Pickup Truck Centerline Crossover Collision With Medium-Size Bus on US Highway 83, Concan, Texas, March 29, 2017

Highway Accident Report

NTSB/HAR-18/02
PB2018-101631

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National Transportation Safety Board

490 L'Enfant Plaza SW
Washington, DC 20594

National Transportation Safety Board. 2018. *Pickup Truck Centerline Crossover Collision With Medium-Size Bus on US Highway 83, Concan, Texas, March 29, 2017*. Highway Accident Report NTSB/HAR-18/02. Washington, DC.

Abstract: On March 29, 2017, about 12:20 p.m., a 2007 Dodge Ram 3500 pickup truck, occupied by a 20-year-old driver, was traveling north on US Highway 83, near Concan, Texas, when it crossed into the southbound lane and collided with a medium-size bus. The crash occurred near milepost 553.4, near the end of a right-hand curve. The 2004 Ford E350 Turtle Top Van Terra medium-size bus was occupied by a 66-year-old driver and 13 passengers and operated by the First Baptist Church of New Braunfels, Texas. Two people also traveling north in a vehicle directly behind the truck reported its activity to law enforcement and recorded a 14.5-minute cell phone video. The Texas Department of Public Safety reviewed the video and determined that the truck was visible for 12 minutes 48 seconds. In the video, the truck crosses the white edgeline bordering the right side of the roadway 37 times and moves into the grassy area beyond on at least five occasions. For much of the video, the truck straddles the edgeline and rarely travels within the lane markings. In addition, the truck crosses the yellow centerline 19 times and is fully in the opposing lane of travel at least once. As a result of the crash, the bus driver and 12 passengers were fatally injured. The driver of the truck and one bus passenger were seriously injured. The crash investigation focused on the following safety issues: drug-impaired driving and medium-size bus seat belt systems. The NTSB made safety recommendations to the National Highway Traffic Safety Administration (NHTSA), the state of Texas, the Texas Department of Transportation, several medium-size bus manufacturers, and two seating manufacturers. The report also reiterated one recommendation to NHTSA.

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Acronyms and Abbreviations

ACM	air bag control module
ARIDE	advanced roadside impaired driving enforcement [NHTSA]
BAC	blood alcohol concentration
CDL	commercial driver's license
CFR	*Code of Federal Regulations*
CNS	central nervous system
DEC	drug evaluation and classification [IACP–NHTSA]
DOT	US Department of Transportation
DRE	drug recognition expert [IACP]
DUID	driving under the influence of drugs
DWI	driving while intoxicated
EMS	emergency medical services
FAA	Federal Aviation Administration
FARS	Fatality Analysis Reporting System [NHTSA]
FHWA	Federal Highway Administration
FMVSS	Federal Motor Vehicle Safety Standard
g	acceleration due to gravity
g/dL	gram per deciliter
GAO	US Government Accountability Office
GHSA	Governors Highway Safety Association
GVWR	gross vehicle weight rating
IACP	International Association of Chiefs of Police
µg/L	microgram per liter
µg/mL	microgram per milliliter
mg	milligram
mg/L	milligram per liter
mmHg	millimeter of mercury
ng/mL	nanogram per milliliter
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board

OSA	obstructive sleep apnea
OTC	over-the-counter
PTSD	posttraumatic stress disorder
SFST	standardized field sobriety testing [NHTSA]
SHSP	strategic highway safety plan
THC	delta-9-carboxy-tetrahydrocannabinol [marijuana]
TxDOT	Texas Department of Transportation
TxDPS	Texas Department of Public Safety
US-83	US Highway 83
VFD	volunteer fire department

Executive Summary

Investigation Synopsis

On March 29, 2017, about 12:20 p.m., a 2007 Dodge Ram 3500 pickup truck, occupied by a 20-year-old driver, was traveling north on US Highway 83, near Concan, Texas, when it crossed into the southbound lane and collided with a medium-size bus. The crash occurred near milepost 553.4, near the end of a right-hand curve. The 2004 Ford E350 Turtle Top Van Terra medium-size bus was occupied by a 66-year-old driver and 13 passengers and operated by the First Baptist Church of New Braunfels, Texas. As a result of the crash, the bus driver and 12 passengers were fatally injured. The driver of the truck and one bus passenger were seriously injured.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the Concan, Texas, crash was the failure of the pickup truck driver to control his vehicle due to impairment stemming from his use of marijuana in combination with misuse of a prescribed medication, clonazepam. Contributing to the severity of the injuries was the insufficient occupant protection provided by the lap belts worn by passengers seated in the rear of the medium-size bus.

Safety Issues

This crash investigation identified the following safety issues:

- ***Drug-impaired driving:*** The truck driver's erratic operation of his vehicle was due to impairment from the combined use of marijuana and a prescription medication. To increase the effectiveness of law enforcement in deterring drug-impaired driving, officers need additional training in the detection of drivers under the influence of drugs and additional tools, such as roadside drug testing devices.

  The state of Texas has one of the highest rates of fatal crashes involving impaired drivers. Additional efforts are needed at both the state and national levels to identify best practices, effective science-based safety countermeasures, and drug testing protocols to reduce the fatalities, injuries, and crashes caused by drug-impaired drivers.

- ***Medium-size bus seat belt systems:*** The bus was equipped with lap belts in rows 1–4 behind the driver, though these seat belts are not required by federal regulation. The 12 bus passengers seated in these rows were restrained. Upper body flailing over the lap belts—which concentrated the load in the pelvis and abdomen—exacerbated the injuries to passengers seated outside of the intrusion area. Further contributing to injuries for the four occupants seated in the rear row of bench seats were the narrow lap belt anchorage points, which resulted in additional forces on the pelvis and abdomen.

  Most medium-size bus manufacturers offer passenger lap/shoulder belts as an option, but they are not required. Because lap/shoulder belts provide a greater level of

protection, bus and seat manufacturers should move toward providing them as standard, rather than optional, equipment for all seating positions on medium-size buses. Additionally, the National Highway Traffic Safety Administration (NHTSA) should amend Federal Motor Vehicle Safety Standard 208 on occupant protection to require lap/shoulder belts for medium-size buses.

Recommendations

The NTSB makes new safety recommendations to NHTSA, the state of Texas, the Texas Department of Transportation, several medium-size bus manufacturers, and two seat manufacturers. The NTSB also reiterates one safety recommendation to NHTSA.

1 Factual Information

1.1 Crash Narrative

1.1.1 Crash Events

On Wednesday, March 29, 2017, about 12:20 p.m., a 2007 Dodge Ram 3500 pickup truck, driven by a 20-year-old male, was traveling north on US Highway 83 (US-83), near Concan, in Uvalde County, Texas, when it crossed into the southbound lane and collided with a medium-size bus.[1] The 2004 Ford E350 Turtle Top Van Terra medium-size bus was transporting 13 parishioners of the New Braunfels First Baptist Church.[2] The bus was owned and operated by the church and was being driven by a 66-year-old male. The truck driver had departed Uvalde on the morning of March 29 en route to Leakey.[3] The bus was returning to New Braunfels following a 2-day retreat at the Alto Frio Baptist camp and conference center in Leakey (see figure 1).

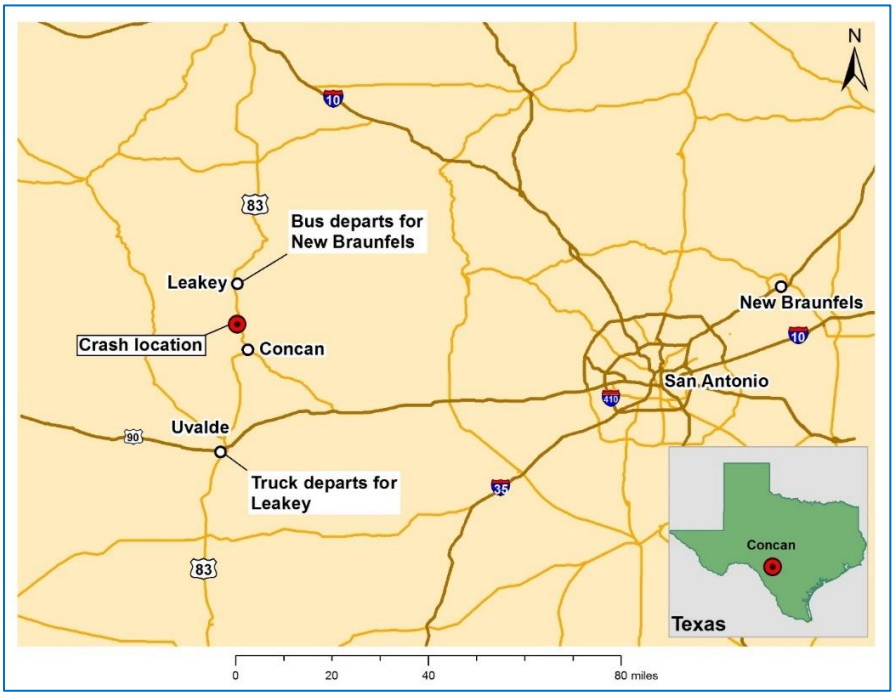

Figure 1. Map showing US-83 crash location and departure locations for truck and bus.

