UMTRI
research review
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INSIDE...

Celebrating 50 Years of Transportation Research Excellence

The U-M Transportation Research Institute is celebrating a half-century of making transportation safe and carrying out research that has had an impact on the lives of road users around the world.

UMTRI research findings have influenced public policies, safety regulations, industry standards, and product design, all leading to safer highway travel and lives saved.

The institute plans a yearlong anniversary celebration, which officially began January 11 at a special UMTRI reception held at the Transportation Research Board's 94th annual meeting and will continue throughout the year with special events featuring UMTRI researchers and their university collaborators.

"We are using this anniversary as a springboard for the future. UMTRI is looking forward to its next half-century of impactful and transformative research," said Peter Sweatman, UMTRI's director since September 2004.

UMTRI started in 1965 as the Highway Safety Research Institute (HSRI) and was founded through a gift to the university from the automotive industry. Ford Motor Co. and General Motors, as well as the Automobile Manufacturers Association and Fruehauf Corp., contributed a total of $10 million.

The responsibility for forming the new institute was given to vice president for research A. Geoffrey Norman.

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Celebrating 50 Years of Transportation Research Excellence

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He appointed an ad hoc program-advisory committee comprising twelve faculty members, with Robert L. Hess, professor of engineering mechanics, as its chairman. Hess subsequently was appointed HSRI's first director (1966-83). Other directors include Jim O'Day (acting director 1983-85), Howard Bunch (acting director 1985-86), Robert Ervin (acting director 1986-89), Patricia Waller (1989-2000), and Barry Kantowitz (2000-04).

HSRI's initial mission was to analyze the elements of the complex and dynamic system of people, vehicles, and the environments in which they operate, and to develop practical and effective solutions to the urgent problems of highway safety within that system. Programs were designed to encourage comprehensive and integrated approaches to highway safety through interdisciplinary research.

In late 1982 the institute's name was changed to the U-M Transportation Research Institute to more accurately reflect the broad array of transportation issues that the staff had targeted as topics for research investigation.

Researchers within UMTRI continue to pursue the goals stated in the original mission by means of projects that emphasize the diversity of disciplines involved in transportation research.

"For fifty years our work has focused on the most critical issues in transportation-safety research," Sweatman said. "Throughout our history we have maintained a structure that requires a multidisciplinary approach. Our researchers are experts in mechanical engineering, biomedical engineering, behavioral sciences, statistical analysis and public-policy analysis, and today, connected vehicles."

In one of its most recent milestones, UMTRI was chosen by the U.S. Department of Transportation in 2012 to lead the largest on-road test of connected-vehicle technology in the world, representing a significant leap forward in vehicle safety. Known as the Safety Pilot Model Deployment, the project instrumented nearly 3,000 vehicles in the Ann Arbor area with wireless devices that communicate with each other and to infrastructure in an effort to reduce motor vehicle crashes.

As Safety Pilot leader, UMTRI was instrumental in the creation of the Mobility Transformation Center in 2014. The MTC is a public/private R&D partnership that will lead a revolution in mobility by developing the foundations for a commercially viable ecosystem of connected and automated vehicles. As part of this effort, a 32-acre "mini-city" designed expressly for testing connected and automated vehicle systems, and other emerging 21st-century smart city technologies, is taking shape on the University of Michigan's North Campus. M City will be officially launched during UMTRI's 50th year.

Publications Milestone

UMTRI reports downloaded more than 1.5 million times

Over the years UMTRI researchers have conducted more than 1,000 projects, which have in turn resulted in a widely accessed series of publications.

According to Charles Watkinson, associate university librarian for publishing at the University of Michigan, UMTRI reports have been downloaded over 1.5 million times from U-M's digital repository, Deep Blue.

"This is a tremendous milestone and is evidence of the importance of the work being done at UMTRI," said Watkinson. "UMTRI reports are one of the most downloaded report series of any college or institute at the University of Michigan. In 2013, UMTRI reports were downloaded an average of 9,500 a month."

"People continue to download reports in large numbers from all points in UMTRI's history," said Robert Sweet, information resources manager at UMTRI. "In 2014, the top ten reports downloaded included work from the seventies, eighties, nineties, as well as that of the current year. What this tells me is that our work has had value and continued impact," said Sweet.

UMTRI director Peter Sweatman announced this significant achievement at the Transportation Research Board's 94th annual meeting in January. "UMTRI is a premiere leader in transportation safety research. For fifty years UMTRI's research has had impact on the lives of drivers around the world. Our research findings are found in policies, regulations, and products designed to save lives."

