

RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • JULY-SEPTEMBER 2012 • VOLUME 43, NUMBER 3 •



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Connected Vehicles Hit the Road

*Safety Pilot Model Deployment
underway in Ann Arbor*

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UMTRI RESEARCH REVIEW

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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

Connected Vehicles Hit the Road

Safety Pilot Model Deployment underway in Ann Arbor

Nearly 300 people converged at UMTRI on August 21 to mark the official launch of the UMTRI-led Safety Pilot Model Deployment, a \$25 million program funded by the U.S. Department of Transportation (USDOT) to test connected-vehicle technology in a real-world setting.

“Today is a big day for [automotive] safety,” said U.S. Transportation Secretary Ray LaHood. “This cutting-edge technology offers real promise for improving both the safety and efficiency of our roads.”

The large-scale, connected-vehicle pilot study will test a Wi-Fi-like technology that allows vehicles to communicate with other vehicles and with roadside infrastructure to reduce crashes and improve traffic congestion. The project is part of a joint research initiative led by the National Highway Traffic Safety Administration to see how well wireless-communication technology works in the real world.

UMTRI is installing wireless communication devices on nearly 3,000 vehicles that will let passenger cars, commercial trucks and transit buses “talk” to each other, as well as to traffic lights and other road signals located at intersections, curves and highway sites throughout a test-pilot area in northeast Ann Arbor.

The connected-vehicle technology involves both vehicle-to-vehicle and vehicle-to-infrastructure communications that transmit and receive vehicle data such as position, speed and direc-

tion. Drivers are alerted to a potential crash situation—such as a nearby vehicle unexpectedly braking, a sudden lane change, merging traffic, etc.—by a visual or audible warning inside their vehicles.

“This is a game-changer for transportation. There are many safety and convenience applications to this, as well as applications related to mobility and sustainability,” said program manager Jim Sayer, a research scientist at UMTRI. “This is a tremendous oppor-

ing high-quality research and deploying solutions to critical transportation issues.

“Safety Pilot Model Deployment is an example of our leadership in the area of safety and sustainability research. Connected vehicle technology has the ability to address as much as 80 percent of crashes of unimpaired drivers and greatly reduce carbon emissions. We also believe connected-vehicle technology will influence new economy startups and innovation in the existing industrial base.”

The data generated and archived as part of the project will be used to inform future regulatory and policy decisions by the USDOT. It also will be made available to the transportation industry for use in developing additional approaches to vehicle safety, mobility, and environmental sustainability. The testing phase will last one year, but the overall program will operate for thirty months.

“The technological advances in today’s vehicles are improving the lives of citizens and making products designed and produced in Michigan more competitive in the marketplace,” said Governor Rick Snyder. “The connected vehicle technologies being developed in partnership with the automotive industry and our universities provides great opportunity to create high-tech, high-paying jobs here in Michigan.”

For more information, see <http://safetypilot.umtri.umich.edu>. 

MICHIGAN PHOTOGRAPHY



UMTRI director Peter Sweatman (right) discusses connected-vehicle technology with U.S. Transportation Secretary Ray LaHood and Michigan Governor Rick Snyder.

tunity, and we are very excited to be able to support the USDOT’s demonstration of cutting-edge transportation technologies in our community.”

UMTRI Director Peter Sweatman said the project is emblematic of the work being done at the institute today and in the future.

“The University of Michigan Transportation Research Institute is playing a key role in the reduction of negative societal impacts associated with transportation around the world,” he said. “UMTRI’s expertise is in deliver-

From Science to Practice

Approaching motor vehicle crashes as a public health problem

Each year, more than 32,000 Americans are killed in motor vehicle crashes and many more are seriously injured. For those between the ages of 5 and 34, motor vehicle crashes are the leading cause of death.

In the coming years, UMTRI researchers will use a public-health research model to reduce motor-vehicle-related injuries and fatalities by an order of magnitude.

“We want to intervene to drag down the number of serious injuries and fatalities in motor vehicle crashes,” said UMTRI director Peter Sweatman. “We need good science to help us design countermeasures to human risk-taking.”

The four steps of the public-health research model begin with first identifying a health threat (in this case, injuries and fatalities caused by motor-vehicle collisions). The next steps are to use research to identify risk and protective factors, then to develop interventions, programs, and policies (countermeasures) and evaluate them to determine which ones reduce the occurrence or impact of the health threat. The final step is to identify effective approaches and processes to disseminate the countermeasures to the entire affected population.