[1] See appendix A.

[2] A medium-size bus is typically designated as such because the bus body is built on a medium-duty truck chassis. The weight range for a medium-size bus is 10,001–26,000 pounds gross vehicle weight rating (GVWR).

[3] The truck driver stopped at a pharmacy in Uvalde to refill prescription medications. Pharmacy surveillance video footage showed the truck arrive at the drive-thru window at 11:03 a.m. and depart at 11:09 a.m. The driver also made a stop for food before departing for Leakey.

Near the end of a right-hand curve near milepost 553.4, the truck departed the US-83 north travel lane and crossed into the southbound lane, colliding with the front left of the bus (see figures 2 and 3).[4] The bus driver and 12 passengers were fatally injured, and the driver of the truck and one bus passenger were seriously injured.

Figure 2. Vehicles postcrash within southbound lane of US-83, facing north. (Source: TxDPS)

[4] The crash occurred about 9.7 miles from the Alto Frio Baptist camp and conference center.

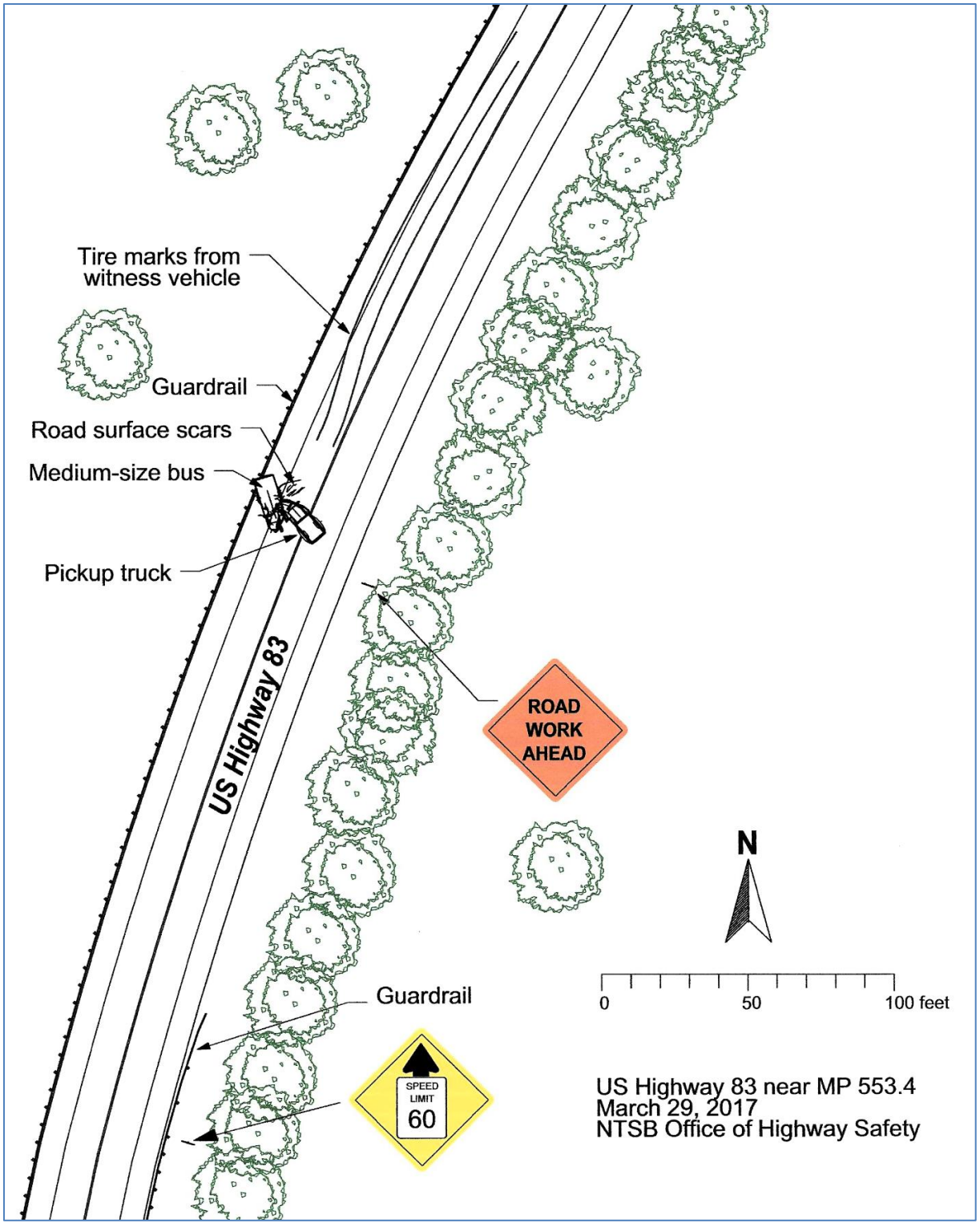

Figure 3. Crash scene diagram, showing at-rest positions of truck and bus.

1.1.2 Statements and Video Evidence

1.1.2.1 Truck Driver Statements. After being removed from the truck, the driver provided an initial statement to Texas Department of Public Safety (TxDPS) troopers at the scene. He said that he was returning to Leakey after picking up medication in Uvalde. A trooper asked him if he had taken any of the medication, and he replied that he had taken two Klonopin about an hour previously.[5] The driver said that the prescription was for posttraumatic stress disorder (PTSD), and it made him drowsy.[6] He also told troopers that he was texting at the time of the crash.[7]

National Transportation Safety Board (NTSB) investigators and the 38th Judicial District Attorney's Office also interviewed the driver. He told NTSB investigators that he was checking his phone immediately before the crash, though he added that he was not expecting a call from anyone in particular. He told district attorney investigators that he was checking his phone to see if his girlfriend had texted him. He said that he did not see the oncoming bus until the very last second—and stated that he slammed on the brakes, but the truck did not "stop on a dime."

The driver mentioned to both sets of investigators that his truck had steering problems. During the NTSB interview, he said that the truck "had play in the wheel." When he spoke with district attorney investigators, he said that the steering box on the truck was going out, and the pitman arm shook. He said that he wanted to get it fixed, but the repair would cost about $1,000.[8]

1.1.2.2 Witnesses Following Truck. Two people traveling north on US-83 in a vehicle directly behind the truck witnessed it weaving erratically and failing to maintain its lane of travel. At 12:02 p.m., they called the Uvalde Police Department to report the hazard. At 12:07 p.m., they called the Real County Sheriff's Office. During both recorded phone calls, they voiced concern about the erratic driving. They made numerous statements indicating that the truck was going to cause a head-on collision or some other type of crash. The Uvalde Police Department dispatched a county deputy at 12:04 p.m. in response to the "reckless driver" call, but the deputy was unable to intercept the truck.

In addition to reporting the truck to law enforcement, the witnesses recorded a 14-minute 27-second cell phone video.[9] TxDPS reviewed the video and determined that the truck was visible for 12 minutes 48 seconds. In the video, the truck crosses the white edgeline bordering the right side of the roadway 37 times and moves into the grassy area beyond the edgeline on at least five occasions. For much of the video, the truck straddles the edgeline and rarely travels within the lane markings.[10] In addition, the truck crosses the yellow centerline 19 times and is fully in the opposing lane of travel at least once. The video records several near misses with vehicles in the opposing lane and on the right shoulder. The cell phone stopped recording shortly before the

[5] Klonopin is the brand name for the prescription drug clonazepam (see section 1.6.2.2 for additional details).

