

UMTRI

# RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • APRIL-JUNE 2007 • VOLUME 38, NUMBER 2 •



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## **Prioritizing Improvements to Mirror Systems on Commercial Trucks**

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ISSN 0739 7100

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UMTRI / Biosciences Division

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The UMTRI Research Review is published four times a year by the Research Information and Publications Center of the University of Michigan Transportation Research Institute, 2901 Baxter Road, Ann Arbor, Michigan 48109-2150 (<http://www.umtri.umich.edu>). The subscription price is \$35 a year, payable by all subscribers except those who are staff members of a State of Michigan agency or an organization sponsoring research at the Institute. See the subscription form on the inside back cover. For change of address or deletion, please enclose your address label.

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## UMTRI's Strategic Intent

To be the leader in transportation systems research integrating vehicles, people, and infrastructure to achieve a highway transportation system where:

- Fatalities and injuries are eliminated
- People and goods flow efficiently
- Reliance on nonrenewable energy is reduced

# Prioritizing Improvements to Mirror Systems on Commercial Trucks

**Although a view of the environment surrounding a vehicle is critical for driving, little effort has been directed at quantifying the optimal field of view and mirror image quality. This information is especially useful for drivers of heavy trucks, whose direct vision around the vehicle is often obstructed.**



UMTRI / BIOSCIENCES DIVISION

Although a view of the environment surrounding a vehicle is critical for driving, little effort has been directed at quantifying the quantity and quality of the field of view that is required. In particular, drivers of heavy trucks rely to a greater extent than drivers of smaller vehicles on indirect vision. However, most heavy trucks provide no view through the rear of the vehicle, so vision to the rear is restricted to the view provided by exterior mirrors. Regulatory requirements for truck driver vision are minimal. The only standard that bears directly on driver fields of view is Federal Motor Vehicle Safety Standard (FMVSS) 111,

which regulates mirror systems. Trucks over 10,000 lb are required to have planar mirrors with an area of at least 323 cm<sup>2</sup> on each side of the cab. Direct vision is unregulated.

Any increase in the visibility of the exterior environment could be viewed as an improvement in driver vision, and any decrease could be viewed as a detriment. But all increases or reductions are unlikely to have the same effects on safety. For example, raising the hood by 10 cm might have a larger effect on safety than lowering the top of the windshield by 10 cm. But whether either change would have a significant impact on safety would depend on

the baseline condition. Similarly, the potential effects of changes in mirror configurations are difficult to determine.

UMTRI researchers Matt Reed (*see related article on page 7*), Daniel Blower, and Mike Flannagan investigated the contributions of the quantity and quality of the field of view to truck safety, and developed priorities for improving the visibility from heavy trucks. The study covered three major areas:

- **Crash data analysis:**

Researchers quantified the role of driver vision in truck-initi-

*continued...*

ated crashes through analyses of crash data from several sources.

- **Lane-change pilot study:** Researchers evaluated truck drivers' conflict detection in a lane-change scenario using various mirrors and direct vision.
- **Evaluation method for near-cab visibility:** Researchers developed a quantitative method for evaluating truck cab designs with respect to near-cab visibility.

## Crash Data Analysis

The crash environment for medium and heavy trucks was characterized using nationally representative computerized crash files and supplementary data collected specifically for this project for selected crash types. The computerized crash files used were the Trucks Involved in Fatal Accidents (TIFA) file, which is compiled by UMTRI, and the National Automotive Sampling System General Estimates System file (NASS GES, referred to simply as GES hereafter), compiled by the National Highway Traffic Safety Administration using an aggregate file for seven years (1994–2000). The TIFA file is a survey of all medium and heavy trucks involved in a fatal traffic accident in the United States. The GES crash file is a nationally representative sample of police-reported crashes, covering all vehicles involved in a traffic accident, not just trucks.

Results show that crashes occurring in areas where the truck driver has to rely on mirrors to determine if it is safe to maneuver account for 19.7 percent

of all truck crash involvements, or almost one out of five crashes. The most common mirror-relevant crash type is a truck backing into other vehicle, with 7.0 percent of all truck involvements. Lane changes and merges (LCM) account for 6.8 percent, with a significant disparity in crash involvements when the truck was maneuvering to the left in comparison with maneuvers to the right. LCM right crashes occur 4.4 times more frequently than LCM left crashes. Similarly, right turn crashes are significantly more frequent than left turn crashes. There are 4.2 right-turn mirror-relevant crashes for every mirror-relevant crash while turning left.

