Transportation Research Today

TECHNOLOGY | IMPAIRMENT | MOBILITY | INFRASTRUCTURE

Focusing in on motorcycle safety

Turning the research we do into information for you!

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NSTSCE
National Surface Transportation Safety Center for Excellence
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About NSTSCE

The National Surface Transportation Safety Center for Excellence (NSTSCE) located at the Virginia Tech Transportation Institute (VTTI) was established by the Federal Public Transportation Act of 2005 to develop and disseminate advanced transportation safety techniques and innovations in both rural and urban communities.

NSTSCE uses state-of-the-art technology, including the Virginia Smart Road, to focus on four main research areas:

1. **Safety devices and techniques that enhance driver performance;**
2. **Evaluations of the built roadway environment and infrastructure-based safety systems;**
3. **Safe mobility for vulnerable road users; and**
4. **Driver impairment.**

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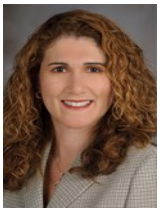
Along for the Ride

As the mother of a future driver's license holder, the work we do under NSTSCE has a completely new meaning. Once our children are in the driver seat, we lose control of their safety and need to rely on what they have learned and the technologies (passive and active safety systems) available to try to keep them as safe as *we* would. Our research at NSTSCE provides the tools needed to assist in the process of improving driving safety. The research showcased here on how teen drivers could coexist with heavy-vehicle drivers is very important. If implemented, it could immensely assist our future generation of drivers. At NSTSCE we strive to assist in solving many other aspects that could potentially impact driving safety, such as technologies to avoid crashes that involve animals on the roadway as well as technologies that assist by monitoring the drivers. I am certain you will find the articles related to those topics very motivating.

Another potential group of vulnerable road users are motorcycle drivers. This issue of *Transportation Research Today* presents how NSTSCE researchers characterize motorcycle riders' willingness to participate in studies and their concerns in order to design studies that maximize participation. The Motorcycle Research Group at VTTI is already performing multiple naturalistic studies that take advantage of these results. For updates on their results and other naturalistic research-related information we invite you to attend NSTSCE's Fourth International Symposium on Naturalistic Driving Research at The Inn at Virginia Tech and Skelton Conference Center in Blacksburg, Virginia on August 25-28, 2014. Hope to see you there!

Please feel free to contact us with your ideas and feedback at NSTSCE_Outreach@vtti.vt.edu. Safe travels!

Myra Blanco
Outreach Coordinator, NSTSCE



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Surveying Motorcyclists to Improve their Safety

By Vicki Higginbotham Williams

Motorcyclist fatalities have been increasing over the last decade. According to 2009 records, motorcyclists account for one out of every seven road user fatalities. NSTSCE researchers in the Motorcycle Research Group at VTTI are dedicated to conducting research to help provide a deeper understanding of motorcycle-related activities in order to improve motorcycle safety. The motorcycle survey described here was an effort to gather information directly from riders with the specific goal of supporting effective, meaningful research.

A total of 424 motorcycle riders volunteered to complete the survey, which included 90 questions. These questions covered topics related to demographics (such as gender, age, location, and licensure), experience (years, mileage, and trip description), motorcycle characteristics, rider training, safety issues, and respondent interest in participating in a naturalistic (real-world) riding study.

Survey Results

Some traits of these survey respondents were not completely reflective of the national motorcyclist population. For example, this survey included a large percentage of fairly experienced riders who tended to ride in Virginia, a bias likely related to the method of recruitment (i.e., through an email list associated with The Motorcycle Safety Foundation [MSF] and through local advertisements). The majority of respondents were also willing to consider participation in an on-road motorcycle study. This willingness could be largely related to the type of rider who would voluntarily respond to an online survey. However, while not implying that all riders nationwide would be willing to participate in an on-road study, results are encouraging in terms of the feasibility of finding riders who are willing to be a part of naturalistic on-road motorcycle studies.

The group of motorcyclists who chose to complete this survey were mostly male (93%), and more than half of all respondents were in the 40-59 year age category. These percentages are fairly representative of the overall population of riders, according to a 2010 Motorcycle Industry Council survey. Respondents rode in a variety of locations, although 20% of the total respondents rode mostly in Virginia. Most riders indicated that they are trained, riding more than 100 days annually for work as well as pleasure, but also logging more miles in automobiles than on motorcycles. The average riding season was 10 months out of the year. Riders tended to maintain their own motorcycles and wear appropriate protective gear. Most of the primary motorcycles were around 10 years old or newer, and more than half of these were manufactured by BMW or Honda (with a variety of other types mentioned also). Although most riders had been involved in a "crash" (including laying the bike down), the majority had not been involved in multiple crashes.

