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FIA Foundation Seminar

The Role of Advanced Technologies in Enhancing Safety:
NHTSA's Approach to Road Safety

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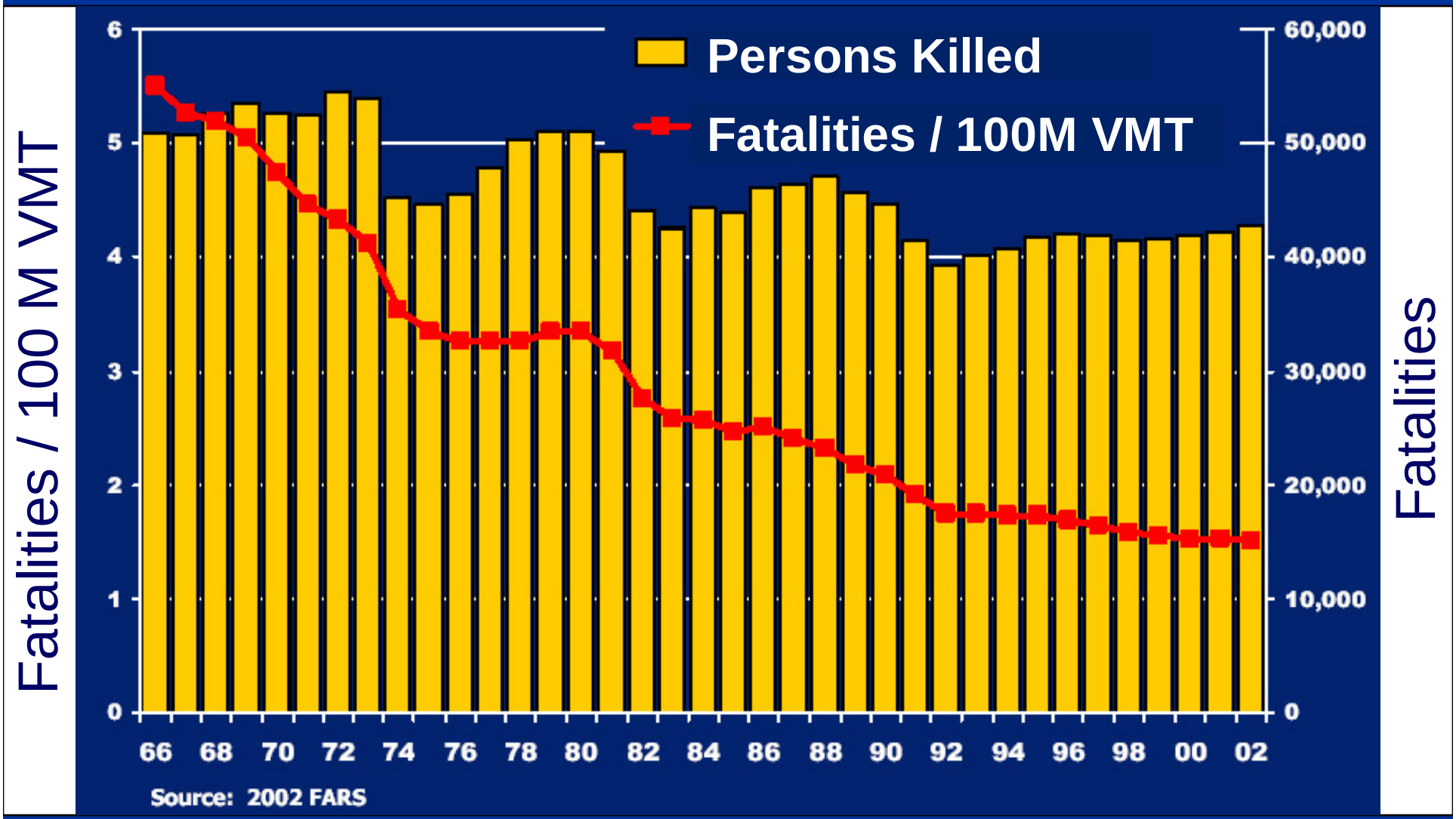
Person Killed and Fatalities per 100M VMT



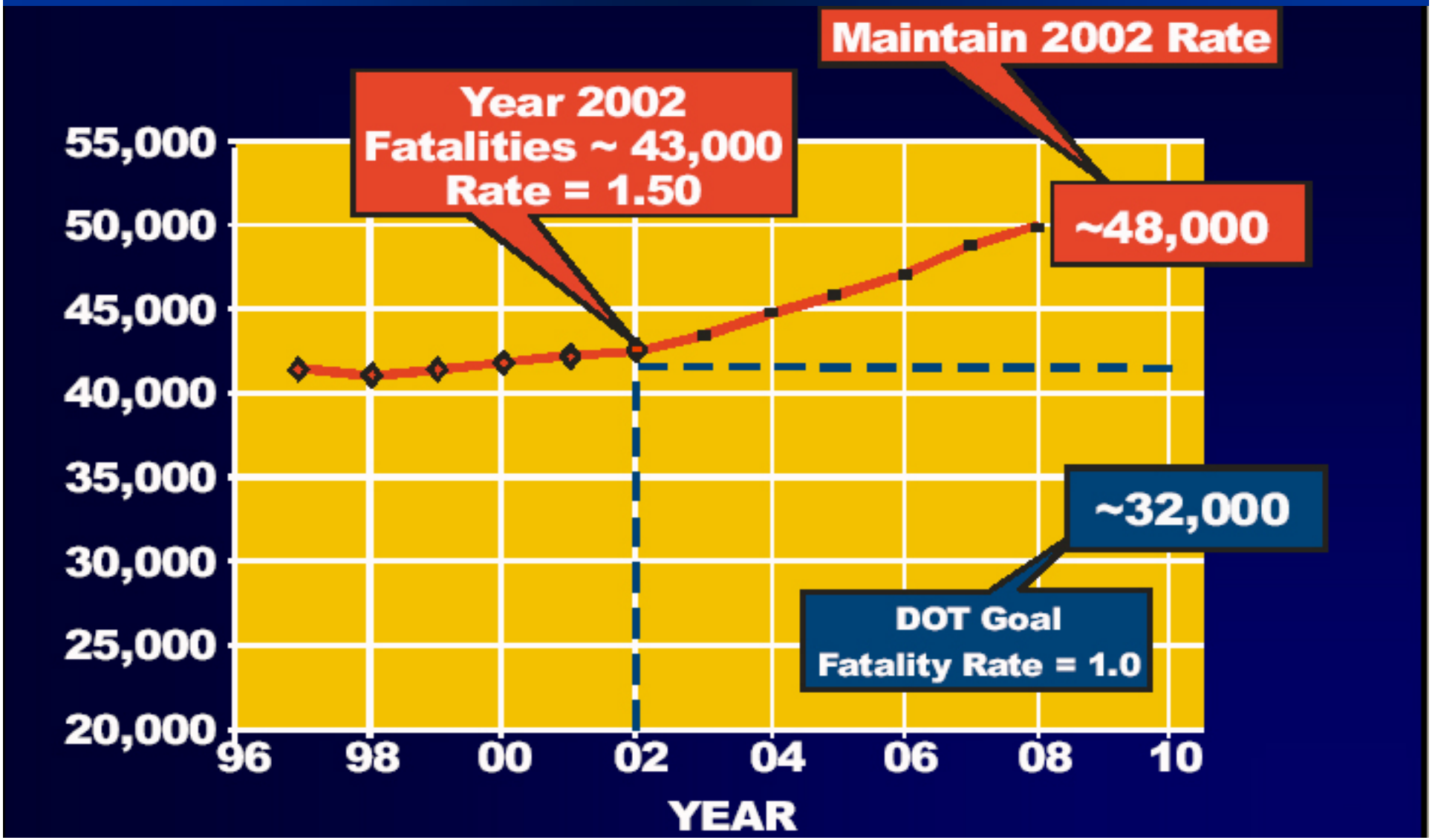
Top 10 Leading Causes of Death in the United States for 2001, by Age Group

