

# RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • JULY-SEPTEMBER 2010 • VOLUME 41, NUMBER 3 •



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## UMTRI Completes Analysis of IVBSS Heavy Truck Field Tests

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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

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# UMTRI Completes Analysis of IVBSS Heavy Truck Field Tests

UMTRI researchers, in cooperation with the U.S. Department of Transportation (U.S. DOT) and industry partners, recently released key findings from the heavy-truck portion of the Integrated Vehicle-Based Safety Systems (IVBSS) program.

The IVBSS program is a five-year, \$32 million cooperative agreement with the U.S. DOT, UMTRI, and partners to test an integrated system of crash-warning technologies designed to enhance the safety of both light vehicles and heavy trucks. The heavy-truck platform partners are Eaton Corporation, International Truck and Engine Corporation, Takata Corporation, Con-way Freight, and Battelle.

The advanced safety system was installed on ten commercial trucks and combines several crash-warning subsystems that alert drivers to threats related to forward collision, lane departures, and lane changes. The safety system uses visual displays and auditory tones to warn drivers of potential threats.

Eighteen drivers from Con-way Freight's Detroit terminal participated in the heavy-truck field tests. Each participant drove one of the specially equipped, class 8 tractors for ten months. The first two months represented the baseline-driving period, during which no warnings were presented to drivers but on-board data about driver performance was collected. During the subsequent eight months, the safety system was activated.

## By the Numbers

In all, truck drivers in the study traveled 601,844 miles, made 22,724 trips, and generated 13,678 hours of data. While the test vehicles were driven, data-acquisition systems recorded driver actions and responses to the integrated warning system.

UMTRI researchers then analyzed the detailed data to study the effect that the integrated warning system had on driver acceptance and driver behavior. Associate research scientist Jim Sayer coordinates the IVBSS program for UMTRI with assistant research scientist Dave LeBlanc.

“At the end of the ten-month experience, thirteen of the eighteen drivers who participated felt that the integrated system increased their driving safety,” said Sayer. “Seven of the drivers specifically said that the integrated system prevented them from getting into a crash.”

Sayer noted that drivers in general received about eighteen warnings per 100 miles driven. The most common warning was a lane-departure warning, which comprised about 75 percent of all warnings.

## Key Findings

Some of the key findings related to driver acceptance include the following:

- The majority of drivers perceived that integrated crash-warning systems would increase driver safety. Drivers stated that the integrated system made them more aware of the traffic

environment around their vehicle and their position in the lane.

- Seven drivers reported that the integrated system potentially prevented them from having a crash.
- Fifteen out of eighteen drivers said they prefer a truck equipped with the integrated safety system and would recommend that their employers purchase such a system.

Some of the key findings related to driver behavior include the following:

- In situations where there were multiple threats, the initial warning was generally enough to get the attention of drivers, and resulted in an appropriate action when necessary.
- Drivers did a better job of maintaining their position in the lane with the integrated system.
- Overall, drivers responded more quickly to threats of a rear-end collision while the safety system was active than they did when the system was not active.

## Rich Source of Data

The test data is a treasure trove of information about real world driving by professional truck drivers, said LeBlanc, as observed during both long haul and local operations of these semitractor-trailer combinations. Over 500 data signals were captured continuously from the trucks and their prototype systems, including data from six radars, five cameras, Global Positioning Systems, and all driver activities. According to LeBlanc, the data can be

*continued...*

*Continued from page 1*

used to answer a wide range of questions beyond the scope of the IVBSS program.

“Our researchers are among the world’s best at zeroing in on behaviors that straddle the line between safety and danger. Analyzing those behaviors gives us and our partners insights into driving and the potential of technologies or policy,” he said. “We are able to discover, for example, when do drivers use cell phones, and are they relatively safe moments? How much fuel does one driver use compared with the next?”

The researchers expect the data to live a long life after the completion of the project, providing fodder for disser-

tations as well as facts to support policy decisions.

