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Vehicle Safety Communications 3

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Research & Development North America, Inc.



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Intelligent Transportation Systems

V2V-SP Light Vehicle Driver Acceptance Clinics and Model Deployment Support ITS World Congress

Oct 20, 2011

Presentation Outline

- V2V Safety Pilot Light Vehicle Driver Acceptance Clinics and System Performance Testing
- V2V Safety Pilot Light Vehicle Build and Model Deployment Support
- Questions during presentation are encouraged



V2V Light Vehicle Driver Acceptance Clinics (DAC) Project

- Period of Performance: Sep 2010 to March 2013
- Assess if and how drivers from a diverse cross-section of US residents accept and respond to V2V safety technology
- Assess V2V safety system performance and reliability (especially 5.9 GHz DSRC & GPS) across a wide variety of environments and diverse geographic locations
- Promote V2V-based safety technology and its potential safety benefits

Team

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AUTOMOTIVE EVENTS

V2V Safety Applications per OEM

OEM/Applications	Ford	GM	Honda	Mercedes	Toyota	Hyundai-Kia	Nissan	VW-Audi
EEBL	X	X	X	X	X			X
FCW	X	X	X	X		X	X	X
BSW / LCW	X	X	X	X	X	X	X (BSW)	
DNPW	X	X	X					
IMA	X	X	X	X	X			X
LTA							X	

EEBL: Emergency Electronic Brake Lights

FCW: Forward Collision Warning

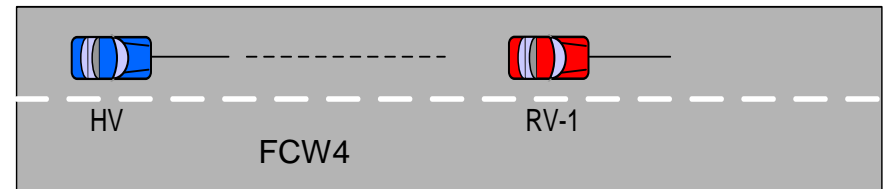
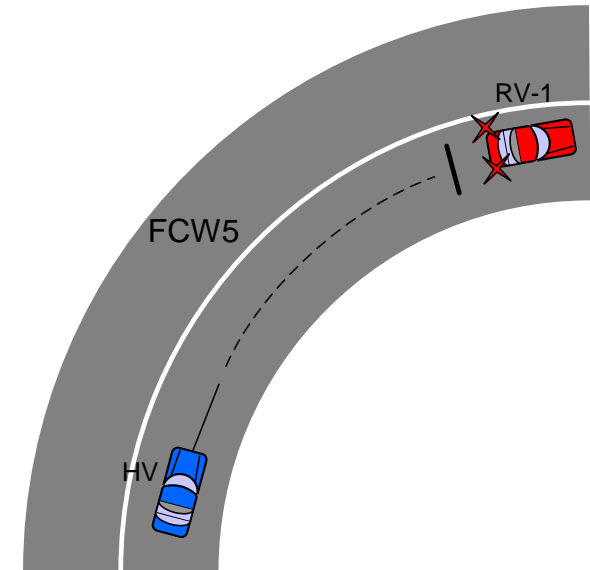
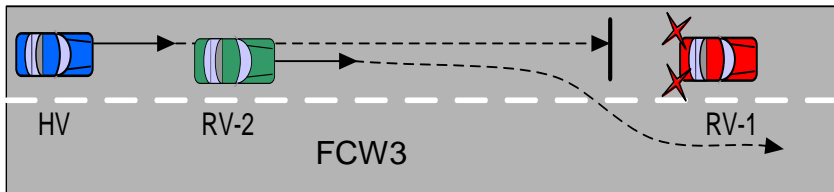
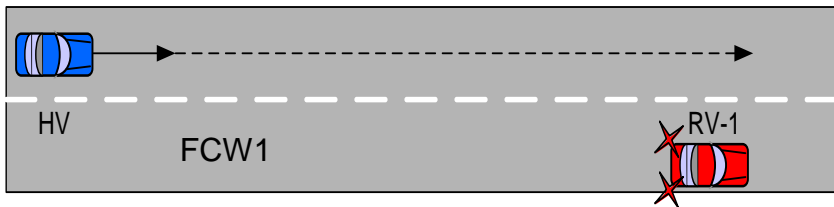
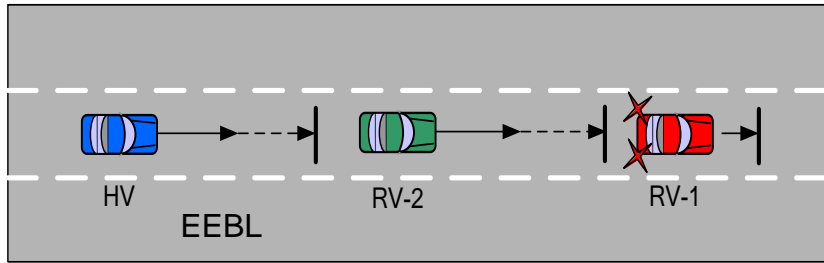
BSW/LCW: Blind Spot Warning/Lane Change Warning

