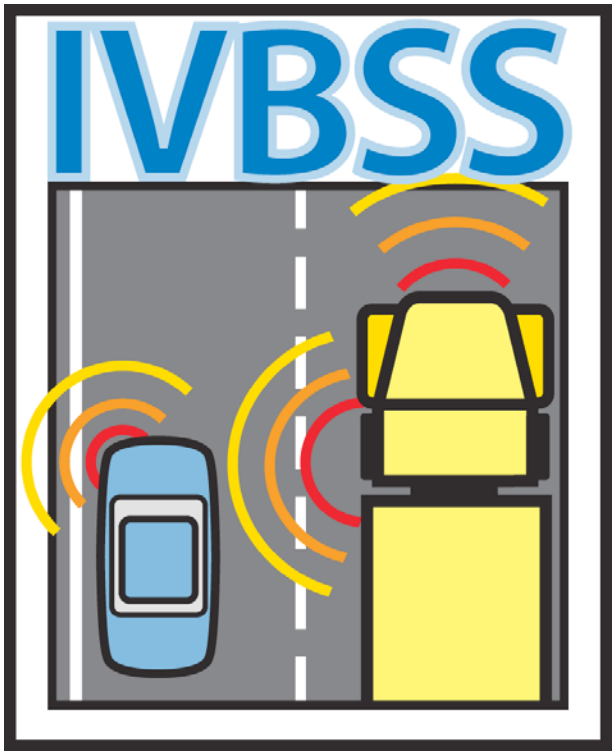


Results from an Extended Pilot Test of an Integrated Vehicle-Based Safety System for Heavy Trucks

Scott Bogard

University of Michigan Transportation Research Institute

Overview

- Program objectives
- Partners and organization
- FOT Status
- Heavy-truck IVBSS Implementation
- EPT objective and subjective results
- EPT conclusions, lessons learned, and changes for the FOT

Program Objectives

- UMTRI-led cooperative agreement with U.S. DOT (JPO, NHTSA and FMCSA)
- Assess integrated vehicle-based safety systems in passenger cars and heavy trucks
- Lateral Drift, Lane Change/Merge, Forward Crash and Curve Speed Warning functions
  - Builds on previous, non-integrated, systems
  - Provides arbitration of multiple crash threats

Program Objectives

- Includes field testing on public roads by end users
- An independent evaluation to assess:
  - Safety benefits
  - Driver acceptance / ease of use
  - Willingness to purchase / marketability
- Diversity of stakeholders and partners with a common challenge