In general, the survey respondents indicated a high level of willingness to participate in an on-road study and to have their motorcycles instrumented for such. This willingness to participate did not appear to be directly related to factors such as rider age, training level, experience, or motorcycle type, make, or year. For those riders who were the most hesitant to participate in an on-road study or allow motorcycle modification/instrumentation, the main concerns were invasion of privacy, inconvenience, and disruption of the freedom and stress release inherent in their riding activities. The respondents who indicated the most willingness to participate noted that they did have concerns about possible damage or altered appearance of their motorcycles, and were especially concerned about changes to their helmets.

NSTSCE researchers identified three groups which indicated high interest in study participation and the willingness to allow associated motorcycle modifications.

The first type of rider (and largest of all groups, incorporating over 50% of all respondents) included mostly males (93%), typically middle-aged (averaging 50 years old), who tended to ride more annual miles than most of the other groups. They rode for work (commuted) as well as for pleasure, and rode more than one motorcycle (averaging two), typically of the sport-touring or touring type.

The next largest group (20% of all respondents) indicating high willingness levels consisted of younger members (average age of 31) with a male/female ratio of 92/8 percent, and rode a medium level of annual mileage compared to other groups. They rode for work as well as pleasure, and rode more than one motorcycle (averaging two), typically of the sportbike type.

The third largest group of willing respondents (18% of the total respondents) included older members (average age of 64), at a male/female ratio of 96/4 percent, who rode more annual miles than most of the other groups. Most of these respondents rode more for pleasure than for work, and rode more than one motorcycle (averaging three), mostly of the sport-touring or touring type.

Applying Survey Results to NSTSCE Research

Based on the respondents that completed this survey, the general willingness of motorcyclists to participate in an on-road data collection study was fairly high, regardless of individual characteristics. Factors cited as affecting participation for most of the respondents included invasion of privacy (including possible monitoring and legislation), the effort required and

the disruption of routine, possible damage to equipment/helmet, and unsuitable personal circumstances. Respondents who were the least willing were especially concerned about privacy and disruption issues; those who were of medium willingness were also worried about being low-mileage, multi-bike, or novice riders; those who were the most willing focused largely on whether participation would damage or alter their equipment, particularly the helmet. These findings are not especially troublesome to NSTSCE researchers, who design their studies to minimize all of these concerns.

Knowledge of the characteristics and attitudes of the motorcyclist population can only improve the ability of researchers to effectively design and implement motorcycle safety research. This survey provided a synopsis of many characteristics of this population with an emphasis on factors related to study execution. This is just a portion of information that the Motorcycle Research Group at VTTI has utilized as they embark on their third large-scale study of real-world riding since 2007. The group, as well as other motorcycle safety research organizations, will continue to utilize applicable information such as this to continue to conduct motorcycle-related research in the hopes of preventing future rider injury and fatalities. The complete final report for *A Survey of Motorcyclists: Data for Research Design and Instrumentation* can be found at http://vtechworks.lib.vt.edu/handle/10919/23317.

For more information about the Motorcycle Research Group at VTTI, including becoming involved as a rider, please visit http://www.motorcycle.vtti.vt.edu.

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Vicki Williams was the project lead for *A Survey of Motorcyclists: Data for Research Design and Instrumentation.*

Ms. Williams is a human factors engineer for the Motorcycle Research Group at VTTI.

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NSTSCE Researcher Profile

Dr. Jon Hankey is the subject matter expert for the NSTSCE focus area entitled Safety Devices and Techniques that Enhance Driver Performance in addition to being the Senior Associate Director for Research and Development at VTTI.

Dr. Hankey has more than 20 years of experience in the areas of human factors, driver behavior and performance, and transportation safety. He has conducted extensive transportation research on public roads, the VTTI Smart Road test track, and in driving simulators. He obtained his Ph.D. in industrial engineering from the University of Iowa in 1996.

Transportation Tidbit

Did you know that, in the United States, male drivers aged 15 to 24 account for 30% of the total costs of motor vehicle injuries annually while female drivers of the same age group account for 28%?

To put that into perspective, male and female drivers combined in this age range represent just 14% of the U.S. population.

Finkelstein EA, Corso PS, Miller TR, Associates. (2006). Incidence and Economic Burden of Injuries in the United States. New York: Oxford University Press.

