

UMTRI

RESEARCH REVIEW

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FLYING AND DRIVING AFTER 9/11

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Flying AND *Driving* AFTER THE SEPTEMBER 11 ATTACKS

By Michael Sivak and Michael Flannagan*

This article was first published in *American Scientist*, January–February 2003, and is reprinted in this edition with permission of *American Scientist*, magazine of Sigma Xi, The Scientific Research Society.

Many people who are perfectly relaxed cruising our nation's highways become jittery when they get on an airliner—although most know full well that flying is safer than driving. The statistics

are indeed clear on this point. For example, we and a colleague, Dan Weintraub, published a paper in 1991 that documented the substantially lower risk of flying compared with driving in the United States. Some of the many millions of Americans who flew over the next few years probably derived comfort from such hard facts.

But now, a decade later, things have changed: The hijacking of four large jets on September 11, 2001, and the disastrous events that ensued led

many to forgo flying in the United States during the following months. For example, in the fourth quarter of 2001, there was a drop of 18 percent in the number of passengers compared with the same time period in 2000. Many still avoid air travel. We thus thought it appropriate to again calculate the risks involved in flying and driving, taking into account the latest statistics, including the tragic deaths of the passengers on those four hijacked planes.

continued...

* Michael Sivak and Michael Flannagan both work in UMTRI's Human Factors Division, Sivak as division head and Flannagan as a senior associate research scientist.




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Any nervous passengers on this flight heading for Detroit Metropolitan Airport could calm themselves with the knowledge that, from a statistical perspective, they are much safer flying than those driving below on Interstate-94.


SAFETY IN NUMBERS

The risks of flying and driving are influenced by different parameters. Whereas the risk of driving depends most strongly on the distance traveled, the risk of flying is primarily affected by the number of takeoffs and landings. A study carried out by Boeing indicates that out of 7,071 worldwide airline fatalities during the interval between 1991 and 2000, 95 percent happened either during takeoff and climb after takeoff, or during descent and landing. Conversely, only 5 percent of the fatalities resulted from accidents that occurred at cruising altitudes. Consequently, as we and others have pointed out before, the risk of flying depends mostly on the number of flight segments involved in the trip, not on the distance traveled.

In gathering the statistics for flying, we considered the scheduled domestic passenger operations of 10 major U.S. airlines: Alaska, America West, American, Continental, Delta, Northwest, Southwest, TWA, United, and US Airways. (The commuter affiliates of these airlines were not included.) Because the number of airline fatalities varies greatly from year to year, we used the data compiled by the National Transportation Safety Board for a 10-year period from 1992 through 2001. To calculate the probability that a particular passenger would be killed on a nonstop (one-segment) flight, we divided the number of passengers killed during 1992–2001 (433, including the 232 aboard the four hijacked flights)



The calculations showed
that *driving*
the length of a typical nonstop flight
is 65 times as risky as
flying on the
10 major U.S. airlines.



by the product of the total number of nonstop segments (54,061,237) and the average number of passengers per nonstop segment (101.9). The resulting value is 78.6×10^{-9} , or roughly eight in a hundred million.

The probability of a fatality on a one-stop (two-segment) flight can be calculated by combining the probabilities of a fatality on either segment. Roughly speaking, the probability of becoming a fatality on a two-segment

PHOTOS: UMTRI / SHEKINAH BERKINGTON

flight is just two times the probability of becoming a fatality on a one-segment flight. (In actuality, because one must survive the first segment to become a fatality on the second, the full probability calculation is more complicated. But given the very low probabilities involved here, the simple approximation is quite accurate.) Similarly, the probability of a fatality on a three-segment flight is approximately equal to three times the probability for a single-segment flight, and so on.

When one decides between flying and driving, the latter option usually involves being the driver (as opposed to a passenger). Because the susceptibility to injury varies with the position of the occupant in the vehicle, we included only drivers in this analysis. Also, we tallied just cars, light trucks, vans, and sport utility vehicles, ignoring heavy trucks, buses, and motorcycles. Furthermore, we considered travel just on rural interstate highways because those constitute the most likely setting when one chooses to drive as an alternative to flying. To gauge the

risks of such motoring, we used statistics from the year 2000, the most recent data available in detail.

To calculate the probability of fatality per kilometer of driving, we divided the number of driver fatalities on rural interstate highways in 2000 (1,511) by the estimated distance traveled on those roads by cars, light trucks, vans, and SUVs (345×10^9 kilometers). The resulting value is 4.4×10^{-9} , or about four in a billion per kilometer.