Partners

Visteon

UMTRI

EATON

HONDA
The power of dreams.™

TAKATA

INTERNATIONAL

Battelle
The Business of Innovation

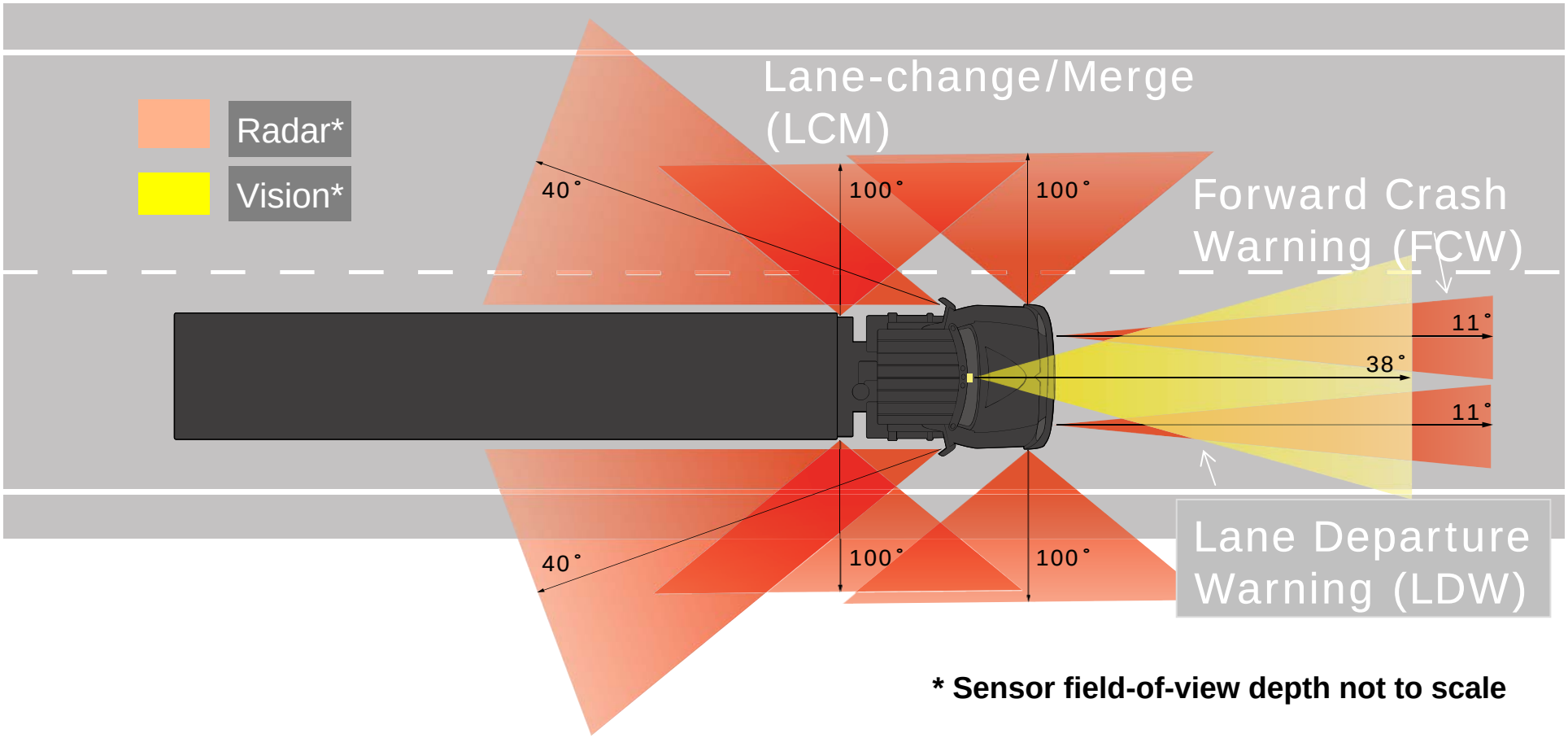
MDOT

Con-way

Heavy Truck Status (Will be updated to include FOT Status)

- 10 Vehicle Fleet
  - 4 tractors in service, collecting FOT baseline
  - 3 tractors in final check-out phase, go into service on February 16
  - 3 tractors being outfitted, early March service
- April 1 the IVBSS systems become active in first 4 tractors
- FOT will be completed in December of ‘09

Heavy Truck Sensor Coverage

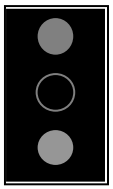
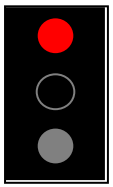


