

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

Mr. Henry Gray, Director
Arkansas Highway and Transportation
Department
P.O. Box 2261
Little Rock, Arkansas 72203

SAFETY RECOMMENDATION(S)

H-83-7 through -9

About 5:40 a.m. on March 25, 1983, a Jonesboro School District schoolbus was traveling westbound on State Highway 214 near Newport, Arkansas. The schoolbus was transporting 31 high school students and 7 teacher-supervisors from the Vocational-Technical Training Center in Jonesboro, Arkansas, to the Annual State Skills Olympics in Little Rock, Arkansas. The sky was clear, the road was dry, and the sun was just below the horizon. ^{1/} As the schoolbus entered a sharp, 200-foot-radius, 230-foot-long curve leading to a T-intersection with State Highway 18, it slid out across the centerline and onto the opposing lane's shoulder, continued to yaw and slide across Highway 18, overturned, and struck the top edge of a roadside drainage ditch. The teacher-driver, 4 other teachers, and 4 students were killed, and 2 teachers and 27 students were injured.

State Highway 214 is a relatively straight highway for about 9 miles before the curve at the accident site, with an unposted speed limit of 55 mph. According to the Arkansas Highway and Transportation Department (AHTD), this curve was constructed about 6 years ago when the intersection was redesigned to improve sight distance for drivers of vehicles entering State Highway 18. The current traffic control system on the approach to the curve consists of:

- (1) A solid yellow centerline for westbound State Highway 214 traffic that begins about 885 feet before the curve and extends through the curve.
- (2) A combination "curve" warning and 35-mph advisory speed sign located about 870 feet before the beginning of the curve.
- (3) A "Junction, State Highway 18" sign located about 595 feet before the beginning of the curve.
- (4) A "stop ahead" warning sign located about 250 feet before the beginning of the curve.
- (5) A 2-foot-high by 4-foot-wide sign with a large arrow (pointing right) located on the opposing lane shoulder edge in the curve. This sign is directly in line with the centerline of State Highway 214 on the approach to the curve.

^{1/} Civil twilight occurred at 5:34 a.m. This is the time of minimum sky illumination required to carry on normal work out-of-doors. Witnesses reported that the sky was daylight in color, surface features were somewhat muted, and it was probably advisable to use headlights when driving. The bus headlights were on high beam.

A stop sign is located at the end of State Highway 214 where it intersects with State Highway 18. According to the AHTD, other highways in the State have been constructed, marked, and signed in a similar manner.

Prior to this schoolbus accident, the AHTD had received only two police reports of property-damage-only accidents occurring at this curve over a 6-year period. 2/ One accident involved a pickup truck that ran off the road in the curve and rolled over; the pickup driver reported that she could not see well because of an early morning fog. The second accident involved a car that traveled the same path as the schoolbus, but did not roll over. The car driver reported that he did not see the curve until it was too late because he was involved in flashing his lights at an oncoming vehicle with its high beams on. The car driver said that the oncoming vehicle was actually operating eastbound on State Highway 18. This illusion of an oncoming vehicle on State Highway 214 can occur because both highways are oriented along the same line and direction before they both curve to the north and intersect. While this illusionary problem could have been discovered from an examination of the latter accident report, the low reported accident rate of two accidents in 6 years would not have indicated to the AHTD any need for a detailed analysis of the accident reports or the accident location. It was only after the schoolbus accident focused attention on the curve that several local residents reported an extensive accident history at this location.

At a March 29, 1983, public hearing that was held by the AHTD at the request of these residents, 25 of 100 attendees reported that they had personally assisted people involved in other accidents at the curve. Safety Board investigators interviewed the current and previous owners of a store located at the curve, an employee at that store, and residents of a house near the curve. Collectively, the two store owners said that about 200 property-damage-only/loss-of-control/emergency maneuver accidents or incidents had occurred at the curve over the past 6 years. In addition, two to three times a day, persons at the store would hear tires squealing from vehicles that were apparently making emergency maneuvers around the curve or sliding to a stop at the stop sign. The Safety Board found relatively fresh tire marks from two previous incidents during its 5-day, onscene investigation of the schoolbus accident, indicating that such incidents were occurring, but probably not to the extent being reported by some residents.

Local residents reported that most of the accidents or incidents occurred at night and over the weekend. There appeared to be fewer incidents during inclement weather, perhaps due to lower traffic volumes or operating speed, according to residents. Cars and pickup trucks were usually involved, but one store owner said he had towed at least three tractor-semitrailers out of the ditch at the curve. Most of the accidents or incidents were said to have involved persons who were not familiar with the site, but five area residents said they had an accident or incident at the curve. Several of the accidents were said to have involved young drivers, drivers who had been traveling above the speed limit, and drinking drivers. Residents also reported that reflectorized delineators had been placed around the outside of the curve when it was constructed, but they had been quickly knocked down, perhaps by wide farm equipment.

2/ A total of 7 accidents had been reported near the intersection of State Highways 214 and 18 over the 6-year period. Four of these accidents occurred on the curved section of State Highway 18; one of these accidents is the schoolbus accident currently being investigated; the remaining two accidents are described above.