Teen Drivers & Heavy Vehicles: Coexisting Safely

By Scott Tidwell

How many of you remember learning to drive? That first time behind the wheel of a car may have been nerve-wracking not only for you but also for your parents! Looking back at those times can be a scary but exciting memory. Teens wait in anticipation for the big day when they obtain their driver's license. That sense of freedom, being able to drive to school, and taking a date to the movies is something most teenagers yearn for, but more experienced drivers know that teens don't thoroughly comprehend the inherent risks of sharing the road with other vehicles.

Sobering Facts

A sobering fact that you—and teen drivers—may not realize is that, per mile driven, teen drivers between the ages of 16 and 19 are three times more likely to die in a car crash than drivers aged 20 or older (IIHS, 2012). In 2010, this equaled 2,700 teens (aged 16 to 19) killed and another 282,000 injured in motor vehicle crashes (CDC, 2012).

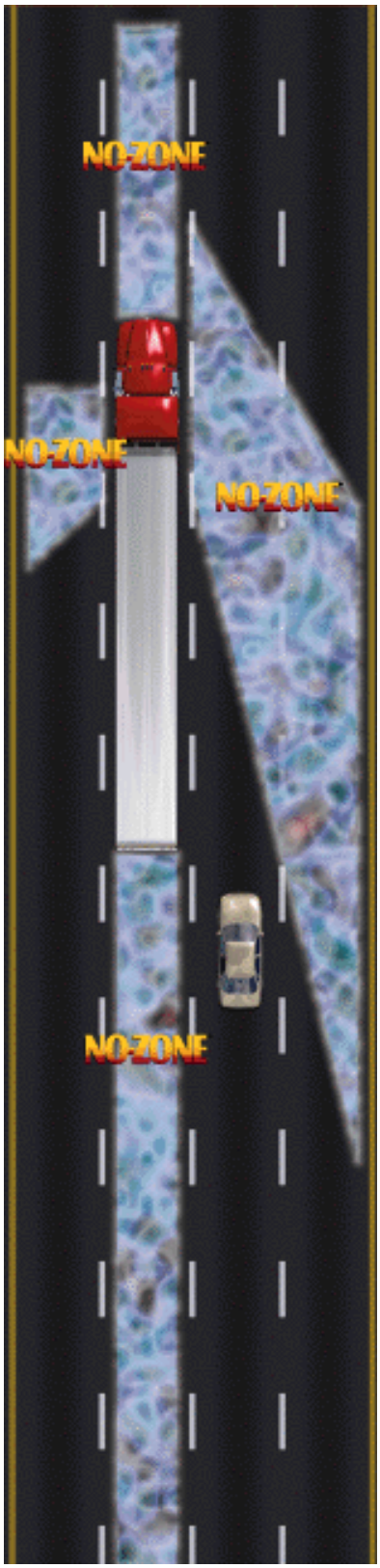
Sharing the Road Safely

Previous research investigating crashes and near-crashes involving a light vehicle and a heavy vehicle found that 78% were initiated by the light-vehicle driver (Hanowski et al., 2007). One aspect of this large proportion of light-vehicle drivers being at-fault may result from inadequate training in driver education programs on how to share the road safely with heavy vehicles. With this in mind, NSTSCE researchers investigated driver education programs for content on sharing the road safely with heavy vehicles and then developed a supplemental practices document with key information that could be used by educators. There are a few private organizations (such as the Commercial Vehicle Safety Alliance and the Walmart Road Team) that promote sharing the road safely through DVDs and hands-on experiences, but there is typically no requirement that driver education programs incorporate these methods within their own curriculum. One aspect of the supplemental practices that NSTSCE researchers focused on was the hands-on experience.

A pilot test of the hands-on supplemental method was conducted with a regional high school's driver education program. This hands-on learning experience started with a 20-minute presentation by a Class A Commercial Driver's License holder with experience in truck driver training and safety. The presentation covered topics such as crash statistics, heavy-vehicle characteristics, and five sharing-the-road tips: 1) Don't hang out in the no-zone, 2) Maintain a safe following distance, 3) Don't get squeezed, 4) How to properly pass heavy vehicles, and 5) Don't get cut off. Ample time was provided for students to ask questions.

Following the classroom portion, students participated in a 40-minute interactive experience that took place outside. A tractor-trailer along with three light vehicles located in the tractor-trailer's no-zone were set up in the school parking lot. Each student was provided with the opportunity to sit in the driver's seat of the tractor-trailer. This allowed each student to see from the perspective of a truck driver and the challenges faced when driving a heavy vehicle. While seated in the driver's seat, the students were unable to see the light vehicles parked in their blind spots; this provided a valuable lesson.