*** Sensor field-of-view depth not to scale**

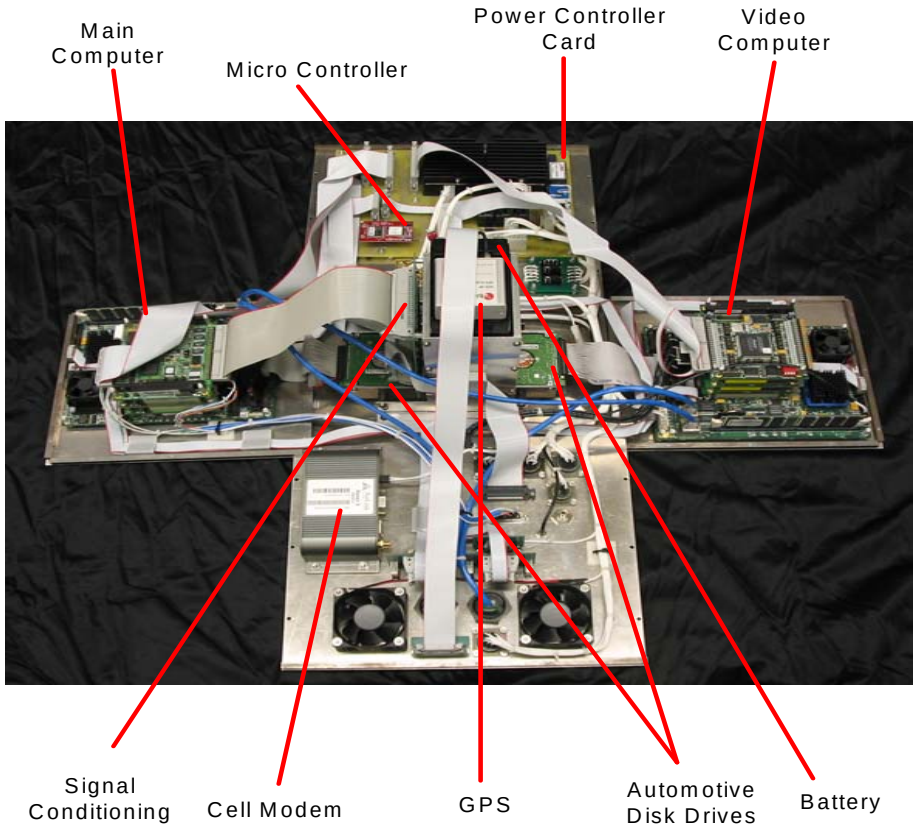
Heavy Truck Integration

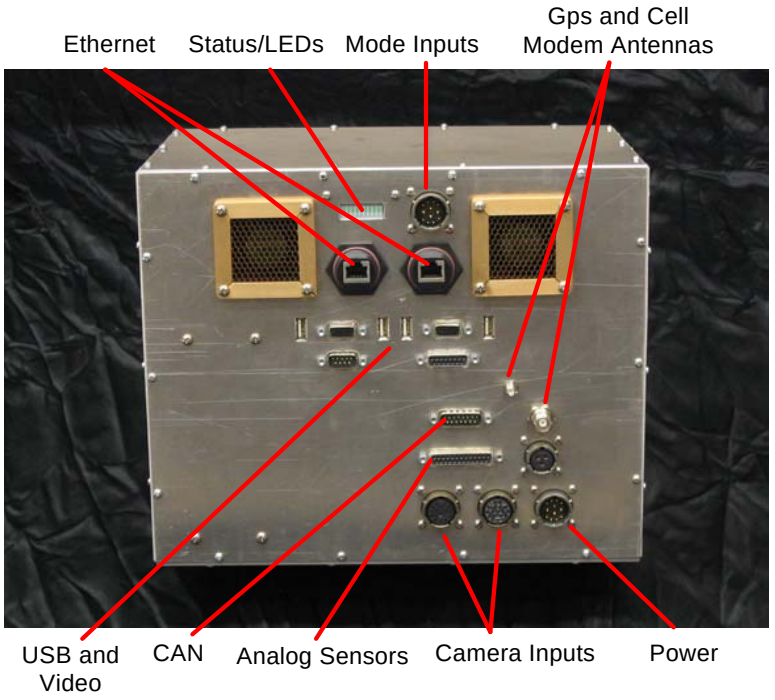
IVBSS Heavy-truck Driver Vehicle Interface

Heavy Truck DVI

Cond. Code	Initiation Condition	Visual Displays Side	Visual Displays Forward	Auditory Display (Directional)
FCW-3	Forward object within 2s headway	N/A		Opening=None Closing=Short Alert
FCW-6	Slower moving vehicle in the front	N/A		Repeating Alert
LDW-1	Subject vehicle drift just outside the lane boundary toward an unoccupied lane			Directional lane excursion warning
LCM-3	Adjacent vehicle detected AND lane change maneuver IS detected		N/A	Right/Left channel side collision warning

