



Improving Highway Safety with Intelligent Transportation Systems

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About the Author

Jessica Hutton received her BS in Civil Engineering from the University of Missouri-Columbia in May, 2003. She will begin her career with the Missouri Department of Transportation as a Traffic Engineering when she returns to Missouri at the end of the summer. She has also begun taking classes toward a Masters in Public Administration with an emphasis in public policy at the Truman School of Public Affairs at the University of Missouri. She participated in the Washington Internships for Students in Engineering in the summer of 2003, and was sponsored by the American Society of Civil Engineers.

The WISE Program

The Washington Internships for Students of Engineering, created in 1980, is the joint effort of the National Science Foundation and several professional engineering societies. Each summer, 12 to 16 engineering students from around the country apply to take part in the WISE program to become familiar with the intersection of science and technology and public policy. The WISE program strives to make the future leaders of the engineering profession aware of the ways in which they can and should participate in important legislative and regulatory policy decisions. During the ten weeks of the program, students work with a mentor from their sponsoring society to choose and research a relevant technical policy issue. During the last week of the program, the students present their analyses of the subject in a final presentation, and the completed papers are published on the WISE website in the Journal of Engineering and Public Policy. Students also participate in meetings with various congressional leaders and committees, executive office departments, and governmental and private research groups. WISE interns are housed on the George Washington Campus and are provided a stipend during their stay.

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I would like to thank the American Society of Civil Engineers for choosing to continue to participate in the WISE program at a time when it would have been easy to remove from the budget. ASCE has given me an office, computer, internet access and phone, as well as any needed supplies during my stay in D.C. this summer. The Government Relations staff, including my mentor, Martin Hight, has provided me with resources and guidance throughout the project. I would also like to thank Dr. Jim Dennison, who served as Faculty Member in Residence to this year's WISE interns. He provided motivation, guidance and an abundance of patience throughout the phases of our projects.



Introduction

Each year, over 42,000 people lose their lives on our nation’s roads. The losses associated with these accidents include not only the lives of those involved, but also the time spent in stopped or slowed traffic, excess fuel consumption, the cost of health care, and tax dollars spent on emergency response. The total cost reaches over \$230 billion, according to a GAO report in 2001.¹ Productivity loss accounts for \$81 billion of the total cost, medical expenses cost \$32.6 billion, and property damages make up \$59 billion of the \$230 billion. This is roughly equivalent to \$820 for every person living in the United States. Although the rate of highway fatalities has steadily decreased, considering the increase in the number of vehicle miles traveled each year, the number of fatalities has remained flat, and transportation-related deaths remain the number one cause of death among people ages 1 to 34.² The cost to society in lives, wasted fuel and time, emergency services and decreased productivity is unacceptable and must be reduced.

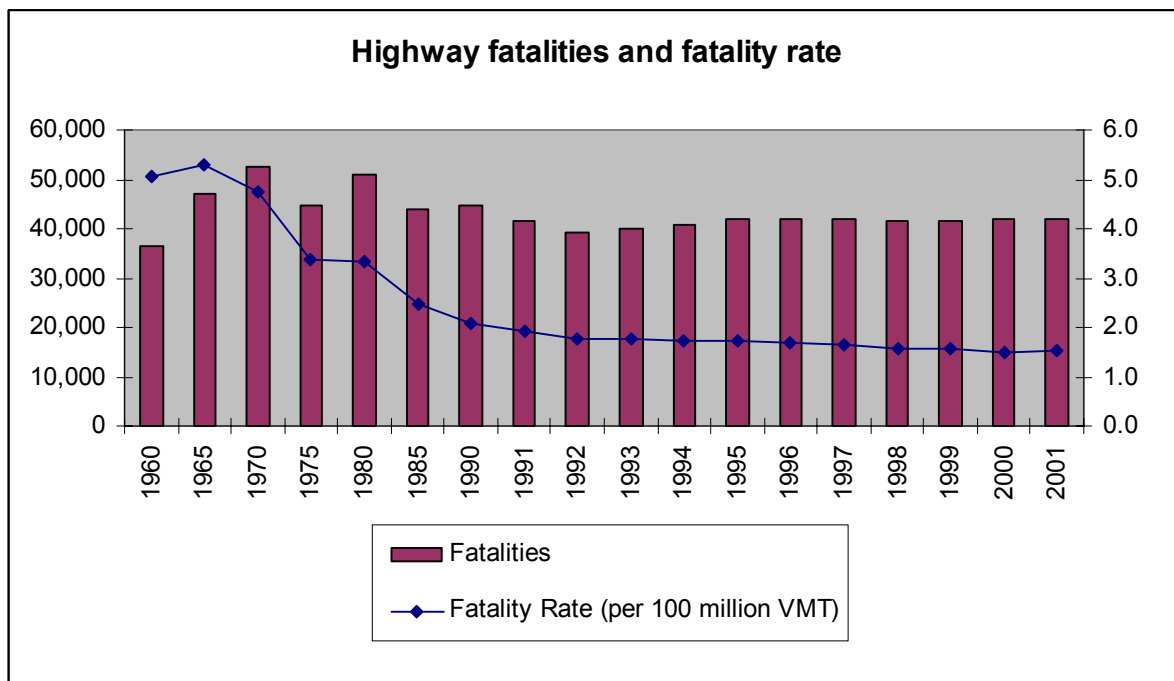


Figure 1: Number and rate of highway fatalities.

¹ General Accounting Office. “Factors Contributing to Traffic Crashes and NHTSA’s Efforts to Address Them.” GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

² Runge, Jeffery W. Administrator, National Highway Traffic Safety Administration. “Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, United States House of Representatives.” May 21, 2003. < <http://www.house.gov/transportation/highway/05-21-03/runge.pdf> > June 24, 2003.

The Transportation Equity Act for the 21st Century, which authorized surface transportation spending from 1998 till 2003, expires September 30, 2003. This only gives Congress a few months to set the policy guidelines for transportation programs and spending recommendations for the next several years. In May 2003, President Bush submitted his Safe, Accountable, Flexible and Efficient Transportation Equity Act, or SAFETEA, which follows in the footsteps of its predecessors, ISTEA and TEA-21, and has recently been introduced in both houses of Congress. As the name of the bill suggests, the main focus is on transportation safety, and one of SAFETEA's main objectives is to reduce the number of highway deaths from 1.5 to 1.0 fatality per 100 million vehicle miles traveled by 2008.³ The bill allocates significant resources to safety programs, creates a Blue Ribbon Panel, and encourages states to implement their own safety strategies by allowing funding flexibility for safety programs that are working. Both houses of Congress are drafting reauthorization legislation, and several other organizations are providing recommendations for overall funding levels and policies in the reauthorization as well.

In order to determine the best way to allocate limited funding to programs that effectively and efficiently work toward the goal of highway safety, it is important to understand the significant factors leading to car accidents. Reports show that most car accidents are caused by a combination of human factors, road conditions, and vehicle failure. Many programs have been implemented to address driving behavior, such as “click-it or ticket” campaigns and state legislation that reduces legally allowable blood alcohol levels of drivers. The automobile industry is continually developing better restraining systems, crash avoidance systems, and vehicle location devices. Research has also been conducted to create intelligent infrastructure and driver warning systems. In order to significantly increase highway safety, all three strategies—behavior modification and driver education, vehicle safety, and smart infrastructure—must be used in conjunction with one another.

While safety is the highest priority, reducing congestion on our nation's highway has also become a major concern. Between 1985 and 1995, the number of vehicle miles traveled per year has increased 37 percent, while the number of lane miles constructed has only

³ Office of Management and Budget. Department of Transportation. Budget FY 2004. < <http://whitehouse.gov/omb/budget/fy2004/transportation.html> > July 24, 2003.

increase by 1 percent over the same time period.⁴ Road construction crews are at work in more locations for longer periods of time as they try to increase capacity to meet the growing demand. Even so, congestion in many urban areas continues to increase. Safety in work zones and congested areas is becoming increasingly important, and improving the safe, efficient flow of traffic on congested highways is essential.

The standard solution to increased congestion is building more highway lane miles. Although more roadway miles do mean more capacity and less congestion, it is an expensive solution. In many urban areas, the number of lane-miles that can be added to a system is not only limited by the staggering cost, but also by the amount of space available for construction. Funding for safety is typically invested into educational and behavioral programs that focus on seatbelt use and decreasing impaired driving. Although reducing the number of alcohol-related incidents and the number of fatalities that could have been prevented with seatbelt use is important, it is not the only safety precaution available. Increasing funding for behavioral programs begins to have diminishing returns at some point. A 100 percent compliance with traffic safety laws will never be realized, no matter how much money is invested in the programs. Safer and smarter highway infrastructure, intelligent vehicle applications and systems capable of warning drivers of potential hazards can be, in many cases, very efficient ways of minimizing the consequences of traffic violations and impaired driving.

Several Intelligent Transportation Systems (ITS) exist to help control the flow of traffic, coordinate signal timing to reduce conflict in intersections, pass important traffic information along to drivers, warn travelers of inclement weather conditions, reduce congestion along toll roads with electronic fare collection, and reduce the number of red-light and speeding violations with automatic enforcement devices. ITS can also be used to gather data and report it to emergency response teams so that response times are reduced. Many of these technologies have been in existence long enough for useful information regarding their effectiveness, cost and benefits to be obtained, and much of this information is being collected in a national database. Some technologies are cutting edge and are only in the concept or preliminary experimental phases. As the information becomes available, it is

⁴ American Road and Transportation Builders Association. "The Federal Highway Program and Highway Safety." 1998. < www.ntweek.org/campaigns/econ1.pdf > August 1, 2003.

necessary that the lessons learned from each implementation be passed along to other researchers and DOTs, so the benefits of available technologies can be realized by all communities. Ideally, as states and communities continue to invest in transportation infrastructure projects, they will incorporate ITS strategies that make sense for each project. The goal is to eventually create a national system, capable of real time communication that safely and efficiently moves people, goods and services across the country.

Background: Causes of highway accidents and fatalities

The causes of vehicle accidents fall into three main categories: human factors, road and environmental conditions, and vehicle failure or malfunction. But rarely is any accident the result of a single, easily determined cause. In many cases, circumstances leading to a crash involve factors from more than one of the categories. For example, an accident involving a young driver whose breaks aren't functioning properly driving on icy pavement has several contributing factors, even though only one may be named in the accident report. A report published by the General Accounting Office claims that human factors, which include speeding, violating traffic laws, inattention, age, effects of alcohol and drugs, and decision errors, most often contribute to accidents. Roadway environment, such as roadside hazards, poor road design, pavement conditions and weather, closely follow human factors, with vehicle factors being the least common contributor to crashes.⁵

In order to determine the most effective approaches to reduce highway deaths, injuries, and related costs to acceptable levels, it is necessary to have an accurate and complete picture of the causes and circumstances of traffic accidents. The last comprehensive study on the causes of highway accidents was conducted in the 1970's,⁶ and much advancement in road and vehicle safety and changes in driver attitudes have changed transportation safety issues in the past three decades.

Alcohol-related traffic accidents claimed nearly 18,000 lives in 2002, and driver impairment due to alcohol is the single most contributing factor to accidents. Although the rate of alcohol-related fatalities has steadily declined from about 59.6 percent of the total highway deaths in 1982 to about 39.7 percent in 1999, the percentage has increased in each of the past three years, and was 41.9 percent in 2002. The rate of alcohol-related highway fatalities was 0.65 deaths per 100 million vehicle miles traveled in 1997, and has had almost no further decline since.⁷

⁵ General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

⁶ Runge, Jeffery W. Administrator, National Highway Traffic Safety Administration. "Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, United States House of Representatives." May 21, 2003. < <http://www.house.gov/transportation/highway/05-21-03/runge.pdf> > June 24, 2003.

