Photo Source: Thinkstock

CONNECTED VEHICLES: VEHICLE-TO-VEHICLE (V2V)

COMMUNICATIONS FOR SAFETY

Vehicle-to-vehicle (V2V) communications for safety is the wireless exchange of data among vehicles traveling in the same vicinity that offers opportunities for significant safety improvements.

V2V communications for safety is a key component of the connected vehicle research program within the Intelligent Transportation Systems Joint Program Office (ITS JPO) of the U.S. Department of Transportation (USDOT) Research and Innovative Technology Administration (RITA).

Through the multimodal program, the ITS JPO and the private sector are able to share information between vehicles to achieve transformative safety benefits for the multimodal transportation sector.

Vision

The vision for the USDOT's V2V communications for safety program is that each vehicle on the roadway will eventually be able to communicate with other vehicles, and that this rich set of data and communications will support a new generation of active safety applications and systems.

Research Plan

The four major objectives of the V2V communications for safety program are:

1. Develop V2V active safety applications that address the most critical crash scenarios.
2. Develop a rigorous estimation of safety benefits that will contribute to the assessment of a 2013 National Highway Traffic Safety Administration (NHTSA) agency decision.
3. Work with industry and enable market factors that will accelerate V2V benefits through in-vehicle V2V technologies and through the use of aftermarket and/or retrofit options to ensure that the first V2V-equipped vehicle owners find value in their investment.
4. Building from the results of the Vehicle Infrastructure Integration program's proof-of-concept tests, complete the development and testing of the V2V communications technologies and standards.

Transforming the nation's transportation system through V2V connectivity can provide significant safety benefits.

Research Goals:

- Employ advanced V2V wireless technologies to reduce, mitigate, or prevent a significant percentage of light-vehicle crashes by unimpaired drivers.
- Establish robust DSRC standards for safety-critical applications.
- Accelerate in-vehicle technology to ensure value to the first V2V vehicles.

Research Outcomes:

- The planned outcome of this research is to document and validate potential benefits of V2V technologies, and to develop the factual evidence needed to support the 2013 NHTSA agency decision


Photo Source: Thinkstock

Dedicated Short-Range Communications (DSRC)

U.S. Department of Transportation

Research and Innovative Technology Administration


Photo Source: Thinkstock

Multimodal

The V2V communications for safety program incorporates a collaborative research process that engages the appropriate stakeholders in a multi-track program to address the breadth of technical and non-technical V2V research needs. This research also addresses critical policy issues, which will be useful as wide-scale deployment approaches.

Research Tracks

- **Track 1:** Identification of critical crash scenarios for V2V has been completed. Initial benchmarks for safety application function, performance, and effectiveness have been developed.
- **Track 2:** Ensure interoperability and determine supporting infrastructure needs for V2V deployment. Safety applications must work on all types of equipped vehicles and adhere to communication standards to ensure security and message integrity.
- **Track 3:** Develop rigorous estimates of safety benefits. The development of performance measures, objective test procedures, and an adaptation of Advanced Crash Avoidance Technologies will assist in validating safety benefits.
- **Track 4:** Develop prototype active safety applications and evaluate through objective tests and field trials. The development of these applications depends on and assists in the analysis of the functional and performance requirements for the underlying technologies, such as positioning and communications. However, additional research needs to be conducted to address more complex crash scenarios for a number of additional scenarios. Another effort under this track will be the cooperative research and development of a safety application with European Union partners.
- **Track 5:** Develop effective driver vehicle interfaces. Collision warning system effectiveness relies on the quality of its interface, which can affect the driver's performance.
- **Track 6:** Investigate policy issues and formulate regulatory decisions within the context of the broader program.
- **Track 7:** Develop and evaluate V2V safety applications that incorporate the unique needs and vehicle dynamics of commercial vehicles, large trucks, and motor coaches. Research from NHTSA estimates V2V applications can address a significant percentage of all heavy truck crashes involving unimpaired drivers. Other applications for commercial vehicle operators will also be evaluated.
- **Track 8:** Develop transit safety applications. Using the work done on automobile safety applications and transitioning its applicability to transit vehicles could positively impact the industry.

Work in Progress

Human Factors Research

The ITS JPO has established a Human Factors Research effort to study the effects of alerts and warnings on drivers and travelers throughout the transportation system to assess the human side of response to the in-vehicle alerts and warnings.

Standards

Data and communication standards have been developed through this research effort including the Society of Automotive Engineers J2735 Basic Safety Message and a standard communications architecture/platform communicating in the 5.9 GHz band of radio spectrum.

Potential V2V safety applications include safety warnings for drivers such as:

- Emergency brake light warning
- Forward collision warning
- Intersection movement assist
- Blind spot and lane change warning
- Do not pass warning
- Control loss warning
- Vehicle stabilization activation on roadways alerting transit operators to weather-related information

Photo Source: USDOT

For more information about this initiative, please contact:
Mike Schagrin, Safety Programs Manager
ITS Joint Program Office | (202) 366-2180 | mike.schagrin@dot.gov | www.its.dot.gov

FHWA JPO-11-029