



May 8, 2023

HIR-23-06

Wrong-Way Driving Crash between Service Truck and Motorcoach on Interstate 20

Big Spring, Texas
November 19, 2021

On Friday, November 19, 2021, about 4:02 p.m., a crash involving a service truck and a motorcoach occurred in the eastbound lanes of Interstate 20 (I-20) near Big Spring, Howard County, Texas.¹ A 2016 Ford F-350 service truck traveling in the wrong direction in the eastbound lanes struck a 2005 MCI motorcoach nearly head-on. The service truck then sideswiped a 2018 Freightliner bus.² The motorcoach sustained frontal damage, the bus sustained minor damage to its left side, and a postcrash fire consumed the service truck (see figure 1). Three vehicle occupants died and 50 passengers sustained minor-to-serious injuries.

¹ (a) In this report, all times are central standard time. (b) Visit [nts.gov](https://www.nts.gov) to find additional information in the [public docket](#) for this National Transportation Safety Board (NTSB) investigation (case no. HWY22FH001). Use the [CAROL Query](#) to search safety recommendations and investigations. (c) Based on the Texas Department of Public Safety's initial crash report, the crash occurred at 4:01 p.m. Big Spring Police Department dispatch recordings indicate that the first call to report the crash occurred at 4:02 p.m.

² For the purposes of this report, to distinguish between the 2005 MCI commercial passenger vehicle and the 2018 Freightliner commercial passenger vehicle, the MCI vehicle is herein referred to as a motorcoach and the Freightliner vehicle as a bus.

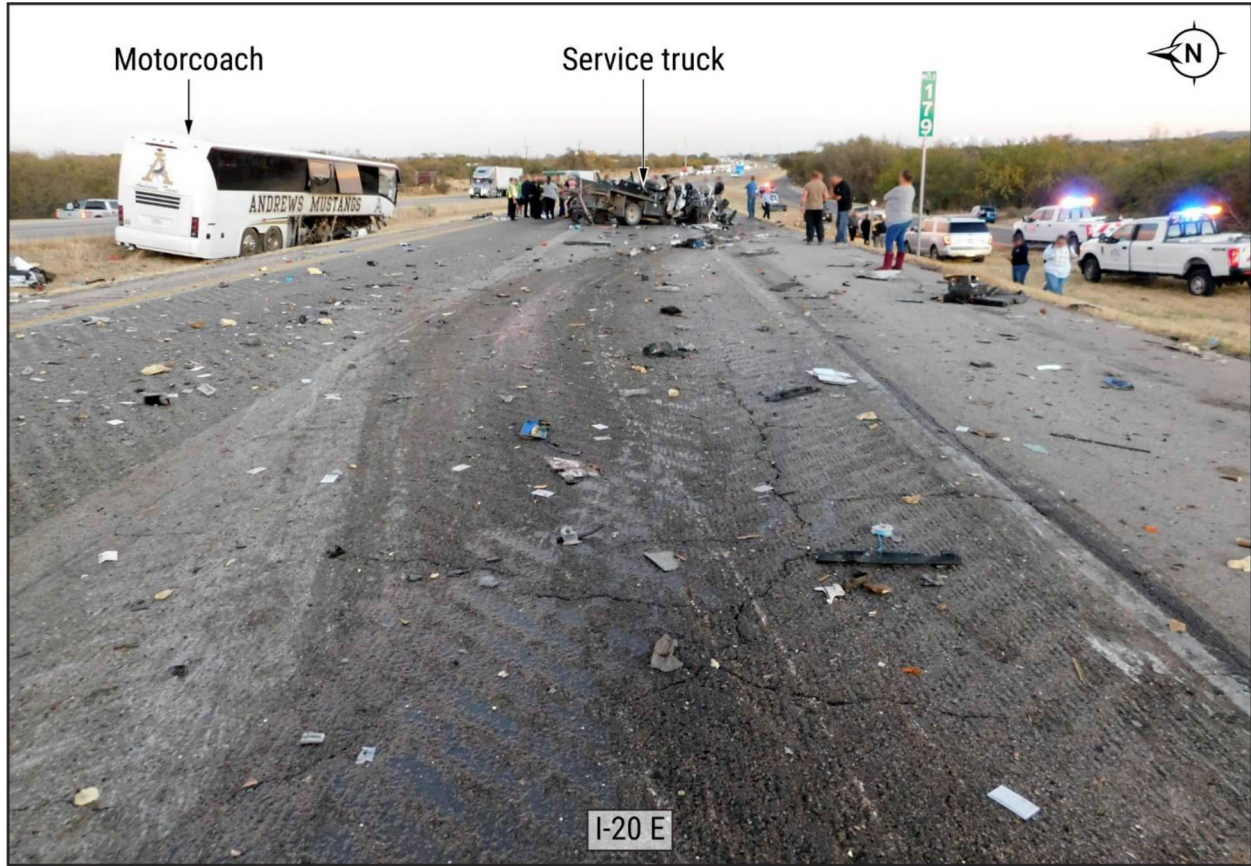


Figure 1. Impact area, with motorcoach in median and service truck in right-hand eastbound traffic lane, both at final rest. Freightliner bus, not pictured, is farther east on the right shoulder of I-20. (Source: Texas Department of Public Safety)