⁷ General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

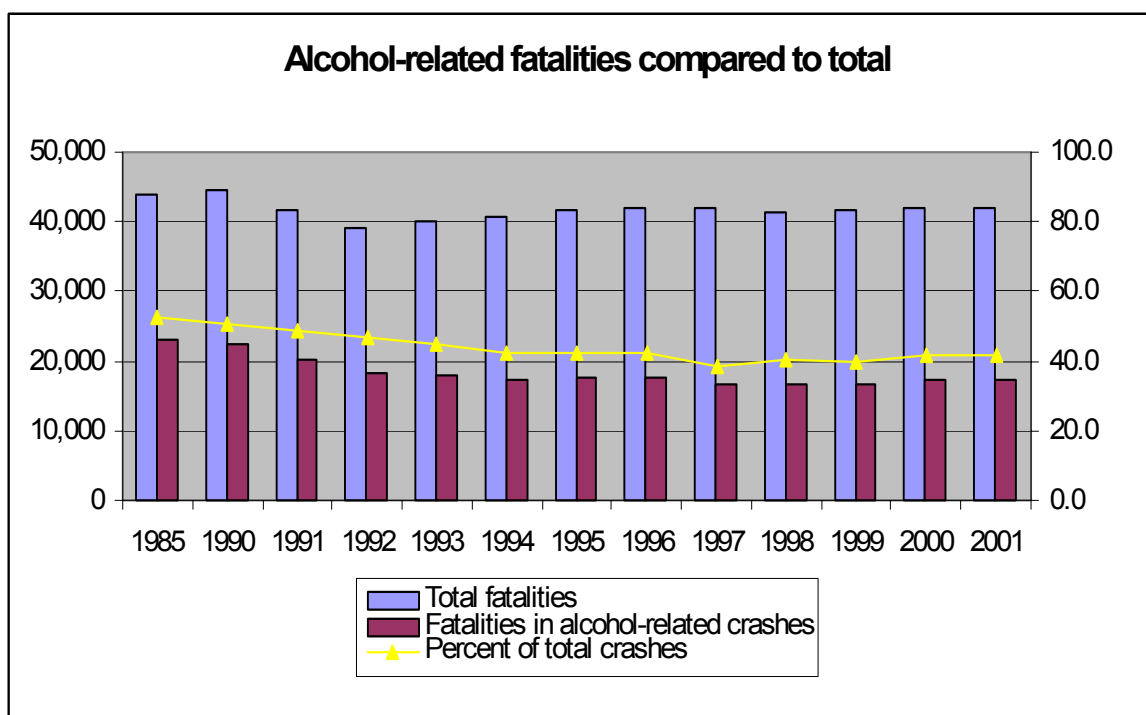


Figure 2: Alcohol-related fatalities compared to total fatalities.

Speeding is another leading cause of fatal accidents, claiming over 12,000 lives in 2000 and contributing to 30 percent of all fatal crashes. Driving faster than posted speed limits or what safety would dictate reduces the driver's ability to negotiate curves or steer around objects in the roadway, extends the distance required to stop the vehicle, and increases the distance the vehicle travels during the driver's reaction time.⁸ Speed-related accidents are not only found on high-speed Interstates. In fact, only 13.9 percent of speed-related fatalities occurred on Interstates, while 38.7 percent were on other arterial roads, 24.3 percent on collector roads and 23.1 percent on local roads. The cost of speed-related accidents exceeds \$24.4 billion annually. The National Highway Transportation Safety Board has shown a correlation between alcohol use and speeding in fatal crashes. In 2000,

⁸ General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

while only ten percent of nonspeeding underage drivers were intoxicated, 23 percent of speeding underage drivers were under the influence of alcohol.⁹

Speeding contributes to fatal accidents more often when weather conditions create poor road environment. In 2000, speeding was a factor in 27 percent of accidents on dry roads, 34 percent of accidents on wet roads and 48 percent of accidents on icy roads. Speeding is also a contributing factor in 27 percent of work zone fatalities. Crashes in construction and work zones is a growing concern as the number of fatalities in these areas increased from 868 in 1999 to 1,093 in 2000.¹⁰

Almost one-third of all crashes are rear-end collisions. The National Transportation Safety Board investigated 9 rear-end collisions in which 20 people died and 181 were injured. In each of these accidents, the driver had a degraded perception of traffic conditions ahead. None of the drivers tested positive for alcohol or drugs. In some cases, glare, fog or smoke inhibited the driver's ability to see upcoming traffic. In other cases, the driver was not able to detect that traffic had slowed to a halt due to congestion at work zones or accident scenes. Some drivers may have been distracted or fatigued. A study by Daimler-Benz in 1992 claimed that if drivers are given an additional 0.5 seconds of warning time, 60 percent of rear-end collisions can be prevented and an extra full second could prevent almost 90 percent of rear-end collisions.¹¹

Seatbelt use, which has increased from 14 percent in 1983 to 75 percent today, has helped to reduce the number of fatalities on the road.¹² However, it is estimated that if the national average of safety belt use increased from the current 75 percent to 90 percent, approximately 4,000 lives would be saved annually.¹³

Driver age is also a significant contributing factor in fatal accidents. Although the highway fatality rate has been cut in half since 1980, highway vehicle miles traveled have

⁹ United States Department of Transportation. Federal Highway Administration. "Status of the Nation's Highways, Bridges, and Transit: 2002 Conditions and Performance Report." Chapter 5: Highway Safety Performance. <<http://www.fhwa.dot.gov/policy/2002cpr/ch5.htm>> July 8, 2003.

¹⁰ Ibid.

¹¹ National Transportation Safety Board. "Vehicle- and Infrastructure-Based Technology for the Prevention of Rear-end Collisions." NTSB # SIR-01/01. June 16, 2002. <<http://ntsb.gov/publictm/2001/SIR0101.htm>>

¹² General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. <www.gao.gov/new.items/d03730t.pdf> June 10, 2003.

¹³ Mineta, Norman Y. Transmittal Letter to the Honorable Richard B. Cheney, President of the Senate. May 12, 2003. <<http://www.fhwa.dot.gov/reauthorization/transletter051203cheney.htm>> June 12, 2003.

increased, and are projected to continue their growth rate for the next decade. Younger and older drivers are expected to increase, and these groups have the highest risk of becoming involved in an accident. In the next 20 years, the number of drivers over 70 will double, and these drivers often have poor vision, medication side-effects and slower reaction times. Drivers under 25 are most likely to be killed in crashes because they have the highest intoxication rates and the lowest seat-belt use.¹⁴

Although roadway environment is believed to be the second most prevalent factor leading to traffic fatalities, it is difficult to quantify the extent to which it contributes. Poor road design, location of medians, lack of shoulders, access points, intersection geometry, sharp curves, poor stopping sight distance, improper speed limits, and roadside hazards all increase the chances of highway accidents and fatalities. Weather conditions that decrease visibility and reduce friction on the road are also considered in this category.¹⁵ The National Highway Traffic Safety Administration's (NHTSA) crash database contains limited information on how these design features and weather conditions contribute to accidents.¹⁶ It is estimated that poor road conditions and outdated alignments contribute to about 13,000 road-related fatalities in the U.S. each year, almost a third of the total.¹⁷

Intersections are prime locations for fatal crashes. One third of rural crashes and one half of urban crashes occur at intersections. Intersections require drivers to be more aware of their environment. Decisions have to be based on many factors, including presence of oncoming traffic, often from more than one direction, speed of oncoming traffic, and traffic signals or signs. Slight judgment errors can easily lead to accidents in these situations.¹⁸ A greater number of fatalities occur in rural systems than in urban systems. In the past decade, fatality rates on rural systems are more than twice the rate on urban systems, with local roads in rural areas demonstrating the highest fatality rates. Urban freeways and expressways

¹⁴ American Association of State Highway and Transportation Officials. "Highway Safety: Facing the Growing Challenge." < <http://www.transportation.org/download/issues/hwysafety2003.pdf> > June 25th, 2003.

¹⁵ General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

¹⁶ Ibid.

¹⁷ American Road and Transportation Builders Association. "ARTBA Calls for Minimum \$50 Billion Per Year Federal Highway Investment in Next Program Reauthorization to Maintain System Conditions." Press release April 9, 2001. < http://www.artba.org/news/press_releases/2001/04-09-01a.htm > July 21, 2003.

¹⁸ United States Department of Transportation. Federal Highway Administration. "Status of the Nation's Highways, Bridges, and Transit: 2002 Conditions and Performance Report." Chapter 5: Highway Safety Performance. < <http://www.fhwa.dot.gov/policy/2002cpr/ch5.htm> > July 8, 2003.

showed the greatest decrease in fatality rate since 1993, while rural interstates have shown an increase in fatality rates.¹⁹ Although two-lane roads only account for half of the total vehicle miles traveled, 77 percent of all fatal motor vehicle accidents occur on these types of roads.²⁰

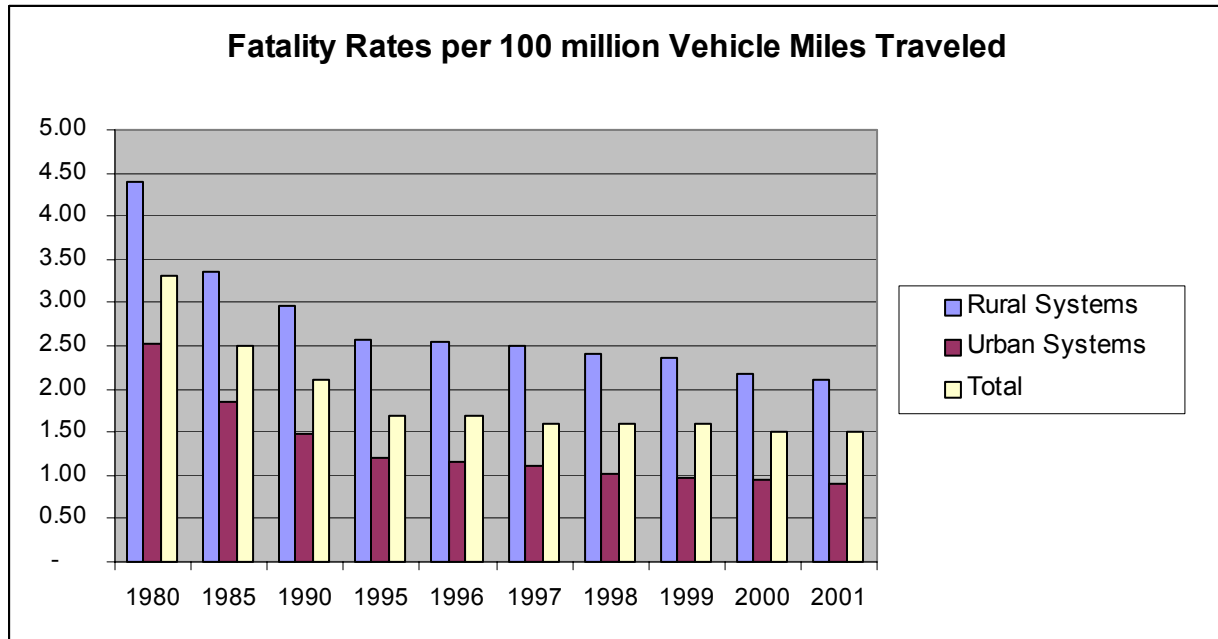


Figure 3: Fatality rates by type of road system.

Vehicle design is an important factor in whether or not accidents will be fatal. Although in 2002 it was found that only about 2 percent of the 32 million crashes in 1997 could be directly linked to a vehicle-related factor, vehicle design affects handling in different situations. Vehicles with a higher center of gravity, such as SUVs, are much more likely to roll over than are passenger cars. Passengers in vehicles that roll over have a lower likelihood of surviving and accident. In 2002, fatalities in rollover crashes involving pick-up trucks and SUVs accounted for 53 percent of the increase in traffic deaths.²¹

¹⁹ Ibid

²⁰ American Road and Transportation Builders Association. "ARTBA Calls for Minimum \$50 Billion Per Year Federal Highway Investment in Next Program Reauthorization to Maintain System Conditions." Press release April 9, 2001. < http://www.artba.org/news/press_releases/2001/04-09-01a.htm > July 21, 2003.

