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Rep. Michael Speedy
Rep. Lloyd Arnold
Rep. William Davis
Rep. Randall Frye
Rep. Jud Mcmillin
Rep. Rick Niemeyer
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Rep. Benjamin Smaltz
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Sen. Earline Rogers
Sen. Ronald Grooms
Sen. James Banks
Sen. Vaneta Becker
Sen. Michael Crider
Sen. James Merritt
Sen. Allen Paul

JOINT STUDY COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE ASSESSMENT AND SOLUTIONS

Legislative Services Agency
200 West Washington Street, Suite 301
Indianapolis, Indiana 46204-2789
Tel: (317) 233-0696 Fax: (317) 232-2554

LSA Staff:

Sarah Freeman, Attorney for the Joint Study Committee
Stephanie Wells, Fiscal Analyst for the Joint Study Committee

Authority: *IC 2-5-28.5*

MEETING MINUTES[1]

Meeting Date:	**October 16, 2013**
Meeting Time:	**10:00 A.M.**
Meeting Place:	**State House, 200 W. Washington St., the Senate Chambers**
Meeting City:	**Indianapolis, Indiana**
Meeting Number:	**3**

Members Present: **Rep. Edmond Soliday, Chairperson; Rep. Michael Speedy; Rep. Lloyd Arnold; Rep. William Davis; Rep. Jud Mcmillin; Rep. Rick Niemeyer; Rep. Thomas Saunders; Rep. Benjamin Smaltz; Rep. Daniel Forestal; Rep. Edward Delaney; Rep. Cherrish Pryor; Sen. James Arnold; Sen. Jean Breaux; Sen. Earline Rogers; Sen. Ronald Grooms; Sen. Vaneta Becker; Sen. James Merritt.**

Members Absent: **Rep. Randall Frye; Rep. Steven Stemler; Sen. Thomas Wyss, Vice-Chairperson; Sen. James Banks; Sen. Michael Crider; Sen. Allen Paul.**

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[1] These minutes, exhibits, and other materials referenced in the minutes can be viewed electronically at http://www.in.gov/legislative Hard copies can be obtained in the Legislative Information Center in Room 230 of the State House in Indianapolis, Indiana. Requests for hard copies may be mailed to the Legislative Information Center, Legislative Services Agency, West Washington Street, Indianapolis, IN 46204-2789. A fee of $0.15 per page and mailing costs will be charged for hard copies.

Chairman Soliday called the meeting to order at 10:10 A.M.

Alternate Fuel Vehicles and Road Use

Stephanie Wells, LSA fiscal analyst for the Committee, spoke to the Committee about federal, state, and local road and bridge funding, noting that both federal highway funding and state motor fuel tax revenue are expected to decrease. See Exhibit A.

Matthew Dorfman of D'Artagnan Consulting distributed two publications on road usage charging. See Exhibits B and C. He spoke about the need for road usage charging as fuel efficiency increases and fuel tax revenues decrease as well as road usage charging programs implemented in Oregon and Washington. See Exhibit D.

Trevor Vance, on behalf of Auto Alliance, Jeff Perry of General Motors, and Genevieve Cullen of the Electric Drive Transportation Association testified in opposition to road impact fees targeted specifically at alternate fuel vehicles. Mr. Vance and Ms. Cullen indicated their acceptance of a fee that is technologically neutral. Ms. Cullen and Mr. Perry encouraged a comprehensive update of the existing transportation funding model.

Professor Denvil Duncan of the Indiana University School of Public and Environmental Affairs spoke about implementing a mileage fee to counteract declining fuel tax revenues. He stated that a mileage fee can be a technologically neutral measure of both road usage and damage and recommended that Indiana move forward with a pilot program.

David Holt of Conexus Indiana recommended that the state study the feasibility of imposing a vehicle mileage tax (VMT) on all vehicles in lieu of a motor fuel or gasoline tax. With respect to alternate fuel vehicles, he suggested imposing an equivalent user fee as a short term solution while the VMT is being phased in. See Exhibit E.

Dennis Faulkenberg appeared on behalf of the Build Indiana Council and stressed the importance of being able to pay for the preservation of the state's roads. He echoed Mr. Holt's suggestion of creating a short term fix while pursuing a long term solution.

Cam Carter of the Indiana Chamber of Commerce proposed imposing a VMT as a long term solution and expressed support for an interim mileage fee on alternate fuel vehicles.

Phil Terry of Monarch Beverage and EF Transit testified about Monarch's experience in transitioning its fleet to alternate fuel vehicles, which reduced the company's operating expenses and increased its energy independence. See Exhibit F.

Chairman Soliday recessed the meeting for a lunch break.

Long Term Funding for Passenger Rail and Mass Transit

Chairman Soliday reconvened the meeting at 1:35 P.M.

At the request of Chairman Soliday, Abby Weingardt from INDOT spoke to the Committee about the agreement entered into by AMTRAK, INDOT, and several local governmental units to continue funding the Hoosier State Line for up to 16 months. Ms. Weingardt agreed to provide the Committee with a list of participating local units. Chairman Soliday encouraged Committee members to read INDOT's report on the costs and benefits of continuing service on the Hoosier State Line.

Mayor Tony Roswarski of Lafayette, Eric Angermeir of Nanshan America, Arvid Olson of

the Greater Lafayette Chamber of Commerce (see Exhibit G), and Mayor Dennis Buckley of Beech Grove testified about the importance of the continued operation of the Hoosier State Line to their respective communities.

Ron Gifford presented the IndyConnect funding plan for transit in central Indiana and described possible governance structures. See Exhibit H.

Indiana Commercial Ports on Statutorily Designated Waterways

Sarah Freeman, LSA staff attorney for the Committee, presented a memorandum describing the statutes governing the Ports of Indiana (Ports) and local port authorities. See Exhibit I. Jody Peacock appeared on behalf of the Ports and stated that, while the current statutory scheme creates potentially overlapping jurisdiction, the Ports has not seen evidence of jurisdictional problems. See Exhibit J.

Jeff Stratman, attorney for the City of Aurora, provided a local perspective on the overlapping jurisdictions and asked the Ports to consider the possibility of establishing a regional statistical port for Indiana on the Ohio River.

Seat Belts on School Buses

Sarah Freeman, LSA staff attorney for the Committee, briefly reviewed several scholarly studies on the effectiveness of seat belts on school buses. See Exhibit K.

Chairman Soliday explained that, due to the federal government shutdown, witnesses from the National Transportation Safety Board and the National Highway Traffic Safety Administration were unable to testify before the Committee.

Representative John Bartlett spoke in support of requiring the installation of seat belts in school buses and indicated that expert and industry opinions on this issue are changing and becoming more receptive to requiring seat belts.

Danielle Smith, whose five year old daughter Donasty died in a school bus crash in 2012, testified in support of requiring seat belts in school buses and shared her belief that her daughter would have survived the crash if she had been restrained by a seat belt. Reginald Bishop, Ms. Smith's attorney, expressed his surprise that seat belts are not required in Indiana school buses and stated that they should be required in the future.

Dr. Joseph O'Neil of the Indiana Chapter of the American Academy of Pediatrics spoke in support of requiring seat belts in school buses to reduce student injuries and decrease driver distractions. See Exhibit L. Dr. O'Neil noted that compartmentalization provides protection for front end collisions but is not as effective in rollover and side impact crashes.

Michael LaRocco, Director of Transportation for the Indiana Department of Education, testified that school buses provide extremely safe transportation but stated his support for the installation of seat belts in school buses if financially feasible. He acknowledged that installing seat belts in school buses is not cost effective.

Sherry Deane of AAA Hoosier Motor Club testified that AAA ultimately supports seat belts in new school buses but believes that children are at greater risk when entering and exiting a bus. Ms. Deane advocated for requiring stop arm cameras on school buses to allow better enforcement of laws prohibiting passing a school bus.

Other Business

The Committee received copies of five proposed recommendations for inclusion in the Committee's final report. See Exhibit M. The Committee unanimously approved Recommendations #1 and #2. Recommendation #3 was approved with twelve aye votes, with Representative Davis voting against the recommendation and Representative Pryor abstaining. The Committee did not discuss or vote on Recommendation #4 or #5.

Chairman Soliday adjourned the meeting at 4:20 P.M.

October 16, 2013

JOINT COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE ASSESSMENT & SOLUTIONS

INDIANA ROAD AND BRIDGE FUNDING

- Three Primary Sources:
  - Federal Funding
  - State Funding
  - Local Funding

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FEDERAL FUNDING

- Comes from the Federal Highway Administration.
- Indiana is anticipated to receive $919.9 M in federal highway funds in FFY 2014, and $865.9 M in FFY 2015, according to INDOT.
- This is down from $957.2 M in FFY 2005.
- Stability of federal funding is in question as federal government has been borrowing from general fund to fully fund the Federal Highway Trust Fund (from federal gas tax).

STATE FUNDING

- Motor Vehicle Highway Account
  - Funded by a combination of a portion of gasoline tax, special fuel tax, vehicle fees (BMV) and motor carrier revenues. In FY 2013, the MVHA had $513.3 M available for disbursement.
    - In 2013 Budget Bill, added 1% of Sales Tax as well as removed many expenses that were previously paid for out of MVHA. Expected to add an additional estimated $210 M of new revenue to the MVHA, starting in FY 2014.
    - However, it is expected that motor fuel revenues will continue to decrease. Not accounting for inflation, annual gasoline and fuel use tax revenues decreased by roughly 6% between FY 2008 and FY 2013.

STATE FUNDING

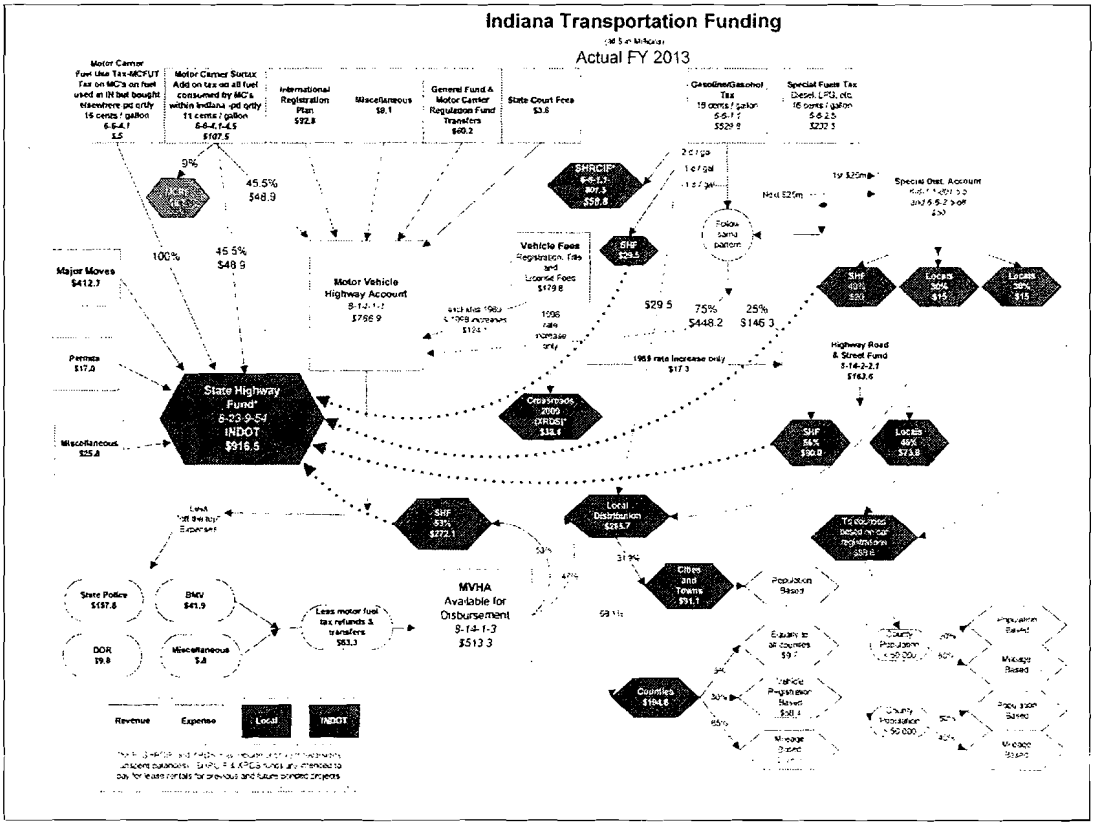
- Motor Vehicle Highway Account
  - Split between the State (53%) and Locals (47%).
  - State share goes into State Highway Fund.

STATE FUNDING

- Highway Road and Street Fund
  - Funded by Gasoline Tax, Special Fuel Tax, and Vehicle Fees (BMV).
  - Split between the State (55%) and Locals (45%).
  - Local distribution referred to as Local Road and Street Account.
  - This fund had $163.6 M available for disbursement in FY 2013.

STATE FUNDING

- Accelerated Distributions
  - Two distributions that come from an "off the top" portion of gasoline and special fuel taxes.
  - $30 M to locals from these distributions per year.
    - $15 M distributed via MVHA formula.
    - $15 M distributed via Local Road & Street formula.



LOCAL FUNDING

- Cumulative Bridge Funds
- Wheel Tax/Surtax
- LOIT
- Property Tax
- Gaming Revenues/Toll Road Lease Revenues (some counties)

CONCLUSION

- Lower expected federal highway funds.
- Potentially lower motor fuel revenues into state in the future.
- The state will exhaust the majority of Major Moves funding by FY 2014 and FY 2015 (with the exception of the $500 M Next Generation Trust Fund and the Major Moves 2020 Trust Fund).

WHAT

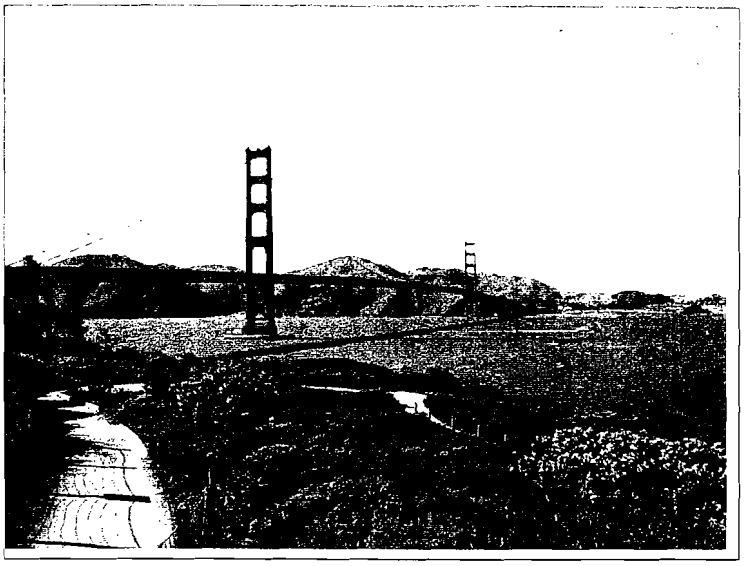
ROAD USAGE CHARGING

Road usage charging is a policy of assessing fees for the use of roadway infrastructure across an entire roadway network, at all times. With growing interest in sustainable and equitable methods of generating revenue for the maintenance and operations of transportation infrastructure, road usage charging programs have proliferated worldwide over the past decade.

Road usage charges support the notion of managing transportation infrastructure as a utility. Similar to utilities such as electricity and gas, road usage charges are a fee paid per unit of consumption, reinforcing the long-standing "user pays" paradigm for road transportation. Road usage charges also provide a platform for other innovative transport policies, such as tolls, managed lanes, and demand-based parking pricing, and may be deployed in conjunction with them.

Road transport revenue collection policies around the world	
Fuel taxes	Prevalent in the U.S. since introduction by Oregon in 1919
Tolls	Over 150 tolled facilities and corridors in North America alone
Managed lanes	Over a dozen active facilities in the U.S. with several dozen more planned
Congestion charging	Active schemes in Singapore, London, Stockholm, Gothenburg, and several Italian cities.
Road usage charging	Various schemes operating globally for trucks and passenger cars

Road usage charging has been deployed across the globe, including in New Zealand since 1977 and throughout Europe since the early 2000s. In 2013, following a decade of policy development and pilot tests, Oregon became the first U.S. jurisdiction to establish road usage charges for light vehicles, with a system set to go live for 5,000 vehicles in 2015 and expand thereafter.



Road usage charges provide a reliable and equitable revenue stream while allocating costs to drivers in direct proportion to their actual usage of the road. Fundamental characteristics of road usage charges include:

- **Network-wide.** Charges are assessed across a network of facilities within a specified geography rather than for a single facility, corridor, or trunk line as is often the case in tolling.
- **24 / 7.** Charges are assessed regardless of the time of use and may vary. In this respect, road usage charges are akin to a utility model or any other consumer product in which the user of a good or service is expected to pay for it at the time of use.
- **For general highway use.** Revenue allocation generally spans a State or large region, rather than being limited to a single facility or small jurisdiction, reflecting the network nature of our road infrastructure.
- **Many operational concepts.** Road usage charges can be implemented using a wide range of approaches, from paper licenses and odometer readings to automated technologies, such as telematics systems built in to vehicles. **GPS and other location technologies are not required.**

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WHY

ROAD USAGE CHARGING

The U.S. highway transportation system was built largely on fuel excise taxes, which were first implemented in Oregon in 1919 at 1 cent per gallon, followed eventually by the other 49 states and the federal government

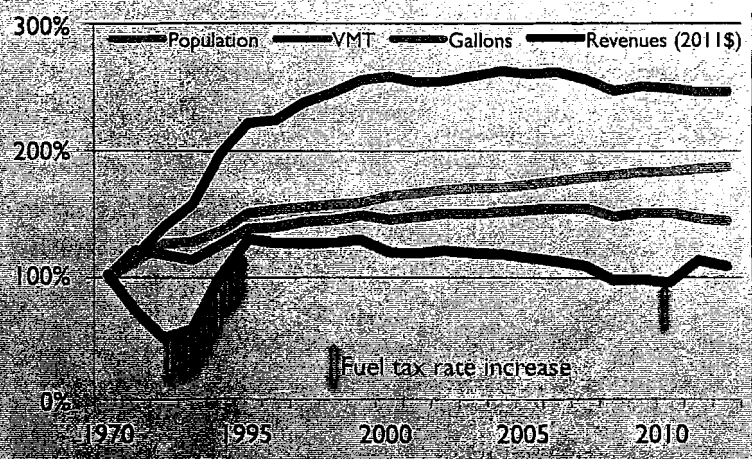
Today, fuel tax revenues are in permanent decline due to two persistent trends:

- Consumers are purchasing and driving ever more fuel-efficient vehicles, including electric vehicles, thus paying less in tax per mile driven than ever before.
- Although fuel prices have increased dramatically in the past decade, tax rates are not tied to inflation.

Despite declines in fuel tax revenues, population and vehicle miles traveled continue to grow, as illustrated below by data from Oregon.

Electric, plug-in hybrid electric, and highly efficient internal combustion engine vehicles have already arrived. Nearly two dozen new models are coming in the next five years to help meet U.S. CAFE standards of 54.5 MPG by 2025. Fuel tax revenues have already begun a decline that will only steepen under status quo policies.

The adoption of highly fuel efficient vehicles is not occurring equally across all segments of the population. Low-income and rural motorists drive older, less fuel efficient vehicles on average. As a result, under a policy of reliance on fuel taxes, they are incurring much higher tax rates per mile traveled and paying a disproportionately large share of road fees compared to more affluent and urban motorists who drive highly fuel efficient vehicles. This inequity is expected to increase.



Several U.S. study commissions and numerous organizations have endorsed the concept of road usage charging, beginning with the 2007 National Surface Transportation Policy & Revenue Study Commission. Successful implementations abroad and successful pilot tests in the U.S. demonstrate the feasibility of implementing such policies. The time is ripe for a shift in transportation policy from commodity-based taxation toward addressing the road network as a utility with usage-based payments. In summary:

- The quality of fuel consumption as a proxy for road usage is rapidly degrading, drawing into question the validity of fuel excise taxes as the basis for road funding.
- Technology, administration, cost and privacy barriers to direct, distance-based network-wide road usage charges have eroded based on the work of the past several years.

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WHO

ROAD USAGE CHARGING

D'Artagnan Consulting LLP (DCL) is a partnership of professionals specializing in transportation policy, planning, road usage charging (RUC), and Intelligent Transportation Systems (ITS). Each of the four D'Artagnan partners and our associates has gained expertise supporting projects that pioneered the modern era of RUC and ITS, including distance-based charging, all-electronic tolling systems, interoperability of electronic tolling, and value added services for road pricing such as controlled access and parking. The partners' experience includes policy analysis and advice, business case analysis, technology analysis, expert opinions, economic theory of road charging, marginal social cost analysis for RUC projects, and program implementation support.

DCL has remained at the forefront of RUC policy development and implementation through a range of projects in North America, Australia, New Zealand, Asia, and Europe, a sample of which are described below.

Oregon Department of Transportation

Since 2011, DCL has developed and analyzed policies and systems for distance-based road usage charges on all public roads in Oregon, culminating in the passage of enabling legislation in 2013. Services include overall project strategy, planning, and scheduling; policy and technical design; implementation support; stakeholder communications; and support for the Road User Fee Task Force (RUFTF) to refine policy decisions based on detailed analysis of technologies, costs, revenues, organizational constraints, international comparators, and public attitudes.

Washington State Transportation Commission

Washington State Department of Transportation

DCL provided research and analytical support for the Road Usage Charge Steering Committee leading up to a unanimous finding that road usage charging is feasible for Washington State. Current phases of work include policy refinement, technology and operational concept development, and business case analysis. Future phases will include R&D, pilot testing, and communications with the public and key stakeholders.

roadsaustralia

DCL serve as expert advisers to Roads Australia as it formulates policy justification, operational concepts, and organizational design for road usage charging and implementation of a utility model for transportation systems.

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

DCL provided RUC policies and strategies for SCAG as the agency developed a long-range transportation plan that includes road usage charging as a pillar of regional funding by 2025.

LINKING MELBOURNE AUTHORITY

DCL provided toll system advice to support Linking Melbourne Authority (LMA) as part of a study of current practices in Victoria and Australia. The cutting edge study provided new views of technology alternatives and paradigms for distance-based tolling in conjunction with the future opening of the East West Link highway.

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WHO

ROAD USAGE CHARGING

D'Artagnan Consulting LLP (DCL) partners have seven decades of combined experience in the transportation sector. Together, their diverse backgrounds and perspectives have created a one-of-a-kind consulting venture that offers unparalleled knowledge, experience, and cutting edge ideas to promote transformation toward financial sustainability and equity in surface transport.

Jack Opiola is Managing Partner and President of DCL. For the past 25 years he has specialized in project management for road usage charging, congestion charging, and Intelligent Transportation Systems (ITS). Mr. Opiola has been a pioneer in road usage charging, including work in Hong Kong, New Zealand, Australia, Singapore, the UK, and the USA. Recognized as one of the leading policy and technology thinkers in the global transport industry, he is frequently in demand as a speaker. He is currently the lead advisor to the Oregon Department of Transportation's design of policy and systems for road usage charging. He is also managing DCL's assessment of road usage charging for Washington State. Recently, he provided policy analysis for a study of funding alternatives for the Southern California Association of Governments (SCAG), leading to adoption of RUC in the long-range transportation plan.

Matthew Dorfman is Partner and Vice President of DCL. He has over a decade of experience in the design, implementation, and testing of road usage charging systems, toll systems, and ITS. Matthew is currently leading research and development efforts for Oregon's groundbreaking road usage charge system. He is also providing technology analysis and operational concepts for a range of policy approaches to road usage charging alternatives in Washington State. He has provided similar support for road usage charging projects in Australia, New Zealand, and the UK. Matthew's background in technology includes prior work as an ITS consultant for Booz Allen Hamilton and Strategy Manager at Kapsch TrafficCom, where he provided technical oversight of tolling projects and helped design plans to convert existing tolling systems to open road tolling technology.

Steve Morello is Senior Partner and Senior VP of DCL where he leads organizational design, communications, and certification activities for road usage charging and ITS. Mr. Morello has worked in the transport sector for over 20 years. For the past ten years, he has worked as a consultant and vendor formulating policy, evaluating benefits, and designing systems for road usage charging in Australia, Czech Republic, Greece, France, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Slovakia, Slovenia, South Africa, the UK, and the USA. Currently, he is leading organizational framework analysis and technology certification workstreams for the Oregon Department of Transportation's implementation of a road usage charging system. He is also providing international comparators, analyzing organizational alternatives, and developing operational concepts for Washington State's assessment of road usage charging.

Travis Dunn is Partner and Vice President of DCL, where he is leading policy analysis, evaluation strategy, and financial modeling of costs and revenues for Oregon's road usage charge. He is also conducting a business case analysis for Washington State's exploration of road usage charges. Dr. Dunn brings a decade of experience in the transportation sector, including prior work as a consultant to local, state, and federal transportation agencies in the areas of road usage charging and ITS evaluation. Dr. Dunn is a graduate of MIT's doctoral program in transportation, where he conducted research in Portugal on road usage charging alternatives for the national motorway network. More recently, he completed a Fulbright fellowship in Mexico City, where he worked with federal officials to develop a national ITS strategy and tolling interoperability plan.

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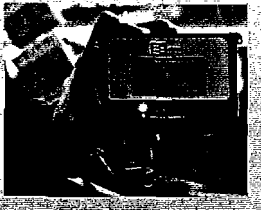
WHERE

ROAD USAGE CHARGING

New Zealand

Since 1977, New Zealand has collected road usage charges from heavy trucks and non-gasoline vehicles based on weight and distance traveled on all public roads in the country. Today, 250k trucks and 500k diesel cars (out of 3 million total) pay the fee known locally as RUC. RUC payers have two options:

- Purchase and display windshield mileage permits, checked against odometers (image below left).
- Employ a certified, third-party provider such as ITL or EROAD (image below right) to install electronic distance reporting devices in their vehicles.



Europe

Many European countries have employed road usage charging for over a decade:

(1) Heavy (commercial) vehicle road usage charging requires trucks driving in certain countries to be equipped with distance and location reporting devices to measure distance travelled on main roads.

(2) Passenger car "vignettes" or sticker permits which allow passenger vehicles access to the road network of a country for a specified period of time such as one day, week, month, or year.

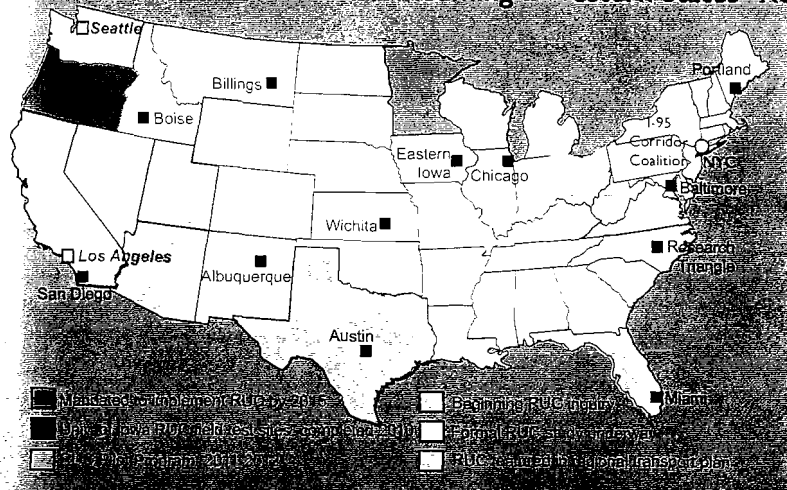
Oregon

In 2013, Oregon became the first North American jurisdiction to impose road usage charging for cars, with the passage of legislation to implement a system by 2015. The system will accommodate 5,000 volunteer vehicles but is designed for quick expansion to a larger segment of the fleet.

Oregon is one of four states (other states include Kentucky, New Mexico, and New York) that assesses a weight-distance tax on heavy vehicles. Currently, the tax is self-reported manually, but a pilot test is underway for automated, electronic reporting.

Other U.S. Pilots

The map below summarizes RUC systems, pilot tests, and studies around the U.S. over the past decade. Notably, Oregon and Minnesota have run extensive pilots testing a wide range of methods for measuring and collecting road usage charges. Nevada, Oregon, and Washington are currently forming a Western States "RUC Consortium."



Numerous states have begun studies and formal inquiries, while Southern California and Puget Sound regional planning agencies have assumed road usage charging on all roads will be realized by 2025 as part of their long range transportation plans (LRTP).

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HOW

ROAD USAGE CHARGING

User Choice

There are many methods of assessing a road usage charge, ranging from simple, manual processes to sophisticated, automated technologies. Each jurisdiction may choose its own combination of available methods based on the preferences of its transportation system stakeholders.

An important principle of the most successful road usage charge systems, including Oregon's, is **user choice**: allowing users (drivers) to select charge determination and payment methods from a menu of options that provides them the most personal convenience. The range of choices may include:

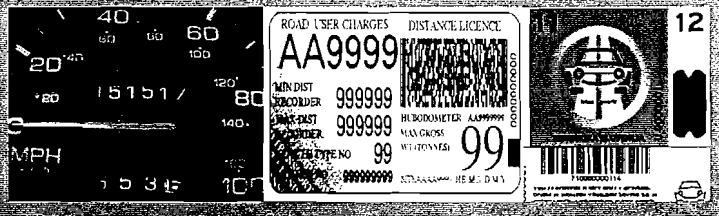
- Prepaid permits for specified time (e.g., 1 month, 1 year) or distance (e.g., 1000 miles, 5000 miles).
- Prepaid annual distance estimates with periodic reconciliation through odometer inspections.
- Post-pay charge based on odometer inspections.
- Automated total mileage reporting from in-vehicle devices, without location technology.
- Automated total mileage reporting from in-vehicle devices with location information to support off-road or out-of-jurisdiction refunds.

Open Systems

Due to the range of road usage charge operational concepts, implementing a system requires a range of administrative concepts for the implementing agency. State agencies handle traditional revenue collection such as sales, income, property, and fuel excise taxes. However, road usage charging requires the ability to assess and collect variable payments from individual motorists across a jurisdiction, which may pose a challenge for agencies.

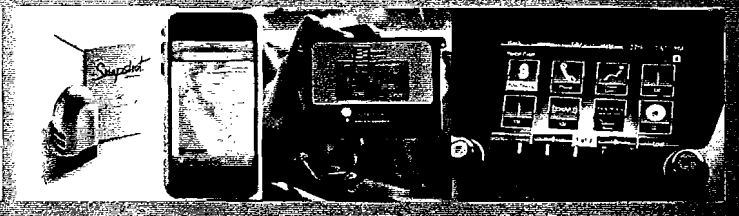
Technology and service providers can collect road usage charges on behalf of governments through an **open system** paradigm. Insurers, mobile phone providers, toll road companies, and others have been attracted to the road usage charge market by the prospect of selling value-added services such as pay-as-you-drive insurance, traveler information, vehicle diagnostics, and more. Service providers do not have contracts with government, but rather a license or service agreement to collect road usage charges and remit them to the state subject to state standards and requirements. By offering value-added services on the same platform, the marginal cost of road usage charge collection to the state decreases dramatically.

Manual Processes



Manual processes for road usage charge reporting are largely based on pre-payment. Verification of payment and usage may occur through periodic odometer reads by certified inspectors (above left); distance permits affixed to the windshield or carried in the vehicle to check against odometer reads (above center); or time permits enforced similarly to distance permits (above right).

Automatic Devices



Automatic devices for road usage charge reporting range from simple devices such as pay-as-you-drive mileage reporting devices that only count and report total miles driven (example above left is Progressive's *Snapshot*), to smartphone apps (center left), to aftermarket location-based reporting devices (center right), to in-vehicle telematics which can measure, report and process transactions (right).

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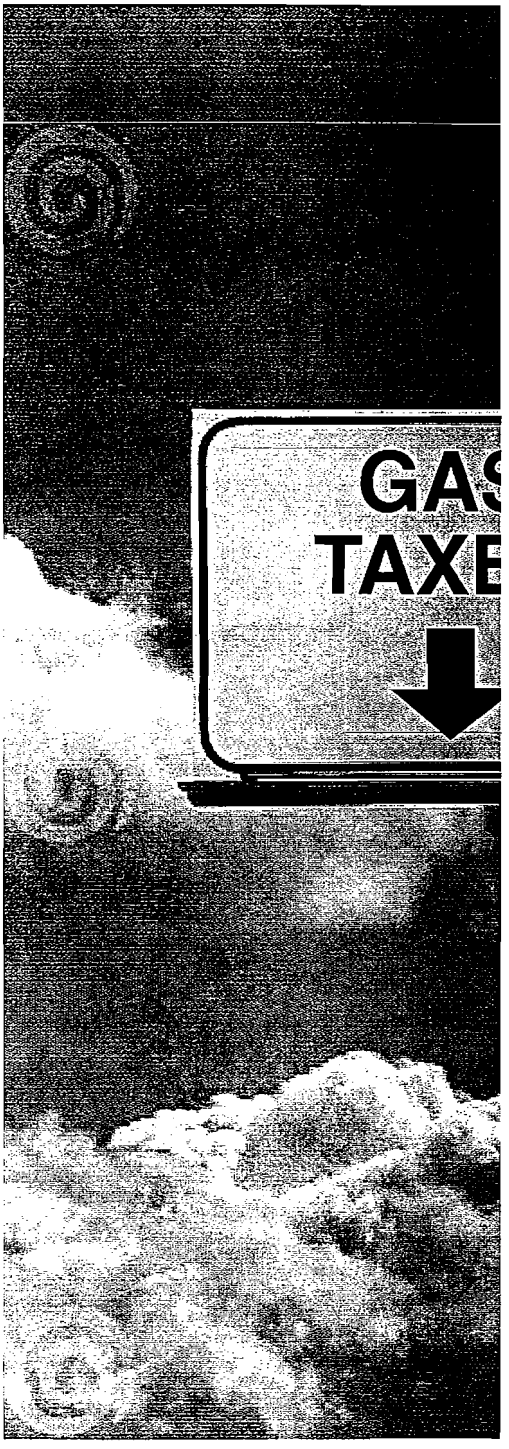
For Those About to RUC (We Salute You)

Matthew Dorfman on the US's potentially painful transition from gas tax to distance-based charging



It is time for US States and other jurisdictions to begin transitioning from fuel taxes to distance-based road usage charging (RUC) as the principal source of transportation revenues. RUC has been discussed for decades as a sustainable funding source, and many writers have stated that an ultimate transition to RUC is inevitable, yet most writers have placed the start of such a transition at 10 or 20 years in the future. But the policies and technologies to implement RUC are now mature, and the time to start the transition is now.

FOR THOSE ABOUT TO RUC

A few US States are boldly leading the way to effective RUC technologies and policies. As this article goes to press, Oregon House Bill 2453 is working its way through the Oregon Legislature. This bill follows a second RUC pilot project in Oregon that demonstrated RUC could be implemented efficiently (with commercial off-the-shelf equipment) and in a way that relieved the privacy concerns of users.

The US State of Minnesota has just completed a major RUC pilot; final results haven't been published, but all interim results have shown the project to be feasible and user-friendly. Nevada DOT continues to operate and expand upon the pilot work they have performed. The Washington State legislature convened a Steering Committee that unanimously concluded that RUC is a feasible method of generating transportation revenues. Texas, Florida, Massachusetts and other states are considering how to develop a RUC policy. The courage of these states in developing these groundbreaking policies will help lead the way to a new means of funding transportation initiatives worldwide.

FUEL TAXES ARE IN A STATE OF PERPETUAL DECLINE

These forward-looking states have been forced to innovate because fuel tax revenues are in a state of perpetual decline. Several studies have shown that the Obama administration's recent increase of the Corporate Average Fuel Economy (CAFE) standards will cause a major (20-60 per cent) drop in fuel tax revenues by 2025. Simultaneously, vehicles that pay no or little fuel taxes are entering the market—such as electric, plug-in hybrid, natural gas, and other alternate fuel-powered vehicles.

Fuel taxes were always a proxy for road usage. As far back as 1919, when Oregon was the first US State to introduce the gas tax (the federal gas tax was introduced two decades later), the gas tax was a proxy for road usage because then as now, State transportation expenditures cover fixing roadway wear-and-tear, and how much roadway wear-and-tear (the quantity that consumers are effectively paying for) is proportional to how much they drive.

For decades, vehicle fuel efficiency was fairly stable, and the fuels tax functioned fairly well as a proxy for road wear-and-tear. However, new vehicle technologies such as fully electric powertrains are creating vehicles that pay no fuels tax at all, or increasing fuel efficiencies faster than the fuels tax can be raised in modern political cycles, and thus eroding the efficacy of the fuels tax as a proxy. These trends are illustrated in the figure below.