Casting transportation-related injuries and fatalities as a public-health issue requires that scientists take their research through the four stages of the model to ultimately impact society. A number of UMTRI researchers already employ facets of the public-health approach, said Ray Bingham, research professor at UMTRI and in the U-M School of Public Health.

“One of the things that makes UMTRI unique is that a lot of work done by our researchers is in the latter stages of the model,” explained Bingham. “Testing, evaluating, developing effective countermeasures, for example, are the types of activities that not only impact society, they save lives.”

Profiled in this issue of the *UMTRI Research Review* are three UMTRI programs that impact society by putting effective safety measures directly into the hands of those populations most affected.

Checkpoints™ Program for Teen Drivers

At last count, nearly 30,000 Michigan parents of teenage drivers have taken advantage of the safety tools and resources offered through the online Checkpoints™ program presented by UMTRI and the Michigan Department of Community Health. The program provides information and tools to help parents protect their teens while they gain experience driving without adult supervision.

The Checkpoints™ program, located at www.saferdrivingforteens.org, is built upon many years of research examining the actions and motivations of teen drivers, the driving population at greatest risk of motor-vehicle crashes due to their young age and lack of driving experience.

The program addresses four driving situations that



UMTRI YOUNG DRIVER BEHAVIOR AND INJURY PREVENTION GROUP

research has shown to be especially risky for teen drivers: driving with teen passengers, at night, in bad weather conditions, and at high speeds.

“Parental monitoring is what makes the difference,” explained UMTRI research professor Jean Shope. “Checkpoints™ guides parents in that process.”

The website features an easy-to-use, interactive parent-teen driving agreement called Checkpoints™, which helps clearly establish where and when teens can drive without adult supervision, and how teens can earn increased driving privileges. Because the agreement is interactive, parents can use it to establish driving privileges during special times of the year, such as prom and graduation season for example, and revisit

it as their teen gains driving experience. The website also includes information about Michigan's driving laws for teens, and videos about using the agreement and talking with teens about driving.

The Checkpoints™ parent-teen driving agreement was created by Bruce Simons-Morton of the National Institutes of Health and has been tested in several states, including Michigan, where it has been used in a series of collaborative studies. Teens whose parents use the agreement receive fewer tickets and report less-risky driving behaviors.

Shope says that making the Checkpoints™ program available via the Internet has made it widely accessible to the parents of teen drivers.

For more information, contact Jean Shope,

jshope@umich.edu.

Wheelchair Transportation Safety Standards

Thanks in large part to the work of UMTRI's biosciences researchers, new industry safety standards for equipment used in transporting people seated in wheelchairs are now being published.

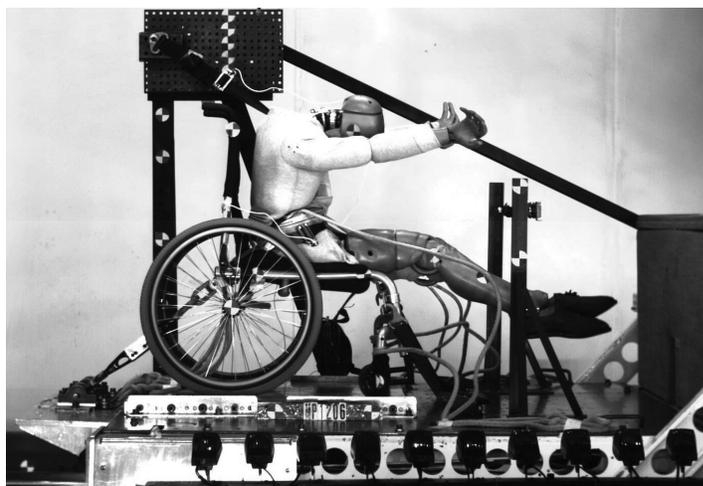
UMTRI research professor Larry Schneider is chair of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Committee on Wheelchairs and Transportation, which recently completed revisions and enhancement of industry standards for wheelchair-tiedown and occupant-restraint systems (WTORS) and wheelchairs that are designed for use as seats in motor vehicles.

Schneider has worked for more than thirty years to apply basic principles of occupant safety and crash protection to the development of industry standards that help to provide people who travel while seated in their wheelchairs the opportunity for a safe ride and a reasonable level of crash protection.

Voluntary U.S. and international standards to improve transportation safety for occupants seated in wheelchairs were first published more than a decade ago and were the first standards to specify design and performance requirements that would provide for effective securement and frontal-impact crashworthiness of wheelchairs and the lap/shoulder-belt restraint systems used with them, which are necessarily comprised completely or partially of after-market components (i.e., restraint-system components that are not provided by the vehicle manufacturer).