Top Ten* UMTRI Reports

- Mortality from road crashes in 193 countries: a comparison with other leading causes of death
  http://hdl.handle.net/2027.42/102731
- Analysis of accident rates by age, gender, and time of day based on the 1990 Nationwide Personal Transportation Survey. Final report
  http://hdl.handle.net/2027.42/1007
- The Indian automobile industry - a primer describing its evolution and current state
  http://hdl.handle.net/2027.42/1025
- Material selection processes in the automotive industry
  http://hdl.handle.net/2027.42/1034
- Recent changes in the age composition of drivers in 15 countries
  http://hdl.handle.net/2027.42/86680
- An evaluation of the changes in the legal drinking ages in Michigan. Final report
  http://hdl.handle.net/2027.42/417
- United States shipbuilding standards master plan update
  http://hdl.handle.net/2027.42/1185
- The Japanese automotive industry: recent developments and future competitive outlook
  http://hdl.handle.net/2027.42/1064
- Has motorization in the U.S. peaked?
  http://hdl.handle.net/2027.42/98098
- Brake force requirement study: driver-vehicle braking performance as a function of brake system design variables
  http://hdl.handle.net/2027.42/1354

**As reflected solely by the number of downloads*

In 2015, a series of articles in the *UMTRI Research Review* will highlight the technological and cultural progress in four key areas impacting transportation safety–data collection and analysis, occupant protection, the lifecycle of driving and drivers, and connected technology.

Data-Driven Approach

UMTRI researchers embrace technology to gather, manage, and analyze data

Whether simple or complex, data is a part of daily life. It underscores everything we do, deepening our insight and understanding and allowing us to make sound decisions. In the fast-moving world of transportation, gathering and analyzing data has been an important part of UMTRI's work for fifty years.

From 1965 to the present, UMTRI researchers have been at the forefront of transportation-data collection, management, and analysis. They build databases to manage crash data, collect driving data via field tests and simulations, build state-of-the-art computer models to enhance vehicle safety, and create cutting-edge data-analysis and access tools to answer increasingly complex research questions.

"We used to ask about outcomes in crashes: What happened and why?" says UMTRI statistician Carol Flannagan. "Now we're asking about crash avoidance: How can crashes be prevented? What are drivers thinking or attending to? This wouldn't have been possible without the spectacular progress that's been made in transportation-data collection, management, and analysis."

Below are just a few of the many ways that transportation-data management, technology, and analysis have evolved at UMTRI over the past fifty years.

Managing Crash Data

UMTRI's Charlie Compton remembers a time in the early 1970s when motor-vehicle accident data arrived at UMTRI on paper from teams around the United States. In fact, Compton says, he was hired full time to help work a federally funded project to computerize collision report and injury forms, or accident reports. The job required some serious manpower.

"There was a room on the third floor where all the coders were, maybe ten or so, whose job was to code the collision report forms to get the data computerized," recalls Compton. "Those were the days of mainframes and punch-cards."

As part of this endeavor, several colleagues created the first automated data access and analysis system (ADAAS) for crash data at HSRI in 1970, which was operational for more than two decades. Compton used this tool extensively in his work and eventually became manager of UMTRI's successful and long-running Transportation Data Center. The Data Center evolved into a stand-alone unit in the early 1980's for crash-data analyses and it has recently evolved again into the Center for Management of Information for Safe and Sustainable Transportation (CMISST).

Today, Compton still manages incoming crash data and also consults and collaborates with industry, government, and academic researchers on data quality and use. Among his activities, he is a member of the crash-data users group that helped state officials design updated crash-report forms, which are currently almost all electronic in Michigan. (The state is viewed as a model for crash data collection, analysis, and management.)

Advancements in technology have also had a significant impact on data quantity, says Compton: "When I first started, I could only work with a small random sample of state crash data. Now I can fit an entire year of Michigan crash data on a thumb drive. That has made the process a lot easier."

Over the years, just about every UMTRI research group has relied at some point on crash data and analysis. "At one time, crash data was a part of every research project," says Compton.