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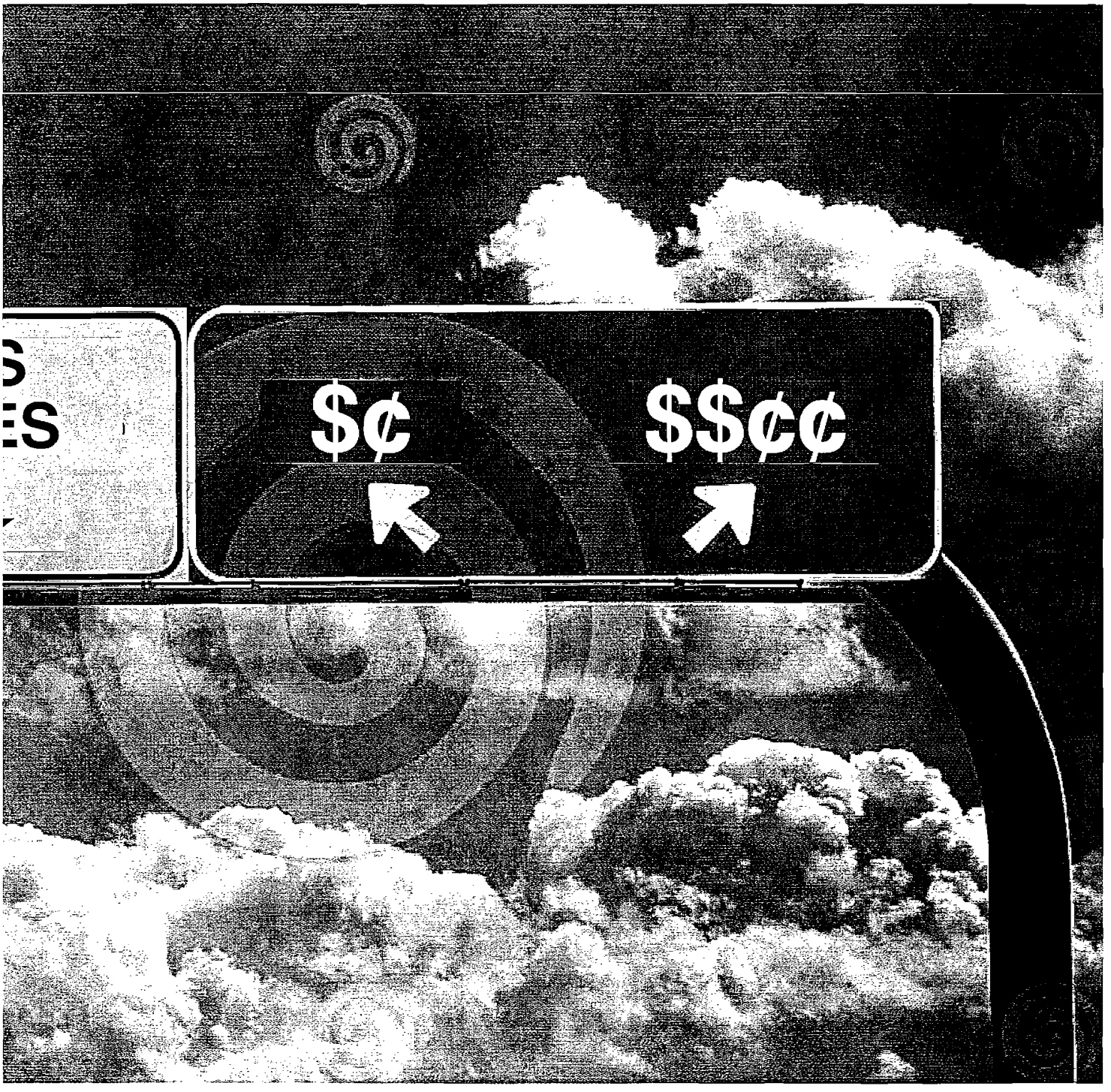
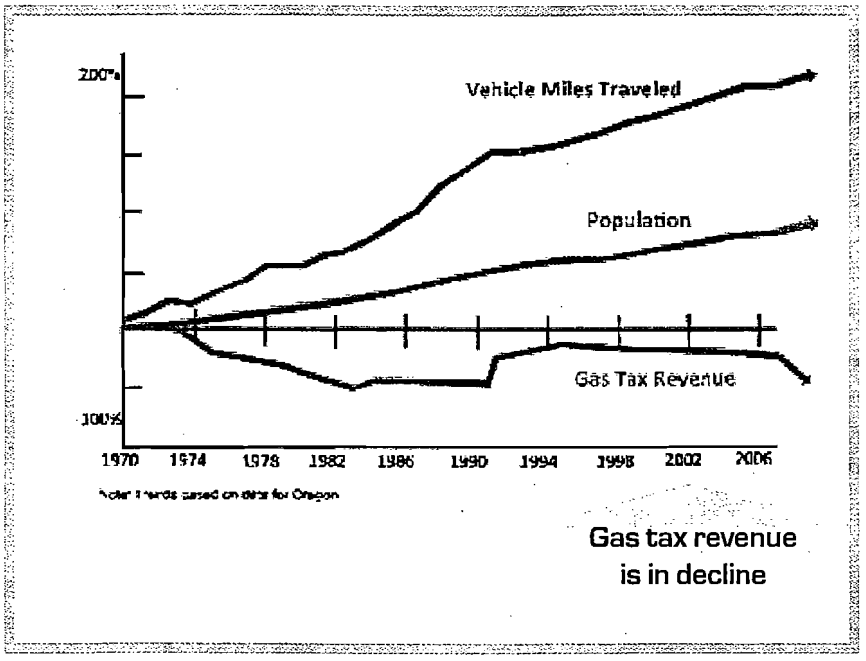
10/16/13 Ex. C

"New vehicle technologies such as fully electric powertrains are **creating** vehicles that pay no fuels tax at all, or increasing fuel efficiencies **faster** than the fuels tax can be raised in modern political cycles"





Gas tax revenue is in decline

Why call it RUC?

Road usage charging is alternately referred to as vehicle miles traveled (VMT) fees or Mileage-based User Fees (MBUF). The author prefers RUC for the following reasons:

- Most countries measure distance in kilometers instead of miles. Thus both VMT and MBUF are US-centric.
- The phrase 'road usage' suggests treating roadways as a publicly provided or regulated utility like water or gas.
- Words like 'tax' and 'fee' have specific legal and business meanings, while concept of a 'charge' is neutral. RUC could be a tax in one place and a fee in another.

Fortunately, at the same time, new technologies are reducing the administrative and cost barriers to collecting RUC. It's time to transition from the unsustainable and ever-worse proxy (fuel tax) to the real thing (RUC).

RUC: THE MOST EFFICIENT AND THE MOST FAIR

RUC is the most economically efficient means of generating revenues for transportation uses when RUC-generated revenues are dedicated to road or transportation uses. The economic efficiency derives from the fundamental benefit of RUC: that it is resilient to increasing vehicle fuel efficiency and is independent of a vehicle's powertrain type (electricity/gasoline/diesel/natural gas). So long as RUC revenues are exclusively dedicated to transportation, RUC guarantees consistent transportation funding regardless of vehicle technology improvements.

A major economic benefit of RUC's guarantee of a consistent, predictable funding stream is that a steady revenue source allows long-term monetary authorizations, which allow much easier financing of large-scale long-term projects. In contrast, partial or total support from government general funds leads to short-term appropriations, such as the two-year transportation authorization recently passed by the US Congress (MAP-21). Short-term authorizations make it very difficult to finance capital projects whose schedule exceeds the term appropriation, and many major infrastructure projects are impossible to complete in two years, even if all permitting is complete.

Additionally, RUC supports collection services being provided by private service providers in competition with one another, which supports low administrative costs. In an 'open system,' private providers would be authorized by a state to compete for customers. The private provider would charge for providing value-added services, such as pay-as-you-drive insurance, simplified or consolidated billing of tolls, parking, express lanes, and others. These value-added services could minimize or eliminate any charges for collecting the RUC and provide a substantial business case for the service provider.

RUC is also the fairest means of generating revenues for transportation uses. Inherently, RUC is more proportional to roadway usage and damage than fuels taxes: roadway wear-and-tear is proportionate to the number of miles driven, not the number of gallons or kilowatts consumed. Thus RUC is the fee that supports an allocation of charges that most closely reflects user-imposed costs. This means that RUC implements the 'user-pays' principle.

Many surveys have shown the public view 'user-pays' as the most equitable way for paying for public goods that are individually consumed—more fair than paying for them out of the general fund or property taxes or sales taxes or a myriad of other less equitable taxes. Essentially 'user pays' means treating roadways as a public utility, similar to water, electricity, or natural gas.

This is appropriate, because the transportation system is actually the most important utility, since it supports the supply of all the necessities to the human population including; food, shelter, clothing, and equipment needed to supply electricity and water. Finally, RUC corrects an inequity of gas tax: lower income families often drive older vehicles that consume more fuel and thus pay a greater share of gas taxes than higher income families that can afford to purchase ever-increasing fuel efficient vehicles.

WHAT ABOUT PRIVACY, RURAL DRIVERS, AND THE COST TO IMPLEMENT?

Three common arguments against distance-based charging include privacy concerns, rural driver equity, and cost of administration. Each of these criticisms can be addressed by a thoughtful RUC policy.

1. Privacy concerns

The key to relieving privacy concerns stemming from a RUC system is offering drivers subject to the RUC multiple choices of how road usage is measured. The choices offered must include at least one fully manual option (such as a flat fee for unlimited use during a year or a charge based on odometer mileage reporting). Other choices include:

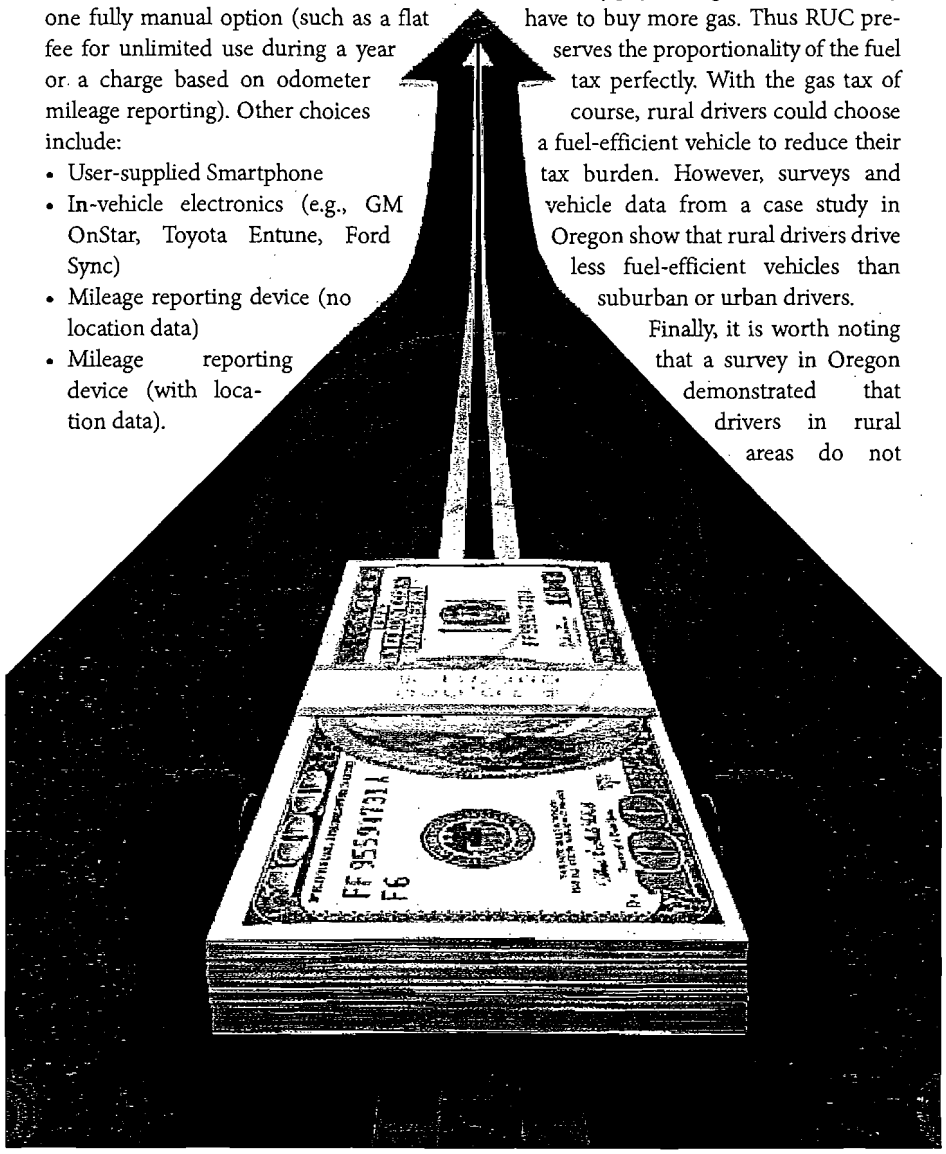
- User-supplied Smartphone
- In-vehicle electronics (e.g., GM OnStar, Toyota Entune, Ford Sync)
- Mileage reporting device (no location data)
- Mileage reporting device (with location data).

When drivers have multiple choices of how RUC is measured, and when a totally manual option is offered that allows individuals uncomfortable with any charge-collecting technology to pay a fee, our experience has shown that opposition to RUC due to privacy concerns is mitigated.

2. Rural driver equity

A common misperception about RUC is that rural drivers would have to pay more—disproportionately more—under RUC than under the gas tax. This perception is incorrect. Long-distance drivers already pay more gas tax because they have to buy more gas. Thus RUC preserves the proportionality of the fuel tax perfectly. With the gas tax of course, rural drivers could choose a fuel-efficient vehicle to reduce their tax burden. However, surveys and vehicle data from a case study in Oregon show that rural drivers drive less fuel-efficient vehicles than suburban or urban drivers.

Finally, it is worth noting that a survey in Oregon demonstrated that drivers in rural areas do not actually drive more miles than urban drivers: rural trips are on average longer but less frequent than urban trips. Rural commuters have trips that are on average shorter than urban commutes—many rural residents work on their property, while urban drivers tend to have long commutes. Total distances traveled in a given year are similar across urban and rural drivers.



3. Cost of administration

A final argument used against RUC systems is that they will have a high cost of administration compared to that of fuels taxes. First, the use of private service providers mentioned above will drive the cost to the state down considerably. Such systems are already used in in New Zealand's RUC for diesel vehicles (passenger and commercial) and Ireland's interoperable tolling system. Such a system could lower the cost of administration well below 10% of revenues.

Next, fuels tax estimates that put the cost of administration as low as 1 per cent of revenue generally omit significant costs to the government such as evasion (fuel tax evasion, which has not been documented in the U.S. since the 1990s, may exceed 5 per cent) and enforcement (when records were kept by the US Government enforcement was as high as 7 per cent). Perhaps RUC will never be quite as cheap to administer as fuels taxes, but the revenue sustainability it offers in the face of decreasing fuel consumption and the corresponding decline in fuels tax revenue is worth the additional cost.

POLICY CONSIDERATIONS

One major policy consideration that should be mentioned is that the transition to RUC in the US will begin at the state level, not the federal level, just as the gas tax was first introduced at the state level in the early 20th century. This is because developing RUC requires developing a new range of policies, which involves political risk. This process invokes the role of US States to serve as 'crucibles of democracy'—the jurisdiction where policies are refined and perfected. However,

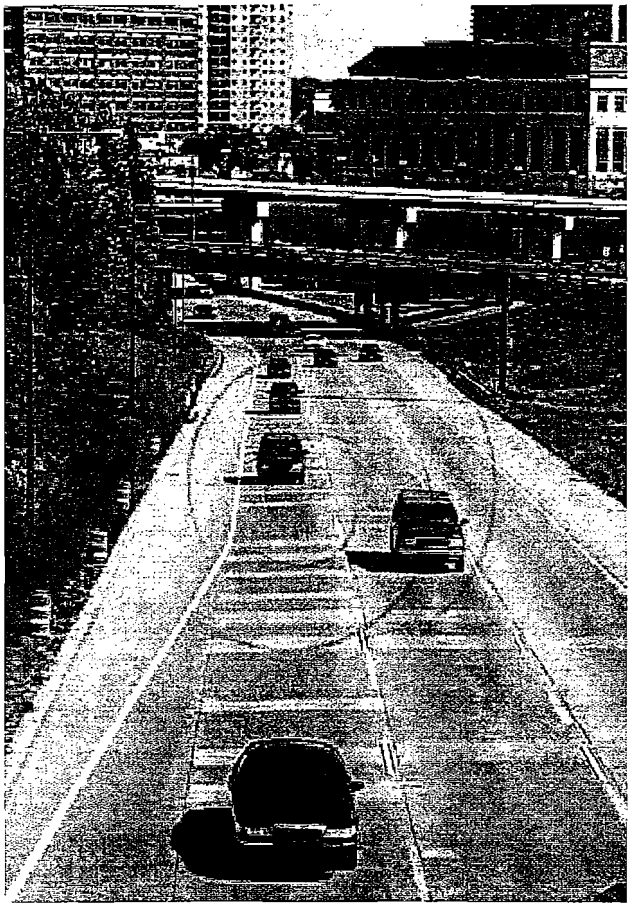
development of RUC programs should benefit from both federal and state government financial support.

A second policy consideration is that when passing a distance-based charging bill, states should focus on revenue sustainability, and minimize emphasis on other goals commonly associated with RUC such as congestion reduction. Revenue sustainability is the most pressing problem to States, and thus provides the strongest political justification for a significant shift in policy. Reducing the number of policy goals being pursued also minimizes the number of political opponents a policy will face, clarifies the message, and increases the likelihood of support and passage. Once legislation is passed and the system operational, other goals may be pursued later.

A third policy consideration is that at its start, RUC may not apply to all vehicles in a given jurisdiction. It may take a significant time to phase in RUC. In fact, a RUC policy may never apply to all internal combustion engine vehicles. At a per-mile fee that generates revenues equal to the revenues generated by the gas tax, lower-than-average fuel efficiency vehicles pay more in gas tax than in distance fees. It makes sense to leave the lower-than-average vehicles on the gas tax, at least for some transition time, or until the RUC is raised to a per-mile fee that generates more revenue than the gas tax currently does. When RUC applies only to a subset of vehicles (rather than the entire fleet), vehicles not included in the mandate, may be allowed to opt in to RUC. Opting into RUC status may help the overall transition plan move forward faster.

Fourthly, introducing RUC does not preclude increasing state or federal gas taxes before the RUC is implemented, especially in states where RUC is not yet a mature policy. Raising the gas tax may be the fastest way to fix the current decline in revenues during a transition to RUC. However, the expending political capital to raise the gas tax may limit the political will available to pass a RUC bill.

Last, implementing RUC does not preclude building new toll facilities. Tolling will remain an important means paying for new infrastructure. Drivers currently pay both gas taxes and tolls to use toll facilities, so there is no reason why this would change with RUC.



Drivers currently pay both gas taxes and tolls to use toll facilities, so there is no reason why this would change with road user charging

WE SALUTE YOU

To keep transportation funding consistent and sustainable, the time has come to implement RUC. Oregon is close to passing a RUC-enabling bill. Washington State just found RUC to be a feasible transportation revenue policy. Nevada and Minnesota are working on RUC trials. And there is great interest from many other states (Massachusetts, Wisconsin, Vermont, West Virginia, Florida, Texas, etc.).

In states where significant policy groundwork for RUC has been laid, it's time to pass legislation and get a system started. For states where it is not yet a mature policy, more policy development and pilot testing is needed. These states can benefit from the work of the more advanced states, but will still need to do policy research, communications, focus groups and public outreach to customize a policy appropriate for their own political landscape. But, for those about to RUC, we salute you!

Matthew Dorfman is a partner with D'Artagnan Consulting with over 10 years of experience in the design, implementation, and testing of road user fee, ITS, and toll collection systems. He is currently leading research and development efforts for a groundbreaking vehicle mileage tax system

matthew.dorfman@dartagnan.co

www.dartaagnan.co

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TTAS
10/10/13
Ex. D

Road Usage Charging

State of the Practice in Oregon & Washington

Matthew Dorfman
D'Artagnan Consulting LLP

Agenda

Why Road Usage Charging is Needed

Road Usage Charging Policy in Oregon and Washington

- What Road Usage Charging is/is not
- Policy principles
- Mileage reporting methods
- Lessons learned

Oregon SB 810

Why Road Usage Charging is Needed

Transportation Funding in the Age of Fuel Efficiency

Fuel tax receipts are now in permanent decline

US CAFE standards for 2016 (34.5 mpg) and 2025 (54.5 mpg) will impact the entire future passenger vehicle fleet composition and fuel efficiency

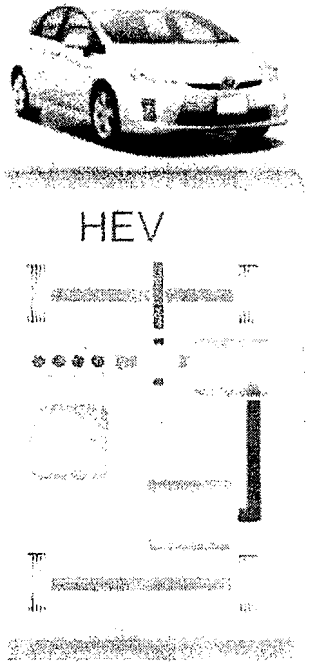
Standard passenger vehicles with 100 percent electric motive power entered marketplace in 2010

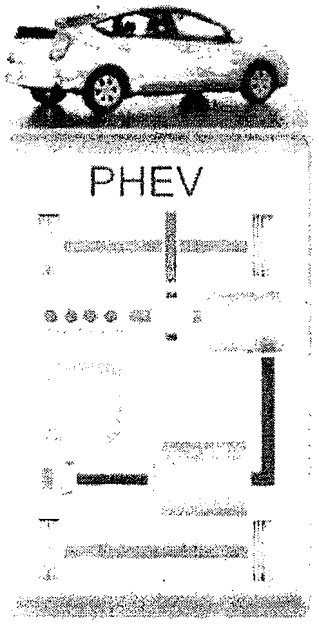
- Four main models in 2012
- More than 11 models being commercialized in 2013
- 15-18 models announced by all automobile manufacturers and introduced by 2015

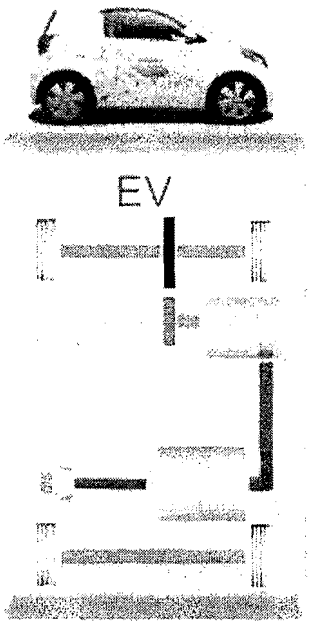
Plug-in hybrid vehicles entered marketplace in 2012, CNG in 2013/2014

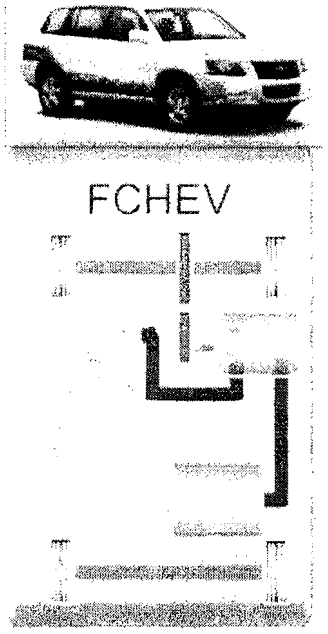
The Challenge: Efficient Engine Technology

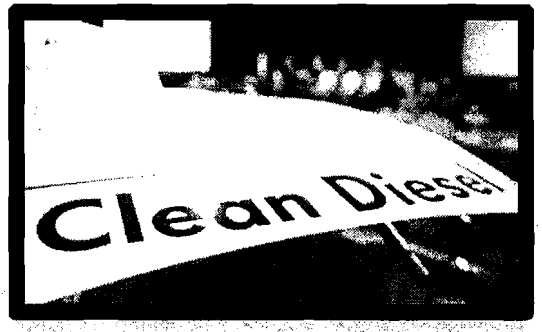
Using hybrid technology for PHEV, EV and FCHEV



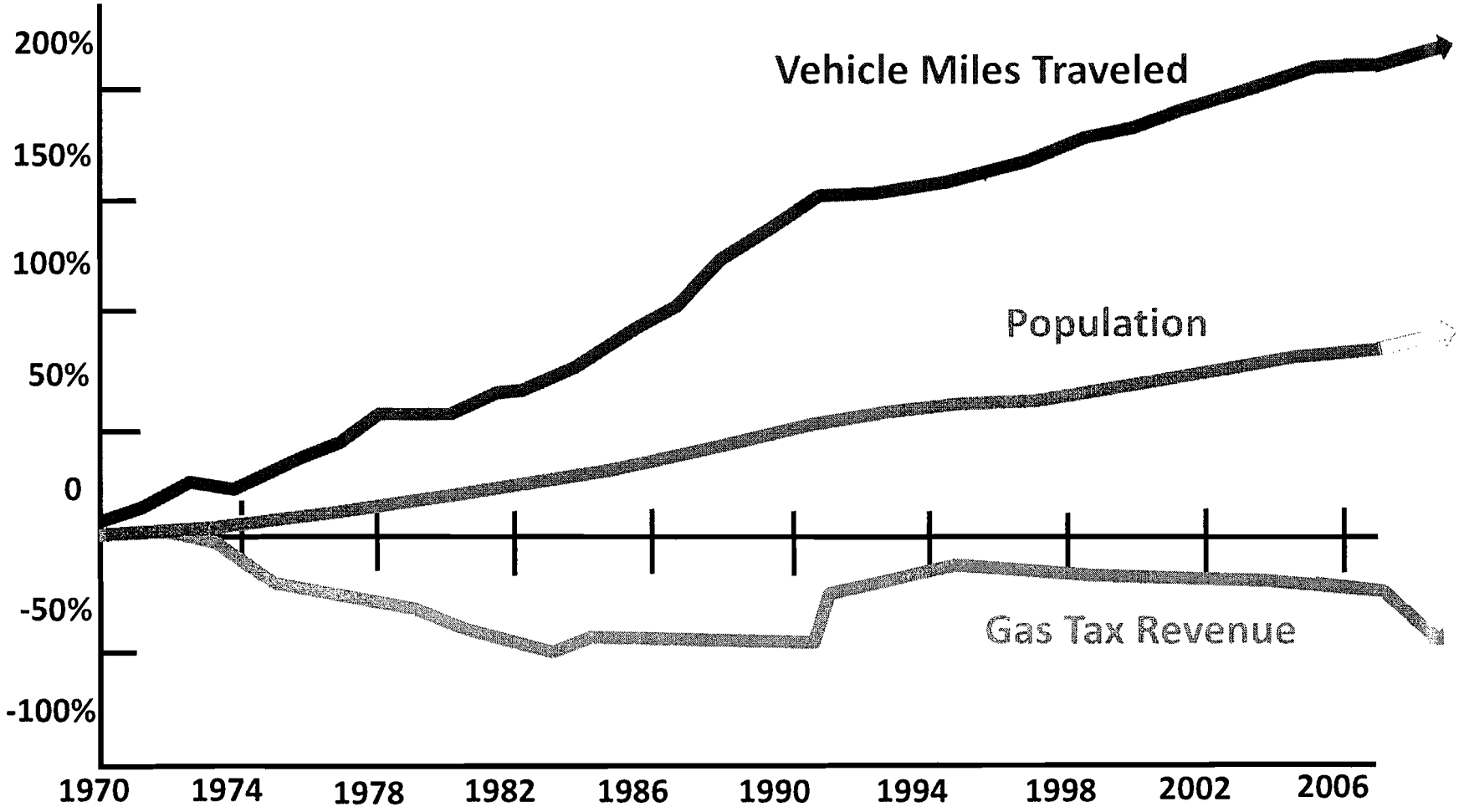






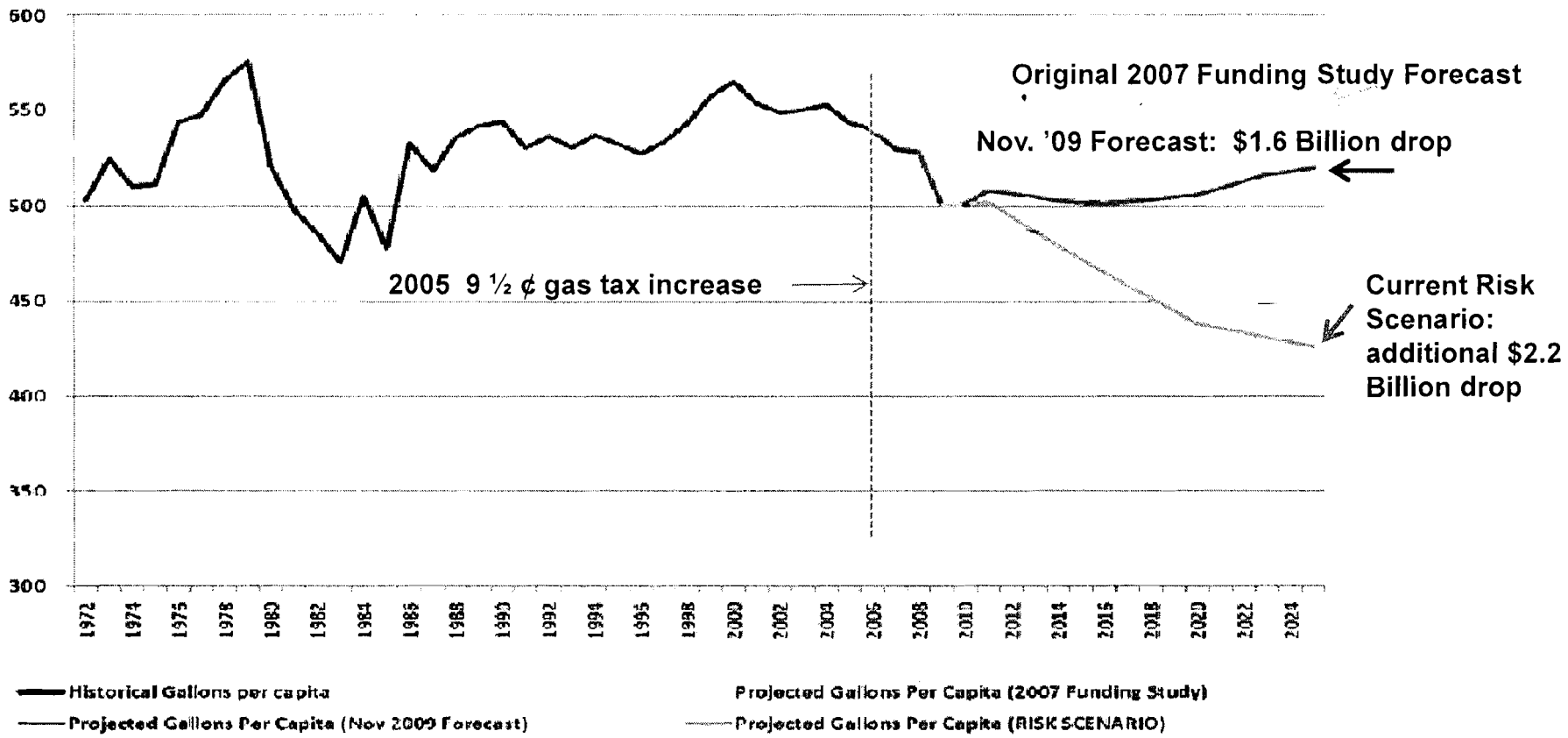


Revenues have not kept Pace with Population and VMT Growth (Oregon Example)



Note: Trends based on data for Oregon

Forecast revenues can drop even when the gas tax is raised (Washington Example)

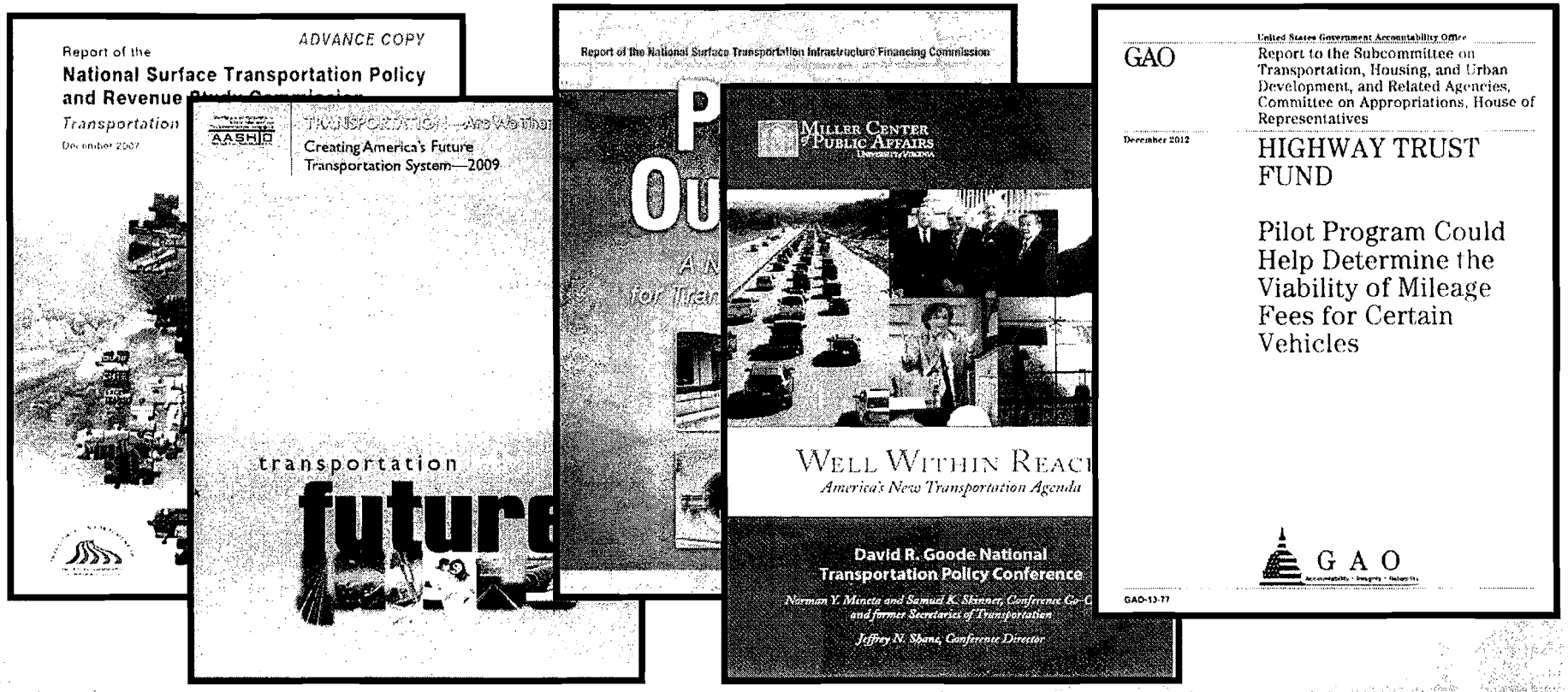


Source: WS Joint Transportation Committee – Implementing Alternative Transportation Funding Methods, 2009.

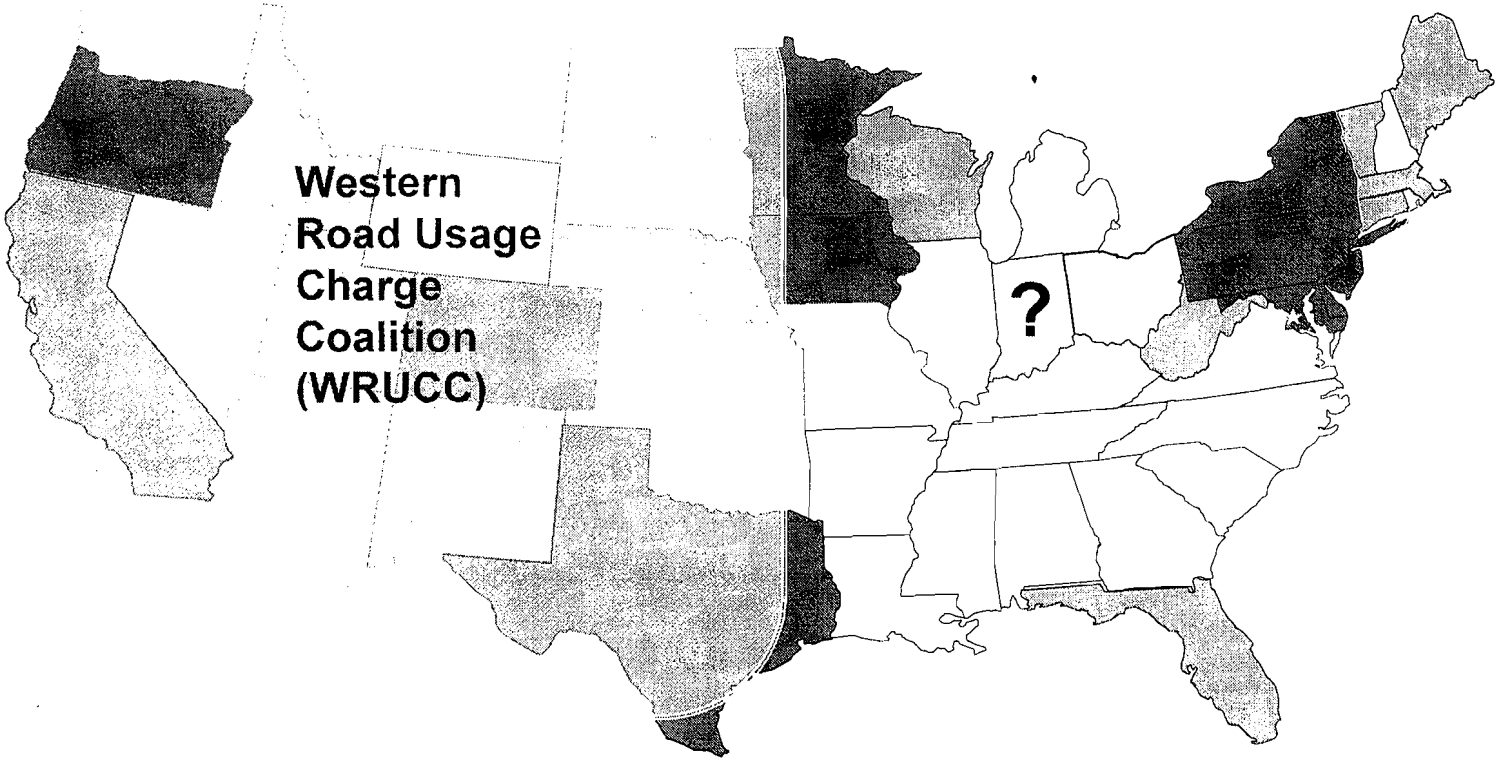
Solution: Road Usage Charging

Charge a user fee for the actual commodity consumed, roadway usage, instead of using gasoline as a proxy

Treat roadway usage as a utility



USA RUC Pilots and studies



- Legislative mandate
- Active legislative/DOT interest
- Beginning inquiry
- Formal study

Agenda

- Why Road Usage Charging is Needed
- **Road Usage Charging Policy in Oregon and Washington**
  - **What Road Usage Charging is/is not**
  - **Policy principles**
  - **Mileage reporting methods**
  - **Lessons learned**
- Oregon SB 810

What Road Usage Charging Is and Is not

Road Usage Charging <u>IS</u>:

- Per-mile fee
- Network wide
- Charged 24/7, not time-varying
- Revenue for general highway use
- Replacement or supplement for the gas tax for some/all vehicles

Road Usage Charging <u>IS NOT</u>:

- Congestion charging
- Tolling
- Express lanes

Policy Principles Road Usage Charging from Oregon and Washington

No Black Box/GPS mandate

- Manual reporting possible

User Choice

- Mileage reporting method (next slides)
- Technology (which device, if technical method chosen)
- Payment method (credit/debit/check/cash/EFT)
- Account service provider (if private sector involved)

Open System

- No technology device vendor lock-in

Technology uses commercial-off-the-shelf (COTS) products

- Especially Pay-as-you-drive Insurance hardware, vehicle telematics

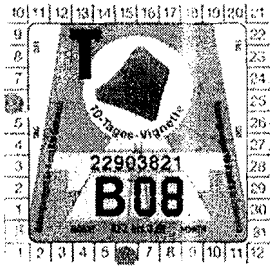
Cars are different than trucks

May not apply to all vehicles at program start—or ever

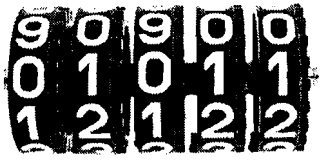
Manual Mileage Reporting Methods

- Non technology options for those with aversion to technology or older vehicles without a standard electronics interface

  - **Time Permit**—pay for unlimited mileage for a fixed period of time (e.g., a year, can be with registration)



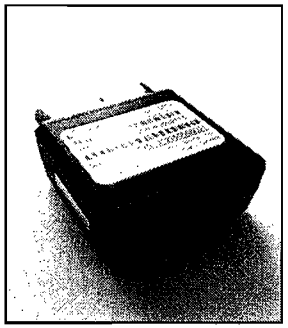
  - **Odometer Charge**—self-reported or read by officials, prepay estimated value for year or post-pay



- Drawback to manual methods: no refund/credit possible for out-of-state driving

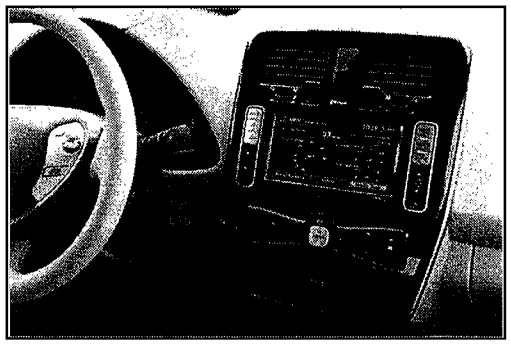
Automated Mileage Reporting Methods

1. **Basic**: report all miles driven (No GPS)
2. **Advanced**: report miles by geographic location
3. **Switchable**: changeable reporting between basic and advanced



PAYD Insurance Dongle

OnStar®



In-vehicle Telematics (Infotainment System)

Open System: Certification & Mileage Message

Certification of private sector entities under open system for:

1) Mileage reporting technologies
2) Tax processing
3) Account management

Mileage Message:

- Vehicle ID number
- Reporting device ID number
- Timestamp for installations and removals of reporting device
- Total mileage during reporting period
- Fuel consumption during reporting period
- For advanced reporting, travel regions

Standard Mileage Message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Lessons Learned: Policy Development

Technology should follow policy—and tech work is tied in closely to policy work

Pilot testing helps develop policy direction and gain political acceptance

A state-level committee of stakeholders should direct policy development (created by legislation)

- Committee guides staff at DOT/transportation commission, staff hires consultants as needed.
- **Oregon**: Road User Fee Task Force formed in 2001. Includes ~18 community stakeholders. Pilots in 2006-7 (pay-at-the-pump) and 2012-13. Currently guiding implementation of SB810.
- **Washington** Road Usage Charge Steering Committee formed in 2012. Includes ~24 community stakeholders and state legislators. Leveraging knowledge gained from Oregon. Currently Examining business case for Road Usage Charging.