²¹ General Accounting Office. "Factors Contributing to Traffic Crashes and NHTSA's Efforts to Address Them." GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

Large trucks account for a disproportionate number of fatal accidents. While large trucks only make up 4 percent of the registered vehicles in the U.S. and 7 percent of the traffic volume, they are involved in 13 percent of all fatal crashes.²² These accidents also tend to be more expensive, because often more resources and time are needed to clear the accident. Not only is productivity decreased and fuel wasted while travelers sit in congestion, but also damage to the truck and its cargo is a costly loss.

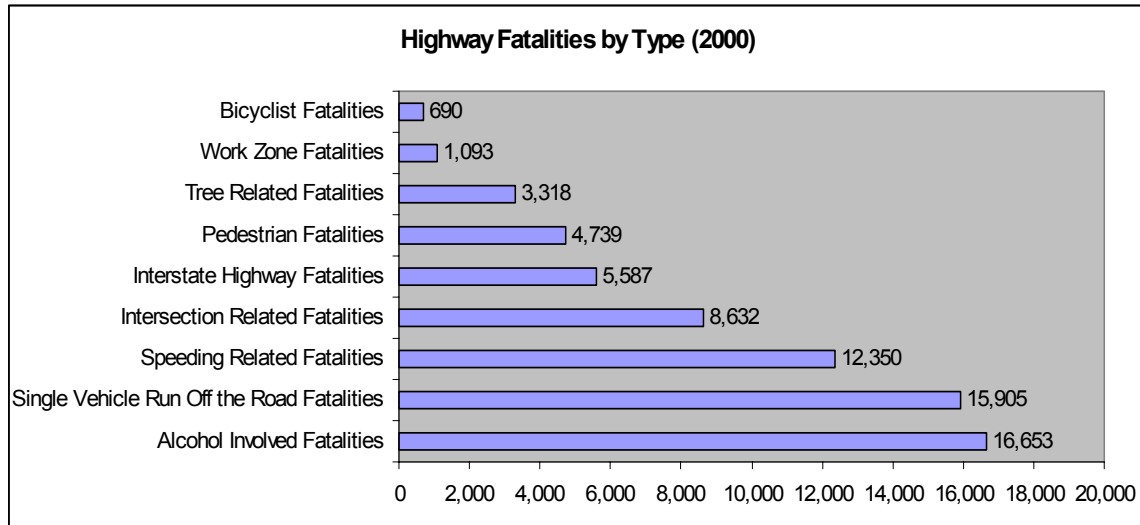


Figure 4: Highway fatalities by type.

Once the causes of accidents are understood, the question then becomes how to spend the funding allocated for safety and Intelligent Transportation Systems. The National Motor Vehicle Crash Causation Survey, as outlined in the President’s SAFETEA proposal, will work to clearly identify key areas of concern and define specific needs for improvement and change in our safety strategies. SAFETEA also requires that states have an incident reporting system in place within two years.²³ The United States Department of Transportation’s (U.S. DOT) Bureau of Transportation Statistics (BTS) has also developed a

²² United States Department of Transportation. Federal Highway Administration. “Status of the Nation’s Highways, Bridges, and Transit: 2002 Conditions and Performance Report.” Chapter 5: Highway Safety Performance. < <http://www.fhwa.dot.gov/policy/2002cpr/ch5.htm> > July 8, 2003.

²³ Intelligent Transportation Society of America. “SAFETEA: Questions and Answers about the TSM&O and ITS Provisions.” ITS Cooperative Deployment Network Newsletter. May 29, 2003. < http://www.nawgits.com/icdn/safetea/safetea_qa.html > June 19, 2003.

Safety Data Initiative to improve the quality of transportation data in order to identify and minimize risk factors. BTS developed and DOT approved a Safety Data Action Plan after a series of national conferences and workshops with stakeholders, which includes ten research projects to improve data quality. Research topics include developing better data on accident precursors, reporting “near-miss” data to gather information that may prevent future accidents, exploring ways to use new technology in data collection, and developing reporting guidelines so that the same categories of information are reported in the same way for all accidents.²⁴

Although accident rates have been declining in every major area of transportation, the diminishing gains suggest that some safety programs may be reaching their performance limits.²⁵ Alternatives to standard safety programs aimed at encouraging people to wear seat belts and enforcing stricter laws regarding driving under the influence of alcohol or drugs need to be established. The decisions drivers make will always be uncontrollable and unpredictable to a certain extent. Making the roads and vehicles smarter and safer can minimize the consequences of driver error, helping to protect the victims of another driver’s poor judgment.

²⁴ Bureau of Transportation Statistics. “Safety Data Initiative.” < <http://www.bts.gov/sdi/> > July 1, 2003.

²⁵ Ibid.

Key players and their roles

Several groups, both public and private, are stakeholders in the surface transportation reauthorization. A few of the organizations that have given recommendations, proposals or testimony regarding the levels and distribution of safety or ITS funding under the reauthorization have been briefly described below. It should be noted that all of the organizations mentioned below believe improving the nation's highway system and highway safety are high priorities. Although there are several groups that oppose higher investment in highway infrastructure for various reasons, they were not included in the scope of this paper.

Government groups

The President and the Secretary of Transportation presented to Congress in May 2003, their transportation reauthorization plan, the "Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003." As the name suggests, one of SAFETEA's primary goals is to make the highways safer, by reducing the number of incidents, injuries and fatalities that occur on our roads every year. In his transmittal letter to the Senate, Secretary Norman Mineta cites the 43,000 lives lost and economic impact of \$230 billion dollars each year due to motor vehicle crashes and states, "We have a moral, as well as an economic, obligation to address immediately the problem of transportation safety." By emphasizing the goal to reduce the number of lives lost on the highways, the administration will work to gain the support of the public and lawmakers for their reauthorization plan.²⁶

The United States Department of Transportation is the primary federal agency responsible for "shaping and administering policies and program to protect and enhance the safety, adequacy, and efficiency of the transportation system and services." As with the other federal agencies, the Department of Transportation works with President's Office of Management and Budget each year to provide congress with requests for funding the DOT's various programs and projects. The Secretary oversees eleven individual operating administrations, including the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA), the Federal Railroad Administration (FRA) and the Federal

²⁶ Mineta, Norman Y. Transmittal Letter to the Honorable Richard B. Cheney, President of the Senate. May 12, 2003. < <http://www.fhwa.dot.gov/reauthorization/transletter051203cheney.htm> > June 12, 2003.

Transit Administration (FTA), which each handle different aspects of highway safety.²⁷ In 1994, the Department of Transportation established the Intelligent Transportation Systems Joint Program Office, housed in the FHWA, to coordinate and lead the ITS research and deployment among the previously listed agencies.²⁸

The Federal-Aid Highway Program is one of the two main programs within the Federal Highway Administration. This program provides the states with federal financial assistance to construct and improve roads and bridges on the National Highway System and in urban and rural areas. Funds are used for general improvements and safety development. The FHWA also provides technical expertise and training to its partners, such as state DOTs, in several areas, including highway safety, intelligent transportation systems, and research, development and technology transfer. Policies and guidelines are developed by the FHWA to achieve the goals of safety and economic development.²⁹

The National Highway Traffic Safety Administration is responsible for reducing the human and economic losses resulting from vehicle crashes by setting and enforcing motor vehicle and equipment safety standards. NHTSA provides grants to the states to aid in safety programs aimed at reducing the threat of drunk drivers, increasing safety belt and child safety seat usage, and providing information on safety topics. NHTSA also works to determine the most effective means of working toward safety improvements by conducting research on driver behavior and traffic safety.³⁰

The ITS Joint Program Office, formally established in 1994, seeks to provide leadership for ITS research, development, testing and deployment, to guide policy coordination and to ensure resource accountability. The ITS Management Council, chaired by the Deputy Secretary of Transportation, provides policy guidance, while the ITS Strategic Planning Group, made up of surface transportation leaders throughout the department, provides planning guidance. The individual program administrations, such as FHWA,

²⁷ United States Department of Transportation. Office of the Historian. "The United States Department of Transportation: A brief History." < <http://isweb.tasc.dot.gov/Historian/history.htm> > June 25, 2003.

²⁸ United States Department of Transportation. "ITS Program Coordination." < <http://www.its.dot.gov/itsweb/jpostaff/backgrd.htm> > June 25, 2003.

²⁹ United States Department of Transportation. Federal Highway Administration. "Who We Are and What We Do." < <http://www.fhwa.dot.gov/whoweare/whoare4.htm> > June 25, 2003.

³⁰ United States Department of Transportation. National Highway Traffic Safety Administration. "About the National Highway Traffic Safety Administration." < <http://www.nhtsa.dot.gov/nhtsa/whatis/overview/> > June 25, 2003.

NHTSA, FTA, FRA, and FMCSA are responsible for ITS implementation. The national ITS program seeks to improve the efficiency and safety of the nation's surface transportation system using advanced technology for both information and infrastructure based approaches.³¹

State Departments of Transportation also play a critical role in highway safety and the deployment of ITS. Most of the categorically funded federal highway programs provide 80 percent of the funds, while the states are required to provide the other 20 percent. The previous two surface transportation reauthorizations have worked to increase the flexibility that states have with the use of federal funds. Although federal money often comes with mandates, these mandates are becoming increasingly performance-based, allowing the state DOTs more freedom in how to achieve the performance goals. State and local transportation officials have a much clearer understanding of the specific transportation needs and strengths in their region, and typically are best suited for determining what types of programs, whether for construction, highway safety, or ITS deployment are most appropriate for their state, county or town.

The National Transportation Safety Board (NTSB) is an independent federal agency that investigates significant accidents and issues safety recommendations to prevent similar accidents from occurring in the future. Although the NTSB is primarily concerned with investigating all civil aviation accidents, it also investigates selected highway accidents and transportation accidents involving recurring problems. The NTSB has no regulatory or enforcement powers but is known for being impartial, and most of its recommendations are adopted. Currently, the NTSB lists the three most wanted safety improvements on the highway as being primary seat belt enforcement laws, commercial truck and bus safety and youth highway safety. NTSB highway studies and special reports range in topic from driver fatigue to brake system failures of trucks to school bus safety.³²

Funding for the Department of Transportation ultimately comes from Congress, who authorizes, allocates and appropriates federal dollars. Currently both the House and the Senate are considering the President's reauthorization proposal, SAFETEA, and drafting

³¹ United States Department of Transportation. "ITS Program Coordination." < <http://www.its.dot.gov/itsweb/jpostaff/backgrd.htm> > June 25, 2003.

³² National Transportation Safety Board. "History and Mission." < http://www.nts.gov.Abnt_NTSB/history.htm > June 25, 2003.

their own proposals. The authorization legally provides for the existence of the programs associated with surface transportation. The current authorization expires September 30th, 2003, so the Congress has only a few months to pass a reauthorization in order to legally continue the operation of the Department of Transportation. The Intermodal Surface Transportation Equity Act (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21), SAFETEA's predecessors, were both six-year authorizations, and it is expected that the next reauthorization will have the same life-span. However, it is likely that a six-year plan may not be agreed upon by both House and Senate before the current reauthorization expires. If this happens, Congress would likely pass a reauthorization that basically extends the current policy and funding levels for a short period of time, perhaps six months or a year, until a long term reauthorization can be developed and agreed to.³³

Authorization bills not only lay out the policy and funding levels for the programs it authorizes, but must also provide sources of funding to support those programs. In general, the Appropriations committee will appropriate the level of funding specified in the authorization. Most of the programs are categorical and the funding they provide to each state is based on a formula described in the authorization. However, discretionary funds, which are not automatically distributed to the states by formula, are often earmarked for projects that benefit the Appropriators' constituents.³⁴

The congressional ITS Caucus was formed in 2001 to raise awareness of and support for intelligent transportation systems during the reauthorization of transportation funding. The caucus created an advisory committee of experts in ITS technologies, who decided to focus on congestion, safety and transportation security, because they believe these are the three most important issues that are most likely to benefit from the use of ITS.³⁵ Many members of the ITS Caucus are on the committees drafting the surface transportation reauthorization legislation. The ITS Caucus advisory committee provides recommendations to Congress on the benefits of different funding scenarios for ITS research, development, deployment and operations.

