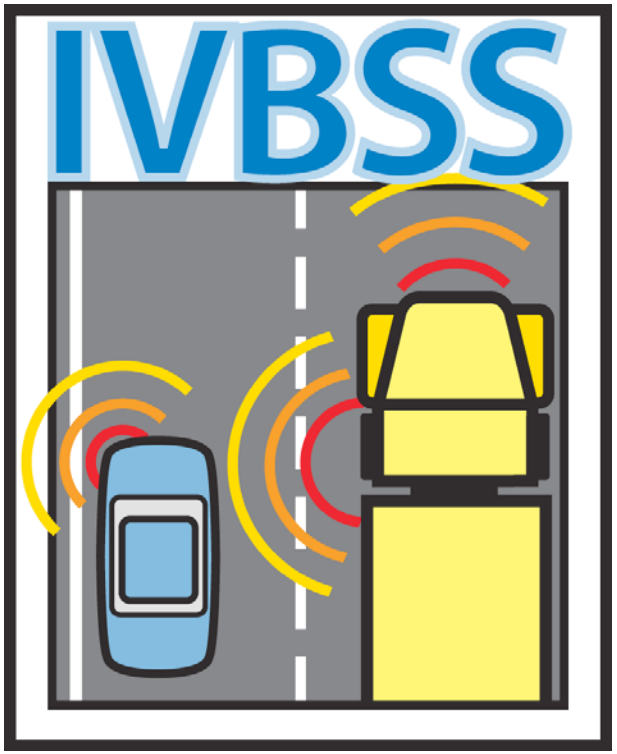


Independent Evaluation Overview

Emily Nodine
USDOT/RITA/Volpe Center

2009 ITS America Annual Meeting

Session SS09

June 1, 2009

Outline

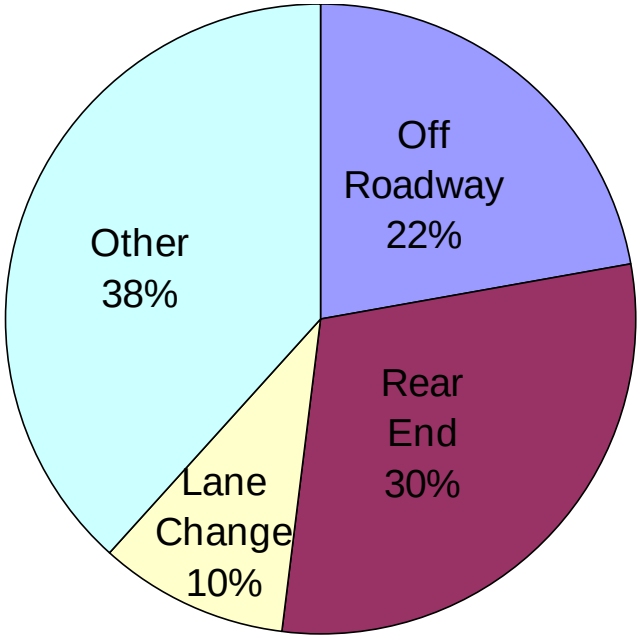
- Goals
- Safety benefits
- Driver acceptance
- System capability
- Key deliverables

Independent Evaluation Goals

- Understand safety benefits and unintended consequences
- Determine driver acceptance
- Characterize system performance and capability

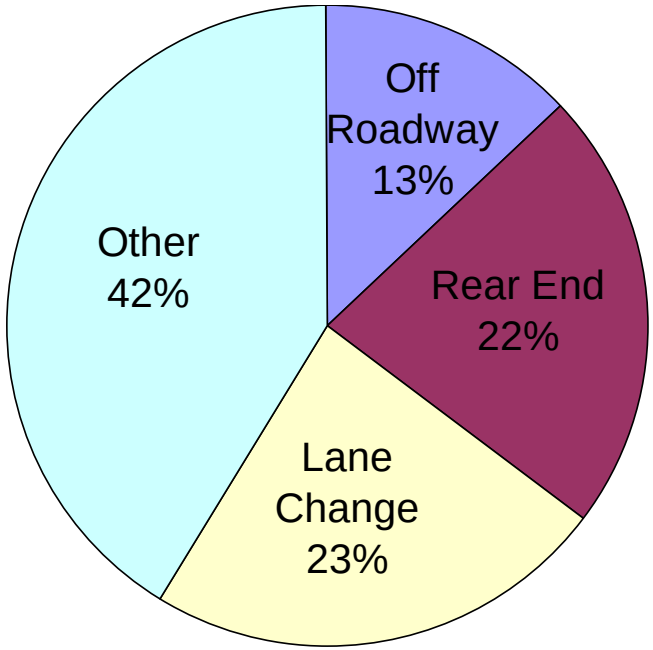
How Many of These Crashes Will Be Avoided?