When classifying crashes by direction to conflict, the proportion of conflicts to the front and rear are nearly equal, as are conflicts directly to the left

occur primarily on roads with two-way traffic.

Results also show that, overall, mirror-relevant crashes are not more likely in adverse conditions. However, adverse weather does affect the relationship between maneuvers to the left and right. In rain, snow, or sleet conditions, LCM right involvements are about 10 percent *more* frequent, and turning right crashes are 10 percent *less* frequent, than in nonadverse conditions. Light condition, however, plays a large role. Darkness increased the right/left ratio for LCM crashes by about 37 percent. The dark-lighted condition (in which there is no natural light but overhead street lighting) further increased the relative frequency of lane changes to the right.

Supplemental data on selected crash types reinforced these findings, and identified the area to the right of the truck, particularly right forward, as significantly overrepresented in certain crash types. In lane-change crashes, movement to the right is overrepresented by over four times compared with movement to the left, and the problem is exacerbated at night and in dark-lighted conditions. In low-speed maneuvers involving pedestrians and other nonmotorists, the critical areas are immediately in front and to the right of the truck.

In sum, the area to the right of the truck, particularly right forward, is clearly significantly overrepresented in certain crash types. In lane-change crashes, movement to the right is overrepresented by over four times compared with movement to the left, and the problem is exacerbated at night and in dark-lighted conditions. In low-speed maneuvers involving

### Improving Mirror Systems on Commercial Trucks

Researchers prioritized four areas of driver vision that require the most improvement:

- The area immediately to the right of the cab, extending to the far side of the adjacent lane and 5 m rearward from the front bumper.
- The area immediately to the right of the truck, extending to the far side of the adjacent lane, beginning 5 m from the front bumper and extending to a line 5 m rearward of the back of the truck (including trailer).
- The area immediately behind the truck.
- The area immediately in front and to the right-front of the truck, extending through the truck's lane across the right adjacent lane and extending 5 m forward of the front bumper.

and right. Left forward is significantly higher than right forward (10.6 percent versus 2.6 percent). Conflicts to the left forward result in head-on collisions or sideswipes in which the vehicles are moving in opposite directions. These



pedestrians and other nonmotorists, the fact that the truck driver is largely unable to view the immediate vicinity of the vehicle places the burden of avoiding a collision largely on the other parties around the truck. Populations that are less mobile are especially vulnerable. The critical areas are immediately in front and to the right of the truck.

## Lane-Change Pilot Study

This study evaluated the performance of drivers in detecting lane-change conflicts under a variety of conditions in a static, parking-lot environment. A target vehicle was placed in a lane adjacent to a tractor-trailer at various distances from the front of the truck. Some of these conditions represented a lane-change conflict for the truck. Drivers used the mirrors and direct vision to determine whether a lane change to the right or left was safe, pressing one of two buttons to indicate their judgment. Six experienced truck drivers participated in both daylight and night trials with several different mirror configurations.

Drivers generally indicated it was safe to complete a maneuver at a minimum of 25 m behind the front of the tractor-trailer, with ratings of safety increasing with distance. Shorter distances were generally deemed safe only for right-turn maneuvers. Longer distances were deemed safer at night. Go responses at very short distances were primarily limited to the night condition on the right side.

Reaction times ranged from 1 to 2 seconds and were consistently higher on the right side, particularly for very short distances at night. However, there is no general increase in reaction times at night. There was a rise in reaction times when the passenger car is near the end of the trailer (about 20 m).

## Evaluation Methods for Near-Cab Visibility

Researchers based their evaluation methods on SAE J1050 (recommended practices for describing and measuring drivers' field of view) and also considered the priority of the regions of the field of view. In general, areas immediately ahead of the truck or adjacent to the cab were given higher priority than areas farther from the truck. The prioritization of improvements was based on the findings of the crash-data analysis as well as the results of the experimental findings regarding the detection of lane-change conflicts.