RANK	Cause and Number of Deaths											Years of Life Lost
	Infants Under 1	Toddlers 1-3	Young Children 4-7	Children 8-15	Youth 16-20	Young Adults 21-24	Other Adults 25-34	Other Adults 35-44	Other Adults 45-64	Elderly 65+	All Ages	
1	Perinatal Period 13,734	Congenital Anomalies 496	MV Traffic Crashes 533	MV Traffic Crashes 1,546	MV Traffic Crashes 5,979	MV Traffic Crashes 4,136	MV Traffic Crashes 6,759	Malignant Neoplasms 16,569	Malignant Neoplasms 139,785	Heart Disease 582,730	Heart Disease 700,142	Malignant Neoplasms 23% (8,614,131)
2	Congenital Anomalies 5,513	MV Traffic Crashes 421	Malignant Neoplasms 400	Malignant Neoplasms 829	Homicide 2,414	Homicide 2,738	Homicide 5,204	Heart Disease 13,326	Heart Disease 98,885	Malignant Neoplasms 390,214	Malignant Neoplasms 553,768	Heart Disease 22% (8,110,571)
3	Heart Disease 479	Accidental Drowning 393	Exposure to Smoke/Fire 178	Suicide 447	Suicide 1,879	Suicide 1,924	Suicide 5,070	MV Traffic Crashes 6,891	Stroke 15,518	Stroke 144,486	Stroke 163,538	MV Traffic Crashes 5% (1,700,952)
4	Homicide 332	Homicide 362	Congenital Anomalies 168	Homicide 391	Malignant Neoplasms 814	Accidental Poisoning 771	Malignant Neoplasms 3,994	Suicide 6,635	Diabetes 14,913	Chronic Lwr. Resp. Dis. 106,904	Chronic Lwr. Resp. Dis. 123,013	Stroke 5% (1,687,683)
5	Septicemia 312	Malignant Neoplasms 321	Accidental Drowning 164	Congenital Anomalies 324	Accidental Poisoning 566	Malignant Neoplasms 768	Heart Disease 3,160	HIV 5,867	Chronic Lwr. Resp. Dis. 14,490	Influenza/ Pneumonia 55,518	Diabetes 71,372	Chronic Lwr. Resp. Dis. 4% (1,444,745)
6	Influenza/ Pneumonia 299	Heart Disease 200	Homicide 133	Accidental Drowning 293	Heart Disease 398	Heart Disease 543	Accidental Poisoning 2,507	Accidental Poisoning 5,036	Chronic Liver Disease 13,009	Diabetes 53,707	Influenza/ Pneumonia 62,034	Suicide 3% (1,079,822)
7	MV Traffic Crashes 139	Exposure to Smoke/Fire 170	Heart Disease 82	Heart Disease 273	Accidental Drowning 326	Accidental Drowning 211	HIV 2,101	Homicide 4,268	Suicide 9,259	Alzheimer's 53,245	Alzheimer's 53,852	Perinatal Period 3% (1,070,154)
8	Nephritis/ Nephrosis 133	Septicemia 96	MV NonTraffic Crashes 51	Exposure to Smoke/Fire 140	Congenital Anomalies 244	Congenital Anomalies 206	Stroke 601	Chronic Liver Disease 3,336	MV Traffic Crashes 8,750	Nephritis/ Nephrosis 33,121	MV Traffic Crashes 42,443	Diabetes 3% (1,014,201)
9	Stroke 108	Influenza/ Pneumonia 92	Benign Neoplasms 46	MV NonTraffic Crashes 125	Accidental Falls 114	HIV 167	Diabetes 595	Stroke 2,491	HIV 5,437	Septicemia 25,418	Nephritis/ Nephrosis 39,480	Homicide 3% (924,263)
10	Meningitis 78	Perinatal Period 63	Septicemia 33	Chr. Lwr. Resp. Dis. 102	Acc. Dischg. of Firearms 114	Accidental Falls 134	Congenital Anomalies 458	Diabetes 1,958	Nephritis/ Nephrosis 5,106	Hypertension Renal Dis. 16,397	Septicemia 32,238	Chronic Liver Disease 2% (623,998)
ALL	27,568	4,288	2,703	6,672	15,851	14,940	41,683	91,674	412,204	1,798,420	2,416,425	All Causes 100% (36,866,317)

Persons Killed and Injured in Crashes

	Year		
	2001	2002	2003
Persons Killed	42,196	42,815	43,220
Persons Injured	3,033,000	2,926,000	2,891,000

