Connected Vehicle Safety Program

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National Highway Traffic Safety Administration

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It’s All About Connectivity

Opportunity for Safer Driving

- Greater situational awareness
  - Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see

- Reduce or even eliminate crashes thru:
  - Driver Advisories
  - Driver Warnings
  - Vehicle Control

Opportunity for Greater Mobility & Efficiency

- Create an information-rich environment for multi-modal transportation solutions.
- Enable environmental management through V2I capability

Connected Vehicles have the potential to address over 80% of the vehicle crash scenarios involving unimpaired drivers
The Vehicle That Doesn’t Crash

- Price
- False Alarms
  - Delayed Warnings
- Crash Scenarios
# Vehicle to Vehicle Safety Research Plan

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<td><strong>Complete CAMP-V SC-A</strong></td>
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<td><strong>Update Crash Scenarios</strong></td>
<td><strong>Define Initial Performance Requirements</strong></td>
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<td><strong>Select Applications</strong></td>
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<td><strong>IntelliDrive™ System Engineering</strong></td>
<td><strong>Complete Message and Communication Standards</strong></td>
<td><strong>Data Authentication</strong></td>
<td><strong>Final Standards &amp; Protocols</strong></td>
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<td><strong>IntelliDrive™ Principles</strong></td>
<td><strong>Define Performance Measures</strong></td>
<td><strong>Field Tests</strong></td>
<td><strong>Performance Requirements</strong></td>
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<td><strong>Develop Objective Tests</strong></td>
<td><strong>Adapt ACAT Methodology</strong></td>
<td><strong>Conduct Objective Tests</strong></td>
<td><strong>Safety Benefits Estimate</strong></td>
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<td><strong>Develop &amp; Build Prototype Safety Application Vehicles</strong></td>
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<td><strong>DVI Effectiveness – Multiple Warnings</strong></td>
<td><strong>Driver Workload Issues</strong></td>
<td><strong>Driver Acceptance</strong></td>
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<td><strong>Retrofit &amp; Aftermarket Req’s</strong></td>
<td><strong>Security &amp; Privacy Policy</strong></td>
<td><strong>5.9 Enforcement</strong></td>
<td><strong>Business Models</strong></td>
<td><strong>Governance</strong></td>
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<td><strong>Define Initial Performance Reqs and Measures</strong></td>
<td><strong>Acceptance Driver Workload Issues and Field Tests</strong></td>
<td><strong>FTA Implementation Decision (2014)</strong></td>
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**TRACK 0** Current Activities

**TRACK 1** Crash Scenario Frame Work

**TRACK 2** Interoperability

**TRACK 3** Benefits Assessment

**TRACK 4** Application Development

**TRACK 5** Driver Issues

**Track 6** IntelliDrive™ Policy Issues

**Track 7** Commercial Vehicle

**Track 8** Transit Vehicle

IntelliDrive™ Principles

- Security & Privacy Policy
- 5.9 Enforcement
- Business Models
- Governance

FTA Implementation Decision (TBD)
• Driver Acceptance Clinics
• Model Deployment
Safety Pilot – Driver Acceptance Clinics

- 6 Locations
- 100 drivers per locations
- Experience Crash Warnings
  - Forward Crash Warning
  - Emergency Brake Light
  - Blind Spot Warning
  - Lane Change Warning
  - Intersection Assist
  - Do Not Pass Warning
Safety Pilot – Model Deployment

- More than 2,800 vehicles
  - Passenger cars, commercial trucks, transit
- 73 lane-miles of roadway instrumented with 29 roadside-equipment installations
- 1 year of data collection
Ann Arbor as the Deployment Site
SAFETY PILOT MODEL DEPLOYMENT SITE PLAN: ANN ARBOR, MICH.

