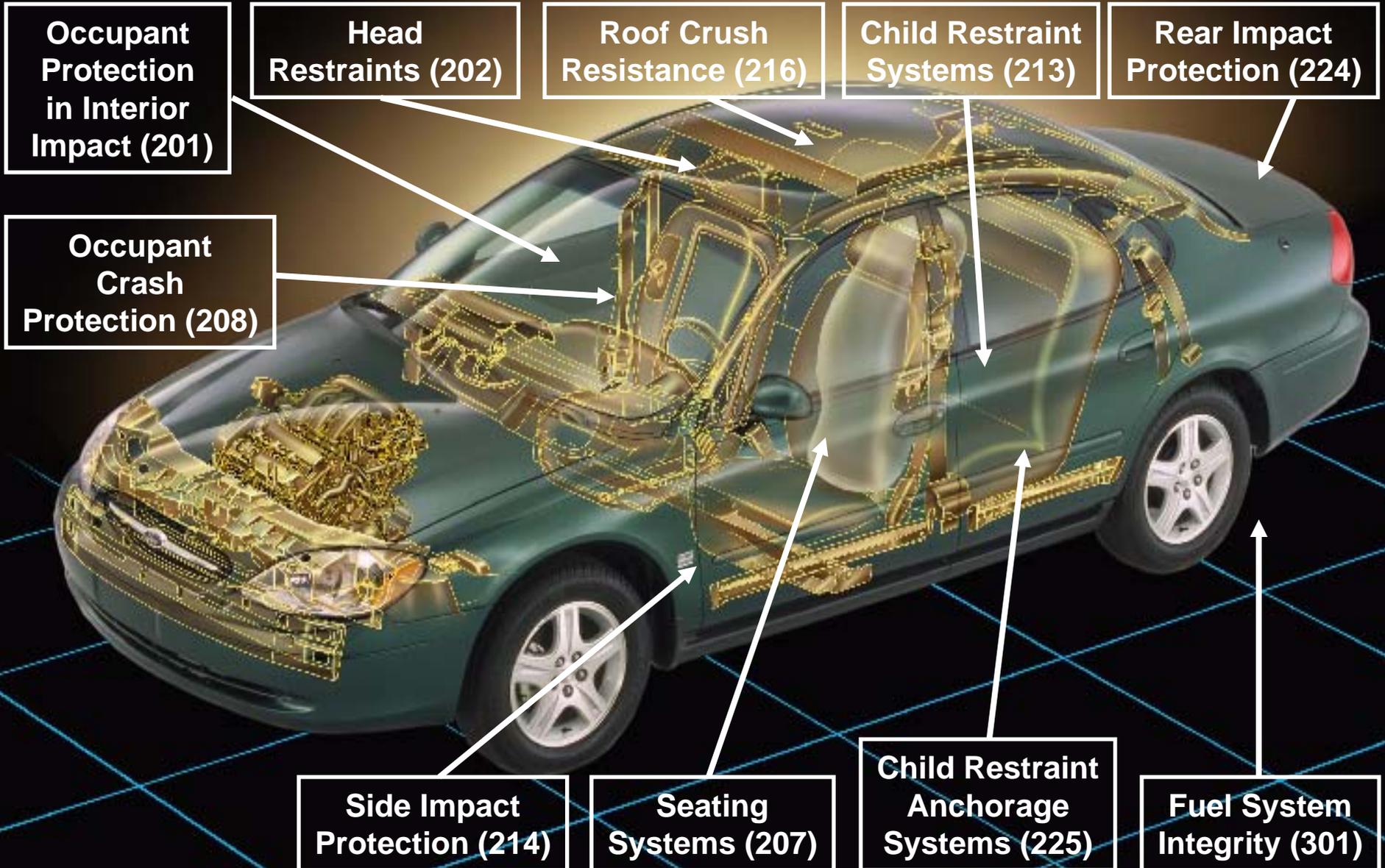
# Data Sources

- **Data Sources:**

- **Police reports**
- **Scene inspections**
- **Vehicle inspections**
- **Driver and occupant interviews**
- **Autopsy and hospital records**