Students rotated through each of the light vehicles in the no-zone and received instruction on the five sharing-the-road tips. This enabled the students to get up close to a tractor-trailer and see how big these vehicles can be, and also what it is like to be in each of the blind spots. Physically standing next to a heavy vehicle provides a completely different perspective than just passing by one on the highway! It should be noted that this hands-on experience could just as easily be conducted with a motorcoach or transit bus in place of a tractor-trailer. The pilot test proved to be a success for



Courtesy of the Federal Motor Carrier Safety Administration

the NSTSCE researchers. Feedback from the driver education instructor felt that this not only improved her class content but made it more interesting and helped to keep the students' attention. The students also displayed enthusiasm for the hands-on experience. Focus groups were conducted with the students and, while some students did not participate, those who did were in 100% agreement that the hands-on experience was very helpful. Both the instructor and students noted that this provided a real-life experience rather than just reading about the topic in a text book.

Moving Forward

These supplemental practices were developed for teen drivers in driver education programs as this is a vulnerable driving population with the statistics to back it up; however, these practices do not have to be limited to teen drivers. The hands-on experience could be incorporated with other training programs, such as driving safety and defensive driving courses. Additionally, workplace settings that require driving as part of the job could also benefit from this hands-on experience. The ultimate goal is to share the road safely with heavy vehicles and this applies to all drivers, not just teen drivers. Expanding this pilot program could benefit the general driving public and save lives by reducing the number of light vehicle/heavy vehicle conflicts on our roadways.

This project falls under the NSTSCE focus area of Safe Mobility for Vulnerable Road Users and the final report is currently in-press. Once published it will be available at http://vtechworks.lib.vt.edu/handle/10919/5529

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Stephanie Baker served as the project lead for the *Evaluation of Light-Vehicle Driver Education Programs Targeting Sharing the Road with Heavy Vehicles* study.

Ms. Baker is a project associate for the Center for Truck and Bus Safety at VTTI.

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Announcement!

The 4th International Symposium on Naturalistic Driving Research

Hosted by NSTSCE and VTTI

August 25-28, 2014—Blacksburg, Virginia

www.vttindrs.org

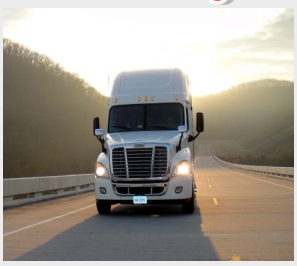
Keynote Speakers

Ken Leonard, Director of the U.S. Department of Transportation Intelligent Transportation Systems Joint Program Office

&

Ann Brach, Director of the Second Strategic Highway Research Program at the Transportation Research Board

CMV Driving Safety



CMV Driving Safety is an NSTSCE-developed and maintained website with the goal of helping truck and bus fleets improve their driving safety. The website includes six interactive modules that can be viewed online or downloaded. No sign-up required.

Begin improving your fleet safety today!

Ongoing Studies

There are currently more than 50 studies being conducted under the NSTSCE program; featured below and on the following page are two of these ongoing studies.

Animal Versus Vehicle...Potential for Avoiding the Conflict

By: Paul Bartholomew

In the United States this year, it is expected that the number of animal-to-vehicle collisions will exceed 1 million and that trend is projected to continue. Of these crashes that are likely to happen, approximately 200 fatalities are expected annually (Insurance Journal, 2012). Damages to vehicles and property cost nearly $4 billion each year and an additional $4 billion is spent on medical care, emergency response and crash management, and animal carcass removal and disposal (Donaldson and Moruza, 2010).

An NSTSCE project is currently testing a new system that may reduce the number of animal-vehicle collisions, and potentially save lives. This new animal detection system depends on a roadside cable that is buried nine inches underground which senses larger animals by their size, speed, and electrical conductivity. The buried cable can detect animals in either direction and up to four feet above ground. Once an animal is sensed, the system will relay that information to a data acquisition system onsite, including where along the road the animal was located.

Current testing is being conducted on the Virginia Smart Road at VTTI. The Smart Road provides a great location for this testing as numerous wildlife can be found on and around the facilities. Video surveillance at the Smart Road will help to monitor animal movement to evaluate how well the system is working. The surveillance system is running continuously, in all weather conditions and even through the night, when animal vehicle crashes could be the most dangerous. There have been numerous sightings of deer, coyotes, and even bears on the Smart Road. Parts of the Smart Road have wooded areas on either side of the road, so animals will often be found moving across the roadway. Because of this, the Smart Road is a prime location for this project.

The installation of the animal detection system was completed during the last quarter of 2013, with data collection scheduled to continue until November 2014. The entire Smart Road phase of the project is scheduled to end in March 2015.