[6] PTSD is a condition that may develop in someone who has seen or lived through a disturbing event.

[7] A forensic download of the driver's cell phone showed no evidence of texting at the time of the crash.

[8] NTSB investigators examined the steering components of the truck and found that the steering gear was mechanically functional and free of defects.

[9] See appendix B for still images from the witness video.

[10] TxDPS concluded that the truck was partially outside of its lane of travel for 8 minutes 34 seconds during the video, which accounts for 67 percent of the time it was visible.

crash. Both the driver and the passenger witnesses provided speed estimates of 60–80 mph for the truck but added that it slowed as it approached the curve where the crash occurred. Postcrash, the driver witness spoke to the truck driver and told him what he had hit. The truck driver replied that he had been texting before the crash.

NTSB investigators studied the witness video to estimate the speed of the truck during the last minute of the video as 69 ±2 mph.[11] The posted speed limit on US-83 at the crash location is 70 mph.

1.1.2.3 Witnesses Following Bus. Two people traveling on US-83 south in a vehicle directly behind the bus witnessed the crash. According to the driver of that vehicle, his cruise control was set at 64–65 mph and he was gaining slightly on the bus, which he believed was traveling about 60–62 mph. He estimated that he was 300 feet behind the bus at the time of the crash. The driver did not notice anything unusual about the operation of the bus and noted that it was within its lane. He first noticed the oncoming truck as it rounded the curve. He believed that the truck was in its lane when it first appeared but that it then drifted into the opposing lane. He estimated that two-thirds of the truck occupied the southbound lane when the crash occurred. The witness recalled no illumination of brake lights or evidence of evasive action by the bus driver. He slammed on his brakes as soon as he witnessed the crash and skidded to a stop a short distance from the two vehicles.[12] The statement of the passenger witness was consistent with that of the driver. The passenger reported the truck being three-fourths into the southbound lane immediately before the crash.

1.2 Injuries

Table 1 provides injury levels for the truck driver, bus driver, and bus passengers. Thirteen bus occupants were fatally injured. The driver of the truck and one bus passenger were seriously injured and were transported to hospitals by medevac helicopters.

[11] See the video study in the NTSB public docket for this investigation (HWY17MH011).

[12] The crash scene diagram (figure 3) depicts tire marks deposited by the witness vehicle.

Table 1. Injury levels for truck driver, bus driver, and bus passengers.

Injury Severity[a]	Fatal	Serious	Minor	TOTAL
Truck driver	0	1	0	1
Bus driver	1	0	0	1
Bus passengers	12	1	0	13
TOTAL	13	2	0	15

[a] Although 49 *Code of Federal Regulations* (CFR) Part 830 pertains only to the reporting of aircraft accidents and incidents to the NTSB, section 830.2 defines fatal injury as any injury that results in death within 30 days of the accident, and serious injury as any injury that: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date of injury; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages or nerve, muscle, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

The bus was equipped with a driver and a passenger seat in the front compartment and four rows of seats in the passenger compartment. Figure 4 shows the bus configuration and the seating location, age and gender, and classification of injuries for each occupant.

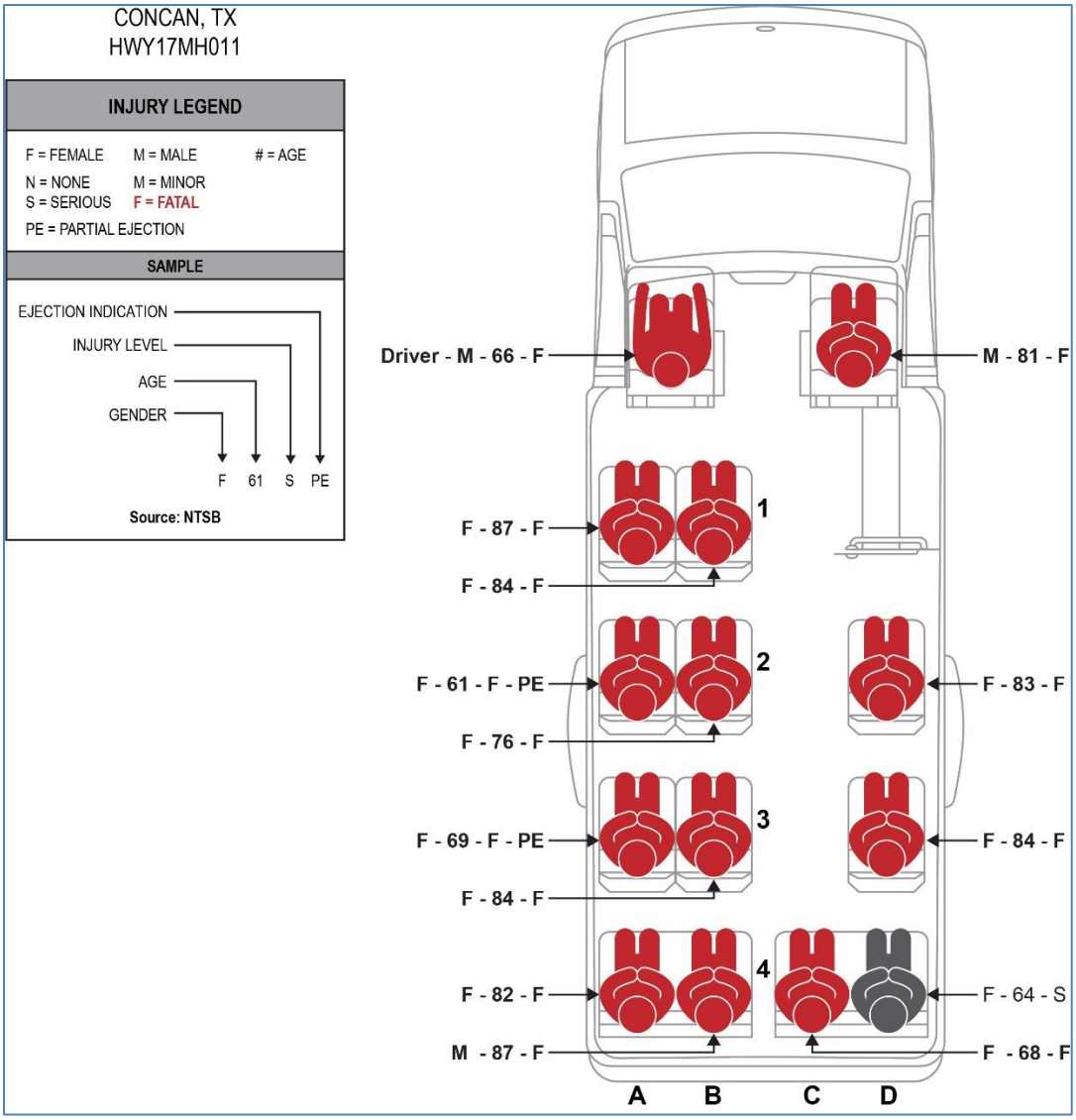

Figure 4. Bus seating chart with injury and demographic information.

The bus sustained major front-end damage and intrusion, which extended down the driver side of the bus. Fatal injuries to the driver, the front passenger, and the occupants of the first and second rows on the driver side (within the intrusion zone) consisted of blunt force trauma. Aft of the intrusion zone, the occupants in row 3 and the two left-seated occupants in row 4 sustained fatal injuries to the head, neck, and chest. The occupant in seat 4C sustained fatal injuries to the abdomen, pelvis, and lumbar spine. The sole survivor was seated in the last row, right corner, at a location farthest from the impact (seat 4D). She sustained serious injuries to the pelvis and abdomen, and multiple extremity fractures. According to first responders and witnesses, the occupants of seats 2A and 3A—despite being lap belted—were partially ejected from the bus.

The truck driver sustained multiple facial, extremity, and rib fractures.