³³ Upchurch, Dr. John. ASCE fellow to the U.S. House Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit. Personal Interview. July 14, 2003.

³⁴ Ibid.

³⁵ "Recommendations of the Congressional ITS Caucus Advisory Committee." February 14, 2003. <[http://www.itsa.org/subject.nsf/926a8faa89b0667e86256e91005e0425/425d52b2367ba58b85256d0e0029416d/\\$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc](http://www.itsa.org/subject.nsf/926a8faa89b0667e86256e91005e0425/425d52b2367ba58b85256d0e0029416d/$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc)> July 10, 2003.

Non-government groups

The Intelligent Transportation Society of America (ITS America or ITSA) serves as an advisory committee to the United States Department of Transportation and works to develop partnerships between the public and private sectors to use advanced technologies to increase the safety and efficiency of surface transportation. ITS America strives to identify, develop, integrate and deploy these advanced technologies by promoting awareness and acceptance of technology solutions in transportation. Government agencies at all levels, foreign and domestic, companies involved in ITS development, universities, research organizations and others interested in intelligent transportation systems make up the membership of ITS America.³⁶

The American Road and Transportation Builders Association (ARTBA), which represents an industry that generates more than \$200 billion in U.S. economic activity and employs 2.2 million Americans, has been advocating strong federal investment in transportation infrastructure for over a century. In recent decades, ARTBA has also been recognized as a leader in highway work zone safety, holding two national conferences on the issue in 1985 and 1994, and helping to establish the National Work Zone Safety Clearing House in 1998. ARTBA played a vital role in both the 1991 and 1998 Surface Transportation reauthorizations by providing legislative recommendations, and will undoubtedly play an important role in the current reauthorization.³⁷

The American Association of State Highway and Transportation Officials (AASHTO) is a nonprofit association, representing the transportation departments in all 50 states, D.C and Puerto Rico. AASHTO works to advocate transportation policies, facilitate institutional change, provide technical services and demonstrate the contributions of transportation. The goal of AASHTO is to advance the development, maintenance and operation of an integrated national transportation system.³⁸ AASHTO has developed specific

³⁶ The Intelligent Transportation Society of America. "About ITS America."

< [http://www.itsa.org/new.nsf/vLookupAboutITSA/\\$first?OpenDocument](http://www.itsa.org/new.nsf/vLookupAboutITSA/$first?OpenDocument) > June 25, 2003.

³⁷ American Road and Transportation Builders Association. "A Century of Service to the U. S. Transportation Construction Industry." http://www.artba.org/about_artba/history/overview.htm June 25, 2003.

³⁸ American Association of State Highway and Transportation Officials. "Organization Overview." < <http://www.transportation.org/aashto/organization.nsf/homepage/overview> > June 25, 2003.

recommendations for the reauthorization of TEA-21 in several categories, including highway safety, operations and ITS, and research.

The American Society of Civil Engineers (ASCE), a professional society made up of over 140,000 individual members, works not only to keep their members informed of important legislation and policy that affects civil engineers, but also to promote a strong relationship between the legislature and practicing engineers. In the case of the transportation reauthorization, ASCE provides its members with information on what the legislation might mean to them, whether specific policies work toward or against ASCE's goals, and strategies for informing members of congress of technically sound policies to achieve those goals. ASCE also publishes a report card rating the condition of the roads, bridges, transit and other infrastructure in the nation, and estimates the level of investment needed to maintain and improve the system.

These organizations are only a few of the many groups who have an interest in the policies and funding levels laid out in the reauthorization of TEA-21. Other stakeholders include the Transportation Construction Coalition, a group of 27 national associations and labor unions with a direct market interest in the federal transportation programs, and the Institute of Transportation Engineers, an international individual member educational and scientific association of professionals who are responsible for meeting society's needs for safe and efficient surface transportation worldwide. Although the Subcommittee on Highways and Transit under the Transportation and Infrastructure Committee in the House and the Subcommittee on Transportation and Infrastructure under the Environment and Public Works committee in the Senate are the most involved in the reauthorization, several committees and subcommittees have role in funding transportation. In the house, the bill was also referred to the Committees on Ways and Means, the Budget, Science, Resources, the Judiciary, Energy and Commerce, Government Reform, and Rules. In the Senate, the Commerce, Science and Transportation Committee also has jurisdiction over parts of the reauthorization.

Transportation Reauthorization

The President's proposal

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), and the Transportation Equity Act for the 21st century (TEA-21) of 1998 provided the foundation for addressing the nation's present and future transportation challenges. ISTEA provided the states with unprecedented flexibility to solve their local problems while still working toward national goals. TEA-21 ensured that all highway user fees go toward highway, transit and safety programs, and that funding levels are guaranteed by a budgetary firewall mechanism.³⁹ The President's proposal for transportation reauthorization, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA), works to further this trend and to give states and local partners more tools and greater responsibility to plan and implement unique solutions in key program areas. In the area of highway safety, states would be rewarded for their increased safety performance with increased funds and the flexibility to use them on behavioral safety programs, such as seatbelt usage, or infrastructure safety projects.⁴⁰ SAFETEA contains several sections relating specifically to funding for safety and ITS.

Safety funding

In his testimony before the House Subcommittee on Highways, Transit and Pipelines, Jeffrey Runge, and administrator in the National Highway Traffic Safety Administration (NHTSA), stated that the new core highway safety infrastructure program established in SAFETEA, called the Highway Safety Improvement Program will more than double the level of safety funding in TEA-21, providing \$7.5 billion over the 6-year authorization period. States would not only be given funding for safety, but they would also be encouraged to formulate their own comprehensive safety plans.

³⁹ United States House of Representatives. Committee on Transportation and Infrastructure. "Administration's 'Inadequate' Highway & Transit Funding Proposal Criticized by Congressional Panel." Press release May 15, 2003. < <http://www.house.gov/transportation/press/press2003/release88.html> > June 9, 2003.

⁴⁰ Runge, Jeffery W. Administrator, National Highway Traffic Safety Administration. "Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, United States House of Representatives." May 21, 2003. < <http://www.house.gov/transportation/highway/05-21-03/runge.pdf> > June 24, 2003.

Significant proportions of the money allocated for highway safety in the SAFETEA proposal goes toward increased use of seat belts. NHTSA's Section 402 safety programs will be more streamlined in SAFETEA, providing \$1.05 billion over the six-year authorization period to the basic formula grant program. The new Safety Belt Performance Grant encourages states to pass primary safety belt laws and to achieve greater usage rates and provides up to \$100 million a year to reward states that do so. Additional grants for improving safety belt usage rates provide \$182 million over the six-year period. In certain circumstances, states may use up to 100 percent of their grant money for infrastructure investments eligible under the Highway Safety Improvement Program.

Although the statistics show that passengers wearing seatbelts are much more likely to survive accidents than those who are not restrained, seatbelt usage fails to prevent accidents from occurring. It has also been shown that the average lifetime cost for a critically injured accident survivor is \$1.1 million.⁴¹ Although the value of human life is not measurable, preventing accidents from occurring will do much more to lower the \$230 billion in associated costs than will decreasing fatalities by promoting seatbelt usage.

The General Performance Grant, also under section 402, provides state \$340 million over the six-year period in incentives to reduce motor vehicle fatalities, alcohol-related fatalities, and pedestrian and bicycle fatalities. Up to 50 percent of these grants can be used for the new Highway Safety Improvement Program (HSIP) activities, and according to section 151, which outlines flexibility for safety initiatives, up to 50 percent of the money available to states for the HSIP can be used for activities in section that are not eligible for assistance under the HSIP section.⁴²

Section 150 describes the role of the states and the DOT in the new Highway Safety Improvement Program. In order to receive funds under this section, each state is required to develop its individual HSIP, which provides a process to identify and analyze highway safety problems and opportunities and produces a program of projects for funding under section 150. The Secretary will establish implementing guidelines, including adopting strategic,

⁴¹ Runge, Jeffery W. Administrator, National Highway Traffic Safety Administration. "Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, United States House of Representatives." May 21, 2003. < <http://www.house.gov/transportation/highway/05-21-03/runge.pdf> > June 24, 2003.

⁴² United States Senate. S.1072: Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003. May 15, 2003. < <http://thomas.loc.gov/cgi-bin/query/F?c108:1:./~c108b11Wx5:e100485:> > June 9, 2003.

performance-based goals for the states' HSIPs that focus resources on areas of greatest need and compliment programs developed under section 402, advancing traffic records data collection and analysis on all public roads to identify hazardous locations and other dangers to motorists, bicyclists and pedestrians, determining priorities for improvements, and evaluating the results achieved by safety improvements projects carried out under this section. States will report to the Secretary, according to the schedule and requirements he determines.⁴³

ITS funding

SAFETEA requests a total of approximately \$1.7 billion in funding for Intelligent Transportation Systems over the next six years. This is a 20 percent increase from the \$1.3 billion authorized in TEA-21. Jeffery Paniati, FHWA Associate Administrator for Operations and Acting Director of the U.S. DOT ITS Joint Program Office explained the ITS funding available under SAFETEA in an interview with the ITS Cooperative Deployment Network. There are three main programs that fund ITS. The ITS Performance Incentive is a categorical program that provides \$135 million a year by formula to the states. States are also given a share of the \$25 million a year for Commercial Vehicle Information Systems and Networks. The third program is a two percent set-aside of National Highway System funds for intermodal connectors. Funding for ITS exists in some of the other programs as well. For example, the Infrastructure Performance and Maintenance Program is focused on projects that can be completed quickly to maintain the system and increase performance. This program provides a million dollars of Surface Transportation Program funding to the states by formula specifically to address traffic choke points or congestion. States can decide to use the funding to preserve the system or for ITS to manage and control traffic to achieve this goal. TEA-21 ensured that funding for ITS would be available under the National Highway System (NHS), Surface Transportation Program (STP), and Congestion Mitigation and Air Quality (CMAQ) Improvement Program, but Paniati suggests that SAFETEA takes this a step further by providing incentives for ITS and developing a categorical program for ITS funding. SAFETEA emphasizes information acquisition and sharing and gives greater

⁴³ United States Senate. S.1072: Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003. May 15, 2003. < <http://thomas.loc.gov/cgi-bin/query/F?c108:1:./~c108b11Wx5:e100485:> > June 9, 2003.

flexibility to regional institutions, which are the central components of supporting ITS deployment. SAFETEA has gone further toward mainstreaming ITS in both its funding and language by defining the role that ITS plays in management and operations.⁴⁴

Research and Development funding

SAFETEA would provide the NHTSA's highway safety research and development program \$559.5 million over the six year period. This program collects and disseminates highway safety data and supports state highway safety behavioral programs and activities. Research under this program is meant to provide scientific basis for the effectiveness of certain safety measures to ensure that tax dollars are spent on programs that can provide results. Much of the program is focused on behavioral research, such as impaired driving programs, safety belt and child safety seat law enforcement, speed management, aggressive driving, fatigue and inattention.⁴⁵

Section 402 provides a key provision for undertaking a comprehensive National Motor Vehicle Crash Causation Survey, funded out of the highway safety research and development program at \$10 million a year. The survey will provide data based on current assumptions of traffic patterns, vehicle technologies, driver attitudes and vehicle designs, which have changed significantly since the last comprehensive survey was completed in the 1970's. States are also provided incentives to improve traffic records data with a \$300 million grant program.⁴⁶ The survey will be directed by the proposed National Blue Ribbon Commission on Highway Safety, which would be comprised of the Secretary of Transportation, administrators from the NHTSA, FHA, FMCSA, and the FRA, and 10 people appointed by the Secretary representing states, the safety community, law enforcement agencies, public health officials and related House and Senate committees. The Committee is authorized to spend \$8 million over the length of the study, and will provide Congress with an initial report by September 2006, giving legislative recommendations to reduce highway

⁴⁴ Intelligent Transportation Society of America. "SAFETEA: Questions and Answers about the TSM&O and ITS Provisions." ITS Cooperative Deployment Network Newsletter. May 29, 2003. < http://www.nawgits.com/icdn/safetea/safetea_qa.html > June 19, 2003.