UMTRI researchers are continuing their analysis of the light-vehicle field-test data, which is scheduled for release in mid October. Key findings of the heavy-truck and light-vehicle portions will be presented at a public meeting on October 20 in Ypsilanti, Michigan. *See details below.*

### **Public Meeting Scheduled**

The U.S. Department of Transportation (U.S. DOT) will host a one-day public meeting on October 20, 2010, to provide a final report on the Integrated Vehicle Based Safety System

(IVBSS) program to members of the vehicle-safety research community and other interested parties. The meeting will be held at Eagle Crest Conference Center in Ypsilanti, Michigan.

This final public meeting of the IVBSS program will provide attendees an opportunity to hear from U.S. DOT and IVBSS team members as they discuss results from light-vehicle and heavy-truck field operational tests that were completed during this past year.

Registration instructions and additional information on the meeting can be found at <http://www.umtri.umich.edu/public/ivbss/>

### **Con-way Freight Implements Findings**

As part of participation in the IVBSS heavy truck field tests, Con-way Freight purchased ten class-8 tractors that were equipped with the Integrated Vehicle-Based Safety System (IVBSS) technology.

“Safety is one of Con-way Freight’s core values,” said Bob Petrancosta, vice president of safety for Con-way Freight, in an August 2010 press release. “We are committed to the safety of our drivers and the motoring public, and by implementing findings from the IVBSS program and investing in these types of safety technologies we are advancing this commitment.”

Partnering with Con-way Freight was a very positive experience, said UMTRI’s Jim Sayer: “It was particularly rewarding to see Con-way make direct use of our research findings and begin equipping their vehicles with similar safety systems.”

Under the program, the company has put into service nearly 1,300 new Freightliner Cascadia 2010-model tractors, each equipped with an integrated suite of advanced driver-alert and truck-control technologies, which provide for rollover stability, front collision warning with adaptive cruise control, and lane-departure warning.



# UMTRI Study: Stability-Control Technology Could Reduce Truck Rollovers

Stability-control systems could save lives by preventing thousands of rollover accidents every year if all existing tractor-semitrailers operating on U.S. roads were fitted with the technology, according to an UMTRI study.

The study, *Safety Benefits of Stability Control Systems for Tractor-Semitrailers*, was conducted by UMTRI under a cooperative agreement between the National Highway Traffic Safety Administration (NHTSA) and Meritor WABCO to examine the performance of electronic stability control (ESC) systems, and roll-stability-control (RSC) systems for heavy-truck tractor-semitrailers.

“It’s just a really powerful technology,” said study coauthor John Woodrooffe in an August 4 article by the Associated Press. Woodrooffe heads UMTRI’s Vehicle Safety Analytics Group. Other authors on the study are Daniel Blower, Timothy Gordon, Paul E. Green, Brad Liu, and Peter Sweatman.

The October 2009 UMTRI study was based on the analysis of independent crash datasets using engineering and statistical techniques to estimate the probable safety benefits of stability control technologies for five-axle tractor-semitrailer vehicles.

Because deployment of the stability technologies for large trucks has only occurred recently, national crash databases do not yet have a sufficient amount of data on the performance of these technologies. Employing a novel approach to examine the potential benefits of these systems, researchers used national crash databases to select crash scenarios that could likely benefit from the technologies and estimated the probable effectiveness of each. The analysis was based on probable outcome estimates derived from hardware-in-the-loop simulation (HiL), field test experience, expert panel assessment, and fleet crash data.

Findings of the study indicate that stability-control systems provide substantial safety benefits for tractor-semitrailers. If all five-axle tractor-semitrailer vehicles operating on U.S. roads were fitted with RSC, the technology could prevent 3,489 rollover crashes and save an estimated 106 lives. Alternatively, if all five-axle tractor-semitrailer vehicles operating on U.S. roads were fitted with ESC, the technology could prevent 4,659 rollover crashes and save an estimated 126 lives.