# Various Crashworthiness Standards



# Overview of Scene

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- **Physical Plant**
  - **Roadway features, etc.**
- **Evidence**
  - **Skid marks, etc.**
- **Scaled Diagrams**



# Field Data

- **Vehicle Exterior Inspection**
  - **Crush Profile - Length, Depth and Location**
  - **Collision Deformation Classification**
  - **Principle Direction Of Force (PDOF)**
  - **Tires**
  - **Rollover**
  - **Side impact detail**



# Field Data

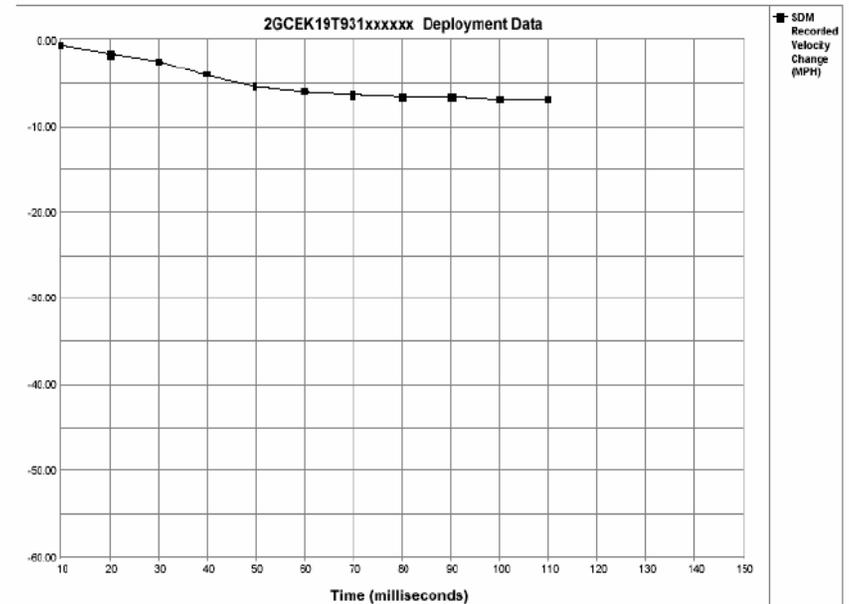
## Vehicle Interior Inspection

- Glazing
- Ejection / Entrapment
- Intrusion
- Restraint Systems
- Occupant Contacts



# Case Data

- **Crash Severity Indicators**
  - **WINSMASH**
    - **Delta V**
    - **Barrier Equivalent Speed**
    - **Visual Estimates**
      - **Speed Changes in Ranges**
      - **Minor, Moderate, or Severe**
- **Event Data Recorder**
  - **Delta V over time**
  - **Air bag logic**



# Injury Data

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- **Medical Coding**
  - **Injury Determination**
    - Medical Record Review
  - **Injury Coding**
    - Injury Coding based on AIS-90 (Update 98)
    - Moving toward AIS 2005



# NHTSA & EDRs

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- **Final Rule issued Jan 14, 2008**
- **Does not mandate EDR's in vehicles**
- **However, if there is an EDR**
  - ◆ **Capture uniform data in a uniform format**
  - ◆ **Standardized notification statement in vehicle owner's manual**
  - ◆ **Commercially available tool to access the data**

# Aviation “Black Boxes” or Flight Data Recorders (FDR)

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# Event Data Recorders



# NHTSA & EDRs

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- **New EDR Rule takes effect with vehicles manufactured after 9/1/12**
- **If EDR equipped required items:**
  - **Delta V Long**
  - **Max Delta V Long**
  - **Time, Max Delta V**
  - **Speed, vehicle indicated**
  - **Engine throttle % of full**
  - **Service brake on /off**
  - **Ignition cycle, crash**
  - **Ignition cycle, download**
  - **Safety belt status, driver**
  - **Frontal air bag warning lamp on/off**
  - **Frontal air bag time to deploy – driver air bag**
  - **Frontal air bag time to deploy – passenger air bag**
  - **Multi-event – number of events**
  - **Time from event 1 to 2**
  - **Complete file recorded yes/no**

