CTS Project Summary Report

Center for Transportation Safety
Texas Transportation Institute

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Project: Reducing School Bus Stop-Arm Violations in Texas for TxDOT Traffic Operations – Traffic Safety Section

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Reducing School Bus Stop-Arm Violations in Texas:

Pilot Test Results for the Application and Effectiveness of Digital Video Technology in Identifying School Bus Stop-Arm Violations

Approximately 35,000 public school buses transport over 1.4 million Texas children every day (Texas Department of Public Safety (DPS). School buses are one of the safest forms of transportation but children must take care when boarding or leaving the bus.

According to the National Highway Traffic Safety Administration (NHTSA), children are at greatest risk when they are getting on or off the school bus. Most of the children killed in bus-related crashes are pedestrians, five to seven years old. Nearly one-third of the deaths occur in the 10-foot area surrounding the school bus because of passing motorists who ignore the flashing red warning lights and disregard a bus' deployed stop-arm (NHTSA).

The potential for injury or death caused by motorists passing a stopped school bus with its red lights flashing and stop-armed extended is extremely high. All states have laws making the passing of a stopped school bus illegal (commonly called a "stop-arm" violation).

The penalty for a stop-arm violation also varies among states. In Texas, violators can be fined up to $1,000 for the first offense. A second conviction under the statute is a state jail felony.

For school bus drivers, this problem is not new. Drivers have long complained about motorists illegally passing their school bus, but proving that a violation occurred can be challenging. In many states, including Texas, a law enforcement officer must witness the violation in order to write a traffic citation.

The use of technology is an important tool in identifying stop-arm violators for targeted educational efforts and to provide information to law enforcement for the issuance of citations.

In the past, school districts have used stop-arm cameras mounted outside of the bus to capture information about vehicles passing the stopped bus such as make, model, color, and license plate number – all required evidence for issuing citations for stop-arm violations. High costs and legality issues prevented widespread use of these systems.

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Digital cameras installed on drivers' side to capture information about vehicles that illegally pass stopped school bus with stop-arm deployed.

"The availability and performance of digital video monitoring systems in potentially reducing stop-arm violations and improving school bus safety is still relatively unknown."

Significant improvements in the technology have resulted in computer-based digital video systems equipped with high resolution cameras, improved accessibility, and significantly lower costs.

The availability and performance of digital video monitoring systems in potentially reducing stop-arm violations and improving school bus safety is still relatively unknown.

This project was conducted to accomplish three major objectives: 1) document the magnitude of school bus stop-arm violations on a statewide basis; 2) evaluate and test the application and effectiveness of a mobile digital video camera monitoring system in identifying violators of the State stop-arm law; and 3) recommend strategies to address the stop-arm violation problem in Texas.

What We Did…

The Texas Department of Public Safety (DPS) School Transportation Unit conducted the first statewide survey of school bus violations in 2006. The survey was distributed to 1,254 public school districts and charter schools with instructions for school bus drivers to participate in the one day survey on November 8, 2006.

TTI researchers obtained the survey data from DPS, analyzed the data, and summarized the results to determine the magnitude of the stop-arm violation problem in Texas.

TTI also conducted a field evaluation to determine the potential application and use of school bus stop-arm cameras to document the stop-arm violation problem and help enhance school bus safety through the reduction of stop-arm violations. The evaluation included selecting a mobile digital video monitoring system for testing; developing a field test protocol; implementing the testing protocol; and evaluating the results.

Researchers conducted a review of mobile digital video camera systems and based on cost and system features selected the *Seon Explorer ™* for pilot testing. The system came equipped with four 12mm cameras, one lock box, one DVR unit, one 60 gigabyte (GB) hard drive and installation instructions and hardware.

The College Station Independent School District (CSISD) Transportation Services in College Station, Texas participated in the pilot test. The CSISD Transportation Services operates about 70 school buses over 53 routes, the majority of which are urban.

