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nhtsa

people saving people

Overview of NHTSA Research Organization and Programs

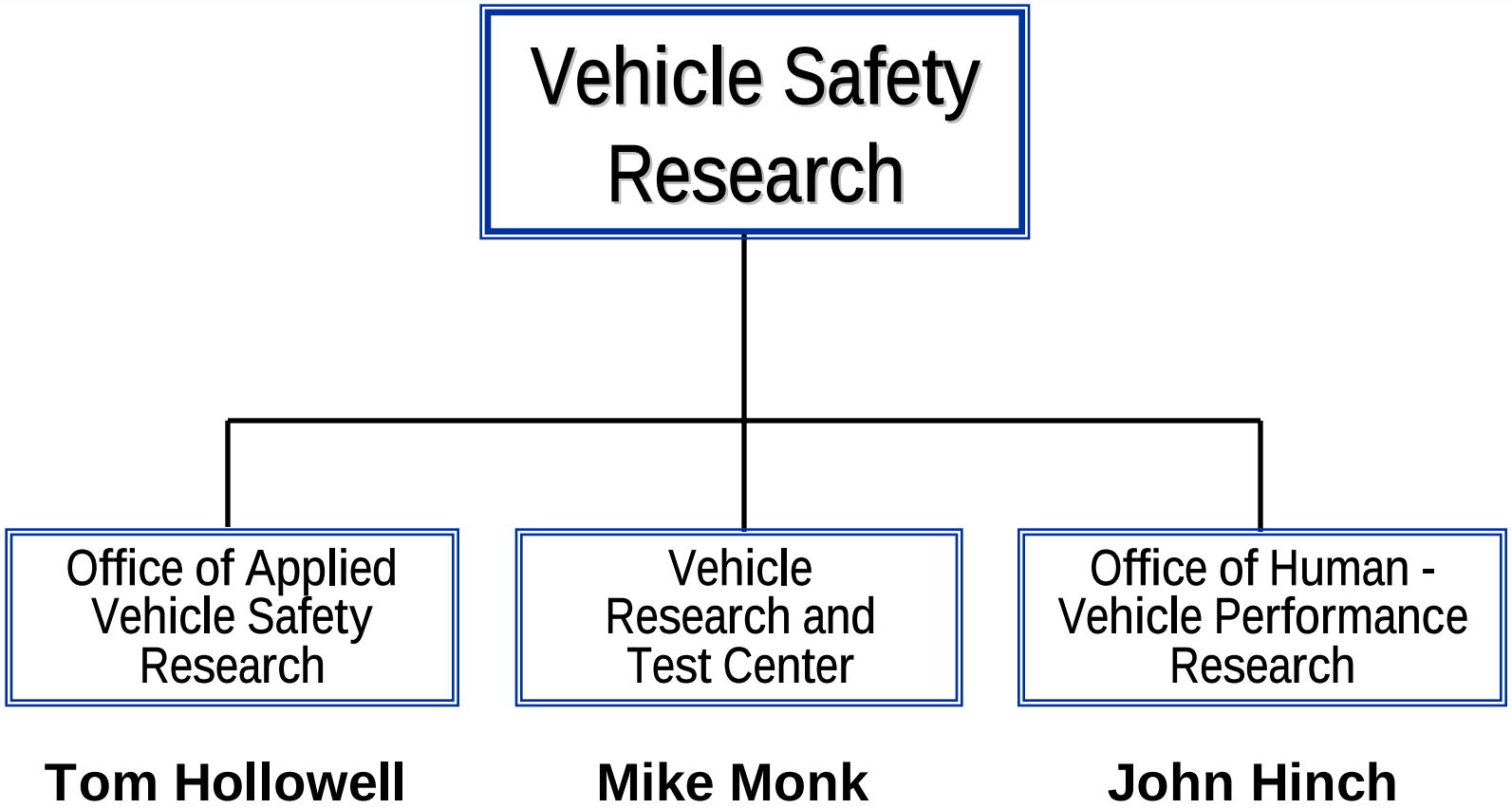
August 9, 2006

Office of Vehicle Safety Research

Agenda

1. Organization and Budget
2. Research Objectives and History
3. Vision for Vehicle Safety
4. Program Overview

Organization



Vehicle Safety Research
($ in thousands)

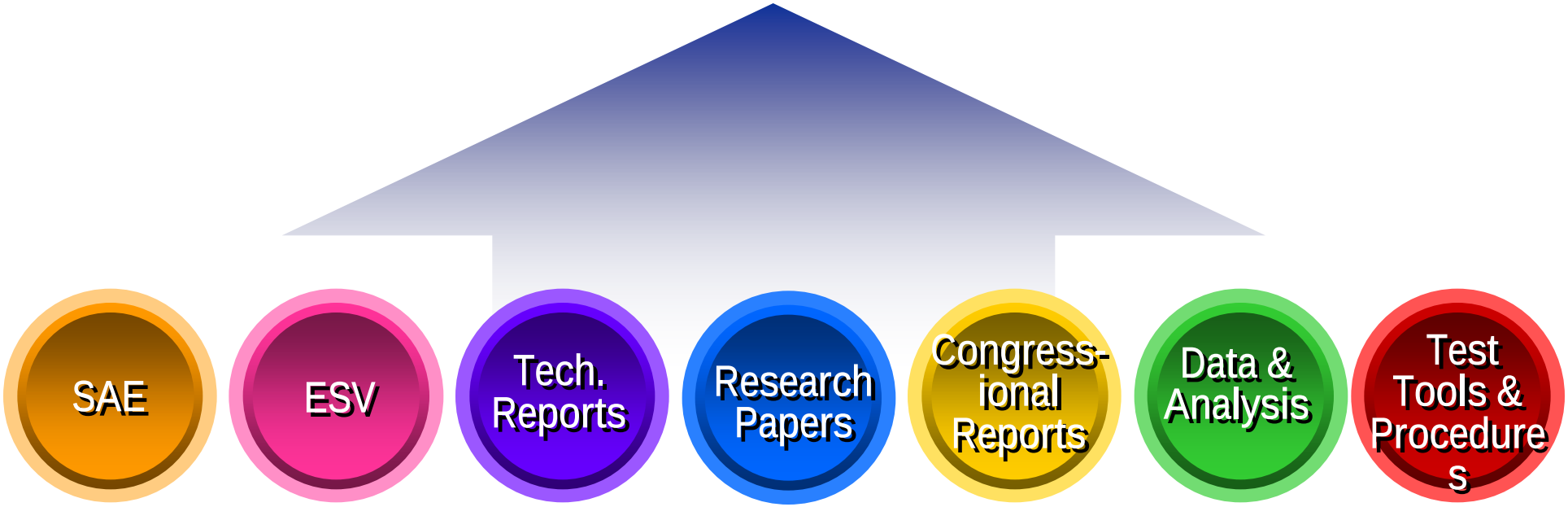
	Enacted FY'04	Available FY'05	Available FY'06	Request FY'07
Safety Systems	$11,078	$9,151	$9,134	$7,726
Biomechanics	$15,191	$16,112	$13,860	$11,500
Heavy Vehicles	$2,105	$2,098	$4,470	$2,115
Tire Research	$613	$859	$615	$300
Driver Simulation Research	$3,509	$0		
Human - Vehicle Performance	$3,450	$7,079	$6,980	$6,750
New Crash Avoidance Initiative		$492	$495	
VRTC	$1,007	$1,004	$1,002	$1,012
Hydrogen Fuel Cell	$0	$0	$916	$925
Plastic & Composite vehicles	$0	$0	$248	
TOTAL VEHICLE SAFETY RESEARCH	$36,953	$36,795	$37,720	$30,328