The latest versions of these standards, which are contained in volume 4 of RESNA wheelchair standards, *Wheelchairs and Transportation*, are based on research and testing conducted by the Rehabilitation Engineering Research Center on Wheelchair Transportation Safety (RERC WTS), which has been funded by the National Institute on Disability and

Rehabilitation Research (NIDRR) and for which Schneider has served as the director for the past five years.



One of the research projects conducted by RERC WTS has involved investigations of real-world crashes and noncrash events, such as emergency-vehicle stops or sudden turns, for which at least one occupant of a vehicle was seated in a wheelchair. A key finding from these investigations is that very few people riding in vehicles while seated in wheelchairs are using a properly constituted and/or properly positioned lap/shoulder belt restraint system and that improper and/or incomplete use of a seatbelt results in a high incidence of serious to fatal injuries in both crash and noncrash events.

While education and training of drivers and caregivers on how to properly use and position belt restraints on passengers sitting in different types of wheelchairs is critical, the design of wheelchairs often makes proper positioning of lap/shoulder-belt restraints very difficult to achieve. Therefore, one of the new requirements of the revised standard for wheelchairs used as seats in motor vehicles is for wheelchairs to be designed to facilitate proper seatbelt positioning.

The revised versions of these two primary standards are section 18 (WC18) and section 19 (WC 19), respectively, in volume 4 of RESNA wheelchair standards: *Wheelchairs and Transportation*. In addition, a new standard, section 20 (WC20) establishes requirements for wheelchair seating systems relative to their use as seats in motor vehicles.

Like the original standards, the revised standards apply to WTORS, complete wheelchairs, and wheelchair seating systems that are suitable for use in all types of vehicles. This means that they are crash tested for 30-mph frontal-impact conditions that can be expected with vans and minivans, which are commonly used to transport people in wheelchairs.

These voluntary industry standards are essential to providing people who travel while seated in wheelchairs the

opportunity for safe transportation and a reasonable level of crash protection. However, Schneider says these standards are of little value if manufacturers of wheelchairs, WTORS, and seating systems don't design their products to comply with the standards and if they don't promote the sale and use of these products. In addition, he adds that many other stakeholders, including clinicians who prescribe wheelchairs, transportation providers, rehabilitation suppliers, and caregivers need to know about these standards and apply their knowledge of best practice in transportation safety in their professional involvement with people who use wheelchairs.

"For example, clinicians who prescribe wheelchairs and suppliers of rehabilitation technology need to determine whether their clients will need to remain seated in their wheelchairs when traveling in private and/or public motor vehicles and, if they will, they need to give serious consideration to prescribing/providing a wheelchair that complies with WC19 and facilitates the proper use of belt restraint systems," says Schneider. "Similarly, insurance companies and other third-party payers, such as Medicaid, need to understand the safety implications of using a WC19-compliant wheelchair and make it their policy to cover the additional cost of products that comply with WC19."

Toward this goal of making key stakeholders aware of these industry standards and the goal of ensuring that they implement practices and policies that follow these standards, the staff of the RERC WTS have written numerous articles in consumer magazines, such as *Exceptional Parent* and *Paraplegia News*, and have given numerous presentations, workshops, and courses on wheelchair transportation safety at conferences and professional meetings. They have also developed and disseminated over 75,000 copies of a simply written and illustrated foldout brochure called "Ride Safe" and developed a related website, www.travelsafer.org, which describes the key steps to providing safe transportation for travelers seated in wheelchairs.

The website of the RERC WTS, www.rercwts.org/info, also provides a wealth of information on best practice in transportation safety for people seated in wheelchairs when traveling in different types of motor vehicles, including copies of articles published in consumer magazines, videos of product crash tests, and lists of products that have been designed and successfully crash tested to these standards. Finally, WTORS manufacturers, such as Q'Straint/Sure-Lok, provide excellent videos that are available on their websites on how to properly use their equipment in transporting people seated in wheelchairs.

For more information, contact Larry Schneider, lws@umich.edu

Crash Avoidance through Connected-Vehicle Research

By some estimates, connected-vehicle technology has the potential to prevent 80 percent of motor-vehicle crashes. UMTRI research scientist Jim Sayer and his team are working toward that goal.