According to the AP, NHTSA hopes to complete studies on the potential benefits of requiring the systems for tractor-trailer trucks before the end of the year. To read the AP article, “NHTSA: New Technology Can Prevent Truck Rollovers,” see

<http://www.google.com/bostednews/ap/article/ALeqM5ivrMvI9MR5Tus5Pz-nmWBQzOrNEAD9HC6H1G1>

To read the full UMTRI report, see *Safety Benefits of Stability Control Systems for Tractor-Semitrailers*

<http://deepblue.lib.umich.edu/bitstream/2027.42/64283/1/102397.pdf>

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JOYCE DANIELS/UMTRI

## Powertrain Strategies Conference Looks Beyond 2016

UMTRI's Focus on the Future conference series presented "Powertrain Strategies for the 21st Century: Looking Beyond 2016" on July 14. Held at the University of Michigan, the day-long conference highlighted the state of alternative powertrain technologies that will soon provide the basis for new federal fuel economy goals.

UMTRI assistant research scientist Bruce Belzowski moderated the conference. He noted that while most manufacturers will be able to meet current Corporate Average Fuel Economy (CAFE) goals by making changes in their vehicle mix and improvements in their internal combustion engines, it's not clear what will happen after 2016.


"Manufacturers are trying to determine which powertrain technologies will be needed to meet future regulations, while at the same time trying to manage the cost of investing in the development of a variety of new technologies," said Belzowski.

Conference speakers included Gary Smyth of General Motors, Mike Omotoso of J.D. Power and Associates, Gary Hunter of AVL, Les Alexander of A123Systems, John Woodrooffe of UMTRI, and Bryan Krulikowski of Morpace Market Research.

UMTRI's John Woodrooffe presented findings from a recent National Research Council report on the future of alternative powertrains for the medium- and heavy-truck industry. Woodrooffe, head of UMTRI's Vehicle Safety Analytics Group, is a coauthor on the NRC report.

"Trucks are very difficult to regulate in terms of fuel economy because of the value of the practical work that the vehicles perform," explained Woodrooffe. The report evaluates various technologies that could improve the fuel economy of medium- and heavy-duty vehicles, such as tractor-trailers, transit buses, and work trucks.

Sponsors of the powertrain conference included Denso Corporation, U.S. Environmental Protection Agency, and Nissan Technical Center.

The third annual Focus on the Future automotive research conference series begins Wednesday, September 15 with "The Business of IT: Transforming the Organization and the Vehicle." The conference will look at the current state of IT in the auto industry from within the organization and within the vehicle. For more information, see <http://www.umtri.umich.edu/divisionPage.php?pageID=265> 

## Traffic Fatalities: What's Behind the Drop?

Road fatalities in the United States dropped 22 percent from 2005 to 2009, from 43,510 to 33,963, the largest decline over a short period of time since World War II. A recent UMTRI report, authored by research professor Michael Sivak, head of UMTRI's Human Factors Group, and Brandon Schoettle, investigates the factors behind this unprecedented drop. Sivak and Schoettle used the Fatality Analysis Reporting System (FARS) database to examine 269 variables involved in fatal crashes. They highlight the most interesting patterns of change in their report *Toward Understanding the Recent Large Reductions in U.S. Road Fatalities*.

To access the full report, see <http://hdl.handle.net/2027.42/71390> 



JOYCE DANIELS/UMTRI

# Human Factors Engineering Short Course

Professionals from a wide range of disciplines converged at U-M July 26–August 6 for the annual Human Factors Engineering Short Course. The intensive, two-week course attracts engineers, psychologists, medical professionals, managers, and others interested in designing systems, products, and services to make them easier, safer, and more effective to use.

Paul Green, research professor in UMTRI's Driver Interface Group, serves as course program coleader with Christopher Wickens, professor emeritus, University of Illinois, and senior research scientist at Alionscience Corporation.

Green said that what distinguishes the program is the “tremendous cross-section of people who attend” and the wide variety of application environments they bring to the course—from aircraft cockpits, to nuclear power plants, medical environments, motor vehicles, and military settings, to name just a few.

This year's program featured 29 lectures by experienced instructors from several universities and companies, complemented by small group activities, hands-on design experience, and four different tours on the University of Michigan campus.