Research Mission and Goals

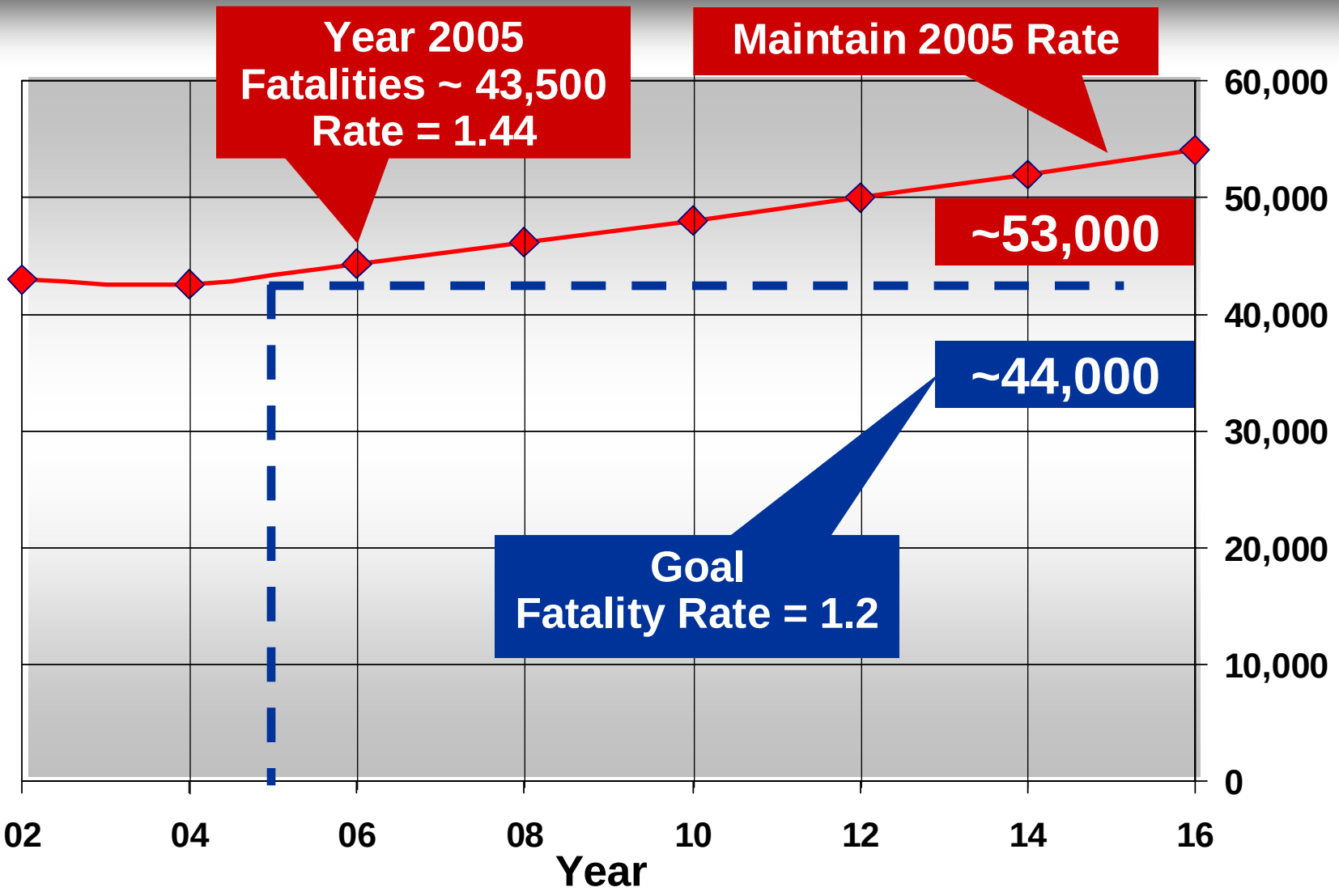
- **Advance Scientific Knowledge in support of NHTSA's mission**
  - Identify Opportunities for Increasing Safety
    - Crashworthiness, Crash Avoidance, Restraint systems
  - Understand Performance of Advanced Technologies
    - Crash Prevention, Crash Severity Reduction, Integrated Safety
  - Develop Objective Tests to Discriminate Performance
  - Address Human-Vehicle Performance Issues
  - Retain Leadership in Human Injury Research
  - Support Rulemaking, Consumer Information and Enforcement Programs
- **Research Programs in Vehicle Safety**

Research Products

Products



Fatality Reduction Goal is Challenging



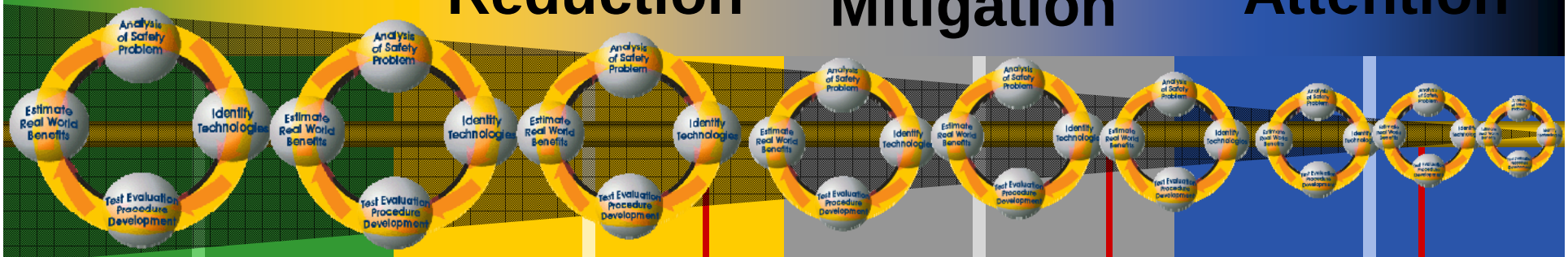
Crash Time Line

Prevention

Severity Reduction

Injury Mitigation

Medical Attention



Crash may not be prevented-but **Severity** can be **Reduced**

0

200 m.sec.

