

**NATIONAL TRANSPORTATION SAFETY BOARD**  
**Public Meeting of May 22, 2018**  
**(Information subject to editing)**

**Special Investigation Report**  
**School Bus Transportation Safety, Baltimore, Maryland, November 1, 2016,**  
**and Chattanooga, Tennessee, November 21, 2016**

**NTSB/SIR-18/02**

This is a synopsis from the NTSB's report and does not include the Board's rationale for the conclusions, probable cause, and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing to reflect changes adopted during the Board meeting.

## **Executive Summary**

School bus travel is one of the safest forms of transportation in the United States. Every day, nearly 600,000 buses carry more than 25 million students to and from school and activities. Children are safer traveling in school buses than in any other vehicle.

Although school buses are extremely safe, the National Transportation Safety Board (NTSB) continues to investigate school bus crashes in which fatalities and injuries occur. Improved oversight of school bus drivers and enhancements to school bus design—such as installation of passenger lap/shoulder belts, electronic stability control, and automatic emergency braking—could prevent or mitigate such crash outcomes.

In November 2016, the NTSB began the investigation of two multifatality crashes involving school buses. Each crash was initiated when the driver lost control of the school bus. In the November 1 crash in Baltimore, Maryland, the driver was epileptic and suffered a seizure. In the November 21 crash in Chattanooga, Tennessee, the driver was speeding while using a cell phone and ran off the road. In both cases, the school bus operators were private for-hire motor carriers performing contracted student transportation services. Although the specific safety issues differed, the crashes shared one common factor: poor driver oversight by both the school districts and the contracted motor carriers, which resulted in unsafe operation of the school buses.

This special investigation report focuses on:

- School districts' lack of oversight of student transportation service providers (Baltimore, Chattanooga).

- Poor management of unsafe school bus drivers by the motor carriers and school districts (Baltimore, Chattanooga).
- Medically unfit school bus drivers (Baltimore).
- Commercial driver license fraud in Maryland (Baltimore).
- Large school bus occupant protection (Chattanooga).
- Electronic stability control, automatic emergency braking, and event data recorders (Baltimore, Chattanooga).

## **PROBABLE CAUSES**

### *Baltimore, Maryland*

The National Transportation Safety Board determines that the probable cause of the *Baltimore, Maryland*, school bus crash was (1) the loss of vehicle control due to incapacitation of the bus driver because of a seizure stemming from a long-standing seizure disorder; (2) the bus driver's continued operation of a school bus with a disqualifying medical condition and a fraudulently obtained commercial driver's license; and (3) the failure of AAAfordable Transportation and the Baltimore City Public Schools to provide adequate bus driver oversight, allowing the medically unfit driver to drive a commercial vehicle with a medical condition that they knew, or should have known, could lead to the unsafe operation of the school bus. Contributing to the severity of the crash was the lack of a collision avoidance system with automatic emergency braking on the school bus.

### *Chattanooga, Tennessee*

The National Transportation Safety Board determines that the probable cause of the *Chattanooga, Tennessee*, crash was (1) the school bus driver's excessive speed and cell phone use, which led to the loss of vehicle control; (2) Durham School Services' failure to provide adequate bus driver oversight, allowing an inexperienced driver to operate a commercial vehicle with escalating risky driving behaviors that it knew, or should have known, could lead to the unsafe operation of the school bus; and (3) the Hamilton County Department of Education's lack of followup to ensure that Durham had addressed a known driver safety issue. Contributing to the severity of the crash was the lack of passenger lap/shoulder belts on the school bus.