Sayer and UMTRI colleagues will put connected-vehicle technology to its most stringent test over the next twelve months as part of the Safety Pilot Model Deployment. (See page 1.) The US DOT-funded project involves up to 3,000 instrumented vehicles that will drive in and around the Ann Arbor region.

The vehicles will be specially equipped to communicate with other instrumented vehicles, and to some extent, with surrounding infrastructure. The communication devices used in the Safety Pilot will provide drivers with alerts such as forward-collision warnings, do-not-pass alerts, and warnings that a vehicle ahead has stopped suddenly.

The work represents phase two of the US DOT's Connected Vehicle Safety Pilot program. Previous US DOT research involving a series of driver acceptance clinics (phase one) indicated that 82 percent of drivers strongly agreed that they would like to have vehicle-to-vehicle safety features on their personal vehicles. Now, in phase two, the UMTRI team and collaborating partners will gather data to help assess the effectiveness of connected-vehicle technology in real-world conditions.

The knowledge and experience gained from many years of research in crash-avoidance technology will aid the UMTRI Safety Pilot team as they put connected-vehicles to the test. Results of the Safety Pilot Model Deployment will aid NHTSA in its decision-making regarding the future of connected-vehicle technology—a decision that affects the entire American driving public.

For more information, contact Jim Sayer, jimsayer@umich.edu 



US DOT

In the Driver's Seat

State-of-the-art driving simulator is a resource available to university faculty and others

University of Michigan (U-M) researchers representing multiple academic disciplines will visit UMTRI in October to get a firsthand look at the institute's new driving simulator. The state-of-the-art facility, installed in 2012, represents the latest in simulator technology.

While housed and operated by UMTRI, the simulator is a resource available to university faculty and outside organizations. Research professor Ray Bingham, chair of the UMTRI Simulator Committee, anticipates that the new facility will be used by faculty from the medical school, public health, and engineering disciplines, among others, for research in collaboration with UMTRI.

"The UMTRI driving simulator is a powerful research tool in driving safety, human factors, and roadway design studies, but is also applicable to many other areas of research, such as the effects of health conditions and medications on task performance, cognitive development and functioning, decision-making, peer influences, and many other areas," says Bingham. "Simulator data, which provide a detailed assessment of driving performance, can be coupled with other data, such as physiological activity, brain function, or hormone levels, to test a broad variety of hypotheses."

Virtual World

The heart of UMTRI's new driving simulator is the software used to generate and control traffic scenarios. Eight separate computers control UMTRI's driving simulator, which also features seven image generators.

To run the simulator, UMTRI technicians must first create a virtual world, which includes roads, intersections, buildings, the movement of vehicles, and even pedestrians. The scenario is then projected on three forward, two lateral, and one rear floor-to-ceiling screens around the driver, who sits in the cab of a Nissan Versa. The car is instrumented with sensors and cameras that collect data at a rate of one megabyte per hour.

The technology offers a great deal of flexibility



to graphically create and adapt driving scenarios based on research project goals. This makes the new technology particularly adaptable.

"We have the ability to change infrastructure—roadway design, lane markings, signage, and obstructions such as buildings and trees," explains UMTRI electronics engineer Mark Gilbert. "A wide variety of vehicles and actors may be scripted to behave in different ways, including passenger cars, heavy trucks, pedestrians, and cyclists."

Data Collection

As test subjects operate the vehicle within this virtual world, a data-acquisition system simultaneously collects data on many variables including the vehicle's position within the virtual environment, its movement relative to other vehicles, as well as information on driver behavior. The data-acquisition system records variables from the simulator's eye-tracking system and other sources, including six channels of video and two channels of audio, and synchronizes all these data for analysis and review.

"A common time reference allows all objective measures to be synchronized," adds Gilbert "so we're more efficient with using the data." The goals of each research study determine which variables are measured.

UMTRI's new driving simulator represents an important investment in the institute's research capabilities and plays a vital role in advancing UMTRI's new strategic plan. UMTRI's driving simulator was made possible with financial support from the U-M Office of the Vice President for Research. Nissan contributed the cab of the Versa.

For more information regarding the UMTRI driving simulator and its use, please contact Ray Bingham, rbingham@umich.edu 

Preventing Injury through Research and Education

U-M chosen as one of handful of CDC injury centers

Research devoted to reducing fatalities and injuries from car crashes, violence, prescription drug overdoses, and other types of preventable injuries will be funded at the University of Michigan (U-M) by a new \$4.2 million grant. The federal Centers for Disease Control and Prevention (CDC) has selected U-M to become one of its Injury Control Research Centers, a rare designation held by only ten other institutions.