Lessons Learned:
Public Outreach and Political Strategy

Public Outreach:

- Privacy issues – emphasize choice and no GPS mandate
- Rural vs. Urban Issues – rural drivers often drive less, less fuel-efficient vehicles
- Rate setting – typically revenue neutral with gas tax (add inflation track?)
- Inform public that rate is 1-2 cents per mile (toll charges can be ~10 cents/mile)
- Explain what will be done with the revenues and why they can't be misdirected

Political Strategy:

- Concerned stakeholder groups: trucking association, electric vehicle association, automakers, ACLU
- Generally more politically successful to have simple goals (revenue generation) than multiple goals (congestion reduction, environmental benefits)
- Open market approach & use of certified service providers may reduce costs
- Inflation track desirable
- Enforcement and legal appeals process are critical

Agenda

Why Road Usage Charging is Needed

Road Usage Charging Policy in Oregon and Washington

- What Road Usage Charging is/is not
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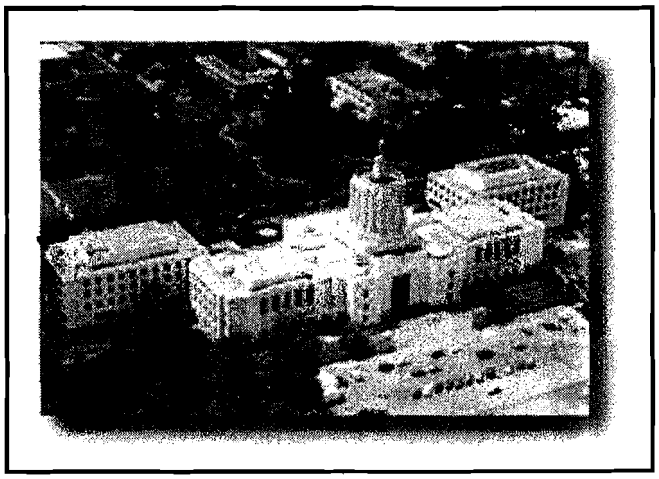
Oregon SB810

Oregon Road Usage Charge Legislation (SB 810)



- Permanent program
- 5,000 volunteer light vehicles
- 1.5 cents per mile
- Rebate of fuel tax paid
- Motorists must have reporting choices
- At least one reporting choice must not use GPS
- Open system of reporting technologies (No government box)
- Private sector administration option
- Requirement to protect personally identifiable information
- Penalties for false statements, non-payment and tampering

Privacy Solutions under SB 810

- Motorist chooses reporting method and provider
- Motorist chooses mileage reporting device from marketplace (No Government Box or GPS)
- Protection of personally identifiable information
  - Limits who has access to PII
  - Imposes obligation to protect PII
  - Destroy mileage data within 30 days after later of
    - Payment processing
    - Dispute resolution
    - Noncompliance investigation

What's Next in Oregon

- Implement SB 810 in Oregon by July 1, 2015
  - Establish mileage reporting methods and tax administration
  - Market formation for road usage charge collection
  - Marketing to volunteers
  - Communications to general public
- Western Road Usage Charge Consortium
  - Research multi-jurisdictional issues
  - Precision communications
  - Multiple state pilots
  - Potential for regional system
- Oregon Road Usage Charge Summit Nov 13-15
  - Seminar for public agencies and legislators
  - Workshop for vendors

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CONSULTING

Thank you!

Matthew Dorfman

+1 703 608 4321

matthew.dorfman@dartagnan.co

Indiana General Assembly
Joint Study Committee on
Transportation and Infrastructure
Assessment and Solutions
October 16, 2013

CONEXUS
INDIANA

Importance of Logistics

- Logistics employs approximately 300,000 Hoosiers.
- An estimated 75,000 more Hoosiers are employed in logistics positions by the state's manufacturers.
- Logistics jobs, on average, pay 15% more than a private sector job.

CONEXUS
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"Crossroads of America"

Economic Impact:
- $10 billion or 4.1% of Indiana's 2011GDP
- Employs approximately 300,000 people in Indiana

Indiana's Infrastructure:
- 1st in interstate access with 14 interstate highways
- 1st in pass-through interstates
- 12th in interstate highway miles
- 9th in rail miles with 4,446 miles
- 5 intermodal rail facilities
- 2nd largest FedEx hub in the world
- Strong network of airport facilities
- 4 of the top 125 cargo airports serving Indiana
- 3 public ports (1 Great Lakes; 2 Ohio River)
- 67 private ports (3 Great Lakes; 64 Ohio River)

Indiana's Advantages:
- 75% of U.S. & Canadian populations within a day's truck drive
- Indiana has a trade surplus
- Leader in exports/imports of important commodities (coal, iron/steel products, grains, food products, scrap metals, etc.)

Executive Summary

- The Conexus Indiana Logistics Council (CILC) is a forum of 50 logistics executives and thought leaders from throughout Indiana representing the following logistics sectors – air; infrastructure; rail; trucking; warehousing distribution; waterborne; advanced manufacturing and service firms. Logistics users are manufacturers; distributors/warehousing; and third party providers.
- CILC is working to:
  - Enhance the environment for companies in advanced manufacturing and logistics to grow their business, taking advantage of Indiana's position at the heart of the global supply chain;
  - Create a more attractive environment for manufacturing and logistics companies to relocate to or expand in Indiana, thereby creating jobs and increasing state and local revenue; and
  - Create high paying jobs for Hoosiers: the average wage of Indiana manufacturing and logistics jobs is more than 33% higher than the state's median income.
- Launched *Phase I: A Plan for Indiana's Logistics Future* in March of 2010
- **Launching *Phase II: A Plan for Indiana's Logistics Future* by 1st quarter of 2014**

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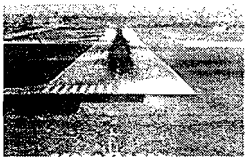
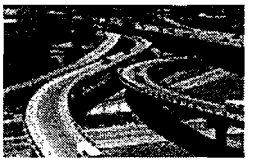
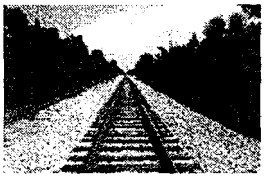
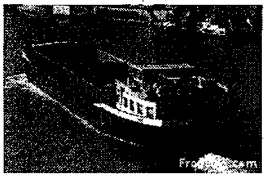
State Transportation Revenue Allocation Recommendations

Modes

- Airports
- Highways
- Railroads
- Waterways

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State Highway Revenue Allocation Recommendations

End Diversions

- State highway fuel taxes (gas/sales)
- Funds used for highways, bridges and maintenance only

Federal/State Lockbox

- Motor Vehicle Highway Account

Short Term Solutions

- Index state fuel taxes to CPI (based on the previous year)
- **Alternative fueled and electric car user fees**

Long Term Solutions

- **Study phase in of state mileage taxes and phase out of state gas taxes** and other unique source not yet identified

State vs. Federal Control

- Devolution

CONEXUS INDIANA

State Highway Revenue Allocation Recommendations

"Use the Road; Pay for the Road"

- **Alternative Fueled/Electric Cars**
  - Short Term - Equivalent User Fee
  - Long Term - Vehicle Mileage Tax (VMT)
- **Study Vehicle Mileage Tax for All Vehicles**
  - Long Term Solution
  - Phase Out Gas Tax/Phase In VMT
  - State Study Recommended
  - Technologies Developed
    - ✓ Mile to Mile
    - ✓ Collected at Pump

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Questions & Answers?

For more information, please contact David Holt, Vice President of Operations and Business Development, at (317) 638-2108, dholt@conexusindiana.com, or visit **ConexusIndiana.com**

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Monarch CNG

MONARCH

- **Economics**
  - Reduced operating expenses
  - Reduced fuel expense volatility
- **Environment**
  - Reduced carbon footprint
- **Energy Independence**
  - Improved energy security and reduced dependence on foreign oil

MONARCH GREEN DELIVERY

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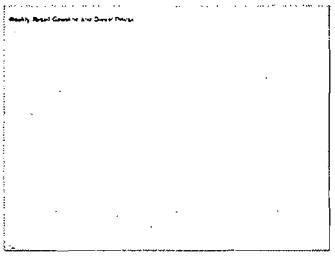
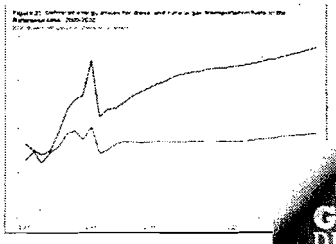
- Cost of Diesel
  - **$4.07 DGE, ~6.250 MPG**
  - Equal to **66** cents per mile
- 800,000 Diesel Gallons
- Cost of CNG
  - **$1.60 DGE, ~5.740 MPG**
  - *Equal to **28** cents per mile*
- **Natural Gas = Less Volatility**

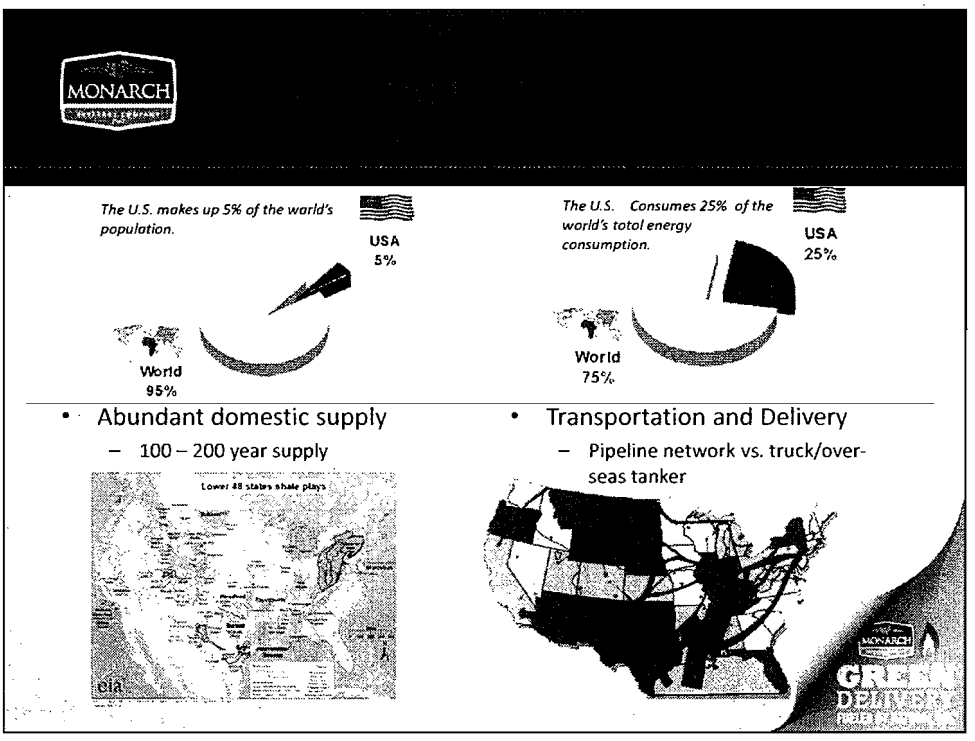
Diesel Prices

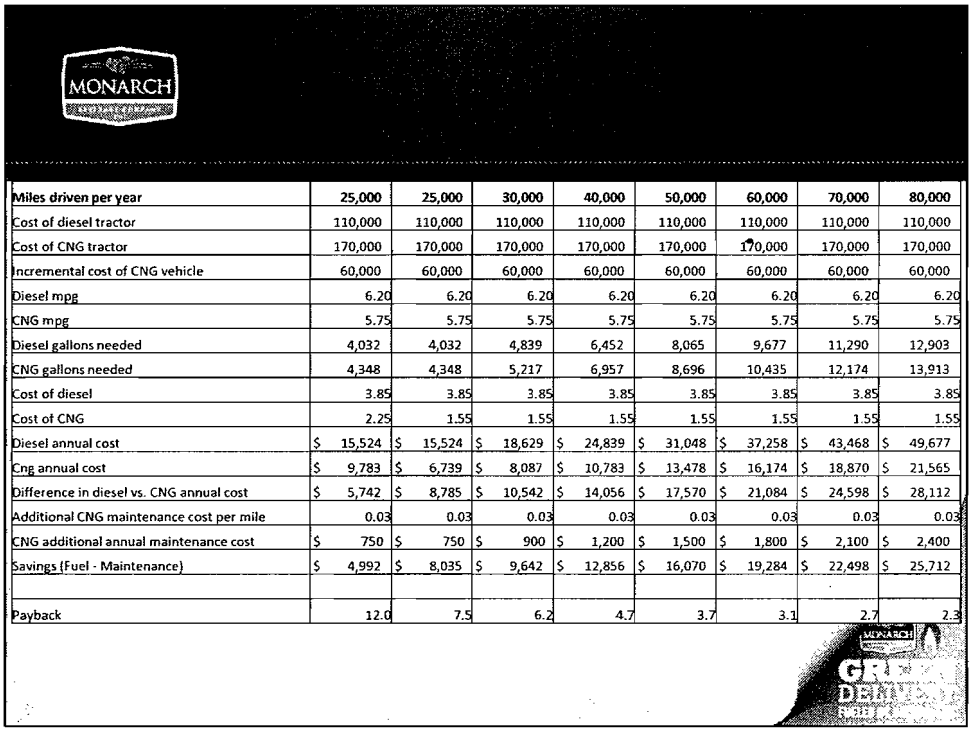


Diesel vs. Natural Gas



- $45 Billion spent on Health Care related to Air Pollution in US
- Lower Nitrogen Oxide (NO_x) emissions than diesel
  - 50% or more reduction
- Lower Particulate Matter emissions than diesel
  - 50 – 75% or more reduction
- Lower Sulfur Dioxide (SO_2) emissions than diesel
  - 90% or more reduction
- Lower Carbon Dioxide (CO_2) emissions than diesel
  - 20% or more reduction
- Overall Greenhouse Gases (GHG)
  - 20-27% reduction





Miles driven per year	25,000	25,000	30,000	40,000	50,000	60,000	70,000	80,000
Cost of diesel tractor	110,000	110,000	110,000	110,000	110,000	110,000	110,000	110,000
Cost of CNG tractor	170,000	170,000	170,000	170,000	170,000	170,000	170,000	170,000
Incremental cost of CNG vehicle	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Diesel mpg	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20
CNG mpg	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75
Diesel gallons needed	4,032	4,032	4,839	6,452	8,065	9,677	11,290	12,903
CNG gallons needed	4,348	4,348	5,217	6,957	8,696	10,435	12,174	13,913
Cost of diesel	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85
Cost of CNG	2.25	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Diesel annual cost	$ 15,524	$ 15,524	$ 18,629	$ 24,839	$ 31,048	$ 37,258	$ 43,468	$ 49,677
Cng annual cost	$ 9,783	$ 6,739	$ 8,087	$ 10,783	$ 13,478	$ 16,174	$ 18,870	$ 21,565
Difference in diesel vs. CNG annual cost	$ 5,742	$ 8,785	$ 10,542	$ 14,056	$ 17,570	$ 21,084	$ 24,598	$ 28,112
Additional CNG maintenance cost per mile	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
CNG additional annual maintenance cost	$ 750	$ 750	$ 900	$ 1,200	$ 1,500	$ 1,800	$ 2,100	$ 2,400
Savings (Fuel - Maintenance)	$ 4,992	$ 8,035	$ 9,642	$ 12,856	$ 16,070	$ 19,284	$ 22,498	$ 25,712
Payback	12.0	7.5	6.2	4.7	3.7	3.1	2.7	2.3

- Compressed Natural Gas (CNG)
  - Compressed to 3,600 PSI
  - Spark ignited (no after treatment equipment required)
  - More constrained by fuel range
  - Unlimited "hold times"
  - Delivery: underground pipelines

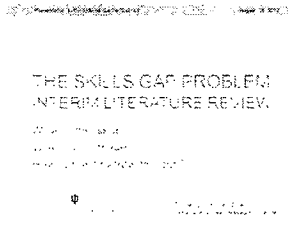
- Liquefied Natural Gas (LNG)
  - Natural gas is cooled to below 260°F to liquefy
  - Compression ignited (after treatment equipment required)
  - Less constrained by fuel range
  - Limited "hold times" – Use it or lose it…
  - Delivery: tanker truck

Greater Lafayette Commerce

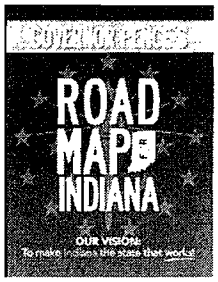
Keeping the Next Generation

Passenger Rail and Reversing the Brain Drain

The Challenge: Reversing Indiana's Brain Drain



JOURNAL & COURIER MEDIA GROUP



- Over 92% of Purdue graduates leave Tippecanoe County
- 61% of graduating college students remain in Indiana one year after receiving their diploma
- In comparison, 78% of graduating college students remain in Ohio one year after completion
- "I want to go some place that looks interesting"

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The Potential Student Retention Market

- Purdue: 39,256
- Indiana: 42,731
- IUPUI: 30,461
- Purdue-Calumet: 10,054
- Univ. of Indy: 5,200
- St. Joe College: 1,100
- Wbash: 910
- DePauw: 2,400
- IvyTech Lafayette: 8,000

Lafayette Commerce

Key Points of "From Good to Great; Making Greater Lafayette a Community of Choice"

- People want to live in smaller communities with urban amenities
- They want to be near cities like Indianapolis and Chicago
- They want ease of access to the big city
- This is especially true of the next generation of creators, inventors, and change agents

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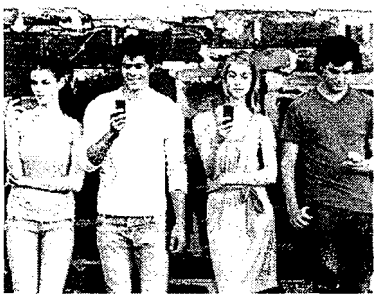
Understanding the Next Generation of Doers, Inventors, and Creators

- Millennials are unlike their Gen-X parents and Boomer grandparents
- Born between 1982 and 2004
- 80 million strong
- Big events
  - September 11, 2001
  - The great recession
- Coming of age purchase: Smart Phone



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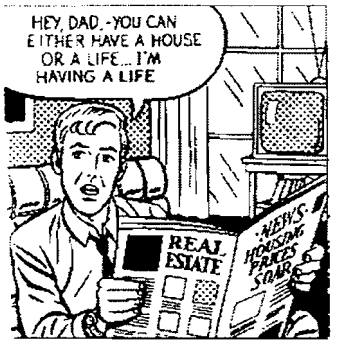
The Millennial Lifestyle Differs from Xer's & Boomers

- They are heavily indebted (college loans)
- They're prone to rent/live at home
- Desire a high sense of community
- Largest income gap vs. older workers
- Social media and connectivity are very important



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Millennials and Passive Transportation Choices

- The slowest generation to buy a car in 60 years
  - 1982: 80% of 18's drove
  - 2012: 60% of 18's drive
- Prefer car pooling, cycling, transit, and rail
- Choose to live near transportation centers
- US annual miles driven have not increased since 2004

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What Others Say About Millennials & Transportation

- "...the issues are economic insecurity and climate change, and they're telling us, in every way they can, that they are not as interested in cars."
- "Intermetropolitan passenger rail is a vital component of the country's national transportation network."
- "Transit may capture even more millennials — and keep them as they age — as agencies tap into millennials' smart phone addictions."

San Francisco Chronicle

The Brookings Institution

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Improving Passenger Rail Transportation

- Preserve 7-day Indianapolis to Chicago route
- Improve on-time performance
- Improve ride experience
- Improve schedule and reduce trip time
- Increase train frequency

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Funding Midwest Passenger Rail Transportation

Changing priorities toward passenger rail

Midwest Rail	SE Speedline FY '08-'09
Illinois	$241,314,314
Indiana	$150,000
Iowa	$110,000,000
Michigan	$64,750,000
Minnesota	$132,250,000
Missouri	$98,910,000
Ohio	$284,085,000
Wisconsin	$156,518,000
TOTAL	**$1,087,977,314**

Federal Funds: 2008-2014
Midwest Funding: $2,564,839,563
Indiana Portion: $71,364,980

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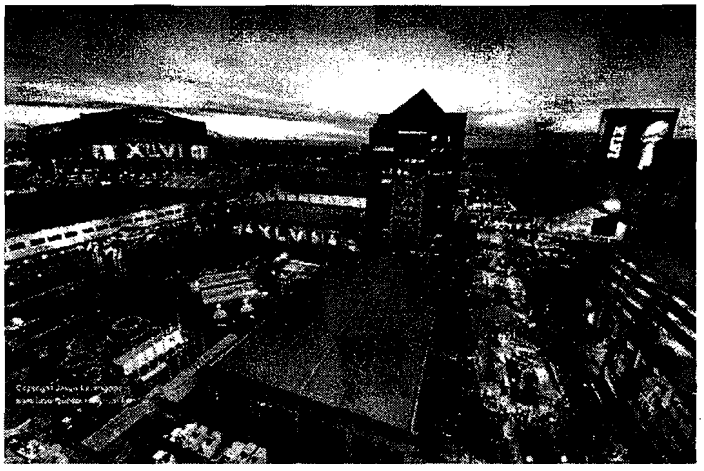
The Signature of a Growing Community: Indianapolis



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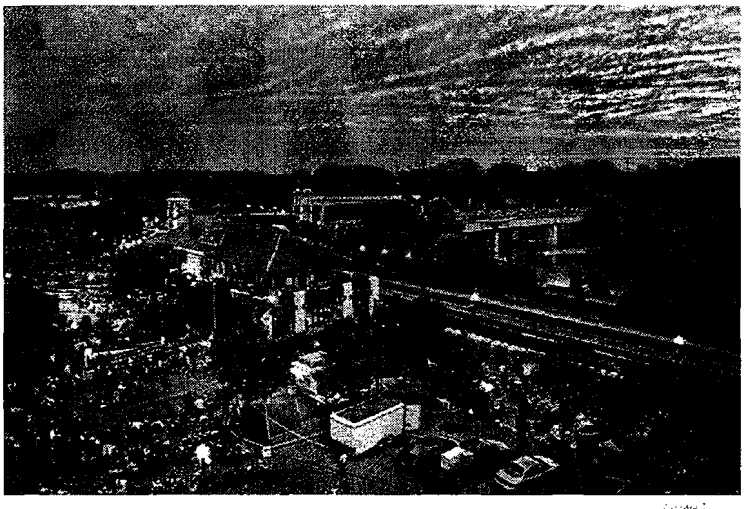
The Signature of a Growing Community: Greater Lafayette



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The Indy Connect Funding Plan

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10/10/13
Ex. H

Joint Study Committee on Transportation
and Infrastructure Assessment and Solutions

September 26, 2013

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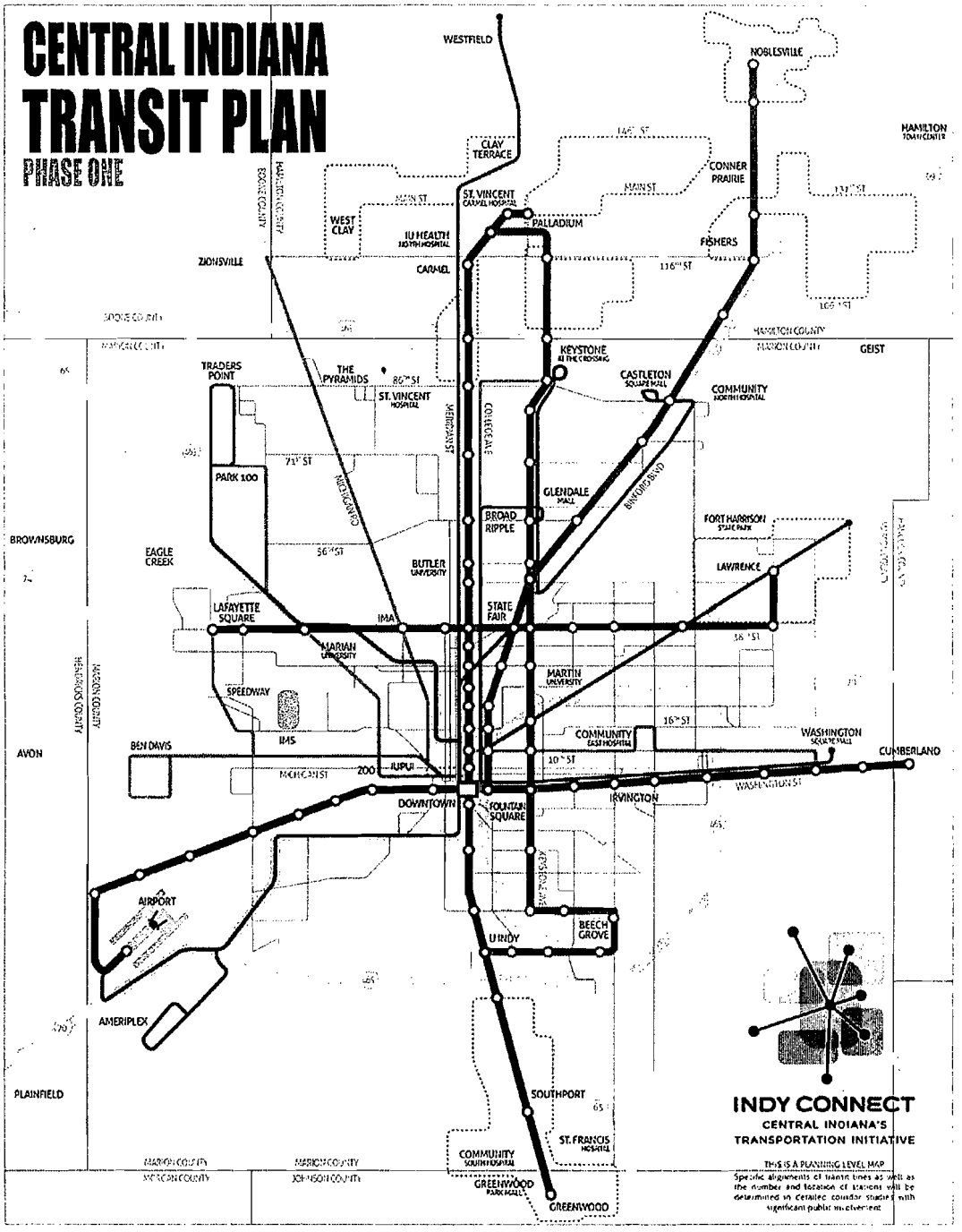
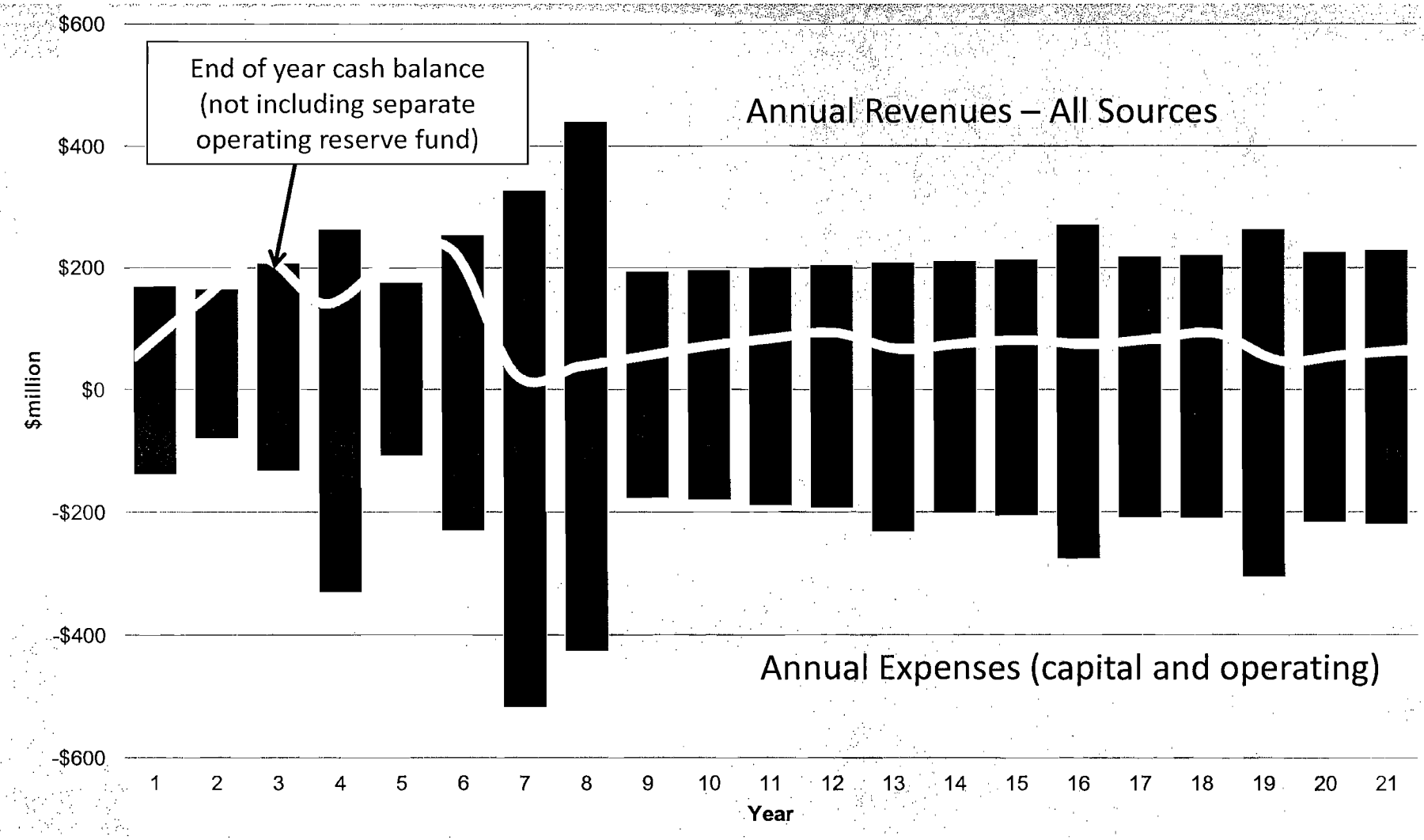
Indy Connect Plan (10 year phase in)

- Doubles local bus service in Marion County and adds service in Hamilton County
- Express bus service between counties
- Circulator routes downtown and in other communities
- 5 Rapid Transit Lines:
  - Route locations and choice of technology will be finalized in 2013-2014 for Red, Blue and Green Lines
  - Purple and Orange Lines will likely follow beginning in 2015



Long-Term Cash Flow Analysis



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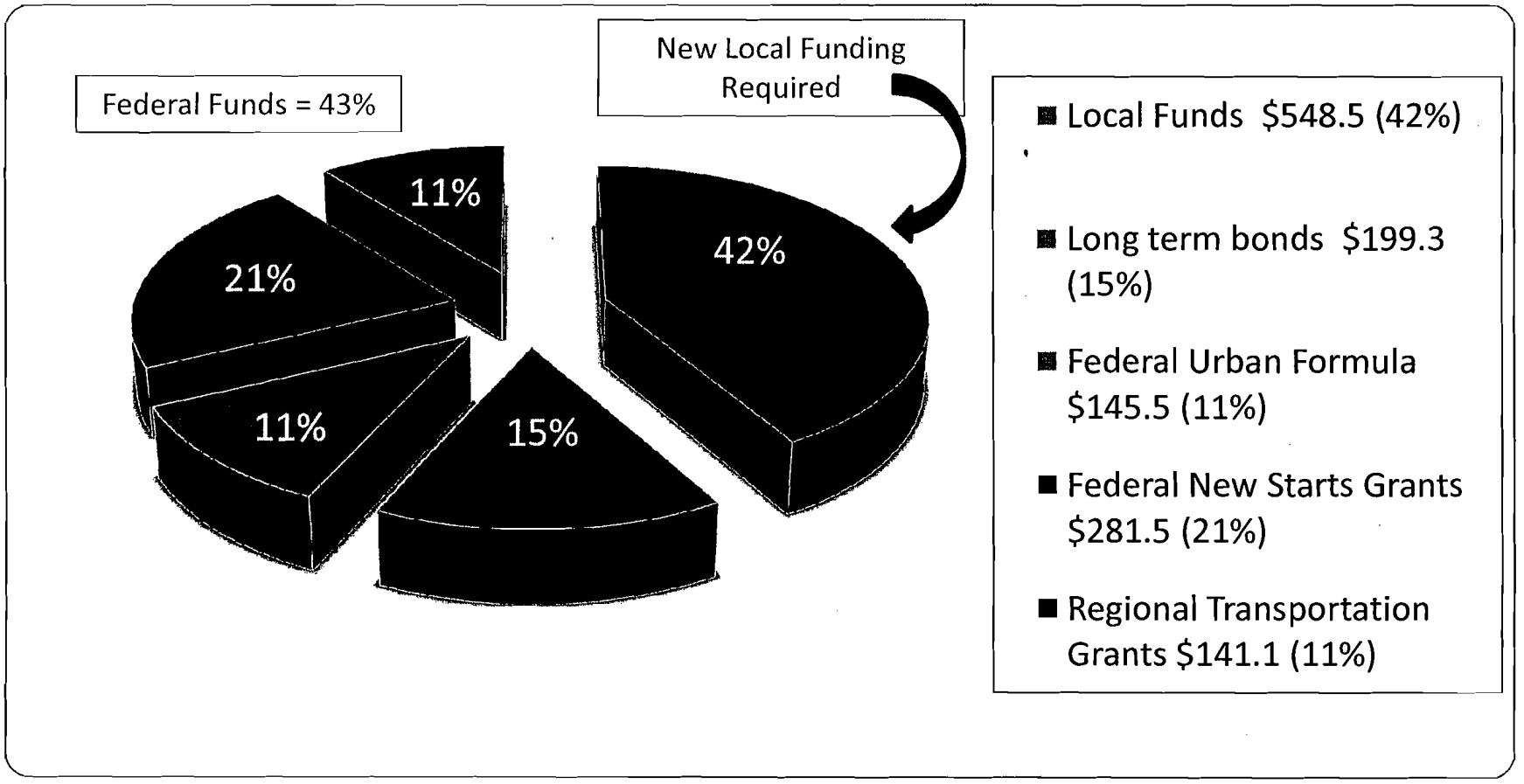
Capital Revenues By Proposed Source (over 10 years)



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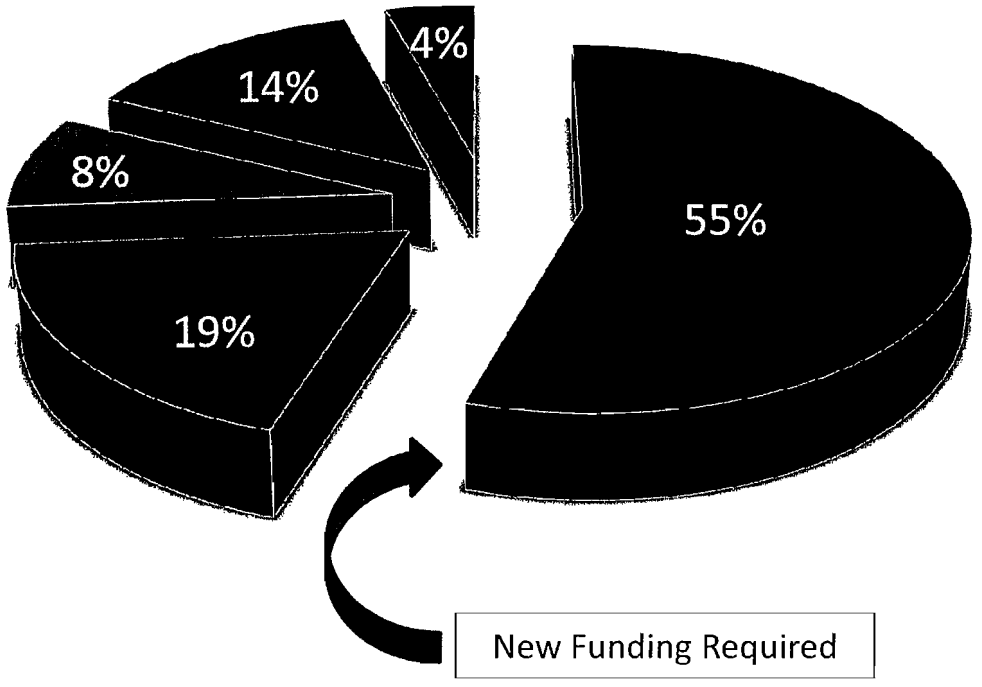
Operating Revenues By Proposed Source
(when system is fully operational)



- New Transit Funds $102.4 (55%)
- Fare Receipts $35.5 (19%)
- Federal Urban Formula $15.4 (8%)
- Existing Local Funds $25.4 (14%)
- State PMTF $141.1 (4%)

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Most Regions Fund Transit via <u>Dedicated Local Sales Tax</u>

- Atlanta 1%
- Charlotte 0.5%
- Cleveland 1%
- Columbus 0.5%
- Dallas 1%
- Denver 1%
- Houston 1%
- Phoenix .40%
- St. Louis .75%
- Seattle 1.3%

Features of the Funding Plan

- Dedicated local funds to leverage federal grants
- "Pay as you go" for most capital expenses
- Minimal debt service:
  - As needed in year 6 or 7 for capital build out
  - 15% of total revenues
  - Debt service payments built into revenue cash flow projections
- Conservative estimates on federal grant amounts
- Conservative projections of revenue growth

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Evolution of Task Force Proposal for Local Dedicated Funding Source

Reviewed multiple funding options for transit:	
Local sales or income tax	Vehicle registration tax
Food and beverage tax	Motor fuel taxes

	February 2010 0.5% local sales tax * Based on 2007 taxable sales, per Stats Indiana/Dept of Revenue	November 2011 0.3% local income tax * Based on projected 2015 income tax base	New Option? 0.5% local sales tax * Based on 2011 taxable sales, per Stats Indiana/Dept of Revenue
Marion	$53.8 million	$55.0 million	$45.9 million
Hamilton	$21.3 million	$32.0 million	$10.5 million

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Comparative Sales Tax Rates in Major U.S. Cities

Tax Foundation Fiscal Fact, No. 296 — *April 11th, 2012*

Riverside (c)	California	7.25%	0.5%	7.75%	53
Sacramento (c)	California	7.25%	0.5%	7.75%	53
San Diego (c)	California	7.25%	0.5%	7.75%	53
Santa Ana (c)	California	7.25%	0.5%	7.75%	53
Reno	Nevada	6.85%	0.875%	7.725%	61
Saint Paul	Minnesota	6.875%	0.75%	7.625%	62
Denver	Colorado	2.9%	4.72%	7.62%	63
Colorado Springs	Colorado	2.9%	4.5%	7.4%	64
Modesto (c)	California	7.25%	0.125%	7.375%	65
Wichita	Kansas	6.3%	1.0%	7.3%	66
Charlotte	North Carolina	4.75%	2.5%	7.25%	67
Bakersfield (c)	California	7.25%	0.0%	7.25%	67
Durham	North Carolina	4.75%	2.25%	7.0%	69
Fayetteville	North Carolina	4.75%	2.25%	7.0%	69
Fort Wayne	Indiana	7.0%	0.0%	7.0%	69
Indianapolis	Indiana	7.0%	0.0%	7.0%	69
Jersey City	New Jersey	7.0%	0.0%	7.0%	69
Lincoln	Nebraska	5.5%	1.5%	7.0%	69
Newark	New Jersey	7.0%	0.0%	7.0%	69
Omaha (g)	Nebraska	5.5%	1.5%	7.0%	69
Hialeah	Florida	6.0%	1.0%	7.0%	69
Jacksonville	Florida	6.0%	1.0%	7.0%	69
Miami	Florida	6.0%	1.0%	7.0%	69
Pittsburgh	Pennsylvania	6.0%	1.0%	7.0%	69
Saint Petersburg	Florida	6.0%	1.0%	7.0%	69
Tampa	Florida	6.0%	1.0%	7.0%	69

7.5% sales tax rate would move Indy from 69th to 64th

Peer Cities sales tax rates (state & local):

Chicago	9.5%
Seattle	9.5%
Phoenix	9.3%
Nashville	9.25%
St. Louis	8.491%
OKC	8.375%
Austin	8.25%
Atlanta	8.0%
Kansas City	7.85%
Minneapolis	7.775%
Cleveland	7.75%

Source: Tax Foundation Fiscal Fact No. 296, April 11, 2012

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BioCrossroads CONEXUS INDIANA ESN TECHPOINT

QUESTIONS

Members

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Rep. Lloyd Arnold
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Sen. Michael Crider
Sen. James Merritt
Sen. Allen Paul

JOINT STUDY COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE ASSESSMENT AND SOLUTIONS

Legislative Services Agency
200 West Washington Street, Suite 301
Indianapolis, Indiana 46204-2789
Tel: (317) 233-0696 Fax: (317) 232-2554

LSA Staff:

Sarah Freeman, Attorney for the Joint Study Committee
Stephanie Wells, Fiscal Analyst for the Joint Study Committee

Authority: IC 2-5-28.5

To: TIAS Committee Members
From: Sarah Freeman, Committee Attorney
Date: October 15, 2013
Re: Indiana statutes governing port authorities

The purpose of this memorandum is to describe the statutes governing Indiana's ports in order to assist the Committee in making recommendations to the Indiana General Assembly concerning possible amendments to and clarifications of existing law.