2008 Goal is Challenging



How People Die on the US Roadways

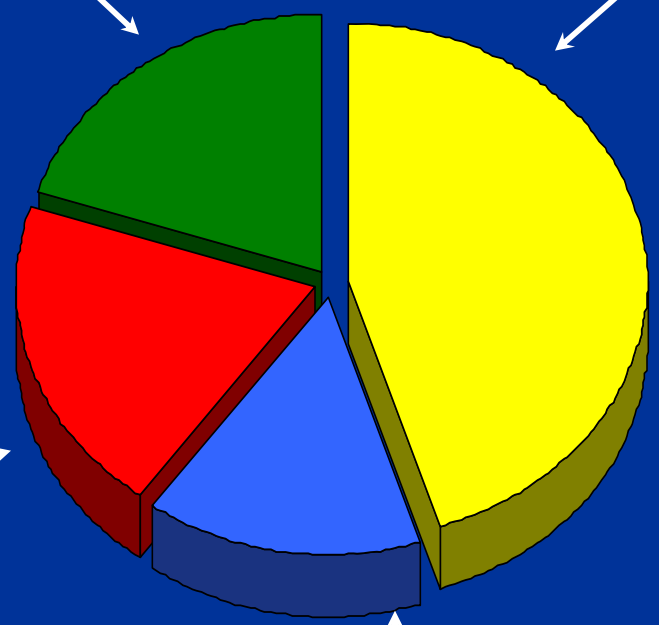
Single Vehicle 20%

- Front 13%
- Side 5%
- Other 2%

Multi-Vehicle 45%

- Frontal 25%
- Side 17%
- Rear 3%

120/day



~43,000 deaths in 2003

Single Vehicle Rollover 20%

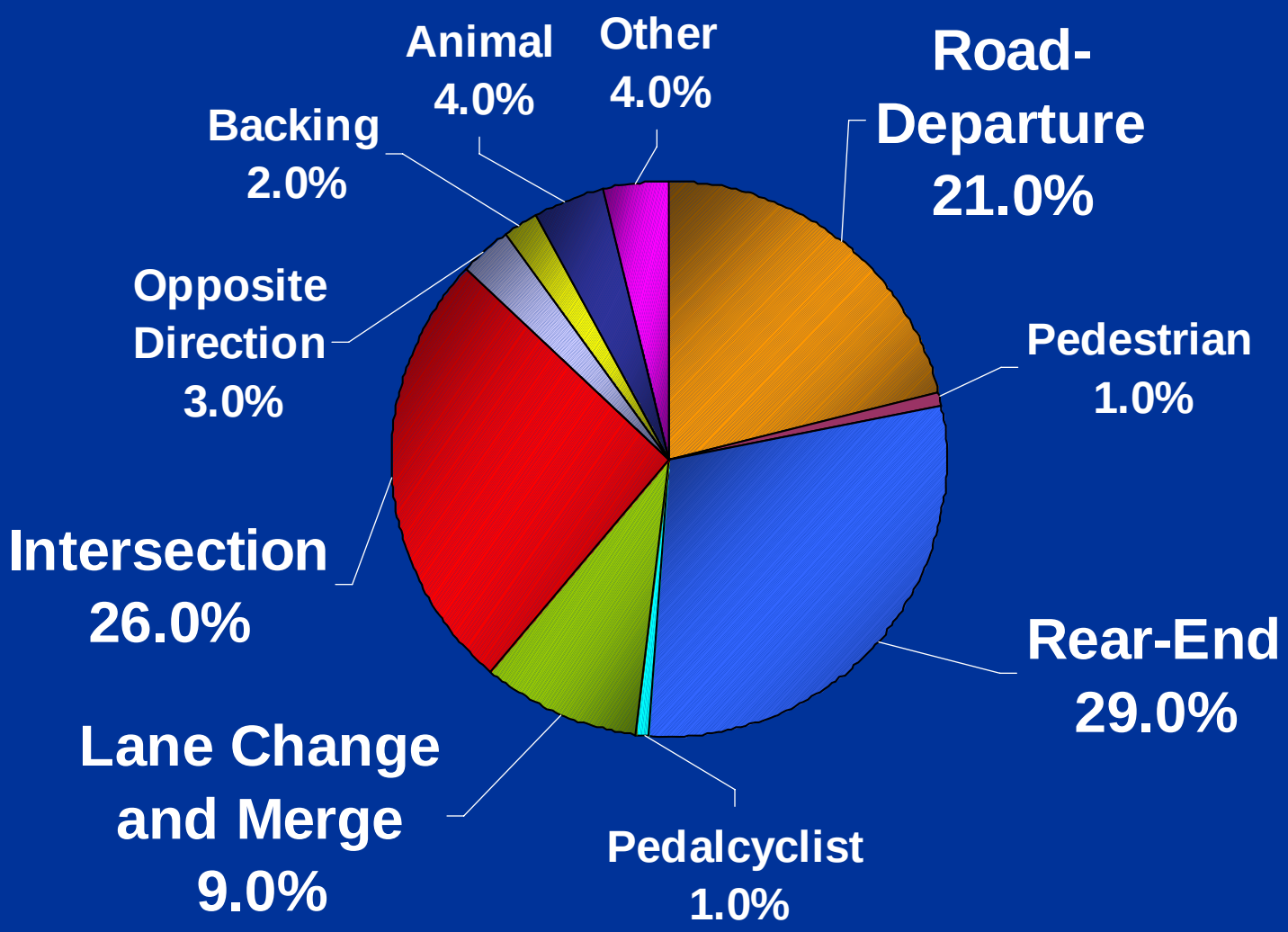
- Pass Car 10%
- Light Truck 9%
- Heavy Truck 1%