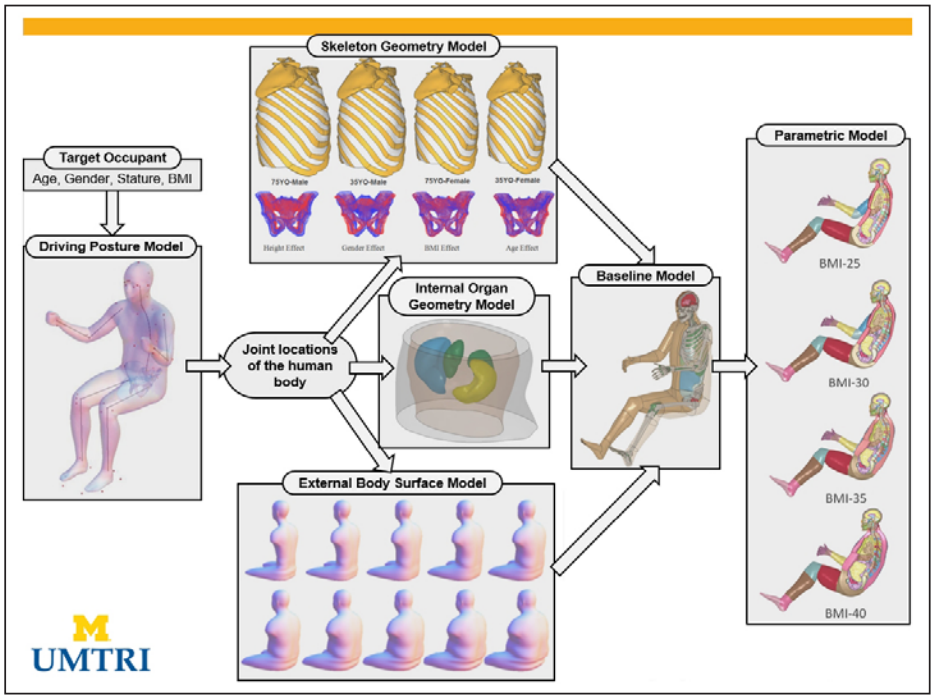
Now, however, new technologies and the availability of new data types and sources have allowed researchers to broaden their approach to solving some of transportation's toughest challenges, one of which is safety.

Digital Human Modeling

For several decades, three crash-test dummies—representing data on a mid-sized male, small female, and large male—formed the foundation for crash testing and vehicle-safety research at UMTRI and similar labs around the country.

Today, in UMTRI's Biosciences Group, associate research scientist Jingwen Hu sits in front of two large computer monitors showing multicolor variations of the human body in seated, in-vehicle positions. Hu created the models by combining multiple data sources representing external human-body measurements as well as internal body geometry.

"Technology has really changed what we can do," says Hu. "In the past, tape measures, calipers, and other simple apparatus were used to collect anthropometric data. Nowadays we use a 3-D scanner. In twelve seconds, we can generate a three-dimensional image of the whole body."



Courtesy Jingwen Hu, UMTRI Biosciences Group

The laser scans—combined with data from thousands of medical images of bone and soft tissue geometries—allow the researchers to generate computerized models of different-sized people, which they can then run through crash simulations. The models show how people of various ages, sizes, and body shapes are injured in vehicle crashes and give the researchers a better understanding of vulnerability.

Hu and his team have found, for example, that obese people fare worse in frontal crashes than the typical mid-sized male, which has formed the basis for crash-test dummies for several decades. The focus now, he says, is on these vulnerable populations to get a better idea of how people are injured, which could one day lead to vehicles with adaptive safety restraints.

"So the data nowadays is really to codify the physical differences among people," says Hu. "If we have that, we can develop an injury-assessment tool that accounts for the variation in the population. We want to protect more than just mid-size males."

Driving Simulator Data

In the early 1980s, a Commodore 64 computer with a tape drive controlled one of UMTRI's first driving simulators. "It wasn't fancy," recalls research professor Paul Green, "but it solved our research needs."

The homespun technology, which featured an instrumented mock-up of a Ford Escort, allowed UMTRI researchers to conduct simple tracking tasks projected onto a screen that "looked a little like driving at night," says Green. Though rudimentary, the driving data would have been impossible or too dangerous to gather on actual roadways.

Fast forward to 2012 when a state-of-the art driving simulator was installed in a specially adapted facility on UMTRI's second floor. Assistant research scientist Anuj Pradhan is one of the scientists who frequently use the high-tech facility. He says that contemporary simulators benefit not only from the enormous advances in general processing power but also from improvements in visual displays, image generators, and graphical systems. This allows researchers to increase the scope of simulation studies in terms of the types, complexities, and duration of drives, and can inject a much higher level of realism and ecological validity.

"These advances also generate much larger volumes of data," says Pradhan, "but, happily, they also allow for higher data-collection capabilities and the ability to meld and link disparate data sources using advanced data-management techniques."

The heart of UMTRI's new driving simulator is the software used to generate and control traffic scenarios. Ten separate computers control the 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.

As test subjects operate the vehicle within this virtual world, a data-acquisition system simultaneously collects data on many variables related to the vehicle's movement, including speed, heading, location, acceleration, position of other objects, and even driver eye-gaze data.

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 so data analysis is more efficient than ever before.

Credit: UMTRI Young Driver Behavior and Injury Prevention Group

Driving simulator data can be coupled with other data, such as physiological activity, brain function, or hormone levels, to test a broad variety of hypotheses. In one ongoing study, for example, UMTRI researchers are examining the brain activity of drivers using a brain-imaging technique known as fNIRS (functional near-infrared spectroscopy). They measure brain activity (via blood oxygenation levels) in the cortical regions of the brain via relatively unintrusive instrumentation and apparatus.

