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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

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 undervalued. 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.

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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.

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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 undervalued. 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.

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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.

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 fatally 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).

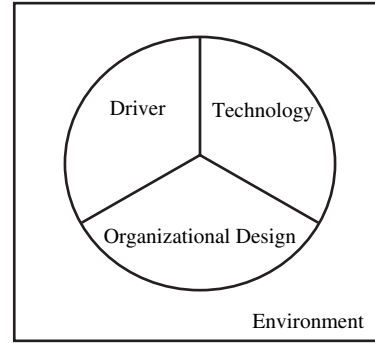


FIGURE 1 Socio-technical systems model (Emery and Trist 1960).

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. Schadow (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 multi-function 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 & Associates, 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.

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).

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 (<i>n</i> = 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

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

	<i>n</i>	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?

	<i>n</i>	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	<i>n</i>	Average	Range
Number with GPS	152	340	0–30,000
Number with AVL	125	129	0–15,000

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 5
DRIVER AND MONITOR ISSUES

	<i>n</i>	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	<i>n</i>	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	<i>n</i>	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	<i>n</i>	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)?

<i>n</i>	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)?

<i>n</i>	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)?

<i>n</i>	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)?

<i>n</i>	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)?

<i>n</i>	Average Responses “thorough”
186	5.7

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

Training	<i>n</i>	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

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.

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 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.

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 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

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 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

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

	Responses
Yes	147
No	9
Total	156

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



Peer Review for Synthesis Survey on School Bus Safety

June 20, 2008



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



Agenda

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



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



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



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



Survey Review (see email attachment)



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



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
 - Position Title:
- Other State Agency
 - Job Title:
- Transportation Specialist
- Contractor management beyond local operations
- Bus Attendant/Monitor
- Maintenance Supervisor
- Mechanic/Technician
- Routing Specialist/Dispatcher
- Instructor/Trainer
- School Bus Manufacturer
 - Position Title:
- School Bus Special Interest Group
 - Position Title:
- Federal Agency
 - Position Title:
- Transportation Researcher
 - Position Title:
- Other
 - 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)?

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Not at All Thorough</i>					<i>Very Thorough</i>	

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)?

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Not at All Thorough</i>					<i>Very Thorough</i>	

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@vti.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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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.


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-1, 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.



<p>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 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.</p>	
<p>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. <i>[Editor's note: Type D school buses are referred to as RE for "rear-engine," and FC for "forward control."]</i></p>	
<p>Type III vehicles are standard passenger vehicles, such as cars, small vans, SUVs, or station wagons.</p>	

APPENDIX F

Overall Safety Issues by Ranking

TABLE F1
OVERALL SAFETY ISSUES BY RANKING

	<i>n</i>	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