⁴⁵ Runge, Jeffery W. Administrator, National Highway Traffic Safety Administration. "Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, United States House of Representatives." May 21, 2003. < <http://www.house.gov/transportation/highway/05-21-03/runge.pdf> > June 24, 2003.

⁴⁶ Ibid.

fatalities, and will give the final report by February 2009, with further recommendations for safety strategies and funding levels.⁴⁷

Congressional Criticisms

Transportation and Infrastructure Committee Chairman, Representative Don Young (R-AK), praises the Bush reauthorization proposal for putting such a strong emphasis on saving lives, but claims that one-third of all fatal traffic accidents are caused by substandard road conditions or roadside hazards. Congressman Young's committee is supporting a reauthorization totaling \$375 billion dollars as compared to the President's \$247 billion plan.⁴⁸ Young states that the Department of Transportation's "2002 Conditions & Performance" report indicates that in order maintain and improve the nation's bridges, highways and transit systems, \$75 billion will need to be invested annually. He also claims that SAFETEA's highway funding levels were not adjusted for inflation, and that in 2003 dollars, TEA-21 actually provided more highway funding than the President's proposal.⁴⁹

In May 2003, Global Insight published a report that analyzed the economic impacts of the funding levels supported by the House Transportation and Infrastructure Committee and compared them to a baseline representing the funding proposed by the administration. The report found that increasing highway funding from \$247 billion in the next six years to \$375 billion over the same period would result in a \$48 billion increase to the Gross Domestic Product (GDP) each year, and that for each dollar invested in highway and transit capital outlays, more than \$2.50 in economic activity will be generated. The report also predicted that consumer spending would increase \$98 billion and that a \$129 billion increase in consumer disposable income would be realized. Federal tax receipts would increase by \$102

⁴⁷ United States Senate. S.1072: Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003. May 15, 2003. < <http://thomas.loc.gov/cgi-bin/query/F?c108:1:~/c108b11Wx5:e100485:> > June 9, 2003.

⁴⁸ United States House of Representatives. Committee on Transportation and Infrastructure. "Administration's 'Inadequate' Highway & Transit Funding Proposal Criticized by Congressional Panel." Press release May 15, 2003. < <http://www.house.gov/transportation/press/press2003/release88.html> > June 9, 2003.

⁴⁹ United States House of Representatives. Committee on Transportation and Infrastructure. "Administration's Highway & Transit Funding Levels are Inadequate to Meet America's Growing Surface Transportation Needs." Press Release May 14, 2003. < <http://www.house.gov/transportation/press/press2003/release86.html> > June 9, 2003.

billion due to increased economic activity, which would help to reduce the federal deficit.⁵⁰ According to a previous report, the Committee's proposal would create 1.3 million new jobs in all 50 states. At a press conference discussing the Global Insight report, Chairman Young said, "Our substantial increase in highway and transit funding will help address America's growing congestion and safety problems. But our proposal will also have another positive benefit and that will be in giving a major boost to our nation's economy."⁵¹

In order to fund a \$375 billion authorization, a level on which the House Committee seems unwilling to budge, sources of revenue are going to have to be identified. The administration is opposed to increases any taxes for any reason; however, if the authorization does not pass this year, it will meet even stiffer opposition next year when the president is seeking reelection. Several sources of funding for Chairman Young's \$375 billion plan are being considered. For example, the cash balance in the Highway Trust Fund is currently between \$18 and \$20 billion dollars. Many believe that this level could be dropped to around \$8 billion without significantly increasing the risk of running out of funds. The interest on this account, unlike any other account, is currently being transferred to the general fund instead of remaining in the Highway Trust Fund. The current tax subsidy on Ethanol-based fuel, which was originally meant to encourage the use of ethanol, results in a cost about 2.5 cents lower per gallon than gasoline. Although many in the ethanol producing mid-west may disagree, some people feel that ethanol tax subsidy should be eliminated. Improving collection practices to reduce tax and fee evasion is also a means of finding additional revenue.⁵²

Although all of these strategies would provide more funding for surface transportation, even all working together, they would not produce the \$128 billion dollar difference between the President's proposal and Young's proposal. In order to fully fund a \$375 billion reauthorization, an increase in user fees is necessary. This increase could

⁵⁰ Cuomo, Robert and Joyce Brimmer. "Impact of the Bipartisan House Transportation and Infrastructure Committee's FY 2004-2009 Highway and Public Transportation Investment Proposal on the US Economy." Global Insight. May 13, 2003.

⁵¹ United States House of Representatives. Committee on Transportation and Infrastructure. "House Highway & Transit Funding Proposal Would Substantially Benefit National Economy, According to Economic Forecast Report." Press Release May 13, 2003.

< <http://house.gov/transportation/press/press2003/release82.html> > July 10, 2003.

⁵² Upchurch, Dr. John. ASCE fellow to the U.S. House Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit. Personal Interview. July 14, 2003.

increase at a rate proportional to the annual increase in the Consumer Price Index (CPI). Some even advocate a retroactive increase, beginning in 1993. This would immediately increase the gas tax to the point at which it would be if it had been following the CPI since 1993. This would increase the gas tax about five cents from the current level of 18.4 cents, and would continue increasing it from that point each year.⁵³ Although the bipartisan leadership of the Transportation and Infrastructure Committee supports raising revenues, the House Majority Leader Tom Delay (R-TX), following the lead of the White House, has voiced strong opposition to increasing or indexing user fees.⁵⁴

The Senate also supports a reauthorization level higher than the Administration's \$247 billion, although not as high as what the House is considering. Of the President's proposal, Senator Inhofe (R-OK), Chairman of the Environment and Public Works Committee, said, "SAFETEA focuses on reducing highway fatalities and injuries, reducing congestion, protecting the environment, increasing funding flexibility for state and local governments, and providing economic stimulus the nation's economy—all worthy goals. Unfortunately, the funding proposed in the President's bill is inadequate."⁵⁵ The Environment and Public Works Committee will likely introduce legislation authorizing \$311 billion over six years. The Senate is less likely to support an immediate increase user fees, but several lawmakers seem open to the idea of indexing the gasoline tax to increase with inflation.⁵⁶ The Senate Commerce, Science, and Transportation Committee, whose subcommittee on Surface Transportation and Merchant Marine has jurisdiction over the Surface Transportation Board, the Federal Railroad Administration, the Motor Carrier Industry, Transportation Safety, and Hazardous Materials Transportation, recently approved the Surface Transportation Safety Reauthorization Act of 2003. The bill authorizes funding for National Highway Traffic Safety Administration, Federal Motor Carrier Safety

⁵³ Upchurch, Dr. John. ASCE fellow to the U.S. House Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit. Personal Interview. July 14, 2003.

⁵⁴ Intelligent Transportation Society of America. "TEA-21 Reauthorization Update." July 11, 2003. < <http://www.itsa.org/ITSNEWS.NSF/0/50663ff4197f722685256d600069c946?OpenDocument> > July 21, 2003.

⁵⁵ United States Senate. Committee on Environment and Public Works. "Inhofe Introduces President Bush's Transportation Legislation." Press Release May 19, 2003. < http://www.senate.gov/~epw/Releases/release_05-19-03.htm > July 21, 2003.

⁵⁶ Intelligent Transportation Society of America. "TEA-21 Reauthorization Update." July 11, 2003. < <http://www.itsa.org/ITSNEWS.NSF/0/50663ff4197f722685256d600069c946?OpenDocument> > July 21, 2003.

Administration, and the Hazardous Materials Transportation Safety program. This bill will be offered as an amendment to the TEA-21 reauthorization legislation when it is considered by the full Senate.⁵⁷

Recommendations from other groups

In March, Dr. Mike Walton, Chairman of the Intelligent Transportation Society of America's Board of Directors, testified before Congress on the needs of the nation's surface transportation system. While recognizing that investment into advanced transportation technologies cannot replace investment in highway and transit infrastructure, it can ensure that the system is operating at optimal efficiency. He stated that "the continued and expanded integration of ITS into our nation's surface transportation system is a necessary and prudent investment in the future of that system."

Specifically, Dr. Walton outlines four recommendations to Congress that would work to advance the federal ITS program and ITS America's goal of an Integrated Network of Transportation Information. First, he recommends a new formula-based categorical program for the deployment, operations and management of ITS. Second, multiple Comprehensive Area Deployment Initiatives (CADI) should be authorized to demonstrated the integration of data from automobiles, transit systems, rail, trucks, and ITS traffic operation centers. Next, enhanced flexibility of program funds from the STP, NHS and CMAQ are recommended for operations and regional coordination. Finally, Dr. Walton emphasizes the need to accelerate research, education and program support for ITS.⁵⁸

When considering the reauthorization of TEA-21, the advisory committee to the Congressional ITS Caucus chose to focus on three critical issues related to ITS: congestion, safety and surface transportation security. The advisory committee detailed the five steps they felt the reauthorization must include in order to move closer to realizing the full

⁵⁷ United States Senate. Committee on Commerce, Science and Transportation. "Committee Passes Surface Transportation Safety Reauthorization Act of 2003." Press release June 26, 2003.

< <http://commerce.senate.gov/newsroom/printable.cfm?id=205587> > July 29, 2003.

⁵⁸ Intelligent Transportation Society of America. "ITS America Chairman Testifies Before Congress." The ITS Legislative Report. March 18, 2003.

< [http://www.itsa.org/subject.nsf/926a8faa89b0667e86256c91005e0425/425d52b2367ba58b85256d0e0029416d/\\$FILE/3.18.03%20The%20ITS%20Legislative%20Report.doc](http://www.itsa.org/subject.nsf/926a8faa89b0667e86256c91005e0425/425d52b2367ba58b85256d0e0029416d/$FILE/3.18.03%20The%20ITS%20Legislative%20Report.doc) > July 10, 2003.

potential of ITS in these areas. The five steps, as listed in the advisory committee's recommendations are as follows:⁵⁹

1. Increase the amount of money available for surface transportation, including for ITS.
2. Provide the financial resources needed to accelerate the deployment of ITS technologies with the capacity to reduce traffic congestion, enhance highway safety, and augment surface transportation security.
3. Increase funding for operating and managing ITS technologies via the new ITS program, and enhance the flexibility and accessibility of STP, National Highway System, and Congestion Mitigation and Air Quality Improvement funds for these same purposes without time limitations.
4. Accelerate ITS research, education, and program support to help public- and private-sector ITS deployers make the best use of technology to provide service to citizens better, faster, and cheaper, and to augment surface transportation security.
5. Implement procedural changes affecting the federal role in ITS transportation projects to encourage the acceleration of ITS deployment and research.

Under the first step, the committee advocates the creation of a new funding program for ITS deployment, operations, and management. It also encourages increasing funding for ITS research, education and program support. The report provides cost estimates for three different funding scenarios for ITS: Subsistence, Minimum Desirable, and Breakthrough.