- Primary Model Deployment Routes
- University of Michigan Campus/Medical Center (Primary Driver Recruitment Area)
- Proposed Curve Warning Locations
- UMTRI Facilities (Showcase, Facilities, Equipment and Data Storage)
- Roadside Equipment Co-Located with Freeway ITS Installation
- Roadside Equipment Co-Located with Actuated Traffic Signal
- Roadside Equipment/SPaT-Enabled Traffic Signal
- Prototype Solar/Cellular Roadside Equipment Installation

The Safety Pilot Model Deployment includes more than 73 lane-miles of instrumented roadways.
Federal Motor Vehicle Safety Standards
## V2V Program

<table>
<thead>
<tr>
<th>Track</th>
<th>Objectives</th>
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<tr>
<td>1 – Crash Scenario</td>
<td>Develop a comprehensive Pre-Crash Scenario Framework, and countermeasure concept profiles for both light vehicles and heavy trucks.</td>
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<td>2 – Interoperability</td>
<td>Ensure that V2V safety systems can successfully function across equipped vehicles regardless of make/model.</td>
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<td>3 – Benefits Assessment</td>
<td>Benefits assessments for V2V safety applications</td>
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<td>4 – Application Development</td>
<td>Develop applications for benefits assessment</td>
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<td>5 – Driver Issues</td>
<td>Develop a framework to assess the impact of driver issues on the effectiveness of DVI's used with V2V safety applications.</td>
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<td>6 – Policy</td>
<td>Through coordination of the technical and policy aspects of V2V this track will result in a set of policy recommendation to support V2V deployment.</td>
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<td>7 – Commercial Vehicles</td>
<td>Identify and coordinate the commercial vehicle component of V2V safety applications.</td>
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<td>8 – Transit Vehicles</td>
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Safety Need
Safety Need

- Identify target pre-crash scenarios
- Depict priority pre-crash scenarios
- Determine crash avoidance needs
- Develop countermeasure profiles

Effectiveness

- Track 3
- Safety Pilot
Safety Need

• Projections of crash reductions
• Overall driving behavior
• Driver attention
• Impact of deployment rate
INTEROPERABILITY
- Standards
- Interoperability
- Communications Scalability
- Security Management
- Data Integrity and Reliability
- Certification
Practicability

SAFETY APPLICATIONS

Technical
- Track 2
- Track 4
- Pilot

Economic
- Track 6
- Safety Pilot

Driver Acceptance
- Track 5
- Safety Pilot
CHARACTERIZE SYSTEM PERFORMANCE AND CAPABILITY:

- Accuracy
- Interoperability
- Security
- Alert logic
Practicability

Policy
- Benefit-Cost Analysis
- Governance
- Privacy
- Liability
- etc....
Practicability

Determine driver acceptance:
- Ease of use
- Usefulness
- Ease of learning
- Willingness to use/Advocacy
Compliance

Objective Tests
- Track 3
- Track 4

Certification
- Systems Engineering
- Safety Pilot
Vehicle Type

- **Light Vehicles**
  - V2V
  - Safety Pilot

- **Heavy Vehicles**
  - Track 7
  - Safety Pilot

- **Transit Vehicles**
  - Track 8
  - Safety Pilot
# Commercial Vehicle V2V and Safety Pilot Roadmap

## Research Completed to Date
- DVI Needs Identification
- Performance Requirements
- CV Interoperability Issues

## Upcoming Research
- Prototype Truck Tractors
- Safety Pilot
  - Driver Acceptance Clinics
  - Model Deployment

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<td>Develop Performance Requirements</td>
<td>HV Retrofit Safety Device</td>
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<td>CV Interoperability Issues</td>
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<td>2011 ITS World Congress Demo</td>
<td>V2V LV Benefits Assessment</td>
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<td>Performance Specifications &amp; Test Procedures</td>
<td>Estimate HV Safety Benefits</td>
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**Independent Evaluation of Testing Activities**
Vehicle Type

- Light Vehicles
  - V2V
  - Safety Pilot

- Heavy Vehicles
  - Track 7
  - Safety Pilot

- Transit Vehicles
  - Track 8
  - Safety Pilot
Right-Turn In Front Crashes

This application was discussed and recommended by transit stakeholders during transit stakeholder meetings.
Contact Information

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http://www.its.dot.gov/

NHTSA
www.nhtsa.gov