Week one provided an introduction to human factors and an overview of topics important to designers and researchers. Some of the topics include manual task analysis, visual displays, motor skills and manual controls, workload, and human error.

Week two presented an overview of major trends in human computer interaction, including usability testing, cognitive task analysis, and web interface design, among others.

Forty-eight people attended the first week of the Human Factors Engineering Short Course, and forty attended the second. The course is offered through the U-M College of Engineering, Interdisciplinary Professional Programs. For more information, see <http://interpro.engin.umich.edu>

**RR**

## Program Instructors for 2010

Instructors from several universities and companies presented lectures and led seminars for the 2010 program:

**Mark Ackerman**, Associate Professor, School of Information, University of Michigan

**Tom Armstrong**, Professor of Industrial and Operations Engineering, University of Michigan

**Charles Woolley**, Research Engineer, Industrial and Operations Engineering, University of Michigan

**Deborah Boehm-Davis**, Professor of Psychology, George Mason University

**Bruce Bradtmiller**, Owner and President, Anthrotech

**Neil Charness**, Professor of Psychology, Florida State University

**Clayton Lewis**, Professor of Computer Science, University of Colorado

**Yili Liu**, Associate Professor of Industrial and Operations Engineering, University of Michigan

**Mark Newman**, Assistant Professor, School of Information, University of Michigan

**Richard Pew**, Principal Scientist, BBN Technologies

**Nadine Sarter**, Associate Professor of Industrial and Operations Engineering, University of Michigan

**Douglas Wiegmann**, Associate Professor of Industrial and Systems Engineering, University of Wisconsin

**RR**



UMTRI research professor Paul Green oversees a classroom activity illustrating the concept of workload.

EMMEN 10/UMTRI

## U-M Study: Pep Talk to Teens in the ER Reduces Violence, Alcohol Misuse



UMTRI  
*UMTRI associate director Jean T. Shope and research professor Ray Bingham are coauthors on a recent article published August 4 in a theme issue of the Journal of the American Medical Association. Shope, research professor in UMTRI's Young Driver Behavior and Injury Prevention Group, is also research professor in the Department of Health Behavior and Health*



UMTRI  
*Education at the University of Michigan (U-M) School of Public Health. Bingham, research professor in the Department of Psychiatry in the U-M School of Medicine and in the Department of Health Behavior and Health Education in the U-M School of Public Health, heads UMTRI's Young Driver Behavior and Injury Prevention Group.*

### ER Visit Becomes Opportunity

A brief, motivational talk in the emergency room reduced by half the chances that teenagers would experience peer violence or problems due to drinking, according to a study published Aug. 4 in a theme issue of the *Journal of the American Medical Association*.

The special issue on violence and human rights includes the work of University of Michigan Health System researchers who immersed themselves at the Hurley Medical Center emergency department, in Flint, Mich., for three years. Additional authors are UMTRI associate director Jean T. Shope and UMTRI research professor C. Raymond Bingham, Marc A. Zimmerman, and Frederic C. Blow, all of U-M.

Researchers offered help to 726 adolescents, ages 14-18, who reported they experienced aggression or had a drink of beer, wine, or liquor

at least two or three times in the past year.

A one-on-one talk with a therapist resulted in a 34 percent reduction in peer aggression. Teens who received only a brochure had a 16 percent drop in aggression over the next three months.

The study showed similar drops in alcohol misuse after teens heard prevention messages delivered by a therapist or while using a role-playing computer program.

“Violence and alcohol use are preventable behaviors and the emergency department can be a key location for reaching high-risk teenagers,” says senior author Rebecca Cunningham, M.D., an emergency room physician and director of the U-M Injury Research Center.

Violence and injuries are the leading causes of deaths among adolescents in the United States and the incidents are often fueled by alcohol. The U-M study showed emergency department interventions can also reduce alcohol-related problems by as much as 32 percent for six months.

The talks with teens were more complex than a parent talking to a child about the dangers of drinking and how to avoid peer pressure.