Location	I-20 eastbound at mile marker 179, near Big Spring, Howard County, Texas (see figure 2)
Date	November 19, 2021
Time	4:02 p.m.
Vehicles involved	3
People involved	73
Injuries	3 fatal (service truck driver, motorcoach driver, 1 motorcoach passenger), 50 injured (37 motorcoach passengers, 13 bus passengers), 20 uninjured (1 motorcoach passenger, bus driver, 18 bus passengers)
Weather	Dry, clear, and daylight
Roadway information	Interstate with two travel lanes in each direction, separated by a depressed earthen median and a cable barrier

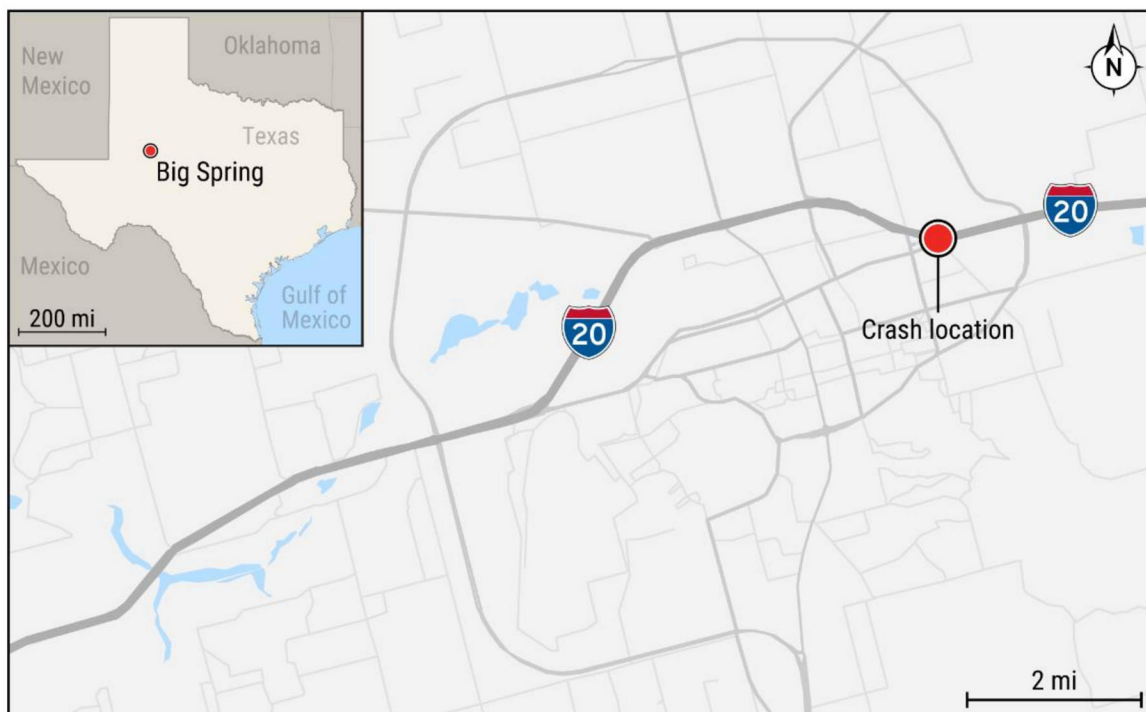


Figure 2. Map showing crash location on I-20. (Source: Google Maps)

1. Factual Information

1.1 Background

On Friday, November 19, 2021, about 4:02 p.m., a 2016 Ford F-350 service truck traveling the wrong way (west) in the eastbound lanes of I-20, near mile marker 179, struck a 2005 MCI motorcoach nearly head-on. The service truck had traveled about 1 mile west from the location of the exit 179 off-ramp when the crash occurred. The motorcoach was the lead vehicle in a caravan of three commercial vehicles from Andrews Independent School District traveling to a high school football game in a neighboring town.

At the crash location, I-20 consisted of two travel lanes in each direction, separated by a depressed earthen median and a cable barrier. The posted speed limit was 75 mph. At the time of the crash, the weather was clear and the roadway was dry. There were no environmental obstructions to the line of sight near the crash area.

1.2 Event Sequence

Surveillance videos from six local businesses in Big Spring showed the service truck driver as he traveled east on a frontage road that was just north of and adjacent to westbound I-20. He eventually made a wrong turn that led him to begin traveling west on eastbound I-20 (see figure 3).

