



National Transportation Safety Board

Washington, D.C. 20594

Highway Accident Brief

Accident No.: HWY-08-FH-018
Accident Type: School bus struck in left rear by automobile, loss of control, and rollover
Location: Interstate 10, ten miles east of Milton, Florida
Date and Time: May 28, 2008, 9:30 a.m. central daylight time
Vehicle One: 2002 Bluebird/International 65-passenger school bus
Motor Carrier: Okaloosa County School District
Occupants: Driver and 17 passengers (14 children and 3 adults)
Injuries: 2 serious and 14 minor; 2 uninjured
Vehicle Two: 2002 Chevrolet Tahoe 4-door sport utility vehicle
Operator: Private owner
Occupant: Driver
Injuries: None

Accident Description

About 9:30 a.m. on Thursday May 28, 2008, a 2002 Bluebird/International 65-passenger school bus operated by the Okaloosa County School District, transporting 14 third-grade students, 3 adult passengers, and the 60-year-old bus driver on a school-sponsored field trip, was traveling westbound on Interstate 10 (I-10). Also known as Florida State Route 8 at the accident location, I-10 is a two-way, four-lane divided highway, approximately 10 miles east of Milton, Florida. The school bus had departed from the Walker Elementary School and was en route to the National Naval Aviation Museum in Pensacola, Florida.

The school bus was traveling in the right traffic lane at the vehicle's governed maximum speed of 55 mph when, for unknown reasons, the bus driver drifted partially into the left lane of I-10 westbound. At the same time, a 2002 Chevrolet Tahoe was traveling westbound in the left lane at a driver-estimated speed of 70–75 mph. As the Tahoe was passing the school bus, and the school bus drifted into the left lane, the Tahoe's right-front bumper struck the left-rear bumper of the bus. The roadway is flat, and the posted speed limit is 70 mph at the accident location. (See figure 1.)