## Baltimore Findings

1. None of the following were primary or contributing factors in the Baltimore, Maryland, crash: (1) distraction, substance impairment, or fatigue for either of the two bus drivers; (2) licensing or experience of the transit bus driver; (3) medical condition of the transit bus driver; (4) mechanical condition of the school bus or transit bus; (5) weather; or (6) roadway lighting or conditions.
2. The Baltimore school bus driver was likely incapacitated by a seizure due to his long-standing seizure disorder, which resulted in collisions with the car and the transit bus.
3. The Baltimore school bus driver had fraudulently obtained his driver's license by providing documents with different name spellings or birth dates to circumvent the Maryland Motor Vehicle Administration verification system.
4. The Maryland Motor Vehicle Administration verification system failed to prevent the Baltimore school bus driver from obtaining a driver's license through fraudulent means.
5. The Maryland Motor Vehicle Administration facial recognition program can help prevent persons identified as unqualified for licensure from continuing to operate a commercial motor vehicle under a fraudulently obtained license or from obtaining a commercial driver's license through fraudulent means.
6. The Baltimore school bus driver understood his diagnosis of epilepsy and intentionally hid the disqualifying medical condition and use of treatment medications during his commercial driver medical examinations to prevent denial of certification.
7. The Concentra, Inc., forms used to collect additional information provide an opportunity for certified medical examiners to learn from treating health-care providers of the conditions that a driver has omitted from his or her medical history.
8. Although a certified medical examiner may use the *391.41 Driver Medication Form* to record medications a driver is using to assist in determining certification status, the form does not specifically address medications that indicate a potentially impairing condition or conditions that may be directly hazardous.
9. Nonphysician health-care providers and non-law-enforcement first responders are a potentially valuable, but underutilized, resource in the reporting of drivers with medical conditions.
10. School districts and their contracted student transportation service providers would benefit from awareness training on federal and state commercial driver fitness regulations and the avenues available to report drivers with medical conditions that may make it unsafe to operate a school bus.
11. To improve the frequency with which health-care providers address the safety risks of seizures, particularly with respect to driving, electronic health records should be configured with reminders of specific data, such as the patient's occupation.

12. AAAfordable Transportation exercised poor driver safety oversight by allowing a known medically unfit driver to operate a school bus for 5 consecutive days leading up to, and including, the day of the Baltimore crash.
13. Although Baltimore City Public Schools was responsible for driver oversight, it failed to address multiple deficiencies and to identify the bus driver as high risk.
14. Had the newly manufactured Baltimore school bus been equipped with a forward collision avoidance system with automatic emergency braking, the initial impact with the car would likely have been mitigated; and the subsequent impact between the school bus and the transit bus would not have occurred.
15. With the continued lack of standards and requirements for heavy vehicle event data recorders, crash data valuable to better understand highway collisions and to improve highway safety continue to go unrecorded.
16. In the Baltimore crash, the engine control module recorded no useful crash-related data, because it lacked the secondary function of event data recording.

## **Chattanooga Findings**

1. None of the following were primary or contributing factors in the Chattanooga, Tennessee, crash: (1) school bus driver licensing or medical certification; (2) substance impairment, medical condition, or driver fatigue; (3) mechanical condition of the school bus; (4) weather; or (5) roadway design or conditions.
2. At the accident speed of 52 mph, the Chattanooga bus would have been operating at close to the limits of its cornering capability as it entered the curve; and, if the driver had to suddenly increase steering for any reason while in the curve, the bus could quickly exceed the limits of its cornering capability and become difficult to control.
3. The high speed of the Chattanooga school bus through the curve was the primary contributing factor to the loss of vehicle control.
4. The failure of the Chattanooga school bus driver to initially react with an appropriate steering input as the bus entered the right curve too fast resulted in the bus departing the roadway and the loss of control, followed by the left overcorrecting steering input—which led to the bus rollover and crash.
5. In attempting to control student behavior, the Chattanooga school bus driver had previously operated the bus in a manner that caused passengers to fall or be thrown from their seats, and his precrash steering behaviors and speeding were consistent with these unsafe driving patterns.
6. The driver's cell phone use while operating the Chattanooga school bus increased his crash risk and impaired his ability to control the bus.
7. The Chattanooga school bus driver's speeding—combined with his use of a cell phone while driving—led to the vehicle loss-of-control, run-off-the-road, and rollover crash.
8. The Hamilton County Department of Education failed to follow up to determine the outcome of driver-related complaints and remove an unsafe driver from transporting county students.