With the five-year grant from CDC, U-M researchers will expand their already strong effort to prevent death and disability, as well as to treat injuries from automobile crashes, prescription drug overdoses, violence—such as bullying, suicide, and child maltreatment—and other leading causes of injury in the region.



JEAN SHOPE

Much of that work is done by the U-M Injury Center, which brings together researchers and funding from the U-M Medical School, School of Public Health, UMTRI, the Office of the Vice President for Research, and other areas.

Several UMTRI staff members are involved in the U-M Injury Center. UMTRI research professors Jean Shope and Ray Bingham will continue their leadership as members of the center's Internal Advisory Committee. Shope is also the co-lead of the Training and Education Core, which focuses on developing and managing training opportunities for students and junior



RAY BINGHAM

faculty through internships, fellowships, seminars, courses, symposia, and more. Bingham is the lead of the Unintentional Injury Prevention segment of the Research Core. He will oversee the center's annual pilot study funding competition. Bingham is also leading two CDC-funded research projects related to teen driving.



CAROL FLANNAGAN

UMTRI assistant research scientist Carol Flannagan is a member of the center's Statistics and Methods Section, providing injury researchers with technical expertise and assistance with injury datasets. UMTRI director Peter Sweatman

will serve on the executive committee, which will provide feedback and guidance and establish accountability for the center.

Together, the dozens of researchers involved in the U-M Injury Center generate new findings that can impact both policy and individual behavior. Recently, the center has provided seed money to test new ways to counsel prescription painkiller users on preventing overdoses, to prevent child abuse, to prevent teen drivers from crashing, and more.



PETER SWEATMAN

“Becoming a CDC injury center will help us take our work to the next level, to help us understand why injuries occur, and what works best to mitigate physical and emotional harm,” says Rebecca Cunningham, U-M emergency physician who directs the center. “Injuries are common and too often we accept them as just part of life. But injuries are not accidents. Injuries can be prevented, and their consequences can be reduced.”

With the new grant, U-M will partner with researchers from Wayne State University, Michigan State University, and others to serve as a regional resource and to increase the opportunities for researchers from different areas to work together. In addition, the funding will allow for greatly expanded educational opportunities for students, physicians, and practitioners who are interested in

injury prevention, including a certificate program, as well as regional conferences and seminars.

For more on the U-M Injury Center, visit www.injurycenter.umich.edu

For more on the CDC's Injury Control Research Centers, visit <http://www.cdc.gov/injury/erpoliocr> **RR**

Federal Safety Official Joins UMTRI

A leading international figure in efforts by the federal government and the automotive industry to reduce fatalities and injuries on the nation's roadways has joined UMTRI.

John Maddox had been the associate administrator for Vehicle Safety Research at the National Highway Traffic Safety Administration (NHTSA) since December of 2008. He joined UMTRI on August 13 as the director of collaborative program strategies. Maddox will also work with Texas Transportation Institute (TTI) and strategize ways that UMTRI, TTI, and other partners can work closely together to tackle significant problems in transportation safety, the environment, and mobility that can be addressed only through collaborative research.

Maddox's extensive background at the U.S. Department of Transportation and in the auto industry will be of immense value in helping UMTRI develop collaborative opportunities with federal agencies and stakeholders in industry. His leading work on future intelligent transportation systems and automated driving, which require the private and public sectors to come together with common goals, has the potential to dramatically advance safety, mobility, and sustainability.

Maddox will help create and direct strategies that will build, support, and promote the one-of-a-kind Ann Arbor connected-vehicle test environment. This will include the development of a strategy geared toward maximizing the value of the test environment for innovation in vehicle-to-vehicle and vehicle-to-infrastructure communications technologies. These innovations will, in turn, further establish southeast Michigan as the nation's



JOHN MADDOX

preeminent region for safe and sustainable transportation. This is the goal of the Michigan Sustainable Transportation Initiative, the development and promotion of which Maddox will undertake with UMTRI Director Peter Sweatman.

"I am extremely excited to have John join UMTRI and help us move forward with TTI, at a time of such opportunity for getting new transportation technology deployed. We are committed to expanding the R&D base, combining automotive and ITS in new ways to benefit society and create jobs," said Sweatman.

On a broad scale, Maddox will promote UMTRI's research capabilities to major national sponsors of transportation research in government and industry. His work will focus on increasing federal research programs and on positioning UMTRI within the automotive industry as a leader in the development of automotive-safety-technology roadmaps and precompetitive research topics.