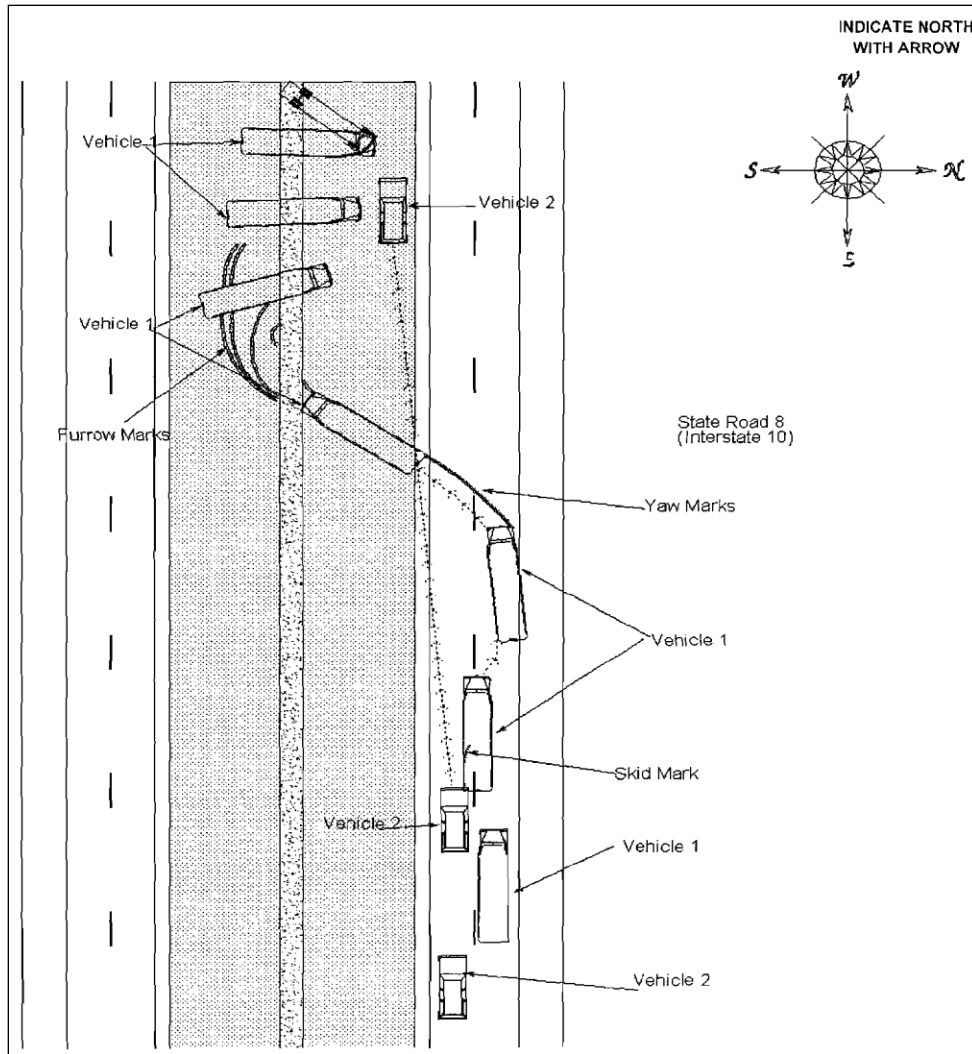


Figure 1. Police scene drawing of accident vehicle dynamics. (Source: Florida Highway Patrol.)

As a result of the impact and difference in vehicle bumper heights, the right-front bumper of the Tahoe became snagged on the left-rear bumper corner of the school bus, and both vehicles remained in contact for approximately 17–18 feet.¹ As a result of the impact from the rear by a vehicle traveling at a higher rate of speed, the school bus veered back into the right lane and dragged the Tahoe into the right lane, where the vehicle’s bumper then separated. The Tahoe slowed and continued forward onto the left shoulder and grass median of I-10, while the school bus passed the Tahoe and continued onto the left shoulder and grass median and began to yaw counterclockwise. Furrow marks in the center median indicate that, after the bus entered the median, it began to rotate clockwise as it reached the center of the median. After the front-left tire of the school bus began to plow into the earthen median, the bus overturned. Physical evidence at the scene indicated that the bus rolled over at least twice (720 degrees) before

¹ Based on tire marks found on the road from the locked Tahoe right-front tire.

coming to final rest. In addition, the bus body separated from the chassis at a point just beyond the engine unit rearward. (See figure 2.)



Figure 2. Final rest position of bus body and chassis.

The Florida Highway Patrol traffic accident report indicated that neither driver was under the influence of alcohol or drugs at the time of the accident. The accident report noted “Improper Lane Change” by the school bus driver as a contributing cause to the accident.

Investigators from the National Transportation Safety Board (NTSB) travelled to the accident site to examine the effectiveness of seat belts in school bus rollover accidents. The NTSB investigators and the investigating officer examining the scene found physical evidence in the westbound lanes, including a tire mark that the investigating officer identified as being from the Tahoe’s right-front tire. According to the officer, this tire mark was caused by the impact between the Tahoe and the school bus. The tire mark began in the right side of the left lane and veered slightly into the right lane.

When interviewed by NTSB investigators, the school bus driver recalled that her first indication that something was wrong was when she heard a “pop like a tire blew.” The driver stated that, almost immediately, the school bus veered to the right and then to the left as she attempted to correct by turning the steering wheel to the left. When asked, the driver said that she did not recall the school bus drifting into the left lane and had not observed the Chevrolet Tahoe in the left lane before the accident.

As a result of the accident, the lap/shoulder-belted school bus driver and one lap-belted student on the school bus sustained serious injuries; the three adult passengers and the 13 other students, all of whom were secured by lap belts, received minor or no injuries. The driver of the Tahoe was uninjured. The students were transported to three area medical facilities via ambulance, where they were examined, treated, and released. The school bus driver and one student passenger were transported via Medevac helicopter.

Seat Belts in Rollover Accidents

Florida statute (316.6145) requires that school buses purchased after December 31, 2000, be equipped with safety belts or another restraint approved by the Federal government. The statute also requires that school bus passengers wear a properly adjusted and fastened safety belt while the bus is in operation, if the bus is so equipped. According to the bus driver, she and an adult chaperone confirmed that the students were wearing their lap belts prior to departure.