UMTRI DAS

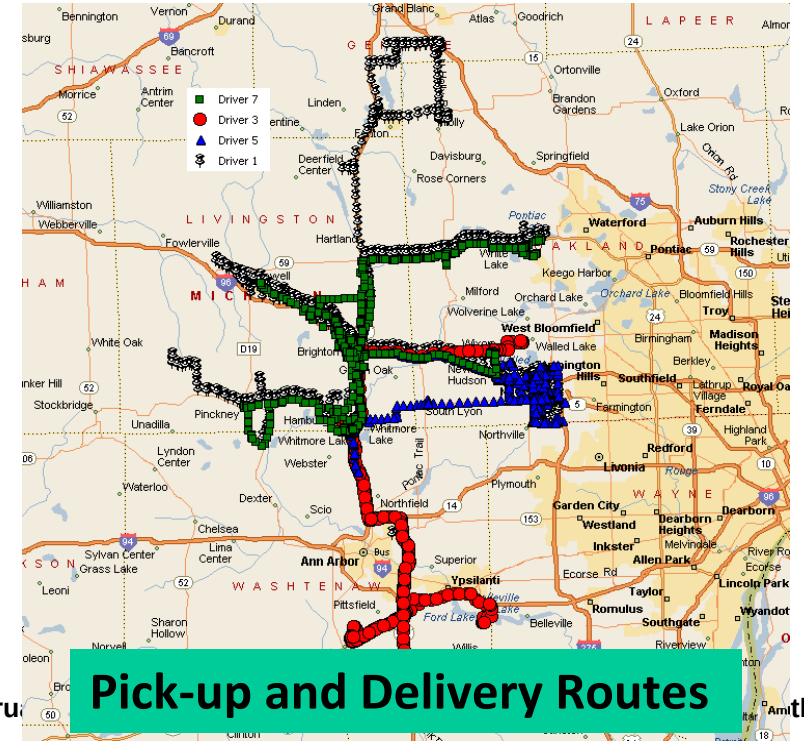

Main Computer
Micro Controller
Power Controller Card
Video Computer
Signal Conditioning
Cell Modem
GPS
Automotive Disk Drives
Battery

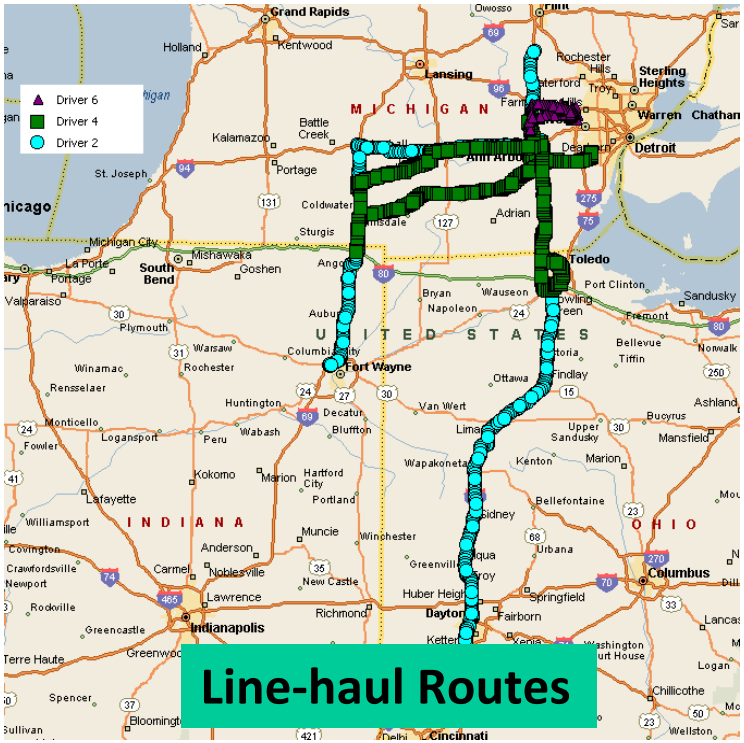

Ethernet
Status/LEDs
Mode Inputs
Gps and Cell Modem Antennas
USB and Video
CAN
Analog Sensors
Camera Inputs
Power

DAS Camera Views and Collection Rates

EPT Summary

Seven drivers over a 4 week period from Nov 13th to Dec 12th, 2008
Exposure: 5562 miles driven over 459 trips. Total time 159 hrs.
Data archive size 30.5 GB both video and numerical (193 MB/hr)
Overall invalid alert rate 10.3 alerts per 100 miles