Non-Occupant 15%

- Pedestrian 13%
- Pedalcyclist 2%

Source: FARS Census

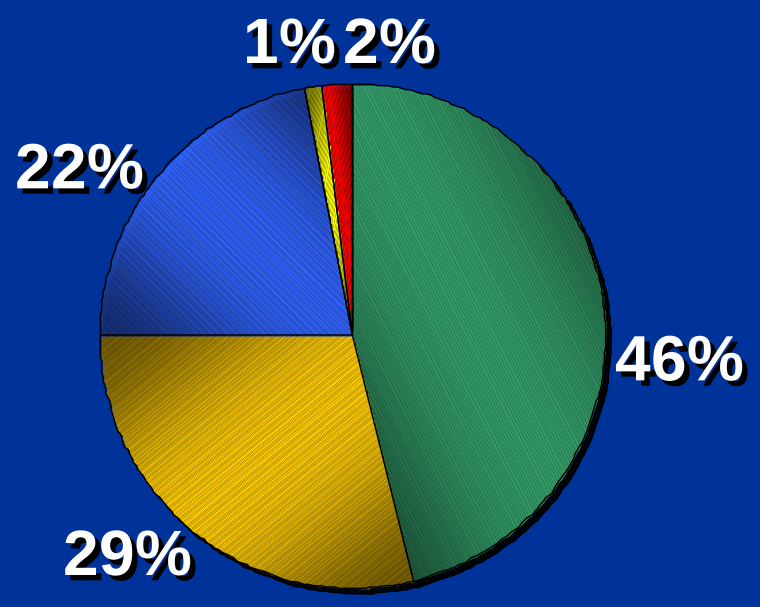
Crashes of all Severities, 2000 GES



Vehicles and Fatalities by Collision Type 2002

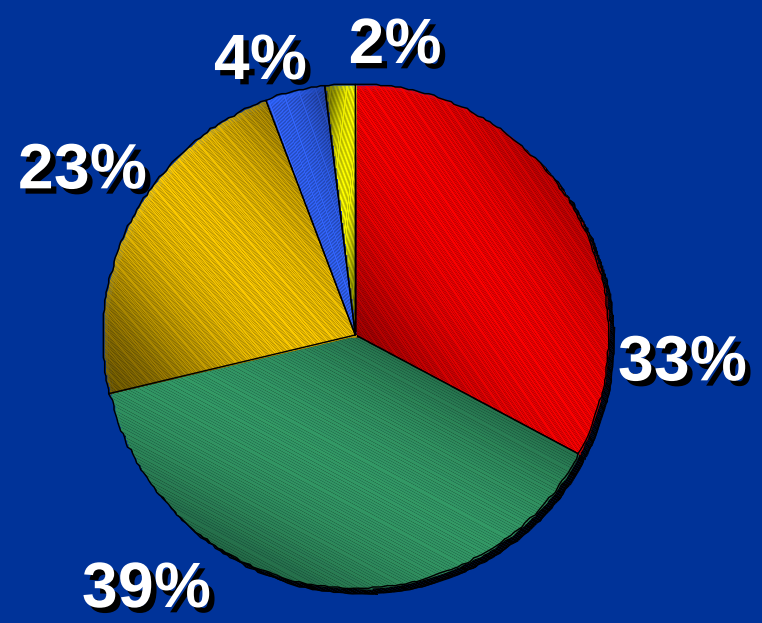
Passenger Vehicles in Crashes

Approx. 10.6 million vehicles involved



Passenger Vehicles Occupant Fatalities

32,335 total occupants killed

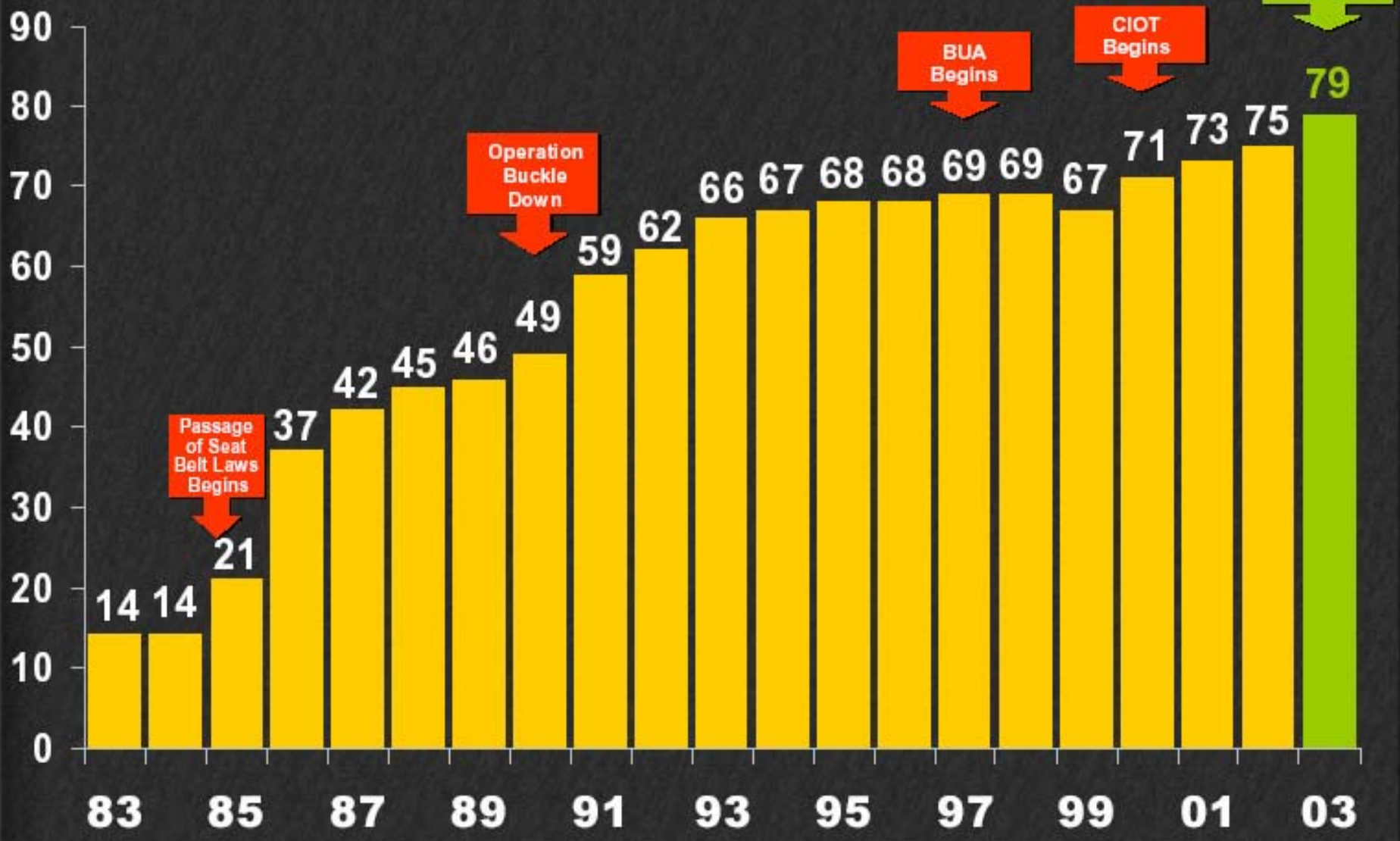


Rollover | Front | Side | Rear | Other

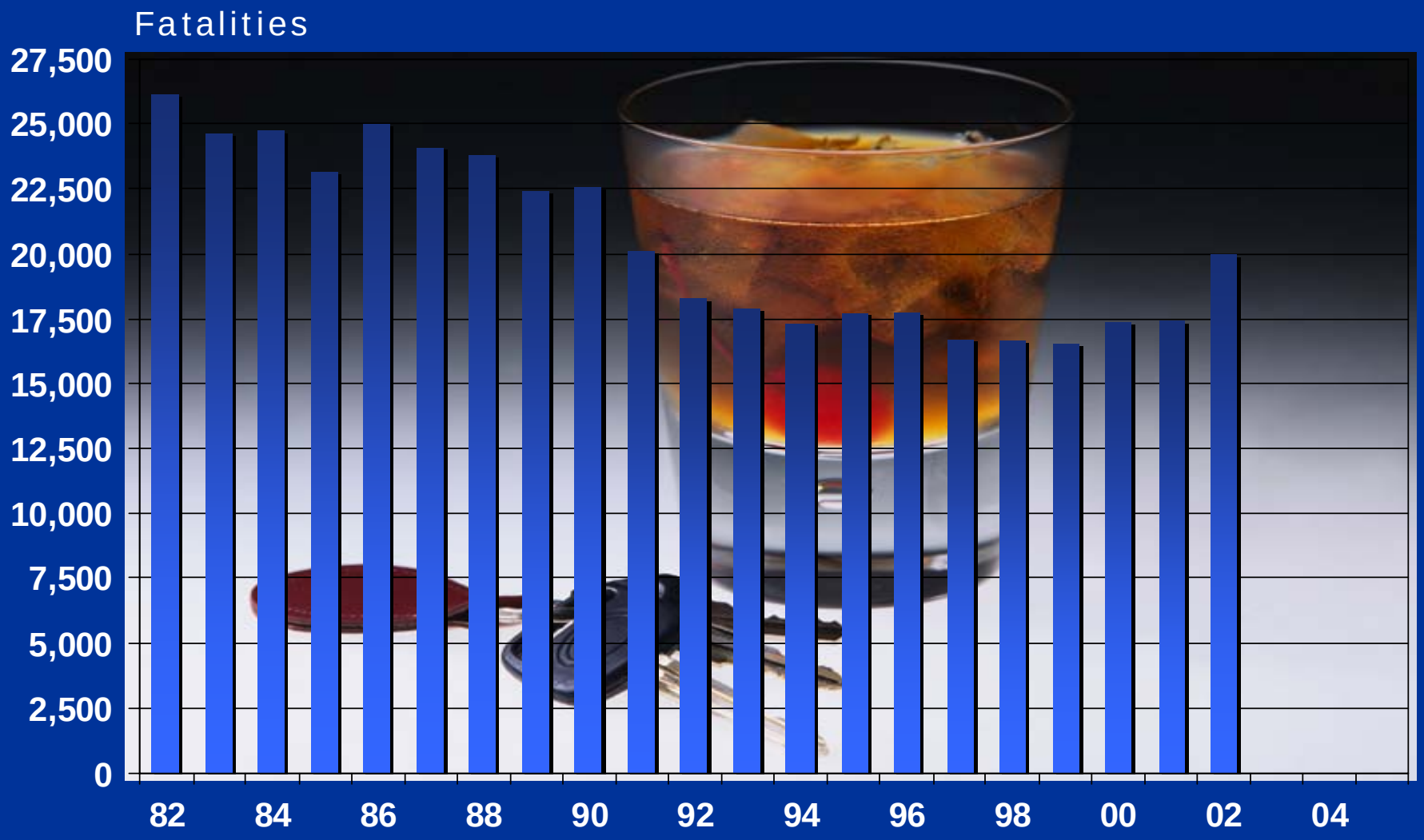
NHTSA Priorities

- **In September 2002, NHTSA formed four Integrated Project Teams (IPTs) to conduct an in-depth review of four priority areas**
  - Safety Belt Use
  - Impaired Driving
  - Rollover Mitigation
  - Vehicle Compatibility
- **Final Reports were released June 2003**