The Ports of Indiana is a body corporate and politic that operates three ports in Indiana: the Port of Burns Harbor (Portage), the Port of Mount Vernon, and the Port of Jeffersonville. IC 8-10-1-3(a). A seven member commission is responsible for implementing the powers and duties of the Ports of Indiana. IC 8-10-1-3(b), (g). The powers of the Ports of Indiana extend to both ports and projects throughout Indiana. IC 8-10-1-1.

- A *port* is any combination of one (1) or more places on a body of water, whether natural or artificial, in which a water-borne vessel may be loaded, unloaded, or otherwise accommodated, and any other nonmaritime port or traffic exchange point in Indiana, regardless of the mode of transportation. IC 8-10-1-2(b).

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- A *project* includes any facilities necessary and useful to port operation, whether or not permanently situated at a port, as well as any other project in Indiana (not located at a port) that will enhance or promote economic development, public-private partnerships, and other industrial, commercial, business, and transportation purposes. IC 8-10-1-2(c).

The powers of the Ports of Indiana include the powers to do the following:

- Acquire land, including lands under water and riparian rights, by the exercise of the power of eminent domain. IC 8-10-1-11.

- Acquire facilities for manufacturing, storing, or processing goods, or to carry on commercial, business, or recreational activities to increase traffic into or out of a port project. IC 8-10-2-2.

- Issue revenue bonds to pay for a port or project. IC 8-10-1-13; IC 8-10-4.

- Enter into agreements with the federal government to build and construct public ports and terminal facilities in Indiana on Lake Michigan, the Ohio River, the Wabash River, and other waters adjacent to Indiana. IC 8-10-1-5.

- Adopt rules and regulations under IC 4-22-2. IC 8-10-9.

- Construct and operate canals and storage facilities. IC 8-10-2; IC 8-10-3.

In 1959, the Indiana General Assembly enacted IC 8-10-5, which authorizes the establishment of local port authorities "to permit the prompt organization of port authorities to take advantage of the St. Lawrence Seaway project authorized by the [United States] Congress, thereby advancing the interests and the welfare of the state of Indiana and its citizens.". IC 8-10-5-19. A municipality, a county, or a combination of municipalities, counties, or both municipalities and counties, may establish a port authority under IC 8-10-5 as a body corporate and politic. IC 8-10-5-2. To date, the following local port authorities have been established:

Logansport Port Authority, Cass County
Hoosier Heritage Port Authority, Hamilton County (Fishers, Noblesville, and Hamilton County)
City of Madison Port Authority, Jefferson County
East Chicago Port Authority, Lake County
Hammond Port Authority, Lake County
Michigan City Port Authority, LaPorte County

White River Port Authority, Lawrence County (City of Bedford)
Rising Sun Port Authority, Ohio County
Perry County Port Authority, Perry County
Evansville Port Authority, Vanderburgh County

A local port authority may exercise jurisdiction within all geographic territory of the political subdivision that established the authority as well as with respect to any facility that the port authority owns and operates, regardless of its geographical location. IC 8-10-5-7. However, the same geographic area may not be included in the territory more than one local port authority. Id. The establishment and operation of a local port authority under IC 8-10-5 does not impair the powers of any other county, township, or municipal corporation to develop or improve port and terminal facilities. IC 8-10-5-14. For purposes of a local port authority, a port is any area that is on or adjacent to a body of water that is in or adjacent to Indiana, and that is used for servicing, storing, protecting, mooring, loading, unloading, or repairing watercraft. IC 8-10-5-1.

The general powers of a local port authority are enumerated at IC 8-10-5-8 and include the powers to do the following:

- Purchase, construct, sell, lease, and operate docks, ports, and other facilities.
- Regulate port usage and activities.
- Exercise eminent domain for the efficient operation of port facilities.
- Borrow money.

In addition, a local port authority may acquire, maintain, and operate railroad property and rights of way. IC 8-10-5-8.1. The railroad facilities are not required to serve a port. Id.

Except in limited circumstances, and unlike the Ports of Indiana; a local port authority does not have direct bonding power but instead may recommend that the governing body of the entity or entities that established the authority issue bonds to acquire or improve port sites or for other purposes necessary for the proper operation of the port authority. IC 8-10-8.5-8.7. However, a local port authority that operates a railroad may issue bonds to successfully operate the railroad. IC 8-10-5-8.1.

Some local port authorities have special powers or limitations. For example, the East Chicago Port Authority and the Hammond Port Authority may not exercise the power of eminent domain. IC 8-10-5-8.5. The port authority of a city that includes a channel navigable to Lake Michigan may impose either or both an annual dock fee or marina launch fee for deposit a cumulative channel maintenance fund to provide funds for port-related purposes, including the dredging of channels and the purchase of lands necessary to fulfill the board's plan for the port. IC 8-10-5-17, -22, -23.

Comments by Jody Peacock, Vice President, Ports of Indiana
To the Joint Study Committee on Transportation Infrastructure
Chairman Ed Soliday – October 16, 2013

Mr. Chairman, members of the Joint Committee, thank you for the invitation to participate in today's discussion. As the state's port authority, we have been asked to provide our perspective regarding what some people may perceive to be overlapping jurisdictions related to the development and expansion of ports in Indiana by the state port authority – the "Ports of Indiana" – and port authorities established by local governments.

Let me begin by applauding the committee's recognition of the overlapping authority as it is something we have been aware of for many years, however, it is not something that the Ports of Indiana has had any occasion to resolve or reconcile.

Under IC 8-10-1, the Ports of Indiana is empowered to promote the agricultural, industrial, and commercial development of the state by the construction and operation of a modern port system throughout Indiana at locations approved by the Governor.

Under IC 8-10-5, municipal corporations or counties may create a port authority that is an instrumentality of the state and has similar authority to the Ports of Indiana.

When our CEO Rich Cooper addressed this study committee several weeks ago in Portage, he mentioned that we receive a number of calls each year from communities asking how they can establish their own ports or port authorities.

Some of these communities are located on a body of water and some are not. Some are looking for ways to establish an "inland rail port," others are looking for a tool they can use to issue bonds.

In these instances, we were not aware of projects that involved a state investment and most were small in scale or differed significantly from our current port operations.

To date, we have not seen any evidence where the overlapping authorities have created a problem, but we do recognize that the possibility is there.

We would have some concerns about overlapping authorities in certain cases, particularly if a local port authority were to pursue projects that would duplicate a state asset that has excess capacity.

The State of Indiana has invested millions of dollars to build an international port system and created a statewide port authority to manage that system without the need for ongoing public funding. Indiana's three public ports all have significant capacity for future growth.

I know none of us would want to see these investments diminished or diluted by duplicative efforts that are not supported by current market conditions.

We are often approached by local government officials after they have received optimistic forecasts from transportation consultants about potential port projects or intermodal developments, and in some cases, those officials are being advised that their project may require a significant public investment from local or state funds.

We would be the first to support an investment of public funds into maritime-related or transportation projects that would produce sufficient returns on those investments.

We would be concerned to see a major public investment in a port project that was not viable as a result of current market conditions, both because it could limit the state's ability to fund other vital transportation projects and because it could potentially reflect poorly on other port development opportunities in the state.

Indiana is a leader in the world of logistics because of our wise investment strategies for building and maintaining transportation infrastructure. I am sure none of us want to see this change anytime soon.

(continued)

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Ex. J

Because of the overlapping statutes. we could envision a scenario where a local port authority. with the very best of intentions, might not consult the Ports of Indiana when pursuing a project that might not be viable under current market conditions.

By operating ports every day, our organization is exposed to a wealth of industry information and expertise through our 60-plus port customers and hundreds of business associates at ports, railroads, shipping lines and logistics providers around the globe.

As always, we are happy to share our industry perspectives with any local communities that are considering port-related projects.

Something else to consider here is that Indiana has one of the most successful port models in the country.

We often hear from our port colleagues in other states about the difficulties they experience when ports operated by city or county authorities in the same state must compete against each other for a limited number of business opportunities.

As a result, some ports in our neighboring states must rely on government subsidies and local property taxes to cover shortfalls in their revenue, which can be as much as a third of their operating budget in some cases.

The strategic development and statewide organizational structure of Indiana's port system has generated significant economic growth for Indiana over the past 52 years.

The most recent economic impact analysis of Indiana's ports determined that maritime operations at these three facilities contribute $6.4 billion per year in economic value to the state economy and support over 50,000 total jobs.

Indiana's three ports work collaboratively to share market information, operational best practices and all organizational resources under one system.

This consistent model has also prompted multiple companies to establish facilities at more than one of our ports, even though they are in very different markets.

We strongly believe in Indiana's model for developing a statewide port system, and we would have concerns that major changes brought about by overlapping jurisdictions could alter the current balance and disrupt Indiana's successful model.

We are pleased to report that we have not experienced any problems related to this issue to date; however, this committee's discussion presents a good opportunity to reconcile the statutory authorities granted by the legislature and avoid any unintended negative economic impacts to existing or future investments by the state.

Our organization conducts regular reviews of our statutory code to provide legislators with recommendations for potential changes related to operational efficiencies, evolving market conditions, new economic development opportunities, as well as other statutory ambiguities and improvements.

If this committee believes the potential for future conflict warrants additional review of this matter, the Ports of Indiana would be happy to review the language and provide suggestions for how best to reconcile the authority granted to the Ports of Indiana and port authorities created by local governments.

Seat Belts, School Buses and Safety

nea.org

At first blush, the question of whether seat belts should be required on school buses seems obvious. Seat belts save lives in cars, so it seems logical that they would make school buses safer. It appears a lot of people agree with this logic: the results of an on-line poll conducted by *NEA Today* magazine found that 53% of respondents favored seat belts, while 47% were opposed.

But it turns out that the question isn't so simple. When the NEA members with the most hand-on experience in bus safety — bus drivers — are asked, most of those who have expressed an opinion on the question are strongly opposed to seat belts. And the National Highway Transportation Safety Administration has found that seat belts would not add to the safety of school bus passengers. So what's going on here?

Bus Drivers' Concerns

Some of the concerns that drivers express about seat belts are:

- Students can and do use the heavy belt buckles as weapons, injuring other riders.
- It is next to impossible to make sure that all students keep their belts properly fastened, so that they are not injured by the belts in an accident.
- If a bus has to be evacuated in an emergency, such as a fire, panicked or disoriented students might be trapped by their belts.

When drivers balance these concerns against the many safety features already built into the design of school buses, they conclude that given the way buses are presently operated, they are safer without seat belts.

The Bigger Issues

To understand the question of school bus seat belts, one really has to look at the larger questions of student supervision, discipline, and safety on and around buses. There has been a lot of recent attention given to the problems that disruptive, or even violent, students can cause in schools. Bus drivers must contend with these same students.

Unlike teachers, bus drivers must care for up to 50-70 student charges at a time, while manuevering a large vehicle, contending with traffic, bad weather, and adverse road conditions. And do it all with their backs turned to the students!

Most school districts do not provide bus aides, who can help with discipline and safety (such as ensuring that seat belts are properly worn, or evacuating a bus in an emergency), except on special education buses. Also, many bus drivers complain they are not supported by administrators when they encounter student discipline problems on their buses.

Bus drivers feel strongly that students' time on the bus needs to be considered a part of the school day, and point out that the ride to school in the morning sets the tone for the entire day.

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The bottom line? Many drivers feel that strong administrative support for their efforts to maintain discipline, and bus aides to assist the drivers, would do a lot more to protect students than would a "quick fix" like seat belts.

The NHTSA Position

The National Highway Transportation Administration (NHTSA) has issued a position statement on seat belts on school buses, concluding that "there is insufficient reason for a Federal mandate for seat belts on large school buses." The statement points out that:

> "School bus transportation is one of the safest forms of transportation in the United States. We require all new school buses to meet safety requirements over and above those applying to all other passenger vehicles. These include requirements for improved emergency exits, roof structure, seating and fuel systems, and bus body joint integrity. These requirements help ensure that school buses are extremely safe."

NHTSA feels that the best way to provide crash protection to passengers is through "compartmentalization," in which "buses provide occupant protection so that children are protected without the need to buckle-up. Occupant crash protection is provided by a protective envelope consisting of strong, closely-spaced seats that have energy-absorbing seat backs." Read the NHTSA statement, "Seatbelts on School Buses."

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Introduction

The National Highway Traffic Safety Administration (NHTSA) establishes Federal motor vehicle safety standards to reduce the number of fatalities and injuries from motor vehicle crashes, including crashes involving school buses. NHTSA requires all new school buses to meet safety standards in addition to those that apply to all other passenger motor vehicles. These include requirements for improved emergency exits, roof structure, seating and fuel systems, and bus body joint integrity. NHTSA also works with each State on school bus safety and occupant protection programs. School bus safety is one of our highest priorities.

The following are NHTSA's answers to often-asked questions about seat belts on large (over 10,000 lb GVWR) school buses.

How safe are school buses compared to all other motor vehicles?

School buses are one of the safest forms of transportation in the United States. More than 42,000 people are killed in traffic crashes on U.S. roads every year. Every year, approximately 450,000 public school buses travel about 4.3 billion miles to transport 23.5 million children to and from school and school-related activities. Yet, on average, every year, six school age children (throughout the U.S.) die in school bus crashes as passengers. NHTSA strives to ensure that there are no fatalities in school buses.

We have seat belts in passenger cars. Why don't we have them on school buses?

Seat belts have been required on passenger cars since 1968. Forty-nine States and the District of Columbia have enacted laws requiring the wearing of seat belts in passenger cars and light trucks. There is no question that seat belts play an important role in keeping occupants safe in theses vehicles, however school buses are different by design and use a different kind of safety restraint system that works extremely well.

Large school buses are heavier and distribute crash forces differently than do passenger cars and light trucks. Because of these differences, the crash forces experienced by occupants of buses are much less than that experienced by occupants of passenger cars, light trucks or vans. NHTSA decided that the best way to provide crash protection to passengers of large school buses is through a concept called "compartmentalization." This requires that the interior of large buses provide occupant protection such that children are protected without the need to buckle-up. Through compartmentalization, occupant crash protection is provided by a protective envelope consisting of strong, closely-spaced seats that have energy-absorbing seat backs.

Small school buses (with a gross vehicle weight rating of 10,000 pounds or less) must be equipped with lap and/or lap/shoulder belts at all designated seating positions. Since the sizes and weights of small school buses are closer to those of passenger cars and trucks, seat belts in those vehicles are necessary to provide occupant protection.

School bus crash data show that compartmentalization has been effective at protecting school bus passengers. NHTSA's 2002 Report to Congress[1] found that the addition of lap belts did not improve occupant protection for the severe frontal impacts that were studied for that report.

The National Transportation Safety Board (NTSB) and the National Academy of Sciences (NAS) have come to similar conclusions. The NTSB concluded in a 1987 study of school bus crashes that most fatalities and injuries occurred because the occupant seating positions were in direct line with the crash forces.[2 NTSB stated that seat belts would not have prevented most of the serious injuries and fatalities from occurring in school bus crashes. In 1989, the NAS completed a study of ways to improve school bus safety and concluded that the overall potential benefits of requiring seat belts on large school buses were insufficient to justify a Federal mandate for installation.[3] NAS also stated that the funds used to purchase and maintain seat belts might be better spent on other school bus safety programs and devices that could save more lives and reduce more injuries.

Can States or school districts purchase large school buses that have seat belts?

States or school districts are not prohibited by the federal government from purchasing seat belts at any passenger seating position in large public school buses. Over the past 30 years, some States have required new large school buses to come equipped with seat belts. There have been no documented injuries or fatalities resulting from use of the seat belts on school buses.[4] However, States should take into consideration the increased capital costs, reduced seating capacities, and other unintended consequences associated with seat belts that could result in more children seeking alternative means of traveling to and from school or school-related events. These alternative modes of travel could put children at greater risk because they are not nearly as safe as school buses. If seat belts are to be beneficial, States that require them on school buses should ensure that the belts are worn properly by all school bus passengers.

How safe are school buses compared to other motor vehicles?

School buses are approximately seven times safer than passenger cars or light trucks. The school bus occupant fatality rate of 0.2 fatalities per 100 million vehicle miles traveled (VMT) is considerably lower than the fatality rates for passenger cars or light trucks (1.44 per 100 million VMT). The relative safety of school buses was addressed in 2002 by the National Academy of Sciences (NAS) in "The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment."[5] It found that there are about 815 fatalities related to school transportation per year. Only 2 percent are associated with official school transportation, compared to 22 percent due to walking/bicycling to or from school, and 75 percent from passenger car transportation to or from school.

What is the cause of most school bus-related fatalities?

Pedestrian fatalities account for the highest number of school bus-related fatalities. There are about 17 such fatalities per year, two-thirds of which involve the school bus itself and the rest involving motorists illegally passing the stopped school bus. In its 1989 report, the NAS stated that since children are at "greater risk of being killed in school bus loading zones (i.e., boarding and leaving the bus) than in the bus, a larger share of the school bus safety effort should be directed to improving the safety of school bus loading zones." NHTSA agrees with the NAS that States and localities should focus their efforts toward improving school bus loading zones.

[1] School Bus Safety: Crashworthiness Research, National Highway Traffic Safety Administration, April 2002.
[2] Crashworthiness of Large Poststandard School Buses, National Transportation Safety Board, March 1987.

[3] Transportation Research Board of the National Academies, Special Report 222, Improving School Bus Safety, 1989.

[4] State law governs the use of seat belts on vehicles. We have no data on the extent to which States require use of lap belts (if provided) on school buses or enforce the proper use of the belts.

[5] Transportation Research Board of the National Academies, Special Report 269, June 2002.

behalf of an association, business, labor union, *etc.*). DOT's complete Privacy Act Statement was published in the **Federal Register** on April 11, 2000 (65 FR 19477).

Authority: 49 U.S.C. 60101 *et seq.*; 49 CFR 1.53.

Issued in Washington, DC, on August 18, 2011.

Jeffrey D. Wiese,

Associate Administrator for Pipeline Safety.

[FR Doc. 2011–21753 Filed 8–24–11; 8:45 am]

BILLING CODE 4910–60–P

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2011–0131]

Federal Motor Vehicle Safety Standards; Denial of Petition for Rulemaking; School Buses

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation.

ACTION: Denial of petition for rulemaking.

SUMMARY: This document denies a petition for rulemaking from the Center for Auto Safety (CAS) and 21 others asking that NHTSA mandate the installation of three-point seat belts (lap/shoulder belts) for all seating positions on all school buses. We are denying the petition because we have not found a safety problem supporting a Federal requirement for lap/shoulder belts on large school buses, which are already very safe. The decision to install seat belts on school buses should be left to State and local jurisdictions, which can weigh the need for, benefits and consequences of installing belts on large school buses and best decide whether their particular pupil transportation programs merit installation of the devices.

FOR FURTHER INFORMATION CONTACT: For legal issues: Ms. Deirdre Fujita, Office of the Chief Counsel, NCC–112, phone (202) 366–2992. For non-legal issues: Ms. Shashi Kuppa, Office of Crashworthiness Standards, NVS–113, phone (202) 366–3827. You can reach both of these officials at the National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

Overview

This document denies a petition for rulemaking from the CAS and others [1] (hereinafter referred to as the "CAS petition") asking NHTSA to mandate the installation of three-point seat belts (lap/shoulder belt) for all seating positions on large school buses.[2]

Federal Motor Vehicle Safety Standard (FMVSS) No. 222, "School bus passenger seating and crash protection," requires lap/shoulder belts for all seating positions on small school buses, and requires that passengers on large school buses be protected through a concept called "compartmentalization." [3] The deceleration experienced by small school buses necessitates installation of the belts for adequate occupant crash protection. For large school buses, we have determined there is not a safety problem warranting national action to require the addition of lap/shoulder belts to these vehicles. Large school buses are very safe due to their greater weight and higher seating height than most other vehicles, high visibility to motorists, and occupant protection through compartmentalization. The vehicles have compiled an excellent safety record.

In considering the issue of seat belts for large school buses, NHTSA has been mindful that a requirement for seat belts could affect funding for school transportation. A Federal requirement for seat belts on large school buses will increase the cost to purchase and operate the vehicles, which would impact school budgets. Increased costs to purchase and operate large school buses could reduce the availability of school bus service overall, and reduce school bus ridership. The reduced ridership may result in more students finding alternative, less safe means of getting to or from school or related events, such as riding in private vehicles—often with a teenage driver. When alternative means are used, the risk of traffic-related injury or fatality to children is greater than when a large school bus is used.

As such, there are many factors to be weighed in deciding whether seat belts should be installed on large school buses. Throughout the past 34 years that compartmentalization and the school bus safety standards have been in effect, the agency has openly and continuously considered the merits of a seat belt requirement for large school buses. (See, *e.g.*, responses to petitions to require seat belt anchorages and seat belt assemblies, 41 FR 28506 (July 12, 1976) and 48 FR 47032 (October 17, 1983); response to petition for rulemaking to prohibit the installation of lap belts on large school buses, 71 FR 40057 (July 14, 2006).)

Most recently, NHTSA discussed the issue of requiring seat belts on large school buses at length in a rulemaking proceeding completed in 2010 (Regulation Identifier Number (RIN) 2127–AK09) (NPRM upgrading school bus passenger crash protection, 72 FR 65509 (November 21, 2007); final rule, 73 FR 62744 (October 21, 2008)); (RIN 2127–AK49) response to petitions for reconsideration, 75 FR 66686 (October 29, 2010)). NHTSA undertook the rulemaking to raise the minimum seat back height on school bus passenger seats, require small school buses to have lap/shoulder belts at each passenger seating position (the small buses were previously required to provide at least lap belts [4]), and incorporate test procedures to test lap/shoulder belts in small school buses and voluntarily-installed lap/shoulder belts in large school buses. The test procedures ensure both the strength of the seat belt systems and the compatibility of the

[1] The petition, dated March 9, 2010 on CAS letterhead, described itself as from the following groups and individuals in addition to the CAS: the National Coalition for School Bus Safety, Public Citizen, Consumers for Auto Reliability and Safety, Consumers Union, *KidsandCars.org*, Advocates for Highway and Auto Safety, Consumer Federation of America, SafetyBeltSafe U.S.A., the Trauma Foundation, the American Academy of Pediatrics (AAP), the American Association of Orthopaedic Surgeons, the Orthopaedic Trauma Association, 2safeschools.org, Safe Ride News, the Advocacy Institute for Children, Belt Up School Kids, the Coalition for Child Safety, Nancy Bauder, Lynn Brown/Rhea Vogel, Ruth Spaulding, and Norm Cherkis.

[2] "School bus" is defined in 49 CFR 571.3 as a bus that is sold, or introduced in interstate commerce, for purposes that include carrying students to and from school or related events, but does not include a bus designed and sold for operation as a common carrier in urban transportation. A "bus" is a motor vehicle, except a trailer, designed for carrying more than 10 persons. In this document, when we refer to "large" school buses, we refer to school buses with a gross vehicle weight rating (GVWR) of more than 4,536 kilograms (kg) (10,000 pounds (lb)). These large school buses may transport as many as 90 students. "Small" school buses are school buses with a GVWR of 4,536 kg (10,000 lb) or less. Generally, these small school buses seat 15 persons or fewer, or have one or two wheelchair seating positions.

[3] Compartmentalization is a protective envelope formed of strong, closely spaced seats that have energy absorbing seat backs so that passengers are cushioned and contained by the seat in front in the event of a school bus crash. Compartmentalization is described more fully in the next section of this denial notice.

[4] Small school buses are different from large ones in that they are built on the same chassis and frame as a light truck and thereby have similar crash characteristics of a light truck. The upgraded seat belt requirements (from lap belts to lap/shoulder belts) on these vehicles reflects the similar upgrade to lap/shoulder belts in other passenger vehicles.

seat belt systems with compartmentalization.

In that rulemaking, the agency presented up-to-date information and discussed the reasoning behind the agency's decision not to propose to require seat belts in large school buses. The NPRM and final rule preambles presented data and findings from the following studies of the National Transportation Safety Board (NTSB), National Academy of Sciences (NAS), and NHTSA (in chronological order):

Studies

• *NTSB, 1987*

In 1987, the NTSB reported on its investigation of forty-three post-standard school bus crashes.[5] The NTSB concluded that most fatalities and injuries in school bus crashes occurred because the occupant seating positions were directly in line with the crash forces, and that seat belts would not have prevented those injuries and fatalities. (NTSB/SS–87/01, Safety Study, Crashworthiness of Large Post-standard School Buses, March 1987, National Transportation Safety Board.)

• *NAS, 1989*

A 1989 NAS study concluded that the overall potential benefits of requiring seat belts on large school buses were insufficient to justify a Federal mandate for installation. The NAS also stated that funds used to purchase and maintain seat belts might be better spent on other school bus safety programs with the potential to save more lives and reduce more injuries. (Special Report 222, Improving School Bus Safety, National Academy of Sciences, Transportation Research Board, Washington, DC 1989).

• *NTSB, 1999*

In 1999, the NTSB reported on six school bus crashes it investigated in which passenger fatalities or serious injuries occurred away from the area of vehicle impact. The NTSB found compartmentalization to be an effective means of protecting passengers in school bus crashes. However, because many of those passengers injured in the six crashes were believed to have been thrown from their compartments, the NTSB believed other means of occupant protection should be examined. (NTSB/SIR–99/04, Highway Safety Report, Bus Crashworthiness Issues, September 1999, National Transportation Safety Board).

• *NAS, 2002*

In 2002, the NAS published a study that analyzed the safety of various transportation modes used by school children to get to and from school and school-related activities. The NAS found that among 815 school-age children killed in motor vehicle crashes during normal school travel hours each year, less than 0.6 percent are passengers in school buses, 1.8 percent are children outside the bus near the loading/unloading zone, 22 percent are students walking/bicycling, and 75 percent are in crashes involving passenger vehicles, especially those with teen drivers. The report stated that changes in any one characteristic of school travel can lead to dramatic changes in the overall risk to the student population. Thus, the NAS concluded, it is important for school transportation decisions to take into account all potential aspects of any changes in school transportation. (Special Report 269, "The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment," Transportation Research Board of the National Academies, 2002.)

• *NHTSA, 2002*

In 2002, NHTSA issued a report to Congress detailing school bus occupant safety and analyzing options for improvement. NHTSA concluded that compartmentalization effectively lowered injury measures by distributing crash forces with the padded seating surface. Lap belts showed little to no benefit in reducing serious/fatal injuries. The agency determined that properly used lap/shoulder belts have the potential to be effective in reducing fatalities and injuries for not only frontal collisions, but also rollover crashes where seat belt systems are particularly effective in reducing ejection. However, the addition of lap/shoulder belts on buses would increase capital costs and reduce seating capacity on the buses. ("Report to Congress, School Bus Safety: Crashworthiness Research, April 2002," *http://www.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/Crashworthiness/SchoolBus/SBReportFINAL.pdf.*)

In addition, the agency considered the public discussions at a July 11, 2007 roundtable meeting with State and local government policymakers, school bus and seat manufacturers, pupil transportation associations, and consumer groups. (Notice of public meeting, 72 FR 30739, June 4, 2007, Docket NHTSA–2007–28103.)

The agency explained in the NPRM and final rule preambles of the documents comprising RIN 2127–AK09 that, after considering all available information, NHTSA was not able to conclude that requiring seat belts on large school buses would protect passengers against an unreasonable risk of death or injury in an accident. NHTSA continued: "Whether the same conclusion can be made by a State or local jurisdiction is a matter for local decision-makers and we encourage them to make the decisions most appropriate for their individual needs to most safely transport their students to and from school." *Id.* 73 FR at 62745.

Following publication of the final rule, CAS *et al.* submitted the petition for rulemaking discussed today to require lap/shoulder belts on large school buses. The petition refers to a "Highway Accident Brief" published November 12, 2009 by the NTSB.

Also following publication of the final rule, the State of Alabama completed a comprehensive study to evaluate the merits of having lap/shoulder belts on newly purchased large school buses in Alabama. Among other factors, the State evaluated the rate of seat belt use, the effects on bus discipline, the attitudes of other stakeholders, the loss of capacity attributable to seat belts, and cost effectiveness of requiring lap/shoulder seat belts. The study found that, for Alabama, the cost and consequences of ordering the seat belts on large school buses would exceed the benefit. The authors concluded that if funding is to be spent on school bus safety, more lives could be saved in Alabama by investing in enhanced safety measures in loading/unloading zones.

Additionally, following publication of the final rule, NHTSA completed an estimate of possible impacts that reduced school bus ridership might have on traffic-related injury or fatality. This analysis is discussed later in this document. The agency undertook the analysis to understand, in a more comprehensive manner, the possible consequences of a national requirement for seat belts on large school buses. If a national requirement were imposed, how could such a requirement affect the availability of school bus service? How might reduced availability of school bus service impact pupil transportation safety? The analysis is illustrative in nature and is based on established economic methodologies. Under the described conditions, the agency estimates that the increased risk from students finding alternative, less safe means of getting to and from school could result in an increase of 10 to 19 school transportation fatalities annually.

After carefully considering the petition for rulemaking and all the above information, the agency is denying the petition.

The agency notes that part of the response repeats some discussion from the November 21, 2007 NPRM and the October 21, 2008 final rule comprising

[5] FMVSS No. 222 became effective on April 1, 1977.

RIN 2127–AK09, *supra*. The discussion is set forth again here because it is relevant, particularly because a large part of the petitioners' "facts which it is claimed establish that an order is necessary" [6] are not new, having been previously raised to the agency and to which NHTSA has responded. The agency is repeating some of the discussion set forth in the November 21, 2007 NPRM and the October 21, 2008 final rule for completeness, and to provide a context for discussion of the petition.

Discussion

Introduction

School buses are one of the safest forms of transportation in the United States. Every year, approximately 485,500 school buses travel approximately 4.2 billion miles to transport 23 million children to and from school and school-related activities.[7] The school bus occupant fatality rate of 0.23 fatalities per 100 million vehicle miles traveled (VMT) is nearly 6 times lower than the rates for passenger cars (1.29 per 100 million VMT [8]). The safety of current school buses was confirmed by NAS in 2002.[9]

The agency estimates that an average of 19 school-age children die in school bus-related traffic crashes [10] each year: 5 are occupants of school buses and 14 are pedestrians near the loading/unloading zone of the school bus.[11] These numbers do not include school-age children who are killed going to or from school using means other than by school buses.

The CAS petition cited an American Association of Pediatrics (AAP) analysis of the National Electronic Injury Surveillance System (NEISS). The AAP analysis indicated that there are 17,000 school bus-related nonfatal injuries annually, among which 7,200 were crash related, 4,060 were during boarding/alighting, 1,160 were slips/fall related, 860 were non-crash related, and 3,750 were of other/unknown cause. Among those injured in this study, 97 percent were treated and released from the hospital. Most of these injuries were of minor severity (strains, sprains, and bruises).

We agree with the petitioners that school bus crashes are an important public health priority. Due to regulation in this area and public interest in the safety of school buses, school buses are very safe vehicles. The Motor Vehicle and School Bus Safety Amendments of 1974, which amended the National Traffic and Motor Vehicle Safety Act (Vehicle Safety Act), directed NHTSA to issue motor vehicle safety standards applicable to school buses and school bus equipment. In response to this legislation, NHTSA revised several of its safety standards to improve existing requirements for school buses, extended ones for other vehicle classes to those buses, and issued new safety standards exclusively for school buses. FMVSS No. 222 was promulgated to improve protection to school bus passengers during crashes and sudden driving maneuvers.

Effective since 1977, FMVSS No. 222 contains occupant protection requirements for school bus seating positions and restraining barriers. Its requirements for school buses with GVWRs of 4,536 kilogram (kg) (10,000 pound (lb)) or less differ from those set for school buses with GVWRs greater than 4,536 kg (10,000 lb), because the "crash pulse," or deceleration, experienced by the small school buses is more severe than that of the large buses in similar collisions. For the small school buses, the standard includes requirements that all seating positions must be equipped with properly installed seat belts for passengers. NHTSA decided that seat belts were necessary on small school buses to provide adequate crash protection for the occupants.

For large school buses, FMVSS No. 222 relies on requirements for "compartmentalization" to provide passenger crash protection. Investigations of school bus crashes prior to issuance of FMVSS No. 222 found the school bus seat was a significant factor in causing injury. NHTSA found that the seat failed the passengers in three principal respects: By being too weak, too low, and too hostile (39 FR 27584; July 30, 1974). In response to this finding, NHTSA developed a set of requirements which comprise the compartmentalization system.

Compartmentalization ensures that passengers are cushioned and contained by the seats in the event of a school bus crash by requiring school bus seats to be positioned in a manner that provides a compact, protected area surrounding each seat. If a seat is not compartmentalized by a seat back in front of it, compartmentalization must be provided by a padded and protective restraining barrier. The seats and restraining barriers must be strong enough to maintain their integrity in a crash yet flexible enough to be capable of deflecting in a manner which absorbs the energy of the occupant. They must meet specified height requirements and be constructed, by use of substantial padding or other means, so that they provide protection when they are impacted by the head and legs of a passenger. Compartmentalization minimizes the hostility of the crash environment and limits the range of movement of an occupant. The compartmentalization approach ensures that high levels of crash protection are provided to each passenger independent of any action on the part of the occupant to buckle up.

Nonetheless, throughout the past 34 years that compartmentalization and the school bus safety standards have been in effect, the agency has openly and continuously considered the consequences, pros and cons, of a seat belt requirement for large school buses. The most recent detailed discussion of the issue was in NHTSA's October 21, 2008 final rule.