Light Vehicle



Target crashes account for 3,541,000 of 5,752,000 crashes

Heavy Truck



Target crashes account for 424,000 of 722,000 crashes

Safety Impact Objectives

- Estimate the number of crashes and injuries that could be reduced
- Examine exposure and response to driving conflicts with and without the integrated system
  - Conflict: a pre-crash scenario in which a crash will occur if the driver does not intervene
  - Map conflict experience to national crash data
- Investigate unintended consequences

Safety Measures

- Individual/multiple conflict events per time or distance traveled
- Speed ratio
- Time gap
- Proportion of signaled lane changes
- In-lane position
- Time distracted relative to time traveled
- Eyes-off-road events per time traveled

Estimation of System Effectiveness

Crashes *Avoided* = Crashes *Without* – Crashes *With*

$$\text{Crashes } \textit{Avoided} = \text{Crashes } \textit{Without} \times \left(1 - \frac{\text{Crashes } \textit{With}}{\text{Crashes } \textit{Without}}\right)$$

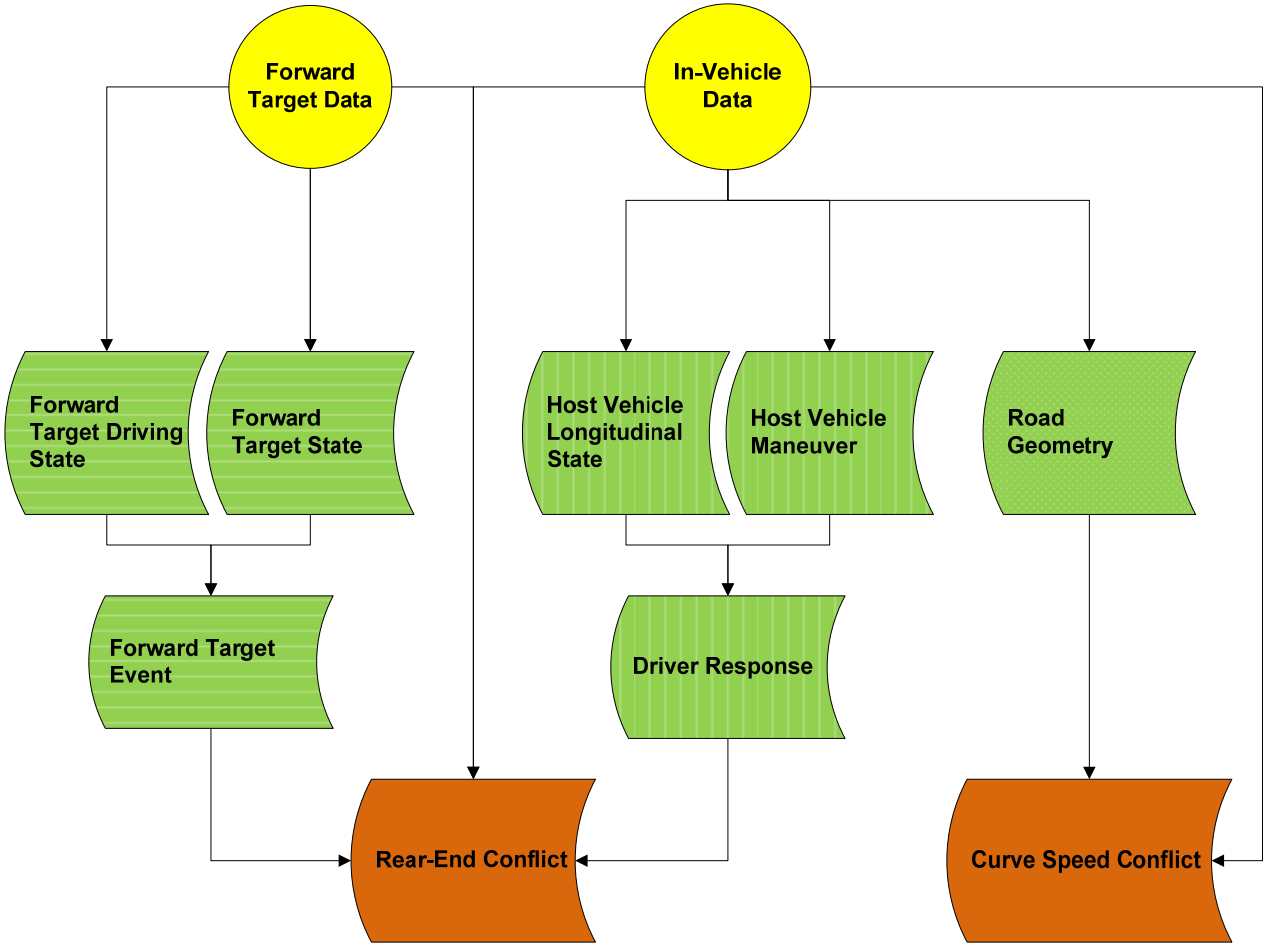
System Effectiveness

Determine Crashes *With* and Crashes *Without* from:

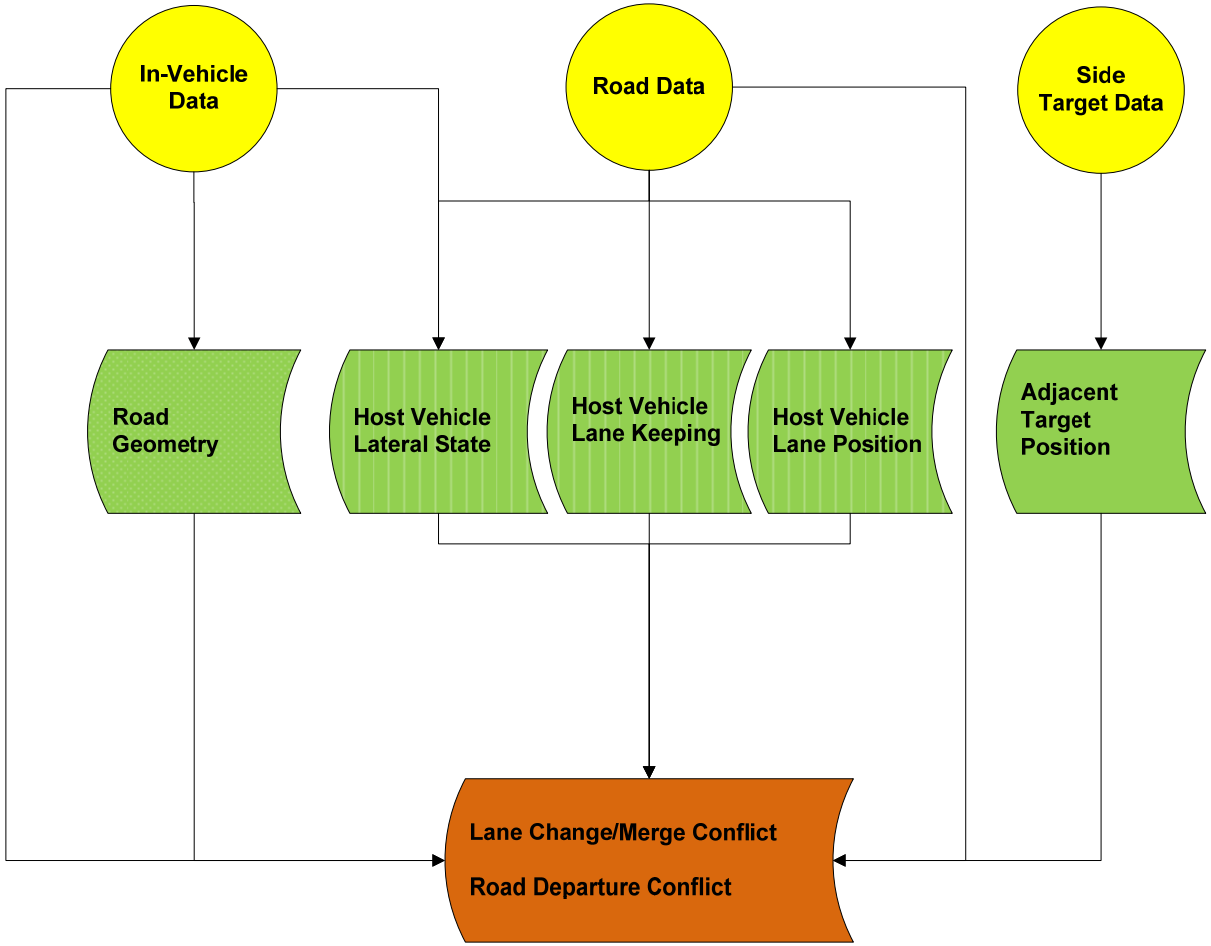
$$\text{Crashes} = \text{Conflicts} \times \text{Probability}(\text{Crash}|\text{Conflict})$$