1 hr

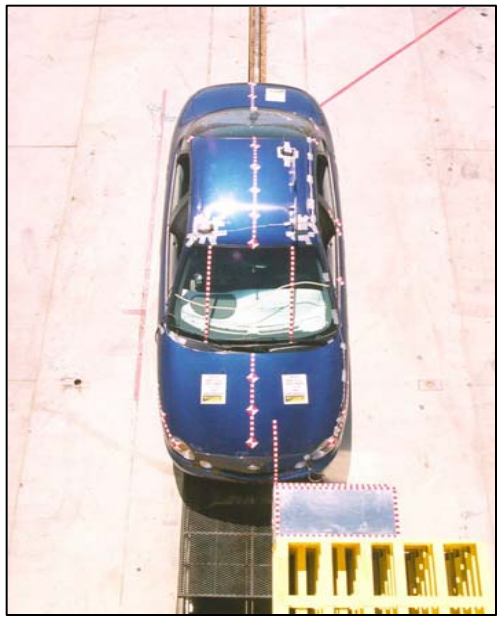
Developed by: Joseph N. Kanianthra

Strategic Vision

Frontal Crashworthiness

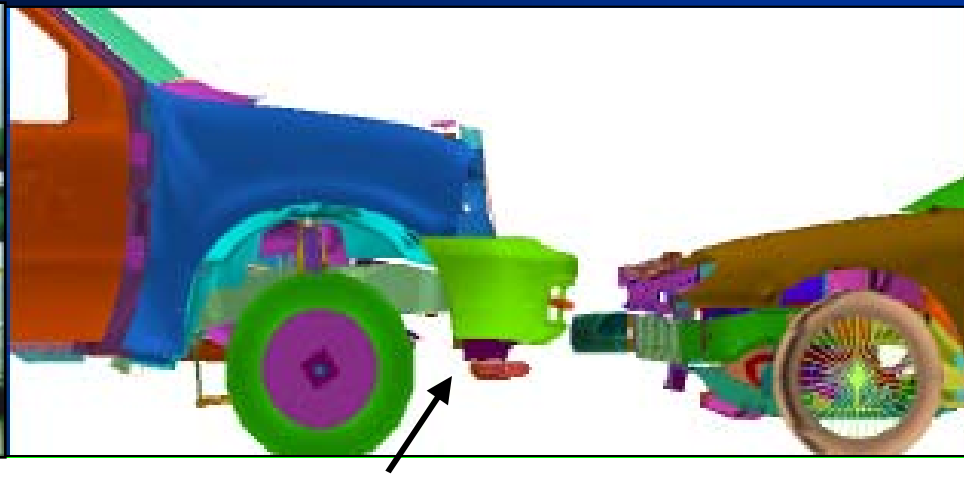
3 YO test dummy

- Out of position (OOP)/unrestrained young children are severely injured each year by airbags in frontal crashes.
- Test procedure is being developed to evaluate real-time sensors and systems to disable airbags for OOP occupants.



- Offset car crashes involve about 85,000 moderate or worse injuries each year to lower extremities.
- Test procedure being developed that could prevent 1,300 – 8,000 moderate or worse injuries.

Frontal Compatibility Research

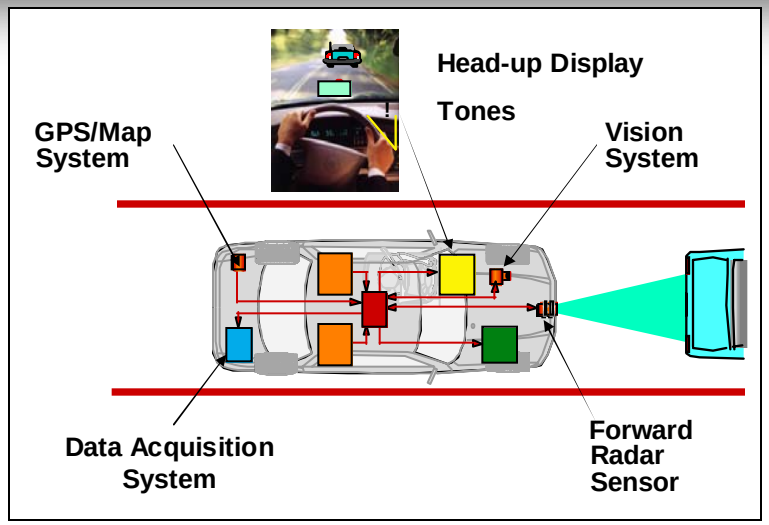


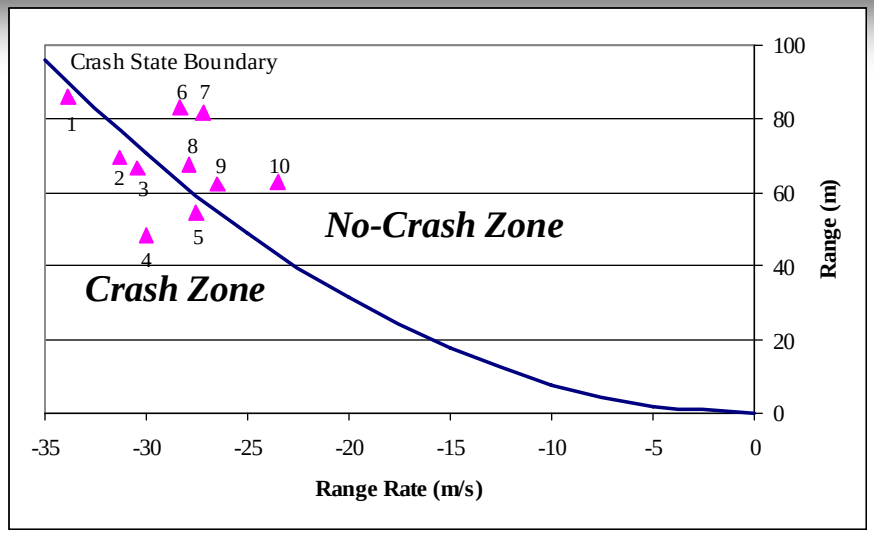
Bigger vehicles can be more aggressive

New structures since 2003 to improve interaction

- In 2004, 1,323 car and 307 LTV occupants died in car-LTV crashes.
- CDS data and vehicle testing have shown that vehicles matched for height of forces and energy absorption have the lowest injury rates.
- Developing dynamic test procedures for height of force and energy absorption to ensure fleet compatibility