Armed with these two risk estimates, one for driving and the other for flying, we can specify something we call the indifference distance—the distance at which the two modes of travel are equally risky. For distances shorter than the indifference distance, driving is safer; for distances longer than the indifference distance, flying is safer. The indifference distance for driving versus a nonstop flight can be calculated by dividing the risk of flying a nonstop segment (78.6×10^{-9}) by the risk of driving a kilometer (4.4×10^{-9}). The result is 18 kilometers. For one-stop

and two-stop flights, the indifference distances are 36 kilometers and 54 kilometers, respectively. Thus for any distance that is long enough for flying to be an option, driving even on the safest roads is more risky than flying with the major airlines.

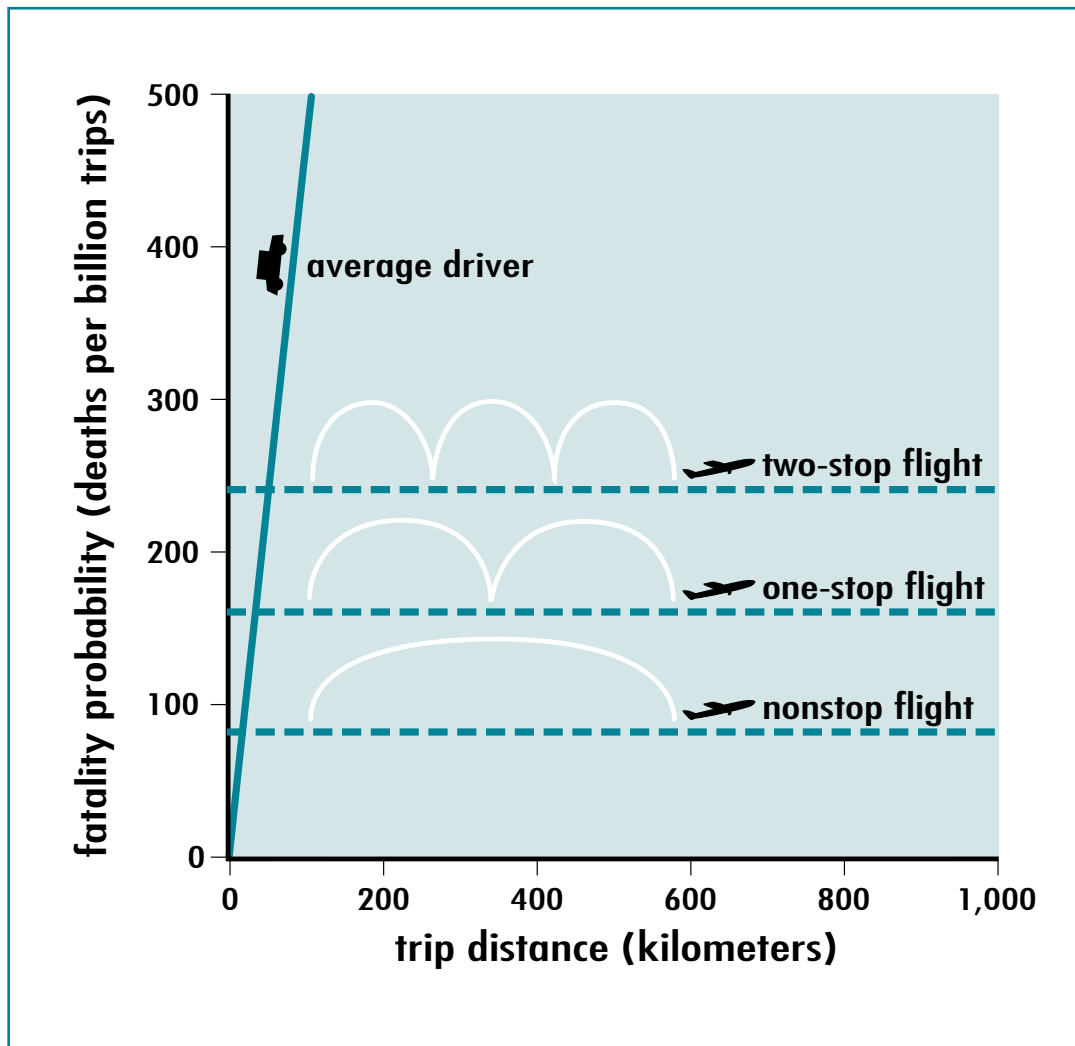
Astute readers will note that our calculations do not include the trip to an airport (for flying) or the travel on local roads on the way to a rural interstate (for driving). True, we've overlooked this complication. But in many circumstances, the risks for these portions of the journey for the two modes

of long-distance travel may be about the same. So we don't believe that our estimates of indifference distance would change all that much, even if such factors were fully accounted for.