In its 1999 special report on bus crashworthiness,² the NTSB addressed protection for school bus occupants and recommended that the National Highway Traffic Safety Administration (NHTSA) do the following:

In 2 years, develop performance standards for school bus occupant protection systems that account for frontal impact collisions, side impact collisions, rear impact collisions, and rollovers. (H-99-45)

Once pertinent standards have been developed for school bus occupant protection systems, require newly manufactured school buses to have an occupant crash protection system that meets the newly developed performance standards and retains passengers, including those in child safety restraint systems, within the seating compartment throughout the accident sequence for all accident scenarios. (H-99-46)

In a rollover accident, a vehicle's restraint system acts to keep occupants in their seating compartments, away from other occupants and other surfaces that may cause injury, and to reduce the risk of ejection from the vehicle. Lap belts function by restraining the pelvis, but the upper body is still free to rotate about the pelvis. In its final rule on school bus crash protection,³ NHTSA estimated that lap/shoulder belts in school buses may reduce rollover fatalities by 74 percent. NHTSA further noted that lap belts are almost as effective as lap/shoulder belts in rollover crashes. However, because NHTSA did not mandate an occupant protection system that would maintain occupants in their seating area in real-world accidents such as rollovers, the

² *Bus Crashworthiness*, Highway Special Investigation Report NTSB/SIR-99/04 (Washington, DC: National Transportation Safety Board, 1999).

³ Department of Transportation, National Highway Traffic Safety Administration, "49 CFR Part 571—Federal Motor Vehicle Safety Standards; Seating Systems, Occupant Crash Protection, Seat Belt Assembly Anchorages, School Bus Passenger Seating and Crash Protection; Final Rule," *Federal Register*, vol. 73, no. 204 (October 21, 2008), pp. 62750 and 62752.

NTSB classified NHTSA’s response to Safety Recommendation H-99-46 as “Closed—Unacceptable Action” and Safety Recommendation H-99-45 as “Open—Acceptable Response.”⁴

Passenger seating in the accident school bus was arranged into 11 rows with three passengers per seat on each side of the bus, except for the last seat on the left side, which was designed for two occupants to provide adequate space for the rear emergency exit door. (See figure 3.) Both the two-person and three-person seats were equipped with IMMI lap belts⁵ for each seating position. The driver’s seat was equipped with an IMMI lap/shoulder belt.

The school bus driver sustained serious hand injuries, which were caused when the bus body partially separated from the chassis and the instrument panel shifted, trapping the right hand of the bus driver. (See table 1.) She also sustained a right rib fracture, which most likely resulted from seat belt loading.

Two passengers (9-year-olds in seats 9F and 10E) reported that they either slipped out from under the lap belt or that the belt unlatched during the overturn sequence. Both reported that they wore the lap belt loosely, which may have permitted enough movement during the vehicle’s 720-degree rollover to allow occupants to become free of the lap belt. Only one of these two passengers (seat 10E) sustained serious injuries, which included a clavicle fracture, a fracture to the humeral head, and scalp lacerations. The other passenger (seat 9F) sustained minor contusions, lacerations, and knee sprains. None of the bus passengers, including these two passengers, were ejected from the school bus during the overturn sequence.

Table 1. Injuries.

Injury Type	Bus Driver	Schoolbus Passengers	Tahoe Driver	Total
Fatal	0	0	0	0
Serious	1	1	0	2
Minor	0	14	0	14
None	0	2	1	3
Total	1	17	1	19

Title 49 *Code of Federal Regulations* (CFR) 830.2 defines a fatal injury as any injury that results in death within 30 days of the accident. It defines a serious injury as an injury that requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; results in a fracture of any bone (except simple fractures of the fingers, toes, or nose); causes severe hemorrhages, or nerve, muscle, or tendon damage; involves any internal organ; or involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

⁴ The Board’s vote on the status of Safety Recommendation H-99-45 was split, with two members voting “Closed—Acceptable Alternate Action” and two members voting “Closed—Unacceptable Action.” As a result of the split vote, Safety Recommendation H-99-45 remained “Open—Acceptable Response.”

⁵The label on the lap belt webbing indicated that these lap belts conformed to Federal Motor Vehicle Safety Standards 209 and 302. In addition, the manufacture dates ranged from October to December 2001.