Advanced Technologies in Crashworthiness

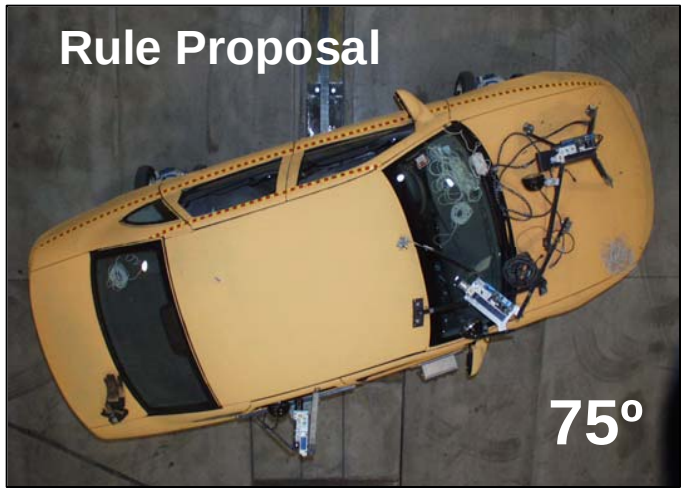


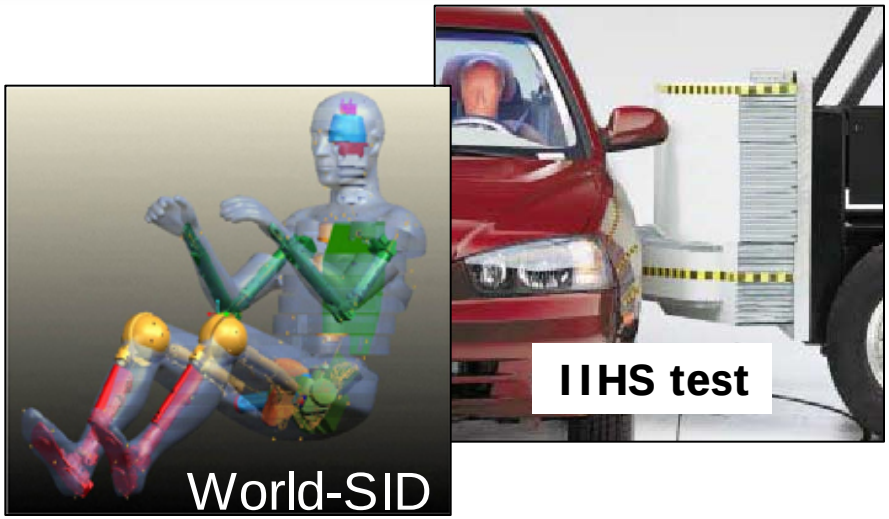


Last-Second Initial Braking for Lead Vehicle Stopped

- Sensors monitor environment, driver.
- Crash line is crossed, human can't save it, crash will happen. 27% don't brake at all, those that do underbrake, belts are 50% effective – if used.
- Vehicle diagnoses, brakes hard, adapts and prepares restraints.
- Injury outcomes are reduced compared to passive safety.

Side Impact Crashworthiness





- Side impact rule pole upgrade addresses 3,070 fatalities, could save 1,086 lives by forcing side bags.
- Next steps are to evaluate a dummy upgrade to the WorldSID and an LTV-like barrier (similar to the IIHS test)

Ejection Mitigation Research

- **Developed Hardware and Test Procedures**
  - Required hands-on development
- **Evaluated Countermeasure Effectiveness and Feasibility**
- **Worked Cooperatively With Component Suppliers**
- **Evaluating Current Fleet Performance**
- **Conducting Accident Case Studies**

Ejection Mitigation

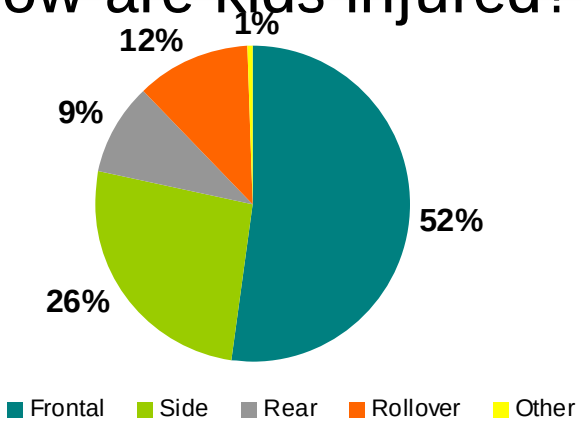
Roof Crush Research

- Supporting High Priority Rulemaking Initiative
- Evaluating Potential New Test Procedures
- Evaluating Current Fleet Performance
- Performing Finite Element Analysis
- Conducting 2-Sided Tests
- Conducting Accident Case Studies

Roof Crush

Child Safety Crashworthiness

How are kids injured?

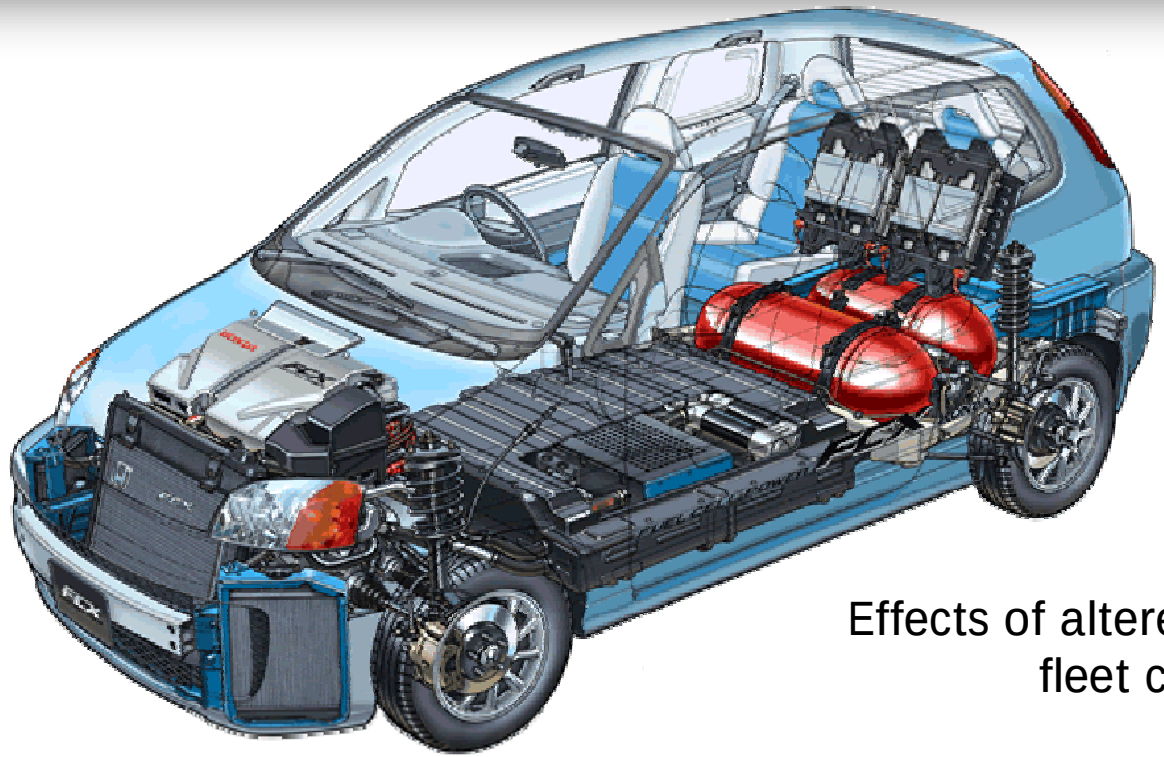


3 YO side impact test

10 YO front sled test

- **52% of all rear occupants are children 0-12 years old.**
- **Tests are being developed to evaluate 10 YO booster seats in frontal crashes.**
- **Tests are being developed to evaluate child restraints in side crashes.**