DNPW: Do Not Pass Warning

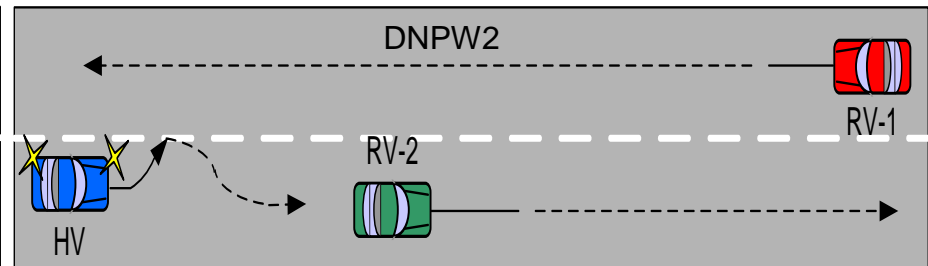
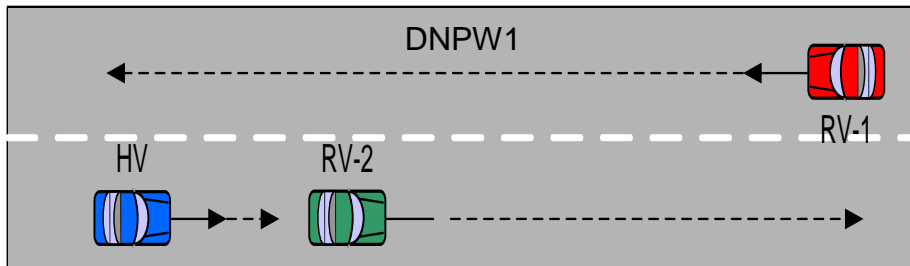
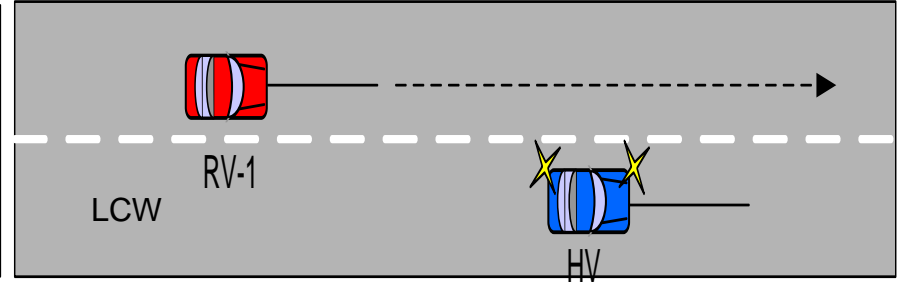
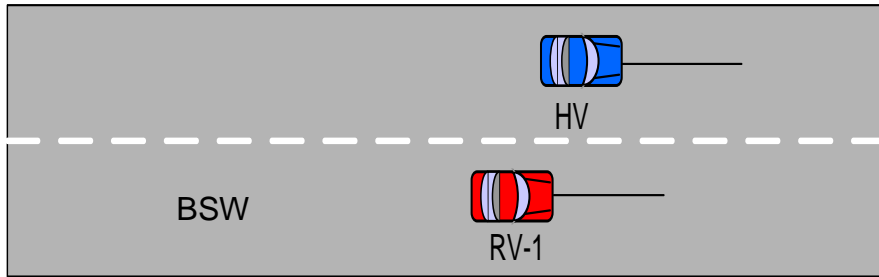
IMA: Intersection Movement Assist