1.3 Emergency Response

Appendix C presents a timeline of the emergency communications and response, beginning with the initial notification call about 12:20 p.m. and ending with the reopening of US-83 at 12:07 a.m. on March 30. Almost immediately following the crash, an emergency medical services (EMS) ambulance stopped at the scene to render aid.[13]

A multiagency response consisted of 16 local and state emergency service agencies, which included resources from the Uvalde Volunteer Fire Department (VFD), Utopia VFD, Concan VFD, Reagan Wells VFD, Leakey VFD, TxDPS, Uvalde County Sheriff's Office, Real County Sheriff's Office, Garner State Park Police, and Texas Parks and Wildlife Police. While en route to the crash scene, the lead Utopia EMS responder and initial incident commander heard radio traffic from Real County describing the crash as involving multiple fatalities and injuries. The incident commander immediately requested a medevac helicopter. Such requests are commonplace in this area due to the 90-mile distance to the level 1 trauma hospital in San Antonio.

Six ambulances and five helicopters were dispatched to the crash scene. The first medevac helicopter landed within 30 minutes of notification.

1.4 Occupant Restraints

1.4.1 Bus

The bus was equipped with front driver and passenger air bags, both of which deployed. The driver and front passenger seats were equipped with lap/shoulder belt assemblies. Freedman Seating Company manufactured the 12 rear passenger seats, eight of which were equipped with traveling retractor lap belt assemblies (see figure 5).[14] The two-person bench seats in the last row on each side of the bus—which could be folded to allow for the storage of luggage—were equipped with manually adjustable lap belt assemblies (see figure 6).

[13] The EMS ambulance was operating in the area and transporting a patient to the Uvalde hospital.

[14] A traveling retractor is a belt retractor system that is mobile and travels with the latch side of the belt. The most common belt retractor in passenger cars is mounted to the seat frame and fixed.

Figure 5. Lap belt assembly in seat 3A, showing traveling retractor with latch and buckle.

Figure 6. Fourth-row bench seat (left) and closeup view of lap belt anchorage points (right).

The four lap belts on the bench seats in the back row were bolted to the seat frame and designed with a manual tightening/cinching mechanism. In contrast to the lap belt anchorage points for the first three rows of seats, which were spaced 11.5 inches apart, the lap belt anchorage points for the bench seats were spaced only 6.5 inches apart.[15] The 6.5-inch spacing meets the requirements for belt anchorage points under Federal Motor Vehicle Safety Standard (FMVSS) 210.[16]

[15] (a) "Anchorage points" refers to the locations at which the belts are attached to the seat. (b) Freedman Seating informed the NTSB that, as of October 1, 2017, it is not installing lap belt anchors at the 6.5-inch lateral spacing. Freedman has increased the anchorage spacing to 8.5–12.5 inches, for an average of 10.5 inches.

[16] FMVSS 210 states that anchorages for an individual seat belt assembly shall be at least 165 millimeters (6.5 inches) apart laterally, measured between the vertical centerlines of the bolt holes.

According to interviews with first responders, all bus occupants were restrained by the installed seat belt assemblies. Examination of the vehicle interior showed physical evidence of loading, with areas of heat abrasion and cupping on each of the seat belt assemblies inspected.[17] Moreover, autopsy reports noted abrasion and contusion to the abdomen and hips of most of the bus occupants.

1.4.2 Truck

The truck was equipped with front driver and passenger air bags, both of which deployed. The driver and front passenger lap/shoulder belts were found locked in the stowed position.[18] According to first responders and witnesses, the driver was found on the passenger side floorboard of the truck and remained there until extracted by first responders. A dog was reportedly in the cab of the truck and survived the crash.

1.5 Vehicles

1.5.1 Bus

1.5.1.1 General. The bus was configured as a 12-passenger medium-size bus with the installation of a Turtle Top bus body on a 2004 Ford E-350 chassis, which retained the original equipment manufacturer cab and forward seating positions (driver and right-front passenger). The GVWR of the bus was 10,700 pounds. Using certified scales, TxDPS inspectors recorded the total bus weight as 7,650 pounds (excluding the weight of the bus occupants).

1.5.1.2 Damage. The bus sustained an offset frontal impact at the driver side, with direct contact damage overlapping about 37 inches of the vehicle width (figure 7). The damage extended more than 62 inches down the driver side of the bus. An interior inspection of the bus showed that, outside of the intrusion zone—which extended to the second row of seats—the body and floor structure were intact. The third- and fourth-row seats remained attached to the vehicle structure, with no displacement.

[17] Cupping occurs when occupant loading curls the seat belt webbing.

[18] The seat belt was retracted and locked in its normal position against the B-pillar, indicating that it was not in use at the time of the crash. The seat belt was not cut or damaged.

Figure 7. Damage to front and driver side of bus.

1.5.1.3 Mechanical Systems. NTSB investigators performed an inspection and functional check of the steering, suspension, braking, and electrical systems, as well as the wheels and tires. The examination revealed no evidence of preexisting defects.

1.5.1.4 Inspection, Maintenance, and Safety Recalls. Maintenance and service records were obtained from the owner of the bus, the First Baptist Church of New Braunfels. The bus was regularly serviced at a Ford dealership. The most recent work order, dated January 30, 2017, showed that the front and rear shock absorbers and a driver window regulator were replaced; and a safety inspection of the tires, brakes, and battery found no defects. State vehicle inspection records showed that the bus was inspected on April 18, 2016, and passed the evaluation criteria.

A search of the National Highway Traffic Safety Administration (NHTSA) safety recall database revealed no recalls related to the bus.

1.5.1.5 Event Data Recording. The bus was equipped with an air bag control module (ACM) capable of recording data related to deployment of the frontal air bag supplemental restraint systems. The ACM was removed from the bus and brought to the supplier, Continental Automotive Systems US, Inc., for data recovery. Continental reported that crash data from the ACM accelerometer were available for 210 milliseconds for the longitudinal (length) and lateral (width) axes of the bus. Based on these data, the maximum cumulative change in velocity along the longitudinal axis was 33.2 mph, and the maximum change in velocity along the lateral axis was 12.0 mph. Examination of the data showed that the magnitude of the acceleration and change in velocity was underreported.[19] The ACM recorded no precrash data, such as vehicle speed or braking.

[19] A review of accelerometer graph data showed that data were clipped at certain times during the crash pulse recording. Continental advised that the ACM has acceleration limits of 61 g (longitudinal) and 30 g (lateral). Data exceeding these limits were not recorded, resulting in an overall underreporting of the acceleration and speed change.

1.5.2 Truck

1.5.2.1 General. The 2007 Dodge Ram 3500 quad cab pickup truck had four-wheel drive, a six-speed manual transmission, and a seating capacity of six. It was equipped with an 8-foot-long truck bed and dual rear wheels. Its GVWR was 12,200 pounds. Using certified scales, TxDPS inspectors recorded the total truck weight as 7,750 pounds (excluding the weight of the driver).

1.5.2.2 Damage. The truck sustained an offset frontal impact at the driver side, with direct contact damage overlapping about 37 inches of the vehicle width (figure 8). The crash resulted in intrusion into the driver compartment. The steering wheel, instrument panel, and footwell regions were displaced aft into the driver seating position. Postcrash, the distance from the steering wheel to the driver seatback was about 7 inches. The front of the truck was shifted rearward and to the left (toward the driver side). The forward frame rails were shifted more than 40 degrees to the left. The driver door was separated at the upper hinge, and the door frame was collapsed. The driver side rear passenger door was displaced rearward.

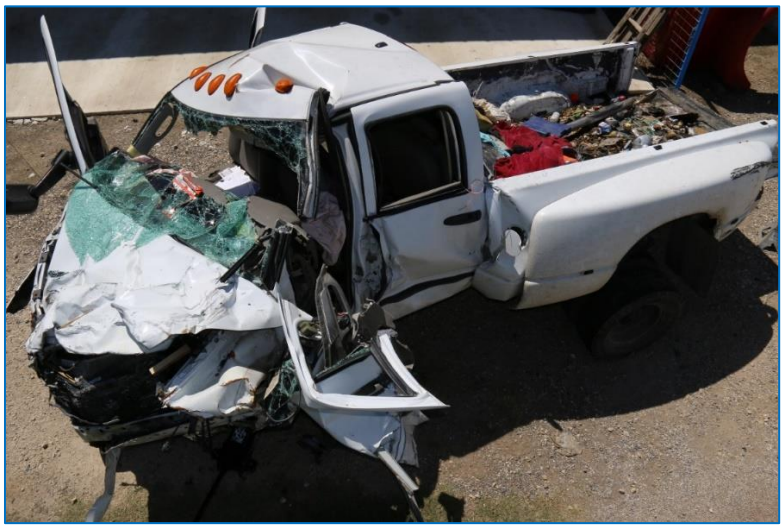

Figure 8. Damage to front and driver side of truck.