# NHTSA & EDRs

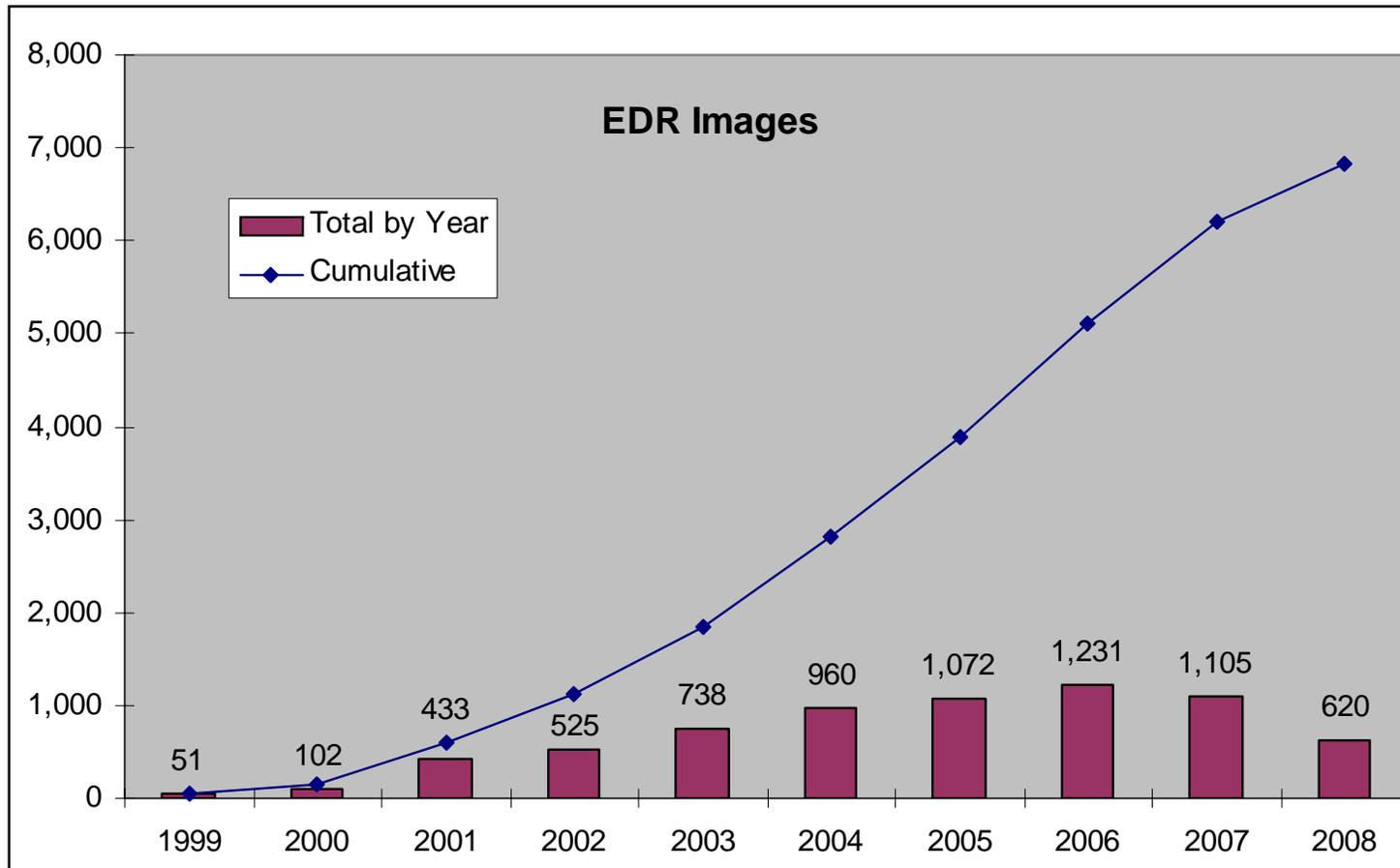
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- **Additional items are required “if reported” some include:**