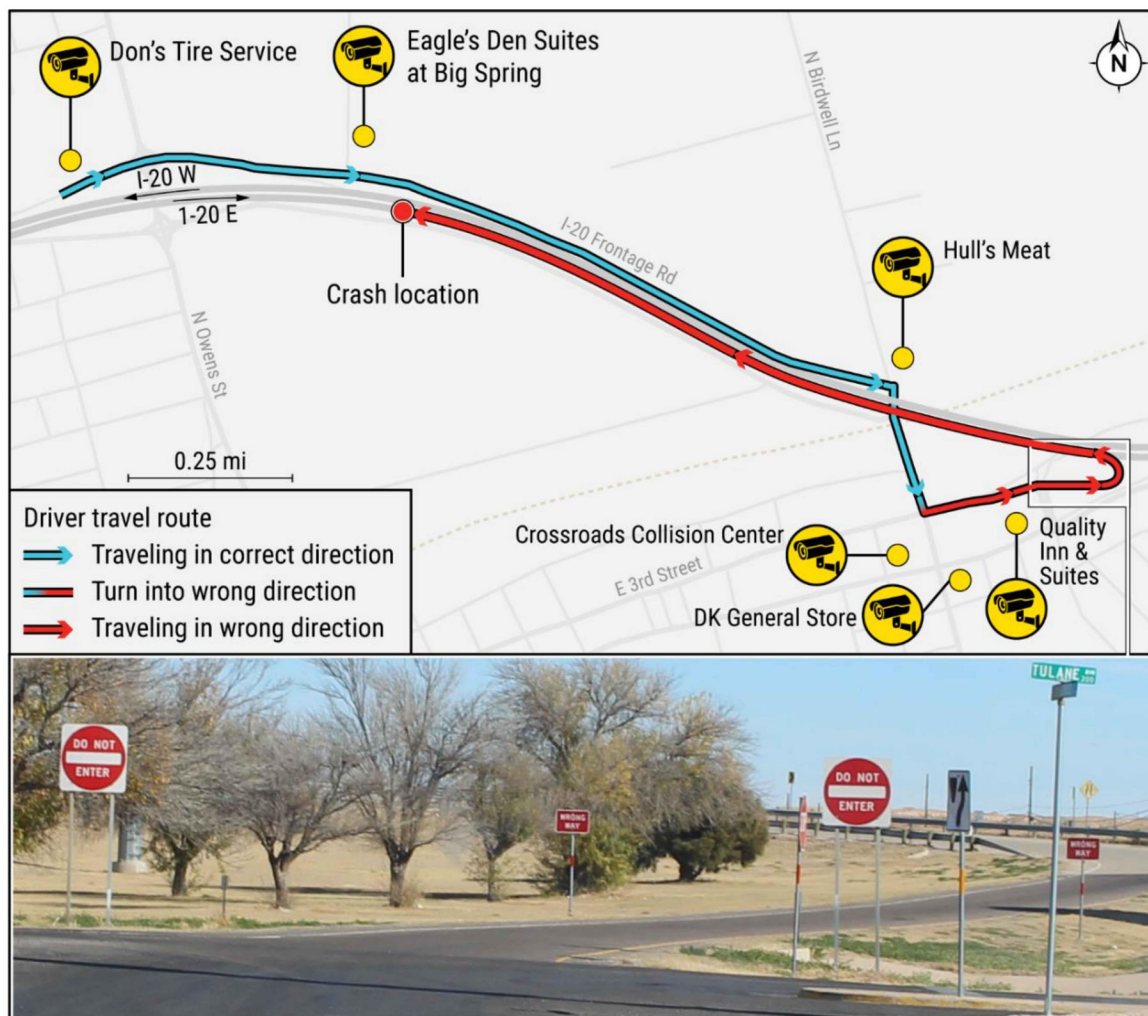


Figure 3. Service truck driver's path of travel as determined by surveillance video and witness testimony. Blue arrows show travel in the correct direction, and red arrows show travel in the wrong direction. (Map Source: Google Maps; annotated by NTSB)

The surveillance videos showed the service truck driver traveling east on the frontage road and making a left into Don's Tire Service. While at Don's, he exited his vehicle and approached and spoke with three separate individuals. Afterwards, he returned to his vehicle and drove away.

He continued driving east on the same frontage road, pulled into the parking lot of Eagle's Den Suites (about 0.4 miles east of Don's), and exited his vehicle to speak separately with two individuals. He then drove to Hull's Meat Company (about 1 mile east of Eagle's Den), parked, and spoke with someone before walking next door to the Big Spring Livestock Auction. The driver returned to his vehicle and then spoke briefly to another driver, with both remaining in their vehicles. In the videos, the driver appeared to walk quickly and gesture with his hands while speaking.