In brief, the evaluation method consisted of the following steps:

1. Obtain a computer model of the vehicle to be evaluated.
2. Establish a viewing point.
3. Establish a grid of sample points.
4. Compute the minimum view height at each sample point.
5. Compute the fraction of the pedestrian population visible at the view height.
6. Compute an aggregate obscuration score.

This method differs from previous approaches in that it provides an aggregate score that is related to a specific crash-safety issue. The method is based on the visibility of standing adult pedestrians, and hence addresses the specific problem of pedestrian involvement in start-up and right-turn crashes. Quantitative comparisons between vehicle designs with respect to exterior vision can be conducted using the new method. The method could be applied to evaluate alternative mirror systems, camera-based systems, and other technologies that might be developed to address the priorities established in the study. **RR**

# Safer Travel for Wheelchair Users

Recently, a twenty-one-year-old Michigan man received nationwide media coverage by surviving an amazing high-speed highway ride when his powered wheelchair became stuck in the front grill of a semi-truck. However, thousands of people who remain in their wheelchairs when they travel in motor vehicles face many safety risks every day, even if they aren't on the nightly news.

Recommendations for how to provide safer transportation for wheelchair-seated travelers can be found at [www.travelsafer.org](http://www.travelsafer.org) and [www.recrewts.org](http://www.recrewts.org). Adult wheelchair users who can transfer safely from their wheelchairs to the vehicle seats should do so, remembering to use the federally-regulated seatbelts provided by the vehicle manufacturer. Children who can transfer out of their wheelchairs should use approved child safety seats or belt-positioning boosters. Some child safety seats are now available that provide a five-

point harness restraint for kids weighing up to eighty pounds.

It is best if people who need to stay in their wheelchairs during travel have a wheelchair that has been crash tested and has special hardware for attaching to tiedown hooks. These wheelchairs will be labeled to indicate that they comply with ANSI/RESNA WC19, a voluntary wheelchair standard for wheelchairs used as seats in motor vehicles. When traveling in a wheelchair, it is also necessary to use a crash-tested wheelchair tiedown and occupant restraint system, or WTORS. The tiedown system secures the wheelchair to the vehicle and the occupant restraint system provides restraint for the wheelchair user in the event of a crash or emergency maneuver. Many wheelchairs have postural-support belts but these should not be relied upon for effective restraint in the event of a crash.

Most WTORS for passengers seated in wheelchairs use a four-point, strap-type tiedown system that can adapt to a wide range of wheelchair types and models. Typically, each tiedown strap is hooked to attachment points on the frame of

the wheelchair. For drivers who are seated in wheelchairs, a docking securement system is needed so that the wheelchair can be locked in position when the wheelchair moves forward into the driver station. These systems require the addition of special hardware to the wheelchair frame.


These recommendations are based on research conducted by the Rehabilitation Engineering Research Center on Wheelchair Transportation Safety (RERC WTS).

Adult wheelchair users who can transfer safely from their wheelchairs to the vehicle seats should do so, remembering to use the federally regulated seatbelts provided by the vehicle manufacturer. Children who can transfer out of their wheelchairs should use approved child safety seats or belt-positioning boosters.



This is a five-year research and development program funded by the National Institute on Disability and Rehabilitation Research (NIDRR) at UMTRI, the University of Pittsburgh, the University of Louisville, and the University of Colorado.

One of the research projects of the RERC WTS involves the investigation of real-world crashes and other adverse incidents involving wheelchair users who do not transfer to the vehicle seat when traveling in motor vehicles. If you know about a crash where someone was seated in a wheelchair, please call us at 734-647-2940 or email us to learn more about how you can help improve transportation safety, usability, and independence for wheelchair-seated travelers.

For more information on UMTRI's research for wheelchair users, see [www.umtri.umich.edu/expertiseSub.php?esID=95](http://www.umtri.umich.edu/expertiseSub.php?esID=95). 

## Social Support Is Main Predictor of Young Adult Drinking and Driving

A recent UMTRI study found two main predictors for drinking and driving by young adults:

- Having a circle of friends who condone getting behind the wheel after imbibing
- Believing there are few negative consequences for drinking and driving

The study, conducted by UMTRI researchers Ray Bingham and Jean Shope, surveyed nearly 3,500 young adults and various risk factors. Once the influence of alcohol use was factored out, two influences emerged as most closely linked to drinking and driving: social support and perceived risk.