- Lateral acceleration
- Max Delta V Lateral
- Engine RPM
- Vehicle roll angle
- ABS activity
- Stability control on / off
- Safety belt status, front right passenger
- Frontal air bag suppression switch status RF passenger
- Side air bag time to deploy – Driver
- Side air bag time to deploy – RF passenger
- Side curtain / air tube time to deploy driver side
- Side curtain / air tube time to deploy pass. side
- Pretensioner time to fire (driver and passenger)
- Etc.

# NHTSA & EDRs

- *Almost 7,000 “images” to date*



# Changes to EDR data Collection

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- Jan '08 – Vetronix owned by Bosch
- Software by subscription
  - ◆ (1-3 years)
- Hardware / cables are purchased separately
- Planned - multiple releases a year

# NHTSA & EDRs

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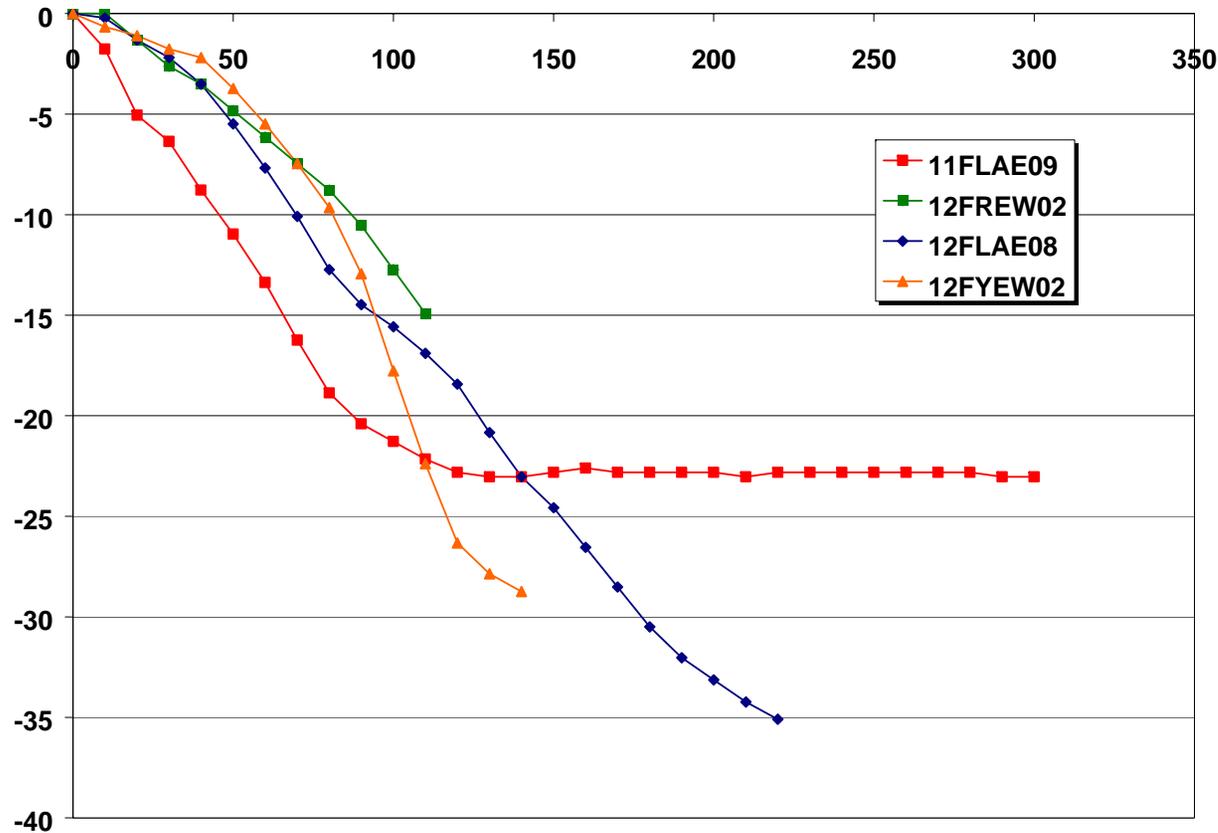
- **Currently three supported manufacturers**
  - ◆ **General Motors (most 1994 and newer)**
    - Isuzu Hombre 2000 - 2002 and Ascender 2003
  - ◆ **Ford (some 2001 and newer)**
  - ◆ **Chrysler (some 2004 – 2008)**
- **Varying level of data currently available**
- **Additional support available for the Ford Power Control Module**
  - ◆ **Some vehicles contain “minutes” of looped data – which can be overwritten!**