October 21, 2008 Final Rule

On October 21, 2008, the agency issued a final rule, *supra*, upgrading the passenger protection requirements for school buses. The NPRM preceding the final rule discussed the agency's considerations when we drafted the NPRM as to whether to propose requiring lap/shoulder belts in large school buses. We considered whether Federal enhancements on an already very safe vehicle were reasonable and appropriate, given the low safety need [12] and especially when the cost of installing and maintaining lap/shoulder belts on the buses could impact the ability of transportation providers to transport children to or from school or spend funds in other areas affecting pupil safety. After considering that large school buses were already very safe, and

[6] 49 CFR 552.4(c), Requirements for petition for rulemaking.

[7] Based on the 2006–07 school year, "School Bus Fleet, 2009 Fact Book," page 30.

[8] 2008 Traffic Safety Facts FARS/GES Annual Report, *http://www-nrd.nhtsa.dot.gov/Pubs/811170.pdf*.

[9] National Academy of Sciences, Special Report 269: The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment, National Research Council, Washington, DC, September 2002.

[10] A school bus-related crash is a crash which involves, either directly or indirectly, a school bus body vehicle (*e.g.*, a yellow school bus), or a non-school bus functioning as a school bus (*e.g.* a transit bus functioning as a school bus), transporting children to or from school or school-related activities.

[11] School Transportation-Related Crashes, Traffic Safety Facts 2008 Data, DOT HS 811 165.

[12] As indicated earlier, among 19 school-age child fatalities in school transportation-related crashes each year, 5 are passengers of school buses while 14 are killed outside the school bus at or near the loading/unloading zone, by motorists passing the bus or by the school bus itself. Children inside the bus are typically killed in crashes when they are in the direct zone of intrusion of the impacting vehicle or object, in such circumstances seat belts will not be effective in preventing the fatality.

after considering the possibility that seat belts on large school buses could affect school bus service and ridership, NHTSA decided not to propose to require lap/shoulder belts on large school buses.

The agency estimated the benefit that seat belts in large school buses may offer in frontal, side, and rollover crashes. For frontal crashes, we estimated the benefits of seat belts by using the sled test data obtained from NHTSA's 2002 school bus safety study. For estimating the incremental benefits of seat belts in rollover and side crashes, the agency used the effectiveness estimates of 74 percent for rollover crashes and 21 percent for side crashes attributed to seat belts in passenger cars.[13] We estimated that lap/shoulder seat belts would save about 2 lives per year and prevent about 1,900 crash injuries, of which 97 percent are of minor/moderate severity (mainly cuts and bruises), assuming every child wore them correctly on every trip.

The agency estimated that the incremental cost of installing lap/shoulder belts on a new 45-inch school bus seat to be $467–$599 and that on a 30-inch seat to be $375–$487. The incremental cost of newer seat designs that minimize any loss in seating capacity due to seat belts was estimated to be within these cost ranges. Assuming that an average large school bus has 11 rows of seats with 2 seats per row, we estimated the incremental cost of installing lap/shoulder belts in large school buses to be $5,485–$7,346. (This cost does not include added fuel costs to operate the buses, which would increase due to the added weight from the seat belt system and different school bus seats.) The benefits would be achieved at a cost of between $23 and $36 million per equivalent life saved. (This estimate of cost per equivalent life saved did not factor in increased fuel costs or the effect of the loss in seating capacity.)

After considering all available information, NHTSA was not able to conclude that there exists an unreasonable risk of death or injury in an accident that justified an FMVSS requirement for seat belts on large school buses.[14] Aside from the fact that large school buses were already very safe, real world data showed that fatalities and injuries occurring in school bus loading/unloading zones, and fatalities and injuries associated with other school transportation modes (walking, biking, transporting in private vehicles), are significantly higher than those occurring in the school bus. The agency determined that a Federal requirement for seat belts to address fatalities and injuries on large school buses would not be appropriate since large school buses were very safe and the cost of such a requirement would likely impact the monies available to local jurisdictions to use toward their pupil transportation programs. The greater cost to buy and operate a school bus with seat belts may reduce the number of school buses available for pupil transportation and divert the limited school transportation funds away from important safety programs, such as driver and pupil training on safe loading/unloading practices.

In the October 2008 final rule, the agency affirmed that States and local jurisdictions should continue to have the choice of whether to order seat belts on their large school buses since belts could enhance compartmentalization. We stated our view that States and local school districts are better able to analyze school transportation risks particular to them and identify approaches to best manage and reduce those safety risks.

The agency encouraged local officials to make the decisions most appropriate for their individual needs to most safely transport their students to and from school. (Final rule, 73 FR at 62745.)

The Petition

The CAS petition requests the agency to mandate a lap/shoulder belt requirement for all seating positions on all school buses. The petitioners disagree with the agency's discussion in the November 21, 2007 NPRM and October 21, 2008 final rule on this subject (RIN 2127–AK09) and believe that the agency "ignored" NTSB recommendation NTSB/SIR–99/04 (1999).[15] NTSB/SIR–99/04 recommended, among other things, that NHTSA develop performance standards for school bus occupant protection systems that account for frontal impacts, side impacts, rear impacts, and rollovers (Recommendation H–99–45), and recommended that NHTSA require new school buses to have an occupant crash protection system that meets the new performance standards and retains passengers within the seating compartment throughout the accident sequence of all accident scenarios (H–99–46). The petitioners state that NTSB classified NHTSA's response to H–99–46 as "Closed—Unacceptable Action."[16]

The petitioners provided an overview of the development of seat belts in motor vehicles, starting in the 1950s, and expressed dissatisfaction with FMVSS No. 222 due to the standard's specifying, since 1977, requirements for compartmentalization for large school buses and not for seat belts. They base many of their arguments for a seat belt requirement on what they believe to be limitations of compartmentalization, views that were previously expressed, most recently in response to the 2007 NPRM of RIN 2127–AK09, by proponents of the opinion that NHTSA should require seat belts on large school buses.

The petitioners cite an NTSB Highway Accident Brief[17] regarding a May 28, 2008, school bus rollover accident near Milton, Florida, in which all the passengers were wearing lap belts and only one sustained a serious injury (according to the NTSB, the injury was possibly due to a loosely worn belt.) The NTSB determined that injury severity in the Milton, Florida crash "was mitigated by the use of lap belts." The petitioners state that NTSB referred to a similar rollover crash in

[13] The benefits analysis is explained in the Final Regulatory Evaluation (FRE), Final Rule to Upgrade School Bus Passenger Crash Protection in FMVSS Nos. 207, 208, 210, and 222, Docket No. NHTSA–2008–0163–0002, *http://www.regulations.gov*. We used the passenger car effectiveness estimates because real-world data on the effectiveness of seat belts on buses is not available. Data are available on the effectiveness of seat belts on passenger cars and light trucks. We used the passenger car effectiveness estimates to calculate the effectiveness of seat belts in school bus side impact and rollover events because the passenger car effectiveness is closer to what we expect for school buses. The light truck effectiveness estimates are highly influenced by ejections, which are not common in large school buses.

[14] Under the Vehicle Safety Act, NHTSA is authorized to prescribe motor vehicle safety standards that are practicable, that meet the need for motor vehicle safety, and that are stated in objective terms. Under the Safety Act, "motor vehicle safety" means the performance of a motor vehicle or motor vehicle equipment in a way that protects the public against unreasonable risk of accidents occurring because of the design, construction, or performance of a motor vehicle, and against unreasonable risk of death or injury in an accident. * * *" 49 U.S.C. 30102(a)(8). After considering all available information, we could not conclude that a requirement for seat belts on large school buses would protect against an unreasonable risk of accident or an unreasonable risk of death or injury in an accident. 73 FR at 62745. Based on available information, we concluded that a science-based, data-driven determination that there should be a Federal requirement for seat belts could not be supported.

[15] National Transportation Safety Board, Highway Special Investigation Report, Bus Crashworthiness Issues, September 21, 1999.

[16] With regard to H–99–45, the NTSB explains in the Highway Accident Brief NTSB/HAB–9/03, footnote 4 that "[t]he Board's vote on the status of Safety Recommendation H–99–45 was split, with two members voting 'Closed—Acceptable Alternative Action' and two members voting 'Closed—Unacceptable Action.' As a result of the split vote, Safety Recommendation H–99–45 remained 'Open—Acceptable Response.'"

[17] National Transportation Safety Board, Highway Accident Brief, School Bus Loss of Control and Rollover, Interstate 10, Near Milton, Florida, May 28, 2008, NTSB/HAB–09/03.

Flagstaff, Arizona, on August 14, 1996. In the Arizona crash, the large school bus did not have passenger seat belts, and the accident resulted in multiple ejections and one passenger sustaining lifetime crippling injuries.[18]

The petitioners also believe that NHTSA should require seat belts on large school buses because there has been a "thirty-year history of failure by school districts and states to voluntarily install belts on large school buses." The petition refers to a January 9, 2010 fatal crash in Hartford, Connecticut, involving a school bus carrying 16 students and 2 adult passengers, which did not have seat belts.[19] The petition states that following the crash, there was a State move to require seat belts on school buses, but it was unsuccessful. "History has demonstrated that * * * voluntary implementations by school authorities are extremely rare unless the vehicle construction improvement is required by law or regulatory standard at time of manufacture."

NHTSA Response to Petition

NHTSA has considered the question of whether seat belts should be required on large school buses from the inception of compartmentalization and the school bus safety standards and has reassessed its decisions repeatedly. Each time, after analyzing the implications of a seat belt requirement and all available information, we have concluded that a seat belt requirement for large school buses has not been shown to be warranted.

We have discussed our position regarding the need for seat belts on large school buses at length in the 2007 NPRM and 2008 final rule documents of RIN 2127–AK09. To the extent the petitioners' assertions are repetitive of previously discussed points-of-view, our positions on the issues are set forth at length in the November 21, 2007 and October 21, 2008 preambles, and are summarized above. For plain language purposes and to avoid redundancy when possible, we do not repeat the detailed discussion here; interested persons can review those documents for the agency's full response to the issues. In Appendix A of today's document, we address a few miscellaneous issues the petitioners raised, in a question-and-answer format.

We carefully considered NTSB's recommendation H–99–46 when we developed the 2007 NPRM and 2008 final rule documents. We recognized in the RIN 2127–AK09 rulemaking that seat belts in large school buses may have some effect on reducing the risk of harm in frontal, side and rollover crashes, since seat belts can help restrain occupants within the seat and prevent their ejection and impact with interior surfaces. We estimated that in frontal, side and rollover crashes, lap/shoulder belts would save 2 lives annually.[20]

After considering all views, including H–99–46, we could not agree with those asking us to propose to require seat belts on large school buses. We assessed the safety need for seat belts. Since school buses are already very safe and are the safest mode of school transportation, a seat belt mandate would result in very few benefits.

We also weighed that safety need against possible negative consequences of requiring seat belts on large school buses. The greater cost to purchase and operate a large school bus with seat belts may reduce the number of school buses available for pupil transportation, and/or divert limited school transportation funds away from other necessary safety programs, such as driver and pupil training on safe loading/unloading practices. We determined that it would be inappropriate for NHTSA to require seat belts given the low safety need for the belts, when such a decision has a direct bearing on the ability of the local decision-makers to allocate and spend limited pupil transportation resources on other school transportation safety needs that are likely to garner greater benefits, perhaps at lower cost.

It bears repeating that the agency has been acutely aware that a decision on requiring seat belts in large school buses cannot ignore the implications of such a requirement on pupil transportation costs. The agency has been attentive to the fact that, as a result of requiring belts on large school buses, school bus purchasers would have to buy and operate belt-equipped vehicles regardless of whether seat belts would be appropriate for their needs. NHTSA has concluded that those costs should not be imposed on all purchasers of school buses when large school buses are currently very safe. In the area of school transportation especially, where a number of needs are competing for limited funds, we did not believe there was reason to limit the policymaking discretion of the States and local governments in deciding school transportation issues.

As presented later in this document, our analysis shows that a National lap/shoulder belt requirement for large school buses could result in an increase of 10 to 19 student fatalities annually in the U.S. A State or local jurisdiction, that is able to, could adjust its budget in the face of a seat belt mandate to avoid impacting its pupil transportation safety program in a manner that might result in this net increase in student fatalities. However, each State or local jurisdiction will differ in its ability to adjust to the cost impacts of a belt mandate. Moreover, even if a State or local jurisdiction were able to adjust its budget, the soundness of a public policy that imposes this burden on State or local jurisdictions is debatable when the incremental benefit from seat belts on large school buses is so low. We believe that the decision to reallocate local resources to account for a seat belt mandate should be a matter left to the policymaking discretion of the State or local authorities.

It is true that seat belts have been proven beneficial in rollover crashes. However, real world data show that school bus passenger fatalities and injuries in rollover events are rare. The CAS petition cites two school bus accidents in support of its position that there is a safety need for seat belts on large school buses. We cannot agree that citing to these rare instances of fatal rollover crashes forms the basis for a finding of a problem of national significance that warrants trumping local policymaking on this matter.

Under the Vehicle Safety Act, the Federal motor vehicle safety standards we issue must "meet the need for motor vehicle safety." "Motor vehicle safety" means the performance of a motor vehicle or motor vehicle equipment in a way that protects the public against unreasonable risk of accidents occurring because of the design, construction, or performance of a motor vehicle, and against unreasonable risk of death or injury in an accident * * *" 49 U.S.C. 30102(a)(8). In large school buses, fatal rollover crashes are rare (approximately 1 crash per year, resulting in 2 fatalities annually), as are fatal side impact crashes in which seat belts would have

[18] The NTSB/HAB–09/03 calls the Florida and Arizona accidents "comparable." The NTSB document does not have a statement about the possible effect of belts in the Arizona accident.

[19] According to the petitioners, the school bus "crashed through a roadside guardrail, plummeted down a 20-foot drop-off, and ended in the ravine below. One child was killed, and fifteen were injured."

[20] This number is low because in side crashes, children are typically killed when they are in the direct zone of intrusion of the impacting vehicle or object. Seat belts would be unlikely to be effective in preventing the side crash fatality. NHTSA is conducting research to determine how the passenger compartment can be made more protective to mitigate injurious impacts with interior surfaces. In rollover crashes, seat belts are effective in mitigating occupant ejections, but real world data show that school bus passenger fatalities and injuries in rollover events are rare (8 serious injuries and 2 fatalities annually).

prevented death or serious injury. Fatal non-rollover frontal crashes in large school buses are uncommon (less than 1 crash per year). Large school buses are already very safe vehicles. More important, as explained below, requiring seat belts on large school buses is likely to have the effect of increasing fatalities related to school transportation. After considering all available information, we cannot conclude there is an unreasonable risk of death or injury in an accident that warrants a Federal requirement for seat belts on large school buses.

The Role of States and Local School Districts

The petitioners state a Federal requirement for seat belts on large school buses is needed because there has been a "thirty-year history of failure by school districts and states to voluntarily install belts on large school buses."

We strongly disagree with characterizing a State's decision not to order seat belts on large school buses as a "failure." We believe that it is most appropriate if the decision to order seat belts on large school buses were left to the States and local jurisdictions rather than to NHTSA. 73 FR at 62750. States and local school districts are better able to recognize and analyze school transportation risks particular to their areas and identify approaches to best manage and reduce those safety risks. Local officials are in the best position to decide whether to purchase seat belts, since the officials must weigh a multitude of unique considerations bearing on purchasing decisions, especially when faced with budgetary constraints. Contrary to the petitioners' view, we believe that if, after weighing all the considerations, a purchaser decides not to purchase the belts, then the purchaser is determining what is best for its needs. 73 FR at 62752.

An example of a State's undertaking a comprehensive assessment of whether to purchase belts for large school buses is illustrated by the State of Alabama. Its study is summarized below.

Alabama Study Group on School Bus Seat Belts

On September 30, 2010, at the direction of Alabama Governor Bob Riley, Alabama issued a comprehensive study evaluating the need for seat belts in its school buses.[21] Governor Riley had formed a Study Group on School Bus Seat Belts in the wake of a tragic school bus crash in Huntsville[22] that took the lives of four students in November 2006. The Study Group's report, "Cost-Effectiveness of Lap/Shoulder Seat Belts on Large Alabama School Buses," was issued as part of an Alabama School Bus Seat Belt Pilot Project. The project was conducted for the Alabama State Department of Education and the Governor's Study Group on School Bus Seat Belts by the University Transportation Center for Alabama, at the University of Alabama in Huntsville.

The goal of the project was to explore the implementation of lap/shoulder belts on newly-purchased large school buses in Alabama. The study included determining the rate of seat belt use, the effects on bus discipline, the attitudes of other stakeholders, the loss of capacity attributable to seat belts, and cost effectiveness of requiring lap/shoulder seat belts. The study also considered flexible seating systems in its analysis.[23]

The study found that school buses in Alabama travelled 83 million miles in 2009–2010 and on an average had 560 traffic crashes annually. The authors noted that school bus crashes per mile travelled is significantly lower than that of other vehicles in the State. In addition, since 1976, there were only five pupil fatalities inside of Alabama school buses.

As part of the pilot project, 12 school buses in the state were equipped with lap/shoulder belts. Researchers observed over 125,000 pupils inside the school buses, and determined that the average seat belt use in Alabama school buses was approximately 61.5 percent. Seat belt use was found to be quite variable in different buses, ranging from 4.8 to 94.5 percent. The study noted a 5 to 18 percent reduction in seating capacity of school buses with seat belts.

The study reported that the estimated net benefit of implementing seat belts on Alabama school buses was −$104 million to −$125 million. The net benefit is negative because the cost of the seat belts exceeds the benefit.

The authors of the study recommended using more cost-effective safety measures, other than implementing seat belts across Alabama's large school bus fleet. Most school bus pupil fatalities in Alabama occur outside the buses, in or near loading/unloading zones. The authors concluded that if funding is to be spent on school bus safety, more lives could be saved by investing in enhanced safety measures in loading/unloading zones.

NHTSA believes that the Alabama study reinforces the view that a Federal mandate requiring seat belts on large school buses would be an overreaching venture for the agency. States such as Alabama have decided that more lives would be saved in the State if its resources were spent on safety measures other than the installation of seat belts. Given the limited safety need at issue, we are not convinced there is merit for NHTSA to override a State's conclusions.

The petitioners were unsatisfied that only six States have laws requiring seat belts on large school buses. We do not view this low number as an indicator that the States have "failed." Instead, we see it as a reflection of a stance taken by the States that their efforts and monies are better spent trying to keep children safe other than by the installation of seat belts on vehicles that are already very safe. For States such as Alabama, it is a decision taken after a thorough consideration of the issue.

NHTSA Analysis on the Changes in School Transportation Fatalities Due to a Seat Belt Requirement on Large School Buses

NHTSA conducted an analysis of accident data to estimate, in a manner not previously explored, how a National lap/shoulder belt requirement for large school buses might affect the current pupil transportation arena as it is today. The analysis illustrates that a National lap/shoulder belt requirement could result in more children's lives lost than saved.

The 2002 NAS study described earlier in this document indicated that the safest means for students to get to school[24] is by a school bus. Among school-aged children killed annually in motor vehicle crashes during normal school travel hours, only 0.5 percent were passengers on school buses and 1.5 percent were pedestrians involved in school bus-related crashes. Seventy-five percent of the annual fatalities were to occupants in passenger vehicles and 24 percent were to those walking or riding a bicycle.

Yet, there are many ways to get to school. If a school bus is not used to transport a child to school, other means

[21] Turner, D., Anderson, K., Tedla, E., Lindly, J., Brown, D., "Cost-Effectiveness of Lap/Shoulder Seat Belts on Large Alabama School Buses," September 30, 2010. *https://docs.alsde.edu/documents/120/Pilot_Project_Cost_Effectiveness.pdf.*

[22] National Transportation Safety Board, NTSB/HAB–09/02, Highway Accident Brief: School Bus Bridge Override Following Collision With Passenger Vehicle, Huntsville, Alabama, November 20, 2006, adopted November 2009.

[23] These newly-developed seating systems have lap/shoulder belts and are reconfigurable to accommodate either three smaller students or two larger students.

[24] By "school," we mean to or from school or related events. See 49 CFR 571.3, "school bus."

will be used to get to school. Those other means of getting to school are associated with higher safety risks.

In previous documents, NHTSA has expressed concern that, when making regulatory decisions on possible enhancements to school bus safety, the agency must bear in mind how improvements in one area might have an adverse effect on programs in other areas. The net effect on safety could be negative if the costs of purchasing and maintaining the seat belts and ensuring their correct use results in non-implementation or reduced efficacy of other pupil transportation programs that affect child safety. For example, if school bus service were reduced because of the costs to purchase and operate large seat belt-equipped school buses, more children would have to get to school using alternative, less safe ways to get to school.

NHTSA has analyzed accident data to estimate possible consequences on overall school transportation fatalities and injuries if a Federal requirement for seat belts on large school buses were adopted.[25] NHTSA used data from the School Bus Fleet, 2010 Fact Book, the 2009 National Household Travel Survey,[26] and the Fatality Analysis Reporting System (FARS). To analyze the effects of lap/shoulder belts on the demand for school buses, we applied the theory of elasticity of demand. Elasticity is an economic term that measures responsiveness of one economic variable to a change in another economic variable. In this case, we are examining the change in demand for school buses when there is an increase in the cost of a bus.

FARS data files for the period 2000 to 2008 were analyzed to determine the number of school-age children killed in motor vehicle crashes during the time of school transportation to and from school (Monday to Friday between 6 AM to 9 AM and 2 PM to 5 PM) of the school year (September 1 to June 15). As shown in Table 1 below, the analysis showed that among 6,869 fatalities of school-age children (5–18 year olds), 0.5 percent were occupants in school buses, 78.6 percent were in passenger vehicles, 12.1 percent were pedestrians, 4.9 percent were motorcycle riders and occupants of other vehicles, and 3.5 percent were pedalcyclists. Only 3.8 percent of the 6,869 fatalities were in school bus-related crashes[27] among which a majority were passenger vehicle occupants and pedestrians as shown in Table 1.

TABLE 1—SCHOOL-AGE CHILDREN (5–18 YEAR-OLD) KILLED IN MOTOR VEHICLE TRAFFIC CRASHES DURING NORMAL WEEKDAY SCHOOL TRANSPORTATION HOURS (MONDAY–FRIDAY, 6 A.M.–9 A.M. AND 2 P.M.–5 P.M.) OF THE SCHOOL YEAR (SEPTEMBER 1–JUNE 15) CATEGORIZED BY MODE OF TRANSPORTATION AND WHETHER THE CRASH WAS SCHOOL BUS-RELATED. FARS 2000–2008

School-age children (5–18 year-old)	Not school bus-related		School bus-related		Total	
	Number	Percent	Number	Percent	Number	Percent
Occupant in School Bus Body Type Vehicle or Vehicle Used as School Bus	** 1	0.0	37	0.5	38	0.55
Occupant of Other Bus Type	2	0.0	0	0.0	2	0.0
Passenger Vehicle Occupant	5268	76.7	131	1.9	5399	78.6
Motorcycle Rider	128	1.9	3	0.0	131	1.9
Occupant of All Other Vehicle Types	198	2.9	5	0.1	203	3.0
Pedestrian	748	10.9	81	1.2	829	12.1
Bicyclist	233	3.4	6	0.1	239	3.5
Other/Unknown	27	0.4	1	0.0	28	0.4
Total	6605	96.2	264	3.8	6869	100.0

** A van-based school bus that was not functioning as a school bus at the time of the crash.

Table 2, below, shows the student miles traveled in the different school transportation modes, obtained from the 2009 National Household Travel Survey. Among 123,266 million miles traveled annually by school-age children to and from school, 69.5 percent was in passenger vehicles, 25.3 percent was in school buses, 2.1 percent was walking and 0.4 percent was riding a bicycle.

TABLE 2—DISTRIBUTION OF STUDENT MILES TRAVELED TO-AND-FROM SCHOOL AND SCHOOL-RELATED ACTIVITIES BY TRANSPORTATION MODE

[Source: National Household Travel Survey—2009]

Mode of travel	Million miles traveled			
	Morning	Afternoon	Total	Percent
School Buses	15407.6	15793.7	31201.3	25.3
Other Buses	868.8	977.5	1846.4	1.5
Passenger Vehicles	39752.7	45975.3	85728.0	69.5
Pedestrian	904.6	1629.4	2534.0	2.1
Bicycles	137.0	320.2	457.2	0.4
Other (Motorcycle, Other Vehicles)	429.5	816.2	1245.7	1.0

[25] "Changes in School Bus Travel by Requiring Lap/Shoulder Belts and the Effect on Fatalities," National Highway Traffic Safety Administration, February 2011. A copy has been placed in the docket for today's document.

[26] 2009 National Household Travel Survey: U.S. Department of Transportation, Federal Highway Administration, February, 2011, *http://nhts.ornl.gov/download.shtml.*

[27] A school bus-related crash is a crash which involves, either directly or indirectly, a school bus body vehicle, or other type of bus functioning as a school bus, transporting children to or from school or school-related activities.

TABLE 2—DISTRIBUTION OF STUDENT MILES TRAVELED TO-AND-FROM SCHOOL AND SCHOOL-RELATED ACTIVITIES BY TRANSPORTATION MODE—Continued

[Source: National Household Travel Survey—2009]

Mode of travel	Million miles traveled			
	Morning	Afternoon	Total	Percent
Unknown	236.0	18.1	254.1	0.2
Total	57736.2	65530.3	123266.5	

In order to determine the number of fatalities per 100 million miles traveled by school-age children to and from school and school-related activities, the fatality data for the years 2000–2008 (Table 1) were used along with the estimates of student miles traveled to and from school in 2009[28] shown in Table 2. An estimate of annual fatalities for each school transportation mode was determined by dividing the number of fatalities in 2000–2008 (from Table 1) by 9. The school-age child fatalities per 100 million miles traveled to and from school was determined by dividing the average annual fatalities for each transportation mode by the corresponding total miles traveled in that mode (Table 2). This analysis is shown in Table 3.

TABLE 3—NUMBER OF SCHOOL-AGE CHILD FATALITIES PER 100 MILLION MILES TRAVELED BY STUDENTS TO AND FROM SCHOOL AND SCHOOL-RELATED ACTIVITIES

Mode of travel	Number of fatalities 2000–2008	Annual fatalities	Miles traveled in 2009 (million miles)	Fatalities per 100 million miles
School Buses	*37	4.1	31201.3	0.01
Other Buses	*3	0.3	1846.4	0.02
Passenger Vehicles	5399	599.9	85728.0	0.70
Pedestrian	829	92.1	2534.0	3.64
Bicycles	239	26.6	457.2	5.81
Other (Motorcycle, Other Vehicles)	334	37.1	1245.7	2.98
Unknown	28	3.1	254.1	1.22

*The van-based school bus in Table 1 that was not functioning as a school bus at the time of the crash was put in the category "other buses" in Table 3.

In order to evaluate the change in fatality due to a Federal requirement for seat belts on all school buses, the agency examined different types of bus seats with seat belts, their costs, and any changes in seating capacity in the bus by replacing existing seats with seats with seat belts. In the October 2008 final rule, the agency estimated that the cost of a large school bus (66–72 passengers) without seat belts is $75,000 and the incremental cost of adding seat belts on large school buses is $5,485 to $7,345 per bus. Some State officials have suggested that seats with seat belts cost closer to $10,296.[29] The agency estimated that these seats with seat belts could result in a loss in bus capacity by as much as 17 percent, depending on the mix of students riding in the buses.

In recent years, flexible school bus seat designs (flex-seats) have emerged in the marketplace where lap/shoulder belts on these bench seats can be adjusted to provide two lap/shoulder belts for two average-size high school students or three lap/shoulder belts for three elementary school students. These flex-seats with seat belts offer the potential for maintaining the original bus capacity. We do not have cost estimates for flex-seats but expect it to be in the range of the high cost estimate ($10,296). To estimate the maximum benefit for lap/shoulder belts, we only considered the flex-seat designs which can potentially limit any loss in bus capacity. Therefore, the percentage increase in cost of a large school bus with lap/shoulder belts without any resulting loss in capacity is 13.7 percent (=$10,296/$75,000).

For determining the effect on demand for school buses due to an increase in cost[30] of a new bus, we estimated a Price Elasticity of Demand (PED) value for school buses. PED is a measure of the responsiveness of the quantity demanded of a good or service to the change in its price and is calculated as the percent change in the quantity demanded divided by the percent change in price.[31] In this case, we are assessing the percentage change in the number of new school buses purchased by school districts, for a percentage change in the price of new school buses due to a requirement for lap/shoulder belts.

In economic terms, the overriding factor in determining the PED is the willingness and ability of consumers after a price change to postpone consumption decisions concerning the good and to search for substitutes. A number of factors can thus affect the PED of a good or service including:

1. *The availability of substitute goods and services:* The more easily available

[28] The distribution of student travel modes has not changed by much since the 2002 National Household Transportation survey.

[29] Presentation by Charlie Hood, Director of Student Transportation in the Florida Department of Eductation at the July 11, 2007 Public Meeting on the issue of seat belts in large school buses, Docket No. NHTSA–2007–28103–0016, *http://www.regulations.gov.*

[30] This cost does not include operating and maintenance costs (such as additional fuel cost due to increase in weight of the bus and additional cost to maintain seat belts).

[31] PED = (percentage change in quantity demanded) / (percentage change in price).

the substitute goods and services, the higher the PED is likely to be.

2. *Percentage of Income:* The higher the percentage of the consumer's income that the good or service represents, the higher the PED tends to be.

3. *Necessity:* The more necessary the good or service is, the lower the PED for the good or service.

4. *Duration of price change:* The longer the price change holds, the higher the PED is likely to be since there is more time available to find substitutes.

5. *Who pays:* When the purchaser does not directly pay for the good, the PED is likely to be lower.

Various research methods are used to calculate PEDs in real life, including analysis of historic sales data and surveys of customer preferences. To determine the PED for school bus transportation, the agency examined PEDs associated with public transportation.[32] The bus transit fare PED values, published by the American Public Transportation Association (APTA) and widely used for transit planning and modeling in North America, suggest PED values in the range of 0.36 to 0.43. This APTA estimate was based on a study of the short-term (less than two years) effects of fare changes in 52 U.S. transit systems during the late 1980s. Based on extensive research, Transportation Research Laboratory (TRL)[33] calculated that bus fare PED values average around 0.4 in the short-run, 0.56 in the medium run, and 1.0 over the long run, while metro rail fare elasticities are 0.3 in the short run and 0.6 in the long run.

We believe that the PED estimates for school bus transportation are likely to be similar to that for transit systems since the alternative services are similar (use of personal car, walking, or biking). Since a mandate for seat belts on school buses would not be a temporary cost increase and would be applicable to all new buses sold after the compliance date of such a rule, we are only considering PED in the long run. The cost of school bus transportation is an indirect cost to the consumer; therefore, we expect the PED for school buses to be a little lower than the estimates of PED in the long run for transit buses and metro rail. We do not expect the PED value for school bus transportation to be equal to 1.0[34] because we expect that school districts will find creative ways to maximize school transportation service in spite of the added cost of new school buses.[35] Therefore, based on the available PED values for transit systems, we estimate PED values for school bus transportation to range between 0.35 and 0.6.

When school district officials are faced with installing lap/shoulder belts in school buses, they will purchase the number of buses according to their budget. If their budget is limited, using PED values from 0.35 to 0.6 for school buses, a 13.7 percent increase in the price of a school bus would result in a 4.795 (13.7 × 0.35) percent to 8.22 (13.7 × 0.6) percent decrease in quantity demanded. We have assumed that the percentage decrease in the demand for school buses results in a similar decrease in school bus ridership (in this case, decrease in student miles traveled in school buses). The decrease in school bus ridership would result in students taking other modes of transportation to and from school. We assume that the students who no longer can take the school bus would adopt a mode of travel roughly in the same proportion as that being used currently by those who do not use the school bus.

Thus, we distributed the decrease in student miles traveled by school buses among the other modes of travel in accordance with the proportion of vehicle miles traveled in non-school bus travel modes presented in Table 2, above. Based on the redistributed student miles traveled, we estimated the number of fatalities associated with the different transportation modes, using the fatalities per 100 million vehicle miles traveled for the different transportation modes in Table 3, above. Table 4 presents the redistribution of vehicle miles traveled and the resulting number of fatalities for an 8.22 percent reduction in vehicle miles traveled in school buses (corresponding to a PED of 0.6).

TABLE 4—STUDENT MILES TRAVELED AND ANNUAL FATALITIES FOR BASELINE CONDITION (NO SEAT BELTS ON SCHOOL BUSES) AND REDISTRIBUTED VEHICLE MILES TRAVELED AND ASSOCIATED ANNUAL FATALITIES FOR A REDUCTION IN SCHOOL BUS MILES TRAVELED BY 8.22 PERCENT CORRESPONDING TO A PED = 0.6

Mode of travel	Miles traveled (millions)		Annual fatalities	
	Baseline (table 3)	Redistributed [1]	Baseline (table 3)	Redistributed [2]
School Buses	31201.3	28636.6	4.1	3.8
Other Buses	1846.4	1897.8	0.3	0.3
Passenger Vehicles	85728.0	88116.2	599.9	616.6
Pedestrian	2534.0	2604.6	92.1	94.7
Bicycles	457.2	469.9	26.6	27.3
Other (Motorcycle, Other Vehicles)	1245.7	1280.4	37.1	38.1
Unknown	254.1	261.1	3.1	3.2
Total	123266.5	123266.5	763.2	784.0

[1] School bus miles traveled were reduced by 8.22 percent of the baseline and these miles were redistributed according to the proportion of vehicle miles traveled in non-school bus transportation modes in Table 2. This column represents the student miles traveled to and from school in the various transportation modes when all school buses have seat belts.

[2] The redistributed annual fatalities were computed by multiplying the fatalities per 100 million miles (last column in Table 3) with the redistributed miles traveled in this table. This column represents the number of fatalities due to a reduction of school bus service by 8.22 percent.

[32] Transportation Elasticities—How Prices and other Factors Effect Travel Behavior, Transportation Demand Management (TDM) Strategies Encyclopedia, Victoria Transport Policy Institute, *http://www.vtpi.org/tdm/tdm11.htm#_Toc161022586.*

[33] TRL (2004), *The Demand for Public Transit: A Practical Guide*, Transportation Research Laboratory, Report TRL 593 (*http://www.trl.co.uk*); at *http://www.demandforpublictransport.co.uk.* This 240-page document is a detailed analysis of factors that affect transit demand, including demographic and geographic factors, price, service quality and the price of other modes.

[34] PED = 1.0 implies that the percentage decrease in the number of school buses bought by a school district is equal to the percentage increase in the cost of a new school bus.

[35] One such option would be reducing operations to a 4-day school week which is currently under consideration in 13 percent of the school districts nationwide. NAPT School Bus Fleet Magazine, June 2010.

In the October 21, 2008 final rule, the agency estimated that seat belts on school buses would prevent 2 fatalities annually. Therefore, the annual redistributed school bus fatalities in Table 4 are reduced by 2 due to seat belts (*i.e.*, 3.8 − 2 = 1.8). Similarly, the total number of school transportation fatalities when all school buses are required to have seat belts is 782 (*i.e.*, 784 − 2 = 782). This total number is 18.8 fatalities more than the baseline when seat belts are not required on school buses. Therefore, for a PED = 0.6 for school buses, the requirement for seat belts on school buses would result in 18.8 more school transportation-related fatalities per year even though seat belts are expected to save 2 lives annually. Using a PED = 0.35 (the lower estimate of the PED range), the number of redistributed fatalities is 775.4. After subtracting the estimated 2 lives saved by seat belts on school buses, the increase in school transportation fatalities when all school buses are required to have seat belts is 10.2 compared to the baseline.

This analysis suggests that there could be an overall increase of 10.2–18.8 school transportation fatalities if seat belts are required on all school buses. The cost estimates used in this analysis assume that there is no loss in capacity. Since school buses are the safest form of school transportation, any reduction in capacity per bus will result in more school transportation fatalities than when there is no loss in capacity. The cost estimates in our analysis also do not account for added fuel costs that would incur due to more fuel being used to operate heavier school buses equipped with seat belt systems.

Conclusion

After carefully considering all aspects of the petition, the agency has decided to deny it. In the 2007 NPRM and 2008 final rule documents, we considered but did not agree with NTSB's recommendation H–99–46 to the extent that the recommendation asked NHTSA to require lap/shoulder belts on large school buses. The petitioners have not presented information to suggest that the agency's decision not to require lap/shoulder belts on large school buses was incorrect.

The agency's latest analysis indicates that a requirement for lap/shoulder belts on all school buses may result in an additional 10 to 19 school transportation fatalities than currently where there is no such Federal requirement. A State or local jurisdiction, that is able to, could adjust its budget to avoid impacting its pupil transportation safety program in a manner that might result in this net increase in student fatalities in the face of a seat belt mandate. However, we believe that the decision to reallocate local resources to account for seat belts should be a matter left to the policymaking discretion of the State or local authorities. Large school buses are already very safe. States or local authorities should continue to have the discretion to decide whether their efforts and monies should be spent on seat belts on large school buses, or on measures that could be more effective in improving pupil transportation safety.

In accordance with 49 CFR part 552, this completes the agency's review of the petition for rulemaking.

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30162; delegation of authority at 49 CFR 1.50 and 501.8.

Issued on: August 18, 2011.

Christopher J. Bonanti,

Associate Administrator for Rulemaking.

Appendix A: Miscellaneous Issues Raised by the Petitioners

Question 1. Why doesn't NHTSA require seat belts on large school buses when NHTSA's April 2002 report to Congress [36] on school bus safety showed that lap/shoulder belts offered the best level of protection compared to lap belts or compartmentalization alone? Didn't the 2002 NHTSA report show that head injury criterion (HIC) measurements were significantly lower for lap/shoulder belts than for compartmentalization and the seat belts kept the dummies in their seats?