Drivers who had greater than average social support for drinking and driving (friends who


drink and drive) were more likely to drink and drive themselves. “A potentially important way of helping people stop drinking and driving might be to help them change their networks of friends so that they have friends who don’t drink and drive,” Bingham says. “Similar approaches have been used in some programs to help people stop drinking.”

Groups like Mothers Against Drunk Driving conduct ongoing campaigns to make drinking and driving less socially acceptable. Other groups are using social marketing to redefine what is “normal” or “typical” behavior. A successful campaign created billboards that read “Most Montana Young Adults (4 out of 5) Don’t Drink and Drive.”

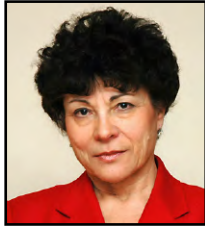
The UMTRI study also found that drivers who believe there is little chance that they will experience the penalties of drinking and driving, such as arrest or license suspension, are more likely to drink and drive. Initiatives such as sobriety checkpoints, stepped-up law enforcement, and aggressive campaigns against drinking and driving could change both behavior and beliefs.

UMTRI researchers also calculated how much factors such as social support and the perception of penalties contribute to the overall risk of drinking and driving. “If we could reduce people’s levels of both these risk factors by 50 percent, then we could expect the drinking-and-driving rate to go down by as much as 56 percent for women and 33 percent for men,” Bingham says.

Bingham and his colleagues are the first to examine drinking and driving in this manner, but there are undoubtedly other factors that are strongly related to drinking-and-driving behavior. But he says this research is another contribution to efforts to find more targeted strategies to curb drinking and driving.

For more information, see the article “Social and Behavioral Characteristics of Young Adult Drink/Drivers Adjusted for Level of Alcohol Use,” in *Alcoholism: Clinical and Experimental Research*, volume 31. For details on UMTRI’s research on young drivers, see [www.umtri.umich.edu/expertiseSub.php?esID=37](http://www.umtri.umich.edu/expertiseSub.php?esID=37). 

## Lidia Kostyniuk Named ITE Fellow



GREGORY KOSTYNIUK

Lidia Kostyniuk, a research scientist in UMTRI's Social and Behavioral Analysis Division, was appointed as a Fellow of the Institute of Transportation Engineers (ITE). The Fellow distinction

is conveyed to ITE members who have attained significant professional stature demonstrated by being a legally registered engineer, having responsible charge of important transportation or traffic engineering work, and demonstrating an active commitment and contribution to the work of ITE or the profession.

Kostyniuk joined UMTRI in 1994. Her professional career spans more than 25 years and includes teaching, research, and consulting in the area of transportation safety and travel behavior. Much of her research has focused on driver behavior, older drivers, use of restraint systems, risky driving behaviors, motorcycles, and crash involvement. She is a member of American Society of Civil Engineers, Institute of Transportation Engineers, Gerontological Society of America, and Sigma Xi. She serves on the editorial advisory boards of the journals *Transportation*, *Accident Analysis and Prevention*, and the *Journal of Safety Research*.

Kostyniuk holds an masters degree in aerospace engineering and a Ph.D. in civil engineering from the State University of New York at Buffalo, and is a licensed professional engineer in Michigan.

## Larry Schneider Named SAE Fellow



UMTRI / SHEENAH BERGTON

Larry Schneider, research professor and head of UMTRI's Biosciences Division, was elected as a Fellow of the Society of Automotive Engineers (SAE) based on his outstand-

ing accomplishments in biomechanics related to automotive and restraint system design. The SAE Fellow distinction honors SAE members who have made a significant impact on society's mobility technology through research, innovation, and/or creative leadership. Honorees are nominated by SAE members and elected by SAE's Board of Directors, based on the significance and impact of their engineering, scientific, and leadership achievements.

Schneider is one of twenty-five SAE Fellows elected this year. His research interests focus on biomechanics in the automotive environment (including seating and occupant positioning during normal vehicle operation) and the study of human impact response and injury tolerance related to improving occupant protection in crash environments through crash investigations and laboratory testing. He has served as principal investigator and project director on numerous projects concerned with biomechanics related to automotive design and restraint system design.