Hydrogen and Fuel Cell Safety



Honda FCX on-road evaluation vehicle

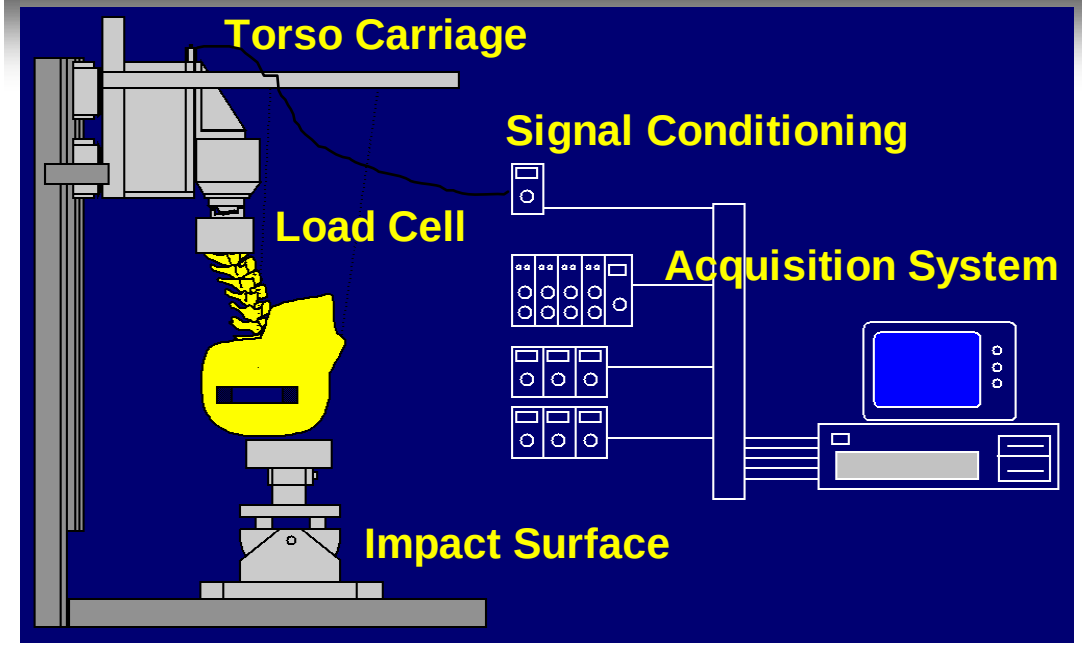
Integrity of high pressure storage in crash, FMVSS 304

Effects of altered mass, stiffness on fleet compatibility

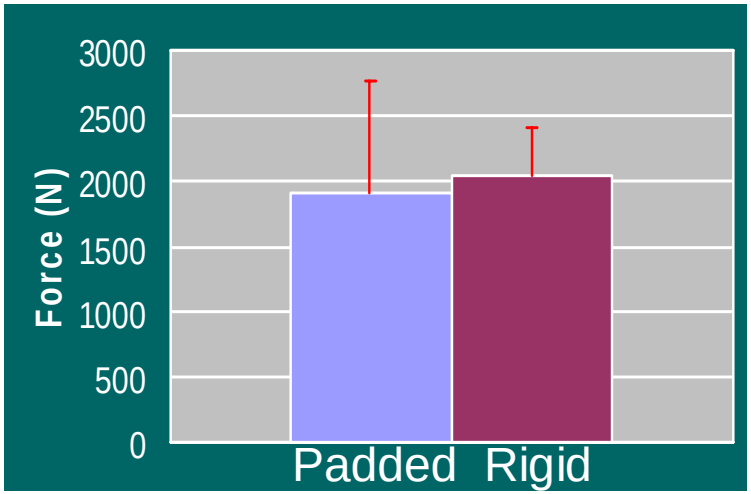
Electrical isolation of high voltage during/after crash, FMVSS 305

Major carmakers are road and crash testing hydrogen vehicles. Participate with GM crash test in the fall.

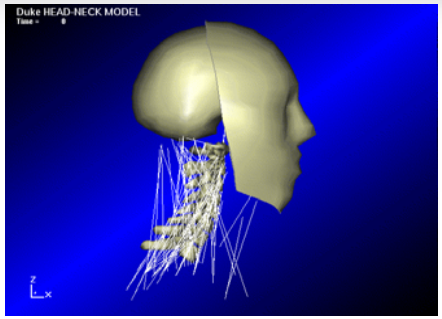
Impact Biomechanics Research



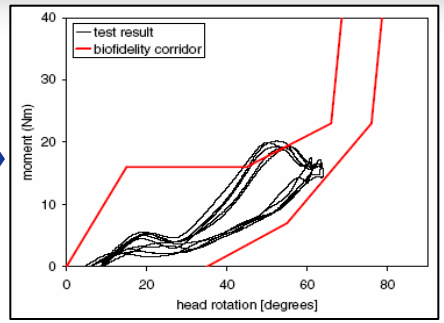
- Neck Injury Research
- Head and Brain Injury Research
- Thorax and Abdomen Injury Research
- Lower Extremity Injury Research



Injury Criteria Development



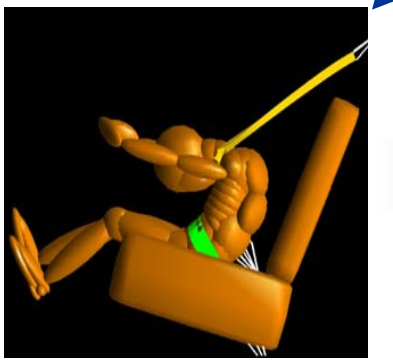
Component tests
and models



Scaling Response
Corridors injury criteria

Crash reconstruction
Real world injury

Whole body tests
Volunteer data

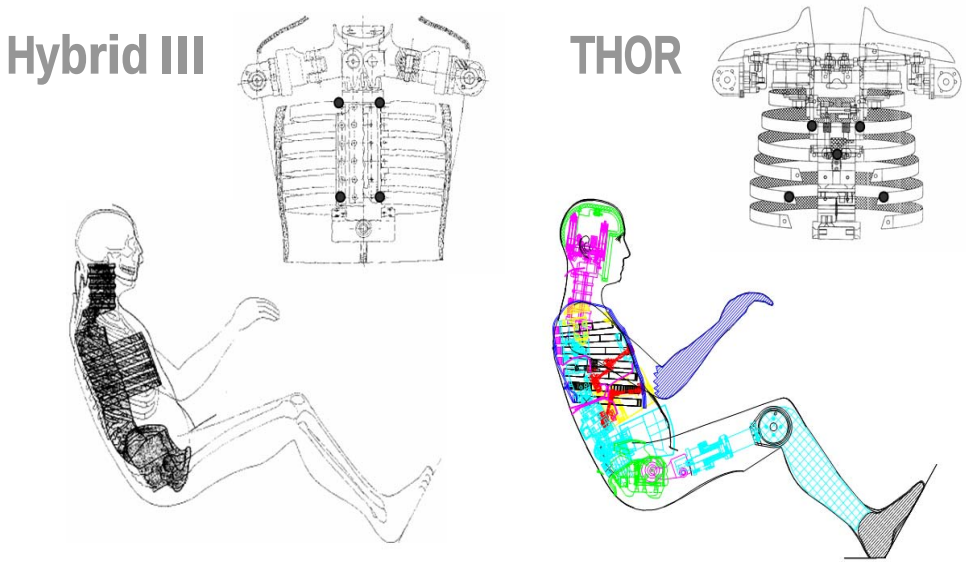


Optimized dummy
response requirements
and associated
injury criteria

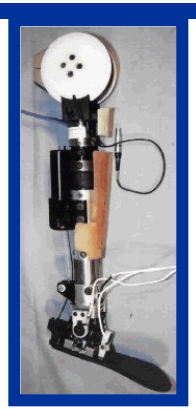
Crash Dummy Specification and Assessment

(THOR : Test Device for Human Occupant Restraint)