"We are studying teenage drivers' brain activities under different driving conditions and passenger conditions to understand differences in prefrontal cortex activities,"

explains Pradhan. "We are also studying the differences between healthy and ADHD drivers in terms of brain activation while driving."

Automated-vehicle research also relies to a great extent upon driving simulations, says Pradhan. "Automated vehicles are soon going to be a reality on our roadways," he explains, "but the safety impact is quite unknown. Because we don't have data from automated vehicles on the road yet, we can use simulated automated vehicles and gather crucial, empirical, human-behavioral data in this safe and controlled environment, even before the first automated vehicle hits the road."

Value and Life Cycle of Data

As the world has progressed technologically, especially in the area of intelligent transportation systems, the volume of data has grown exponentially. Over time, the UMTRI-led Safety Pilot connected-vehicle project generated a massive twenty-three terabytes of data (representing 84 billion basic safety messages), as communication devices in approximately 2,800 vehicles recorded near-constant data such as vehicle position, speed, and heading, and in some cases, driver alerts.

Storing and processing this amount of incoming data was a daunting task. UMTRI's Engineering Systems Group (ESG) developed the data infrastructure. Associate research scientist David LeBlanc explains that these data are loaded into very large databases designed and administered onsite by ESG. The data are now being used by the U.S. Department of Transportation, UMTRI, other University of Michigan researchers, and are also shared with over thirty organizations on four continents, helping to advance the science of safe mobility.

The impact of data comes from understanding, explains LeBlanc, which leads to ways in which researchers or others can more easily characterize, measure, predict, interact with, and change a phenomenon.

"We have server racks with lots of terabytes. Terabytes are cool and necessary, but they aren't the goal," says LeBlanc. "The goal is to get data on the process or phenomenon, and to turn the data into knowledge that will save lives or impact society in other positive ways."

Credit: UMTRI

For instance, he explains, if we have signatures—or surrogate measures—for safe driving, we need only collect those signatures and not data from the entire period of driving. If researchers know how a heavy vehicle with three trailers rolls over, they can create simulations and use a handful of tests to populate models for that simulation, and learn when roll-stability technology can or cannot help prevent a rollover.

"We won't need to do hundreds of tests—just enough to populate the models with parameters," says LeBlanc. "Therefore a large research-data-collection program often makes itself obsolete: as understanding grows, data collection can become more targeted and efficient, and soon it moves out into the world and researchers move on to the next topic."

Sharing and Linking Data

On UMTRI's fourth floor, statistical-analysis experts Carol Flannagan and Jonathan Rupp are approaching modern data from yet another perspective—that of linking large datasets and expanding the capacity of scientists to access the data. Together they lead one of UMTRI's newest initiatives, the Center for the Management of Information for Safe and Sustainable Transportation. CMISST is a data center that gathers, stores, standardizes, and combines all types of transportation datasets, including data collected by UMTRI, and provides web-based tools for automated dataset generation.

In terms of linking data, or merging distinct datasets, recent CMISST research accomplishments have included developing roadmaps for linking crash data to hospital and EMS data to create a richer, more robust dataset that defines serious injury. In terms of data access, they're working with UMTRI's large datasets on naturalistic driving studies conducted over many years to create common access points, or metadata management systems.

Because transportation data is very technical and essentially "hard to use," says Flannagan, CMISST focuses on building tools that enable data sharing.

"The current model of data access for big transportation data is through expert services to query the data," explains Flannagan. "Although UMTRI has the experts here, we're developing software that makes it possible for researchers to have direct access to the data."

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While it's a significant investment up front, she points out, eventually this method will allow equal access to data, not just access to those who can pay for it.

"Transportation datasets in general are developed from large-scale, costly studies," she says. "You won't reap the full value of the data unless it's shared with wide audiences. Part of the benefit is also innovation: Other researchers might analyze these data in ways that we hadn't thought of."

So, what's next in the realm of data, and specifically transportation data at UMTRI?

"The next frontier is data integration," says Flannagan. "Data is typically collected in silos, so to speak, with different data types collected for specific purposes with their own parameters. Once you can provide a common access point and then link those datasets together, the possibilities of what you can accomplish multiply quickly."

Other Types of Data at UMTRI

Naturalistic Driving Data

UMTRI has developed large driver-vehicle databases since the mid-1990s. These not only answer specific questions about the systems being tested (e.g., adaptive cruise control, crash-avoidance systems), but also contain a rich resource of general driving data, representing how people drive in the real world. Current information represents approximately 34 million vehicle miles traveled, and much of this data is highly detailed, containing hundreds of signals measured from the subject vehicle, radar measurements of nearby vehicles, and video data of both the forward scene and the driver's activities. (The largest of these datasets was acquired from the Safety Pilot Model Deployment.)