Safety Belt Use Rates
1983 – 2003 Percentage Use

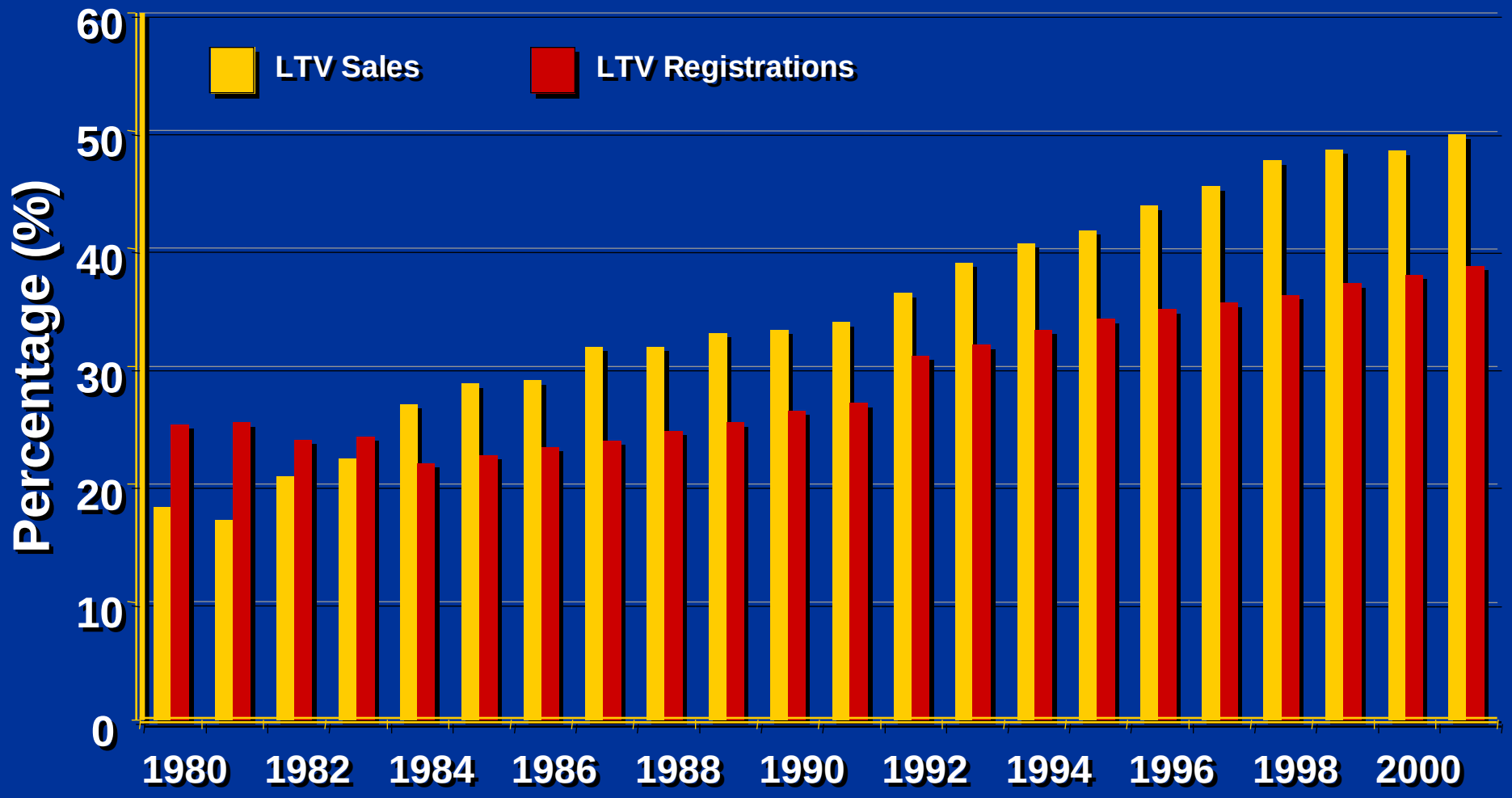


Alcohol-Related Fatalities Trend



Compatibility Problem

US LTV sales have leveled off at just under 50 %



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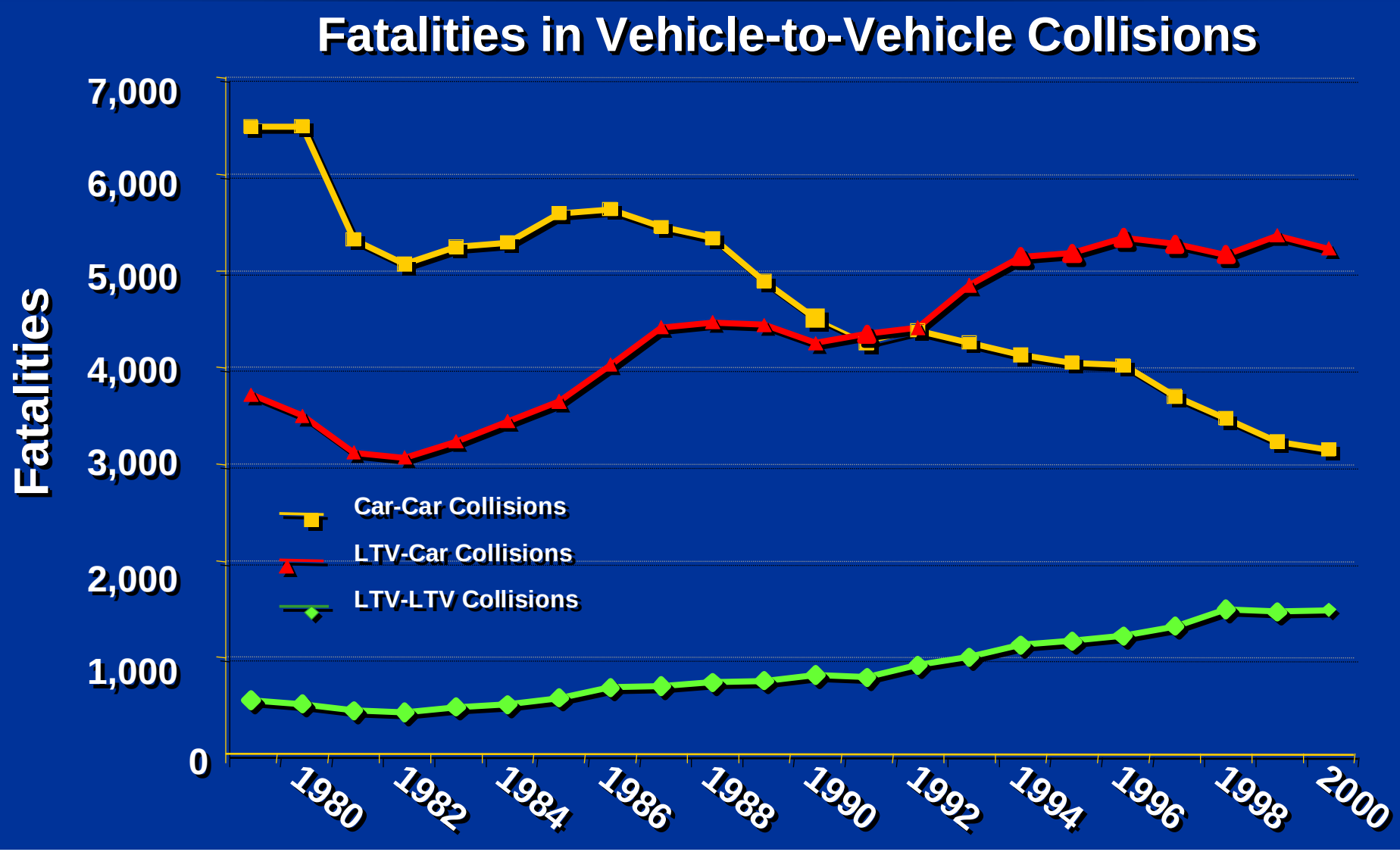