Schneider joined UMTRI in 1973 and became a division head in 1986. He also holds an appointment in the University of Michigan Department of Biomedical Engineering. He earned a B.S. in mechanical engineering, an M.S. in mechanical engineering and bioengineering, and Ph.D. in bioengineering from the University of Michigan.



## Peter Sweatman Appointed President of ITS-Michigan



UM / PHOTO SERVICES

Peter Sweatman, director of UMTRI, was appointed president of the Michigan chapter of the Intelligent Transportation Society of America at its annual meeting in May. ITS-Michigan was

established in 1991 as a not-for-profit organization to foster the use of advanced technologies in surface transportation systems. Since then, ITS America has become a national advocate for the development and deployment of intelligent transportation systems in the United States. Members include private corporations, public agencies, academic institutions and research centers. The national organization and the state chapters share a common goal: to improve the safety, security and efficiency of the nation's transportation system for the traveling public through the deployment of intelligent transportation systems.

Sweatman is a strong advocate for performance-based standards (PBS) as an improved method for regulating heavy vehicles. His work has been influential in developing truck size-and-weight evaluation tools for the Federal Highway Administration and the world's first comprehensive PBS regulatory regime for Australia. Prior to joining UMTRI in 2004, Sweatman built Roaduser Systems Pty Ltd., which specializes in research and development of the operations, productivity, and safety of heavy vehicles. He was also a chief scientist with Australian Road Research Board, founding and developing its heavy-vehicle research program. In 2002, he was awarded the Centenary Medal by the Prime Minister of Australia for Service to Australian Society in Transportation Engineering.

Sweatman holds a bachelor's degree in mechanical engineering and a Ph.D. in vehicle dynamics from the University of Melbourne.

## Matt Reed Wins SAE Distinguished Speaker Award



UMTRI / SHERMAN ERRINGTON

Matt Reed, an associate research scientist in UMTRI's Biosciences Division, was presented the 2006 Lloyd L. Withrow Distinguished Speaker Award at the Society of Automotive Engineers (SAE) annual meeting in April, 2007. He is one of eight professionals from the engineering and science fields who received this honor.

The award is named to honor the late Lloyd L. Withrow, former department head of General Motors Research Laboratories Fuels and Lubricants Department, and a noted speaker at many SAE meetings. The award recognizes individuals who have received the SAE Oral Presentation Award more than twice.

Reed's research interests focus on occupant protection and physical ergonomics for road vehicles. He has conducted research on restraint systems, emphasizing investigation of airbag-induced injuries, crash-dummy positioning procedures, and child-passenger safety. He has developed tools for the ergonomic design of vehicle interiors, including posture prediction and motion-simulation algorithms for use with digital human-figure models. Reed also serves as the research director of the Human Motion Simulation Laboratory at the Center for Ergonomics in U-M's Industrial and Operations Engineering Department. He has worked at UMTRI since 1989. He earned a B.S.E. in mechanical engineering, and an M.S.E. and Ph.D. in industrial and operations engineering from the University of Michigan.

Reed also received the distinguished speaker award in 2004 and 2005. Other UMTRI researchers who won this award include Mike Flannagan, Miriam Manary, and Donald Huelke (retired).

*continued...*

## Chris Winkler Wins SAE Outstanding Contribution Award



UMTRI / DAN HODGKINSON

Chris Winkler, research scientist emeritus in UMTRI's Engineering Research Division, has received the Society for Automotive Engineers' (SAE) Technical Standards

Outstanding Contribution Award for his work on SAE's Vehicle Dynamics Standards Committee. The award recognizes outstanding service on technical committees, such as valuable contributions, unusual leadership, significant contributions to the accomplishments of other organizations, and outstanding research contributions.

Winkler has been involved in the management and conduct of research concerned with the measurement, analysis, and prediction of the behavior of motor vehicles and their components for over thirty years. He retired from UMTRI's Engineering Research Division at the end of 2006, but is still active in the field.