Answer: NHTSA's 2002 school bus safety study results provided information about potential enhancements to large school bus occupant protection that could be achieved through the use of lap/shoulder seat belts. The study involved simulations of a 48 km/h frontal crash test of a large school bus (Type C) into a rigid barrier using a test sled and various test dummies (representing 50th percentile adult male, 5th percentile adult female, and a 6-year old child) in various seat and restraint configurations. The HIC measurements were low and below the injury assessment reference values (IARV) [37] for all the dummies in all the restraint environments (compartmentalization with low and high seat backs, lap belts, and lap/shoulder belts) except for the unrestrained 50th percentile male dummy in some tests with low seat back height where the dummy overrode the seat and contacted the dummy in front. This issue was addressed in the 2008 final rule by requiring higher seat back heights (increased from 20 inches to 24 inches) to enhance protection through compartmentalization for larger occupants. The neck injury measures were above the IARV in some tests with the unrestrained 6-year-old child and 5th percentile female dummy while they were below the IARVs when restrained by lap/shoulder belts. However, neck injuries are rare in real world crashes so it is unclear how representative the laboratory tests were of the real world condition, *e.g.* how representative the test dummies were of humans, the sled test of an actual vehicle crash, and the magnitude of the crash replicated as compared to real-world school bus crashes. Nevertheless, the agency used these test results to determine the incremental benefits garnered in frontal crashes by the addition of lap/shoulder belts to large school bus seats and is presented in detail in NHTSA's Final Regulatory Evaluation (FRE) [38] accompanying the 2008 final rule. The FRE determined that the addition of lap/shoulder belts in large school buses would save 0.55 lives and 750 injuries (97 percent of which are minor/moderate severity) in frontal school bus crashes for 100 percent correct seat belt use. Using effectiveness estimates for lap/shoulder belts of 74 percent in rollover and 21 percent in side impacts, the FRE estimated that lap/shoulder belts on large school buses would save 1.33 lives in rollover and 0.25 lives in side impacts crashes when all occupants use their seat belts. These benefits are relatively low since school buses (with high back seats for effective compartmentalization) are already very safe and are the safest mode of transportation to and from school. The cost-benefit analysis in the FRE found that installing lap/shoulder belts on all new large school buses would cost $183–$252 million annually and save 2 lives and 1,900 injuries per year for 100 percent correct belt use.

Due to the limited funds available for school transportation, a Federal requirement for seat belts on all school buses may reduce school bus service and as a result school bus ridership. We are concerned that the reduced bus ridership may result in more student fatalities, since riding in private vehicles is less safe than riding a large school bus without seat belts. Our analysis presented in this notice shows that a Federal mandate for seat belts on large school buses could result in 10–19 more school children being killed annually while traveling to and from school. Therefore, the agency continues to not support a Federal requirement for seat belts on large school buses. We believe that States and local school districts are better able to analyze school transportation risks particular to them and identify approaches to best manage and reduce these safety risks. The final rule, while not requiring seat belts on large school buses, provides appropriate performance requirements for these systems if school districts determine that seat belt installation is in their best interest.

Question 2. In a document submitted after publication of the October 21, 2008 final rule, Public Citizen (PC) submitted a post-final

[36] National Highway Traffic Safety Administration, Report to Congress—School Bus Safety: Crashworthiness Research, April 2002, *http://www.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/Crashworthiness/SchoolBus/SBReportFINAL.pdf.*

[37] Injury assessment in accordance with that specified in FMVSS No. 208, "Occupant crash protection").

[38] Final Regulatory Evaluation of the Final Rule to Upgrade School Bus Passenger Crash Protection in FMVSS Nos. 207, 208, 210, and 222, October 2008, Docket No. NHTSA–2008–0163–0002, *http://www.regulations.gov.*

rule comment objecting to NHTSA's decision not to require lap/shoulder belts on large school buses. For a summary of the comment, see 75 FR at 66694. Among other things, PC objected to the cost and benefit analysis of the Final Regulatory Evaluation (FRE). PC raised the question: why didn't the FRE "discuss the effect of 'economies of scale' in reducing the incremental cost of adding belts to the buses * * * Economies of scale and learning by doing can significantly reduce costs, but NHTSA's economic analyses makes no mention of these efforts."

Answer: We have evaluated this comment and do not believe that the "economies of scale" and "learning by doing" will significantly reduce the cost of requiring lap/shoulder belts in large school buses. The lap/shoulder belts in large school buses are similar to the lap/shoulder belts that are sold for the many millions of light duty vehicles, so the economies of scale for webbing, buckles, and retractors have already been achieved. There will be little economies of scale by the seat manufacturers; since they are just replacing one seat with one equipped with lap/shoulder belts. Again, they are just installing a different seat and perhaps a different seat track. We also do not agree that "learning by doing" will decrease the cost of installing lap/shoulder belts in large school buses because school bus manufacturers already know how to install lap/shoulder belts in large school buses.

Question 3. In its comments to the final rule, PC stated that lap-only belts should not be permitted in school buses. PC stated that in 1999 the NTSB suggested there may be potential for greater injuries in occupants restrained using lap-only belts in side crashes. Why hasn't NHTSA banned lap belts in large school buses?

Answer: The agency explained in the final rule that it has studied lap belts in frontal crashes in the school bus research program [39] and analyzed data from States which include side impact and rollovers, and could not determine that lap belts translate to an overall greater safety risk. Our real world data indicates that lap belts are as effective as lap/shoulder belts in rollover crashes, and benefit far side occupants in side impacts involving these vehicles.

PC provided no data to support the implication that lap belts may be harmful in side impacts, and we disagree with its view of the 1999 NTSB study. The NTSB came to the conclusion in the 1999 report that "* * * because injuries occurred for all restraint conditions in the simulated accidents and because injury levels varied depending upon occupant kinematics and seating location, the Safety Board concludes that it cannot be determined whether the current design of available restraint systems for large school buses would have reduced the risk of injury to the school bus passengers in these accidents."

The NTSB has since studied two school bus crashes where lap-only belts have been beneficial in mitigating injuries in side impact and rollover crashes. In its review of the March 2000 side impact collision between a school bus and a freight train near the Tennessee and Georgia border [40] and the May 2008 school bus rollover near Milton, Florida,[41] the NTSB concluded that passenger injuries were reduced because of lap belts. We note that the Milton, Florida crash, where the school bus was equipped with lap belts, was cited by the petitioners, among which PC was a signatory, as an exemplar case where seat belts on large school buses were effective in preventing fatalities and serious injuries. Given the available information, the agency declines to change its position on the allowance of lap belts on large school buses in response to PC's comment.

[FR Doc. 2011–21596 Filed 8–24–11; 8:45 am]

BILLING CODE 4910–59–P

[39] Report to Congress, School Bus Safety: Crashworthiness Research, April 2002.

[40] "Collision of CSXT Freight Train and Murray County School District School Bus at Railroad/Highway Grade Crossing, Conasauga, Tennessee," March 28, 2000; National Transportation Safety Board, HAR 01/03, December 2001.

[41] "School Bus Loss of Control and Rollover, on Interstate 10, near Milton, Florida," May 28, 2008; National Transportation Safety Board, HAB–09–03, November 2009.

CTBSSP

SYNTHESIS 17

Special Safety Concerns of the School Bus Industry

A Synthesis of Safety Practice

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COMMERCIAL TRUCK AND BUS SAFETY SYNTHESIS PROGRAM

CTBSSP SYNTHESIS 17

Special Safety Concerns of the School Bus Industry

A Synthesis of Safety Practice

CONSULTANTS
DOUGLAS M. WIEGAND,
DARRELL BOWMAN,
and
RICHARD J. HANOWSKI
Virginia Tech Transportation Institute
Blacksburg, Virginia

CARMEN DAECHER
Daecher Consulting Group, Inc.
Camp Hill, Pennsylvania

GENE BERGOFFEN
MaineWay Services
Fryeburg, Maine

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COMMERCIAL TRUCK AND BUS SAFETY SYNTHESIS PROGRAM

Safety is a principal focus of government agencies and private-sector organizations concerned with transportation. The Federal Motor Carrier Safety Administration (FMCSA) was established within the Department of Transportation on January 1, 2000, pursuant to the Motor Carrier Safety Improvement Act of 1999. Formerly a part of the Federal Highway Administration, the FMCSA's primary mission is to prevent commercial motor vehicle-related fatalities and injuries. Administration activities contribute to ensuring safety in motor carrier operations through strong enforcement of safety regulations, targeting high-risk carriers and commercial motor vehicle drivers; improving safety information systems and commercial motor vehicle technologies; strengthening commercial motor vehicle equipment and operating standards; and increasing safety awareness. To accomplish these activities, the Administration works with federal, state, and local enforcement agencies, the motor carrier industry, labor, safety interest groups, and others. In addition to safety, security-related issues are also receiving significant attention in light of the terrorist events of September 11, 2001.

Administrators, commercial truck and bus carriers, government regulators, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and underevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information available on nearly every subject of concern to commercial truck and bus safety. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day work. To provide a systematic means for assembling and evaluating such useful information and to make it available to the commercial truck and bus industry, the Commercial Truck and Bus Safety Synthesis Program (CTBSSP) was established by the FMCSA to undertake a series of studies to search out and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in the subject areas of concern. Reports from this endeavor constitute the CTBSSP Synthesis series, which collects and assembles the various forms of information into single concise documents pertaining to specific commercial truck and bus safety problems or sets of closely related problems

The CTBSSP, administered by the Transportation Research Board, began in early 2002 in support of the FMCSA's safety research programs. The program initiates two synthesis studies annually that address concerns in the area of commercial truck and bus safety. A synthesis report is a document that summarizes existing practice in a specific technical area based typically on a literature search and a survey of relevant organizations (e.g., state DOTs, enforcement agencies, commercial truck and bus companies, or other organizations appropriate for the specific topic). The primary users of the syntheses are practitioners who work on issues or problems using diverse approaches in their individual settings. The program is modeled after the successful synthesis programs currently operated as part of the National Cooperative Highway Research Program (NCHRP) and the Transit Cooperative Research Program (TCRP).

This synthesis series reports on various practices, making recommendations where appropriate. Each document is a compendium of the best knowledge available on measures found to be successful in resolving specific problems. To develop these syntheses in a comprehensive manner and to ensure inclusion of significant knowledge, available information assembled from numerous sources, including a large number of relevant organizations, is analyzed.

For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practice has been used for solving or alleviating problems; (3) to identify all ongoing research; (4) to learn what problems remain largely unsolved; and (5) to organize, evaluate, and document the useful information that is acquired. Each synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation.

The CTBSSP is governed by a Program Oversight Panel consisting of individuals knowledgeable in the area of commercial truck and bus safety from a number of perspectives—commercial truck and bus carriers, key industry trade associations, state regulatory agencies, safety organizations, academia, and related federal agencies. Major responsibilities of the panel are to (1) provide general oversight of the CTBSSP and its procedures, (2) annually select synthesis topics, (3) refine synthesis scopes, (4) select researchers to prepare each synthesis, (5) review products, and (6) make publication recommendations.

Each year, potential synthesis topics are solicited through a broad industry-wide process. Based on the topics received, the Program Oversight Panel selects new synthesis topics based on the level of funding provided by the FMCSA. In late 2002, the Program Oversight Panel selected two task-order contractor teams through a competitive process to conduct syntheses for Fiscal Years 2003 through 2005.

CTBSSP SYNTHESIS 17

Project MC-21
ISSN 1544-6808
ISBN: 978-0-309-14248-9
Library of Congress Control Number 2009938317

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ACKNOWLEDGMENTS

The study team for this synthesis included individuals from the Center for Truck and Bus Safety at the Virginia Tech Transportation Institute (VTTI), Daecher Consulting Group, and MaineWay Services. Daecher Consulting Group explored a variety of sources to assemble the literature review content of this report, whereas VTTI researchers developed, implemented, and analyzed the synthesis survey. VTTI would like to thank Stephane Babcock at *School Transportation News* and Thomas McMahon of *School Bus Fleet* for their help in recruiting participants by advertising this project. We would also like to thank the various fleet managers and state directors of transportation who helped to widely disseminate the survey. In addition, we would like to thank the anonymous members of the peer review committee that aided in developing the final synthesis survey content. Finally, thanks to Gene Bergoffen for his support throughout this project.

FOREWORD

Administrators, commercial truck and bus carriers, government regulators, and researchers often face problems for which information already exists, either in documented form or as undocumented experience and practice. This information may be fragmented, scattered, and underevaluated. As a consequence, full knowledge of what has been learned about a problem may not be brought to bear on its solution. Costly research findings may go unused, valuable experience may be overlooked, and due consideration may not be given to recommended practices for solving or alleviating the problem.

There is information available on nearly every subject of concern to commercial truck and bus safety. Much of it derives from research or from the work of practitioners faced with problems in their day-to-day jobs. To provide a systematic means for assembling and evaluating such useful information and to make it available to the commercial truck and bus industry, the Commercial Truck and Bus Safety Synthesis Program (CTBSSP) was established by the Federal Motor Carrier Safety Administration (FMCSA) to undertake a series of studies to search out and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in the subject areas of concern. Reports from this endeavor constitute the CTBSSP Synthesis series, which collects and assembles information into single concise documents pertaining to specific commercial truck and bus safety problems.

The CTBSSP, administered by the Transportation Research Board, was authorized in late 2001 and began in 2002 in support of the FMCSA's safety research programs. The program initiates several synthesis studies annually that address issues in the area of commercial truck and bus safety. A synthesis report is a document that summarizes existing practice in a specific technical area based typically on a literature search and a survey of relevant organizations (e.g., state DOTs, enforcement agencies, commercial truck and bus companies, or other organizations appropriate for the specific topic). The primary users of the syntheses are practitioners who work on issues or problems using diverse approaches in their individual settings.

This synthesis series reports on various practices; each document is a compendium of the best knowledge available on measures found to be successful in resolving specific problems. To develop these syntheses in a comprehensive manner and to ensure inclusion of significant knowledge, available information assembled from numerous sources is analyzed.

For each topic, the project objectives are (1) to locate and assemble documented information; (2) to learn what practices have been used for solving or alleviating problems; (3) to identify relevant, ongoing research; (4) to learn what problems remain largely unsolved; and (5) to organize, evaluate, and document the useful information that is acquired. Each synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation.

PREFACE

By Jon M. Williams
Program Director
Transportation Research Board

Every weekday in the school year school transportation systems in the United States operate approximately 440,000 yellow school buses to provide safe transportation for more than 24 million school-aged children. This synthesis documents the various safety issues faced by the school bus industry. Safety issues include each aspect of school bus operations, including the driver, environment, equipment/technology, and organizational design.

Information was gathered through a literature review and a survey on school bus safety issues that was disseminated to a variety of professionals associated with school bus operations.

Douglas M. Wiegand, Darrell Bowman, and Richard J. Hanowski of the Virginia Tech Transportation Institute, Blacksburg, Virginia; Carmen Daecher of Daecher Consulting Group, Camp Hill, Pennsylvania; and Gene Bergoffen of MaineWay Services, Fryeburg, Maine, collected and synthesized the information and wrote the report. The Commercial Truck and Bus Safety Synthesis Program Oversight Committee members are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.

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SPECIAL SAFETY CONCERNS OF THE SCHOOL BUS INDUSTRY

SUMMARY

Every weekday during the school year, school transportation systems in the United States operate approximately 440,000 yellow school buses to provide safe and reliable transportation for more than 24 million school-aged children. This sizeable transportation system is considered the largest mass transit program in the nation, with more than 55 million student trips per day, which equates to approximately 10 billion student trips per year.

The objective of this synthesis is to document current information on the various safety issues faced by school bus operators, including how the issues are currently addressed, barriers to improvements, and making improvements in the future. This synthesis includes a literature review and a peer-reviewed survey on school bus safety issues that was disseminated to a variety of professionals associated with school bus operations.

The literature review involved investigating resources dating back 34 years. School bus safety issues identified in the literature review are presented in terms of each aspect of school bus operations, including the driver, environment, equipment/technology, and organizational design.

The survey was distributed widely across the nation using e-mail, telephone, flyer, print, and electronic advertisements. A total of 198 individuals responded to the survey.

Although there are a variety of safety issues in pupil transportation, those regarded as the most critical by survey respondents included illegal passing of buses by other motorists, the behavior of passengers both on the bus and while loading and unloading, and driver skill level. In addition, there appears to be growing concern regarding security and violence issues on the school bus and at bus stops. These results, including a description of barriers to safety and potential solutions, are discussed in this report.

CHAPTER ONE

INTRODUCTION

BACKGROUND

Each weekday during the school year, school transportation systems in the United States operate approximately 440,000 yellow school buses to provide safe and reliable transportation for more than 24 million school-aged children (School Bus Informational Council 2008). This large transportation system is considered the largest mass transit program in the nation, with more than 55 million student trips per day ("School Bus Safety Overview" 2008), which equates to approximately 10 billion student trips per year (*Pupil Transportation Facts* 2008). The annual transportation costs, on average, are $520 per regular education child and $2,400 per special needs education child across the United States ("School Bus Safety Overview" 2008).

As with any large transportation system, there is significant exposure to vehicle-to-vehicle and vehicle-to-pedestrian incidents. Every year, on average, 20 school-aged children (i.e., younger than 19) are fatality injured as the result of school transportation-related incidents (*School Transportation-Related Crashes* 2006). However, the school transportation system is considered one of the safest forms of transportation (*Pupil Transportation Facts* 2008), with the National Safety Council reporting an overall school bus accident rate of 0.01 per 100 million vehicle-miles traveled, as compared with 0.04 for trains, 0.06 for commercial aviation, and 0.96 for other passenger vehicles ("School Bus Safety Overview" 2008).

At the core of this transportation system are more than 455,000 school bus drivers (*Occupational Outlook Handbook* 2007) who are responsible for the safe and effective conveyance of students to and from school, field trips, and athletic events. During these trips, this special class of professional drivers encounters many unique challenges and safety concerns. In addition to being responsible for perhaps the nation's most precious cargo, school bus drivers face a wide range of distractions, and are subject to upholding laws and performing many tasks that are well beyond the normal professional driving duties. For instance, school bus drivers must be knowledgeable about school transportation policies and route planning, possess some mechanical aptitude, and be a healthcare provider and disciplinarian to their passengers. The National Association of State Directors of Pupil Transportation Services (*School Bus Drivers* . . . 2000) noted that the demands on school bus drivers have increased in recent years owing to changes in various social conditions. For example, with the increasing popularity of technology use in vehicles (e.g., cell phones, DVD players, and onboard navigational systems), school bus drivers are dealing with an increase in inattentive and distracted motorists. The school bus driver must also manage an increased occurrence of "bullying" and other negative interactions among students. Finally, the security of school bus operations and its riders has become ever more important in today's world and presents unique challenges for school bus drivers.

Even with these unique stressors, school bus drivers continue to perform these duties every school day; however, there is a toll on this transportation system. For years, school bus drivers have been in short supply, with estimates of a 21% annual turnover rate (National School Transportation Association n.d.). In an October 2007 survey conducted by *School Bus Fleet* magazine, 89% of the respondents reported experiencing a school bus driver shortage, with 60% indicating their driver shortages as moderate to desperate (Hirano 2007).

To improve the safety and operational conditions of the school transportation system, a better understanding of the primary areas for improvement is needed. As a group, the school bus drivers and the school transportation industry provide the best source for identifying, understanding, and remedying these areas in need of improvement. Therefore, the goal of this work was to gather this information from these different groups and consolidate the findings into one comprehensive report which decision makers can use to address issues and concerns to improve school-related transportation.

OBJECTIVES AND SCOPE

The objective of this synthesis is to document current information on the various safety issues encountered by school bus operators, including how the issues are currently addressed, barriers to improvements, and suggestions for making further improvements. This synthesis includes a literature review and a peer-reviewed survey on school bus safety issues that was disseminated to a variety of professionals associated with school bus operations.

The purpose of the survey was to gain the perspectives and insight of school transportation subject-matter experts regarding school bus safety and security issues. The primary audience for the synthesis study is school bus fleet safety managers, school superintendents, and transportation researchers; however, enforcement agencies, school

bus contractors, school bus manufacturers, and parent organizations may also find this information useful as well.

To ensure that all aspects of school bus safety and security are addressed, an adaptation of the Socio-Technical Systems (STS; Emery and Trist 1960) model has guided the conceptualization and organization of this synthesis report. This adaptation of the STS focuses on four main subsystems associated with transportation safety (see Figure 1) and how these subsystems interact with and influence one another. These four subsystems are: (1) the driver, (2) the driving environment (e.g., road conditions, passengers, and other drivers), (3) technology/equipment, and (4) organizational design (e.g., policies and regulations).

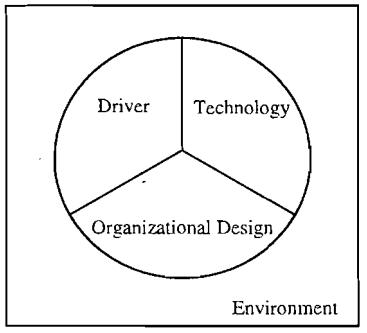

FIGURE 1 Socio-technical systems model (Emery and Trist 1960).

CHAPTER TWO

LITERATURE REVIEW

A literature review was undertaken to identify issues within the school bus industry. It was conducted through classic library style research, as well as through an Internet search. The review extended back more than 34 years. Seventy-two sources of school-related transportation information were identified. This literature review is formatted to follow the STS model, focusing on issues relevant to the driver, environment, technology/equipment, and organizational design of school bus operations. Finally, the safety of the yellow school bus mode is compared with other modes of transport to and from school.

SAFETY CONCERNS REGARDING SCHOOL BUS DRIVERS

As part of its annual survey results for the past eight years, *School Bus Fleet* magazine has identified driver hiring and retention as one of the leading concerns within the school bus industry (Hirano 2007). Other reviewed literature (LeMon 1998; Grenzeback et al. 2005; Salary.com 2008) identified this as an issue throughout the 1990s. Although this concern seems to ebb and flow with economic issues (i.e., the unemployment rate), not only the quantity but the quality of the individuals available to drive school buses continues to be an ongoing concern.

In large part, this concern is rooted in the competitive and economic reality of school bus operations. The 25th percentile salary for a school bus driver is $25,652 and the 75th percentile is $34,966, with a median salary of $29,810 (Salary.com 2008). For this, they must safely operate the school bus, contend with children ranging in age from 4 to 19, and find themselves involved in issues and controversies concerning school districts, parents, students, and employers. These working conditions can be taxing; thus, turnover will continue to be an issue.

In terms of hiring and safeguarding passenger security, criminal background checks for school bus drivers are required by all states. Most states require both state and federal background checks (Hirano 2007). However, some states allow their individual educational agencies to establish their own background check policies. Another hiring criterion for school bus drivers is a minimum age requirement. The youngest age permitted for school bus drivers varies from 18 to 21 throughout the states. Twenty-five states allow a bus driver to be 18 years of age, whereas 18 states require that a bus driver be at least 21 years old (Hirano 2007).

No specific literature was found that discusses physical examinations for school bus drivers. It is known that each state requires physicals of school bus drivers, and some (New York and Washington State) require fitness testing as part of the qualification process (*School Bus Drivers* 2006).

Driver training is established for school bus drivers at the state level. The NHTSA (1974, 2002a,b) has developed and made available to all states and school bus operations a national driver training curriculum. This curriculum offers qualitative content regarding defensive driving, loading and unloading of students, and transporting students with special needs. Many states have prepared and required the use of their own training curriculums (*School Bus Security* . . . 2007; Michigan Department of Education n.d.; Illinois State Board of Education n.d. a,b). In all of these cases, these curriculums closely follow the national standard curriculum established through NHTSA.

There are also school bus driver training materials prepared by outside sources (Bane 1991; Daecher 1991). These training programs are complete and resemble the national training program established by NHTSA.

There was no literature reviewed that discussed school bus driver seat belt usage. Most state laws require the use of a seat belt by drivers; however, the single literature source found concerning seat belt usage for commercial drivers only involved truck drivers.

Fatigue is mentioned only once throughout the literature reviewed (*Hours of Service* . . . 2003). It is not considered a significant issue, but length of the school bus driving day and driver wellness/lifestyle are identified as elements of concern.

Driver distraction because of cell phones appears to be a growing concern. In 2007, the American School Bus Council called for a ban on drivers using cell phones when the school bus is moving or when students are loading/unloading (*Distracted Bus Drivers* 2007; Zuckerbrod 2007). This is not the only driving distraction of concern. Driver eating and drinking are other types of distractions that have been documented as an issue (*Distracted Bus Drivers* 2007).

SAFETY CONCERNS IN THE DRIVING ENVIRONMENT

The literature reviewed presented four fundamental areas of concern within the driving environment:

- Illegal passing of stopped buses by other vehicles,
- Passengers as pedestrians,
- Student behavior on buses, and
- Passengers with disabilities.

Stringent traffic laws in all states prohibit motorists from passing a stopped school bus that is loading or unloading passengers (Wisconsin Department of Education 2006; CBS News 2007; *Bus Laws* n.d.; NHTSA, n.d.a). The loading and unloading of students is a primary consideration and was found repeatedly throughout the literature review. Establishing appropriate sheltered open and visible locations for school bus stops; minimizing the need for students to cross streams of traffic; the use of appropriate safety equipment on school buses when loading and unloading; and the need for drivers to be attentive and checking around and along the bus during loading and unloading procedures and before proceeding into traffic is discussed throughout the training literature cited previously and other document sources (NHTSA 1974, 1998; *Special Report 222* . . . 1989; Daecher 1991; De Santis et al. 1998; *School Bus Stops* . . . 2005; *School Bus Safety Rules* 2008).

Based on our literature review, student management has been a consistent issue of concern in the school bus industry; however, the texture of concern has changed over time. Many school bus drivers cite student behavior as their most pressing concern. Controlling unacceptable behavior on the bus by a driver has been a longstanding issue; however, in recent years "bullying" has grown in its frequency and breadth across age groups. Schadlow (1987) defined the need for trust and respect between the driver and students on a school bus and assertive communication as a basis for controlling behavior. This publication also stresses parental control and support as vitally important to controlling students' behavior.

Protecting children from each other, while simultaneously maneuvering a large commercial vehicle through traffic, takes skill and understanding on the driver's part. In addition, in today's world, the possibility of weapons must be considered anywhere in the school environment, including on the bus. Violent incidents on school buses and at bus stops are not uncommon and are not limited to urban settings. However, how a driver can control behavior is in part affected by possible disciplinary repercussions. If school districts are soft on discipline regarding unacceptable behavior on school buses, the job of the bus driver is even more difficult (Brooks 1995; Education World 1997; American Public Health Association 2005; American Federation of Teachers n.d.; Illinois State Board of Education n.d.a).

A program called "Team Safe" was developed and used in one school district in Allegheny County, Pennsylvania, in the early 1990s. It was developed to elevate the driver in his or her importance for the safety of school children and thus to be more implicit in discussions and decisions regarding student management and behavior in school bus operations. Although the program got little traction, it was received with positive results in Allegheny County and serves as a model for needed restructuring for school bus operations from the student management and behavior perspective (Daecher 1991).

Special needs student transportation is also a concern for drivers. Issues of safe passenger securement, health monitoring, and safe transportation are mutually important issues with regard to special needs students. Drivers' physical capabilities (to maneuver wheelchairs with passengers) and their emotional states (to accept and understand unusual but expected behaviors of special needs students who may be physically and mentally challenged) are important. Drivers' knowledge of health issues for special needs students, especially those who are harnessed or restrained because of their physical conditions, is also of concern (Committee on Injury and Poison Prevention 2001; Illinois State Board of Education n.d.b). Specific information regarding students' needs for medication or handling during an emergency are also important. Most of these issues are effectively managed through training and the development of an Individual Education Plan for each special needs student (NHTSA 2002b; Illinois State Board of Education n.d.b). Thus, the quality of training and information provided to school bus drivers is critically important for all aspects of student management.

TECHNOLOGY AND EQUIPMENT

School bus design is largely regulated by the Federal Motor Vehicle Safety Standards (49 CFR Part 571). Thirty-three motor vehicle safety standards apply to school buses or multifunction school activity buses (LeMon 1998; NHTSA n.d.a). The most recently enacted change to these vehicle safety standards applicable to school bus activities was for multifunction school activity buses. Section 571.3 of the regulation was amended to include the multifunction school activity bus, which is a school bus that is *not* used to transport students to and from home and school bus stops. With this change, this type of bus must comply with all applicable standards for school buses, which addresses concerns in the literature that vehicles used for field trips and other types of activities in transporting students meet certain structural standards (National Transportation Safety Board 1999, 2000). Every year, on average, 20 school-aged children are fatally injured as a result of school transportation-related incidents. Half of these are school-aged pedestrians killed by school transportation vehicles (*School Transportation-Related Crashes* 2006). This underscores the continuing need for improvements in hood design, windshields, and other features that might improve driver visibility.

Federal Motor Vehicle Safety Standard 222 specifically deals with school bus passenger seating and crash protection. "Compartmentalization" protection of passengers is provided through the use of this standard. Currently, a proposed rule change to this standard is being considered by NHTSA. The key elements of the proposed rule change would require lap-shoulder belts instead of only lap belts on small school buses, provide guidance for voluntary installation of lap-shoulder belts on large buses, and raise the minimum seatback height from 20 to 24 in. on all new school buses (CBS News 2007; School Bus Fleet 2008).

According to the literature review, the issue of seatbelts on school buses has been a constant since 1985. Should school buses have seat belts? Today, five states [New York, New Jersey, Florida, California, and Texas (2010)] have required or are in the process of requiring seat belts on school buses. NHTSA continues to assert that compartmentalization, as defined by Federal Motor Vehicle Safety Standard No. 222, provides effective safety for large school bus occupants (Transportation Research Board 1989; Booz, Allen & Hamilton and E. A. Williams & Associations, Inc. 1987). NHTSA is currently conducting crash tests of large school buses to determine the effectiveness of shoulder-lap belt combinations. The intent of these tests is to provide more insight and possibly a unified approach for an issue that has received much attention but divided opinions (LeMon 1998; Cullen 1999; *History of School Bus Safety* . . . 2000; *Enhancing School Bus Safety* . . . 2002; Hinch et al. 2002; National Transportation Safety Board 2008; *Seat Belts, School Buses and Safety*, n.d.).

Reflective tape, cross-view mirrors, stop signal arms, and bus crossing arms are recent improvements of safety equipment on school buses that enhance student safety (*Special Report 222* . . . 1989; NHTSA n.d.a). Reflective tape allows the bus to be seen more easily by approaching traffic during nighttime conditions and cross-view mirrors allow the driver to see students crossing in front of and immediately to the side of the front of the school bus. Stop signal arms, which warn other motorists to stop when students are loading and unloading approximately 10 ft in front of the school bus, are a means of protecting the students from approaching traffic as they begin to cross the street. Bus crossing arms guide students away from the front of the school bus before crossing a street so they are more easily seen by the bus driver and by motorists approaching the school bus.

The use of non-traditional school buses for student transportation is a recurring issue throughout the literature (*Keeping Children Safe* . . . 1995; National Transportation Safety Board 1999, 2000; *Keeping Kids Safe* . . . 2002). Some urban areas are using their community's public transit-style buses to transport students to and from school along regular transit routes. This practice concerns both school bus operators and major school bus organizations because the students must walk to designated transit stops and then walk from stops to school, which is a less direct method of transporting students safely (*Keeping Children Safe* . . . 1995). *Special Report 269* (Committee on School Transportation Safety 2002), however, notes that it is difficult or impossible to determine the relative safety of school buses compared with transit buses used for student travel. This is due to data issues, including that transit properties may not keep statistics on student ridership and that pedestrian injuries in route to transit stops may not be classified as transit-related. The use of motor coaches for field trips and other transportation needs is of concern because of the lack of knowledge regarding the vehicle, the driver, and the company and its operations. Qualification of drivers, issues of fatigue, and the safety of the vehicle are assumed to be acceptable yet neither the school district nor the school bus operator has control over these issues (*Keeping Kids Safe* . . . 2002). Also important is the security of students as it relates to drivers. Transit and motor coach operators are not required to go through a criminal background check as are school bus drivers. School districts are mandating the use of yellow buses for student transportation and requiring more stringent controls of motor coach companies through contractual and procedural requirements.

Emerging technologies for diesel engines and their impact on students' health was also found during this literature review (Fromm and Tujillo 2002; Clean School Bus USA 2003a,b). The implementation of anti-idling and smart driving in combination with more fuel-efficient engines and cleaner fuels (i.e., ultra-low sulfur diesel fuel) is advocated to reduce emissions that can harm the health of young students transported by school buses.

ORGANIZATIONAL DESIGN

The extent to which safety regulations affect school bus operations is dependent on the organization that provides the service. Private school bus contractors are subject to many federal safety regulations (*Federal Motor Carrier Safety Regulations* n.d.) and all state regulations. School districts that operate their own fleet of buses are subject to limited federal regulations (e.g., Commercial Drivers' Licensing and drug and alcohol testing) for those drivers that are included under such regulations and any applicable state regulations regarding operation. Throughout the literature review, regulatory compliance of school bus operations is not a recurring theme.

The *Uniform Guidelines for State Highway Safety Programs,* which is available to each state, includes a guideline for pupil transportation safety (NHTSA n.d.b). The guideline establishes minimum recommendations for state highway safety programs for pupil transportation safety and it includes the maintenance of buses carrying students; the training of passengers, pedestrians, and bicycle riders; and the administration of the program. It also includes minimum requirements for drivers of school buses, other buses, and vehicles that are used for school-chartered activities. The guideline addresses state administration of programs for school bus safety; requirements

for identification and equipment for school buses; regulatory oversight for school buses and drivers; training for students, crossing guards, and student escorts; and route and bus stop selection.

Emergency and rescue procedures are also addressed in the literature. The National Association of State Directors of Pupil Transportation Services created a task force that developed emergency and rescue response procedures as guidelines for school bus organizations (Tull et al. n.d.). Emphasis is placed on preplanning for emergencies, solid incident management procedures, and knowledge and skill in assisting injured students, especially special needs students. Emergency and rescue procedures are included in most school bus driver training curriculums reviewed.

Security concerns have become more dominant in the literature since 2001. This is not only because of terrorist activities but also because of growing violence among school students (*School Bus* Stops . . . 2006; *School Bus Security* . . . 2007). Awareness by all employees of what is "normal" and immediate communication regarding unusual behaviors, packages, or circumstances are the hallmarks of a successful security procedure (*School Transportation Security Awareness* 2005; *School Bus Security* . . . 2007). Vehicle identification and knowledge of vehicle locations are also considered important aspects of an effective security response protocol (*School Transportation Security Awareness* 2005; Hann 2007; *School Bus Security* . . . 2007).

The Transportation Security Administration (*Employee Guide* . . . n.d.) developed security awareness training for employees of school bus operations. This training provides methods for all employees to identify unusual behaviors, packages, or situations.

Many school districts are installing global positioning system (GPS) technology on school buses as a means to have real-time capability for locating buses in any type of emergency, including security situations (Hann 2007).

As mentioned earlier, 72 sources were reviewed to present a summary of available literature and knowledge about the safety of school bus operations. Although there are many resources available on the Internet and in trade publications, academic journals, etc., there is still substantial safety-relevant information about school buses that is not documented. The following sections of this synthesis report detail the development, implementation, and results of a survey designed to address and document a wide range of safety issues in the field of school bus operations.

SAFETY OF SCHOOL BUSES COMPARED WITH OTHER MODES

The National Research Council appointed the Committee on School Transportation Safety to study the safety issues attendant to the transportation of students to and from school and school-related activities by various transportation modes. The final report of the Committee is *Special Report 269: The Relative Risks of School Travel* (Committee on School Transportation Safety 2002). The report compares yellow school bus travel with five other modes of student transportation—other bus; passenger vehicle (adult driver); passenger vehicle (teen driver); bicycle; and walking. Data were aggregated from nine years, 1991–1999.

The findings of the report are that during the study period, 25% of student trips and 28% of student miles traveled were made on yellow school buses. Yet, only 4% of all student injuries and 2% of all student deaths were associated with school buses. By comparison, passenger vehicles with a teen driver made 14% of student trips and 16% of student miles traveled, but 51% of injuries and 55% of fatalities are associated with this mode. The report found that, in comparison with other modes, school bus is a relatively safe mode of transportation.

CHAPTER THREE

SYNTHESIS SURVEY DEVELOPMENT, PEER REVIEW, AND FOCUS GROUP AND METHODS

To ensure that the most relevant safety issues were addressed in this study, the research team sought input from a peer review group of subject matter experts in the field of pupil transportation. The objective of the focus group was to discuss safety concerns relevant to school bus operations, driver selection and training, barriers to safety (and methods for addressing them), and emergency/security issues. In addition, a major objective of the focus group was to obtain detailed feedback regarding the content and structure of the study's draft survey instrument, which was constructed based on information gathering during the work plan development phase of the present study.

PARTICIPANT RECRUITMENT FOR FOCUS GROUPS

Potential participants for the focus group were recruited by means of telephone and e-mail. Each potential participant was given a description of the CTBSSP Synthesis Program and an overview of this synthesis. They were informed of the importance of sharing their experience to ensure that the most important topics in the field of pupil transportation were addressed in this synthesis and were invited to participate in an hour-long teleconference focus group with their peers (see Appendix A for the recruitment e-mail).

Participants were recruited using publicly available contact information from the following websites and publications:

- National Association for Pupil Transportation
- National Association of State Directors of Pupil Transportation Services
- National School Transportation Association
- School Bus Fleet
- School Transportation News.

Individuals identified on these websites as contacts were recruited for the focus group, and a "snowballing" technique was used whereby each person contacted was encouraged to extend the invitation to other colleagues. In some cases, the e-mail invitation was forwarded to listservs of organizations and associations. In addition, school bus fleet managers and directors of transportation from geographically diverse areas of the United States were recruited in an attempt to have a variety of experiences and perspectives represented.

A total of eight individuals expressed interest in participating; however, only six of these individuals were available during the time frames suggested for the teleconference. Given the snowballing recruitment technique, it is difficult to estimate the total number of individuals invited for the teleconference; therefore, the exact response rate cannot be calculated.

METHODS AND RESULTS

Before the conference call, each participant was e-mailed an informed consent document (required for study participation), a draft of the synthesis survey, and a PowerPoint presentation that was used to guide the call.

At the beginning of the call, the facilitator was introduced and reviewed the purpose of the discussion by means of the PowerPoint presentation (see Appendix B). Following brief participant introductions and a general discussion of school bus safety, attention was turned to the draft survey and the scope of topics addressed. The draft survey was discussed item by item and participants commented on the wording and response format of each. In addition, new items could be added if a participant(s) believed that a specific, relevant topic was not included, and items were grouped by topic area.

Following the teleconference, participants were encouraged to send their notes and edits to the survey to the research team. Using this information, the draft survey was revised and redistributed to the focus group for a second round of input, which allowed participants to reconsider the instrument as a whole and to make final comments and suggestions. The survey instrument was finalized (see Appendix C) based on participant edits and suggestions. The final survey instrument included multiple choice, yes/no, quantitative, Likert scale, and open-ended response formats.

PARTICIPANT RECRUITMENT FOR SURVEY

Recruitment of participants for the survey was similar to that of the focus group, but was much larger in scale. For example, the National Association for Pupil Transportation website includes links to national school bus organizations, state

organizations, trade publications, and other interest groups. Each of these links includes pages of contacts that were used to send hundreds of e-mail invitations to complete the survey.

E-mail invitations (see Appendix D) included a full description of the synthesis program and the objectives of the present synthesis, the online survey URL, a recruitment flyer that could be used to advertise the study, and also the pdf survey as an attachment. Again, a snowball recruitment tactic was encouraged, whereby potential participants were urged to distribute the survey widely to their colleagues and employees. In several cases, state directors and fleet managers responded, indicating that they had distributed the survey to all of the school bus drivers under their jurisdiction. Finally, approximately 700 flyers were distributed along with the programs at the annual *School Transportation News* conference and trade show in Reno, Nevada (July 26–30, 2008).