The breakthrough level describes the level of funding needed to immediately improve traveler safety, reduce congestion and enhance security, and would provide a total of \$8.16 billion over the six-year period, with about 80 percent going to deployment, operations and management and 20 percent going to education, research and program support. The portion going to deployment would come from a formula-based categorical program, and if states did not use the funding for ITS, they would lose it. Providing incentives for the states to deploy ITS will help create a comprehensive national system for safety and congestion reduction and will likely increase competition among vendors, leading to new technologies.

The Minimum Desirable funding level, the lowest level possible to begin to see improvements in safety and congestion, would provide a total of \$5.2 billion over the authorization period. The funding for general ITS deployment would be distributed to the states through the formula-based categorical program described for the Breakthrough level.

⁵⁹ "Recommendations of the Congressional ITS Caucus Advisory Committee." February 14, 2003. < [http://www.itsa.org/subject.nsf/926a8faa89b0667e86256e91005e0425/425d52b2367ba58b85256d0e0029416d/\\$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc](http://www.itsa.org/subject.nsf/926a8faa89b0667e86256e91005e0425/425d52b2367ba58b85256d0e0029416d/$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc) > July 10, 2003.

This level was believed to be the lowest level that could be divided 51 ways and still provide states the resources to deploy some ITS systems. In order to develop a comprehensive national ITS system, even the smallest rural states must deploy some ITS.

The Subsistence funding level provides \$2.1 billion over six years and is the minimum funding needed to keep the ITS progress to date from eroding. Instead of dividing the money among states, funding will be provided on a competitive basis through an application process established by the U.S. DOT. States would be encouraged to augment these funds with funds from other programs, such as STP, CMAQ, HNS or local funds. At this funding level, over a third of the funds will be devoted to education, research and program support. The committee believes that increases in research have a direct correlation to effectiveness of current and future ITS. The more money invested in research, the better return we will get on the money invested in deployment. The level of funding available for ITS in the President's proposal falls short even of this Subsistence level funding.

The Congressional ITS Caucus Advisory Committee also makes recommendations for procedural changes to accelerate ITS implementation and research. These changes include simplifying the application process for ITS funds and using alternative methods of awarding contracts. The standard low bid contracts are appropriate when technology isn't changing rapidly and when the owner's expectations of final results can be clearly stated in the beginning of the project. Fixed price, lump sum and unit cost contracts are standard in similar situations. However, the technology associated with ITS can change so rapidly that contractors and owners need more flexibility. Procurement methods such as government-wide acquisition contracts and task order contracts allow an agency to select the most qualified contractor and provide the ability to make changes as they arise during the project.⁶⁰

The American Association of State Highway and Transportation Officials' (AASHTO) recommendations support the FHWA's National Intelligent Transportation Systems program ten-year plan⁶¹, increasing the highway program to \$45 billion dollars in

⁶⁰ "Recommendations of the Congressional ITS Caucus Advisory Committee." February 14, 2003. < [http://www.itsa.org/subject.nsf/926a8faa89b0667e86256c91005e0425/425d52b2367ba58b85256d0e0029416d/\\$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc](http://www.itsa.org/subject.nsf/926a8faa89b0667e86256c91005e0425/425d52b2367ba58b85256d0e0029416d/$FILE/2.14.03%20Advisory%20Committee%20Recommendations.doc) > July 10, 2003.

⁶¹ American Association of State Highway and Transportation Officials. "Operations and ITS: Getting the Most from our Transportation System." March 2003. < http://www.transportation.org/download/issues/ops_its.pdf > June 25th, 2003.

order to provide an extra \$1 billion for states to invest in safety programs for rural two-lane roads, and providing the states incentive-based flexibility in the use of their highway funds.⁶² AASHTO has developed specific recommendations for surface transportation reauthorization, such as increasing ITS research funding to \$125 million per year and ITS Deployment program funding to \$142 million per year. This money would be used to continue work on ITS standards, architecture and training, research human factors, remote sensing and intelligent vehicles, and implement programs such as the 511 traveler information system, National Incident Reporting System and the commercial vehicle information system network. AASHTO also recommends that \$500 million per year from increased resources be used for better surveillance, traffic control and traveler information. These recommendations are consistent with the recommendation of the Congressional ITS Caucus to accelerate deployment of a National Transportation Information System.⁶³

AASHTO also recommends increasing the FHWA's Surface Transportation Research Program by 50 percent to \$300 million annually. Priorities for this funding include supporting research and technology transfer and preparing students for careers in transportation by increasing funding for the University Transportation Centers, doubling the Local Transportation Assistance Program and increasing national-level research. AASHTO also supports funding a Future Strategic Highway Research Program at \$450 million over the six year of the reauthorization period to accelerate progress toward a few high-priority objectives. The National Academy of Sciences would administer the program through the U.S. DOT and under the guidance of state DOTs through AASHTO. The major goals of the program include making highways safer through the use of new technology, and reducing traffic delays due to crashes, breakdowns, bad weather, work zones and other special events by reducing the frequency and effects of these events.⁶⁴

The American Road and Transportation Builders Association (ARTBA) has developed a proposal for reauthorization as well, and in testimony before the House Highways and Transit subcommittee last July, recommend ramping up federal highway

⁶² American Association of State Highway and Transportation Officials. "Highway Safety: Facing the Growing Challenge." < <http://www.transportation.org/download/issues/hwysafety2003.pdf> > June 25th, 2003.

⁶³ American Association of State Highway and Transportation Officials. "Operations and ITS: Getting the Most from our Transportation System." March 2003. < http://www.transportation.org/download/issues/ops_its.pdf > June 25th, 2003.

⁶⁴ American Association of State Highway and Transportation Officials. "Research: Saving Lives, Time, and Money." < <http://www.transportation.org/download/issues/research2003.pdf> > June 25, 2003.

investment by \$5 billion each year, to reach a level of \$60 billion by 2009. Over the same period, ARTBA suggests increasing transit funding to \$14 billion. The reauthorization levels recommended compliment the U.S. Department of Transportation's Conditions and Performance Report that \$75 billion will be needed annually to maintain the existing traffic, safety, and physical conditions.⁶⁵ ARTBA urges Congress and the Bush Administration to consider a combination of six revenue options to reach this level of funding, including spending down the balance in the Highway Trust Fund, increasing user fees by one to two cents, eliminating federal motor fuel fee evasion, eliminating the tax subsidy on ethanol-based motor fuels, fostering tax-exempt financing and innovative financing mechanisms for transportation capital projects, and indexing the motor fuels tax to the Consumer Price Index.

The ARTBA plan for the reauthorization of TEA-21 calls for a variety of safety-related provisions, including establishing a \$1 billion per year federal program improve safety on rural two-lane roads, where a majority of highway fatalities occur. Other recommendations include increasing federal involvement in roadway construction work zone safety initiatives, strengthening federal roadway infrastructure safety programs, and increasing federal support for highway research and technology transfer to \$1 billion per year.⁶⁶ Another innovative suggestion involved the creation of toll-financed, truck-only lanes to improve safety and add to the capacity of the nation's highway network.⁶⁷

The proposals outlined in this section represent only a small portion of all the recommendations by only a few of the many stakeholders in the issue. These particular groups and recommendations were chosen in an attempt to capture the ITS and safety-related recommendations from the most influential groups representing the greatest number of constituents.

⁶⁵ American Road and Transportation Builders Association. "Two Cents Makes Sense." Press release July 16, 2002. < http://www.artba.org/news/press_releases/2002/07-16-02.htm > July 21, 2003.

⁶⁶ American Road and Transportation Builders Association. "ARTBA Calls for Minimum \$50 Billion Per Year Federal Highway Investment in Next Program Reauthorization to Maintain System Conditions." Press release April 9, 2001. < http://www.artba.org/news/press_releases/2001/04-09-01a.htm > July 21, 2003.

⁶⁷ American Road and Transportation Builders Association. "Two Cents Makes Sense." Press release July 16, 2002. < http://www.artba.org/news/press_releases/2002/07-16-02.htm > July 21, 2003.

Benefits of ITS

Intelligent Transportation systems, as defined by the Intelligent Transportation Society of America, “encompass a broad range of wireless and wireline communications-based information, control and electronics technologies. When integrated into the transportation system infrastructure, and in vehicles themselves, these technologies help monitor and manage traffic flow, reduce congestion, provide alternate routes to travelers, enhance productivity, and save lives, time and money.”⁶⁸ The ITS Joint Program Office in the U.S. Department of Transportation publishes annual reports describing the available ITS technologies, the benefits that have been realized in their deployment, and the unit and system costs of ITS for specific projects. Intelligent Transportation Systems can be divided into two main categories, intelligent infrastructure and intelligent vehicles, and in both, numerous technologies exist to minimize the risk of an accident occurring, reduce injury and fatality rates in accidents, and provide the driver with valuable, timely information with which to make critical decisions on the road.

Available Technologies⁶⁹

Arterial and freeway management systems communicate information to the driver in one or more ways through the use of traffic detectors, traffic signals, dynamic message signs and highway advisory radio. Surveillance technologies that monitor traffic flow, such as cameras and sensors enable valuable information to be passed along to the driver. Signals can be coordinated throughout metropolitan areas to adjust the phase times depending on traffic conditions. Signals can also be preempted for emergency vehicles, which not only improves response times, but also reduces the risk of intersection accidents involving responders. Pedestrian and bicycle-actuated signals can be coordinated into the system as well. ITS technologies can aid in traffic management techniques such as reversible flow lanes and lane restrictions. Dynamic message signs can be used to post information on the changing direction of traffic flow and restrictions throughout the day and night. Automated enforcement programs that increase compliance with speed limits, traffic signals, and

⁶⁸ The Intelligent Transportation Society of America. “About ITS America.”
< [http://www.itsa.org/new.nsf/vLookupAboutITSA/\\$first?OpenDocument](http://www.itsa.org/new.nsf/vLookupAboutITSA/$first?OpenDocument) > June 25, 2003.

⁶⁹ United States Department on Transportation. Federal Highway Administration. “Intelligent Transportation Systems Benefits and Costs 2003 Update.” May 2003.
< http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13772.html > June 17, 2003.

aggressive driving laws may also be included in these management systems. On the freeway, ramp meters can be used on entrance ramps to optimize travel speeds on the freeway and ramp meter wait times.

Incident management systems reduce traffic congestion related to vehicle crashes and other incidents by decreasing detection time, reducing response time, and minimizing the time needed to bring traffic back to normal conditions. Intelligent infrastructure and intelligent vehicle technologies work together in these types of systems to provide incident information to responders and travelers. Inductive loop detectors, acoustic roadway detectors and camera systems, as well as wireless enhanced 911 systems, and vehicle technologies such as mayday and automated collision notification systems help detect incidents quickly. Even roadside call boxes can help response teams locate accidents. Response times can be decreased by computer aided dispatch systems and response routing systems. Dynamic message signs and highway advisory radio help travelers negotiate around incidents and aid in quick clearance and reopening of lanes, reducing congestion and minimizing delays.

Emergency response systems use many of the same notification, dispatch and emergency guidance technologies that were described in incident response systems. Both of these systems are often used in conjunction with the traffic management systems as well. Emergency response systems improve public safety by decreasing notification and response times to traffic crashes and hazardous materials incidents and can provide safety to responders traveling to and from incident scenes and managing traffic during emergency evacuations. Advanced automated collision notification (ACN) can improve response time, especially in rural areas, where travel time to a hospital is greater than in a metropolitan area and the consequences of injuries can be more severe. These ACN systems can provide more than just the location of the vehicle, such as the passengers' medical information and crash characteristics. Technologies called telemedicine systems link medical facilities to ambulances, allowing doctors to advise emergency responders on en route treatments. Two-way communication systems between emergency vehicles and dispatchers, and public and private agencies aid in evacuation operations where many agencies must work toward a coordinated plan. Automated Vehicle Location technology can help track emergency vehicle fleets during the evacuation effort.