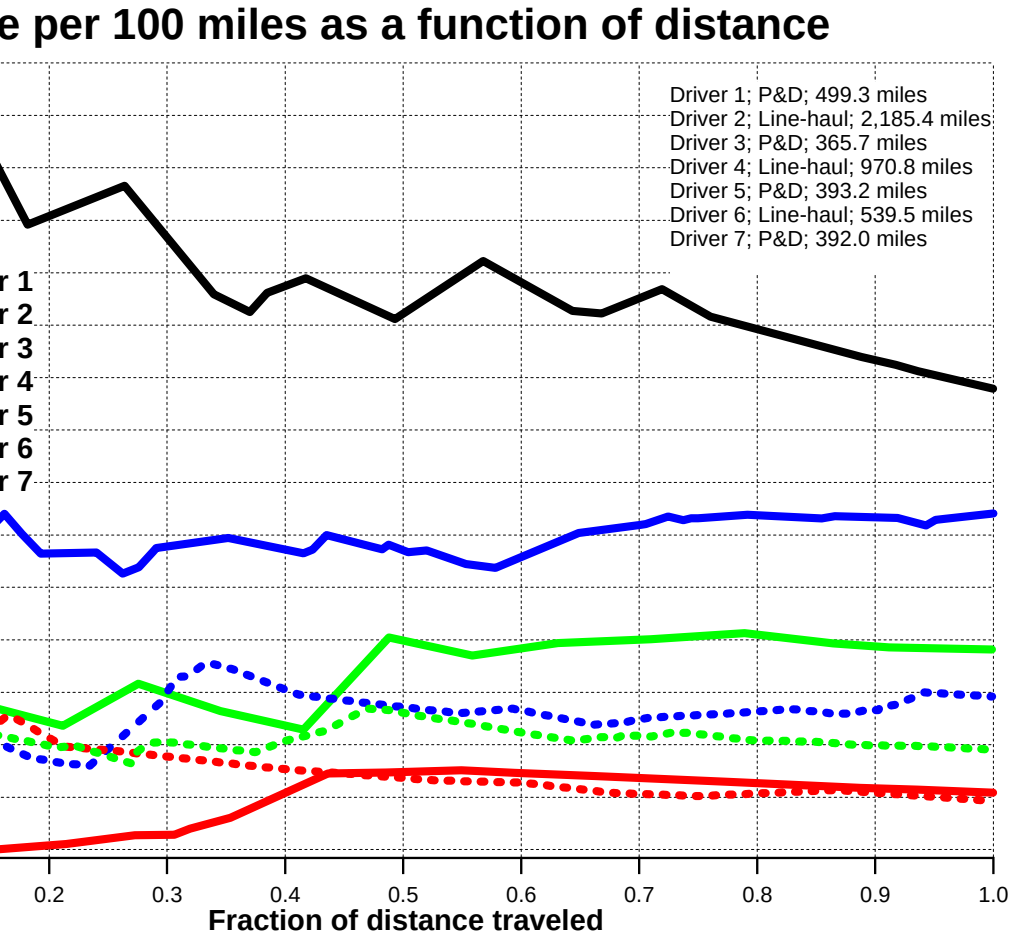
Alert Rate Summary

- This will be a series of slides that high-lights the alert rates for each of the sub-systems by alert category. It will be rather short but will mention the analysis of alert validity and thought leading to the decision to modify the FCW stopped and slower moving suppression algorithms.

Movie of a valid Stopped Alert

Movie of driver falling asleep

Effect of Exposure on Alert Rate



Subjective Results

- I will expand on the re-write of the subjective findings from the EPT report and include the questions and ratings for each of the categories (I might not cover all questions but I will highlight ones that speak to the objectives of the program…ease of use, safety, satisfaction and integration.

Conclusions and Implementation of Results

- Results consistent with business practices of the fleet
- Weather did not play a large role in results
- Invalid alert rates independent of route type with an invalid alert rate of 11.3 and 9.9 for P&D and Line-haul, respectively.
- Large number of valid alerts with the exception of Fcw stopped objects (lead to software changes)

Conclusions and Implementation of Results

- Subjectively, Drivers reported they:
  - Were fairly satisfied with IVBSS
  - Understood the warnings
  - Felt intensity of warnings was appropriate
  - One driver used volume control, none used mute
  - LCM: drivers thought location of the side display could make them more noticeable when checking mirrors