CHAPTER FOUR

SYNTHESIS SURVEY RESULTS

DESCRIPTION OF RESPONDENTS AND FLEETS

A total of 198 individuals participated in this survey, although not everyone fully completed all survey items. Therefore, response tables for individual items show some fluctuation.

Table 1 shows the breakdown of participants by their job title/role. In many cases, individuals indicated serving more than one role, so the total will exceed the number of individuals who completed the survey. A majority of participants were school bus drivers, closely followed by school bus fleet managers. Beyond these classifications, however, a variety of positions/roles within the school bus transportation field are represented.

Participants had an average of 17 years of experience in the area of school bus transportation, with a range of 1 to 40 years ($n = 193$; Table 2).

To estimate the sizes of the school systems that participants were associated with, a survey question asked for an approximate number of pupils in the school system. The number of pupils ranged from 37 to 487,000, with a mean of just over 20,000 pupils (Table 3).

Respondents were asked to report how many of the vehicles in their fleet are equipped with GPS or automatic vehicle locator (AVL) technology. As shown in Table 4, there was considerable variation in responses, ranging from 0 to 30,000 vehicles with GPS and 0 to 15,000 vehicles with AVL.

OVERALL SAFETY ISSUES (RATED AND RANKED)

The survey included a list of 51 "overall safety issues" that participants were to rate based on the severity of the issue. A seven-point Likert scale, where 1 = "Not at all a safety issue" and 7 = "A very serious safety issue," was used. The descriptive statistics for these items are listed here in several tables organized by driver and monitor issues, environmental issues, equipment and technology issues, and organizational design issues. These items were rank ordered based on the mean score, and each item has its "overall rank" listed in the following tables. The rankings go across all four issue areas. A full list of the issues with their ranking in chronological order is available in Appendix F.

Table 5 provides the responses of driver and monitor safety issues. Driver turnover was ranked as the greatest driver safety issue, followed by driver cell phone use and driver physical and mental health. It is important to note the ranking of these issues in comparison to the overall issues.

Table 6 presents the responses of environmental issues. This categorization included the greatest number of survey items, and represents many of the issues that were ranked as the greatest threat to safety. Illegal passing of stopped buses by other vehicles was rated as the greatest safety threat not only in terms of environmental issues, but overall when all items are taken into consideration. This is followed by inattentive or distracted drivers of other vehicles. Thus, based on these survey data, the two top safety issues are related to the actions of other drivers. Many of the other top safety issues (both in terms of the environment and overall) involve the actions of the student passengers, including both behavior on (e.g., not sitting in their seat properly) and off the bus (standing too close to the road at a bus stop). Roadway conditions (e.g., potholes) were ranked as the number 12 safety issue, and visibility of bus stops was ranked as numbers 16 (as a result of inclement weather), 24 (owing to curved roads), and 31 (as a result of hilly terrain).

Table 7 shows the responses of equipment and technology issues. Storage of passengers' personal items was the top safety issue in this category. Driver field-of-view and blind spots was the second safety issue in this category, although it ranked number 22 overall. This is an interesting finding given that "insufficient or ineffective mirrors" was ranked so low (number 47). This may provide evidence that the overall body style of school buses is in need of improvement (e.g., a shorter hood surface to improve visibility of the forward environment). It is important to note that overall equipment and technology issues were rated as some of the least important safety issues.

Table 8 shows the responses of organizational design issues. Organizational design issues pertain to aspects of administration, policies, regulations, and politics of the school transportation field. Lack of sufficient funding for fleets was the top organizational design issue and was ranked number 7 overall. This was followed by a lack of sidewalks at or near bus stops (ranked number 11), which would provide a safer environment and prompt for students to keep off the roadway when entering or exiting the bus.

TABLE 1
WHICH OF THE FOLLOWING BEST DESCRIBES YOUR POSITION?

Job Title/Role	Frequency
School Bus Driver (n = 89)	
Class A commercial drivers license (CDL)	10
Class B CDL	73
Class C CDL	4
No CDL/unspecified	2
Fleet manager	85
Instructor/trainer	34
State agency employee	32
Other	27
Transportation specialist	23
Maintenance supervisor	15
Mechanic/technician	14
Routing specialist/dispatcher	13
State director of pupil transportation services	13
Contractor management	7
School superintendent	5
Bus monitor/aid	5
Transportation researcher	3
Special interest group representative	2
Federal agency employee	0
School bus manufacturer	0
Total	367

OVERALL SAFETY ISSUES (COMPARISONS BETWEEN DRIVERS AND NON-DRIVERS)

The overall safety issues were explored to determine differences between school bus drivers and non-drivers (e.g., fleet managers, etc.). Non-drivers believe turnover is more of a safety issue than do drivers. One other item that appears significant was survey item 21: "Weather conditions when school is not delayed/cancelled." School bus drivers and non-drivers indicated that drivers believe weather conditions are somewhat more of a safety issue than do non-drivers.

OVERALL SAFETY ISSUES (OPEN-ENDED)

In addition to the overall safety issue ratings, respondents were asked several open-ended questions regarding overall safety issues in school bus transportation. Open-ended responses were categorized by two independent raters. If there was a discrepancy between the two raters, the item was discussed until an agreement was reached. In some cases, respondents listed several responses that were tallied separately under the appropriate category. When a respondent replied that they had nothing to say for a particular question, it was tallied as "no suggestion." If an item was left blank, no tally was made; however, total sample size is noted in each of the following tables so one can determine the number of non-responses from participants. Finally, if a response was not understood, appeared to apply only to their specific school system, or otherwise indicated that the respondent did not understand the question, it was categorized as "other."

Table 9 provides the responses for the question: "What do you consider to be the most important safety issue(s) in school bus transportation?" Other motorists and their driving behaviors (notably illegal passing) was the most frequently cited safety issue, followed closely by passenger behavior on the bus. Other frequently cited safety issues included passengers as pedestrians and driver issues (e.g., lack of skill).

Table 10 shows the frequencies of categorized responses for the question: "What are the barriers to these issues?" The most frequently cited responses included funding, lack of support from administration/parents, and lack of law enforcement.

Table 11 presents the responses for the question: "Do you have any recommendations/suggestions for how these issues should be addressed in the future?" Many respondents believe that stronger law enforcement and driver training were methods for addressing safety issues.

TABLE 2
HOW MANY YEARS OF EXPERIENCE DO YOU HAVE IN THE AREA OF SCHOOL BUS TRANSPORTATION?

	n	Response Average	Range
Years of experience	193	17	1–40

TABLE 3
IF YOU WORK WITHIN A SCHOOL SYSTEM, APPROXIMATELY HOW LARGE IS THE SYSTEM BASED ON THE TOTAL NUMBER OF PUPILS?

	n	Response Average	Range
Number of pupils	149	20,267	37–487,000

TABLE 4
PLEASE ESTIMATE THE NUMBER OF VEHICLES IN YOUR FLEET WITH GPS OR AVL

Vehicle	n	Average	Range
Number with GPS	152	340	0–30,000
Number with AVL	125	129	0–15,000

TABLE 5
DRIVER AND MONITOR ISSUES

	n	Average	Overall Rank
Driver turnover	186	3.9	19
Driver cell phone use	192	3.8	28
Driver physical health	189	3.5	33
Driver mental health	190	3.4	36
Driver fatigue	190	3.2	43
Bus monitor/attendant physical health	166	3.1	44
Bus monitor/attendant turnover	165	3.1	45
Bus monitor/attendant mental health	164	3.0	46
Driver safety-belt use	191	2.9	48
Bus monitor/attendant safety-belt use	161	2.5	51

TABLE 6
ENVIRONMENTAL ISSUES

Issue	*n*	Average	Overall Rank
Illegal passing of stopped buses by other vehicles	192	5.7	1
Inattentive or distracted drivers of other vehicles	187	5.0	2
Distractions (to the driver) on the bus	187	4.8	3
Student passengers not sitting in their seat properly	190	4.8	4
Passengers as pedestrians in the loading/unloading zone	188	4.6	5
Horseplay at bus stops	192	4.5	6
Violence/bullying among student passengers	187	4.5	8
Student passengers standing too close to the road at the bus stop	187	4.3	9
Noise levels on the bus	190	4.3	10
Roadway conditions (e.g., sunken/soft shoulders, potholes, width of road)	190	4.2	12
Distractions (to the driver) outside the bus	188	4.2	14
Visibility of bus stops in inclement weather conditions (fog, snow, heavy rain)	191	4.1	16
Passengers not immediately leaving loading/unloading area	186	4.0	17
Traffic congestion	189	3.9	18
Railroad crossing issues	190	3.9	20
Visibility of bus or students on curved roads	188	3.9	24
Students eating/drinking on the bus	191	3.8	25
Student inattention or distraction owing to personal electronic devices	193	3.8	27
Visibility at bus stops in hilly terrain	190	3.6	31
Children left on buses	190	3.6	32
Animal action (e.g., deer or other wildlife)	184	3.5	35
Slippery floors/stairwells	192	3.2	42

SCHOOL BUS DRIVER SAFETY ISSUES: DRIVER HIRING AND TRAINING ISSUES

Several questions regarding the thoroughness of driver hiring and training procedures were explored. Overall, it appears that driver screening and criminal background checks are very thorough and do not necessarily present a safety issue (see Tables 12–16). In particular, the thoroughness of criminal background checks seems to be held in high regard by the survey respondents.

Participants were asked a series of questions regarding the number of pre-service and in-service training hours that are mandated in their school district. The results of these questions are summarized in Table 17. Given the wide range of responses, it may be helpful to focus on the median response. The average for pre-service driver training is 27.9 hours, whereas the average for in-service driver training is 10.4 hours, which shows that the majority of training hours are completed before a driver is on the road.

When considering monitor/attendant training, the number of training hours is markedly decreased in terms of median hours, with a median of 4 hours for pre-service training and a median of 5 hours of in-service training.

Table 18 shows the responses for the question: "What particular aspect of driver training is the most important in terms

TABLE 7
EQUIPMENT AND TECHNOLOGY ISSUES

Issue	*n*	Average	Overall Rank
Storage of passengers' personal items (e.g., backpacks, instruments)	190	4.2	13
Driver field-of-view and blind spots (i.e., visibility issues, hood, body posts, mirrors)	191	3.9	22
Considerations for special needs student passengers	182	3.9	23
Students sticking arms and heads out of windows	188	3.8	26
Keeping up with routine school bus maintenance	188	3.4	37
Restraints for wheelchairs	181	3.4	38
Storage of driver's items (e.g., purses, clipboards, routing information)	192	3.4	39
Passenger restraints for special needs passengers	178	3.3	40
Insufficient or ineffective mirrors on the school bus	189	2.9	47
Rear bumper height	169	2.9	49
School bus foot pedal design (accelerator and brake)	180	2.7	50

TABLE 8
ORGANIZATIONAL DESIGN ISSUES

Issue	*n*	Mean	Overall Rank
Lack of sufficient funding for fleet operation/maintenance/equipment	183	4.5	7
Lack of sidewalks at or near bus stops	189	4.2	11
Security issues	189	3.9	21
Bus stops on major highways	188	3.8	29
Lack of an adequate waiting area for passengers at bus stops	188	3.7	30
Emergency evacuation procedures	191	3.5	34
Too many student passengers at a single stop	187	3.3	41

TABLE 9
MOST IMPORTANT SAFETY ISSUES IN SCHOOL BUS TRANSPORTATION (Open Ended)

Response Category	Frequency
Other motorists	46
Passenger behavior on the bus	41
Passengers as pedestrians	24
Driver issues (e.g., lack of skill)	22
Bus issues (design, maintenance)	18
Turnover, low pay, poor management	16
Lack of monitors/aides on buses	3
Alternative transportation for students (walking, parents driving)	3
Road conditions	2
Bus security	1
Total	176

TABLE 10
BARRIERS TO SAFETY ISSUES (Open Ended)

Response Category	Frequency
Funding	43
Lack of support from administration/parents	27
Lack of law enforcement	23
Driver quality/training	19
Uneducated public	16
Student behavior	10
Other motorists	10
Other	8
Equipment/technology	6
Lack of control	3
Politics	2
No suggestion	2
Total	169

TABLE 11
RECOMMENDATIONS/SUGGESTIONS FOR ADDRESSING ISSUES (Open Ended)

Response Category	Frequency
Stronger law enforcement	23
Driver training	20
No suggestion	19
Increase funding	15
Educating public	12
Other	12
Student discipline	11
Improve bus design/technology	10
Educating parents and getting their support	5
More monitors/aides on buses	5
Other drivers/lack of control	3
Total	135

TABLE 12
IN YOUR OPINION, HOW THOROUGH ARE THE DRIVER SCREENING PROCEDURES FOR YOUR FLEET (or in General If You Are Not Involved with a Fleet)?

n	Average Responses "thorough"
183	5.8

of safety?" The most frequent response to this question was "driver training" (particularly defensive driving). General training and policy awareness, as well as student control, were also frequently cited, as was the proper loading/unloading of passengers.

Table 19 shows the responses for the question: "What, if any, areas of driving training need to be covered that are not part of your training program?" Many respondents indicated that they had no suggestions. However, of those who did make a suggestion, "student management and discipline" was the most frequent response.

TABLE 13
IN YOUR OPINION, HOW THOROUGH ARE THE DRIVER CRIMINAL BACKGROUND CHECK PROCEDURES FOR YOUR FLEET (or in General If You Are Not Involved with a Fleet)?

n	Average Responses "thorough"
187	6.2

TABLE 14
IN YOUR OPINION, HOW THOROUGH ARE THE SUBSTITUTE DRIVER SCREENING PROCEDURES FOR YOUR FLEET (or in General If You Are Not Involved with a Fleet)?

n	Average Responses "thorough"
179	5.9

TABLE 15
IN YOUR OPINION, HOW THOROUGH ARE THE SUBSTITUTE DRIVER CRIMINAL BACKGROUND CHECK PROCEDURES FOR YOUR FLEET (or in General If You Are Not Involved with a Fleet)?

n	Average Responses "thorough"
183	6.2

TABLE 16
IN YOUR OPINION, HOW THOROUGH ARE THE DRIVER TRAINING PROCEDURES FOR YOUR FLEET (or in General If You Are Not Involved with a Fleet)?

n	Average Responses "thorough"
186	5.7

TABLE 17
HOW MANY PRE-SERVICE AND IN-SERVICE HOURS OF TRAINING ARE MANDATED?

Training	*n*	Average (h)	Range (h)
Pre-service driver	152	27.9	0–240
In-service driver	151	10.4	0–56
Pre-service monitor/attendant	123	10.7	0–240
In-service monitor/attendant	122	7.5	0–56

TABLE 18
WHAT PARTICULAR ASPECT OF DRIVER TRAINING IS THE MOST IMPORTANT IN TERMS OF SAFETY? (Open Ended)

Response Category	Responses
Behind the wheel training and defensive driving	47
General training and policy awareness	35
Student control	32
Loading/unloading of passengers	27
Attention/awareness/mirror use	20
Pre-trip inspection	9
Emergency situations	5
Other	1
Total	176

TABLE 19
WHAT, IF ANY, AREAS OF DRIVING TRAINING NEED TO BE COVERED THAT ARE NOT PART OF YOUR TRAINING PROGRAM? (Open Ended)

Response Category	Responses
No suggestion	36
Student management/discipline	24
People/communication skills	12
Specific driving skills (e.g., backing, braking)	9
Emergency situations/first-aid	8
Defensive driving	7
More training	6
Security	5
Special needs students	5
Other	4
Involvement of law enforcement at trainings	1
Total	117

TABLE 20
WHAT ARE THE MOST COMMON DISTRACTIONS TO SCHOOL BUS DRIVERS *ON THE BUS*? (Open Ended)

Response Category	Responses
Student behavior	160
Cell phones and other electronics	10
Medical situations	2
Total	172

Table 20 shows the responses for the question: "What are the most common distractions to school bus drivers *on the bus*?" Student behavior on the bus was clearly the most frequently cited response to this item, followed by distractions from cell phones and other electronics. Two individuals noted that medical situations are common distractions on the bus.

Table 21 shows the responses for the question: "What are the most common distractions to school bus drivers *outside the bus*?" Other motorists' behaviors were the most frequently cited response to this item, followed by pedestrians as passengers.

Table 22 shows the responses for the question: "How can these distractions be minimized?" The most frequently cited response for this item was "driver training," followed by "student discipline" and "law enforcement."

Participants were also asked about the frequency of required physical examinations for drivers (Tables 23 and 24). A majority of respondents indicated that the drivers in their district must complete an annual physical examination. A smaller number of respondents indicated that drivers in their district must complete a periodic exam. Those who indicated that a periodic exam is required were also asked how often these exams occur (Table 24) in an open-ended question format. A majority of those with periodic physical examinations reported that they are required every two years. It is also interesting to note that five individuals reported no mandatory physical examination.

TABLE 21
WHAT ARE THE MOST COMMON DISTRACTIONS TO SCHOOL BUS DRIVERS *OUTSIDE THE BUS*? (Open Ended)

Response Category	Responses
Other motorists	115
Passengers as pedestrians	21
Parents/siblings at bus stops	10
Weather	6
Animals	5
Other	4
Construction	3
Coworker/supervisor-related	3
Not sure	3
Total	170

TABLE 22
HOW CAN THESE DISTRACTIONS BE MINIMIZED? (Open Ended)

Response Category	Responses
Training	40
Student discipline/training	26
Law enforcement	23
Monitors/aides/assigned seats	16
Public awareness	13
Unsure	13
Increase bus driver attention	6
Parent involvement	4
Other	4
Alternative routes	2
Equipment related	2
Total	149

TABLE 23
HOW OFTEN ARE PHYSICAL EXAMS REQUIRED WITH YOUR FLEET?

Frequency	Responses
Annually	111
Annually and periodically	1
Periodically	40
Total	152

EQUIPMENT AND TECHNOLOGY SAFETY ISSUES

Table 25 shows the responses for the question: "How can a school bus design be improved for safety?" The most frequently cited response for this item was related to improving mirrors or visibility around the school bus (e.g., reducing blind spots).

Table 26 provides the responses for the question: "What technology has improved safety in school bus operations?" Many respondents believed that cameras, GPS devices, and improved mirrors and lighting were some of the most useful technological advances in school bus operations.

TABLE 24
IF PERIODICALLY, HOW OFTEN?

Frequency	Responses
1 to 2 years	3
2 years	26
30 days	2
6 months	1
As mandated by Department of Motor Vehicles	2
As necessary	1
Initially, and as required by DMV	1
Never	5
Once	5
Quarterly	1
Home health screening	1
Varies	1
Total	50

TABLE 25
HOW CAN A SCHOOL BUS DESIGN BE IMPROVED FOR SAFETY? (Open Ended)

Response Category	Responses
Improved mirrors/visibility	46
No suggestions	22
General bus design/improve quality of manufacturing	14
Seat issues (ergonomics, seat height)	12
Evacuation related	8
Seat belts	7
Sensors/alert systems	7
Global positioning system	5
Internal/external cameras	5
Improved storage inside bus	5
Uniform switches/controls	3
Improved stairs (reduce slips/trips)	3
Light-emitting diode (LED) lights	3
Improved communication devices	3
Total	143

Table 27 shows the responses for the question: "What technology for improving safety would be useful in the future?" The responses to this item matched closely those cited earlier, with cameras and GPS devices listed as the top responses.

Table 28 presents the responses for the question: "Do you have any suggestions for how to improve driver pre-trip inspections?" Many respondents believe that increased supervision was needed to ensure that drivers are completing inspections. The second most frequent response was to use diagnostic equipment to detect issues.

When asked about the level of compliance for drivers performing pre-trip inspections, a majority of respondents indicated that at least half of their drivers do so (see Table 29). It is interesting that only 23 respondents indicated 100% compliance for pre-trip inspections. On the other hand, 15 respondents indicated low levels of compliance.

TABLE 26
WHAT TECHNOLOGY HAS IMPROVED SAFETY IN SCHOOL BUS OPERATIONS? (Open Ended)

Response Category	Responses
Cameras	41
GPS	24
Mirrors	22
Lighting	21
Seat design	17
Communication devices	15
Other	7
Crossing arm	12
Anti-lock brakes	7
Child monitors	7
Automatic transmissions	5
Body design	4
Total	182

TABLE 27
WHAT TECHNOLOGY FOR IMPROVING SAFETY WOULD BE USEFUL IN THE FUTURE? (Open Ended)

Response Category	Responses
Cameras	25
GPS	23
Other	16
No suggestion	15
Improved lighting	9
Child tracking systems	9
Improved driver training/monitoring	5
Improved seat design	4
Vehicle sensors/backing alarm	3
Improved communication devices	3
Improved equipment for special needs passengers	2
Improved mirrors	2
Total	116

ORGANIZATIONAL DESIGN SAFETY ISSUES

Table 30 shows the responses for the question: "What can fleet safety managers do to improve the safety of their operations?" The most frequently cited response to this item was to improve driver training and monitoring.

Table 31 shows the responses for the question: "Do you have any suggestions for new federal or state regulations for

TABLE 28
DO YOU HAVE ANY SUGGESTIONS FOR HOW TO IMPROVE DRIVER PRE-TRIP INSPECTIONS? (Open Ended)

Response Category	Responses
Increased supervision	39
Technology/diagnostic equipment	33
No suggestion	21
Standardize the procedure	13
Increased training	7
Increase driver pay	3
Install lighting systems under the hood	3
Other	3
"Just do them"	2
Total	124

TABLE 29
WHAT LEVEL OF COMPLIANCE DO THE DRIVERS IN YOUR FLEET MEET FOR PERFORMING PRE-TRIP INSPECTIONS?

Level of Compliance	Responses
0%–24%	15
25%–49%	27
50%–74%	34
75%–99%	80
100%	23
Total	179

TABLE 30
WHAT CAN FLEET SAFETY MANAGERS DO TO IMPROVE THE SAFETY OF THEIR OPERATIONS? (Open Ended)

Response Category	Responses
Improve training/monitoring employees	86
Improve communication with employees	21
Ensure maintenance issues are resolved	8
Other	6
Establish and maintain a safety culture	6
Educate the public, administration, law	6
No suggestions	4
Keep detailed records	3
Total	140

school buses?" Many respondents did not have any suggestions for new regulations. However, one frequently cited response had to do with standardizing laws federally instead of having different laws for states.

Table 32 shows the responses for the question: "Are there any current federal or state regulations for school buses you think should be reconsidered?" There was a wide variety of responses to this item, although the most frequently cited response was "Not applicable or no suggestion." The next most frequent response was that the regulations concerning mandatory seat belts should be reconsidered.

SECURITY-RELATED SAFETY ISSUES

Survey respondents were also asked to report whether they have received and/or given security awareness training for drivers over the course of the last 1, 3, and 5 years. Tables 33–35 show the results. A majority of respondents indicated that security training was completed in the last year.

Table 36 presents the responses for the question: "What do you or your school bus drivers do to ensure your/their bus is safe in terms of security?" Conducting pre- and post-trip inspections was the most frequently cited response. Many respondents also stressed the importance of keeping buses and bus storage yards locked securely.

When considering special needs passengers, survey respondents were asked to report whether there are individual evacuation plans for these students. A majority indicated there are evacuation plans for each of their special needs passengers (Table 37).

Respondents were also asked whether they conduct evacuation drills with special needs passengers (Table 38) and if

TABLE 31
DO YOU HAVE ANY SUGGESTIONS FOR NEW FEDERAL OR STATE REGULATIONS FOR SCHOOL BUSES? (Open Ended)

Response Category	Responses
No suggestions	39
Other	18
Standardize laws; make them federal, not state-based	13
Do not require seat belts	8
Equip buses with new technology	7
Mandatory training	7
Require seat belts	6
Make it mandatory to replace buses after certain age/mileage	3
No cell phones while driving	3
Total	104

TABLE 32
ARE THERE ANY CURRENT FEDERAL OR STATE REGULATIONS FOR SCHOOL BUSES YOU THINK SHOULD BE RECONSIDERED? (Open Ended)

Response Category	Responses
Not applicable or no suggestion	56
Mandatory seat belts	8
Requirements for extensive training/testing of drivers	3
CDL requirements	3
"10 foot" rule	2
Railroad crossing regulations	2
Head Start	2
Seat height requirements	2
Allowing self-inspection	1
Waiver for driver vision testing	1
Aleana's Law in Georgia	1
Hours of service regulation	1
Flame retardant seat requirements	1
Total	83

CDL = commercial driver's license.

TABLE 33
HAVE YOU GIVEN SECURITY AWARENESS TRAINING FOR YOUR DRIVERS IN THE PAST 1 YEAR?

	Responses
Yes	110
No	45
Total	155

TABLE 34
HAVE YOU GIVEN SECURITY AWARENESS TRAINING FOR YOUR DRIVERS IN THE PAST 3 YEARS?

	Responses
Yes	113
No	21
Total	134

TABLE 35
HAVE YOU GIVEN SECURITY AWARENESS TRAINING FOR YOUR DRIVERS IN THE PAST 5 YEARS?

	Responses
Yes	68
No	29
Total	97

TABLE 38
DO YOU CONDUCT EVACUATION DRILLS WITH SPECIAL NEEDS PASSENGERS?

	Responses
Yes	128
No	31
Total	159

so, how often (Table 39). A majority of respondents indicated drills are performed, whereas one-fifth reported having no such drills. Of those performing the drills, a majority indicated the drills are completed twice a year, whereas approximately one-quarter reported annual drills.

TABLE 39
IF YES, HOW OFTEN?

Frequency	Responses
Annually	30
2 times per year with regular passengers	1
2 times per year	67
3 times per year	13
4 times per year	1
9 times per year	1
14 times per year	1
As determined by state or district policy	1
Infrequently	1
Total	116

CLOSING COMMENTS BY RESPONDENTS

Table 40 shows the responses for the question: "Are there any special or unique safety concerns to school bus operations you believe were not addressed in this survey?" Although some of the issues listed below were addressed to some extent in the survey, it may be the case that respondents felt some of these issues (e.g., security) should have received more attention.

TABLE 36
WHAT DO YOU OR YOUR SCHOOL BUS DRIVERS DO TO ENSURE YOUR/THEIR BUS IS SAFE IN TERMS OF SECURITY? (Open Ended)

Response Category	Responses
Pre- and post-trip inspections	59
Keep buses and yards locked	31
Vigilance	17
Training	14
Cameras	7
Other	4
Improve communication	6
Making sure unauthorized people are not on the bus	5
Total	143

TABLE 37
DO YOU HAVE AN EVACUATION PLAN FOR YOUR INDIVIDUAL SPECIAL NEEDS PASSENGERS?

	Responses
Yes	147
No	9
Total	156

TABLE 40
ARE THERE ANY SPECIAL OR UNIQUE SAFETY CONCERNS TO SCHOOL BUS OPERATIONS YOU BELIEVE WERE NOT ADDRESSED IN THIS SURVEY? (Open Ended)

Response Category	Responses
No suggestions	38
Violence/security issues	5
Funding	4
Special needs students	3
Educating the public	2
Management/training issues	2
Safety of students at bus stops (harm from others)	2
Seat belts on buses	2
Driver physical standards	2
Parent involvement	1
Updating equipment	1
Routing	1
Uniform background checks	1
Car seats/boosters	1
Hood wind blow over	1
Lighting in stairwells	1
Windows/windshields	1
First aid	1
Hazard reporting	1
Monitors/aides on buses	1
Hazardous materials training	1
Separating bus and other traffic at schools	1
Total	73

CHAPTER FIVE

CONCLUSIONS

This synthesis report provides an overview of current safety issues in the field of pupil transportation as identified in relevant safety journals, trade and government publications, and Internet sites, as well as research findings from a widely disseminated survey on school bus safety. The peer-reviewed survey questionnaire was designed based on the Socio-Technical Systems model of transportation safety to explore each aspect of school bus operations, including the driver, environment, equipment/technology, and organizational design. Survey respondents included school bus drivers, fleet managers, trainers, mechanics, transportation specialists, and a variety of other positions relevant to school bus operations.

The main objective of this synthesis effort was to identify the most relevant safety issues and explore perceived barriers to making improvements as well as potential solutions. It is clear that although there are a variety of safety issues in pupil transportation, those regarded as the most severe by survey respondents include illegal passing of buses by other motorists, the behavior of passengers both on the bus and while loading/unloading, and driver skill level. In addition, there appears to be growing concern regarding security and violence issues on the school bus and at bus stops.

BARRIERS AND SOLUTIONS TO IMPROVING SAFETY

Survey respondents believe that barriers to improved safety in school bus operations consist mainly of inadequate funding; a lack of strict law enforcement and public awareness of laws; and insufficient support from administrators and parents to improve safety and intervene with the problem behavior of students.

Funding

In terms of funding, many survey respondents believe the typical salary for a school bus driver is insufficient given the level of responsibilities and roles the drivers must fill. Increasing school bus driver pay may reduce turnover and decrease the amount of funding needed for new hiring procedures and training. Many respondents also believe that the amount of passenger monitoring and discipline necessary on the bus is too much for one individual to take on alone, especially while simultaneously attempting to monitor the driving environment. Therefore, school bus monitors/aides are seen as a necessity for improving safety; however, not all school districts/fleets can afford additional staff members to handle such responsibility. Another consideration within this issue is the potential lack of qualified applicants to fill monitor positions. Besides rating monitor turnover (which was not perceived as a relatively important issue as it was ranked 45 of 51 of the overall safety issues), this survey did not directly address hiring issues related to monitors/aides. This may be an important issue to address in future research.

Other funding issues noted were related to driver training and equipment/technology upgrades and maintenance. These issues are discussed in more detail here.

Law Enforcement and Public Education

Many respondents believe that given the frequency of illegal passing of buses by other motorists, that there is insufficient police attention to such issues as they are happening, as well as a lack of prosecution once violators are reported. Some survey respondents believe that there is need for educating the public regarding such laws. For example, some survey respondents believe that other motorists seem unsure of whether they are allowed to pass buses, thus "creeping" past the bus. Other motorists appear to believe that the stop signal arms on buses are to be treated like regular stop signs, whereby the driver only has to come to a momentary complete stop before proceeding past the bus, even if the stop signal arm is still deployed and the loading or unloading of children is still occurring.

Support from School Administration, Parents, and Fleet Management

When responding to the open-ended question regarding barriers to safety, some survey respondents expressed frustration with a lack of follow-through with student disciplinary actions, particularly on the behalf of school administration. For example, it may be the case that problem students are not being disciplined enough to discourage future behavioral issues.

Some respondents indicated that more parental involvement is needed to make parents aware of their children's behavioral problems and to work with school administrators and bus drivers to derive solutions for addressing such issues

on a student-by-student basis. Suggestions were made to include training and education for parents regarding behavioral issues relevant to school transportation and how to effectively teach and/or discipline their children when behavioral issues are reported.

Finally, survey respondents believe that fleet managers should improve training, increase supervision and monitoring of drivers, ensure maintenance issues are resolved, and make efforts to educate the public regarding school bus safety. In addition, six respondents believe fleet managers are responsible for creating and maintaining a safety culture among their fleet. This means making safety a priority, setting a safe example, and improving communication regarding safety issues to drivers on an individual basis as well as in group meetings.

Training

One somewhat conflicting result from the survey is that when asked how thorough driver training procedures are, the average response was less than 7 = "Very thorough" (see Table 16). However, improved driver training was recognized throughout the open-ended responses as a necessity to increasing safety. A need for more, if not improved, behind-the-wheel training and defensive driving skills training seemed to be a recurrent theme in survey responses. Another general training issue recognized was a need for drivers to have improved "people skills" (e.g., communication) in dealing with students, parents, and administration to handle behavioral issues and discipline, as well as the reporting of incidents, safety/discipline concerns, and mechanical issues. Some survey responses included the suggestion for training relevant to stress management skills for school bus drivers to help them cope with frustrations and effectively handle various situations with students, parents, and other motorists. Finally, there were respondents who believe that additional specific training is needed in the areas of special needs students (interacting with, loading/unloading, and evacuation procedures for special needs children) and school bus security.

Technology/Equipment

Survey respondents recognized how various technological advances [e.g., cameras, global positioning systems (GPS), and improved mirror design] have improved driving safety, yet many school districts and fleets lack the funding to include such technologies in their buses, let alone maintain and upgrade their current equipment. Cameras on the bus are useful for monitoring student behavior and dealing with discipline issues, while cameras exterior to the bus are useful for reporting illegal passing and other risky driving behaviors by motorists sharing the roadway. Improved mirror housing designs and placements eliminate blind spots and allow the driver to have a better feel for the driving environment when changing lanes, pulling into traffic, scanning for pedestrians, backing up, etc. GPS and automatic vehicle locator devices are useful for successful route navigation, thus eliminating driver stress and distraction from being lost, as well as for security issues if a situation arises where administrators need to know the exact locations of their vehicles.

Other useful and needed technologies mentioned included passenger monitoring to detect whether all students are accounted for at the appropriate time, so that no passengers are left behind on the bus if they have fallen asleep during the route. Some survey respondents indicated a need for sensors around the vehicle to detect objects or pedestrians in the path of the vehicle, thus adding a layer of protection that mirrors themselves cannot provide. Finally, a recurrent theme was the need for diagnostic programs to aid drivers in detecting maintenance issues with their vehicles, thus providing a more comprehensive inspection of the vehicles pre- and post-trip.

Other aspects of equipment survey respondents mentioned as needing improvement included seat design for both the drivers (ergonomics) and passengers (reduced seat height for a better view of the passengers), as well as evacuation-related improvements (e.g., emergency exits on the floor in case of roll-over, and ramps or slides on emergency exits).

One interesting finding from the survey is that the issue of mandatory seat belt use of passengers did not receive much attention, and when it did, the frequency of positive and negative remarks was nearly equal. For example, when asked about what federal or state regulations should be made (see Table 31), eight respondents indicated that seat belts should not be mandatory, although six respondents believed they should be. It is not clear whether these respondents were in a district where seat belts are mandatory or not, which would have been an interesting comparison if that information were available. Those opposing mandatory seat belts appeared to be mostly concerned about whose responsibility it would be to verify that passengers are buckled up, whereas those who advocated mandatory seat belts believe it would save lives and would also make the high seat backs less of a necessity, thus improving the view of passengers and their behavior.

Finally, in terms of equipment, it is interesting that when asked what level of compliance the drivers in their fleet have for performing pre-trip inspections, many respondents reported that fewer than half of the drivers do so. Possible solutions to improve compliance with this important issue included increased supervision/monitoring of drivers to ensure that they complete the inspections, provision of diagnostic equipment, increased training, and additional incentives (e.g., more pay) to complete the inspections.

Organizational Design

Some of the major organizational design issues included the location and/or quality of bus stops. For example, of the 51 overall safety issues rated, "lack of sidewalks at or near bus stops" was ranked as number 11, "bus stops on major high-

ways" was ranked as 29, and "lack of an adequate waiting area for passengers at bus stops" was 30. Also, some drivers indicated there were issues with bus stop placement, which made them difficult to see, including placement near curves and on hilly terrain.

Security

A majority of respondents indicated either giving or receiving security awareness training in the past year. When asked what drivers could do to ensure that their buses are safe in terms of security, most responses had to do with performing pre- and post-trip inspections, keeping buses locked in a secure area, and increasing vigilance for suspicious or unusual activities, packages, etc. A smaller number of respondents believe that increased and/or improved training in security issues is warranted. Other survey respondents noted concerns regarding terrorism, as well as increased violence among students both on the bus and while at bus stops.

LIMITATIONS AND FUTURE WORK

One of the major limitations of this research was the relatively low response. Extensive efforts were made to distribute the survey widely through listservs, individual e-mails, flyers at a major school bus safety conference, flyers at work, telephone calls, and advertisements/announcements in trade publications. The survey was offered in electronic, paper, and online formats, and those completing the paper version had the options of returning it by mail or fax.

Individuals were encouraged to voice their concerns and have them documented through this process, yet only 198 individuals completed the survey. Another related limitation is that owing to the multiple methods of recruitment and the "snowballing" referral tactic, it was impossible to calculate the exact response rate. Several steps may improve the response in the future, including providing a longer time frame to build networks and distribute the survey (this project, from inception to completion, was to be completed in less than a year), providing incentives for survey completion, and perhaps even shortening the survey. These suggestions may also reduce selection bias, as it is assumed that only the most conscientious or concerned individuals took the time to respond to the survey. With incentives, for example, perhaps a wider variety of individuals would have completed the survey.

The challenge of the survey was to gather as much information regarding school bus safety as possible, without making the survey too long for an acceptable completion time. Although this survey was successful in exploring the major issues, barriers, and solutions to safety problems, future research might focus on particular issues to explore them in more detail. Another limitation was the brevity of questions regarding the demographics of the participants and their school systems. By having more of this information available, it would provide greater context for individuals' responses. Finally, given that a majority of the surveys were completed online and participants were guaranteed anonymity, it was impossible to identify participants to be able to probe based on their responses or otherwise ask for clarification. This too is a difficult issue because guaranteeing anonymity/confidentiality may be necessary to obtain the most truthful responses from participants.

In summary, this synthesis provides a basic foundation of information regarding the safety of school bus operations that will be useful to policymakers, administrators, trainers, fleet managers, and safety researchers.

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APPENDIX A

Recruitment E-mail for Peer Review Group

Dear [Name].

My name is Doug Wiegand, and I'm a Senior Research Associate at the Virginia Tech Transportation Institute (VTTI) in Blacksburg, VA. I am the Principal Investigator for a new Synthesis report entitled *The Special Safety Concerns of School Bus Drivers.* This synthesis will be published in the Transportation Research Board's Commercial Truck and Bus Safety Synthesis Program (http://www.trb.org/CRP/CTBSSP/CTBSSP.asp).

The objective of this synthesis is to document current information on the numerous safety issues faced by school bus operators, including how the issues are currently addressed, and suggestions for making further improvements in the future. The synthesis will also include information gathering in the forms of a literature review and focus groups, which will then inform the development of a survey tool to be implemented to a variety of professionals associated with school bus operations.

You were referred to me either by a colleague of yours or your contact information was found on the National Association for Pupil Transportation's website. I am writing to invite you to participate in an hour-long teleconference focus group with up to 5 other professionals in the school bus transportation field. The focus group will be led by me and my colleague, Darrell Bowman, and will involve sharing your insight, experiences, and opinions regarding school bus safety issues. If you are interested in participating, please contact me at your earliest convenience. We plan to hold the teleconference in the summer of 2008. Your participation is completely voluntary and you may remain anonymous if you choose.

Interested participants will be contacted to schedule a date/time that is convenient for all parties involved. Once the teleconference is scheduled, each participant will receive an email with an informed consent document and a PowerPoint presentation outlining the topics to be addressed during the teleconference.