9. Durham School Services (1) did not adhere to established policies and procedures for handling school bus driver disciplinary issues; (2) lacked a systematic and detailed process to manage complaints or allegations concerning its drivers; and (3) was, therefore, deficient in driver oversight.
10. Durham School Services failed to resolve complaints so as to remediate the bus driver's risky driving behavior, and to intercede and remove him from operating the school bus—even though some Durham supervisors were aware of the numerous complaints of his mishandling of student discipline, including unsafe driving behaviors.
11. The Chattanooga school bus passengers were at risk due to the precrash vehicle motions that threw them from their seating compartments prior to the bus striking the utility pole and during the rollover sequence, rendering compartmentalization ineffective.
12. Properly worn lap/shoulder belts provide the highest level of protection for school bus passengers in all crash scenarios, including frontal, side, and rear impacts—and rollovers.
13. Had the vehicle instability—caused by the Chattanooga bus driver's excessive speed and steering input—occurred in a newly manufactured school bus equipped with an electronic stability control system, the technology could have assisted the driver in maintaining vehicle control and mitigated the severity of the crash by reducing the speed of the vehicle.
14. With the continued lack of standards and requirements for heavy vehicle event data recorders, crash data valuable to better understand highway collisions and to improve highway safety continue to go unrecorded.

## **RECOMMENDATIONS**

As a result of this special investigation report, the NTSB makes safety recommendations to the Federal Motor Carrier Safety Administration; the National Highway Traffic Safety Administration (NHTSA); the states of Florida, Louisiana, New Jersey, and New York; 42 states, the District of Columbia, and the territory of Puerto Rico—which lack requirements for lap/shoulder belts on large school buses; the state of Maryland; the Maryland Department of Education; the Maryland Motor Vehicle Administration; the National Association of State Directors of Pupil Transportation Services, National Association for Pupil Transportation, National School Transportation Association, American School Bus Council, and Maryland School Bus Contractors Association; National Express LLC; school bus manufacturers Blue Bird Corporation, Collins Industries, Inc., IC Bus, Starcraft Bus, Thomas Built Buses, Trans Tech, and Van-Con, Inc.; electronic health record companies Epic, Cerner Corporation, eClinicalWorks, MEDITECH, and NextGen Healthcare; and Concentra, Inc. The report also reiterates four recommendations to NHTSA and reclassifies a recommendation to the Baltimore City Public Schools.

### **New Recommendations**

As a result of these investigations, the National Transportation Safety Board makes the following new safety recommendations:

**To the Federal Motor Carrier Safety Administration:**

1. Provide explicit guidance to encourage certified medical examiners to request a complete list of current medical conditions and medications when obtaining supplemental information from a commercial driver's treating health-care provider.

**To the National Highway Traffic Safety Administration:**

2. Require all new school buses to be equipped with collision avoidance systems and automatic emergency braking technologies.

**To the states of Florida, Louisiana, New Jersey, and New York:**

3. Amend your statutes to upgrade the seat belt requirement from lap belts to lap/shoulder belts for all passenger seating positions in new large school buses in accordance with Federal Motor Vehicle Safety Standard 222.

**To the states of Alabama, Alaska, Arizona, Colorado, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming; the commonwealths of Kentucky, Massachusetts, Pennsylvania, and Virginia; the District of Columbia; and the territory of Puerto Rico:**

4. Enact legislation to require that all new large school buses be equipped with passenger lap/shoulder belts for all passenger seating positions in accordance with Federal Motor Vehicle Safety Standard 222.

**To the state of Maryland:**

5. To help prevent driver license fraud, continue the facial recognition program beyond 2019.

**To the Maryland State Department of Education:**

6. Publicize to the state school districts and school bus communities the methods available for individual reporting of school bus drivers with medical conditions that may affect their ability to safely operate a school bus.

**To the Maryland Motor Vehicle Administration:**

7. Process all current commercial driver's license holders through the facial recognition software system to detect those drivers who may hold fraudulent licenses.

8. Assess the volume of referrals by nonphysician health-care providers and first responders (other than law enforcement) to determine whether improved outreach and adjustments to current reporting methods may increase their reporting of medically at-risk drivers.
9. Publicize to the state school districts and school bus communities the methods available for individual reporting of school bus drivers with medical conditions that may affect their ability to safely operate a school bus.

**To the National Association of State Directors of Pupil Transportation Services, National Association for Pupil Transportation, National School Transportation Association, American School Bus Council, and Maryland School Bus Contractors Association:**

10. Inform your members of the circumstances of the Baltimore, Maryland, school bus crash and lessons learned from the crash investigation to help raise awareness of the avenues available to report school bus drivers with medical conditions that may make it unsafe for them to operate a school bus.

**National Express LLC:**

11. Implement a process to track driver complaints from initial call to case resolution throughout your student transportation service provider companies, including Durham School Services.
12. Use industry best practices to establish resolution accountability for serious or recurring safety violations, to include effective remediation of unsafe driver behavior.