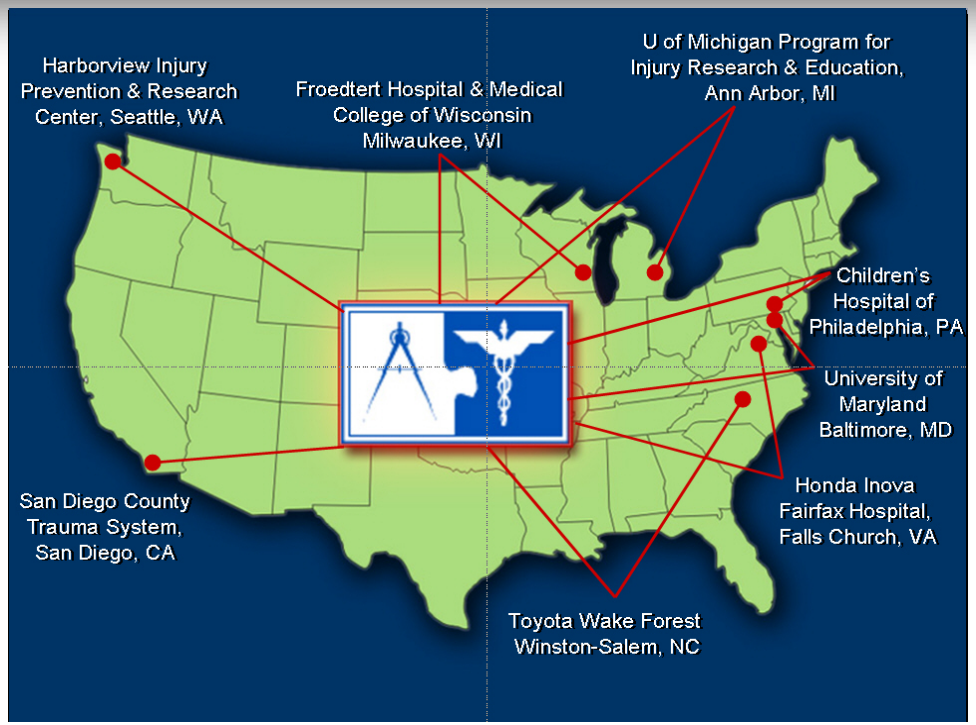
THOR

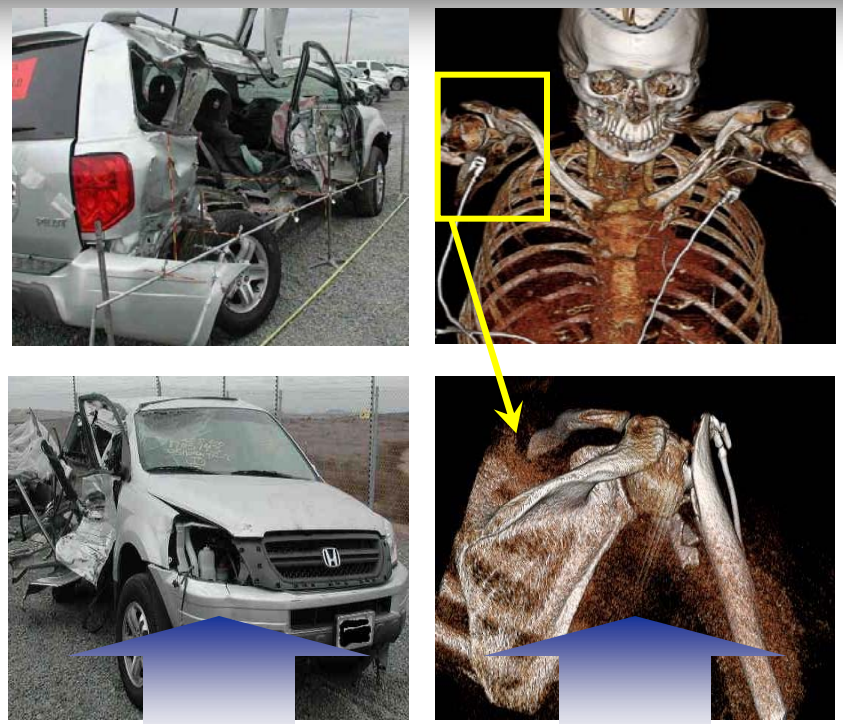


- Improve assessment of head strikes
- Provide facial injury assessment
- Improve neck injury assessment
- Evaluation of advanced restraint systems
- Detect wheel & belt interactions with lower torso
- Improve assessment of hip & ankle/ foot injuries



Crash Injury Data Analysis
(CIREN: Crash Injury Research Engineering Network)





Advanced Crash Data

State-of-the-Art Medical Data

- 8 total centers (6 NHTSA funded, 2 Industry funded)
  - CHOP and Wake Forest/Virginia Tech new centers
- Over 350 cases to be collected in 2006
  - Over 3000 cases collected to date
- Respond to emerging issues (rollover, elderly, etc.)

Evaluation & Federalization

- Ten Year-old Child
- WorldSID
- Side Impact Child
- THOR
- Lx & FLx Legs
- HIII 95th Male
- Rear Impact Dummies
- Pedestrian Tools

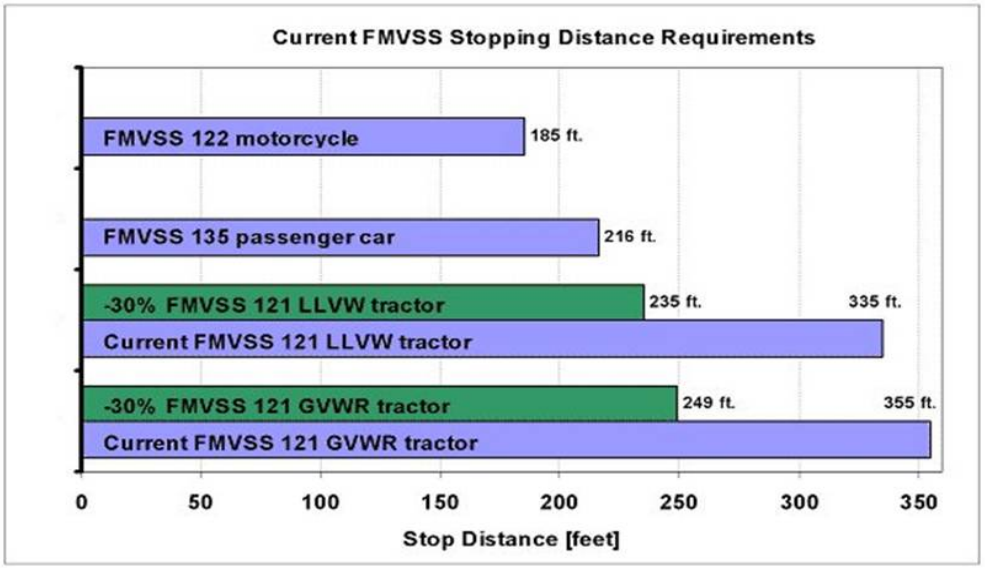
Defects Analysis

- **Engineering Analysis to Support ODI**
  - Testing
  - Field investigations
  - Forensic in nature
- **Determine if System or Component Performs Inappropriately**
- **If So, Determine Consequence to Safety**

Ford Cruise Control Fires

Heavy Truck Brake Research

- **Reduce truck stopping distance**
  - Past research was the basis of an NPRM published Dec 2005
  - Support current FMVSS 121 rulemaking for straight trucks
  - Develop test procedure for semi-trailer ABS