1.5.2.3 Mechanical Systems. NTSB investigators inspected the truck suspension, braking, and electrical systems, as well as the wheels and tires. The examination revealed no evidence of preexisting defects.

The extent of vehicle damage prevented NTSB investigators from performing a functional check of the steering system and several related components. Based on the truck driver's statement indicating a precrash problem with the steering gear, it was removed and sent to the NTSB materials laboratory. Internal examinations concluded that the steering gear was mechanically functional and free of defects.

1.5.2.4 Inspection, Maintenance, and Safety Recalls. Two maintenance receipts from mechanical repairs were found in the truck glovebox. On September 21, 2016, a fuel filter and two batteries were replaced. Repair work on December 15, 2016, included replacement of the transfer case shifter bushings; tightening of the steering stabilizer bolts; installation of four-wheel-drive axles on the front differential; and replacement of the brake caliper, bracket, brake pads, and rotor on the right front axle. A review of state vehicle inspection records showed that the truck was inspected on October 6, 2016, and passed the evaluation criteria.

A search of the NHTSA safety recall database revealed four open recalls for the truck. Two recalls related to the potential for rupture of the air bag inflator. The air bags deployed normally, without rupture. The other two recalls related to the potential for steering gear components to either loosen or fracture under certain driving conditions. NTSB investigators inspected the steering linkage and related components and found no defects.

1.5.2.5 Event Data Recording. The truck was equipped with an ACM capable of recording data on deployment of the frontal air bag supplemental restraint systems. Both TxDPS and the NTSB attempted to download the module, but no data were available because of a power loss during the collision.

1.6 Driver Factors

1.6.1 Bus Driver

1.6.1.1 Licensing and Experience. The bus driver, a 66-year-old male, held a Texas class A commercial driver's license (CDL) with passenger, school bus, and double/triple trailer endorsements.[20] His driving record showed no violations or prior crashes. According to the driver's wife, he served as a relief driver for the Comal school district and drove a medium-size bus on weekends for a waterpark in New Braunfels. He was familiar with the church bus involved in the crash and had not mentioned experiencing any mechanical issues. A First Baptist Church representative reported that the driver had taken various church groups to the Alto Frio camp and conference center during the past 3–4 years and was familiar with the route.

1.6.1.2 Health, Medical Certification, and Toxicology. The bus driver's health, medical certification, and toxicology data are summarized below.

- ***Health:*** NTSB investigators reviewed records from the bus driver's primary care providers from July 2013 through February 2017. His medical conditions included type II diabetes, elevated cholesterol, gout, and neck pain—which were being treated and controlled with diet, exercise, and oral medications. Additionally, he had a history of obstructive sleep apnea (OSA), for which he used a continuous positive airway

[20] A class A CDL permits the holder to operate a vehicle with a gross combination weight rating exceeding 26,000 pounds.

pressure device, though his wife reported that he was not comfortable with it. She also reported that he snored at night, but it did not usually cause him to wake.

- ***Medical certification:*** The driver's current medical certificate was issued in February 2017. He reported taking medications for high blood pressure, high cholesterol, and gout. Because of his controlled high blood pressure, the certified medical examiner granted him a medical certificate for 1 year.[21]

- ***Toxicology:*** Forensic toxicology testing conducted by the Bexar County medical examiner as part of the driver's autopsy detected ibuprofen at low levels. Ibuprofen is an over-the-counter (OTC) and prescription nonsedating pain and fever medication. Tests conducted by the Federal Aviation Administration (FAA) Bioaeronautical Sciences Research Laboratory detected no ethanol in the driver's blood but did detect chlorthalidone and ibuprofen.[22] Chlorthalidone is a nonsedating diuretic that had been prescribed to the driver as treatment for high blood pressure. Both medications are generally considered to be nonimpairing.

1.6.1.3 Precrash Activities. NTSB investigators reviewed cell phone records and interviewed the bus driver's wife, a pastor who arranged the retreat, and camp staff to determine his precrash activities. On each of the 3 nights before the crash, the driver had an opportunity for 7.5 hours of rest. A review of records showed no cell phone activity by the driver during the return trip from the camp to New Braunfels.

1.6.2 Truck Driver

1.6.2.1 Licensing and Experience. The truck driver, a 20-year-old male, held a Texas class C driver's license, which allowed him to operate noncommercial vehicles. A review of law enforcement and license records showed that, in the 4 years before the crash, he had had at least eight interactions with police while driving (see table 2).

[21] See 49 CFR 391.41(b)(6). Stage 1 hypertension corresponds to a systolic blood pressure of 140–159 millimeters of mercury (mmHg) or a diastolic blood pressure of 90–99 mmHg. A driver with blood pressure in this range is at low risk for hypertension-related acute incapacitation and may be medically certified to drive for 1 year. The bus driver's blood pressure was last recorded as 123/67.

[22] Toxicology testing included more than 1,300 substances; see the FAA WebDrugs website for a complete listing, accessed November 6, 2018.

Table 2. Truck driver license history and other interactions with law enforcement, 2013–2017.

Date	Law Enforcement Interaction	Result
01/24/14	Speeding, no driver's license	Citation
02/15/14	Farm license violation	Citation
01/17/15	Property-damage crash in Bexar County, Texas	Police officer determined driver to be at fault
10/03/15	Speeding, equipment violations, expired driver's license	Citation (expired license) Warning (other violations)
10/25/15	No license plates, expired driver's license, no driver's license in possession, no insurance	Citation (expired license) Warning (other violations)
05/17/16	Failure to move over or to slow for certain vehicles, driving with suspended license, no driver's license in possession, no insurance	Citation (driving with suspended license) Warning (other violations)
01/08/17	No/improper mud flap, affixing unauthorized sunscreening device to vehicle	Warning (both violations)
01/14/17	No/improper mud flap, affixing unauthorized sunscreening device, noncompliant head lamps, no driver's license in possession	Warning (all violations)

On January 17, 2015, while driving a car, the truck driver was involved in a property-damage crash in which he crossed into the opposing traffic lane and struck another vehicle. According to witnesses, he stated that he had been on his phone when he drifted into the other lane. No postcrash toxicology testing was conducted, because the police officer observed no overt symptoms of intoxication.[23] The driver was not cited for this crash.

On January 8, 2017, the driver was stopped for having no/improper mud flaps and affixing an unauthorized sunscreening device to his vehicle. The police officer noted that the driver appeared to be nervous, so he requested consent to search the truck. The officer found no contraband and released the driver with a warning. The same officer stopped the driver again on January 14 for similar equipment violations and again issued a warning.[24]

[23] The police officer had not received advanced roadside impaired driving enforcement (ARIDE) training or drug recognition expert (DRE) training at the time of the crash investigation. See the IACP webpage on the DEC program and the Sam Houston State University Criminal Justice Center webpage on the DEC program, accessed November 6, 2018.

[24] The police officer had not received ARIDE or DRE training.

1.6.2.2 Health and Prescribed Medication. NTSB investigators reviewed medical records from August 2014 through September 2016. The truck driver was generally found to be in good health during school physical examinations. He was treated for minor illnesses and orthopedic injuries. On September 19, 2016, he was treated for pain following a right lower leg injury. During that visit, he was prescribed tramadol.[25] There was no evidence that he had refilled or received a new prescription for tramadol since that date.

The truck driver was required to wear corrective lenses while driving. NTSB investigators reviewed his optometry records. On August 24, 2016, an examination documented his uncorrected distance visual acuity as 20/50 right eye and 20/40 left eye. He was prescribed eyeglasses that corrected his distance vision to 20/25 right eye, 20/20 left eye, and 20/20 both eyes. During a postcrash interview, the driver said that he was not wearing his glasses at the time of the crash.