Video showed the driver at the signalized intersection of Birdwell Lane and East 3rd Street, which is a one-way street for westbound traffic. The driver made a left turn onto East 3rd Street and began traveling in the eastbound direction. The intersection had a one-way sign posted on the mast arm of the signalized light on East 3rd Street. After turning left, the driver continued for 30 feet and passed a second one-way sign on East 3rd Street indicating that he was traveling in the wrong direction.³ About 90 feet after he passed the second one-way sign, he passed a wrong-way sign on East 3rd Street.⁴

He continued traveling the wrong way on East 3rd Street and entered the exit 179 off-ramp for eastbound I-20 (refer to the lower image in figure 3). Two do-not-enter signs and two wrong-way signs were posted on either side of the ramp's base; the wrong-way signs were located 150 feet behind the do-not-enter signs. In total, from the point of initial wrong-way travel to his entering the exit ramp, the driver passed seven traffic signs indicating that he was traveling in the wrong direction (see figure 4).



Figure 4. Traffic signs encountered by service truck driver indicating wrong-way travel from Birdwell Lane until he entered the exit ramp onto I-20. (Source: Google Maps; annotated by NTSB).

³ The first one-way sign on East 3rd Street had a mounting height of 13.5 feet, and the second sign had a mounting height of 7 feet; both were 36 inches long and 12 inches wide.

⁴ The wrong-way sign on East 3rd Street had a mounting height of 7 feet and was 36 inches long and 24 inches wide.

Video showed the service truck driver proceeding west on eastbound I-20 and being passed by a vehicle traveling east. Based on 911 call transcripts and witness statements, the service truck driver encountered at least four vehicles heading toward him on I-20 before the crash occurred. One 911 caller stated that “he's going toward traffic on the highway.” Another 911 caller tried to alert the wrong-way driver; a passenger in his vehicle was heard on the call saying “I'm so glad that you honked. I think he saw you, but he wasn't slowing down.” Another caller stated that “he [the service truck driver] almost hit a car.” A witness—who was affiliated with the Andrews Independent School District, was driving a car in front of the school caravan, and spoke to police after the crash—stated that he was “in the right lane and had to swerve into the left as he [the service truck driver] was coming head-on in the right lane.”⁵ The car's passenger tried to call the band director, who was in the motorcoach, to warn the motorcoach occupants about the wrong-way driver, but she heard the crash as she was making the phone call.

The motorcoach was traveling east in the right lane of I-20 while going around a curve and down a grade when it approached the service truck, which was also in the right lane. The motorcoach began braking and steering to the left.⁶ The service truck and motorcoach collided in the right lane. During the impact, the service truck was pushed backward and subsequently sideswiped by a 2018 Freightliner bus, the second vehicle in the caravan. After the collision with the service truck, the motorcoach traveled into the median and struck the cable barrier before coming to rest. The service truck came to rest in the right lane of eastbound I-20 and was consumed by a postcrash fire. The driver of the sideswiped bus was able to make a controlled stop on the right shoulder of the interstate facing east.

Although the Detroit Diesel Electronic Control (DDEC) unit from the motorcoach sustained minor damage, its data recorder was functional and had recorded two previous hard brake events as determined by the associated odometer readings. However, no hard brake event was recorded for this crash, so the motorcoach's travel speed at the time of the crash was not recorded.⁷ Additionally, the airbag control

⁵ For the purposes of this report, the right and left lane designation is based on the appropriate direction of travel.

⁶ For additional narrative information about the crash sequence, see the Texas Peace Officer's Crash Report in the *Big Spring Crash Summary* section of the [public docket](#) for this NTSB investigation (case no. HWY22FH001).

⁷ The two hard brake events recorded in the motorcoach's DDEC unit occurred at odometer readings of 92,165.8 and 90,591.4 miles, respectively. The last odometer reading from the DDEC unit was 105,554.3 miles, which indicated that the other two readings were from previous incidents. The threshold for a hard brake event for the DDEC unit installed in the motorcoach was 7 miles per hour per second (0.3 g-forces); such a threshold might not have been reached in this crash sequence.

module from the truck was damaged in the fire, and data were unrecoverable.⁸ Although the NTSB attempted to download the data from the bus's Cummins electronic control unit, the data received did not contain information related to the crash. Therefore, the travel speeds of the truck, motorcoach, and bus involved in the crash were unknown.

The service truck driver was not wearing his seat belt, and he died from multiple blunt-force trauma injuries. Due to fire damage to the vehicle, it could not be determined if the airbags in the service truck deployed. The driver of the motorcoach, who was wearing his seat belt, sustained traumatic head injuries and died. A male occupant, who had been seated in the right-front passenger row of the motorcoach, was ejected and died.⁹ Of the 38 other motorcoach occupants, 3 were ejected and suffered serious injuries. The remaining motorcoach occupants received injuries ranging from serious to none. In total, 50 passengers sustained injuries (37 motorcoach passengers and 13 bus passengers).