Vehicle Safety Analytics Data

The Vehicle Safety Analytics Group (VSA) has established itself as an authoritative international resource on vehicle safety and crash data. Its Center for National Truck and Bus Statistics was the ultimate source for heavy vehicle accident data, as was the Trucks Involved in Fatal Accidents report series. VSA's heavy-truck and bus crash files are the most comprehensive and accurate data available. The data are used for a variety of needs, including assessing the probable impact of new technology, and supporting the regulatory process by providing targeted analysis for government officials.

Behavioral Traffic Safety Data

UMTRI behavioral sciences researchers have pioneered numerous methods of field data collection in projects that have ranged from unobtrusive identification of occupant restraint system use to driver interviews and vehicle and equipment inspections. Led by research professor David W. Eby, the team has developed new methodologies for efficient field data collection, including the use of personal digital assistants (PDAs), and the collection of field data at night utilizing specialized night-vision equipment. The team has developed specialized algorithms for estimating traffic crashes in Michigan by county, developed the first statewide booster seat study, and maintains nationally-requested survey data.

Road Roughness Data

Senior research associate Steve Karamihas and others have compiled the most comprehensive databases on the roughness of roads to help vehicle manufacturers design vehicles with better ride quality and to help road agencies understand the variations in road surfaces. But, more importantly, the data enables the researchers to build models to study road-vehicle interactions, such as how the change in a road's roughness over time might signal different types of imminent pavement failure.

Spatial Databases

Senior research engineer Michelle Barnes oversees a set of spatial databases including road-network digital maps that have been used widely within UMTRI to link location data, such as GPS data, with information about roads or environments. This enables researchers to get insight into such things as the differences in driver behaviors on freeways versus surface streets; characteristics of roads that are associated with higher crash rates; effects of grade on fuel economy; and safety at intersections.

UMTRI Part of Nationwide Study on Safety of Older Drivers

The U-M Transportation Research Institute is one of five national test sites selected by the AAA Foundation for Traffic Safety to address the well-being of older drivers

Longitudinal Research on Aging Drivers (LongROAD) is a five-year $12 million project that will allow researchers to better understand the role of physical and cognitive functions, medical conditions, medications, and vehicle technologies in driving safety.

Researchers will also examine how older drivers self-regulate to avoid difficult driving conditions, and the causes and consequences of driving cessation.

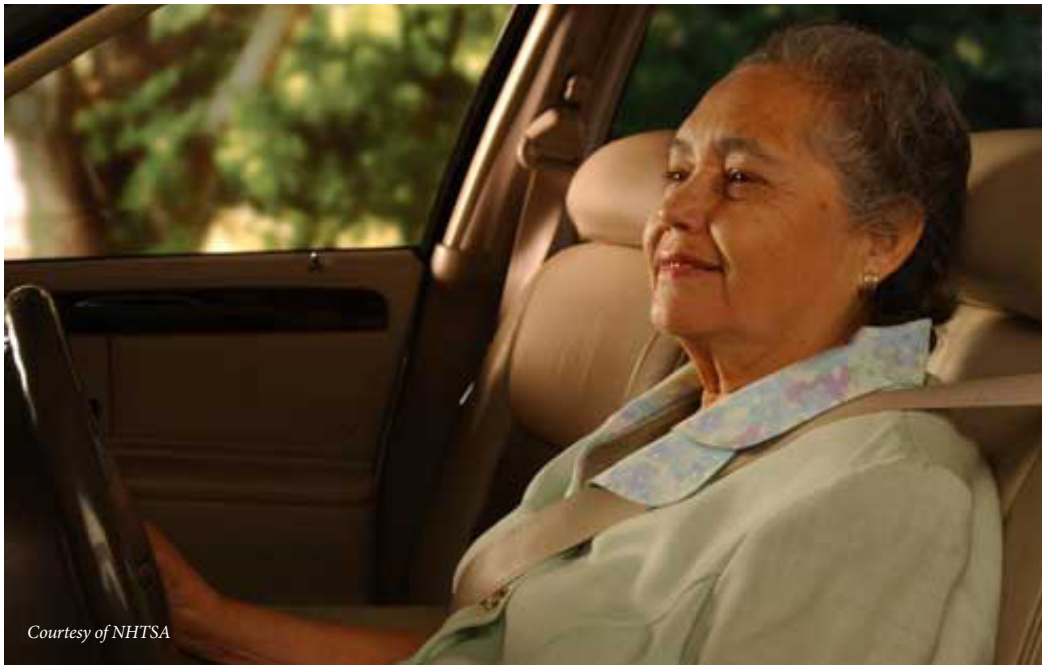
The AAA Foundation for Traffic Safety awarded two separate contracts for the project—one to UMTRI and the other to Columbia University, which funds other test sites in New York, Maryland, Colorado, and California.