According to his medical records, the driver was voluntarily hospitalized for anxiety and depression between September 27 and October 5, 2016. Discharge records documented that he had depression and PTSD. Individuals suffering from PTSD may relive the traumatic event, experience excess arousal to stimulus, and avoid situations that cause symptoms.[26]

The driver's most recent identified outpatient psychiatric visit was for followup after the hospitalization, on November 14, 2016. Documentation noted that he was doing well on current medical treatment and was not a danger to himself or others. The examining psychiatrist documented no other medical or psychiatric conditions, or evidence of substance abuse. The patient was to continue the prescribed medications listed in table 3.[27] No additional followup visits were made. The driver continued to refill his prescribed medications monthly. NTSB investigators identified no additional psychiatric records.

Table 3. Truck driver prescribed medications.

Medication	Brand Name	Dosage	Treatment
Clonazepam	Klonopin	1 mg 3 times per day	PTSD: sedative used to treat seizure and panic disorders
Prazosin	Minipress	2 mg 2 times per day	PTSD: blood pressure medication used also to treat symptoms of PTSD, decrease nightmares
Escitalopram	Lexapro	20 mg 1 time per day	Depression: antidepressant and antianxiety medication
Zolpidem	Ambien	10 mg 1 time per day at bedtime	Insomnia: short-acting sleep aid medication

[25] Tramadol is an opioid pain medication and Schedule IV controlled substance available by prescription.

[26] See the National Institute of Mental Health webpage on PTSD, accessed November 6, 2018.

[27] The treating physician documented discussing the benefits and risks of the prescribed medications, including precautions, potential side effects, and adverse reactions.

Following the crash, four prescription bottles for the medications listed in table 3 were found in the front cab of the truck. The bottles of clonazepam and prazosin were found open and empty, and many loose pills were located throughout the cab. The prescription labels showed that the medications were filled at a pharmacy in Uvalde on the day of the crash. In addition to the prescription bottles, an open box of cold medication (liquid capsules) was found within the truck wreckage.[28] Postcrash, the driver told a TxDPS trooper that he had taken two clonazepam pills an hour earlier.[29]

1.6.2.3 Illicit Drug Possession. During a postcrash inspection of the truck, TxDPS found a metal box containing two unburned marijuana joints, the remains of five partially smoked joints, and a package of rolling papers (see figure 9).[30] Also found in the truck were electronic scales, which TxDPS considered to be drug paraphernalia. According to 21 *United States Code* 812, marijuana is listed as a Schedule I controlled substance.[31]

Figure 9. Marijuana joints (burned and unburned) and rolling papers found in center console of truck. (Source: TxDPS)

1.6.2.4 Toxicology Results. The TxDPS crime laboratory completed toxicology testing of a blood sample collected from the truck driver at University Hospital in San Antonio at 2:20 p.m. (2 hours postcrash; see table 4).

[28] The cold medication contains acetaminophen (pain reliever/fever reducer), dextromethorphan (cough suppressant), and doxylamine succinate (antihistamine).

[29] The driver referred to the pills he ingested as "coladapin," a mispronunciation of the drug Klonopin (brand name for clonazepam).

[30] The TxDPS crime laboratory analyzed the plant substance in the two unburned joints and confirmed it to be marijuana.

[31] Schedule I drugs, substances, or chemicals are defined as drugs with no currently accepted medical use and a high potential for abuse.

Table 4. TxDPS laboratory toxicology results for truck driver, March 29, 2017.

Drug[a,b]	Blood Test Result	Description
Delta-9-THC	7.1 ng/mL	Primary active chemical in marijuana
Clonazepam	0.05 mg/L	Sedating benzodiazepine
Doxylamine	Detected (no quantification)	Sedating antihistamine found in OTC and prescription products for cold and allergy

[a] TxDPS screening was negative for the following drug classes: amphetamines, barbiturates, carisoprodol/meprobamate, cocaine metabolites, opiates, and phencyclidine.

[b] Fentanyl, which was administered postcrash while the driver was en route to the hospital, was also detected in the blood.

The FAA laboratory conducted forensic toxicology testing of the limited remaining blood specimen collected from the driver at 2:20 p.m. on March 29 and of a urine sample collected at 7:42 p.m. (about 7.5 hours postcrash).[32] Delta-9-carboxy-tetrahydrocannabinol (THC), the primary active ingredient in marijuana, was detected in the blood at 7.1 nanograms per milliliter (ng/mL). No ethanol was detected in the blood. Numerous drugs—including 7-amino-clonazepam, benzoylecgonine, citalopram, dextromethorphan, dextrorphan, ecgonine methyl ester, hydromorphone, lidocaine, morphine, and norfentanyl—were detected in the urine.[33]

The potentially driving-impairing drugs confirmed in the blood were THC and clonazepam, descriptions of which follow:

- ***Marijuana (THC):*** Marijuana is a psychoactive central nervous system (CNS) depressant. THC is the primary active chemical in marijuana. 9-Carboxy-tetrahydrocannabinol is an inactive metabolite in THC.[34] Concentrations of the parent drug (THC) and the metabolite are very dependent on the pattern of use as well as dose. Concentrations vary depending on the potency of the marijuana and the way the drug is used.

- ***Clonazepam:*** Clonazepam is a sedative benzodiazepine used in the treatment of seizure disorders and panic disorder.[35]

[32] Toxicology testing included more than 1,300 substances; see the FAA WebDrugs website for a complete listing, accessed November 6, 2018.

[33] (a) 7-amino-clonazepam is the metabolite of clonazepam. (b) Benzoylecgonine and ecgonine methyl ester are metabolites of cocaine. (c) Citalopram is an antidepressant and may be associated with the driver's prescribed medication escitalopram. (d) Dextromethorphan and its metabolite dextrorphan are cough medications. (e) The remaining four drugs detected in the urine are consistent with medications given during postcrash treatment at the hospital.

[34] See the FAA laboratory data sheet on marijuana, accessed November 6, 2018.

[35] See the US National Library of Medicine DailyMed sheet on clonazepam, accessed November 6, 2018.

1.6.2.5 Precrash Activities. Table 5 presents a timeline of the truck driver's activities on the day of the crash and 2 days prior.

Table 5. Precrash activities of truck driver, March 27–29, 2017.

Time	Activity	Source
Monday, March 27		
5:30 a.m.	Awakes	NTSB interview
6:23	First interaction with phone (outgoing text)	Cell phone data
10:17	Works at Vanderpool ranch clearing land	NTSB interview/cell phone data
3:00 p.m.	Departs work	NTSB interview
4:46	Arrives home	Cell phone data
9:48	Last interaction with phone (outgoing text)	Cell phone data
10:00	Goes to bed	NTSB interview
Tuesday, March 28		
5:30 a.m.	Awakes	NTSB interview
6:09	Located in Vanderpool area	Cell phone data
12:55 p.m.	Located in Helotes area (northwest of San Antonio)	Cell phone data
1:52	Located in San Antonio area	Cell phone data
4:10	Located in Helotes area	Cell phone data
5:18	Located in Medina area	Cell phone data
6:34	Last interaction with phone (outgoing text)	Cell phone data
10:00	Goes to bed	NTSB interview
Wednesday, March 29		
5:30 a.m.	Awakes	NTSB interview
6:30–8:00	Departs Medina area	Interview/cell phone data
9:25	First interaction with phone (outgoing call)	Cell phone data
9:40	Located in Utopia area	Cell phone data
9:58	Located in Rio Frio area	Cell phone data
10:00	Located in Leakey area	Cell phone data
11:03	Visits pharmacy in Uvalde	Surveillance video
N/A	Visits restaurant in Uvalde	NTSB interview
N/A	Drives around Uvalde	NTSB interview
12:12 p.m.	Located in Concan area	Cell phone data
12:20 p.m.	**Crash**	Dispatch records

NTSB investigators examined cell phone data and surveillance video and interviewed the truck driver to determine his activities in the 2.5 days before the crash. On Tuesday, March 28, he went to bed around 10:00 p.m. On the following day—the day of the crash—he departed his residence in Medina between 6:30 and 8:00 a.m. He reached Leakey about 10:00 a.m. and then traveled south to Uvalde. Based on surveillance video footage, the driver visited a Uvalde pharmacy at 11:03 a.m. to pick up four prescriptions. After leaving the pharmacy, he stopped to get food before returning to Leakey.