Shortly before the crash, three 911 calls were received (one at 4:01:22 p.m. and the other two at 4:01:44 p.m.) regarding a white service truck traveling east in the westbound lanes of I-20. At 4:02 p.m., a 911 caller reported that a crash had occurred. In total, four agencies assisted with the response. The Big Spring Police Department and the Howard County Sheriff's Office were notified of the crash at 4:03 p.m.; they arrived on scene at 4:14 and 4:15 p.m., respectively. The Texas Department of Public Safety (DPS) and Big Spring Fire/EMS were contacted at 4:04 and 4:07 p.m., and arrived at 4:26 and 4:15 p.m., respectively. Three air ambulances and six ambulances responded to the scene, with the first arriving at 4:15 p.m.

⁸ The airbag control module was recovered from the Ford F-350 service truck; however, it sustained extensive fire damage, rendering it inoperable. No data were recovered from this device.

⁹ The 2005 motorcoach was not equipped with passenger belts and was built before the National Highway Traffic Safety Administration's 2013 Federal Motor Vehicle Safety Standard-issued requirements for passenger lap/shoulder belts for each passenger seating position on all new over-the-road buses and on new non-over-the-road buses with gross vehicle weight ratings greater than 26,000 pounds (with certain exclusions). If the motorcoach had been built on or after November 28, 2016, it would have been required to have belts for each passenger seating position, but it was manufactured before the effective date. (See 49 *Code of Federal Regulations* 571.208 - Standard No. 208, [Occupant Crash Protection](#).)

1.3 Additional Information

1.3.1 Roadway Geometry

Before the crash, the service truck driver incorrectly entered an exit ramp for I-20 from East 3rd Street, which runs perpendicular to Birdwell Lane.¹⁰

The crash occurred on a 4,230-foot-long, right-hand horizontal curve that had a radius of 1 degree or 5,229.58 feet, and that sloped downward on an approximate 2.8% grade. The impact area was approximately 2,990 feet from the beginning of the curve.

1.3.2 Roadway Signs

The traffic signs all met *Texas Manual on Uniform Traffic Control Devices (MUTCD)* requirements, which set minimum standards, provide guidance, and ensure uniformity of traffic control devices across Texas (see figure 5). Further, the exit ramp signage exceeded the *Texas MUTCD* requirements by including two do-not-enter signs and two wrong-way signs (posted on both sides of the ramp) rather than one of each sign (posted only on the right side of the ramp), as is required. The Texas Department of Transportation (TxDOT) is taking further actions to address wrong-way driving by updating traffic control devices (including adding raised, retroreflective pavement markers) to deter wrong-way driving at ramp terminations of divided highways. These additional actions also exceed the requirements in the *Texas MUTCD*.

¹⁰ According to state research cited in the NTSB's *Wrong-Way Driving* Special Investigation Report, exit ramps with rounded corners tend to encourage rather than deter wrong-way movements. The rounded corners provide less distinction between the roadway and the ramp than sharp corners. This design may mislead drivers into continuing along their current path of travel and mistakenly entering the exit ramp (NTSB 2012). In the report, the NTSB recommended that the Federal Highway Administration (FHWA) develop an assessment tool that the states can use to select appropriate countermeasures for problematic controlled-access highway locations. This recommendation was addressed when the FHWA developed and released a countermeasure assessment tool for states in 2014. In this crash, the driver began traveling in the wrong direction when he turned onto East 3rd Street, well before he approached the exit ramp.

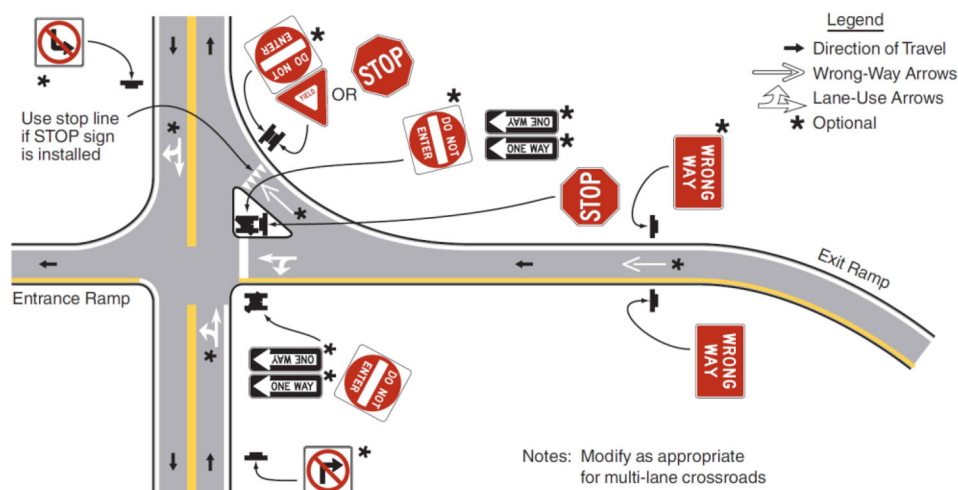


Figure 5. Example application of regulatory signage and pavement markings at an exit ramp termination to deter wrong-way entry. (Source: TxDOT 2014).