Winkler recently completed a three-month assignment as a visiting researcher at the University of Cambridge in England. There, he hosted a meeting of the International Organization for Standardization's (ISO) working group TC22/SC9/WG6, which handles heavy-vehicle dynamics. He also taught a four-day course on heavy-vehicle dynamics at Queens College-Cambridge with colleagues Bob Ervin (UMTRI emeritus) and Dick Radlinski (NHTSA emeritus). The course is similar to Mechanics of Heavy-Duty Truck Systems, which is offered through U-M's Center for Professional Development. For more information on the course, see <http://cpd.engin.umich.edu/cpd-site/programs/details-short.xsl?-db=catalog&course::unqid=2567>.

## Tim Gordon Appointed Chair of TRB Committee AHB30



UMTRI / SHERMAN BERENSON

Tim Gordon, head of UMTRI's Engineering Research Division, was appointed chair of the Transportation Research Board Vehicle-Highway Automation Committee

(AHB30). The three-year appointment began in April. The committee is concerned with the development, application, and operation of driver assistance and automated control to the vehicle and highway system.

Gordon joined UMTRI in 2003 and holds a joint appointment in the University of Michigan College of Engineering as a professor of mechanical engineering. His research interests focus on vehicle dynamics and control relating to automotive design and development, modeling of driver-vehicle interactions, active chassis-system control and integration, and tracking and estimation of vehicles using machine vision. His current work is directed toward developing models to support the development of crash risk metrics that can be extracted from detailed traffic flow measurements.

Prior to joining UMTRI, Gordon was the Ford professor of automotive engineering in the Department of Aeronautical and Automotive Engineering at Loughborough University in England. He holds bachelor and doctorate degrees in applied mathematics from the University of Cambridge. **RR**

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## Journal Articles

Luoma, J.; Sivak, M.; Flannagan, M. 2006. "Effects of Dedicated Stop-Lamps on Nighttime Rear-End Collisions." 7 p. *Leukos*, vol. 3, no. 2, pp. 159–165.

McManus, W. 2007. "The Link Between Gasoline Prices and Vehicle Sales: Economic Theory Trumps Conventional Detroit Wisdom." 8 p. *Business Economics*, vol. 42, no. 1, pp. 53–60.

Reed, M. 2006. "Improved Positioning Procedures for 6YO and 10YO ATDs Based on Child Occupant Postures." 52 p. *Stapp Car Crash Journal*, vol. 50 (Nov. 2006), pp. 337–388.

Vivoda, J.M.; Eby, D.W. 2006. "Using Personal Digital Assistants (PDAs) for the Collection of Safety Belt Use Data in the Field." 7 p. *Behavior Research Methods*, vol. 38, no.1, pp. 158–164.

Zakrajsek, J.; Shope J.T. 2006. "Longitudinal Examination of Underage Drinking and Subsequent Drinking and Risky Driving." 9 p. *Journal of Safety Research*, vol. 37, no. 5, pp. 443–551.

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The research documented in this report was sponsored by the Federal Motor Carrier Safety Administration.

Ervin, R.; Sayer, J.; LeBlanc, D.; Bogard, S.; Mefford, M.; Hagan, M.; Bareket, Z.; Winkler, C. 2005. *Automotive Collision Avoidance System Field Operational Test Methodology and Results, Volume 1: Technical Report*. 518 pp. Report No. UMTRI-2005-7-1/ DOT HS 809 900. <http://hdl.handle.net/2027.42/49539>.

The research documented in this report was sponsored by the National Highway Traffic Safety Administration.

Ervin, R.; Sayer, J.; LeBlanc, D.; Bogard, S.; Mefford, M.; Hagan, M.; Bareket, Z.; Winkler, C. 2005. *Automotive Collision Avoidance System Field Operational Test Methodology and Results, Volume 2: Appendices*. 430 pp. Report No. UMTRI-2005-7-1/ DOT HS 809 901. <http://hdl.handle.net/2027.42/49540>.

The research documented in this report was sponsored by the National Highway Traffic Safety Administration.

Gordon, T.; Bareket, Z. 2006. *Vibration Transmission from Road Surface Features: Vehicle Measurement and Detection*. 50 pp. Report No. UMTRI-2007-4. <http://hdl.handle.net/2027.42/49475>.

The research documented in this report was sponsored by the Nissan Motors Corporation.

Sayer, J.; Mefford, M. 2006. *Conspicuity of High-Visibility Safety Apparel During Civil Twilight*. 15 pp. Report No. UMTRI-2006-13.