Electronic Payment Systems such as Electronic Toll Collection (ETC) at toll plazas work to increase efficiency and convenience of toll collection. Where ETC has been used, throughput has been improved and fuel consumption and emissions have been reduced. Some studies have shown that crashes at toll plazas with ETC have increased, probably due to confusion regarding plaza configuration and differences in speed between vehicles with and without ETC transponders. As this technology develops, it will become possible for drivers to pass through toll collection stations on the main roadway without have to slow down or negotiate toll booths.

Traveler information systems can provide information to the driver both before a trip and during a trip. Pre-trip information may be posted on websites to provide weather forecasts, expected trip times, and route planning. Information regarding travel to and from special events may also be provided. The designated 511 telephone number provides access to travel information after the driver has begun his or her trip, and is being implemented in areas around the country. Roadside information such as dynamic message signs and highway assistance radio is usually operated under the previously discussed arterial and freeway management systems. Most information provided by each of these technologies is regional and sometimes multi-modal. The systems can reduce congestion by encouraging transit use during peak travel times or in heavy traffic areas, can encourage drivers to change the time of their trips, and can help drivers plan alternative routes.

Crash prevention and safety strategies work to reduce the risk of operators and occupants of vehicles, as well as pedestrians and cyclists. Commercial trucks are made aware of dangerous ramps, curves or downgrades through road geometry warning systems. Accidents at highway-rail crossings can be reduced with systems that minimize the risk of collisions between trains and school buses or vehicles carrying hazardous materials. Intersection detection systems can advise drivers of the presence and direction of approaching traffic at rural intersections in order to reduce approach speeds. Drivers can be made aware of pedestrians entering crosswalks by pedestrian safety systems that automatically activate in-pavement lighting. Bicycle warning systems tell drivers when a cyclist is present in an upcoming stretch of roadway, which improves the safety of the cyclist, especially in tunnels or on narrow bridges. Systems using radar to detect large

animals in the roadway are being tested. These systems would be used upstream of frequent crossing areas and would flash warning lights to drivers when large animals were present.

Roadway operations and maintenance ITS can maximize traffic flow through and around construction work zones while protecting the safety of both the travelers and the workers. These systems can stand alone or be used in conjunction with existing traffic management systems to provide information to travelers on the status of work, control travel speeds, notify divers of changed lane configuration, and estimate travel times and delays. Other uses of ITS in this area can help DOT's by providing fleet tracking information and automated data collection for monitoring the condition of highway infrastructure.

Driver Assistance Systems within the vehicle can provide information to help drivers make decisions in unfamiliar areas or hazardous conditions, and can monitor the condition of the driver and the vehicle. Navigation systems using Global Positioning Systems and integrated communication systems can reduce driver error, improve driver decisions, and make on-the-fly rerouting decisions possible. On-board monitoring systems that provide real-time data can be used in commercial vehicles to report the condition of cargo and provide information regarding the mechanical condition of vehicles equipped with in-vehicle diagnostics.

Collision Notification Systems can be manual, such as Mayday, or automatic (ACN) and alert emergency responders of the location and severity of incidents on the roadway. Some advanced ACN systems use a combination of GPS, in-vehicle crash sensors and wireless communication to provide call centers and responders with information on the crash location and the number and nature of passenger injuries. These systems can provide responders with what type of equipment is needed, what modes of transportation will be required for injured passengers and where the nearest medical facility is located. These systems are installed in some high-end luxury cars in the factory and are available to others as after-market installations.

Benefits Already Realized⁷⁰

Individual ITS technologies, systems of ITS and networks of systems have already been implemented in many places around the country. Data from many of these projects have been collected and recorded, and the improvements in safety, travel times, and congestion reduction are being realized already. Although deployment and operations costs are known for these operations, and it is widely accepted that ITS can be a cost effective means of alleviating congestion, it is difficult to determine the cost/ benefit ratio of individual applications with regard to safety applications. However, many studies of the benefits of ITS cite safety improvements after deployment, and a few examples are listed here.

- In some cases, red-light violations have decreased 20 to 75 percent with the use of automated enforcement traffic signals.
- Freeway management systems using ramp meters can reduce accidents 15 to 50 percent. In a six-week study of a freeway management in Minneapolis-St. Paul, Minnesota, it was shown that the ramp meters used reduced crashes by 21 percent, decreased travel time by 22 percent, and increased freeway capacity by 10 percent.
- In Pennsylvania from 1993 to 1997, traffic and incident management systems reduced incidents by 40 percent. The Coordinated Highways Action Response Team in Maryland was shown to reduce the duration of incidents approximately 55 percent in both 1999 and 2000. Yearly savings in states where incident management systems reduced delays were between \$1.2 and \$1.8 million a year.
- In Albuquerque, New Mexico, ITS applications in operations and maintenance during a construction project at the “Big I” interchange reduced incident clearance times 44 percent with the use of motorist assistance patrols and a temporary traffic management center.
- Downhill speed warning signs in Colorado decreased the number of truck accidents by 13 percent and the runaway ramp usage by 24 percent in four years.

⁷⁰ United States Department on Transportation. Federal Highway Administration. “Intelligent Transportation Systems Benefits and Costs 2003 Update.” May 2003. < http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13772.html > June 17, 2003.

- In Idaho, drivers reduced their speeds by an average of 35 percent when dynamic message signs provided weather related warnings and only nine percent when the signs were not used.
- A modeling study by the National Highway Traffic Safety Administration showed that collision warning systems would be effective in over half of all crash situations, including 75 percent of rear-end crashes where the lead vehicle is not moving.
- A three year study of Automatic Collision notification systems in both urban and suburban area of Erie County, New York showed that notification time for vehicles with ACN was less than one minutes, with some notification time as long as two minutes. The average notification times for cars without the technology averaged around three minutes, with some as long as 30 to 45 minutes.
- Traveler information systems in Cincinnati and Northern Kentucky may have reduced fatalities by 3.2 percent.
- The 511 traveler information line is now available to over 45 million people in 17 states. More than 7.3 million calls have been placed, and 99 percent of surveyed users report that the information has helped them avoid traffic problems, save time, and reduce frustration.

These examples are only a few examples of the benefits of ITS directly related to safety. Indirectly, safety is increased when congestion is decreased and when drivers are informed of potential hazards or dangerous zones on the roadways.

Future Technologies

Most Collision Warning Systems, which include intersection collision warning, obstacle detection, lane change collision warning, road departure warning, and forward and rear impact warning, are still in the research and testing phases. These are in-vehicle technologies that use microwave radar and machine vision to detect unsafe lane-keeping typical of drowsy drivers, vehicles or in adjacent lanes, obstacles or animals in the vehicle's path, or quickly approaching vehicles in front of or behind the driver. Visual and audible alerts warn drivers when these things are detected. Warning signs in the rear of the vehicle can warn followers when they are too close or approaching too quickly. When a driver does

not respond to warnings by braking, the vehicle may take over and begin to brake automatically.⁷¹

Other in-vehicle technologies being developed include vision enhancement and safety event recorders. Vision enhancement technologies may be able to improve visibility at night or in low light conditions, during foggy conditions, in drifting snow, and in other inclement weather conditions. Safety event recorders are similar to a black box in an aircraft, collecting vehicle performance data, video data and data from radar sensors, and can provide valuable information concerning the circumstances of an accident just prior to and during the incident.⁷²

The Intelligent Transportation Society of America published in January 2002 a ten year vision for the National Intelligent Transportation Systems program called “Delivering the Future of Transportation.” In the next decade, the plan sets specific goals, such as saving 5,000-7,000 lives each year and significantly reducing the severity of accidents by 2011, saving \$20 billion a year in highway operations costs, reducing gasoline consumption by one billion gallons each year, providing current information to all to aid in travel choices, and increasing security by improving detection and response times to national emergencies or dangerous national events, all through the use of ITS. In the coming decade, drivers will have access to a national network of transportation information, vehicles will alert drivers to potentially dangerous situations, and the culture of transportation will shift to a focus on customer satisfaction.⁷³

Revolutionary changes to the world’s transportation system farther in the future, such as flying cars, magnetic rail transit, which can travel faster than an airplane, and self-driven cars, which will require the occupant to supply only a destination, are currently being researched and developed. These technologies will help to reduce the need for greater capacity on our highways, but will bring a new set of challenges to traffic safety and management.

⁷¹ United States Department on Transportation. Federal Highway Administration. “Intelligent Transportation Systems Benefits and Costs 2003 Update.” May 2003.

< http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13772.html > June 17, 2003.

⁷² Ibid.

⁷³ Intelligent Transportation Society of America. “Delivering the Future of Transportation.” Summary of *The National Intelligent Transportation Systems Program Plan: A Ten Year Vision*.” January 2002.

< [www.itsa.org/resources.nsf/Files/PPRA_Popular_Final/\\$file/PPRA_Popular_Final.pdf](http://www.itsa.org/resources.nsf/Files/PPRA_Popular_Final/$file/PPRA_Popular_Final.pdf) > July 25, 2003.

Roadblocks to ITS deployment

The level of ITS deployment around the nation ultimately depends on the state and local transportation organizations. The culture and attitudes toward making ITS a priority vary greatly from state to state. While some states are already realizing the benefits ITS can provide in traffic management and traveler safety, other states have not even explored these possibilities. Although much of the funding provided by the various transportation programs can be used for ITS, some states may need further incentives to begin to implement ITS solutions, such as categorical formula-based programs specifically for deployment of ITS.⁷⁴

Although transportation organizations spend money on the research and development of vehicle technologies, intelligent vehicle systems are typically paid for by the driver when he or she purchases the car. Intelligent vehicle systems are becoming more common in newer vehicles, but by no means have they become the standard. In order to benefit from a collision warning system or a collision notification technology, the driver has to be willing and able to buy a more expensive vehicle or to have an expensive system installed. But as the cost of these systems decrease, it will become more likely that they will be found in economy cars as well as luxury automobiles. In the future, government mandates could require all new vehicles produced in the country to include these technologies, just as has happened with seatbelts and airbags.

In 2001, the American Society of Civil Engineers published the Report Card for America's Infrastructure. The Report Card gave the nation's roads a D+, bridges a C, and transit a C-. A third of the major roads in the country are in poor or mediocre, meaning that they are in need of improvements immediately or in the near future, and outdated road and bridge design, safety features, and pavement conditions are responsible for 30 percent of fatal accidents on the highways. It was estimated in 1998 that an investment of approximately \$10.6 billion a year for 20 years is needed to improve the 29 percent of the nation's bridges that are structurally deficient or obsolete. The Report Card also claims that transit spending will have to increase by 41 percent to maintain the system in its present condition, as ridership continues to increase faster than highway and airline transportation.⁷⁵

⁷⁴ ⁷⁴ Upchurch, Dr. John. ASCE fellow to the U.S. House Committee on Transportation and Infrastructure, Subcommittee on Highways and Transit. Personal Interview. July 14, 2003.

⁷⁵ American Society of Civil Engineers. "Renewing America's Infrastructure: A Citizen's Guide." 2001. < http://www.asce.org/pdf/citizens_guide.pdf > July 22, 2003.

As most states continue to experience revenue shortfalls and seek ways to balance their budgets, funding for transportation projects is reduced to only the absolutely necessary projects or those which have already been started. Although ITS solutions can be very cost effective ways of stretching the capacity of existing roads, they cannot repair structural deficiencies or poor pavement conditions that are already present. States are forced to focus on repair and rehabilitation projects before they can begin to implement new ITS technologies.

Recommendations

1. Increase overall highway funding.

First and most importantly, overall funding for surface transportation must be increased. Although the House Transportation and Infrastructure Committee seems committed to providing a six year authorization of \$375 billion, this still falls short of \$450 billion needed to provide the \$75 billion a year suggested in the Department of Transportation's 2002 Conditions and Performance Report. The Federal Highway Administration estimates that \$76 billion a year until 2020 will be needed to maintain the current conditions of highways and bridges, and \$107 billion a year to effectively improve the highway system. The level needed to maintain today's average conditions requires an 18 percent increase in surface transportation funding from 2000, and the level to improve requires an increase of 65%.⁷⁶ The level of funding proposed by the administration, a mere \$247 billion for six years, is far too little to improve or even maintain the nation's aging infrastructure.