1.3.3 Sight Line Testing

On December 22, 2021, TxDOT and the DPS conducted sight line distance testing to determine whether sight obstruction due to the geometry of the highway may have contributed to the crash. Testing included a motorcoach and a pickup truck that were similar to the crash-involved vehicles. The truck was placed in the right-hand eastbound lane of I-20, facing west, approximately 400 feet east of where the crash occurred. The motorcoach was driven east on I-20 until the driver could discern the truck. According to the driver of the exemplar motorcoach, the exemplar truck was clearly visible when he was 1,055 feet from the truck. This measured sight distance met the minimum requirements established in table 3-2 of the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, which indicates that for new construction projects, a stopping sight distance of 866 feet should be provided for 75-mph speeds on a 3% downgrade (AASHTO 2018).¹¹

1.3.4 Driver Background

The service truck driver was a 59-year-old male with a class C, noncommercial driver's license with no restrictions. The license was issued in January 2019 with an expiration date in January 2025. According to his spouse, he had previously conducted work in Big Spring and was familiar with the area.

¹¹ AASHTO design criteria provide for a 2.5-second reaction time, a deceleration rate of 0.34 g-forces on wet pavement, a seated eye height of 3.5 feet, and an object target height of 2.0 feet. However, reaction time estimates do not account for closing speeds involving wrong-way drivers.

1.3.5 Driver Sleep and Wake Schedules

NTSB investigators used the service truck driver's spouse's statement and his cell phone records to estimate his sleep/wake times and to determine if he had been using his phone for texting or calling at the time of the crash. According to his wife, the driver typically went to bed about 10:00 p.m. and left the house about 7:00 a.m. for an early workday. The evening before the crash, he went to sleep about 10:00 p.m., his usual time. According to his wife, on the day of the crash, the driver woke up about 5:30 a.m. and left the house between 10:00 a.m. and 10:30 a.m. to evangelize in the neighboring towns. He made one phone call and sent one text message about 11:00 a.m., approximately 5 hours before the crash occurred.

1.3.6 Cell Phone Data

The service truck driver's phone records did not indicate that he was on a call or texting (using the phone's native texting application) at the time of the crash. The records indicated data usage up until the time of the crash; however, because the phone was not recovered, it could not be determined whether the data activity was initiated by the driver or was from an application that was passively running in the background. NTSB investigators found no sources of distraction external to the vehicle in the vicinity of the crash.

1.3.7 Medical Issues

The service truck driver's health records from his September 14, 2021, visit with his primary care physician noted that he had donated a kidney in May 2021. The driver had a history of hypertension, high cholesterol, severe coronary artery disease, and hypothyroidism (low thyroid function). He had negative reactions to treatments for his high cholesterol (including rash and muscle pain) and had discontinued his medication. The health records indicated that the driver was taking amlodipine for his high blood pressure, aspirin to try to prevent heart disease, and thyroid hormone replacement.¹²

Blood and urine kidney function testing performed before the kidney donation was normal. However, testing on his September 14 visit noted an increase in the driver's creatinine from 0.86 milligrams per deciliter (mg/dL) in February 2021 to 1.45 mg/dL in September 2021.¹³ The remainder of his laboratory testing showed elevated cholesterol, but other kidney function tests (blood urea nitrogen and potassium) were normal.

¹² Amlodipine is a blood pressure medication that is not generally considered impairing.

¹³ Creatinine is a toxin produced by protein breakdown in the body that is normally excreted by the kidneys. Normal values are up to about 1.3 mg/dL. Elevated levels point to poorly functioning kidneys. As kidney function declines, the body's ability to excrete potassium and urea nitrogen also declines.

1.3.8 Toxicology

Postcrash toxicology testing performed by the Federal Aviation Administration's Forensic Sciences Laboratory identified amlodipine in the service truck driver's blood and urine. Small amounts of ethanol were found in his blood, likely produced postmortem from microbial action rather than through alcohol ingestion. The autopsy found evidence of severe coronary artery disease, and clinical testing of vitreous fluids identified markers consistent with severe kidney disease.