LTA: Left Turn Assist

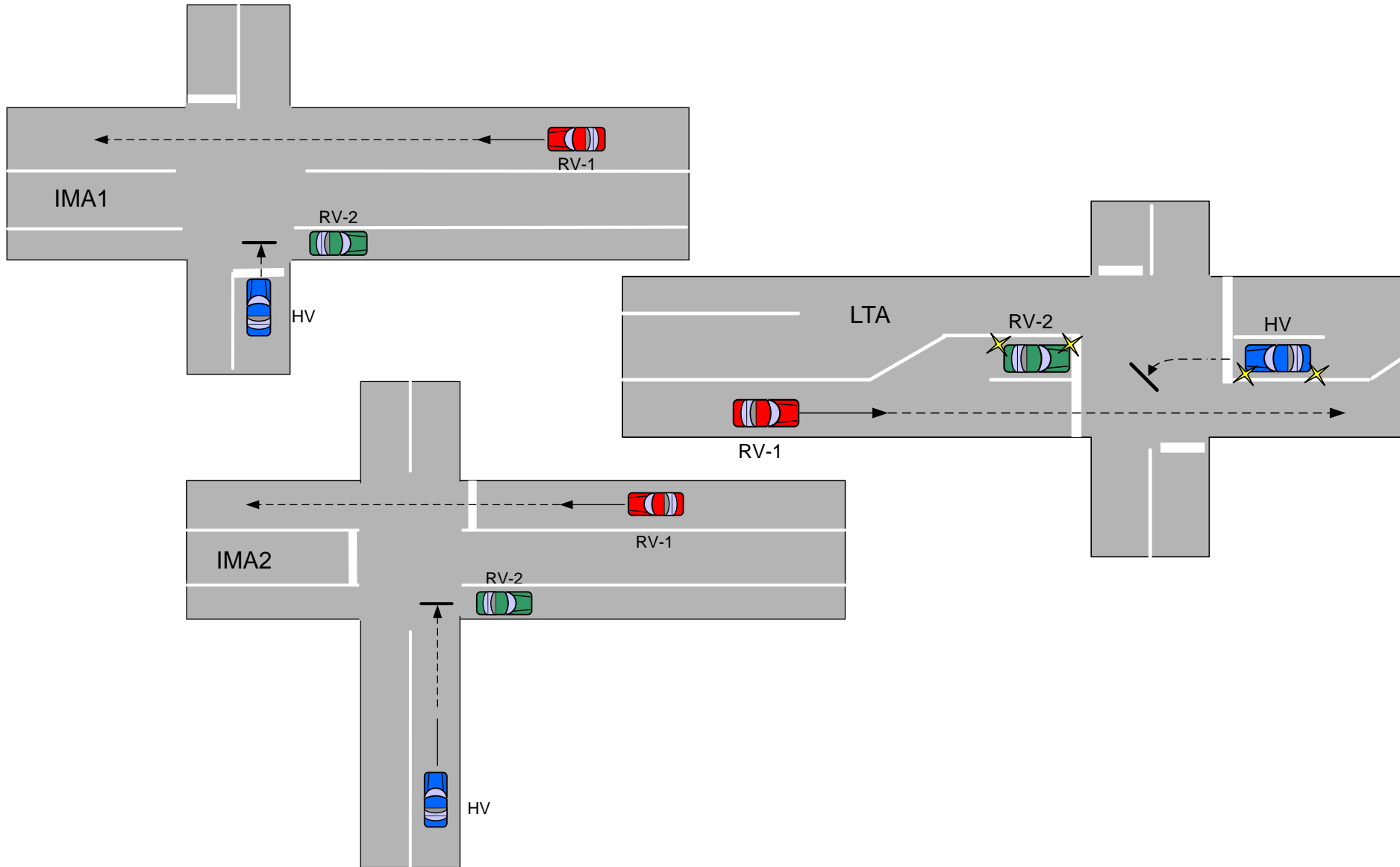
V2V Safety Applications Scenarios 1/3



V2V Safety Applications Scenarios 2/3



V2V Safety Applications Scenarios 3/3



Driver Acceptance Clinics Locations and Dates



- Brooklyn, MI (Michigan International Speedway), August 8-12
- Brainerd, MN (Brainerd International Raceway), September 27-29
- Orlando, FL (Walt Disney World Speedway), October 21-25
- Blacksburg, VA (VTTI Smart Road), November 7-10
- Fort Worth, TX (Texas Motor Speedway), December 5-9
- Alameda, CA (former Alameda Naval Air Station), January 16-21