Just how much safer is flying than driving? For an average-length nonstop flight (which works out to 1,157 kilometers), the risk of flying is just the 78.6×10^{-9} value derived above. The risk of driving those same 1,157 kilometers is $1,157 \times 4.4 \times 10^{-9}$, or $5,091 \times 10^{-9}$. Dividing 5,091 by 78.6, we estimate that driving the length of a typical nonstop segment is approxi-

mately 65 times as risky as flying. Driving farther than 1,157 kilometers would be more than 65 times as risky; driving shorter than 1,157 kilometers, but longer than the 18-kilometer indifference distance, would be between 1 and 65 times as risky as nonstop flying (neglecting the drive to the airport and the travel on local roads on the way to the interstate).

Statistics show that the risk of a fatality while driving on rural interstate highways is proportional to the distance covered (solid), whereas the risk of being killed while traveling with one of the major U.S. airlines depends on the number of intermediate take-offs and landings (dashed). The distance where these lines intersect, "the indifference distance," is quite short (18 kilometers for a non-stop flight), making flying safer than driving for any distance for which taking an airliner is an option.



FUTURE SHOCK?

As all those stock prospectuses say, these figures are descriptive for the time period studied and are not predictions of future performance. Making predictive statements about the relative risk of flying and driving after the attacks of September 2001 is indeed tough. In particular, it requires some assumptions about whether such aberrant events will be repeated and, if so, how often. Because the frequency of such episodes

continued...

cannot be reliably estimated, we instead decided to calculate the frequency needed for the two travel modes to become equally risky.

As we explained above, the risk of a fatality while driving the length of an average nonstop flight is $5,091 \times 10^{-9}$. For nonstop flights to have had the same estimated risk, there would have to have been 28,046 flight fatalities over the 10-year period studied (based on 54,061,237 nonstop segments and 101.9 passengers per nonstop segment). That translates to 27,845 flight fatalities in addition to the 201 people who actually died over those years (not counting those on the four hijacked flights). In turn, dividing 27,845 by 232 (the number of passengers who died on the four hijacked planes) we obtain the following: For flying to become as risky as driving, disastrous airline incidents on the scale of those of September 11th would have had to occur 120 times over the 10-year period, or about once a month.

Two conclusions follow. First, without diminishing the tragedy of September 11th (which also involved many deaths of people on the ground) or its political ramifications, from the perspective of personal safety it is important to consider that the annual number of lives lost in road traffic accidents in the United States is enormous in comparison (42,119 fatalities in 2001). Second, the relative safety of domestic flying on the major airlines over driving is so strong that the direction of the advantage would be unchanged unless the toll of terrorism in the air became, almost unthinkably, many times worse than it has been.

RR

For *flying*
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Bibliography

- Evans, L. *Traffic Safety and the Driver*. 1991. New York: Van Nostrand.
- Evans, L., M. C. Frick, R. C. Schwing. 1990. "Is it safer to fly or drive? A problem in risk communication." *Risk Analysis*, 10:239–246.
- Highway Statistics 2000*. 2001. Washington: U.S. Department of Transportation.
- Sivak, M., D. J. Weintraub, M. J. Flannagan. 1991. "Nonstop flying is safer than driving." *Risk Analysis*, 11:145–148.
- Statistical Summary of Commercial Jet Aircraft Accidents, Worldwide Operation, 1959–2000*. 2001. Seattle: Boeing Commercial Airplanes.

Making Telematics Safer

UMTRI and Delphi Conduct Major Study on Driver Distraction

New in-vehicle technology is constantly being developed. In the not-so-distant future, cars may contain a wide array of technology including cell phones, navigation/information systems, entertainment systems, wireless Internet, and even safety systems that can detect

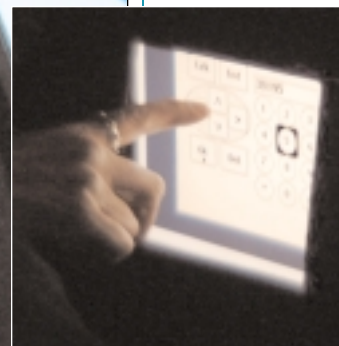
potentially dangerous driving situations and warn drivers to take corrective actions. However, both singly and in combination, these technologies may adversely affect crash risk by distracting drivers from the driving task.