Light Vehicle Brake Assist Research

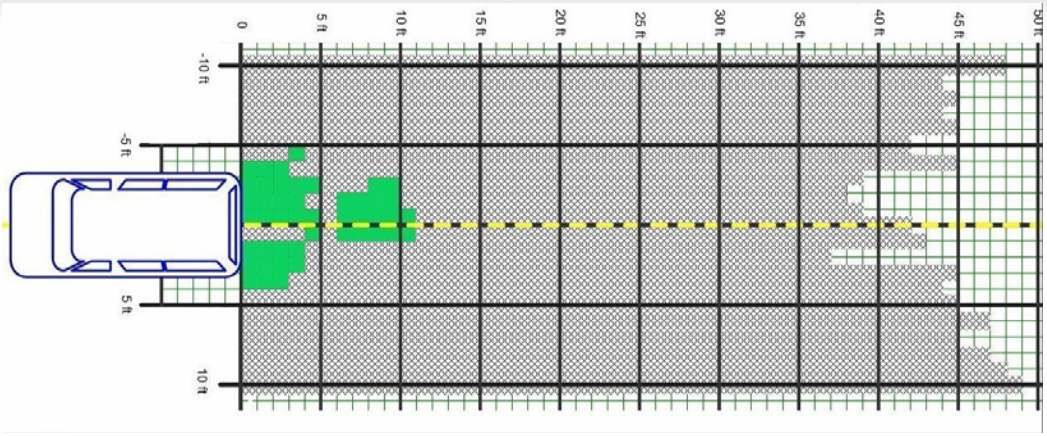
- New 2006 project
- Evaluate driver performance using brake assist technology
- Determine crash avoidance/severity reduction capability
- Evaluate safety benefits

Tire Aging Research

- **Have developed method for artificially aging tires based on "real-world" data.**
- **Developing compliance test for aged tires.**

- **Agency wide team working on report to Congress and possible rulemaking.**
- **Shared information and data with ASTM and industry.**

Backover Avoidance Research



- **Tested OE and aftermarket systems for mandated report to Congress.**

- **Testing systems on medium straight trucks.**
- **Planned Research**
  - Develop performance test
  - Perform human factors testing to determine effectiveness of rear-view video.

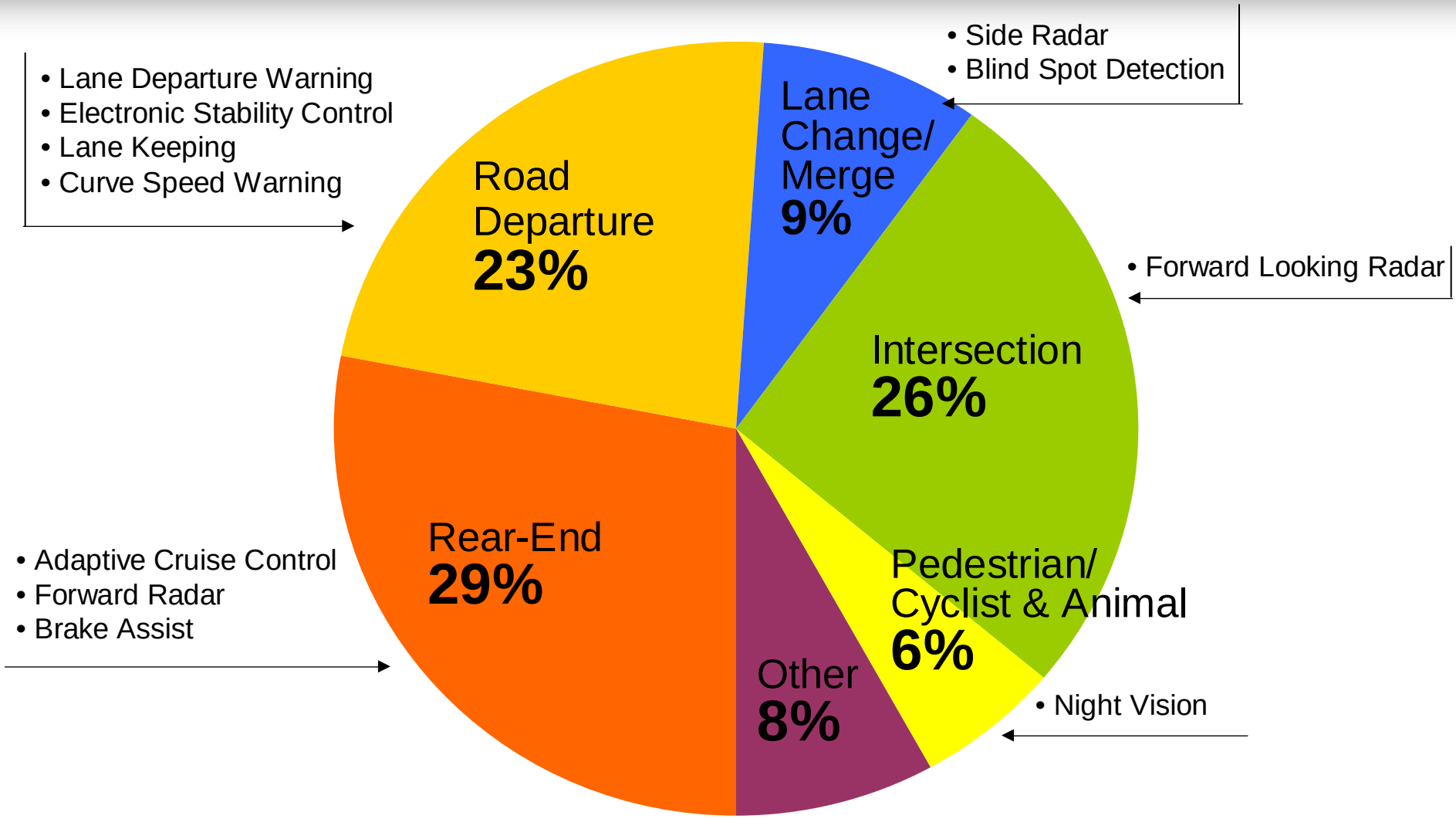
Electronic Stability Control Research

- Developed over-steer prevention performance test for NPRM.
- Supported Rulemaking in developing NPRM.
- Researching under-steer mitigation and roll stability control (RSC) for light vehicles.