1.6.2.6 Cell Phone Data. TxDPS troopers recovered the driver's cell phone at the crash scene. In compliance with a search warrant, TxDPS conducted a forensic download of the phone to analyze its contents. A music application appeared when the phone was first turned on. The last recorded driver-initiated activities were the reading of a text at 11:25 a.m. and accessing music at 11:53 a.m. Further review and testing conducted by the NTSB showed that the driver may have manipulated his phone at 12:14 p.m. or switched to a different application at 12:19 p.m. Additionally, TxDPS recovered text messages, multimedia messages, photographs, videos, call logs, phone activity logs, contact information, and other data items. An examination of the cell phone contents indicated conversations regarding the purchase, sale, and trading of drugs for recreational use. Evidence from the driver's cell phone also showed that he was misusing prescription medications and had plans to sell the clonazepam that he had picked up on the morning of March 29.

1.7 Highway Factors

1.7.1 Description and Characteristics

The crash occurred about 6.5 miles north of Concan, on US-83—which is a two-lane roadway with an 11.5-foot-wide travel lane in each direction. In the vicinity of the crash site, double yellow line pavement striping delineates the travel lanes, indicating that the area is a no passing zone. Raised yellow pavement markers spaced at 42-foot intervals are located between the pavement stripes. The right shoulders are about 8 feet wide, and there are no alert grooves or longitudinal rumble strips and no centerline rumble strips.[36]

The collision occurred within a 1,432.7-foot radius curve, which is 1,445.4 feet long. The truck was traveling uphill in a northerly direction on an approximate 4 percent grade through the right-hand curve. The bus was traveling downhill in a southerly direction on a 4 percent grade, entering the left-hand curve. The superelevation, or bank, of the curve was 9.5 percent.

[36] Other areas along US-83 have both centerline and longitudinal edgeline rumble strips. The Texas Department of Transportation (TxDOT) indicated that rumble strips were not warranted at the crash location because it had no accident history.

1.7.2 Traffic Volume and Speed

The speed limit for US-83 through the curve is 70 mph. A 2014 speed survey conducted by TxDOT at four locations along US-83 showed that the 85th percentile speed ranged from 67 to 71 mph for vehicles traveling north and from 65 to 75 mph for vehicles traveling south.[37] In 2016, the average daily traffic count was 2,726 vehicles.

1.7.3 Highway Signage and Stopping Sight Distance

About 250 feet south of the crash site, a 60-mph warning sign alerts northbound traffic that the speed limit is reduced to 60 mph 950 feet ahead because of the entrances for Garner State Park. Work zone signs were posted in the area, but a scheduled pavement resealing project did not begin until April–May 2017 (see figure 10).

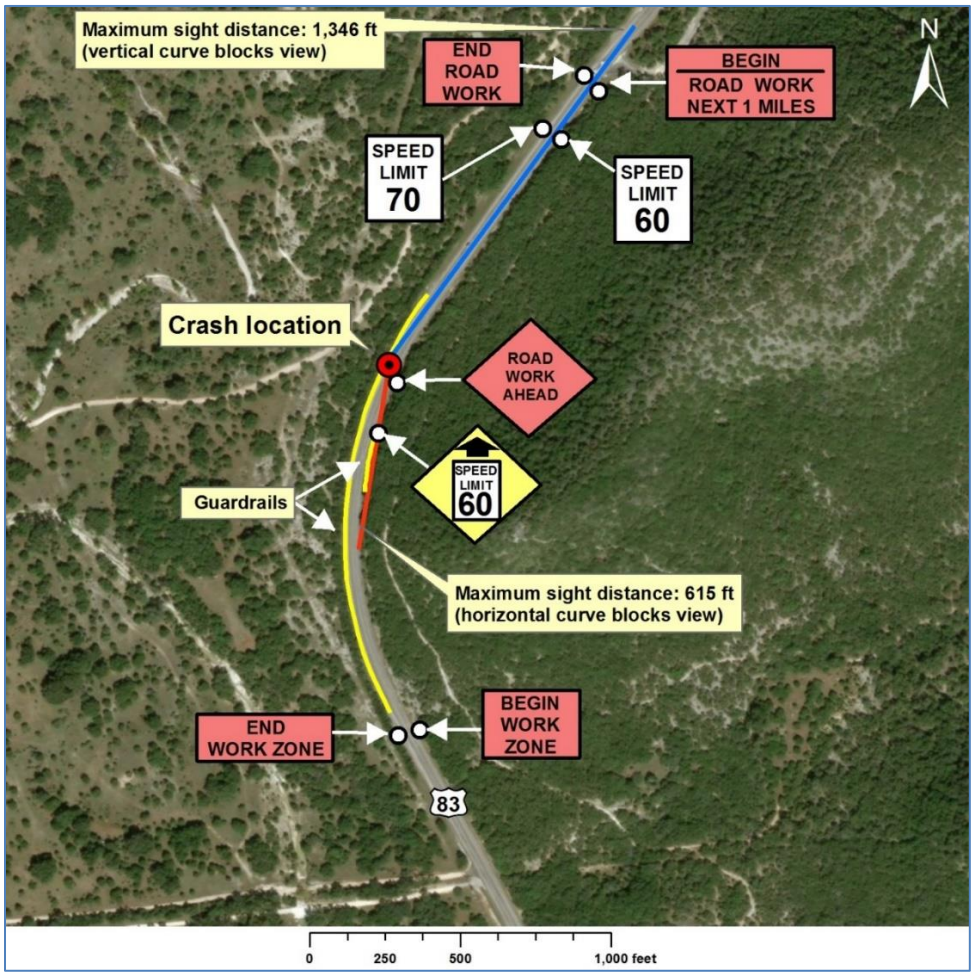

Figure 10. US-83 crash location, showing signage and sight distances. (Source: TxDPS)

[37] The 85th percentile speed refers to the speed at or below which 85 percent of vehicles are traveling. Refer to the highway factors report in the NTSB public docket for this investigation (HWY17MH011) for information on speed survey locations and data.

On the vertical curve approaching the crash site from the north, TxDOT determined that the maximum sight distance for traffic on US-83 was 1,346 feet. The maximum sight distance for traffic from the south was 615 feet because of the vegetation and cut slope along the east side of the highway. For a 70-mph design speed highway at this location, the required stopping distance is 706 feet.[38] Upon evaluating the sight distance at this location with NTSB investigators, TxDOT posted an additional 60-mph advisory speed warning sign in May 2017.

1.7.4 Crash History

NTSB investigators evaluated crash history data provided by TxDOT for a 6-mile segment of US-83 (3 miles north and 3 miles south of the crash site) from 2012 to 2016. Of 31 crashes, 22 were property damage only, eight were injury crashes, and one was a run-off-the-road fatal crash. No other fatal head-on collisions occurred during this 5-year period.

1.8 Weather and Illumination

Historical data from the weather station at Garner Field airport in Uvalde, about 27 miles south of the crash site, indicate that—on March 29, 2017, at 12:15 p.m.—the weather was clear, the temperature was 76.5°F, and the wind was from the west at 8 mph. According to the National Oceanic and Atmospheric Administration solar calculator, at 12:20 p.m. at the crash location, the sun was at an angle 120° of true north, with a 47° elevation in the sky.

[38] The American Association of State Highway and Transportation Officials defines stopping sight distance as the distance required for a vehicle with a driver's eye height of 3.5 feet to detect a 2-foot-tall object in the lane and brake to a stop on wet pavement. The perception–reaction time is calculated as 2.5 seconds, and the deceleration rate is assumed to be 0.34 g.

2 Analysis

2.1 Introduction

The Concan crash involved a 2007 Dodge Ram 3500 pickup truck and a 2004 Ford E350 medium-size bus. The 20-year-old truck driver, traveling on US-83 north near the end of a right-hand curve, departed the travel lane, crossed the centerline into the southbound lane, and collided with the bus. As a result of the crash, the bus driver and 12 bus passengers were fatally injured. The driver of the truck and one bus passenger were seriously injured.

This analysis discusses the dynamics of the crash (section 2.2) and evaluates the following:

- Truck driver performance (section 2.3)
- Drug-impaired driving countermeasures (section 2.4)
- Medium-size bus seat belt systems (section 2.5).