To address this issue, NHTSA is sponsoring the SAVE-IT program (SAfety VEhicles using adaptive Interface Technologies). SAVE-IT aims to create a system that can reduce distraction-related crashes and enhance the effectiveness of collision warning systems. Program members will research and develop a closed-loop vehicle environment by measuring the driver's state, assessing the situational threat, prioritizing information presentation, providing

adaptive countermeasures to minimize distraction, and optimizing advanced collision warning systems.

UMTRI and the University of Iowa, a prominent automotive human factors research institution, offer expertise in human factors innovation. Delphi Corporation contributes knowledge of advanced safety warning systems, driver state monitoring, sensor suite development, data fusion, and advanced human-machine interfaces. General Motors and Ford Motor Company provide an industry perspective to the system's evaluation. Seeing Machines, Inc. will develop a non-invasive eye-tracking system to support the research. The program is administered by the Volpe *continued...*

COLLABORATIONS



PHOTOS: UMTRI / SHEKIMAH ERINGTON

Researcher Ken Mayer works with volunteer Stephanie Powell on a telematics study that measured task completion time and its impact on driving performance. Stephanie is entering telephone numbers into a touchscreen keypad in UMTRI's driving simulator.

National Transportation Systems Center.

UMTRI's effort on the project will be managed by David W. Eby. Project tasks leaders are Barry Kantowitz, Paul Green, David LeBlanc, and Eby. Other key UMTRI researchers include Lidia P. Kostyniuk, John Sullivan, Robert Ervin, Dan Blower, and Charles MacAdam. Their work continues through 2005 and focuses on the six main areas described below.

Crash Statistics Analysis

This task, led by David W. Eby, a senior associate research scientist in UMTRI's Social and Behavioral Analysis Division, will identify which vehicle crash scenarios the SAVE-IT technology should be designed to prevent and will estimate the number of crashes that SAVE-IT technology could potentially mitigate.

UMTRI will perform an initial literature review and assessment of existing data, convene an expert panel to identify scenarios for SAVE-IT to address, and analyze existing data to estimate the potential number of crashes that SAVE-IT could mitigate.

Driving Task Demand

This task will determine crash rates from environmental factors such as the road, traffic, and weather conditions, and convert crash rates to a required reaction time to prevent the crash. Eby will lead a review of human factors literature and crash databases to identify relevant potential measures of driving task demand.

Paul Green, a senior research scientist in UMTRI's Human Factors Division and head of the

The collaboration of SAVE-IT team members will result in a system that can reduce distraction-related crashes and enhance the effectiveness of collision warning systems.

Driver Interface Group, will lead the effort to determine diagnostic measures, such as how the response time to a braking event varies as a function of the workload/visual demand of driving, and how crash frequency relates to braking response times. Green will also lead the effort to develop and validate equations using driving task demand variables for crash frequency and RT_{req} . Based upon the results of simulator studies, a new simulator study will be conducted to cross-validate the equations. To

expand the linkage, multiple crash scenarios—most likely rear-end crashes with moving and stopped vehicles—will be examined.

Performance Measures

This task, led by Green, will determine performance measures that are diagnostic of driver distraction and address questions such as:

- How well do people drive normally and how does driving performance change when drivers are distracted?
 - How do the means, standard deviations, distribution shape, and distribution types for various performance measures differ between the two classes of conditions?
 - Do various types of distractions (e.g., predominantly visual vs. predominantly auditory) have the same effect on various measures of driving performance?
- The team will analyze baseline driving conditions and compare them to “distracted driving” data to determine which performance variables are diagnostic of driver distraction. “Without an understanding of performance in conditions of little or no distraction (baseline driving), it is difficult to determine when

driving performance has declined,” Green says.

Telematics Selection

This task will determine the distraction potential of commonly-used telematics functions. To mitigate excessive distraction, it is important to determine which functions are most distracting and need to be advised against or blocked. Barry Kantowitz, director of UMTRI, will lead the effort to identify demand levels, closely coordinating the experiments with simulator research conducted by Dr. John Lee at the University of Iowa. They will jointly produce scenarios and data reduction programs. Each experiment will test at least sixteen subjects using efficient repeated-measures designs with counterbalancing. Independent and dependent variables will be selected in collaboration. Because telematics demand and driving-task demand can be measured and defined in similar ways, these experiments will be highly integrated and performed at the same site.

