

# How Naturalistic Driving Fits into the NHTSA Research Portfolio:

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# The Problem!



## Safety

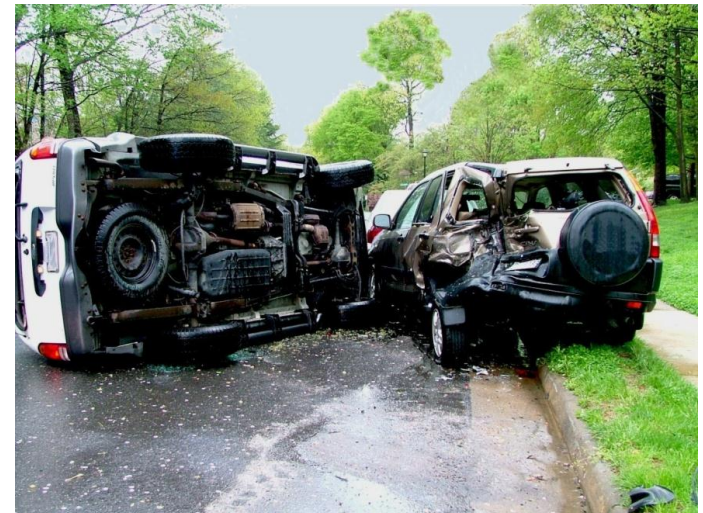
- 32,310 highway deaths in 2011
- 6,000,000+ crashes/year
- Leading cause of death for ages 4 - 34

## Mobility

- 4.8 billion hours of travel delay\*
- \$101 billion - cost of urban congestion

## Environment

- 1.9 billion gallons of wasted fuel



\* Texas Transportation Institute; 2011 Urban Mobility Report

# Crash Avoidance

# [The Portfolio]

# Crashworthiness

	NORMAL DRIVING	NEAR CRASH & CRASH IMMINENT	CRASH	POST-CRASH
<b>PASSENGER CARS &amp; LIGHT TRUCKS</b>	<ul style="list-style-type: none"><li>• Driver Distraction</li><li>• Impairment Monitoring (Drowsy, Distraction, Alcohol)</li><li>• Alcohol Detection</li><li>• Automation</li></ul>	<ul style="list-style-type: none"><li>• FCW</li><li>• Automatic Braking</li><li>• Lane Dep Warning</li><li>• Blind Spot Warning</li><li>• Connected Vehicles (V2V) - multiple warning apps &amp; HF Guidelines</li><li>• DVI Research</li></ul>	<ul style="list-style-type: none"><li>• Dynamic Rollover</li><li>• Oblique/Off-set Frontal</li><li>• Adaptive Restraints</li><li>• Child Side Impact</li><li>• Elderly Occupants</li></ul>	<ul style="list-style-type: none"><li>• Auto Crash Notification</li><li>• Advanced ACN</li><li>• Medical Outcome (CIREN)</li><li>• First Responder Safety</li></ul>
<b>HEAVY VEHICLES - Truck/Bus</b>	<ul style="list-style-type: none"><li>• Drowsy Driving</li><li>• Vision Enhancement</li><li>• Automation</li></ul>	<ul style="list-style-type: none"><li>• Stability Control</li><li>• FCW Warning</li><li>• Lane Dep Warning</li><li>• Automatic Braking</li><li>• V2V</li><li>• Human Factors - DVI Research</li></ul>	<ul style="list-style-type: none"><li>• Underride</li></ul>	
<b>MOTORCYCLES</b>	<ul style="list-style-type: none"><li>• Conspicuity</li></ul>	<ul style="list-style-type: none"><li>• ABS/CBS</li><li>• V2V (future)</li></ul>	<ul style="list-style-type: none"><li>• Helmet Use</li><li>• Airbags</li></ul>	<ul style="list-style-type: none"><li>• ACN</li></ul>
<b>PEDESTRIANS</b>	<ul style="list-style-type: none"><li>• Quiet Car Detection</li><li>• Advanced Lighting Systems</li></ul>	<ul style="list-style-type: none"><li>• Pedestrian Warning</li><li>• Automatic Braking</li><li>• V2P (future)</li></ul>	<ul style="list-style-type: none"><li>• GTR – Hoods / Bumpers</li></ul>	<ul style="list-style-type: none"><li>• ACN</li></ul>