The research documented in this report was sponsored by UMTRI's Industry Affiliation Program for Human Factors in Transportation Safety.

Tsimhoni, O.; Flannagan, M.; Schoettle, B. 2006. *Analysis of Near-Infrared Illuminators*. 19 pp. Report No. UMTRI-2006-10.

The research documented in this report was sponsored by UMTRI's Industry Affiliation Program for Human Factors in Transportation Safety.

RR

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# CONFERENCES & EVENTS

**ITS America Annual Meeting**  
June 4–6, Palm Springs, California  
[www.itsa.org/annualmeeting](http://www.itsa.org/annualmeeting)

**ARC-CSI Crash Conference**  
June 4–7, Las Vegas, Nevada  
[www.crashconferences.com](http://www.crashconferences.com)

**RESNA 2007**  
June 15–19, Phoenix, Arizona  
[www.resna.org](http://www.resna.org)

**Mobility and Transport for Elderly and Disabled People**  
June 18–21, Montreal, Canada  
[www.tc.gc.ca/transed2007](http://www.tc.gc.ca/transed2007)

**International Technical Conference on the Enhanced Safety of Vehicles**  
June 18–21, Lyon, France  
[www.esv.nhtsa.dot.gov](http://www.esv.nhtsa.dot.gov)

**Australian Roads Summit**  
June 19–20, Sydney, Australia  
[www.halledit.com.au/conferences/arfsummit/07](http://www.halledit.com.au/conferences/arfsummit/07)

**Minority Transportation Officials Conference**  
June 22–29, Miami, Florida  
[www.comto.org](http://www.comto.org)

**International Conference on Low-Volume Roads**  
June 24–27, Austin, Texas  
[www.trb.org/conferences/9lvr](http://www.trb.org/conferences/9lvr)

**World Parking Symposium VI**  
June 24–27, State College, Pennsylvania  
[www.worldparkingsymposium.ca](http://www.worldparkingsymposium.ca)

**World Conference on Transport Research**  
June 24–28, Berkeley, California  
[www.wctrs.org/indexconferences.htm](http://www.wctrs.org/indexconferences.htm)

**TRB Summer Conference**  
July 7–9, Chicago, Illinois  
[www.trb.org/calendar](http://www.trb.org/calendar)

**Driving Assessment 2007**  
July 9–12, Stevenson, Washington  
[ppc.uiowa.edu/driving-assessment/](http://ppc.uiowa.edu/driving-assessment/)

**Southern African Transport Conference**  
July 9–12, Pretoria, South Africa  
[www.up.ac.za/academic/civil/satc.html](http://www.up.ac.za/academic/civil/satc.html)

**National Transportation Management Conference**  
July 22, Savannah, Georgia  
[www.transportation.org/meetings/118.aspx](http://www.transportation.org/meetings/118.aspx)

**Traffic Records & Highway Information Systems**  
July 22–26, St. Louis, Missouri  
[www.atsip.org](http://www.atsip.org)

**Transportation and Traffic Theory**  
July 23–25, London, England  
<http://trafficresearch.dlr.de/isttt/index.html>


**International Transport Conference**  
July 25–27, Christchurch, New Zealand  
[www.transport07.co.nz](http://www.transport07.co.nz)

**Annual School Bus Expo**  
July 28–August 1, Reno, Nevada  
[www.stnonline.com/stn/expo/](http://www.stnonline.com/stn/expo/)

**ITE 2007 Annual Meeting**  
August 5–8, Pittsburgh, Pennsylvania  
[www.ite.org/annualmeeting](http://www.ite.org/annualmeeting)

**Maintenance and Rehabilitation of Pavements and Technological Control**  
August 8–10, Park City, Utah  
[www.skytrust.net](http://www.skytrust.net)

**DEER 2007: Diesel Engine-Efficiency and Emissions Research Conference**  
August 12–16, Detroit, Michigan  
[www1.eere.energy.gov/vehiclesandfuels/resources/conferences/deer/](http://www1.eere.energy.gov/vehiclesandfuels/resources/conferences/deer/)

**International Conference on Aging, Disability, and Independence**  
September 1 (*call for papers*); St. Petersburg, Florida  
[www.icadi.php.ufl.edu](http://www.icadi.php.ufl.edu) 



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