# Limitation - Must have a Full Supporting Investigation

2G1WF55E7Y91 System Status At Deployment	
SIR Warning Lamp Status	OFF
Driver's Belt	UNBUCKLED
Passenger Front-Air Bag	ON
Ignition Cycles At Deployment	1596



# Limitation - Longer Recording Times Needed



Offset Crashes Longer than 150 ms

# EDR Program at NHTSA

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- EDR's provide very useful information to crash reconstructions
  - Supports a complete crash reconstruction
    - ◆ Crash pulse, time to deployment, restraint usage, etc
  - Air bag timing and deployment levels cannot be determined by Investigators - EDR is the only source
  - WinSmash vs. OEM EDR Delta-V's are comparable
  - There are limitations to the EDR data
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# Jump into Cases

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National Highway Traffic Safety Administration  
Our Mission: Save lives, prevent injuries, reduce vehicle-related crashes



**www.nhtsa.dot.gov**

What's New:

★ U.S. Transportation Secretary LaHood Announces Record Low Traffic Deaths, Improved State

Search NHTSA

  
Information on ...

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- [Child Safety Seats](#)
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Top Stories

**DOT Sec. LaHood Announces Record Low Traffic Deaths, Improved State Seat Belt Use**

Traffic deaths on U.S. roads last year reached a record low, while seat belt use continued to climb, Transportation Secretary Ray LaHood announced April 6. New state-by-state data shows that Michigan has the highest seat belt use at 97.2 percent, while Massachusetts registered the lowest (66.8%). NHTSA estimated that 37,313 people were killed in motor vehicle traffic crashes in 2008, the lowest number since 1961 (36,285). The nation also saw the lowest fatality rate ever recorded -- 1.28 fatalities per 100 million vehicle miles traveled, down from 1.36 in 2007.

[News Release](#)  
[State-by-state seat belt use](#) | [Estimated Fatalities Report](#)

**New Fuel Economy Standards for Model Year 2011 Cars and Trucks Announced**

U.S. Secretary of Transportation Ray LaHood announced March 27 that the Department of Transportation has posted the new fuel economy standards for cars and light trucks for the 2011 model year. The new standards will raise the industry-wide combined average to 27.3 miles per gallon (a 2.0 mpg increase over the 2010 model year average), as estimated by NHTSA. It will save about 887 million gallons of fuel and reduce carbon dioxide emissions by 8.3 million metric tons.

[Read the Secretary's news release](#)  
[Final Rule \(very large download\)](#) | [Final Regulatory Impact Analysis](#)

**NHTSA Study: More Than 1,700 Fatalities, 840,000 Injuries Yearly Due to**

Always Buckle Up!