**To Blue Bird Corporation, Collins Industries, Inc., IC Bus, Starcraft Bus, Thomas Built Buses, Inc., Trans Tech, and Van-Con, Inc.:**

13. Install a collision avoidance system with automatic emergency braking as standard equipment on all newly manufactured school buses.

**To IC Bus:**

14. Develop and implement engine recording features for the event data recorder in the engine control module for newly manufactured school buses.

**To Epic, Cerner Corporation, eClinicalWorks, MEDITECH, and NextGen Healthcare:**

15. Develop decision support for the evaluation of nontraumatic loss of consciousness episodes or for a diagnosis of epilepsy that will notify providers of the patient's occupation, such as commercial driver; and remind them to address the occupational and driving status of the patient, including the opportunity to inform the state licensing agency of concerns about the patient's driving.

**To Concentra, Inc.:**

16. To better document medical issues identified during commercial driver license examinations, revise your medical information request forms provided to consultants or treating providers to also include specific requests for a complete list of current medical conditions and medications.

**Previously Issued Recommendations**

The National Transportation Safety Board issued the following recommendations in a March 2017 highway safety recommendation report (NTSB 2017b).

**To the Baltimore City Public Schools:**

Request that the Maryland State Department of Education have an independent and neutral third party conduct a performance audit of your transportation department that includes a review of crash reports and of disqualifying conditions for school bus drivers under *Code of Maryland Regulations* section 13A.06.07.07. (H-17-13) (Urgent)

Safety Recommendation H-17-13 is reclassified from “Open—Acceptable Response” to “Closed—Acceptable Action.”

As soon as the performance audit referenced in Safety Recommendation H-17-13 is complete, take the corrective actions recommended to improve internal controls and ensure that all school bus drivers meet the qualification standards under *Code of Maryland Regulations* sections 13A.06.07.06–.07 and that they do not pose any safety risks. (H-17-14)

Safety Recommendation H-17-14 is classified “Open—Acceptable Response.”

**To the Maryland State Department of Education:**

Review and modify the *Code of Maryland Regulations* section 13A.06.07.07, “School Vehicle Driver Disqualifying Conditions and Termination,” to clarify the definitions of disqualifying conditions, and to require notification to the Maryland State Department of Education of all drivers who are determined to be not qualified during pre-employment screening. (H-17-15)

Safety Recommendation H-17-15 is classified “Open—Acceptable Response.”



## **Previously Issued Recommendations Reiterated in This Report**

As a result of its investigation, the National Transportation Safety Board reiterates the following safety recommendations.

### **To the National Highway Traffic Safety Administration:**

Develop and implement, in cooperation with other government agencies and industry, standards for on-board recording of bus crash data that address, at a minimum, parameters to be recorded, data sampling rates, duration of recording, interface configurations, data storage format, incorporation of fleet management tools, fluid immersion survivability, impact shock survivability, crush and penetration survivability, fire survivability, independent power supply, and ability to accommodate future requirements and technological advances. (H-99-54)

Require that all buses above 10,000 pounds gross vehicle weight rating be equipped with on-board recording systems that: (1) record vehicle parameters, including, at minimum, lateral acceleration, longitudinal acceleration, vertical acceleration, heading, vehicle speed, engine speed, driver's seat belt status, braking input, steering input, gear selection, turn signal status (left/right), brake light status (on/off), head/tail light status (on/off), passenger door status (open/closed), emergency door status (open/closed), hazard light status (on/off), brake system status (normal/warning), and flashing red light status (on/off; school buses only); (2) record status of additional seat belts, airbag deployment criteria, airbag deployment time, and airbag deployment energy; (3) record data at a sampling rate sufficient to define vehicle dynamics and be capable of preserving data in the event of a vehicle crash or an electrical power loss; and (4) are mounted to the bus body, not the chassis, to ensure recording of the necessary data to define bus body motion. (H-10-7)

Develop stability control system performance standards for all commercial motor vehicles and buses with a gross vehicle weight rating greater than 10,000 pounds, regardless of whether the vehicles are equipped with a hydraulic or a pneumatic brake system. (H-11-7)

Once the performance standards from Safety Recommendation H-11-7 have been developed, require the installation of stability control systems on all newly manufactured commercial vehicles with a gross vehicle weight rating greater than 10,000 pounds. (H-11-8)