- Researching Heavy Truck ESC and RSC systems.
- Anticipate future rulemaking

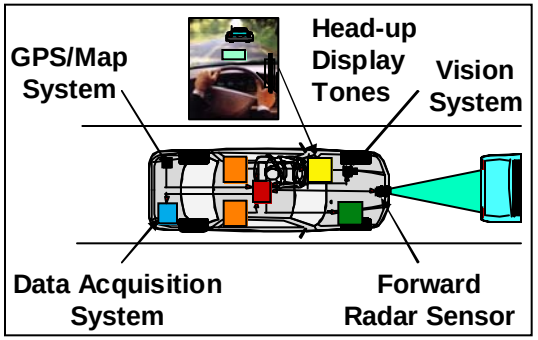
Intelligent Transportation Systems (ITS)

- **Application of advanced technologies to improve transportation safety and mobility**

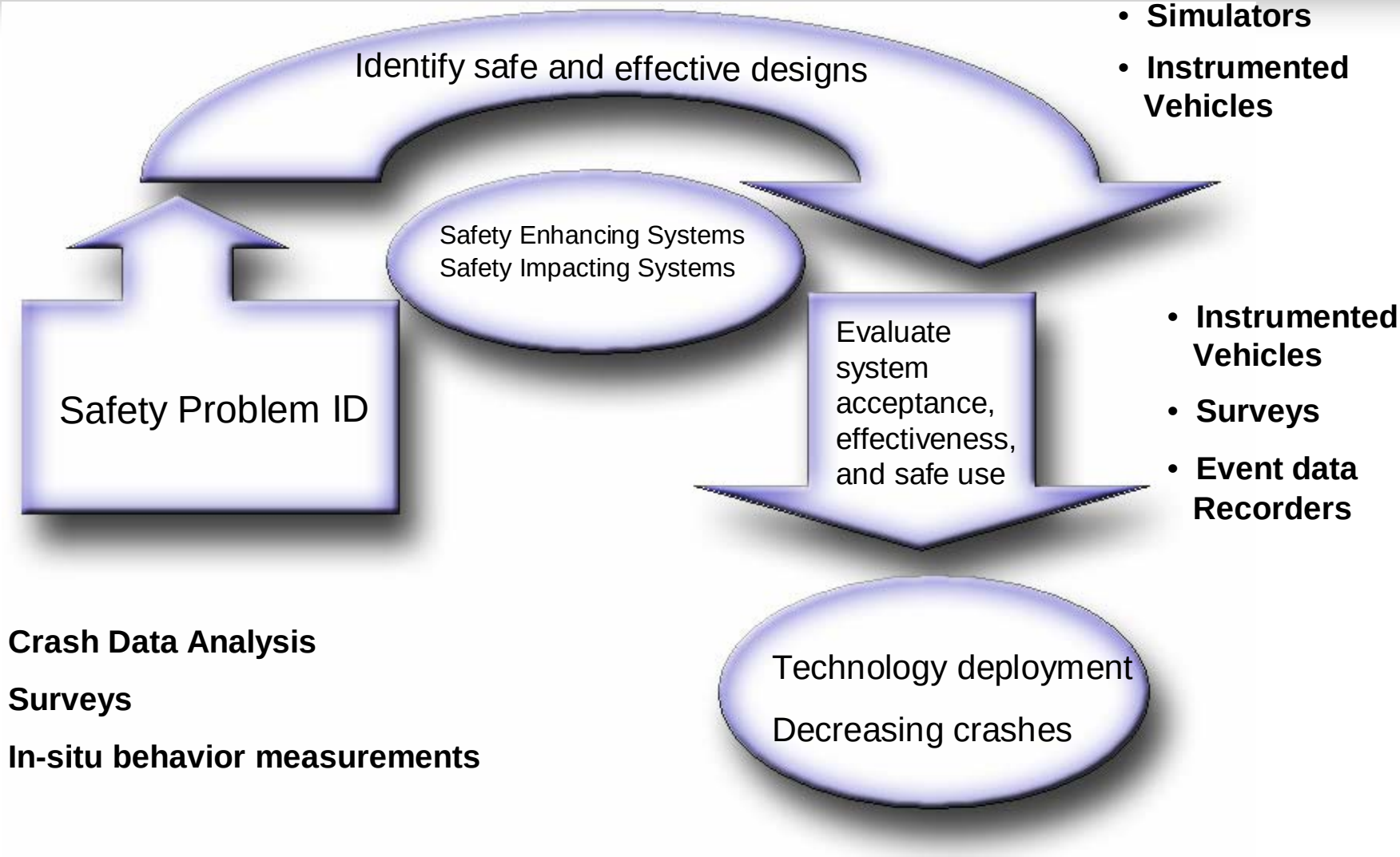

• Lane Departure Warning
• Electronic Stability Control
• Lane Keeping
• Curve Speed Warning
Road Departure 23%
• Side Radar
• Blind Spot Detection
Lane Change/ Merge 9%
• Forward Looking Radar
Intersection 26%
Pedestrian/ Cyclist & Animal 6%
• Night Vision
Other 8%
Rear-End 29%
• Adaptive Cruise Control
• Forward Radar
• Brake Assist

NHTSA ITS Activities

- **IVBSS**
  - Rear-end, run-off-the-road, and lane-change crash countermeasure systems
- **CICAS**
  - Stop sign & signal violation warning
- **VII**
  - Deployment of an integrated communications infrastructure
- **NG911 (NTI)**
  - Foundation for public emergency services in a wireless mobile society



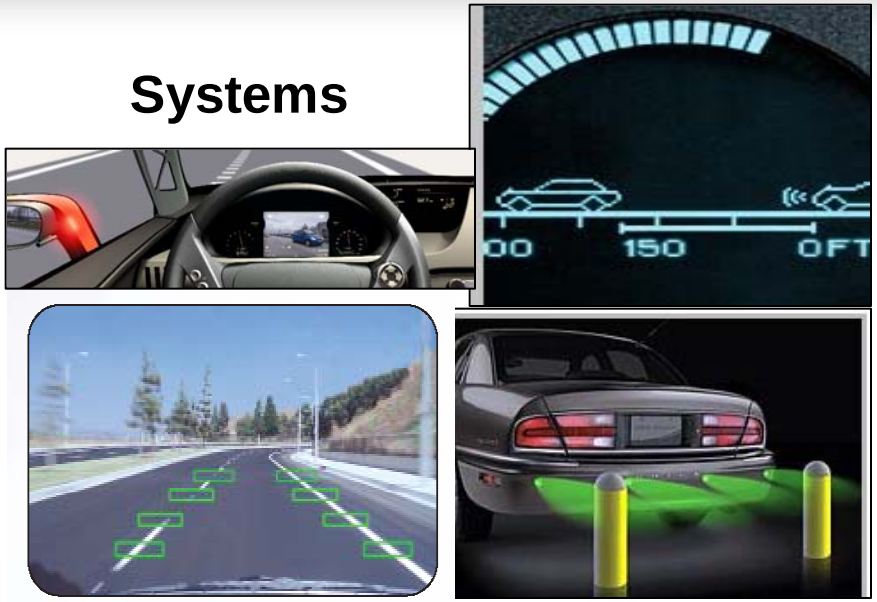
Integration of Human Factors Research in Vehicle Safety Research



Driver Assistance Systems

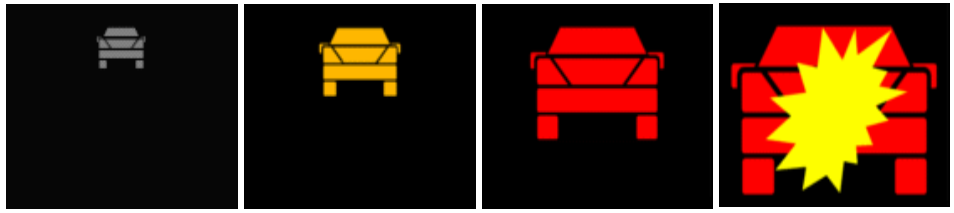
Forward Collision, Lane Change, Road Departure, Adaptive Cruise Control, Night Vision

Systems



Lane Departure Warning computer image

Driver Warning Interface Research



Driver response time to collision warnings

Vehicle Lighting

Forward Lighting

Conspicuity

Rear Lighting

Conclusions