After the all the data has been collected and analyzed, the system's performance will be evaluated to determine its efficacy. If the system is deemed to be effective, the next step will be to apply the system to Virginia public roads. The cables could be implemented in major animal-vehicle conflict areas in Virginia. Using data about animal-vehicle crashes and Virginia Department of Transportation (VDOT) carcass pick-ups, high-risk roads would be identified. In addition, traffic speed data would be collected so that the system can alert drivers with enough time to slow down and avoid the crash.

This project falls under the NSTSCE focus area of *Evaluation of the Built Roadway Environment and Infrastructure-Based Safety Systems,* and the lead researcher is Andy Alden.

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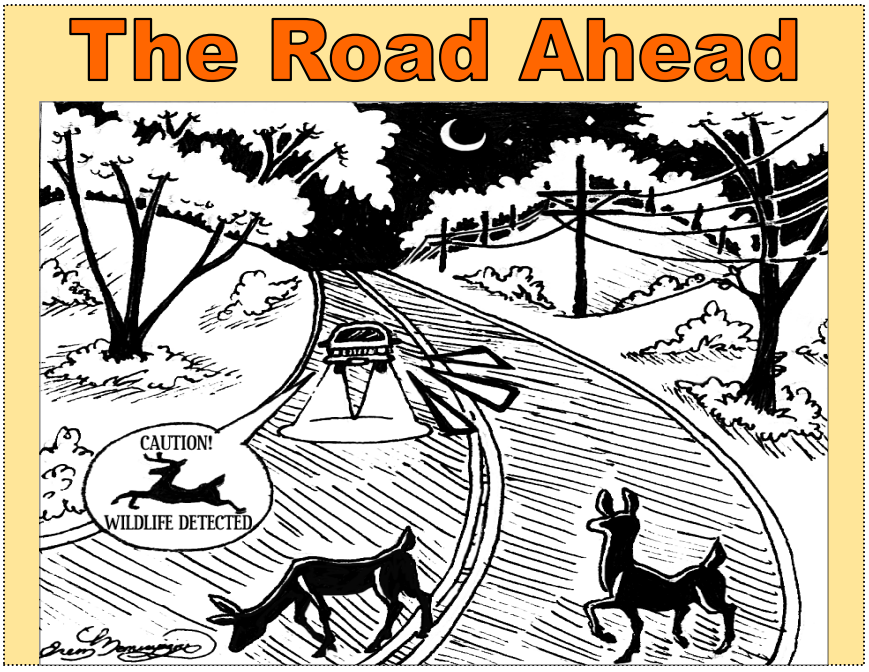

Effective Use of Commercially Available Onboard Safety Monitoring Technologies: Guidance for Commercial Motor Vehicle Carriers

By: Jon Atwood

Believe it or not, crashes involving commercial motor vehicles (CMV) can often be prevented when drivers make small adjustments to their behavior. Some of these behaviors that may result in crashes include speeding, switching lanes frequently, hard braking, and many others. In this study, researchers hope to provide guidance to safety managers and fleet executives in effectively reducing the incidences of these potentially adverse behaviors.

Recent increases in CMV-related crashes demonstrate the need for this research. The U.S. Department of Transportation reported that the amount of fatalities from crashes involving trucks increased 3.7 percent from 2011 to 2012, moving from 3,781 fatalities in 2011 to 3,921 in 2012. The number of trucks involved in fatal crashes was 3,802 in 2012, up 4.7 percent from 2011 and continuing a three-year increase. Crash-related injuries also increased 18.2 percent, from 88,000 in 2011 up to 104,000 in 2012 (U.S. Department of Transportation, 2014).

Though monitoring CMV driver behavior has been difficult due to the traveling and isolation inherent to the occupation, onboard safety monitoring (OSM) makes this task much easier. OSM technologies can provide information about a wealth of behaviors and actions that CMV drivers take behind the wheel. However, because of the wide variety of OSM technologies, knowing which OSM technology to use and how to use it can prove challenging. The researchers want to help companies develop manuals that easily describe how to best make use of OSM technology.

To accomplish the above task, NSTSCE researchers seek to collaborate with providers of OSM technologies. A previously conducted NSTSCE project, Market Guide to Fleet Telematics Services, discusses a variety of these currently available OSM technology providers. The researchers hope to work with these companies to develop materials that will clarify the best practices to effectively use and implement these technologies. Some topics that may be addressed include training, safety culture, development of a Steering Committee, employee involvement and commitment, among others.

This project, which falls under the NSTSCE focus area of *Safety Devices and Techniques that Enhance Driver Performance*, is set to be completed by Fall 2014. The lead researcher for this effort is Matt Camden.

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On Location

The Mile Marker 3 image on the cover was captured on Route 460 in Princeton, WV by Paul Bartholomew.