The Safety Board conducted visibility tests at the accident site on March 27, 1983, using a similar schoolbus and spanning the time of day before, during, and after the time that the schoolbus accident occurred. With no opposing traffic, during darkness and with high-beam headlights on, the traffic control signs before the curve were visible as signs from a distance of 2,200 feet before the curve and from an even greater distance during daylight. Day or night, sign messages could be read completely at distances of about 250 feet from each sign; the distance that sign messages could be read was fixed by the size of the letters used in the sign, not illumination levels. With no opposing traffic, during darkness and with low-beam headlights on, the large arrow sign could be seen at a distance of about 500 feet before the curve. Day or night, with no opposing traffic, the centerline and pavement could be seen curving and bearing to the right at about 275 feet before the curve. And, the stop sign was not fully visible until the test vehicle was in the curve and about 200 feet from the stop sign.

As revealed in the second of the two previous reported accidents at the curve, when vehicles are operating with their lights on, the headlights of eastbound, and taillights of westbound, vehicles on State Highway 18 create an optical illusion to westbound vehicles on State Highway 214. The headlights from eastbound vehicles on State Highway 18 "wash out" the visibility of the centerline, the pavement in the curve, and the large arrow sign posted in the curve, and make it appear that State Highway 214 is straight or slightly curved rather than curved sharply to the right. The taillights of westbound vehicles on State Highway 18 also make the road ahead appear straight. In the daytime, a slight illusion of a straighter road is created because telephone poles along the eastbound side of State Highway 214 continue straight across the open field between the two highways. Also, another field in the distance and beyond the curve appears to be a guardrail or an intersecting road farther ahead because of its narrow width and color.

During visibility tests made at approach speeds of 45 to 55 mph, investigators depended on a variety of visual cues to drive through the accident curve. The only sign that was consistently sighted and used was the first symbolic curve warning sign; the second most-sighted sign was the large arrow sign. Conspicuous by the lack of consistent use as cues were the advisory speed sign, the junction sign, and the stop ahead sign. While investigators believed that they had enough visual cues to safely maneuver through the curve and the stop sign, they also felt that motorists could have problems, especially with the illusional and "wash-out" effects of the traffic on State Highway 18, and that the traffic controls could be further improved by:

- (1) eliminating or reducing the described illusional and "wash-out" effects, where practical. For example, it may not be practical to relocate the telephone lines, but other traffic controls or headlight glare screens ^{3/} may further reduce their illusional influence.
- (2) providing reflectorized delineators at the curve, such as bounce-back posts or raised pavement markers, that will not be easily knocked down or removed.
- (3) providing clearer and more precise advance symbolic and message sign warnings of the three critical factors at the curve--the sharpness of the curve; the coincidence of a curve, an intersection, and a stop sign in a short distance; and the advisory speed to maneuver through the curve and stop.

^{3/} Any type of roadway feature that functions as a physical barrier to direct headlight glare is considered a glare screen, including tall shrubbery, expanded steel mesh fencing, baffles, barriers, or mounds of earth.

- (4) lowering the advisory speed for vehicles entering the curve to 30 mph or less, so that motorists unfamiliar with the intersection can consistently make a more comfortable stop (0.2g or less) at the intersection. According to the Manual on Uniform Traffic Control Devices, a "turn" warning sign is appropriate when the recommended speed on a curve is 30 mph or less.
- (5) monitoring approach speeds and driver actions, and if necessary, providing further methods, such as a reduced area speed limit and rumble strips, to alert drivers and to reduce operating speeds on the approach to the curve.

The Safety Board will issue a full report of its investigation of the Jonesboro School District schoolbus accident after all the evidence is collected and analyzed. The Safety Board will evaluate other alternatives for improving the accident site, including redesigning the intersection. In the interim, the Safety Board believes that the evidence established to date indicates that improvements in the traffic control system on State Highway 214 at the curved approach to State Highway 18 would be beneficial. The Safety Board understands that the AHTD has just installed rumble strips before the curve warning sign and the stop ahead sign on the approach to the curve, and the Board commends the AHTD for such rapid action. However, the Safety Board believes that further improvements are both necessary and possible at this location and that other locations in Arkansas deserve similar evaluation.

Therefore, the National Transportation Safety Board recommends that the Arkansas Highway and Transportation Department:

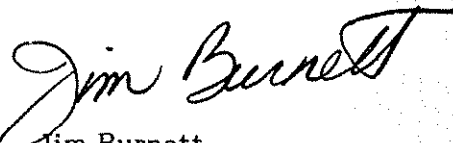
Eliminate or reduce the illusional effects of a straighter road and the "wash-out" effects of headlight glare on State Highway 214 at the curved approach to its intersection with State Highway 18. (Class I, Urgent Action) (H-83-7)

Further improve the traffic control features on State Highway 214 at the curved approach to its intersection with State Highway 18. (Class I, Urgent Action) (H-83-8)

Identify similar locations with sharply curved approaches to intersections in Arkansas, determine the need for further traffic control improvements, and improve these locations as necessary. (Class II, Priority Action) (H-83-9)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility ". . . to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations (P.L. 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations, and the Board would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations.


By Jim Burnett
Chairman