National Enforcement Mobilization on May 18-31



File A Complaint

If you believe there is a safety-related

problem with your vehicle or child seat

Motorcycle Safety Awareness





National Highway Traffic Safety Administration  
Our Mission: Save lives, prevent injuries, reduce vehicle-related crashes



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- Latest Releases
- Fatality Analysis Reporting System (FARS)
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- State Data Program
- Special Crash Investigations (SCI)
- Regulatory Analysis
- Regulatory Evaluation
- State Traffic Safety Information (STSI)
- Traffic Records
- National Driver Register
- About and Contact NCSA
- HIPAA Info

**Quick Clicks**

[Child Safety Seats](#)

# Welcome to NCSA

The National Center for Statistics and Analysis (NCSA), an office of the National Highway Traffic Safety Administration (NHTSA), is responsible for providing a wide range of analytical and statistical support to NHTSA and the highway safety community at large.

## Publications and Data Requests

Click the link below to visit our Customer Automated Tracking System (CATS) where you will find:

- Traffic Safety Fact Sheets
- FARS/GES Reports
- Research Notes and Crash\*Stats
- Technical Reports
- Annual Assessments
- Documentation and Manuals for FARS, GES, and NASS-CDS.

Customers may also leave a customized data request.

[▶ NCSA Publications and Customized Data Requests \(CATS\)](#)

**Always Buckle Up!**

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**Quick Clicks**

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- Locate a Child Seat Fitting Station



**Special Crash Investigations**

NASS project that examines the safety impact of new, emerging, and rapidly changing technology (such as air bags and alternative fuel systems) and for exploring alleged or potential vehicle defects.

- ▶ [Project Description](#)
- ▶ [Crash Notification](#)
- ▶ [SCI Electronic Case Viewer](#)
- ▶ [Crash Notification \(Fill, Print and Fax\) Form](#)



**Related Links**

- ▶ [NMVCCS Case Viewer](#)
- ▶ [SCI Electronic Case Viewer](#)
- ▶ [NMVCCS FTP Site](#)

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**Related Downloads**

- ▶ [Not in Traffic Surveillance \(NiTS\) Case Viewer](#)

**Not in Traffic Surveillance (NiTS) Publications & Data**

Not in Traffic Surveillance incidents can fall into a variety of categories, some are crashes (which occur in private driveways) and some are incidents (occupant getting caught in a power window, hyper/hypothermia, etc.). The SCI program is actively pursuing NITS crashes from its network of sources to provide in-depth information on the particulars of the incident or crash.

- ▶ [SCI NITS Case Totals \(PDF\) April 09](#)
- ▶ [NiTS FTP Site](#)
- ▶ [NiTS Case Viewer](#)
- ▶ [Crash\\*Stats "NiTS 2007 - Highlights" \(DOT-HS-811-085\)](#)
- ▶ [Nontraffic Crash Database User's Manual \(DOT-HS-811-064\)](#)
- ▶ [Noncrash Fatality Database User's Manual \(DOT-HS-811-065\)](#)
- ▶ [Noncrash Injury Database User's Manual \(DOT-HS-811-066\)](#)

## Special Crash Investigations Filters



NHTSA is authorized by congress (Volume 489, United States Code Chapter 301 Motor Vehicle Safety, Section 30166, 30168 and Volume 23 , Section 403) to collect information on motor vehicle crashes to aid in the development, implementation and evaluation of motor vehicle and highway safety countermeasures. The law requires the Agency to protect the privacy of individuals involved in crashes investigated. Agency procedure for release, accuracy and security of research data collected under the SCI program prohibit the dissemination of any information collected, assembled, derived or computed until all conditions of data gathering and reporting, case completeness, quality control and privacy have been completed. The cases available through the SCI web query system have met these conditions.

### SINGLE CASE SELECTION

Case Number

### MULTIPLE CASE SELECTION BASED ON FILTER CRITERIA

#### CASE TYPE

Type

#### CRASH

Year  Month   
State  Mortality

#### VEHICLE

Make   
Model Year From  To

#### OCCUPANT

Role  Age   
Sex  Height

# Special Crash Investigations Notifications

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- 24 Hour Voice Mail Telephone Number  
**Nationwide Toll Free (877) 201-3172**
- FAX Number  
**202-366-3189**
- E-mail Address  
**SCI@.dot.gov**





# Questions?

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Phone: 202-366-0328