Crashes of all Severities, 2000 GES

- Road-Departure: 21.0%
- Rear-End: 29.0%
- Intersection: 26.0%
- Lane Change and Merge: 9.0%
- Pedalcyclist: 1.0%
- Pedestrian: 1.0%
- Other: 4.0%
- Animal: 4.0%
- Opposite Direction: 3.0%
- Backing: 2.0%
Crash Causal Factors

- Driver Related Factors: 90%
- Vehicle Related: 2%
- Road Surface: 8%
Safety Belt Use Rates 1983 - 2004

2004 Rate 82%
Effectiveness of Safety Belts

- Frontal Impact
- Near Side
- Far Side
- Rollover (Primary)
- Rear Impacts & Others

- Car
  - 3 Pt. Belts
- Light Trucks
  - 3 Pt. Belts
Drivers Involved in Fatal Crashes with Positive BACs (BAC>0), 2003

![Bar chart showing the number of drivers involved in fatal crashes with positive BACs (BAC>0) in 2003. The chart displays the BAC levels (g/dL) on the x-axis and the number of drivers on the y-axis. The legal limit in 50 states is indicated, with the median BAC in 2003 set at 0.16. The source of the data is FARS 2003.]
Rollover Priorities

Safety Belts

Ejection Mitigation

Rollover Prevention

Structural Integrity
Lives Saved by Safety Technologies, '60 - '02: 328,551

- Lives Saved by Safety Belts Alone: 168,524
- Lives Saved by All Other Safety Features: 160,027

Cost (2002 Dollars) and Weight (Pounds):

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passen ger Cars</td>
<td>$839.13</td>
<td>125.44</td>
</tr>
<tr>
<td>LTVs</td>
<td>$710.86</td>
<td>86.18</td>
</tr>
</tbody>
</table>

Source: NHTSA
Advanced Car Seating
Restraint Systems
Alcohol Screening Systems

- System needs to be totally unobtrusive
- Nearly 100 percent accuracy essential
- Multiple sensing assures reliability

- Passive system that “sniffs” ambient air
- Applications include testing for alcohol in exhaled breath, vehicles, and other enclosed spaces

Tru touch skin biometric sensor

Siemens sensor technology to detect gases and smells
Data Collection

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**

GM SDM Units
SDM-Sensing and Diagnostic Module

~5 inches

Cover removed
Understanding normal driving performance is important.
Crash Time Line

Prevention

Severity Reduction

Injury Mitigation

Medical Attention

Crash may not be prevented—but Severity can be Reduced

0 m.sec.

100 m.sec.

1 hr

Developed by: Joseph N. Kaniantha
Technology Opportunities

- New High Definition Maps and GPS
- Short Range Radar Sensor
- Long Range Radar Sensor
- Camera Based Lane Detection
Total Safety

Electronic Detection

Driver/Occupant Warnings

Occupant Readiness

Injury Mitigation

Limited Driver Control

Anticipatory Driving Assistance

Prevention

Protection

Developed by: Joseph N. Kanianthra
Intersection Collision Avoidance
Why Advanced Technologies?

- Technologies often bring new opportunities
- Potential for total safety benefits
- Save lives, prevent injuries and reduce the economic costs
- Technologies can compensate for human deficiencies
- However, must ensure enhancement of safety
First Harmful Event - Rollover

Critical Events

- Vehicle Encroaching in Lane
- Vehicle Failure/Loss of Control
- Excessive Speed
- Vehicle Out of Lane
- Vehicle Turning at Intersection
- Another Vehicle in Lane
- Pedestrian/Animal/Object

Percent
First Harmful Event - Rollover

Avoidance Maneuvers

- None
- Braking
- Steering
- Braking & Steering
- Accelerating & Others

Percent
Excessive Speed

Avoidance Maneuvers

- None
- Braking
- Steering
- Braking & Steering
- Accelerating & Others

Percent
First Harmful Events - Combined

- Lane Keeping
- Speed Warning
- Brake Assist
- ESC
Rollover

- Speed Warning
- Lane Keeping
- ESC
- Brake Assist

Percent Percent

Ex.Speed
SubiVehOutLan
Veh.Fal/LossCnt
Ped/Anim/Obj
OthVeh_EncrLn
OthVeh_InLn
SubiVehTurn
No Maneuver
Braking
Steering
Braking/Steering
Safety Benefits Estimation of Crash Avoidance Systems Based on Experimental Data

No. of Crashes = No. Police-Reported Crashes
Driver Vehicle Safety Research

- Safety Impacting & Safety Critical In-Vehicle Technology Evaluation
- Countermeasure Development
- User Acceptance
- System Integration for Optimum Performance
- Driver Workload Management
- Driver Training
- Aggressive Driver Research
- Behavior Modification Research
- Demographic & Social Factors Research
- Information Processing Research
- Physical & Mental Capacity Assessment
- Driving Task Demands
- Cognitive & Attention Demand

Developed by: Joseph N. Kanianthra
Acceleration of Safety Technologies

- Safety Needs Novel Approaches
  - Use market forces
  - Innovative regulatory approaches
  - Consumer information and education
  - Closer cooperation between Government and Industry