I appreciate your consideration and time, and look forward to hearing from you if you are interested in participating.

Sincerely,

Douglas Wiegand, Ph.D.
Senior Research Associate, VTTI
540-231-1055
dwiegand@vtti.vt.edu

APPENDIX B

PowerPoint Presentation for Peer Review Focus Group

Driving Transportation with Technology

Peer Review for Synthesis Survey on School Bus Safety

June 20, 2008

Driving Transportation with Technology

Consent to Participate

- Participation in this discussion is completely voluntary
- Your participation and individual responses will not be identified in the study report
- Risks/Benefits
- You may remain anonymous if you wish
- You may leave the discussion at any time you'd like
- Continuing with the discussion implies consent

Driving Transportation with Technology

Agenda

- Introductions
- Review of synthesis objectives
- Review and discussion of draft survey
- Closing

Driving Transportation with Technology

Objectives

- Synthesis has two parts:
  - Literature review (Daecher consulting)
  - Survey methods and results (VTTI)
- Survey distributed to school bus interest group listserves (e.g., School Transportation News) and to individuals identified on NAPT's website

Driving Transportation with Technology

Objective of This Call

- Peer review process for the survey draft
- Missing topics?
- Prioritization of topics?
- Wording of items
- "Weeding" – hope to have the survey take 30min or less

Driving Transportation with Technology

Survey Objectives

- Gain insight and opinions from individuals in the school bus industry regarding:
  - Unique safety concerns of school bus operations
  - Current methods for addressing these concerns
  - Barriers to safety
  - Suggestions for future improvement

Driving Transportation with Technology

Survey Review
(see email attachment)

Driving Transportation with Technology

THANK YOU!

Contact:

Douglas Wiegand, Ph.D.
Senior Research Associate
Virginia Tech Transportation Institute
540-231-1055
dwiegand@vtti.vt.edu

APPENDIX C

Final Survey Instrument

VirginiaTech TRANSPORTATION INSTITUTE

SURVEY FOR THE TRANSPORTATION RESEARCH BOARD SYNTHESIS ON THE SPECIAL SAFETY CONCERNS OF SCHOOL BUS DRIVERS (PROJECT MC-21)

Under the sponsorship of the Transportation Research Board, MaineWay Services, along with the Virginia Tech Transportation Institute (VTTI) and Daecher Consulting is conducting a study focused on the special safety concerns of school bus operations. As a school bus transportation industry professional, your knowledge and opinions are important to this study. This survey, which should take approximately 45 minutes or less to complete, asks you about various school bus safety issues, how they are addressed, and your opinions for how they can be improved. Final total research results will be provided to interested parties and stakeholders, but **all information provided by you will be kept strictly confidential!** The information collected from this survey will not be used for any purposes other than research. If applicable, you may choose to skip any question(s) you are not comfortable answering. Your permission to include your survey data in the study database will be assumed once you complete/return this survey. Final results of this survey will be available through the Transportation Research Board in 2009.

1. Which of the following best describes your position?

- ☐ School Bus Driver (specify license below)
  - ☐ Class A CDL
  - ☐ Class B CDL
  - ☐ Class C CDL
  - ☐ No CDL
- ☐ School Bus Fleet Manager
- ☐ School Superintendent
- ☐ State Director of Pupil Transportation Services
- ☐ State Agency
  - o Position Title:
- ☐ Other State Agency
  - o Job Title:
- ☐ Transportation Specialist
- ☐ Contractor management beyond local operations
- ☐ Bus Attendant/Monitor
- ☐ Maintenance Supervisor
- ☐ Mechanic/Technician
- ☐ Routing Specialist/Dispatcher
- ☐ Instructor/Trainer
- ☐ School Bus Manufacturer
  - o Position Title:
- ☐ School Bus Special Interest Group
  - o Position Title:
- ☐ Federal Agency
  - o Position Title:
- ☐ Transportation Researcher
  - o Position Title:
- ☐ Other
  - o Position Title:

2. How many years of experience do you have in the area of school bus transportation? Years

3. If you work within a school system, approximately how large is the system based on the total number of pupils in the school system and/or number of annual miles traveled? Pupils Number of miles traveled ☐ N/A

4. Please provide the percentages for each type of environment you provide transportation? Urban Rural Suburban

5. Please estimate the number of each class/type of vehicles in your fleet (if applicable)?

   - Type A—consists of a bus body constructed upon a cutaway front-section vehicle with a left side driver's door, designed for carrying more than 10 persons.
   - Type B—consists of a bus body constructed and installed upon a front-section vehicle chassis, or stripped chassis, with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons.
   - Type C—also known as a "conventional," is a body installed upon a flat-back cowl chassis with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons. The entire engine is in front of the windshield and the entrance door is behind the front wheels.
   - Type D—also known as a transit-style, is a body installed upon a chassis, with the engine mounted in the front, mid-ship, or rear with a gross vehicle weight rating of more than 10,000 pounds, and designed for carrying more than 10 persons. The engine may be behind the windshield and beside the driver's seat; it may be at the rear of the bus, behind the rear wheels; or mid-ship between the front and rear axles. The entrance door is ahead of the front wheels.
   - Multi-purpose vehicles—passenger vehicles not intended for picking up or discharging students between home and k-12 school systems.
   - Type III—standard passenger vehicles such as cars, sport utility vehicles, station wagons, and small vans.
   - Other:
   - ☐ N/A

6. Please estimate the number of vehicles in your fleet:

   - ○ With a Global Position System (GPS)
   - ○ With an Automatic Vehicle Locator (AVL)

OVERALL SAFETY ISSUES

Using the scale below, please indicate how much of a ***safety issue*** the following have been in your fleet/district. If you are not associated with a school district, please give your opinion of the severity of these issues in school bus operations in general.

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All a Safety Issue						***Very Serious Safety Issue***

7. Passengers as pedestrians in the loading/unloading zone

8. Children left on buses

9. Horseplay at bus stops

10. Passengers not immediately leaving loading/unloading area (e.g., going to a mailbox)

11. Illegal passing of stopped buses by other vehicles

12. Railroad crossing issues

13. Tight roads due to trees or overgrowth

14. Blind driveways/intersections

15. Students sticking arms and heads out of windows

16. Animal action (e.g., deer or other wildlife)
17. Student passengers standing too close to the road at the bus stop
18. Insufficient or ineffective mirrors on the school bus
19. Inattentive or distracted drivers of other vehicles
20. Driver field-of-view and blind spots (i.e., visibility issues, hood, body posts, mirrors)
21. Weather conditions when school is not delayed/cancelled
22. Roadway conditions (e.g., sunken/soft shoulders, potholes, width of road)
23. Traffic congestion
24. Visibility of bus or students on curved roads
25. Visibility at bus stops in hilly terrain
26. Visibility of bus stops in inclement weather conditions (fog, snow, heavy rain)
27. Lack of an adequate waiting area for passengers at bus stops
28. Lack of adequate lighting at bus stops
29. Lack of sidewalks at or near bus stops
30. Violence/bullying among student passengers
31. Security issues
32. Noise levels on the bus
33. Distractions (to the driver) on the bus
34. Distractions (to the driver) outside the bus
35. Bus stops on major highways
36. Too many student passengers at a single stop
37. Driver physical health
38. Driver mental health
39. Driver safety-belt use
40. Driver fatigue
41. Driver turnover
42. Bus monitor/attendant physical health
43. Bus monitor/attendant mental health

44. Bus monitor/attendant safety-belt use

45. Bus monitor/attendant turnover

46. Keeping up with routine school bus maintenance

47. Passenger restraints for:

    - Regular education passengers
    - Special needs passengers
    - Wheelchairs (effectiveness or compliance with tie downs)

48. Student passengers not sitting in their seat properly

49. Students inattention or distraction due to personal electronic devices

50. Storage of passengers' personal items (e.g., backpacks, instruments)

51. Storage of driver's items (e.g., purses, clipboards, routing information)

52. Students eating/drinking on the bus

53. Slippery floors/stairwells

54. School bus foot pedal design (accelerator and brake)

55. School bus driver cell phone use

56. Emergency evacuation procedures

57. Rear bumper height (need for a secondary lower flexible bumper to prevent under ride)

58. Lack of sufficient funding for fleet operation/maintenance/equipment

59. Considerations for special needs student passengers

60. What do you consider to be the most important safety issue(s) in school bus transportation (open ended)?

61. What are the barriers to these issue(s) (open ended)?

62. Do you have any recommendations/suggestions for how these issues should be addressed in the future (open ended)?

SCHOOL BUS DRIVER SAFETY ISSUES

63. In your opinion, how thorough are your driver screening procedures for your fleet (or in general if you are not involved with a fleet)?

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All Thorough					***Very Thorough***	

64. In your opinion, how thorough are your driver criminal background check procedures for your fleet (or in general if you are not involved with a fleet)?

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All Thorough					***Very Thorough***	

65. In your opinion, how thorough are your ***substitute*** driver screening procedures for your fleet (or in general if you are not involved with a fleet)?

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All Thorough					***Very Thorough***	

66. In your opinion, how thorough are your ***substitute*** driver criminal background check procedures for your fleet (or in general if you are not involved with a fleet)?

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All Thorough					***Very Thorough***	

67. In your opinion, how thorough are your driver training procedures for your fleet (or in general if you are not involved with a fleet)?

1	*2*	*3*	*4*	*5*	*6*	*7*
Not at All Thorough					***Very Thorough***	

68. How many hours of pre-service and in-service hours of training are mandated?

Pre-service driver	Hours	Pre-service monitor/attendant	Hours
In-service driver	Hours	In-service monitor/attendant	Hours

69. What particular aspect of driver training is the most important in terms of safety (open ended)?

70. What, if any, areas of driver training need to be covered that are currently not part of your training program (open ended)?

71. What are the most common distractions to school bus drivers ***on the bus*** (open ended)?

72. What are the most common distractions to school bus drivers ***outside the bus*** (open ended)?

73. How can these distractions be minimized (open ended)?

74. How often are physical exams required with your fleet?

☐ Annually ☐ Periodically
- *If **periodically,*** how often?

EQUIPMENT/TECHNOLOGY

75. How can school bus design be improved for safety (open ended)?

76. What technology has improved safety in school bus operations (open ended)?

77. What technology for improving safety would be useful in the future (open ended)?

78. Do you have any suggestions for how to improve driver pre-trip inspections (open ended)?

79. What level of compliance do the drivers in your fleet meet for performing pre-trip inspections?

☐ 0%–24%
☐ 25%–49%
☐ 50%–74%
☐ 75%–99%
☐ 100%

ORGANIZATIONAL DESIGN

80. What can fleet safety managers do to improve the safety of their operations (open ended)?

81. Do you have any suggestions for new federal or state regulations for school buses (open ended)?

82. Are there any current federal or state regulations for school buses you think should be reconsidered (open ended)?

SCHOOL BUS SECURITY ISSUES

83. Have you given security awareness training for your drivers (or if you are a driver, have you completed security awareness training)?

Past 1 Year	☐ Yes	☐ No	☐ N/A
Past 3 Years	☐ Yes	☐ No	☐ N/A
Past 5 Years	☐ Yes	☐ No	☐ N/A

84. What do you or your school bus drivers do to ensure your/their bus is safe in terms of security (open ended)?

85. Do you have an evacuation plan for your individual special needs passengers? ☐ Yes ☐ No ☐ N/A

86. Do you conduct evacuation drills with special needs passengers? ☐ Yes ☐ No ☐ N/A

- If *yes,* how often?

CLOSING

87. Are there any special or unique safety concerns to school bus operations you believe were not addressed in this survey (open ended)?

88. Other comments (open ended):

-END-

Thank you for participating in this survey. Please email your responses to dwiegand@vtti.vt.edu, fax to 540-231-1555 (ATTN: Doug Wiegand), or mail to:

Douglas Wiegand
Senior Research Associate
Virginia Tech Transportation Institute
3500 Transportation Research Pl
Blacksburg, VA 24061

APPENDIX D

Recruitment E-mail and Flyer for the Survey

(Note: E-mail included text below, flyer for advertising, and an attachment including the survey form)

Hello,

My name is Doug Wiegand, and I'm a Senior Research Associate at the Virginia Tech Transportation Institute (VTTI) in Blacksburg, VA. I am the Principal Investigator for a new Transportation Research Board Synthesis report entitled *The Special Safety Concerns of School Bus Drivers*. This synthesis will be published in the Transportation Research Board's Commercial Truck and Bus Safety Synthesis Program (http://www.trb.org/CRP/CTBSSP/CTBSSP.asp).

Synthesis reports like this generally entail a thorough literature review and some other form of information gathering, such as a survey. VTTI is one of two subcontractors which were brought on board to complete the synthesis on the Special Safety Concerns of School Bus Drivers. Daecher Consulting is completing the literature review portion of the synthesis, while VTTI is handling the survey portion.

The survey (attached; also available for completion online at http://tinyurl.com/56u487) was developed and **peer reviewed** by VTTI researchers and an anonymous group of school bus transportation professionals. I would like to ask for your help in distributing the survey as widely as possible. **We would like to have anyone who is involved in the school bus industry (drivers, attendant/monitors, fleet managers, manufacturers, members of trade associations, etc.) complete the survey between now and SEPTEMBER 1, 2008**. Apologies if you receive this e-mail multiple times—since I'm asking for help in distributing it, you may receive it from several sources.

If you wouldn't mind, please distribute the information below (between the rows of "+" symbols) to any school bus relevant listserve(s) you are a part of, or any other venues you think would be useful. I've also attached a flyer document/file if you would prefer to send it as an attachment.

If you would like additional information or have any other questions/concerns, please don't hesitate to contact me.

Thanks very much for your time and consideration.

Douglas M. Wiegand, Ph.D.
Senior Research Associate
Center for Truck & Bus Safety
Virginia Tech Transportation Institute
3500 Transportation Research Plaza
Blacksburg, VA 24061
540.231.1055 (office)
540.231.1555 (fax)
dwiegand@vtti.vt.edu

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Under the sponsorship of the Transportation Research Board, MaineWay Services, along with the Virginia Tech Transportation Institute (VTTI) and Daecher Consulting is conducting a study focused on the special safety concerns of school bus operations. As a school bus transportation industry professional, your knowledge and opinions are important to this study. This survey, which should take approximately 45 minutes or less to complete, asks you about various school bus safety issues, how they are addressed, and your opinions for how they can be improved. Final total research results will be provided to interested parties and stakeholders, **but all information provided by you will be kept strictly confidential!** The information collected from this survey will not be used for any purposes other than research. If applicable, you may choose to skip any question(s) you are not comfortable answering. Your permission to include your survey data in the study database will be assumed once you complete/return this survey. Final results of this survey will be available through the Transportation Research Board in 2009.

Virginia Tech
TRANSPORTATION
INSTITUTE

Transportation Research Board
Commercial Truck & Bus Safety Synthesis Program
(Project MC-21)

Special Safety Concerns of School Bus Drivers Survey

As part of a Transportation Research Board sponsored project, the Virginia Tech Transportation Institute is conducting a survey focused on the special safety concerns relevant to school bus operations.

As a professional in the school bus/transportation industry, your knowledge and opinions would be very helpful to ensure the success of this project.

Please participate by completing a survey that asks you about various school bus safety issues, how they are addressed, and your opinions for how they can be improved. The survey should take 30-45 minutes to complete.

All information provided by you will be kept strictly confidential! Final cumulative results will be available through the Transportation Research Board.

The survey is available online at http://tinyurl.com/56u487 or, you can request a version via email at dwiegand@vtti.vt.edu

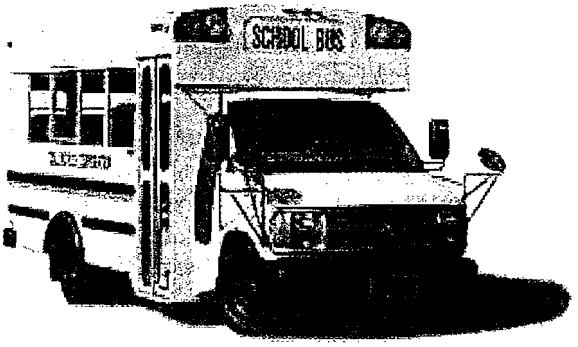
Questions? Please contact:

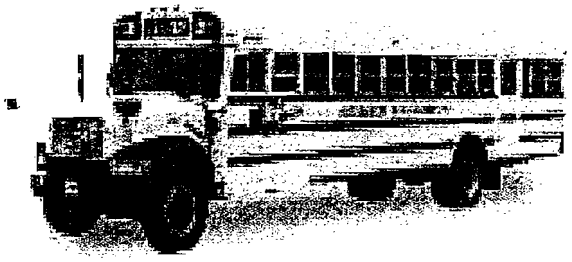
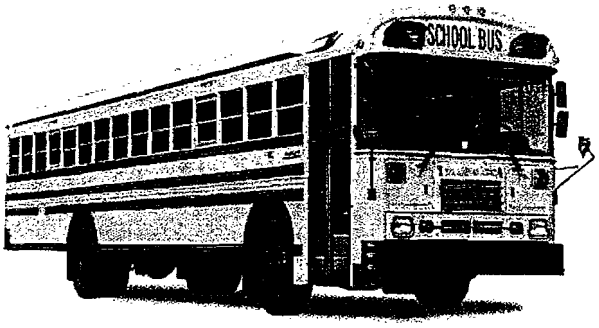
Doug Wiegand, Ph.D.
Senior Research Associate
Center for Truck and Bus Safety
Virginia Tech Transportation Institute
540-231-1055

APPENDIX E

Descriptions of School Bus Types

Descriptions and pictures retrieved from
http://www.stnonline.com/stn/faq/schoolbustypes.htm

The **Type A** school bus consists of a bus body constructed upon a cutaway front-section vehicle with a left side driver's door, designed for carrying more than 10 persons. This definition includes two classifications: Type A-I, with a Gross Vehicle Weight Rating (GVWR) of 10,000 pounds or less, and a Type A-2, with a GVWR of 10,000 pounds or more. Type A school buses meet all Federal Motor Vehicle Safety Standards for school buses.	
The **Type B** school bus consists of a bus body constructed and installed on a front-section vehicle chassis, or stripped chassis, with a GVWR of more than 10,000 pounds, designed for carrying more than 10 persons. Part of the engine is beneath and/or behind the windshield and beside the driver's seat. The entrance door is behind the front wheels. Type B school buses meet all Federal Motor Vehicle Safety Standards for school buses.	

The **Type C** school bus, also known as a "conventional," is a body installed upon a flat-back cowl chassis with a GVWR of more than 10,000 pounds, designed for carrying more than 10 persons. The entire engine is in front of the windshield and the entrance door is behind the front wheels. Type C school buses meet all Federal Motor Vehicle Safety Standards for school buses.	
The **Type D** school bus, also known as a transit-style, is a body installed upon a chassis, with the engine mounted in the front, mid-ship, or rear with a GVWR of more than 10,000 pounds, and designed for carrying more than 10 persons. The engine may be behind the windshield and beside the driver's seat; it may be at the rear of the bus, behind the rear wheels; or mid-ship between the front and rear axles. The entrance door is ahead of the front wheels. Type D school buses meet all Federal Motor Vehicle Safety Standards for school buses. [*Editor's note: Type D school buses are referred to as RE for "rear-engine," and FC for "forward control."*]	
Type III vehicles are standard passenger vehicles, such as cars, small vans, SUVs, or station wagons.	

APPENDIX F

Overall Safety Issues by Ranking

TABLE F1
OVERALL SAFETY ISSUES BY RANKING

	n	Mean	Median	SD	Overall Rank
Illegal passing of stopped buses by other vehicles	192	5.7	6.0	1.6	1
Inattentive or distracted drivers of other vehicles	187	5.0	5.0	1.7	2
Distractions (to the driver) on the bus	187	4.8	5.0	1.7	3
Student passengers not sitting in their seat properly	190	4.8	5.0	1.7	4
Passengers as pedestrians in the loading/unloading zone	188	4.6	5.0	2.1	5
Horseplay at bus stops	192	4.5	5.0	1.7	6
Lack of sufficient funding for fleet operation/maintenance/equipment	183	4.5	5.0	2.2	7
Violence/bullying among student passengers	187	4.5	5.0	1.8	8
Student passengers standing too close to the road at the bus stop	187	4.3	4.0	1.8	9
Noise levels on the bus	190	4.3	4.0	1.6	10
Lack of sidewalks at or near bus stops	189	4.2	4.0	1.9	11
Roadway conditions (e.g., sunken/soft shoulders, potholes, width of road)	190	4.2	4.0	1.7	12
Storage of passengers' personal items (e.g., backpacks, instruments)	190	4.2	4.0	1.9	13
Distractions (to the driver) outside the bus	188	4.2	4.0	1.8	14
Weather conditions when school is not delayed/cancelled	187	4.2	4.0	1.9	15
Visibility of bus stops in inclement weather conditions (fog, snow, heavy rain)	191	4.1	4.0	1.9	16
Passengers not immediately leaving loading/unloading area	186	4.0	4.0	1.9	17
Traffic congestion	189	3.9	4.0	1.8	18
Driver turnover	186	3.9	4.0	2.1	19
Railroad crossing issues	190	3.9	4.0	2.2	20
Security issues	189	3.9	4.0	2.0	21
Driver field-of-view and blind spots (i.e., visibility issues, hood, body posts, mirrors)	191	3.9	4.0	1.9	22
Considerations for special needs student passengers	182	3.9	4.0	2.2	23
Visibility of bus or students on curved roads	188	3.9	4.0	1.8	24
Students eating/drinking on the bus	191	3.8	4.0	1.9	25
Students sticking arms and heads out of windows	188	3.8	3.0	2.0	26
Student inattention or distraction due to personal electronic devices	193	3.8	4.0	1.8	27
School bus driver cell phone use	192	3.8	3.0	2.3	28
Bus stops on major highways	188	3.8	3.0	2.1	29
Lack of an adequate waiting area for passengers at bus stops	188	3.7	3.0	2.0	30
Visibility at bus stops in hilly terrain	190	3.6	3.0	2.0	31
Children left on buses	190	3.6	2.0	2.4	32
Driver physical health	189	3.5	3.0	2.1	33
Emergency evacuation procedures	191	3.5	3.0	2.2	34
Animal action (e.g., deer or other wildlife)	184	3.5	3.0	1.8	35
Driver mental health	190	3.4	3.0	2.2	36
Keeping up with routine school bus maintenance	188	3.4	3.0	2.1	37
Restraints for wheelchairs	181	3.4	2.0	2.4	38
Storage of driver's items (e.g., purses, clipboards, routing information)	192	3.4	3.0	2.0	39
Passenger restraints for special needs passengers	178	3.3	3.0	2.1	40
Too many student passengers at a single stop	187	3.3	3.0	1.9	41
Slippery floors/stairwells	192	3.2	3.0	2.0	42
Driver fatigue	190	3.2	3.0	2.1	43
Bus monitor/attendant physical health	166	3.1	3.0	2.0	44
Bus monitor/attendant turnover	165	3.1	2.0	2.0	45
Bus monitor/attendant mental health	164	3.0	2.0	2.1	46
Insufficient or ineffective mirrors on the school bus	189	2.9	2.0	2.1	47
Driver safety-belt use	191	2.9	2.0	2.1	48
Rear bumper height	169	2.9	2.0	2.1	49
School bus foot pedal design (accelerator and brake)	180	2.7	2.0	2.0	50
Bus monitor/attendant safety-belt use	161	2.5	2.0	1.9	51

Abbreviations used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

School Buses and Seat Belts

Indiana General Assembly

Joint Study Committee on
Transportation and Infrastructure

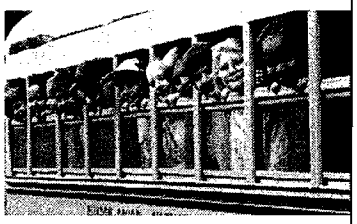
Assessment and Solutions

October 16, 2013

Presented by the Indiana Chapter of
the American Academy of Pediatrics

Purpose

- The purpose of this presentation is to discuss:
  - School bus-related injuries and fatalities
  - How school buses currently protect children
  - How seat belts on school buses can reduce injury by improved seating protection and less driver distraction
  - The pros and cons of adding seat belts to our school buses



TIAS
10/16/13
Ex. L

Travel Facts

School-related travel

- 450,000 public school buses
- 4.3 billion miles transporting
- 23.5 million children

School transportation-related crashes

Average Fatalities Per Year

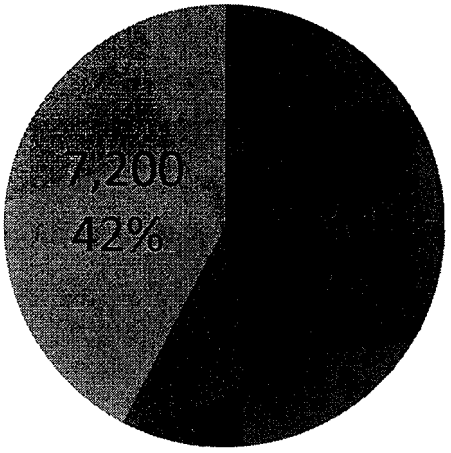
6	Outside Bus
32%	
13	Inside Bus
68%	

School bus or a non-school bus vehicle functioning as a school bus transporting children to or from school-related activities

NHTSA, DOT HS 811 396, 3-2011

School transportation-related crashes

17,000 Average Injuries* Per Year



■ Non-crash injuries

▒ Involving crashes

*Injuries treated in emergency rooms

Source: McGeehan J et al. "School Bus-Related Injuries Among Children and Teenagers in the United States, 2001-2003." *Pediatrics* 2006:118:1978-1984. http://www.medpagetoday.com/PublicHealthPolicy/PublicHealth/4445

Are school buses safe?

- An estimated 17,000 injuries are treated US emergency departments each year of which 42.3% (7,200) are due to motor vehicle crashes
  - Head injuries observed in 31% children injured in motor vehicle crashes
  - 81% neck injuries treated due to school bus motor vehicle crash

Source: McGeehan J et al. "School Bus-Related Injuries Among Children and Teenagers in the United States, 2001-2003." *Pediatrics* 2006:118:1978-1984. http://www.medpagetoday.com/PublicHealthPolicy/PublicHealth/4445

Are school buses safe?

- School buses are nearly 7-times safer in protecting child passengers from motor vehicle related fatalities than other passenger vehicles
  - School bus occupant fatality rate is 0.2 fatalities per 100 million VMT*
  - Passenger motor vehicle fatality rate is 1.44 fatalities per 100 million VMT

*Vehicle miles traveled NHTSH 2006

Why are school buses safe?

How do school buses protect?

- 27 applicable FMVSS's
- 5 unique to school buses
- Differences of mass, size, floor height, and color

[redacted]

[redacted]

[redacted]

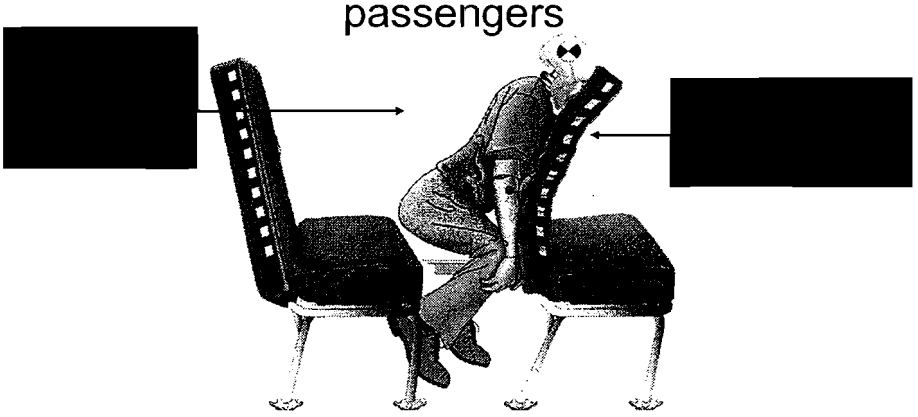
[redacted]

Compartmentalization

- FMVSS 222
- Lap (Lap-shoulder since 10/11) belts required in school buses $\leq$ 10,000 lbs GVWR

What is Compartmentalization?

Passive protection for *UNBELTED* passengers

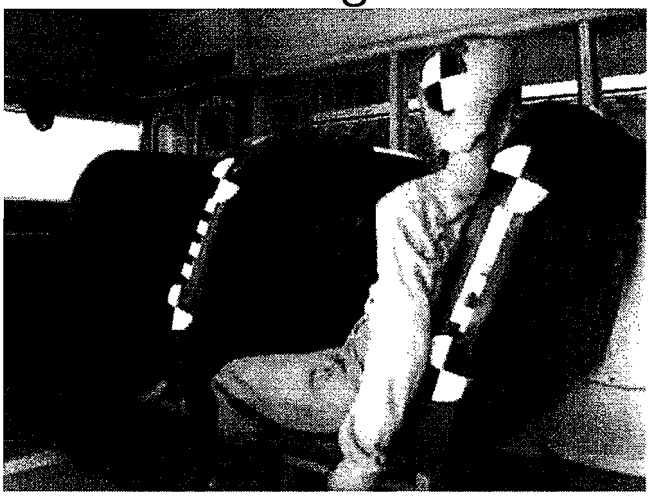


For School Buses Compartmentalization is Incomplete

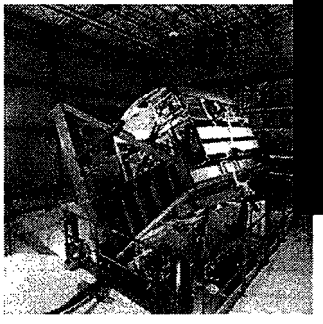
- Kids must be in the "compartment"
- Designed for low-speed, frontal crashes

National Transportation Safety Board study of school bus crashworthiness found compartmentalization provided incomplete protection to passengers during rollover and lateral impact crashes (NTSB, 1999)

Inside Bus During Frontal Crash

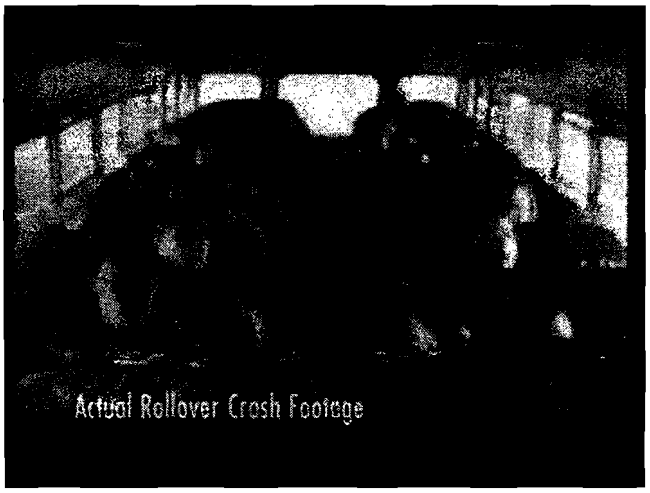


School bus rollover demonstration



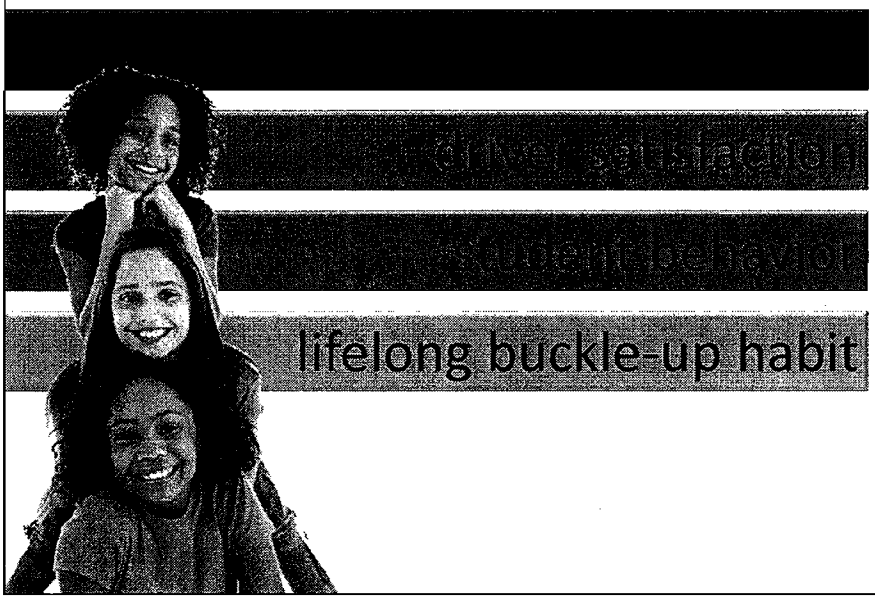
Front Row: Lap-shoulder belts
Back Row: Unbelted

Ohio School Bus Rollover



Seat belts and school buses

Why seat belts on the school bus?



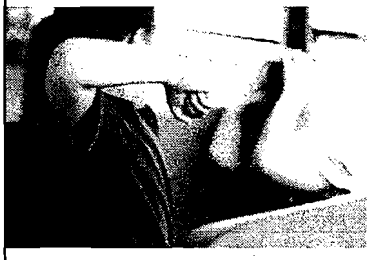
Why seat belts on the school bus?

driver satisfaction

Buckled students equals less driver distraction and decreased behavior problems

Why seat belts on the school bus?

student behavior



Keeping children seated greatly reduces unruly behavior and bullying

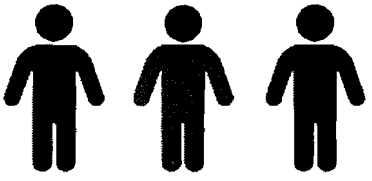
52%

school bus drivers report bullying is a serious problem on the bus

Source: The Bully Project, 2012

Why seat belts on the school bus?

student behavior



1 in 3

school-aged children are bullied each year

Source: School Bus Fleet. 4-2011. http://www.schoolbusfleet.com/Channel/School-Bus-Safety/Articles/Print/Story/2011/06/No-bullies-on-board.aspx

Why seat belts on the school bus?

lifelong buckle-up habit

Safety education starts on the bus. Buckling up on every ride provides a consistent education.

Infants → Driving Teen

Why seat belts on the school bus?

lifelong buckle-up habit

85%

parents want lap-shoulder belts in school buses

Many parents choose to transport children in personal vehicles

Source: 2007 American School Bus Council

Cost

5 Years Ago	Today
$10,000 - $12,000 per bus	$7,000 - $9,000 per bus

Potential Savings [redacted]

We recommend a gradual phase in of seat belts for all new school bus purchases

Recommendations

NHTSA
www.nhtsa.gov

NHTSA crash testing showed school bus passengers were better protected from head injury with a lap-shoulder belt compared with compartmentalization and lap belt only

(NHTSA, 2002)

American Academy of Pediatrics

The AAP has had a long-standing position that new school buses should have safety restraints.

(AAP, 2012)

National Transportation Safety Board study of school bus crashworthiness found compartmentalization provided incomplete protection to passengers during rollover and lateral impact crashes

(NTSB, 1999)

Summary

- Overall school buses are the safest means of transportation to and from school
- Compartmentalization works well when children are properly in their seat and for front collisions
- Compartmentalization does not work well for rollover and side impact crashes
- Seat belts on school buses would increase safety and student behavior on the bus

Resources

***AAP Policy Statement On Seatbelts**
Http://www.inaap.org/uploads/AAPPolicystatementforseatbeltsonschoolbuses.pdf

***2007 Federal Register: "Federal Motor Vehicle Safety Standards; Seating Systems, Occupant Crash Protection, Seat Belt Assembly Anchorages, School Bus Passenger Seating and Crash Protection"**
http://www.inaap.org/uploads/NHTSA_NPRMDocket650S0and4S73_51_web.pdf

***Journal of the American Academy of Pediatrics "School Bus Related Injuries Among Children and Teenagers in the United States, 2001-2003"**
http://www.inaap.org/uploads/SchoolbusinjuriesPediatrics.pdf

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JOINT STUDY COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE ASSESSMENT AND SOLUTIONS

Legislative Services Agency
200 West Washington Street, Suite 301
Indianapolis, Indiana 46204-2789
Tel: (317) 233-0696 Fax: (317) 232-2554

LSA Staff:

Sarah Freeman, Attorney for the Joint Study Committee
Stephanie Wells, Fiscal Analyst for the Joint Study Committee

Authority: IC 2-5-28.5

To: TIAS Committee Members
From: Sarah Freeman, Committee Attorney
Date: October 16, 2013
Re: Committee Recommendations

Proposed Recommendation #1 (Soliday)

The Committee recommends that a Market Study be conducted concerning the long and short term potential economic opportunities and consequences of establishing additional commercial ports in the following regions:

(1) Lake Michigan, including channels that are ordinarily navigable to Lake Michigan.
(2) The Ohio River, including channels that are ordinarily navigable to the Ohio River.

The Committee further recommends that the market study include the following:
(1) Current data and statistics on Great Lakes shipping trends.
(2) An analysis of the federal permitting process administered by the United States Army Corps of Engineers.

Proposed Recommendation #2 (Soliday)

The Committee recommends that legislation be enacted to amend IC 8-10 to:
(1) clarify the potentially overlapping jurisdictions of the ports of Indiana and local port authorities; and
(2) address the rights and responsibilities of local port authorities established before the enactment of the legislation.

(over)

TIAS 10/16/13
Ex. M

Proposed Recommendation #3 (Soliday)

The Committee recognizes that the federal Passenger Rail Investment Improvement Act of 2008 requires states with passenger rail service lines of less then 750 miles to fund the lines' operating costs, and that only the executive branch and the budget committee may address the state of Indiana's assumption of financial responsibility for the Hoosier State line operated between Indianapolis and Chicago by the National Passenger Railroad Corporation (Amtrak). However, the Committee recommends that the creation of a long term subsidy for the Hoosier State line should be considered as a potential solution only after Amtrak submits a more viable business and service plan for review and analysis by the executive branch and the budget committee.

Proposed Recommendation #4 (DeLaney)

The Committee recommends that, not later than December 31, 2014, the Indiana department of transportation (INDOT) report to the Indiana General Assembly as to whether state and local transportation laws and ordinances, planning, and financing are properly balanced among highway, commuter, and air transportation. If, in preparing the report, INDOT determines that there is an imbalance, the Committee further recommends that INDOT propose solutions to create a better balance.

Proposed Recommendation #5 (DeLaney)

The Committee recognizes that the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) allows states to establish infrastructure revolving loan funds that may be capitalized with federal funds; that the 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21) does not allow new FY 2014 funding to capitalize these funds; and that the Indiana Code does not contain statutory authorization for the establishment of a state infrastructure bank, regardless of its capitalization. The Committee therefore recommends that legislation be enacted to establish a state infrastructure bank and to provide an ongoing source of revenue to the fund.