# Naturalistic Driving - Some Key Research Areas



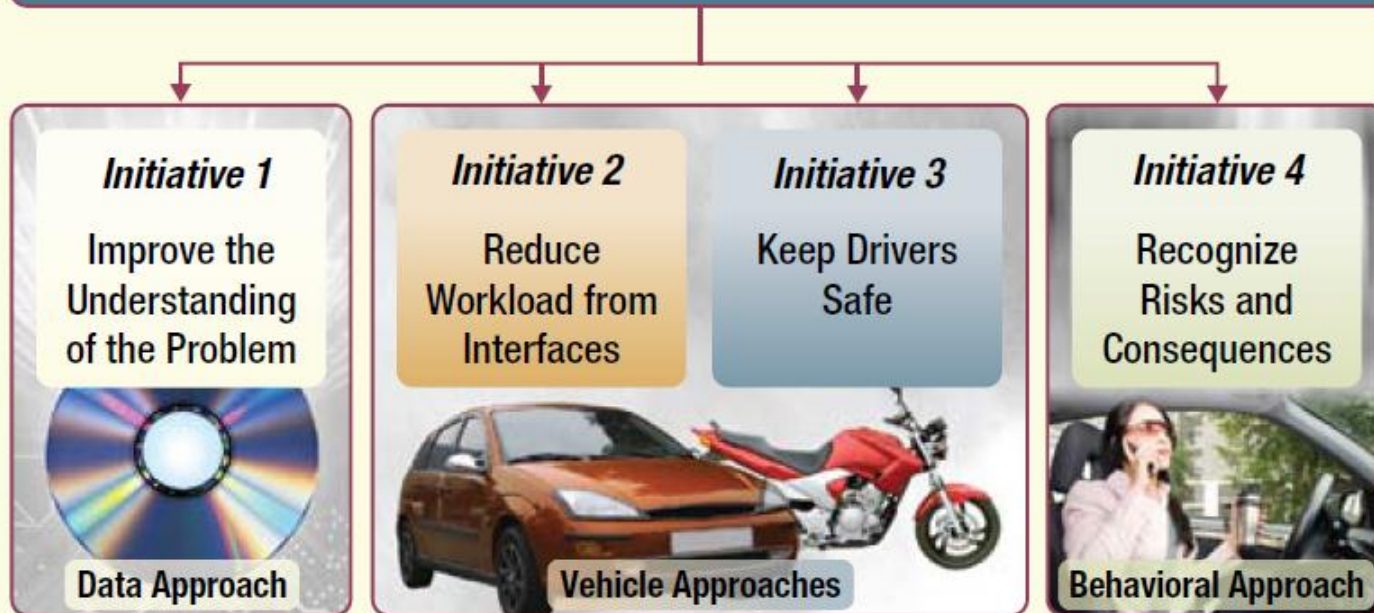
- **Distracted Driving**
- **Crash Avoidance Systems**
  - Driver behavior in near crash/crash situations
  - Effectiveness of Driver Assistance Systems
  - Insights into Driver-Vehicle Interface (DVI) Design
  - Safety Benefits Estimation Methods
- **Automated Vehicles**
- **Impairment/Inattention Monitoring – e.g. drowsy driving**
- **Aggressive Driving**
- **Speeding**