“Therapists used motivational interviewing which is well-suited for adolescent development,” says study lead author Maureen Walton, M.P.H., Ph.D., research associate professor in the U-M Department of Psychiatry, Addiction Research Center. “It doesn’t preach or tell teens what to do, but allows adolescents to weigh the pros and cons of their choices in reference to their goals.”

The therapists’ talks with teens also included role-play exercises and tools to cope with risky situations that involve drinking or violence and referrals to community services.

“Most of the adolescents had high aspirations—they wanted to go to college, be a good role model for their younger siblings. They didn’t want to make the mistakes they saw happening around them,” Walton explains. “We talked to them about the discrepancies between their behavior and what they wanted to do with their lives.”

Motivational Interviewing, with proper training, can be used effectively by healthcare providers as well those without a professional healthcare background. Study coauthor Stephen T. Chermack, Ph.D, a clinical psychologist and addiction specialist at the U-M Health System and the VA Healthcare System in Ann Arbor, is a member



of the Motivational Interviewing Network of Trainers (MINT).

Adolescents in the study reported to the emergency department at Hurley Medical Center between noon and 11 p.m., during the three-year period, September 2006 to September 2009.

All patients completed computerized screening questions regarding alcohol use and violence and were randomized into three groups: a control group receiving a brochure, or one of two groups receiving a 35-minute brief intervention delivered by a computer or a therapist in the emergency room.

Authors say the computer screening worked well with teenagers because of their comfort with using technology. The computer program included animated role playing such as how to handle drinking and driving and conflicts with peers.

“The study tells us that technology can aid in assisting high-risk youth in busy clinical settings, as well as deliver important prevention messages,” says Cunningham who is also an associate professor of emergency medicine at the U-M Medical School and associate professor of health behavior & health education at the U-M School of Public Health. “Emergency staff are busy and not all hospitals have the resource of a social worker or therapist present at all times in the emergency department.”

The emergency department can be a prime location for reaching high-risk teenagers since many may skip school, consider themselves too old to go to a pediatrician, yet often do not have a primary care doctor.

“We see the consequences our patients face from violence,” says Cunningham who is part of the team of U-M physicians who work in the Flint emergency department.

“But in addition to treating the immediate wounds from violence, the emergency department can offer opportunities to help the teens we see prevent future problems with alcohol and violence.”

*Written by Shantell M. Kirkendoll, University of Michigan Health System*

For more information, see <http://www2.med.umich.edu/prmcl/media/newsroom/details.cfm?ID=1674> **RR**

## Sweatman Appointed Chair of ITS America's Coordinating Council

COURTESY OF ITS AMERICA



The Intelligent Transportation Society of America (ITS America) has appointed the next series of leaders for its technical forums, member committees that serve as the focal point for dialogue and networking on the challenges and opportunities surrounding research and deployment of intelligent transportation systems (ITS).

Among those named, UMTRI director Peter Sweatman was appointed the new chair of ITS America's Coordinating Council, the governance body that guides the objectives of the five forums. Sweatman replaces former chair Mike Freitas of Telvent, whose term limit expired this year.

ITS America's five technical forums include the safety forum, sustainable transportation working group, personal mobility forum, commercial vehicle and freight mobility, and cross-cutting issues forum. For a complete list of newly appointed forum leaders, visit the ITS America website, <http://www.itsa.org>

Sweatman is currently a member of the U.S. Department of Transportation's Intelligent Transportation Systems (ITS) Program Advisory Committee and also a member of the board of directors for ITS Michigan. **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](mailto:umtridocs@umich.edu) to inquire about the availability of other publications listed here.

## Books

Reed, M. P.; Klinich, K.D., editors. 2010. *Child Anthropometry for Improved Vehicle Occupant Safety*. SAE International, PT-142, ISBN 978-0768021721.

## Journal Articles

Ehsani, J.P.; Bingham, C.R.; Shope, J.T.; Sunbury, T.M.; Kweon, B. 2010. "Teen Driving Exposure in Michigan: Demographic and Behavioral Characteristics." *Accident Analysis and Prevention*, vol. 42, no. 4, pp. 1386-1391, DOI: 10.1016/j.aap.2010.02.019.