Kantowitz says, “We will be conducting an experiment in our driving simulator to evaluate the cognitive demands placed on the driver by various in-vehicle

telematic devices.” The team will focus on analyzing steering entropy and recording reaction time for driving and embedded telematic secondary tasks.

Data Fusion

Eby will lead the task of fusing various distraction dimensions to determine an overall distraction level. UMTRI will assist Delphi Corporation in scenario generation, simulator operation, subject recruitment,

NHTSA, Delphi Corporation, UMTRI, the University of Iowa, General Motors, Ford Motor Company, and Seeing Machines, Inc. are working together on the SAVE-IT project.

and other tasks. UMTRI will also aid Delphi in its data fusion efforts by performing neural network modeling. UMTRI has experience applying neural networks to driver warning and control functionalities to model driver longitudinal and lateral control behavior, and to classify and detect different styles of driving behavior.

Testing and Evaluation

David LeBlanc, an assistant research scientist in UMTRI’s Engineering Research Division, will head

the evaluation task, which will occur in two phases. First, the team will formulate a research plan that describes the general strategy for evaluating the Driver Safety Management System (DSMS), including the methodology and facilities that will be used for the evaluation. Next, a real-world evaluation will take place, both on a closed-course and on public roads, with recruited drivers. These tests will evaluate aspects of DSMS perform-

ance and assess drivers’ responses to, and perceptions of, the DSMS, including potential driver acceptance of similar systems. The task will also evaluate aspects of the

driver state assessment subsystem as well as the adaptive countermeasure system.

Watch This Space

Watch future editions of the *UMTRI Research Review* for a more in-depth, follow-up story as the project progresses. **RR**

UMTRI's Library Serves You

By Bob Sweet

UMTRI's library, more formally known as the Research Information and Publications Center (RIPC), has been an indispensable feature of UMTRI's research capabilities since the Institute opened in 1969. It is home to one of the world's largest collections of highway-safety literature. Its information is available not only to researchers at UMTRI, but to interested professionals worldwide.

Consistent with the wide variety of disciplines employed by UMTRI researchers, the collection covers the areas of accident patterns and statistics, heavy-vehicle and passenger-car dynamics, biomechanics and injury mechanisms, driver behavior, alcohol and driving, occupant protection, young and elderly drivers, intelligent transportation systems, and human factors. The library catalog has over 105,000 records, representing books, technical reports, journals, individual journal articles, conference papers, brochures, and pamphlets.

The RIPC staff includes three professional librarians (Bob Sweet, Sarah Bidigare, and Kristin Janus), two support-staff members (Marlene Dyer and Anna Harden), and an editor (Monica Milla). In addition to acquiring and maintaining the library collection, RIPC staff members maintain the UMTRI website and an intranet. They provide an editing service for UMTRI authors, write and publish the *UMTRI Research Review*, help to

develop UMTRI promotional materials, write a monthly staff newsletter, and disseminate UMTRI publications to the National Technical Information Service and other libraries and transportation centers.

UMTRI librarians are active members of the Transportation Division of the Special Libraries Association (SLA). The Association provides exceptional opportunities for resource sharing and collaborations that inevitably enhance the RIPC's value to UMTRI and to the research community at large. As part of a pilot project sponsored by the National Transportation Library, UMTRI librarians are working with other SLA members to form a consortium of Midwestern transportation libraries. The consortium, composed primarily of state department of transportation libraries, seeks to build an infrastructure that will facilitate resource sharing and enhance existing cataloging and interlibrary loan services.

Researchers worldwide rely on UMTRI's library as the place to go for

materials that they sometimes can find nowhere else. Since 1999, UMTRI's library catalog has been searchable via the worldwide web (<http://www.umtri.umich.edu/library/simple.html>), making the treasures of the library even more widely accessible. Many searchers avail themselves of UMTRI's document-delivery service to get hard copies of items that they've identified through web-based catalog searches. (See the sidebar for more information on how to navigate the various online catalogs.)

UMTRI reports are now available online at <http://www.hti.umich.edu/u/umtri/>.

Thanks to the advancement of library-services technology, UMTRI researchers are not limited to what the RIPC can house within its walls. UMTRI librarians are able to access materials virtually anywhere in the world. This capability continues to evolve and expand as the University of Michigan Library's digital resources grow. Although the library is a small,



Library staffers (l-r) seated: Marlene Dyer, Sarah Bidigare. standing: Anna Harden, Bob Sweet, Monica Milla, Kristin Janus.