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ICAO* INJURY LEGEND	
N = None	
M = Minor	
S = Serious	
F = Fatal	
F = FEMALE M = MALE # = AGE <small>*International Civil Aviation Organization</small>	
SAMPLE	
INJURY LEVEL	_____
AGE	_____
GENDER	_____
	F-14 : Minor
Source: NTSB	

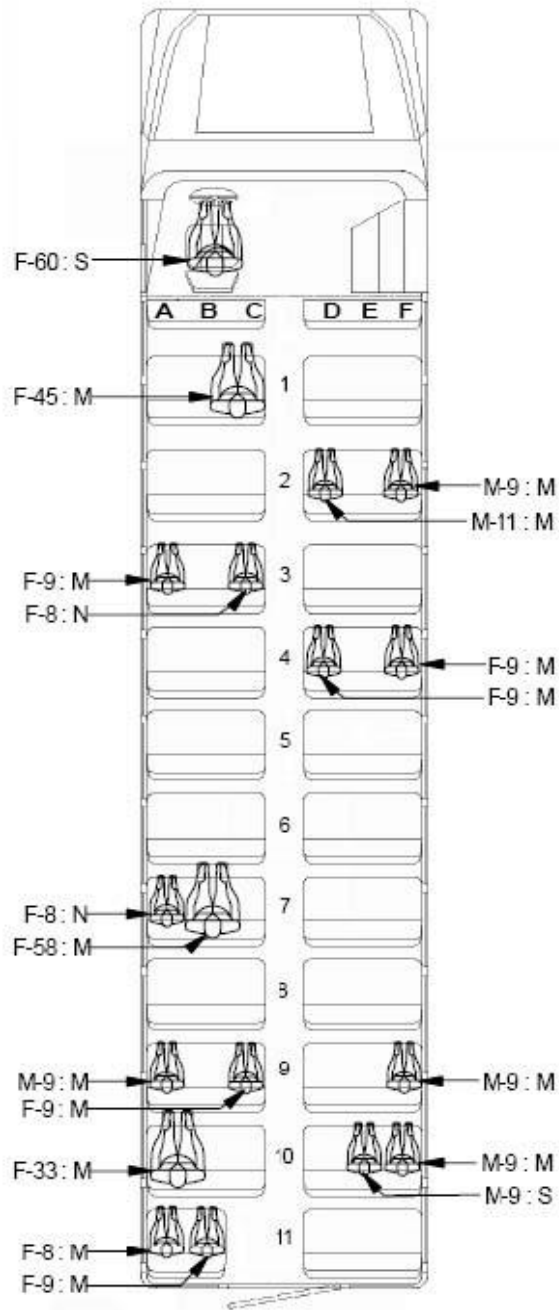


Figure 3. Bus seating chart.

The remaining passengers sustained either minor or no injuries. The minor injuries were consistent with the use of lap belts in a rollover crash with little intrusion into the occupant space. These injuries generally included minor head abrasions, contusions, or lacerations, and minor hip and pelvis abrasions.

The NTSB has investigated numerous large school bus rollover accidents, including an August 14, 1996, accident in Flagstaff, Arizona,⁶ that is comparable to the Milton, Florida, accident. The Flagstaff school bus was carrying a driver and 31 passengers. Both the Flagstaff and Milton buses were traveling at highway speeds (55 and 65 mph, respectively), and both drivers overcorrected to the left after different initiating events, in which the vehicles rolled over in the center median strip. The Flagstaff bus rolled 1 ¼ times (450 degrees), while the Milton bus rolled at least two times (720 degrees).

The Flagstaff school bus was not equipped with any form of passenger restraints; the driver's position was equipped with a lap belt. During the overturn sequence, five passengers were ejected from the bus. Of these ejected occupants, one suffered a severe head injury requiring long-term care and another sustained a cervical spine injury resulting in quadriplegia. In total, the driver and four passengers sustained serious injuries. The remaining passengers sustained minor or no injuries.

In the Milton accident, only one passenger (who may have slipped out of a loosely worn belt) and the driver sustained serious injuries, and these injuries are unlikely to require long-term care. No passengers were ejected from the bus during the Milton overturn sequence.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the Milton, Florida, accident was the school bus driver's failure, for undetermined reasons, to maintain her traffic lane, which resulted in the bus being struck from behind when it drifted into the left lane and into the path of an oncoming faster-moving vehicle. **Injury severity was mitigated by the use of lap belts.**

Adopted: November 12, 2009

⁶ NTSB accident number WRH-96F-H014.