With the assistance of CSISD bus maintenance personnel, TTI installed the cameras, DVR unit and lockbox on the bus. Two cameras were mounted on the driver's side and one camera mounted on the inside of the bus facing forward to view activity from the front bus window. A fourth camera was mounted facing forward on the passenger side of the bus to record the bus door opening and closing. The recording unit was installed inside a lock box and mounted to the bus dashboard.

A red "panic" button was also installed on the driver's side dash board for the driver to push if a stop-arm violation was observed. The system was set up to automatically start recording at the beginning and end of the AM and PM bus routes. Data collection took place between April-May, 2008.

What We Found…

Magnitude of Stop-Arm Violations

About 60% of the school districts and charter schools participated in the one day survey reporting a total of 12,850 school bus stop-arm violations on November 8, 2006.

Findings reveal no particular pattern regarding time of day in which the violation occurred as 47% of the illegal passings happened during the morning hours (6am-10am) while 53% occurred in the afternoon (2pm-6pm).

The majority (58%) of violations occurred while the motorist was traveling in the opposite direction (coming toward) the stopped school bus. In more than one-third of the violations (38%) the motorist was traveling in the same direction as the stopped school bus.

Just over one half (53%) of all reported stop-arm violations occurred on two-lane roadways. In addition, 13% of all stop-arm violations happened on four-lane roadways with a median.

Most motorists were observed passing the left side of the bus (80%). Surprisingly, 11% of the motorists passed the stopped school bus on the right side. Due to data limitations; however, it is not possible to determine if the right-side violation occurred in a right-turn lane adjacent to the stopped school bus.

Statewide estimates were calculated by multiplying the reported number of violations per bus (12,850/27,258) times the total number of school buses in operation in Texas (35,000). Statewide, an estimated 16,450 illegal passings occur each day. This translates into an estimated 2.96 million stop-arm violations that occur during a typical school year (180 days) in Texas. These estimates translate into significant risks for our children.

Field Evaluation

Over the 4-week data collection period, a total of 33 stop-arm violations were recorded. If the same method to estimate daily stop-arm violations statewide is applied to the pilot test data, an estimated 50 illegal passings occur each day in the College Station ISD. This translates to an estimated 9,072 stop-arm violations each school year.

More than one half of all violations occurred during the morning routes (54%). Most stop-arm violations occurred on 4-lane roadways with a center turn lane (14 violations) and 4-lane roadways with a median (10 violations). The majority of passings occurred while the motorist was traveling in the opposite direction (coming toward) the stopped school bus. Vehicle make and model were easily identifiable from the video.

Out of the 33 recorded violations, only one license plate number was readable. In the test system, the size of the camera lens (12mm) and the position on the bus (high) made it difficult to read most license plate numbers from passing vehicles.

To adequately read vehicle license plate numbers would require cameras positioned toward multiple lanes and capable of reading license plate numbers from longer distances.

Overall, the Seon system tested performed well and was capable of recording high quality video to monitor the incidence of stop-arm violations.

System cameras performed well in recording high quality color images of vehicles that passed stopped school buses with their stop-arms extended easily identifying information about the vehicle such as make, model, color, and direction of travel.

Images of vehicles captured illegally passing a stopped school bus with the stop-arm deployed.

For More Details:
The research is documented in:

"Reducing School Bus Stop-Arm Violations in Texas: Pilot Test Results for the Application and Effectiveness of Digital Video Technology in Identifying School Bus Stop-Arm Violations".

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However, license plate numbers of passing vehicles could not be read. This information is essential for obtaining driver information for targeted public education and enforcement efforts.

What Research Recommends…

Some of the major recommendations based on the study outcomes include:

- Continue to monitor the incidence of stop-arm violations by conducting annual stop-arm surveys.
- Develop a comprehensive program to reduce the statewide incidence of stop-arm violations.
- Develop PI&E materials to educate the public about stop-arm violations and the consequences of violating the law.
- Conduct further testing to evaluate technologies and / or cameras capable of capturing license plate information from vehicles that illegally pass stopped school buses so that drivers can be identified.

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