A GAO report published in June 2003 looks at the investment trends in highway infrastructure by federal, state and local governments. The study found that over the past 20 years, federal investment has increased 83 percent, while state and local investment increased 166 percent. Since 1982, highway funding has increased from \$29.6 billion annually to \$66 billion. When compared to the increase in the nation's fiscal capacity, measured by GDP, the nation's highway investment has remained flat, with states showing a stronger level of effort than the federal government.⁷⁷ Although some may argue that a tighter budget will actually encourage states to implement efficiency-increasing ITS solutions, the development and implementation of new technologies cannot even be investigated while bridges are structurally deficient and pavement quality is so poor that vehicle damage and personal injury due to road conditions costs more than repaving the roads. The reauthorization needs to provide the funding to bring the nation's highway system into the 21st century.

In order to provide the level of funding suggested by the U.S. DOT, new revenue will have to be generated. The funds made available by strategies such as reducing the balance in

⁷⁶ General Accounting Office. "Trends in Federal and State Capital Investment in Highways." GAO-03-744R. June 18, 2003. < www.gao.gov/new.items/d03744r.pdf > July 10, 2003.

⁷⁷ Ibid.

the Highway Trust Fund will only make a small dent in the extra \$200 billion dollars over six years that will be needed. Reducing tax and fee evasion, increasing the Ethanol tax to match that of gasoline and returning the interest earned by the highway trust fund back into its own account will also be very small steps toward a large goal. Although no one likes to pay higher taxes, an increased user fee is a fair and needed way to fund improvements to the nation's transportation system. As we've seen in the past, one-time fixed increases provide short-term funds for an ever increasing need. An immediate increase in the user fee needs to be implemented to provide the needed funding for this reauthorization. In order to provide lasting funds, the user fee must increase yearly in proportion to the Consumer Price Index.

If the Congress is serious about passing a reauthorization that provides \$128 billion more than the administration's proposal, and is prepared to increase user fees in order to fund it, it is critical that the reauthorization be passed as soon as possible. Currently, the President does not support an increased user fee; however, as reelection approaches, the administration will only become more strongly apposed to any sort of tax increase. Since it is unlikely that a six-year authorization will pass before TEA-21 expires at the end of September, the US DOT will be forced to rely on temporary continuations of the policy and funding levels outlined in the existing authorization. The country's surface transportation system cannot afford several more years of inadequate funding. A long-term reauthorization, when it is finally passed, must provide higher levels of funding.

2. Create formula-based categorical ITS funding.

The reauthorization of TEA-21 must provide minimum categorical funding for ITS deployment and operations. Some states have already begun to recognize the benefits of deploying ITS systems, but others have not. Although the needs for ITS vary from state to state and area to area, some applications are most effective when available to all travelers throughout the country. Information provided by calling the 511 number may help drivers make decisions about which path to take in or around cities hundreds of miles down the road. Availability of systems that aid in communication and response to hazardous material spills and other security issues is important everywhere in the country.

Formula-based funding also helps reduce earmarking funds for specific projects. As elected officials working for a specific constituency, members of Congress work to bring as

much funding for special projects to their districts as possible. The desire to be reelected may overcome a sense of fairness, or a need for efficiency and effectiveness when it comes to allocating funds. Although it might be necessary to create specific development areas where higher levels of resources are used in one place to study the benefits of coordinated networks of systems, creating a formula based category would give every region access to minimum funding to implement essential ITS solutions.

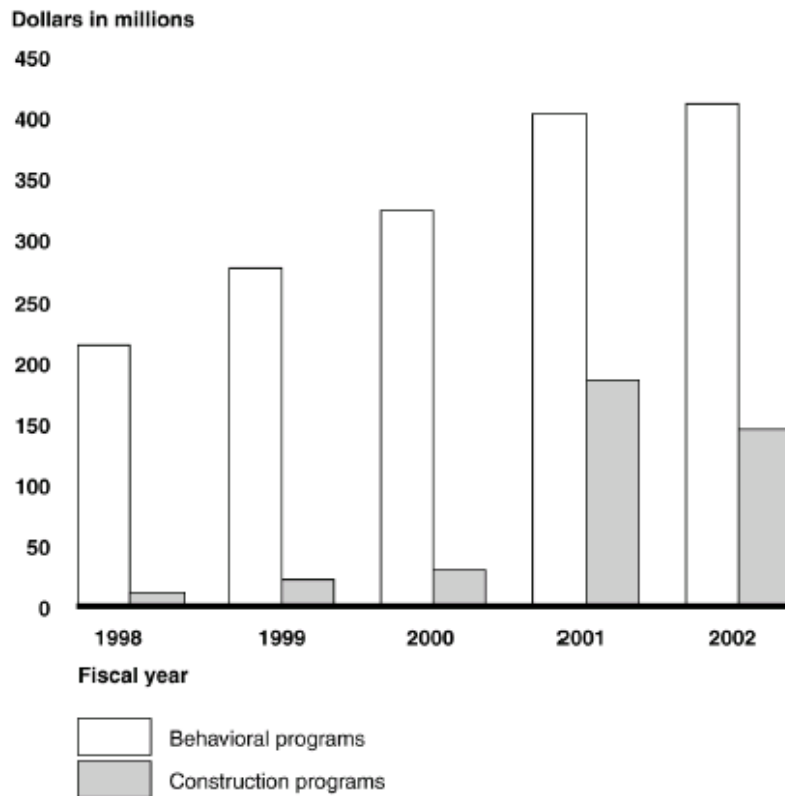
3. Complete a comprehensive study of factors leading to crashes and fatalities.

A comprehensive survey of highway accidents and surrounding circumstances must be completed. Although accident statistics are currently being recorded, it is important to create national guidelines for what information is obtained and how it is recorded. Uniformity in the language used to describe the circumstances and outcomes of accidents is crucial to accurately categorizing and comparing factors that lead to accidents, property damage, injuries and fatalities. ITS technologies can be used to keep real-time data on highway incidents, so that patterns can be identified and remedied in a timely manner. A clear understanding of the roles played by driver, vehicle and roadway in every accident will help guide the allocation of resources aimed at improving highway safety.

4. Understand the cost/benefit ratio of all highway safety programs, including education, behavior modification, law enforcement, construction and ITS strategies.

Once the causes of accidents are understood, the cost/benefit ratio of various safety programs must be determined in order to maximize the ability of each dollar invested in safety to prevent accidents and save lives. Individual components of intelligent infrastructure and intelligent vehicles must be compared in effectiveness to “click it or ticket” and “Don’t Drink and Drive” campaigns. The right balance of driver education, law enforcement, better highway design, high performance materials and better construction techniques, and intelligent transportation will ensure that tax dollars are being spent to save lives. Figure 5, taken from the GAO report “Factors Contributing to Traffic Crashes and NHTSA’s Efforts to Address Them” in 2003, shows the distributions of the National Highway Traffic Safety

Administration’s safety funding between Behavioral and Construction programs over the past several years.⁷⁸



Source: GAO analysis of NHTSA data.

Figure 5: NHTSA highway safety funding to states.

Funding for programs that increase transit capacity and encourage travelers to use transit systems also helps improve traveler safety. First, transit has significantly lower accident and fatality rates than highway transportation, and second, as more travelers use transit, congestion on highways is reduced. Increased transportation funding also provides dollars for systems that may not otherwise receive funding, such as rural road systems, where a majority of fatal accidents occur.

As new technologies are introduced, it is important that the knowledge and experience gained from the first implementations be made available to other transportation agencies. Sharing the lessons learned from deployment successes and failures can reduce

⁷⁸ General Accounting Office. “Factors Contributing to Traffic Crashes and NHTSA’s Efforts to Address Them.” GAO-03-744R. May 22, 2003. < www.gao.gov/new.items/d03730t.pdf > June 10, 2003.

redundant costly mistakes, and can narrow the scope of and speed future research in similar technologies.

Government contracting practices should also be modified to encourage the use of new technologies on government highway construction projects. Low bidding discourages contractors from using higher-risk, but potentially cost- and time-saving construction practices. Using low bid practices on intelligent highway systems that involve new technology applications may compromise the quality of system installed and end up costing the project more in the long run. Quality and performance based contracts may help to ensure the government is getting the best system at the best price. Government can also provide incentives to contractors to use the high-risk construction techniques by sharing the risk or providing tax benefits. As new practices become more commonly used, the risk associated with them decreases and they become the norm. This saves the tax payers money and time.

5. Provide state and local transportation agencies with flexibility to implement solutions that work for them.

The flexibility of state and local transportation organizations to decide how and when to implement new technologies in highway systems must be preserved and even increased. Federal highway programs should allow the flexibility for states to use funds for ITS deployment as well. Funding directed for safety purposes should not be limited to behavioral and educational programs, but should also be available for safety-improving ITS applications. Funding flexibility encourages the states to find and use the safety strategies that are most effective at addressing their specific concerns.

Conclusion

Few can argue that reducing the number of highway fatalities and the time and resources wasted in congestion should not be one of the nation's priorities. For several years, safety funding has focused on changing driver behavior, by encouraging seatbelt use and discouraging drunk driving. Programs have included public information, driver education, making seatbelt and impaired driving laws more stringent and making enforcement stricter. And although the rate of fatalities has been decreasing over the past several years, considering the increased number of vehicle miles traveled each year, the total number of highway fatalities has been holding steady for the past several years, and has actually increased in the past year. As the rate of decline in accidents starts to level off, it is necessary to question if our safety programs have reached the limits of their effectiveness.

Driver error can never be completely eliminated, and driver behavior cannot be controlled or predicted in all circumstances. In order to continue to decrease the number of roadway accidents and fatalities, new approaches to highway safety will need to be developed in highway safety programs. Technologies exist to make the highway infrastructure and vehicles safer. Investment in the development and implementations of new applications of these technologies has the potential to make significant advancements in the nation's goal to reduce highway fatalities. Just as the introduction of seatbelts and crash-worthy vehicle frames significantly reduced the number of highway deaths in the 1980's and airbags increased accident survivability in the early 1990's, making new vehicle and infrastructure technologies the standard in construction projects and vehicle production has the potential to once again show significant decreases in the incident rate on our nation's roadways.

Providing drivers with information in real-time about the traffic, construction and weather conditions can help alleviate congestion by giving drivers the option of choosing alternate routes. Variable message signs that warn drivers of upcoming obstacles or reduced speed limits can increase reaction time enough to prevent accidents. Communication systems capable of reporting incidents as they happen to law enforcement and emergency response can provide more immediate medical attention and reduces the time to clear the accident. Technologies such as ramp metering, electronic toll collection, and variable speed

limits and lane controls make the existing highways more efficient, decreasing congestion and delays by increasing the road's capacity.

Intelligent Transportation Systems can also be used to gather important traffic data, and can record information about the time, location, traffic conditions, road conditions, and direct and indirect causes of each incident and near-miss as it occurs. This information can then be used to determine priorities for highway improvements and investment into technologies that address specific needs. This process will help ensure that the money invested in the transportation infrastructure and in safety programs is used in the most efficient way possible.

In order to create a connected intelligent system of roadways in the country, it is not only necessary to provide funding for ITS development, but also to provide more transportation dollars in general. It makes little sense for states to invest in ITS if they are struggling for the necessary funding to keep their bridges structurally sound and their pavement quality acceptable. The details of preventing individual highway incidents can only be addressed when the risk of recurring accidents due to poor road quality or disasters due to bridge failure are not a concern. When the funding is available to maintain and improve the basic infrastructure, states can then begin to incorporate the highway safety technologies available in their construction and repair projects.

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