1.4 Postcrash Actions

As a result of the November 19, 2021, wrong-way crash, TxDOT reviewed crashes in the vicinity of 3rd and 4th Streets in Big Spring since 2012, and found that 10 were attributable to wrong-way drivers.¹⁴ This review was conducted as part of the TxDOT Abilene District standard monthly meetings to review and address fatal crashes within the district using police reports, Google imagery, photographs from county maintenance supervisors, and the Texas Crash Record Information System to look for trends on particular segments of roadway. These analyses are intended to identify immediate improvements and countermeasures or areas for further study.

The 10 wrong-way driving crashes and this fatal crash led the TxDOT Abilene District to undertake an initiative to evaluate and improve traffic operations and signage at all ramp connections and at-grade crossovers on four-lane divided highways. All ramps and crossovers are being inspected by the three area engineers to ensure that proper signage is in place conforming to *MUTCD* standards. In addition to the required signage, all ramps will have a wrong-way arrow installed that includes raised, retroreflective pavement markers displaying a reflected red light to wrong-way drivers. The projects to inspect and add signage and new pavement markings are expected to be completed by the end of calendar year 2023.

Additionally, an engineering study is underway for 3rd and 4th Streets in Big Spring to examine these routes and to inventory all street, alleyway, and driveway connections; existing signage; and pavement markings. The results of the study will provide TxDOT with recommendations to improve and enhance the conspicuity of the traffic operation elements so that wrong-way driving can be reduced or eliminated in this area before wrong-way drivers reach the connections with ramps leading to the main-line lanes of I-20. Since the crash occurred, the following improvements have been completed:

- At all signalized intersections, do-not-enter and wrong-way signs have been installed along 3rd and 4th Streets.

¹⁴ Two of the 10 crashes on these one-way city streets resulted in injuries.

- Wrong-way signs have been installed on every other block, with wrong-way pavement marking arrows placed on the roadway pavement at intermediate intervals between the signs.
- One-way signs have been placed on all traffic signals and stop signs.

Work is in progress for the placement of one-way signs at all street and alleyway intersections. TxDOT is also planning to place one-way signs at some private driveways where vehicles can enter the property from more than one direction. For example, if a business has a driveway that enters or exits 3rd or 4th Street but also has access from a side street or alley, a one-way sign will be placed in front of the driveway on 3rd or 4th Street.

According to TxDOT, possible improvements will include more frequent installation of do-not-enter signs, wrong-way signs, and movement prohibition signs, as well as the use of lane arrows and pavement markings at strategic locations. The results of the study and implementation of the recommended improvements are anticipated to be completed by the end of 2023.

2. Analysis

Weather was not a factor in this crash, which occurred during daylight hours and in clear and dry conditions. Although the motorcoach was traveling on a right-hand curve, the radius was large enough to not present environmental obstructions to the line of sight. The emergency response was adequate and timely. The service truck driver was familiar with the Big Spring, Texas, area. He had sufficient sleep opportunities before the crash, and evidence indicated that he was not impaired at the time of the crash. His cell phone records indicated that he was not engaged in a phone or texting conversation. Because the phone was not recovered from the crash, there was insufficient evidence to determine whether the data being used at the time of the crash was due to an application that required active operator or passive data inputs.

Although the service truck driver had severe coronary artery disease that placed him at increased risk of having acute symptoms such as chest pain, shortness of breath, palpitations, or fainting, external video evidence of his driving showed that he was actively in control of the vehicle, indicating that he did not experience an incapacitating medical event while operating the truck. Even though he was traveling in the wrong direction, he was able to stay in a lane and then continue onto the highway.

Although severe kidney disease has been associated with cognitive decline over time, this would have occurred over a longer duration rather than as an acute onset during a single drive (Rosenberg 2022). There would be evidence of confusion before the crash with a pattern of inattentiveness and cognitive decline. There were no such

indications from the service truck driver's spouse or from his doctors via his medical records. He was described by his spouse as acting normally on the day of the crash, and as engaged and energetic by the witnesses. Likewise, surveillance video of the driver speaking to people in parking lots showed him actively engaged in conversation. Therefore, it is unlikely that the driver's severe kidney disease caused confusion leading to the wrong-way driving.

Traffic signage was not a factor in the service truck driver's error leading to his travel in the wrong direction. He was presented with multiple traffic signs to guide him to travel in the correct direction. From the initial wrong turn onto a one-way street at the intersection of East 3rd Street and Birdwell Lane until the crash event, the driver encountered seven traffic signs indicating wrong-way travel, as follows:

- One-way sign above the signalized traffic light at 3rd Street and Birdwell Lane
- One-way sign on East 3rd Street
- Wrong-way sign on East 3rd Street
- Two do-not-enter signs at the base of the exit ramp
- Two wrong-way signs 150 feet behind the do-not-enter signs at the base of the exit ramp

After entering the highway, the driver encountered additional cues indicating that he was driving in the wrong direction (see figure 6). Before the crash, at least four vehicles that were traveling east on eastbound I-20 approached and passed him as he continued to travel west. Further, a driver traveling in the wrong direction would face the backs of highway traffic signs. Although subtle, the white pavement line on a highway is located on a driver's right, and the yellow pavement line is located on the left; for a driver traveling the wrong way, these colored lines would appear on the opposite sides.