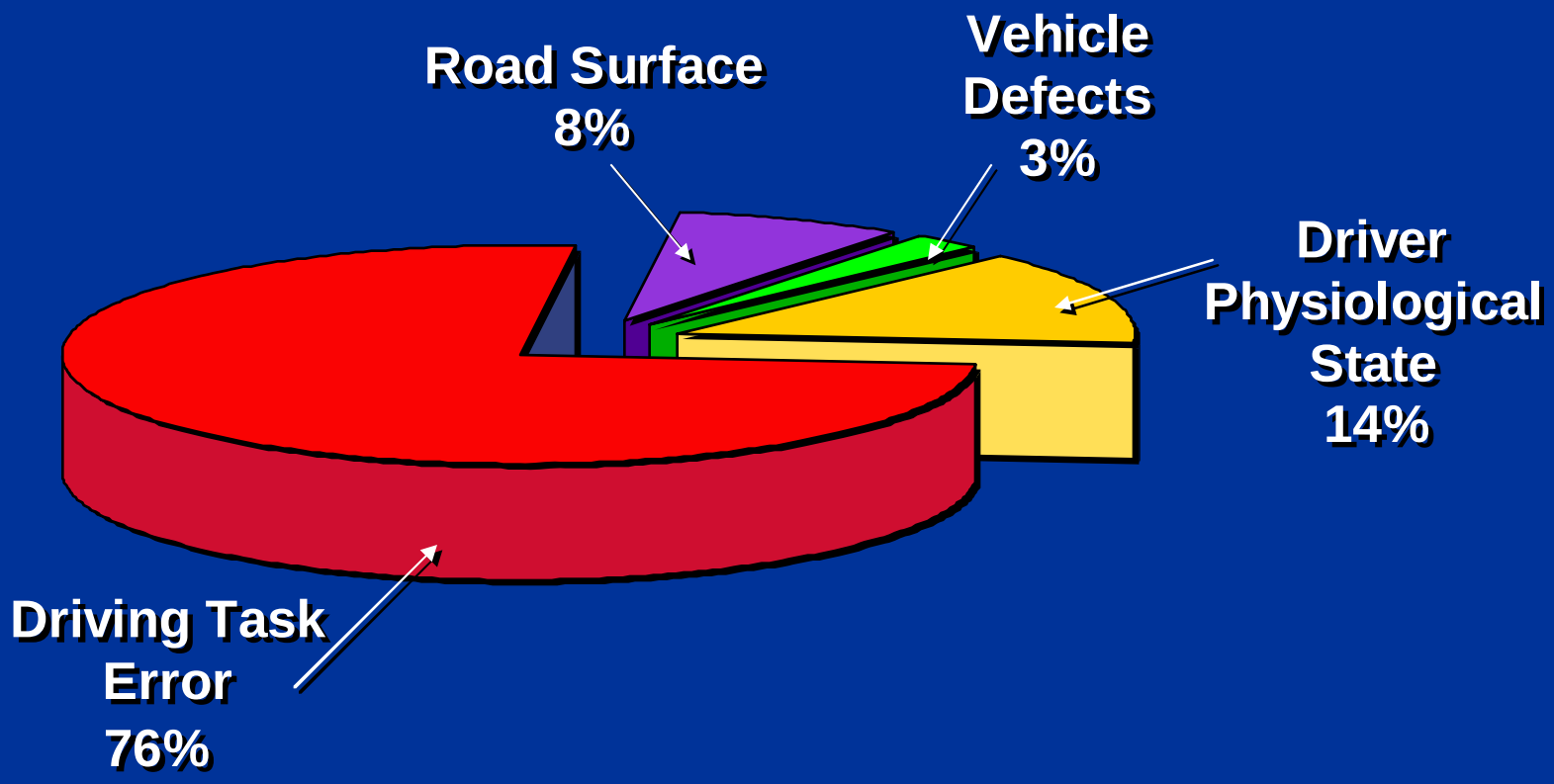
Vehicle Compatibility

Vehicle Compatibility

Address Increased Risk of Head Injuries From Crashes Involving LTVs and Narrow Object

The Safety Problem

Causal Factor Distribution



Technical Highlight:
Programmable Steering Machine

Example:
Fishhook Maneuver Effectiveness

Solving Problems

Event Data Recorder

- A device that is installed in a motor vehicle
- Records technical vehicle and occupant-based information
- Commonly called EDR's
- Function
  1. Detects potential crash events
  2. Senses pre-crash parameters
  3. Stores crash data
  4. Plays back collected data

Current OEM Event Data Recorders (EDR)

~5 inches

<u>Primary purpose:</u>
Deployment of air bag

<u>Secondary purpose:</u>
Record/playback
Crash data

GM Event Data Recorders

- **Sensing and Diagnostic Module (SDM):**
  - Primary function is to control the deployment of the occupant protection systems
    - This system measures longitudinal acceleration and captures longitudinal changes in velocity
      - Up to 300 milliseconds of crash pulse
    - Data related to the driver and passenger air bag deployment
      - Driver Seat belt use
      - Air bag deployment timing
    - 5 seconds of pre-crash data
      - Vehicle speed, engine RPM, engine throttle opening, and brake application

Ford EDR Program

- **Restraint Control Module (RCM)**
  - Primary function is to control the deployment of the occupant protection systems.
- **Some systems record longitudinal and lateral acceleration.**

Why do we need EDRs ?