18th ITS WORLD CONGRESS CONNECTED VEHICLE TECHNOLOGY DEMONSTRATION



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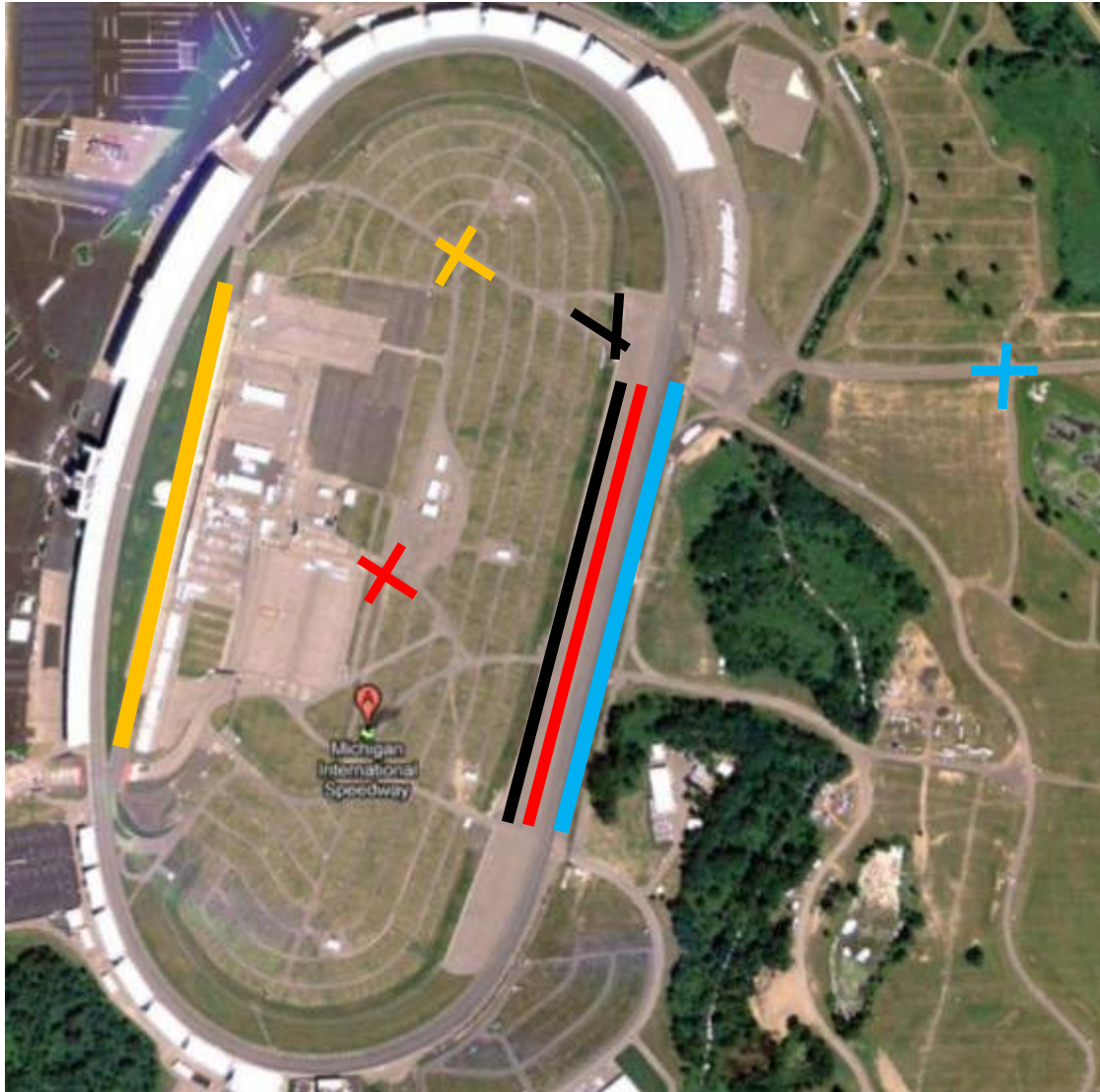
Driver Vehicle Interface Examples



Safety Feature Exposure

- 112 participants over a 4 day period
- Typically, 4 sessions per day at 8 participants each
- Participants are:
 - Equally split by gender
 - Equally split into three age categories (20-30, 40-50, 60-70)
- Participants experience each V2V safety feature
- After each exposure the experimenter asks a series of questions
 - Captures their immediate impressions
 - Safety Application Effectiveness
 - Relevance of Driver Vehicle Interface (DVI)
- Focus Groups

DAC #1 Station Layout



Station 1 – GM & Ford

Station 2 – Honda & M-B

Station 3 – VW & Nissan

Station 4 – Hyundai & Toyota

DAC #1 Station Examples



System Performance Testing - Overview

Purpose

- To assess system performance and reliability in diverse geographic regions of the country under real-world conditions in both rural and urban locations
- Performance testing is a critical activity to support the 2013 V2V NCAP or regulatory decision

