EDR Technology in Support Of a Crash Reconstruction

What is an EDR and what does it mean to you?
Criminal Justice Track
Lifesavers 2008
April 13, 2008

DOT HS 810 950

Augustus “Chip” Chidester
National Highway Traffic Safety Administration
Discussion Topics

• What is an event data recorder  
  ♦ What constitutes data recording
• NHTSA & EDR data
• Public access to EDR data
• What we have learned
• Summary
Aviation “Black Boxes” or Flight Data Recorders (FDR)
Estimate of EDRs in the U.S. fleet

- **Light Fleet**: 200,000,000 vehicles
- **Estimated**: 30,000,000 equipped vehicles
- **Estimated**: 15% of current fleet
- **New Models**: 65-90% equipped
Event Data Recorders (EDR)

Primary Purpose: Deployment of Air Bag
Secondary Purpose: Record/Playback Crash Data
Current Technology

- **Air Bag Control Module**
  (aka SDM, RCM, PCM, ECU, etc.)
  - Accelerometer
  - Microprocessor
  - Bosch, Takada, Delphi

- **Satellite Sensors**
  - Diagnostic functions
  - Central acceleration detection
  - Side crash detection
  - System deployment
SDM Simplified

- Engine Speed (PCM)
- Vehicle Speed (PCM)
- Throttle Pos (PCM)
- Brake switch ON/OFF (ABS)
- Serial Data or CAN (Controller Area Network) Buss
- Manual Pass. Airbag Cutoff Sw. & Indicator
- Driver Seat Belt circuit Sensor
We have been collecting EDR data since the 1990s
Over 6,000 downloads to date
Final rule issued early this year
Does not mandate EDRs in vehicles
However, if there is an EDR
- It must capture uniform data in a uniform format
- Standardized notification statement in vehicle’s owner’s manual
  - Inform consumer of presence of EDR in vehicle
  - Identify the purpose of the EDR
  - Identify the type of data collected by the EDR
- There must be a commercially available tool to access the data
NHTSA & EDRs

- **New EDR rule takes effect with 2012 model year vehicles**
- **If EDR equipped, required items:**
  - Delta V long
  - Max delta V long
  - Time, max delta V
  - Speed, vehicle indicated
  - Engine throttle %
  - 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

- Additional items are required if recorded some include:

  - Lateral acceleration
  - Max delta V
  - Engine rpm
  - Vehicle roll angle
  - ABS activity
  - Stability control on/off
  - Safety belt status front passenger
  - Frontal air bag suppression switch status RF passenger

  - Side air bag time to deploy – driver
  - Side air bag time to deploy – passenger
  - Side curtain/air tube deployment driver side
  - Side curtain/air tube deployment pass. side
  - Pretensioner deployment (driver and passenger)
  - Etc.
• **Currently three supported manufacturers**
  ◦ General Motors
  ◦ Ford
  ◦ Chrysler

• **Varying level of downloaded data currently available**

• **Additional support for the Ford Power Control Module**
  ◦ Some vehicles contain “minutes” of looped data – which can be overwritten!
Public Access to EDR data

- January ’08 – Vetronix is now owned by Bosch
- Software is by subscription (1 to 3 years)
- Hardware/cables are purchased separately
- Hoping for three releases per year
Public Access to EDR data

- We can only read a limited number of vehicles
  - Bosch Crash Data Retrieval System
  - Version 3.0 Software
    - Most General Motors 1994 and newer
    - Some Ford and Mercury 2001 and newer
    - Chrysler 2004-2008
    - And others Isuzu Hombre 2000 - 2002 and Ascender 2003
EDR Program at NHTSA

What We Have Learned

- Some EDR output data may be lost or questionable.
  - Due to power loss and sensor problems.
- Supports a complete crash reconstruction.
  - Crash pulse, time to deployment, restraint usage, etc.
- WinSmash vs. OEM EDR delta-Vs are comparable
- Improves data quality.
  - Used for validation of data.
  - Improves completeness of data
Longer Recording Times Needed

- **Typical offset crash:** 250+ milliseconds
- **EDR (pre-2000):** 300 milliseconds
- **EDR (post-2000):** 150 milliseconds

Offset Crashes Longer Than 150 ms
Effects of Power Limitations on Event Recording

Was This Seat Belt Worn?
NHTSA’s Data Collection Experience With Unsuccessful EDR Downloads

NASS reasons EDRs could not be downloaded
*Based on 2003-2005 data collection years

- Technical and Training Issues: 53%
- Vehicle Damage: 39%
- Data Collection Failed: 2%
- Permission: 6%
- Data Collection Failed: 2%
- Technical and Training Issues: 53%
Summary

- All OEMs that sell a 2012 vehicle equipped with an EDR
  - Inform consumer of presence of EDR in vehicle
    - Identify the purpose of the EDR
    - Identify the type of data collected by the EDR
  - Must capture the data in a uniform format
    - There must be a tool available to access the data
- Current OEM EDR data does NOT replace a crash reconstruction!
Questions?

BUCKLE UP AMERICA
There's Just Too Much to Lose