David Eby, research professor and head of UMTRI's Behavioral Sciences Group, is a co-principal investigator of the overall project, along with Robert Santos of the Urban Institute in Washington, D.C. Guohua Li of Columbia University is the principal investigator.

The Michigan site principal investigators are Lisa Molnar, associate research scientist in UMTRI's Behavioral Sciences Group, and Lindsay Ryan, assistant research scientist at the Survey Research Center in U-M's Institute for Social Research.

"Like most people, older adults consider driving to be essential to independence and well-being," Eby said. "With aging, however, comes a higher likelihood of medical conditions that can affect safe driving ability.

"Thus, it is important for society to both help older adults continue driving for as long as they can safely do so and to help people stay mobile once they have decided to stop driving. This multistate project will provide much needed information to help us solve this pressing societal issue."



Courtesy of NHTSA

Researchers at U-M, Columbia, Johns Hopkins University, University of California-San Diego, University of Colorado-Denver, the Urban Institute and the Bassett Research Institute will recruit 3,000 active drivers ages 65 to 79 at five study sites—600 drivers at each site.

They will follow these drivers over time through annual assessments and interviews, and will fit each driver's vehicle with a GPS device to learn about their driving patterns.

Eby, Molnar and Ryan will work with Dr. Raymund Yung and Linda Nyquist of the U-M Institute of Gerontology to recruit age-eligible participants from U-M medical clinics.

Each participant's car will be fitted with an automatic data-collection device that will record where the vehicle is being driven and some other vehicle-based data. All naturalistic driving data for all sites will be processed at UMTRI by the Behavioral Sciences and Engineering Systems groups.

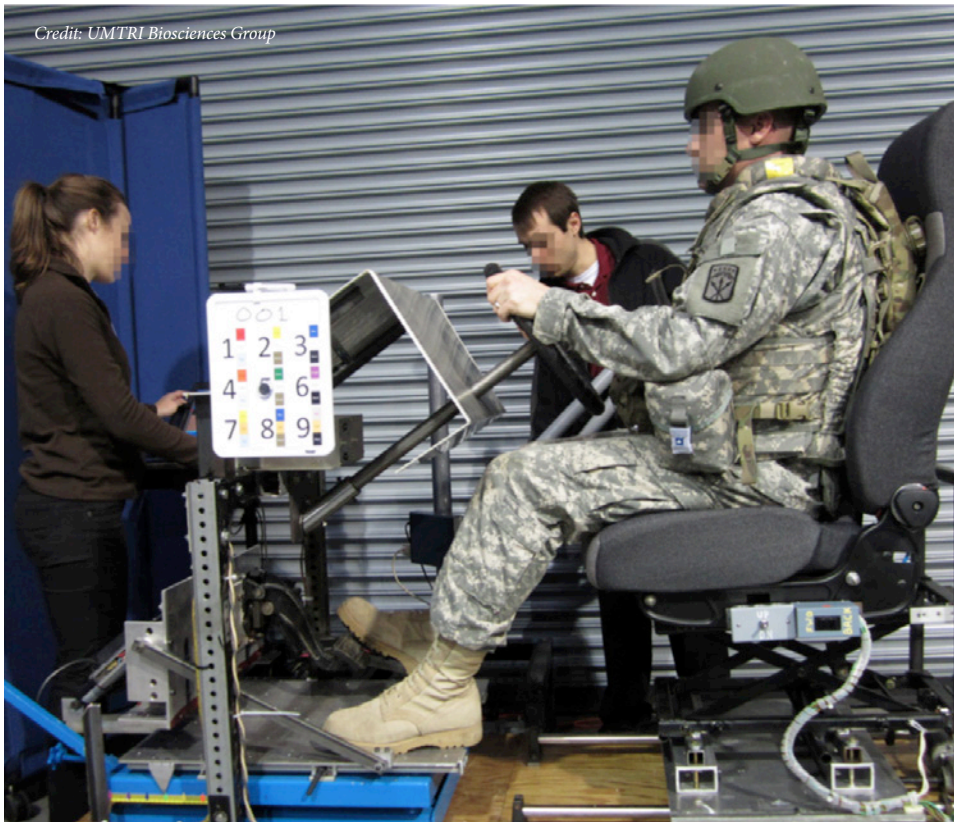
All participants will engage in a comprehensive assessment of physical, mental and perceptual functioning every two years; have their vehicles visually inspected every other year; complete a questionnaire on health, well-being, attitudes, and driving every year; and have all driving trips recorded. The project will also collect medical, crash and driving-history records for all participants.