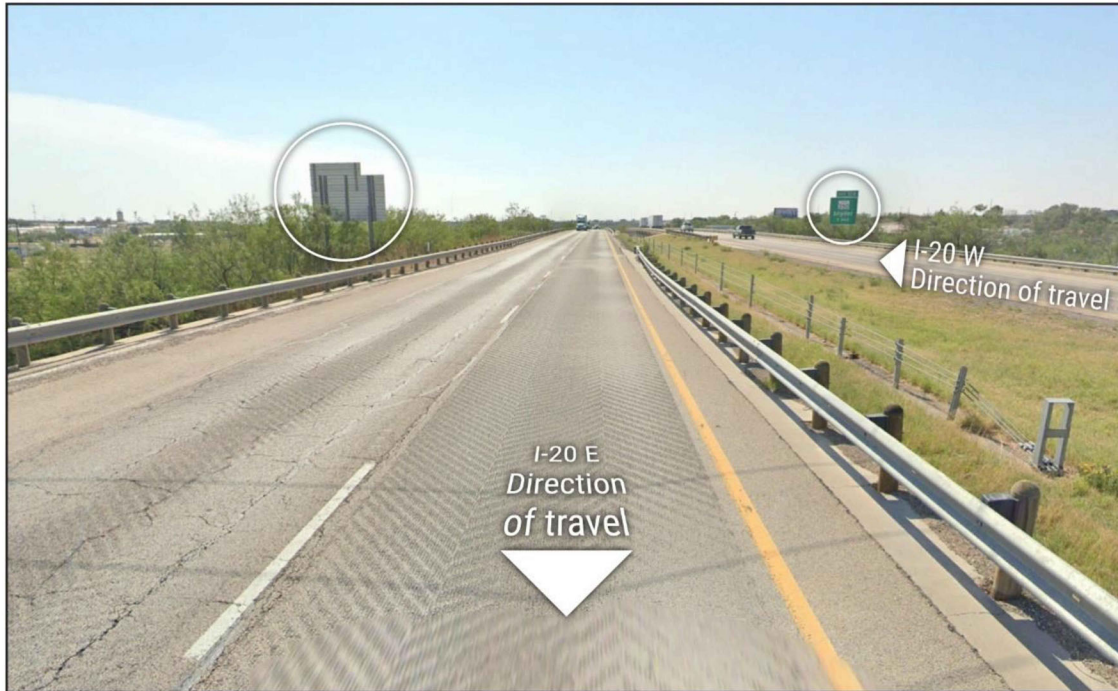


Figure 6. Examples of cues indicating wrong-way travel: facing oncoming traffic and the backs of traffic signs and having the yellow pavement line on the right (incorrect) side. (Source: Google Maps; annotated by NTSB)

In 2012, the NTSB issued a special investigation report identifying safety recommendations to prevent collisions involving vehicles traveling the wrong way on high-speed divided highways (NTSB 2012). The recommendations in the report addressed driver impairment, the need to establish traffic control devices and highway designs with distinctly different views for motorists approaching entrance and exit ramps, monitoring and intervention programs for wrong-way collisions, and in-vehicle driver support systems. The factors that were most often cited as causal in the wrong-way crashes—such as alcohol use, issues associated with older drivers, and possible drug involvement—were not factors in this crash.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the Big Spring, Texas, head-on crash between a service truck and a motorcoach was that the service truck driver was traveling the wrong way on Interstate 20 for unknown reasons.

References

- AASHTO (American Association of State Highway and Transportation Officials). 2018. *A Policy on Geometric Design of Highways and Streets*. 7th Edition. Washington, DC: AASHTO.
- NTSB (National Transportation Safety Board). 2012. *Wrong-Way Driving*. [NTSB/SIR-12/01](#). Washington, DC: NTSB.
- Rosenberg, M. 2022. [“Overview of the Management of Chronic Kidney Disease in Adults.”](#) Edited by G. Curhan, M. Tonelli, and J. Forman. *UpToDate*.
- TxDOT (Texas Department of Transportation). 2014. [Texas MUTCD: Manual on Uniform Traffic Control Devices](#). 2011 Edition - Revision 2, October 2014.

NTSB investigators worked with the **Texas Department of Transportation and Texas Department of Public Safety** throughout this investigation.

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable cause of the accidents and events we investigate and issue safety recommendations aimed at preventing future occurrences. We also conduct safety research studies and offer information and other assistance to family members and survivors for any accident investigated by the agency. Additionally, we serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID HWY22FH001. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

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