- **New technologies**
  - Stability control systems
  - Advanced air bags
  - Other devices that do not leave evidence
- **Better pre-crash data**
- **Better crash severity parameter estimates**
- **Better crash reconstruction**
- **Automated collision notification**

EDRs in US Fleet

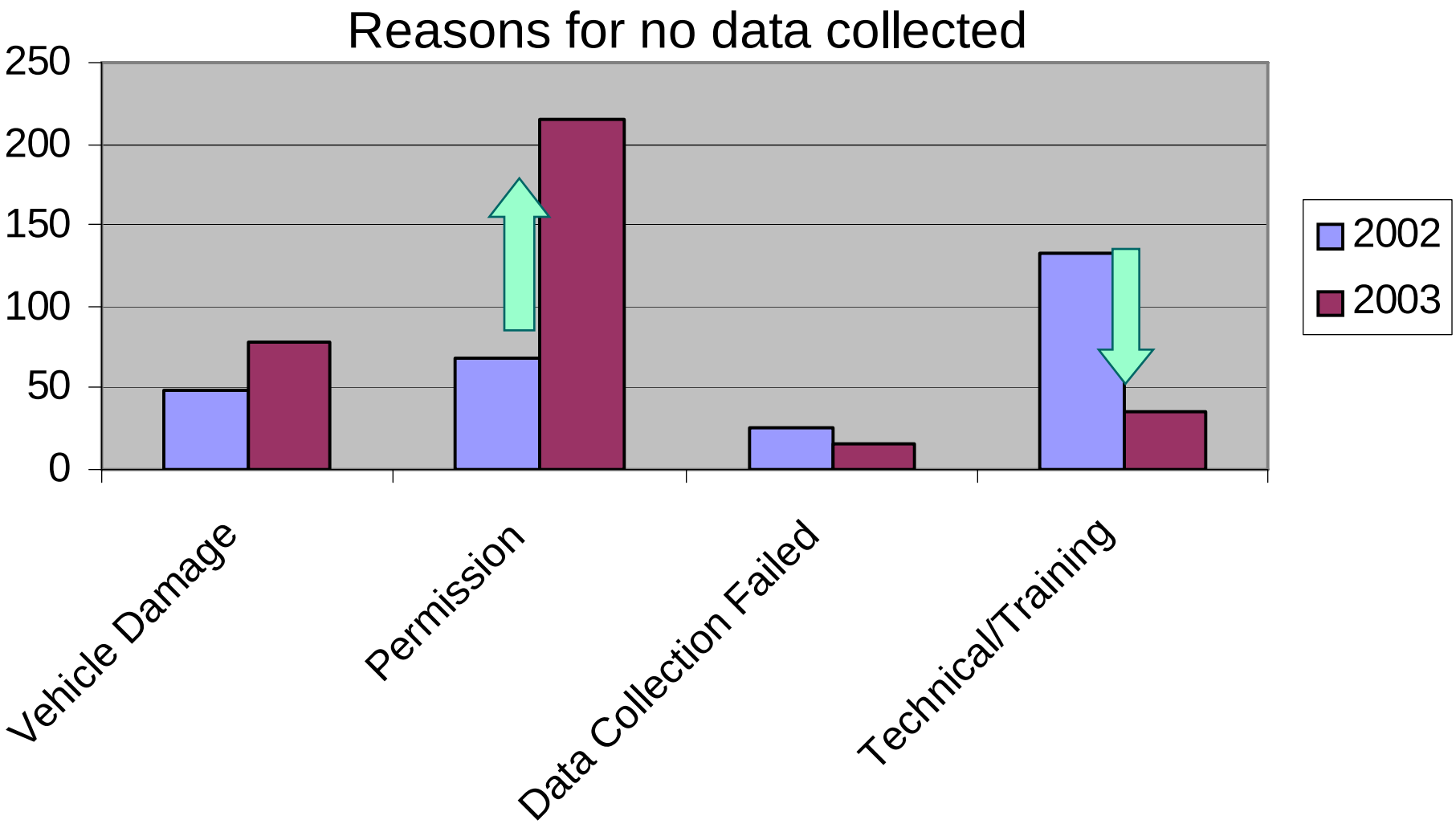
- Light fleet 200,000,000 vehicles
- Estimated 30,000,000 equipped vehicles
- Estimated 15% of current fleet
- New models 65-90% equipped

EDR Field Data Collection Program at NHTSA

- Data collected to Electronic Data System (EDS)
- Data collection systems
  - NASS-CDS
  - SCI
  - CIREN

- First case in 1991
- ~2,000 cases to date

EDR Field Data Collection Program at NHTSA, NASS



Vetronix CDR Retrieval Tool

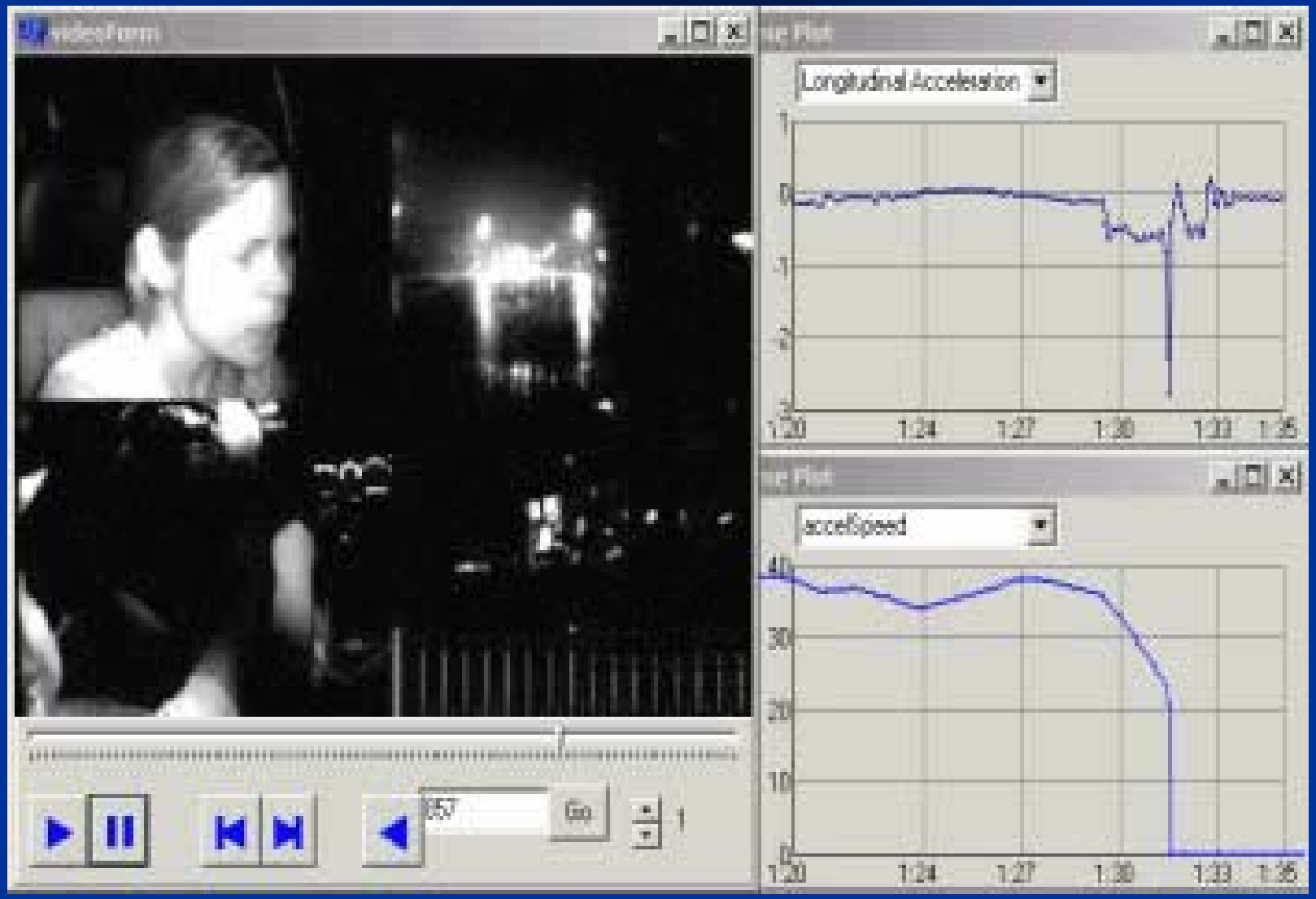
- Publicly available (~$2,500)
- Works with mainly GM and Ford vehicles
- Download
  - directly to module
  - DSL