Pilot testing of about twenty-five drivers will begin at UMTRI early this year and will last for three months before the actual study is launched.

By Bernie DeGroat, Michigan News

Safeguards for Soldiers

Research results have the potential to transform military vehicles


Credit: UMTRI Biosciences Group

A U.S. Army vehicle with five soldiers aboard maneuvers along a barren stretch in southern Afghanistan.

As the vehicle approaches a small village, a roadside bomb triggers underneath the military vehicle and sends it toppling over, severely injuring its occupants.

The scenario is no anomaly. U.S. Department of Defense records reveal that roadside bombs wounded more than 8,700 American troops in Afghanistan from 2010 to 2012.

Those figures don't sit well with Matthew P. Reed, a University of Michigan researcher who has devoted much of his recent efforts to improving safety measures for military personnel.

"Historically, outside of combat, most injuries and fatalities in the Army result from transportation," said Reed, who heads UMTRI's Biosciences Group. "And in recent combat operations, the number-one cause of death and disability is underbody blast caused by improvised explosive devices."

His latest research focuses on the safety and comfort of seating aboard military vehicles.

Reed and his U-M colleagues collected data from more than 300 soldiers stationed at army bases in Kentucky, Texas, and Washington, measuring dozens of variables as the soldiers sat in vehicle mockups.

A powerful laser scanner used to measure posture captured more than 500,000 data points on soldiers' bodies within twelve seconds, which provided researchers further insight on their body dimensions.

"The soldiers who participate in these studies understand very well what we're trying to achieve," he said. "They've been in these vehicles, worn the body armor and understand how hard it is get in and out. They know that there's room for improvement in these vehicles."

That's why the Army's Tank Automotive Research, Development and Engineering Center (TARDEC) agreed to fund the research project through the U-M Automotive Research Center.

Reed has conducted similar safety assessments for the automotive industry, but this particular research is unique in that it caters strictly to military personnel. That means taking into account body armor and body-borne gear, then determining how those items that weigh upwards of sixty pounds impact soldiers' safety and comfort levels within a military vehicle.

"This if the first study that I'm aware of with actual data from actual soldiers that details how they sit in vehicles," he said.

The results of Reed's research—"The Seated Soldier Study: Posture and Body Shape in Vehicle Seats"—recently were released and have the potential to transform military vehicles.

"Ultimately, we want to see vehicles designed that provide better accommodation for soldiers, so that they're safer, less fatigued, and can perform better," he said.

> "Our strategy is to engage as many people as we can in hopes of improving the design and assessment of military vehicles as quickly as possible,"

There also is a great deal of interest among industry partners, who hope to utilize this research for commercial purposes, Reed said.

"Our strategy is to engage as many people as we can in hopes of improving the design and assessment of military vehicles as quickly as possible," he said.

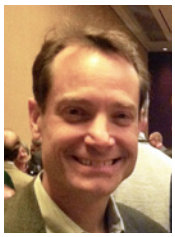
By Alex Piazza, U-M Office of Research

TRB 2015

Experts gather for 94th meeting of Transportation Research Board

UMTRI researchers joined transportation experts from around the world in January at the 94th annual meeting of the Transportation Research Board (TRB), held in Washington, D.C. The TRB meeting covers all transportation modes, with more than 5,000 presentations in more than 750 sessions. UMTRI research faculty are active at multiple levels throughout the week—participating in topic sessions and committees, serving as presenters, moderators, panel discussants, and committee officers and members. Following are highlights of UMTRI activities at TRB 2015:

Advanced Vehicle Technologies and Occupant Protection



Research professor Matthew Reed presented "Posture, Body Shape and Belt Fit for Obese and Elderly Drivers."

Alcohol, Other Drugs and Transportation Committee

Ray Bingham serves as committee secretary. Assistant research scientist Lisa Buckley and research professor Jean Shope (member and former chair) also attended.

Cyber Security Subcommittee Meeting; Critical Transportation Infrastructure Protection Committee

Associate research scientist Andre Weimerskirch presented "Solutions for Automotive Cybersecurity: An Overview of Recent Approaches."

Distraction, Attention, and Driver Performance

Assistant research scientist Shan Bao presented "Distracted Driving Performance Measures: A Spectral Power Analysis"

Dynamic Network Modeling

Research professor Henry Liu presided over the session. He also presented "Boundedly Rational Travel Behavior: A Review of Models and Methodologies" in the session Networking Modeling.

Effective Literature and Search Reviews: Tools and Tricks for the Trade

Information resources manager Bob Sweet participated as a discussion panel member.