Exposure Factor ***Prevention Factor***

Data Mining Overview
Longitudinal Conflicts



Data Mining Overview
Lateral Conflicts



Driver Acceptance Objectives

- Ease of use
- Perceived usefulness
- Ease of learning
- Advocacy
- Driving performance
- Comparison of acceptance and IVBSS experience

Intensity of Subject Experience

- Number of conflicts encountered per distance traveled:

$$\frac{\textbf{Total \# of Conflicts}}{\textbf{Total Vehicle Distance Traveled}}$$

- Number of alerts received per distance traveled:

$$\frac{\textbf{Total \# of Alerts}}{\textbf{Total Vehicle Distance Traveled}}$$

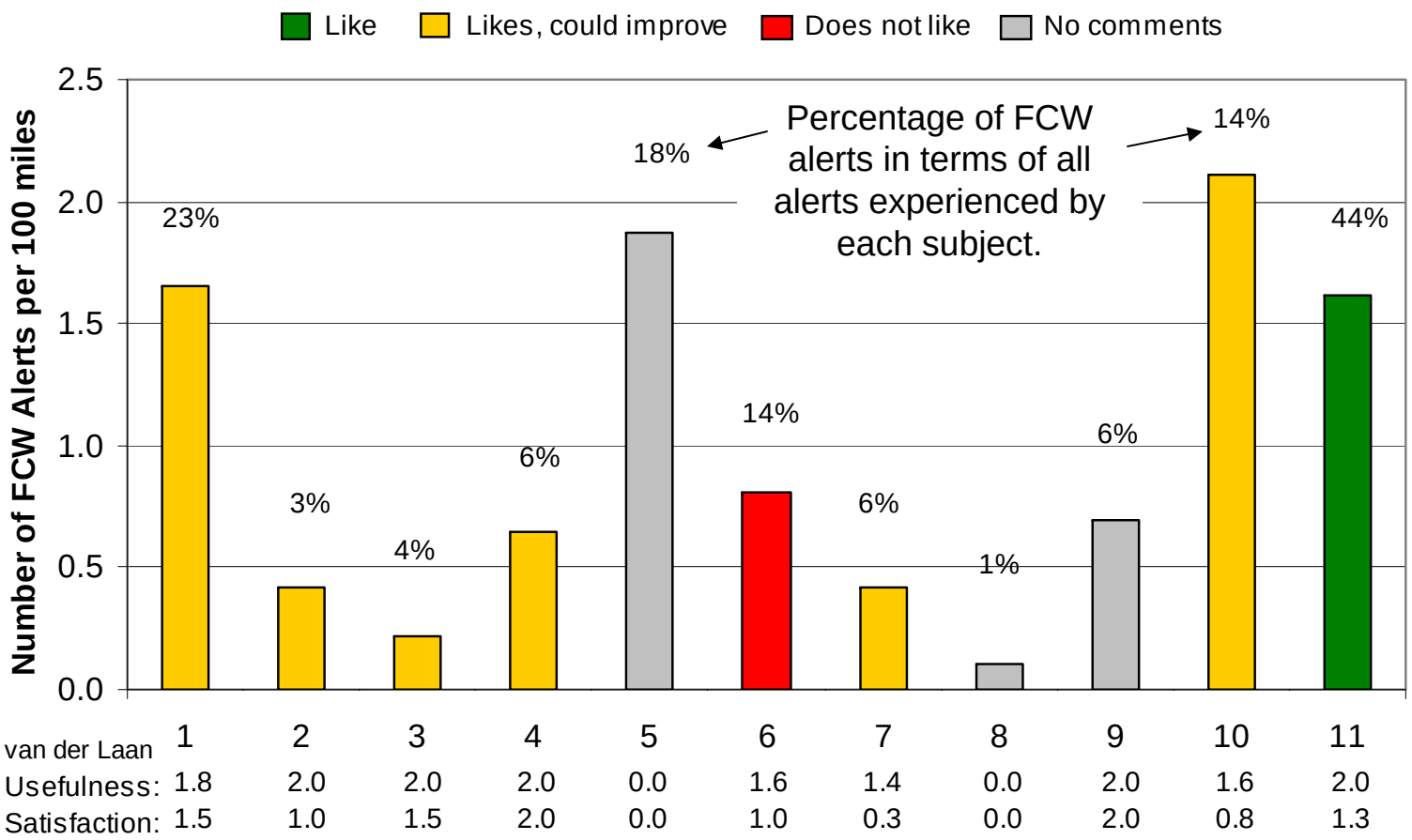
- True alert rate:

$$\frac{\textbf{\# of Alerted Conflicts}}{\textbf{Total \# of Alerts}}$$

- Conflict hit rate:

$$\frac{\textbf{\# of Alerted Conflicts}}{\textbf{Total \# of Conflicts}}$$

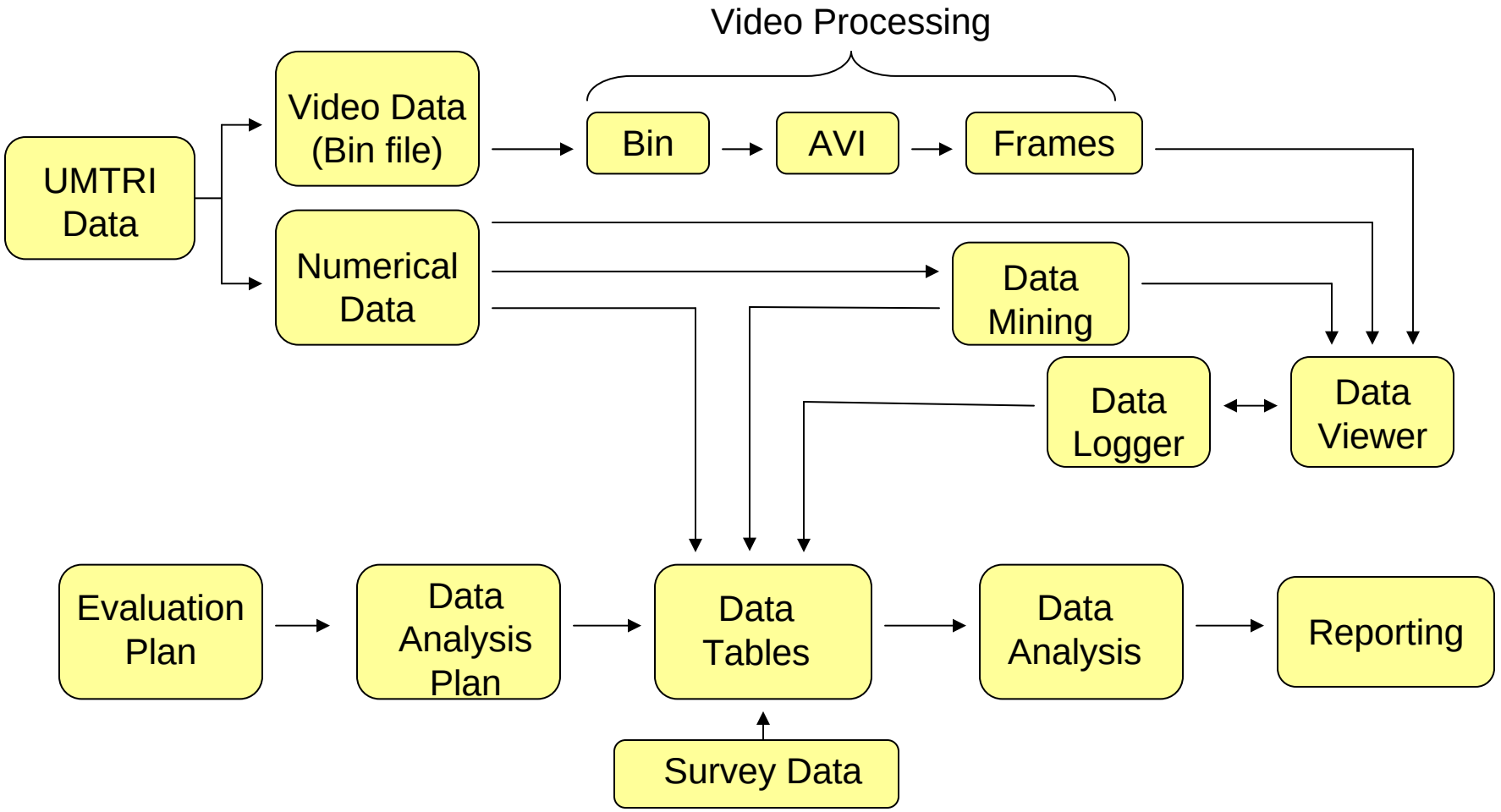
Light Vehicle Extended Pilot Test
FCW Acceptance vs. Experience



System Capability Objectives

- Sensor performance
- Warning logic accuracy
- Driver-vehicle interface

Field Test Data Processing



Data Viewer/Logger

Data Input Fields

- Alert Validity
- Eyes off Road
- Driver Distraction
- Target Type
- Target Maneuver
- Traverse Curve

Key Deliverables

- Heavy Truck Final Report (Fall 2010)
- Light Vehicle Final Report (Spring 2011)