- http://www1.vetronix.com/diagnostics/cdr/index.html

What We Have Learned: EDR Data Collection

- **The most effective method to observe and/or measure and confirm the performance of <u>Advanced 208 Compliant Occupant Protection System Features</u> is through the EDR data**
  - Crash pulse, time to deployment, restraint usage, etc
  - Deployment timing of the dual-stage air bag system

Naturalistic Driving Data



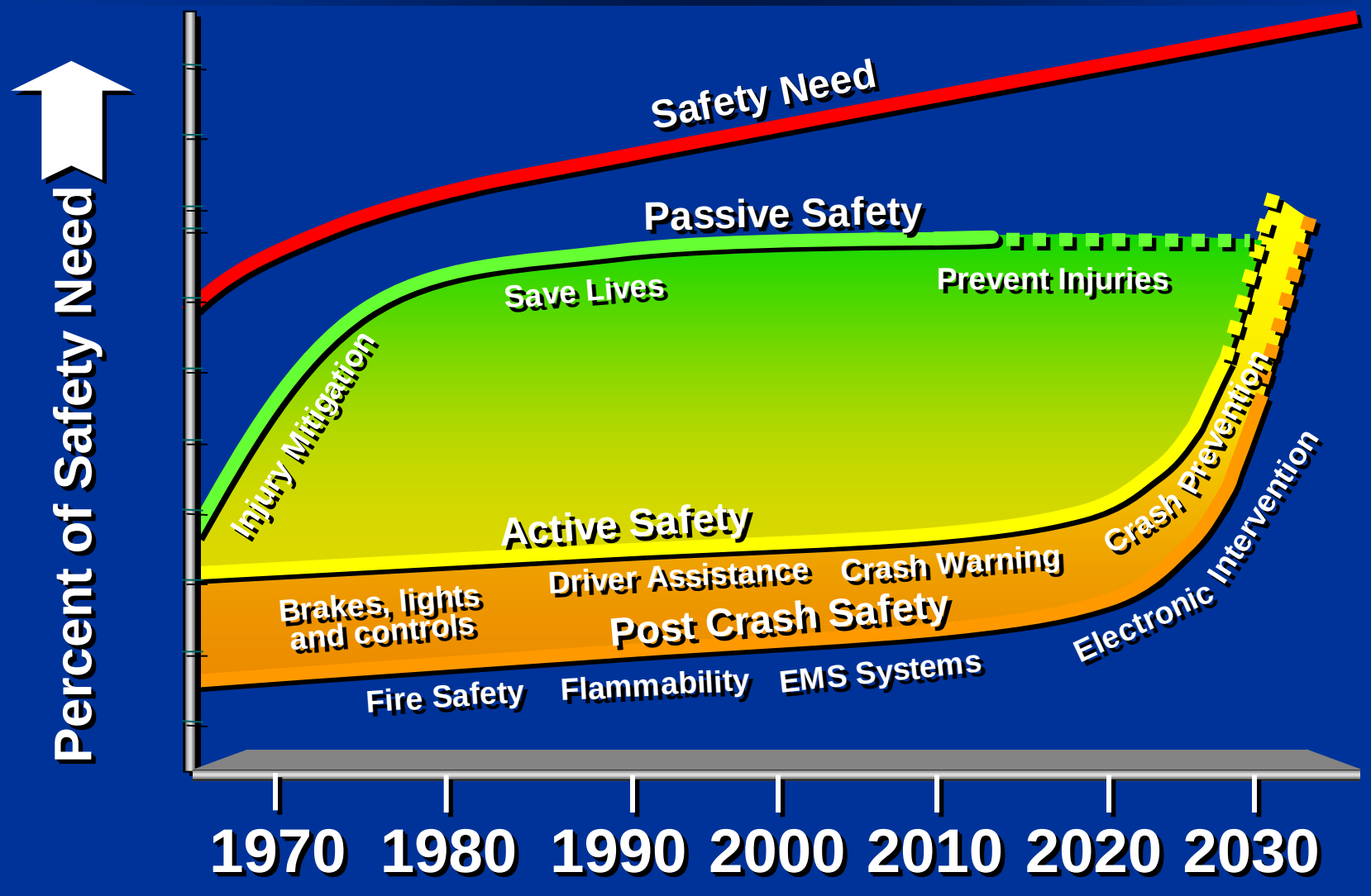
Notice of Propose Rulemaking

- **Beginning September 2008**
  - EDR's record a minimum set of data elements
  - Specify requirements for that data
  - Increase survivability of EDR's
  - Provide information on retrieval
  - OEM statement in owners manual

NPRM – Required Data Elements

- Longitudinal acceleration
- Maximum delta – V
- Speed, vehicle indicated
- Engine RPM
- Engine throttle, % 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 deployment level, driver
- Frontal air bag deployment level, right front passenger
- Each frontal air bag deployment
  - Time to deploy, in the case of a single stage air bag, or
  - Time to first stage deployment, in the case on a multi-stage air bag
- Multi-event, number of events (1,2,3)
- Time from event 1 to 2
- Time from event 1 to 3
- Complete file recorded (yes, no)

The Safety Need



Total Safety

Developed by: Joseph N. Kanianthra

Safety of the Future

- Evolution of Advanced Technology
- Vehicle/Driver/Environment as Total System
  - Need Constant Communications Among All Components
- Society Must Accept Some Control by Vehicle
- Proper Testing and Evaluation Procedures Needed
- Facilitate Deployment Through a Variety of Methods

Conclusions

- **Safety Needs Novel Approaches**
  - EDR is essential
  - Collaborative research needed
  - Innovative regulatory approaches necessary
  - Consumer information and education facilitates deployment
  - Closer cooperation between Government and Industry essential