# Driver Distraction



## Distraction Plan

*Eliminate Crashes Due to Distraction*



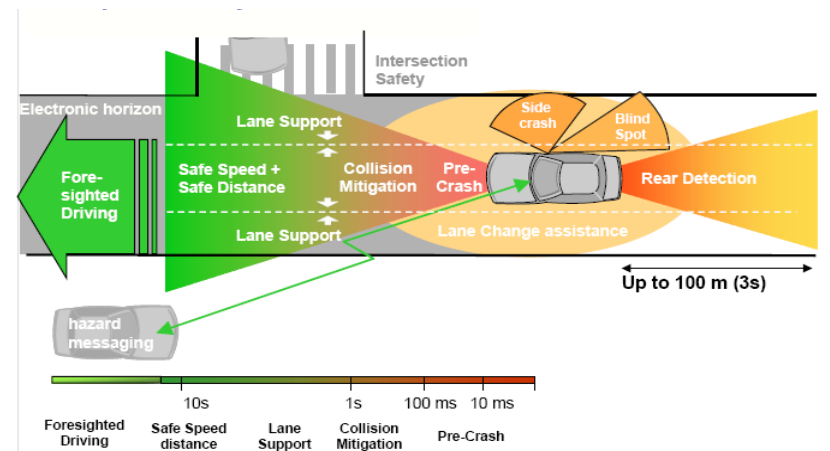
# Naturalistic Data - Driver Distraction Research



- **Secondary Task Risk** - Update the estimated risk (odds ratios) for a variety of tasks including texting and nomadic navigation systems.
- **Effects of Infotainment Systems**: Evaluate driver interaction with in-vehicle and nomadic systems, including communication, navigation and entertainment.
- **Exposure Data**: Collect exposure data to better understand how often and when people engage in secondary tasks.
- **Validate distraction performance parameters**
  - E.g. Eyes Off Road Time (EORT)

# Crash Avoidance - Naturalistic Data Analysis to Facilitate Better Systems

- Evaluate how drivers react to crashes or near-crashes in terms of pre-crash maneuvers with or without crash warning systems and other advanced safety systems.
  - Significant insight into what Driver-Vehicle Interface (DVI) concepts will be effective.
- Analyze the effect of advanced vehicle safety systems on crash risk and identify effects on driver behavior.
  - Effectiveness and driver adaptation



# Crash Avoidance Systems (con'd)



## ■ Enhanced Benefits Estimation Methods

- Evaluate the relationship between driving conflicts, near crashes and crashes to enhance safety benefit estimation methods

## ■ Enhance Driver-Vehicle Interface Designs

- Key to realizing benefits of crash warning systems - effective communication to the driver
- Specifications, guidelines needed
- Significant ongoing NHTSA research ongoing
- Naturalistic Data could be used to enhance our understanding of driver response to an array of pre-crash scenarios.



# Automated Vehicles



- Potential for a significant increase in vehicles with various degrees of automated driving capability in the near future.
- What are the “normal driving” scenarios that a human routinely executes that automated vehicles would need to perform?
  - Develop a typology of real-world driving scenarios.
  - Scenarios facilitate performance requirements
- **Safety Benefits: Use NDS data to better understand driver errors to facilitate benefits estimates for automated vehicles.**



# Gain Insight into “Elusive Behaviors” Drowsy Driving, Aggressive Driving, etc.



- **Use naturalistic data to expand our knowledge of the epidemiology and risks associated with these behaviors.**
  - Expert panels could assist in identifying clear examples of such behaviors in the naturalistic data.
  - Develop characteristic profiles or algorithms of these events could be developed.
  - Use algorithms to search for such events throughout the database, develop epidemiologic profiles and estimate associated crash risks.

# Speed



- Implicated in many crashes, but...inadequate data on both the size of the problem and the specific consequences.
- SHRP2 data presents an opportunity to greatly expand speeding behavior analyses.
- Non-video data could be used to compare the actual speed of vehicles with the posted speed limit and other NDS data to describe the epidemiology and underlying factors associated with speeding.
- Could be completed fairly quickly, and would provide an early “success” from SHRP2.

# THANK YOU!



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