Presentation for FMCSA Federal Motor Carrier Safety Administration

Virginia Tech Transportation Institute

SMARTDRIVE®

# Analyzing Cognitive Distraction with Video and Voice

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# Overview of the Study

- FMCSA-funded, with VTTI and SmartDrive jointly performing the data collection, reduction and analysis work.
- Titled: “Driver Distraction: Eye Glance Analysis and Cognitive Distraction”.
- Builds on two previous studies:
  - “Driver Distraction in Commercial Vehicle Operations” (*Olson 2009*)
  - “Distraction in Commercial Trucks and Buses: Assessing Prevalence and Risk in Conjunction with Crashes and Near-Crashes” (*Hickman 2010*)


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# About SmartDrive

**FOUNDED**
2004

**EMPLOYEES**
370+

A "Top-Ranked Venture Backed Company"

WALL STREET JOURNAL


**EVENTS**
44,000,000

The world's largest and fastest-growing database of risky driving events.

## Global Operations

United States, United Kingdom, China, India, Australia and New Zealand


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# SmartRecorder 3: Platform Capabilities

Primary Camera
Remote Camera
Controller
Optional Keypad


- Video
- Audio
- Speed
- Acceleration
- Location
- Vehicle data (ECU)
- Driver feedback

**120 °** ROAD-VIEW VIDEO


**160 °** IN-CAB VIDEO


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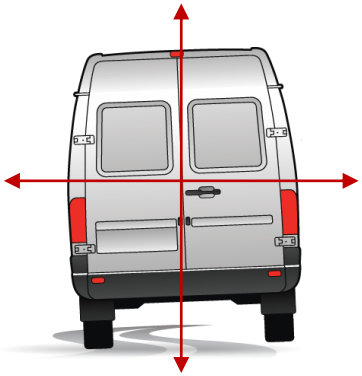
# **SmartRecorder 3:** Triggering

**15**
seconds before

Trigger Point

**15**
seconds after


**Speeding**



**Shock & Erratic Driving**


**Manual Activation**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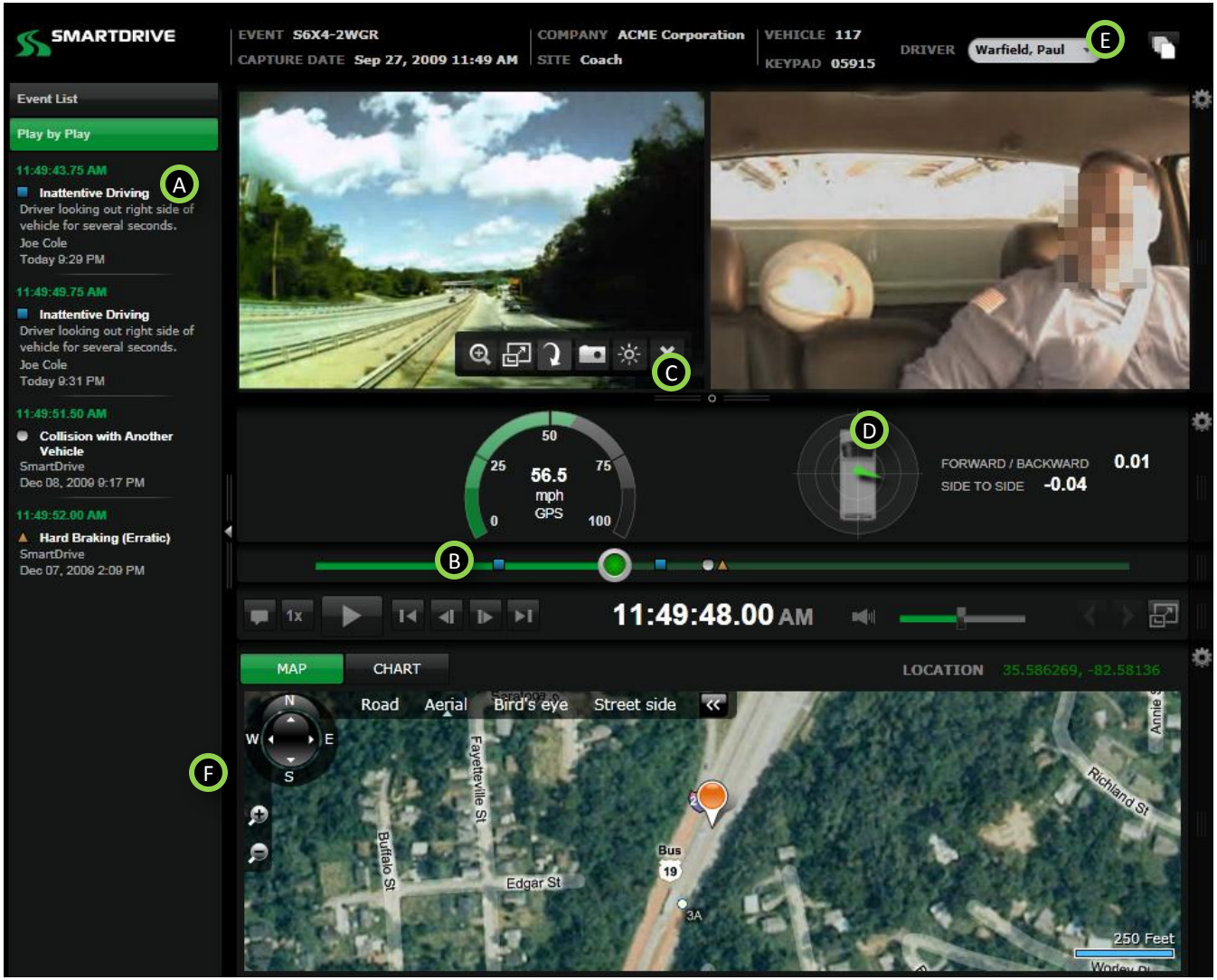
# SmartDrive Event Player

- **A** **Play by play notes**
- **B** **Add annotations in timeline**
- **C** **Video options**
  - Zoom
  - Enlarge view
  - Flip video feed
  - Save snapshot
  - Adjust video
- **D** **Speed and acceleration gauges**
- **E** **Ability to update driver assignment**
- **F** **Advanced analysis when needed**





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# Research Objectives

- Analyze video/voice recordings to determine if there is an objective measure of cognitive distraction.
- Assess whether the risk associated with cognitive distraction depends on the type of conversation:
  - Serious vs. superficial conversation
  - Complex vs. simple conversation
- Characterize the link between eye glace behavior and safety critical events (crashes, near-crashes).
- Examine the effects of talking on hands-free or hand-held mobile phone on eye glance behavior.


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# Study Approach

- Analyze video recordings as SmartDrive captures them in the course of its regular business.
- Identify Safety Critical Events (SCE's) per existing data reduction protocols.
- For each SCE's, identify 4 Spurious and 4 Random baseline recordings.
  - Spurious: existing; triggered as shock false-positives.
  - Random: additional; triggered on random (speed > 0).
- Perform additional data reduction per protocols that were specifically defined for this study.


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# Data Reduction Protocols

- **Environmental** – Lighting/visibility, weather condition, relation to junction and traffic density
- **Driver Distraction** – Various interactions associated with mobile phones, CB's, passengers, etc.
- **Voice** – Length / duty cycle of conversation; emotional content and intensity of conversations
- **Eye Glance** – Frame-level indicators for whether driver's eyes are on or off the forward roadway.


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# Distracted Video Example


Handheld mobile phone_excessive speed.wmv


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