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independent library at the University of Michigan, librarians have access to the full resources of the University library system, a world leader in developing digital-library technology and resources.

RIPC staff members are working in conjunction with the University's Digital Library Production Service on

a project to digitize all of UMTRI's research reports, from the earliest 1960s-era reports to those being written now.

Currently, about 600 reports, published from 1967 through 1979, are online at <http://www.hti.umich.edu/u/umtri/>. By the end of 2003, all unclassified UMTRI reports will be

available. Reports are displayed as digital images and can be downloaded or printed as PDF files that are segmented in twenty-page increments. You can search for reports by key words, title, subject, author, date range, full text, and more. **RR**

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alcohol & drugs	Items that contain <i>both</i> words (items that contain just one of the words will be ignored)
vehicle dynamics ! truck*	"vehicle dynamics" but not "truck," "truckers," "trucks," or "trucking"
biomechanic*	Items beginning with "biomechanic" such as biomechanics, biomechanical, etc.
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Conference Papers

- Ebert, S.M.; Reed, M.P. 2002. "Characterization of driver seatbelt donning behavior." Michigan University, Ann Arbor, Transportation Research Institute, Biosciences Division. 2002 p. *Human Factors in Seating and Automotive Telematics*. Warrendale, SAE, 2002, pp. 119–124. Report No. SAE 2002-01-0783. UMTRI-95608 A17.
- Flannagan, M.J.; Sivak, M.; Mefford, M.L. 2002. "Distance perception in camera-based rear vision systems." Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. 8 p. *Advanced Lighting Technology for Vehicles*. Warrendale, SAE, 2002, pp. 13–20. Sponsored by Ichikoh Industries, Tokyo (Japan) Report No. SAE 2002-01-0012. UMTRI-95572 A02.
- Jahns, S.K.; Reed, M.P.; Hardee, H.L. 2001. "Methods for in-vehicle measurement of truck driver postures." PACCAR, Bellevue, Wash./ Michigan University, Ann Arbor, Transportation Research Institute, Biosciences Division/ International Truck and Engine Corporation. 4 p. *Truck Safety and Driver Issues*. Warrendale, SAE, 2001, pp. 59–62. Report No. SAE 2001-01-2821. UMTRI-95567 A07.
- Reed, M.P.; Lehto, M.M.; Anctil, B.; Brown, C.; Noy, I. 2002. "Development of seatbelt fit assessment components for the ASPECT manikin." Michigan University, Ann Arbor, Transportation Research Institute, Biosciences Division/ Biokinetics and Associates, Ottawa, Ontario (Canada)/ Canada, Transport Canada, Ottawa, Ontario. 6 p. *Advances in Safety Test Methodology*. Warrendale, SAE, 2002, pp. 63–68. Report No. SAE 2002-01-0686. UMTRI-95613 A08.
- Reed, M.P.; Manary, M.A.; Flannagan, C.A.C.; Schneider, L.W. 2000. "Comparison of methods for predicting automobile driver posture." Michigan University, Ann Arbor, Transportation Research Institute, Biosciences Division. Published by Warrendale, PA: Society of Automotive Engineers. 12 p. Report No. SAE 2000-01-2180. UMTRI-95447.
- Schoettle, B.; Sivak, M.; Flannagan, M.J. 2002. "High-beam and low-beam headlighting patterns in the U.S. and Europe at the turn of the millennium." Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. 22 p. *Advanced Lighting Technology for Vehicles*. Warrendale, SAE, 2002, pp. 71–92. Report No. SAE 2002-01-0262. UMTRI-95572 A09.
- Sivak, M.; Flannagan, M.J.; Schoettle, B.; Nakata, Y. 2002. "Benefits of applying adaptive headlighting to the current U.S. and European low-beam patterns." Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. 13 p. *Advanced Lighting Technology for Vehicles*. Warrendale, SAE, 2002, pp. 131–143. Sponsored by Michigan University, Ann Arbor, Industry Affiliation Program for Human Factors in Transportation Safety. Report No. SAE 2002-01-0524. UMTRI-95572 A12.