## Technical Reports

Blower, D. F.; Matteson, A. M. 2009. *Evaluation of 2007 Texas Crash Data Reported to the MCMIS Crash File*. Report no. UMTRI-2009-45.

<http://hdl.handle.net/2027.42/64994>

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

Jarossi, L.; Matteson, A. M.; Woodrooffe, J. 2010. *Buses Involved in Fatal Accidents Factbook 2007*. Report no. UMTRI-2010-9.

<http://hdl.handle.net/2027.42/71382>

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

Jarossi, L.; Matteson, A. M.; Woodrooffe, J. 2010. *Trucks Involved in Fatal Accidents Factbook 2007*. Report no. UMTRI-2010-4.

<http://hdl.handle.net/2027.42/65063>

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

Sivak, M.; Schoettle, B. 2010. *Toward Understanding the Recent Large Reductions in U.S. Road Fatalities*. Report no. UMTRI-2010-12.

<http://hdl.handle.net/2027.42/71390>

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

Zielinski, S. 2010. *Connecting (and Transforming) the Future of Transportation: A Brief and Practical Primer for Implementing Sustainable Door-to-Door Transportation Systems in Communities and Regions*.

<http://hdl.handle.net/2027.42/69252>

The research documented in this report was sponsored by SMART (Sustainable Mobility and Accessibility Research and Transformation).

**RR**

## September

3rd International Conference on Transportation and Logistics  
September 6-8; Fukuoka City, Japan  
[www.t-log2010.com](http://www.t-log2010.com)

2nd National Distracted Driving Summit  
September 21; Washington, D.C.  
<http://www.distractation.gov/2010summit>

Pro Walk/Pro Bike 2010  
September 13-17; Chattanooga, Tennessee  
[www.bikewalk.org](http://www.bikewalk.org)

The Business of IT: Transforming the Organization and the Vehicle  
September 15, Ann Arbor, Michigan  
<http://www.umtri.umich.edu/divisionPage.php?pageID=47>

12th National "Tools of the Trade Conference"  
September 21-24; Williamsburg, Virginia  
[www.trbtoolsofthetrade.org](http://www.trbtoolsofthetrade.org)

International IEEE Conference on Intelligent Transportation Systems  
September 19-22, Madeira Island, Portugal  
<http://itsc2010.isr.uc.pt/site/?q=node/19>

Council of Supply Chain Management Professionals  
September 26-29, San Diego, California  
<http://cscmp.org/>

Transportation Assoc. of Canada Annual Conference and Exhibit  
September 26-29, Halifax, Nova Scotia  
<http://www.tac-atc.ca/english/>

Human Factors and Ergonomics Society Annual Meeting  
September 27-October 1, San Francisco, California  
<http://www.hfes.org/web/DetailNews.aspx?ID=198>

## October

American Public Transportation Association  
October 3-6; San Antonio, Texas  
[www.apta.com](http://www.apta.com)

Biomedical Engineering Society Annual Meeting  
October 6-9, Austin, Texas  
[www.bmes.org](http://www.bmes.org)

European Transport Conference  
October 11-13, Glasgow, Scotland  
<http://www.aetransport.org>

2010 The Business of Plugging In: A Plug-In Electric Vehicle Conference  
Oct. 12-14, Detroit, Michigan  
<http://www.bpiconference.com/>

Light Rail Conference and Study Tour  
October 18-20; Madrid, Spain  
<http://www.uitp.org/events/2010/madrid/en/index.cfm>

ITS World Congress  
October 25-29, Busan, South Korea  
<http://www.itsworldcongress.kr/>

AASHTO Annual Meeting  
October 28-November 1, Biloxi, Mississippi  
<http://www.gomdot.com/Divisions/AASHTO%20Annual/Home.aspx>

## November

54th Stapp Conference  
November 3-5, Scottsdale, Arizona  
[www.stapp.org](http://www.stapp.org)

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# UMTRI RESEARCH REVIEW

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