While at NHTSA, Maddox was responsible for all aspects of vehicle-safety research for the administration. He strategized and established NHTSA's research vision, formulated multiyear roadmaps and priority plans, and implemented yearly operating plans to ensure that all research is aligned with DOT's goals to save lives and reduce injuries due to crashes.

Before NHTSA, Maddox spent over five years with Volkswagen as a compliance officer, with the responsibility of ensuring compliance with all federal and Canadian motor-vehicle safety standards. Prior to that, he spent fourteen years with Ford Motor Company as a senior research engineer and had multiple assignments in three countries including product development, engineering design, and automotive safety. **RR**

Most UMTRI reports are available in full text online. See the website address at the end of the citation. Please contact the UMTRI Library at 734-764-2171 or umtridocs@umich.edu to inquire about the availability of other publications listed here.

Journal Articles

Buning, M.E.; Bertocci, G.; Schneider, L.W.; Manary, M.; Karg, P.; Brown, D.; Johnson, S. 2012. "RESNA's Position on Wheelchairs Used as Seats in Motor Vehicles." *Assistive Technology*, vol. 24, no. 2, pp. 132-41, DOI:10.1080/10400435.2012.659328.

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Sivak, M.; Schoettle, B. 2012. "Accounting for Climate in Ranking Countries' Carbon Dioxide Emissions." *American Scientist*, vol. 100, no. 4, p. 278, July-August, DOI:10.1511/2012.97.278.

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<http://hdl.handle.net/2027.42/90952>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.

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<http://hdl.handle.net/2027.42/92202>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.

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<http://hdl.handle.net/2027.42/92352>

The research documented in this report was sponsored by M-CASTL (Michigan Center for Advancing Safe Transportation throughout the Lifespan).

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*Transportation, Mobility, and Older Adults in Rural Michigan. Lidia P. Kostyniuk, Renee M. St. Louis, David W. Eby, Lisa J. Molnar.

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The research documented in this report was sponsored by the Michigan Department of Transportation.



CONFERENCES & EVENTS

September

Transportation Planning for Small and Medium-Sized Communities: Tools of the Trade

September 12-14; Big Sky, Montana
www.trbtoolsoftbetrade.org

TRANSED 2012: 13th Intl. Conference on Mobility and Transport for Elderly and Disabled People

September 17-21; New Delhi, India
<http://www.transed2012.in/>

Symposium on Pavement Surface Characteristics: SURF 2012

September 19-22; Norfolk, Virginia
<http://www.cpe.vt.edu/surf2012/index.html>

ITS Workshop on Connected Vehicles

September 25-27; Chicago, Illinois
http://www.its.dot.gov/meetings/safetyprogram2_agenda.htm

October

40th European Transport Conference

October 8-10; Glasgow, Scotland, UK
<http://abstracts.etcproceedings.org/>

Transportation Association of Canada conference & exhibition

October 14-17; Fredericton, New Brunswick
<http://www.tac-afc.ca/english/>

AutomotiveUI

October 17-19; Portsmouth, New Hampshire
www.auto-ui.org

Symposium on Population Variability and Occupant Factors in Crash Injury

October 18-19; Ann Arbor, Michigan
www.morphomicanalysisgroup.com

56th Stapp Car Crash Conference

October 29-31; Savannah, Georgia
<http://www.stapp.org/>

ITS World Congress

October 22-26; Vienna, Austria
www.itsworldcongress.com

Human Factors and Ergonomics Society

October 22-26; Boston, Massachusetts
www.hfes.org

Biomedical Engineering Society annual meeting

October 24-27; Atlanta, Georgia
www.bmes.org

Traffic Records Forum

October 28-31; Biloxi, Mississippi
<http://www.trafficrecordsforum.org/>

November / December

Inside China: Understanding the Current and Future Chinese Automotive Industry

November 7; Ann Arbor, Michigan
<http://www.umtri.umich.edu/divisionPage.php?pageID=47>

UTC Spotlight Conference on Sustainable Energy and Transportation: Strategies, Research, and Data

November 8-9; Washington, D.C.
www.trb.org/calendar

AASHTO annual meeting

November 15-19; Pittsburgh, Pennsylvania
<http://www.aashtoannualmeeting.org/>

European Electric Vehicle Congress

November 19-22; Brussels, Belgium
<http://www.eevc.eu/>

International Conference on Connected Vehicles and Expo

December 12-16; Beijing, China
<http://iccve.org/index.html>

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