Journal Articles

- Ervin, R.; Bogard, S.; Fancher, P.S. 2001. "Radar detection of vehicles in a string: gaining situation awareness of a propagating conflict." Michigan University, Ann Arbor, Transportation Research Institute, Engineering Research Division. 7 p. *Transportation Research Record*, No. 1779, 2001, pp. 33–39. Sponsored by National Highway Traffic Safety Administration, Washington, D.C.; Transportation Research Board, Committee on Simulation and Measurement of Vehicle and Operator Performance, Washington, D.C. Report No. 01-0531. UMTRI-62737.
- Fancher, P.S.; Bareket, Z.; Bogard, S. 2001. "Modeling driver behavior by using mind's eye coordinates." Michigan University, Ann Arbor, Transportation Research Institute, Engineering Research Division. 8 p. *Transportation Research Record*, No. 1779, 2001, pp. 1–8. Sponsored by Transportation Research Board, Committee on Simulation and Measurement of Vehicle and Operator Performance, Washington, D.C. Report No. 01-0503. UMTRI-62733.
- Sayers, M.W.; Mousseau, C.W.; Gillespie, T.D. 2002. "Using simulation to learn about vehicle dynamics." Mechanical Simulation Corporation, Ann Arbor, Mich./ Toledo University, Mechanical, Industrial, and Manufacturing Department, Ohio/ Michigan University, Ann Arbor, Transportation Research Institute, Engineering Research Division. 16 p. *International Journal of Vehicle Design*, Vol. 29, Nos. 1/2, 2002, pp. 112–127. UMTRI-62728.
- Shope, J.T.; Bingham, C.R. 2002. "Drinking-driving as a component of problem-driving and problem behavior in young adults." Michigan University, Ann Arbor, Transportation Research Institute, Social and Behavioral Analysis Division/ Michigan University, Ann Arbor, School of Public Health, Department of Health Behavior and Health Education/ Michigan University, Ann Arbor, Medical School/ Veterans Health Administration, Ann Arbor, Mich. 10 p. *Journal of Studies on Alcohol*, Vol. 63, No. 1, Jan. 2002, pp. 24–33. Sponsored by National Institute on Alcohol Abuse and Alcoholism, Rockville, Md. UMTRI-62763.
- Sullivan, J.M.; Flannagan, M.J. 2002. "The role of ambient light level in fatal crashes: inferences from daylight saving time transitions." Michigan University, Ann Arbor, Transportation Research Institute. 12 p. *Accident Analysis and Prevention*, Vol. 34, No. 4, July 2002, pp. 487–498. Sponsored by Michigan University, Ann Arbor, Industry Affiliation Program for Human Factors in Transportation Safety. UMTRI-62821.

Waller, P.F. 2002. "Challenges in motor vehicle safety." Michigan University, Ann Arbor, Transportation Research Institute. 21 p. *Annual Review of Public Health*, Vol. 23, No. 1, 2002, pp. 93–113. UMTRI-95482.

Waller, P.F. 2001. "Public health's contribution to motor vehicle injury prevention." Michigan University, Ann Arbor, Transportation Research Institute. 2 p. *American Journal of Preventive Medicine*, Vol. 21, No. 4, supplement 1, Nov. 2001, pp. 3–4. UMTRI-95483.

Technical Reports

MacAdam, C. 2001. *Development of a driver model for near/at-limit vehicle handling*. Michigan University, Ann Arbor, Transportation Research Institute, Engineering Research Division. 120 p. Sponsored by General Motors Corporation, Research and Development Center, Warren, Mich. Report No. UMTRI-2001-43. UMTRI-95569.

Schoettle, B.; Sivak, M.; Nakata, Y. 2002. *The locations of signaling and lighting equipment on passenger vehicles sold in the U.S.* [The locations of signaling and lighting equipment on passenger vehicles sold in the United States] Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. Published by Ann Arbor, Mich.: University of Michigan, Transportation Research Institute. 19 p. Sponsored by Michigan University, Ann Arbor, Industry Affiliation Program for Human Factors in Transportation Safety. Report No. UMTRI-2002-8. UMTRI-96155.

Sivak, M.; Flannagan, M.J.; Schoettle, B.; Mefford, M.L. 2002. *Driving performance with and preference for HID headlamps*. Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. 19 p. Sponsored by Michigan University, Ann Arbor, Industry Affiliation Program for Human Factors in Transportation Safety. Report No. UMTRI-2002-3. UMTRI-95510.