Ignite! Emerging Technologies in Traffic Signal Systems

Research professor Henry Liu presented "Oversaturation Detection and Performance Metrics." He also coauthored "Quasi-optimal Feedback Control for an Oversaturated Intersection with Maximum Queue Constraints," presented in the session Signal System Operational Performance and Driver Behavior; coauthored the poster "Optimizing Coordination for Signalized Arterials with Separate Left-turn Phases" for the session Signal Timing Design and Optimization; and coauthored "Indifference Bands for Route Switching," presented in the session Activity and Travel Behavior.

Is Transportation Infrastructure Ready for Driverless Cars?

UMTRI director Peter Sweatman presented "Connected Infrastructure to Support Automated Driving."

Joint Subcommittee on Digital Billboards

Anuj Pradhan presented "Motor Vehicle Crashes and Digital Billboards in Michigan: An Epidemiological Study."

▶ Operator Education and Regulation Committee Meeting

Ray Bingham and Anuj Pradhan presented "Connected and Automated Vehicle Systems: State of the Art and Relevance for Teen Driver Research."

▶ Research on Safe & Unsafe Driving

Assistant research scientist Lisa Buckley presided over the session.

▶ The Road Safety Implications of Unlicensed Driving and Strategies to Address the Problem

Research professor C. Raymond Bingham presented "The Association of Unlicensed Driving and Other Problem Behaviors Among Teen Drivers."

▶ Teenage Driving: Latest Findings on Key Topics

Assistant research scientist Anuj Pradhan was a co-presenter of the papers "Systematic Review of Epidemiological Studies on Young Drivers' Crash Risk with Passengers: Final Results" and "Review of Hazard Recognition Training Programs for Young Drivers."

▶ Truck Size and Weight Committee

Research scientist John Woodrooffe presided over the meeting.

▶ When Seniors Transition from Driving

Associate research scientist Lisa Molnar was discussion panel leader for the session. Research professor David W. Eby was a discussion panel member.

▶ Safe Mobility of Older Persons Committee

Lisa Molnar serves as secretary of the committee. She is also a general member of the Committee on Education and Training.

▶ Young Driver Subcommittee

Ray Bingham serves as subcommittee secretary. Lisa Buckley, Anuj Pradhan, and Jean Shope (member and former chair) also attended the meeting.

Recent UMTRI Publications

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.

Conference Papers

Hu, J.; Fischer, K.; Lange, P.; Adler, A. 2015. *Effects of Crash Pulse, Impact Angle, Occupant Size, Front Seat Location, and Restraint System on Rear Seat Occupant Protection.* Society of Automotive Engineers technical paper number 2015-01-1453.

Published April 14, 2015.

Journal Articles

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UMTRI In The News

▶ Driverless vehicles: Fewer cars, more miles

http://ns.umich.edu/new/releases/22677-driverless-vehicles-fewer-cars-more-miles

University of Michigan, 2-11-2015

▶ Vehicle fuel economy at highest mark since last summer

http://www.ns.umich.edu/new/releases/22667-vehicle-fuel-economy-at-highest-mark-since-last-summer

University of Michigan 2-5-2015

▶ What the I-94 pileup can teach you about driving in winter weather

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Michigan Radio, 1-20-2015

▶ Fleets turning to video, big data to lower risk

http://www.ccjdigital.com/fleets-turning-to-video-big-data-to-lower-risk/

Commercial Carrier Journal, 1-20-2015

▶ Big trucks and fast cars drawing a lot of attention at the Detroit show

http://www.mlive.com/business/index.ssf/2015/01/rick_haglund.html

MLive, 1-18-2015

▶ U-M's cityscape will test driverless vehicles

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University of Michigan 1-14-2015

▶ Expert: Parents have power to influence teen drivers

http://www.freep.com/story/money/cars/auto-leadership/2015/01/07/toyota-sayer-teen-safe-driving/21361999/

Detroit Free Press, 1-10-2015

▶ The fatter crash test dummies that could save lives

http://www.bbc.com/future/story/20150107-fat-models-that-could-save-lives

BBC News, 1-8-2015

▶ Harsher distracted driving regulations and penalties needed in 2015

http://www.technologytell.com/apple/144715/harsher-distracted-driving-regulations-penalties-needed-2015/

TechnologyTell, 1-1-2015

Upcoming Events

Aging in America Conference

March 23-27; Chicago, Illinois,
http://www.asaging.org/aia

Michigan Traffic Safety Summit

March 24-26; East Lansing, Michigan,
http://www.michigan.gov/msp

Automotive Cyber Security Summit

March 30-April 1; Detroit, Michigan,
http://www.automotivecybersecurity.com/

AASHTO GIS for Transportation Symposium

April 19-22; Des Moines, Iowa,
http://www.gis-t.org/

SAE World Congress & Exhibition

April 21-23; Detroit, Michigan,
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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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