Approach

- Performance testing will be performed after each of the DACs and executed at close proximity to the DAC sites
- Will utilize eight (8) similarly-equipped OEM engineering template vehicles
- This activity is coordinated with the DAC Schedule

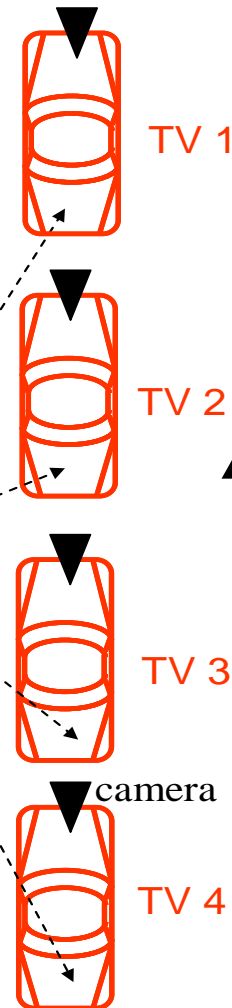
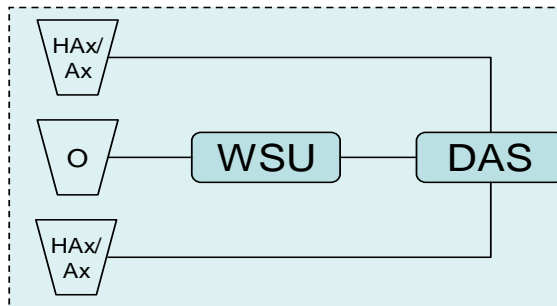
System Performance Testing

- **Open-road testing**
 - Urban, rural and freeway driving with eight (8) vehicles
- **Targeted testing**
 - Performed as needed in specifically identified challenging locations
- **Closed-road testing**
 - Evaluate and refine warning timing for certain system features (e.g., IMA, DNPW)
- **Performance Metrics**
 - GPS solution availability and quality
 - Absolute GPS positioning error
 - Relative GPS positioning error
 - Communications Performance
 - Application Level Performance

Open Road Testing: Final Vehicle Configuration

Vehicles

TV – Template Vehicle



GPS Receivers



O = Novatel OEMV



A1 = uBlox LEA-6T



A2 = Trimble Condor C1919A



HA1 = Hemisphere Crescent



HA2 = Geneq SXBlue

Available combinations receivers for relative error measurements

	O	A1	A2	HA1	HA2
O	✓	✓	✓	✓	✓
A1	✓	✓	✓	✓	✓
A2	✓	✓	✓	✓	✓
HA1	✓	✓	✓	✓	✓
HA2	✓	✓	✓	✓	✓

Open Road Testing: Environment Selection Criteria

Freeway Open Sky



Major Thruway



Local Roads – Tree Cover



Table 7-1: Data Collection Summary

Category	Time collected	%
Deep Urban	1:39:54	3.7%
Major Urban Thruway	9:50:03	21.8%
Major Rural Thruway	8:40:09	19.2%
Major Road	8:10:40	18.1%
Local Road	6:30:48	14.4%
Interstate/Freeway	9:04:51	20.1%
Mountains	1:08:32	2.5%
Total	45:04:57	

Urban Canyon



Mountains



Note: Roadway environment distribution used in VSC-A relative positioning availability/accuracy study. Represents road usage of average driver [*Our Nation's Highways*, FHWA 2008].

Vehicle-to-Vehicle Safety System Light Vehicle Builds and Model Deployment Support (V2V-MD)

(Initial) Period of Performance: 8/1/2011 –
1/31/2012

- Task 1: Technical Project Management
- Task 2: Model Deployment Vehicle Preparation
- Task 5: Device Interoperability and Minimum Performance Testing
- Task 9: Coordination with Other USDOT Programs

MODEL DEPLOYMENT SUPPORT ACTIVITIES

- Equip a total of sixty-four (64) Light Vehicles with V2V Safety Systems
- Each vehicle has Data Acquisition System (DAS) for data collection during Model Deployment
- Support OBE Certification Testing, Perform Safety Application Verification on the Light Vehicles
- Support device interoperability and minimum performance testing
- Coordinate Delivery of Vehicles to USDOT Test Conductor for use in Model Deployment
- Support data collection during Model Deployment duration – August 2012 – August 2013 (two 6-month periods)

Discussion and Q&A