Sullivan, J.M.; Flannagan, M.J.; Schoettle, B. 2002. *The appearance of bending light from other vehicles*. Michigan University, Ann Arbor, Transportation Research Institute, Human Factors Division. 29 p. Sponsored by Michigan University, Ann Arbor, Industry Affiliation Program for Human Factors in Transportation Safety. Report No. UMTRI-2002-2. UMTRI-95511. **RR**

HOT OFF THE PRESS

Strategic Transport Modelling Seminar
November 7, Crowthorne, England
<http://www.trl.co.uk>

Urban Mobility for All
November 12–15, Lome, Togo
<http://www.codatu.org>

NCAT's National Transportation Symposium
November 13–14, Auburn, Alabama
<http://www.eng.auburn.edu/center/ncat/>

International Roadway Work Zone Safety
December 3–7, Orlando, Florida
<http://www.artba.org/>

Work Zone Traffic Control
December 5–6, Las Vegas, Nevada
<http://www.asce.org/conted/seminars/>

TRB 82nd Annual Meeting
January 12–16, Washington, D.C.
<http://www4.trb.org/trb/annual.nsf>

Nodding Off: Fatigue and Transport Accidents
February 4, London, England
<http://www.pacts.org.uk/conferences.htm>

Retroreflective Materials Used in Transportation
February 5–6, Baton Rouge, Louisiana
http://208.233.211.80/TRAIN/astm_practices.htm

68th Road Safety Congress: Safer Driving
March 3–5, Blackpool, England
<http://www.rospe.org.uk/road/>

Motor Vehicle Accident Reconstruction
March 3–5, Detroit, Michigan
<http://www.sae.org/calendar/>

SAE 2003 World Congress
March 3–6, Detroit, Michigan
<http://www.sae.org/congress/index.htm>

National Conference on Highway Safety Priorities
March 9–11, Chicago, Illinois
<http://www.lifesaversconference.org/>

6th International Conference on Fatigue and Transportation
March 9–14, Fremantle, Australia
<http://www.congresswest.com.au/FATIGUE2003/>

Urban Transport 2003
March 10–12, Crete, Greece
<http://www.wessex.ac.uk/conferences/2003/urban03/index.html>

World of Asphalt 2003
March 17–20, Nashville, Tennessee
<http://www.worldofasphalt.com>

Driver Distraction and Telematics
March 18, Troy, Michigan
<http://www.sae.org/calendar/semsafe.htm#drivedist>

Transportation's Role in Successful Communities
March 23–26, Fort Lauderdale, Florida
<http://www.ite.org/Conference/info.htm>


The Safety of New Technology in Transport
March 31–April 4, Leeds, England
<http://www.its.leeds.ac.uk/short/schedule.html#sntt> 

Transportation Tidbits

- The world's first automobile license plates were issued in Paris, France, on August 14, 1893. Plates were not issued in the United States for a few more years, when Boston was the first city to require its motorists to hold a license and register their vehicles.
- On February 1, 1898, the Travelers Insurance Company was the first company to issue an automobile insurance policy to an individual.
- On May 20, 1899, Jacob German, operator of a taxicab for the Electric Vehicle Company, became the first driver to be arrested for speeding. He was stopped by a bicycle roundsman for driving at the “breakneck” speed of twelve miles per hour on Lexington Avenue in Manhattan.
- The first public parking garage in the United States was established on May 24, 1899, in Boston as the Back Bay Cycle and Motor Company. It was advertised as a “stable for renting, sale, storage, and repair of motor vehicles.”
- On April 17, 1911, Charles F. Kettering applied for a U.S. patent for a self-starting mechanism to make starting cars easier than with the crank-starter. Twelve thousand self-starter units were installed in the 1912 Cadillac, providing women with access to cars for the first time.
- The Lincoln Tunnel was officially opened to traffic on December 21, 1937, allowing motorists to drive between New Jersey and Manhattan beneath the Hudson River.
- The first American sports car took shape on June 12, 1952, as Maurice Olley, a chief engineer for Chevrolet, completed a chassis code-named “Opel.” It later became the 1953 Corvette.
- On November 15, 1965, Craig Breedlove set a new land speed record driving his jet-powered Spirit of America–Sonic 1 vehicle at 600.601 mph. **RR**

All facts from “This Day in Automotive History,” <http://www.historychannel.com>.

Editor's Note: The last Transportation Tidbits column incorrectly stated that the red octagonal stop sign was born in 1925. In fact, it was not originally red, but yellow with black lettering. It wasn't until September, 1954 that the stop sign became red. Thanks to Albert L. Godfrey for catching this.



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