Following a comprehensive review of the circumstances that led to the Concan crash, the NTSB established that the following factors did not contribute to the cause of the crash:

- ***Driver qualifications and familiarity with vehicle and roadway:*** Both drivers were properly licensed and were familiar with their vehicles and the US-83 operating environment.
- ***Medical condition or fatigue of the bus driver:*** The bus driver had several ailments that were controlled with diet, exercise, and oral medication. He also had a history of OSA, for which he was prescribed a continuous positive airway pressure device that he found to be uncomfortable. Although the driver suffered from OSA, there was no evidence that it impaired his ability to operate the bus at the time of the crash. According to those who accompanied the bus driver to the Alto Frio Baptist camp, he had had an adequate sleep opportunity the night before the crash.

  Untreated OSA can result in sleep loss, regardless of sleep opportunity, and may cause daytime sleepiness and lapses in attention. Nevertheless, based on statements from witnesses who were traveling behind the bus and had followed it through a series of vertical and horizontal curves, there was no evidence of the driver's inability to operate the bus. Witnesses stated that the bus traveled at a reasonable speed and stayed within its lane. Based on witness statements and limited line of sight, the intrusion of the truck into the path of the bus allowed no time for the bus driver to take evasive action.
- ***Bus driver cell phone distraction:*** There was no evidence that the bus driver was distracted by the use of his cell phone at the time of the crash (12:20 p.m.). According to records obtained from his cell phone provider, the last interaction he had with his phone was at 9:05 a.m. on March 29.

- ***Bus driver impairment by alcohol or other drugs:*** Toxicology testing found no evidence that the bus driver was impaired by alcohol or other drugs.

- ***Vehicle mechanical condition:*** NTSB investigators found no evidence of mechanical problems with the truck or the bus that would have contributed to the crash. Although the truck driver stated that there was "excessive play" in the steering, an examination concluded that the steering gear was mechanically functional and free of defects.

- ***Highway condition:*** An examination of the highway environment revealed no safety deficiencies that would have contributed to the crash. US-83 has no centerline rumble strips at the crash location, which could have alerted the truck driver that he was crossing into the opposing travel lane. However, review of the 14-minute 27-second video of the truck as it traveled from Uvalde to Leakey revealed numerous centerline rumble strips at other locations—which failed to alert the driver and result in corrective action.

- ***Weather:*** The weather was clear, there was no sun glare or precipitation at or near the time of the crash, and the roadway was dry.

The NTSB, therefore, concludes that none of the following were factors in the crash: (1) bus or truck driver qualifications or familiarity with vehicles and roadway, (2) medical condition or fatigue of the bus driver, (3) bus driver cell phone distraction, (4) bus driver impairment by alcohol or other drugs, (5) mechanical condition of either vehicle, (6) highway condition, or (7) weather.

Almost immediately following the crash, medical personnel in an EMS ambulance stopped at the scene to render aid. They reported numerous fatalities and entrapments. A multiagency response consisted of 16 local and state emergency service agencies. The rural location of the crash site required about a 30-minute travel time for the majority of responding agencies. Although extrication of the injured was prolonged due to the extent of intrusion and deformation of the vehicles, the delay did not contribute to the severity of the injuries. The NTSB concludes that considering the rural location of the crash, the emergency response efforts were timely and adequate.

2.2 Crash Discussion

2.2.1 Precrash Video Evidence

Witnesses following the truck recorded a 14-minute 27-second video that was reviewed by NTSB investigators. For much of the precrash video, the truck straddles the edgeline and rarely travels within the lane markings. In addition, the truck crosses the yellow centerline 19 times and is fully in the opposing lane of travel at least once (see figure 11). When the truck crosses the edgeline or the centerline of the roadway (even those portions milled with rumble strips), the driver exhibits no quick corrective action. Instead, he either continues his path across the lane markings, straddles the markings for an extended time, or slowly recovers back into the travel lane.

Figure 11. Still image of truck traveling north in opposing US-83 south lane at time 6:32 of witness video.

Video evidence shows the truck driver appearing to make slow steering corrections to avoid other vehicles. A few vehicles traveling in the opposite direction are forced to make avoidance maneuvers, such as driving on the shoulder.

2.2.2 Crash Description

Witnesses observed the truck cross up to two-thirds into the southbound travel lane. The tire marks deposited on the roadway and vehicle damage patterns indicated a collinear, offset impact (see figure 12). The relative frontal overlap for both vehicles was about 47 percent. Following the impact, both the truck and the bus rotated counterclockwise, with some southward movement in the bus's original direction of travel.

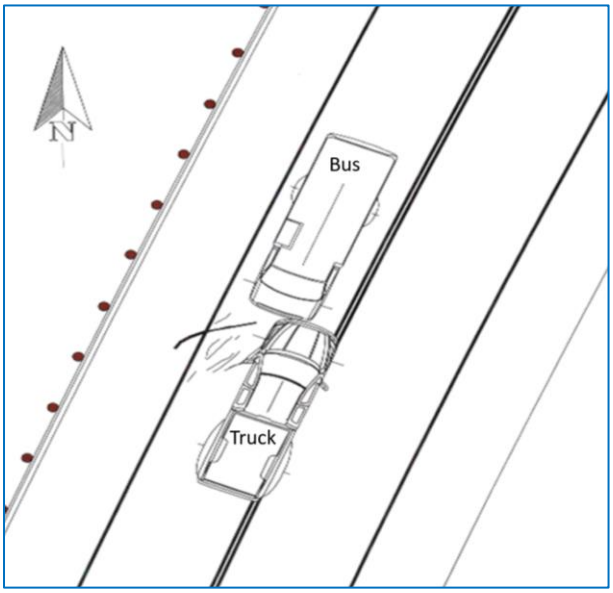

Figure 12. Diagram showing approximate orientation of truck and bus at point of impact.

Based on witness statements and video evidence, coupled with roadway physical evidence and vehicle damage profiles, the NTSB concludes that the truck driver operated his vehicle erratically on US-83 for more than 15 minutes, including extended periods of travel off the right road edgeline and multiple incursions across the highway centerline—which culminated in a head-on crash in the opposing lane of travel.

2.3 Truck Driver Performance

NTSB investigators reviewed the human factors that may have caused the truck driver's sustained erratic driving behavior. Cell phone distraction, fatigue, medical impairment, and impairment by alcohol and other drugs were reviewed, among other factors.

2.3.1 Distraction

Immediately following the crash, the truck driver told witnesses that he had been texting, and he later told investigators that he was checking his cell phone to see if anyone had called him. A forensic examination of his phone by TxDPS showed that the last recorded driver-initiated activities were accessing a text at 11:25 a.m. and a music application at 11:53 a.m. (27 minutes precrash). NTSB testing showed that the driver may also have manipulated his phone at 12:14 p.m. or switched to a different application at 12:19 p.m. No forensic evidence indicated that he was in the act of composing a text or placing a call just before the crash. Therefore, the NTSB concludes that it is possible that the truck driver was glancing at or manipulating his cell phone at the time of the crash, but this action would not explain the prolonged and continuous erratic driving behavior seen in the witness video recording leading up to the crash.

2.3.2 Fatigue

Based on the truck driver's statements to NTSB investigators, he usually went to bed at 10:00 p.m. and awoke at 5:30 a.m.—which provides about 7.5 hours of sleep opportunity.[39] The driver indicated no difficulty sleeping at night. He took a prescribed sleep medication, zolpidem, to assist in his rest. His driving behavior leading up to the crash was not characteristic of a sleep-deprived motor vehicle operator.

Sleep deprivation is generally characterized by noncontinuous lapses in performance, which increase in frequency with sleep loss (Doran, Van Dongen, and Dinges 2001). In addition, sleep-deprived subjects who encounter roadway rumble strips have been found to experience increased alertness, resulting in a temporary reduction in lateral lane deviations (Anund and others 2008). By contrast, the driving behavior of the truck driver suggests a constant state of impairment. During the occasions when the truck crossed the edgeline or centerline of the roadway milled with rumble strips, the driver did not take timely corrective action or temporarily reduce lateral lane deviation, as would be expected from a sleep-deprived driver.

[39] A review of cell phone records showed a lack of activity during the times the driver reported that he was asleep.

Although sleep deprivation does not appear to have contributed to the crash, section 2.3.5, on drug impairment, discusses the sedative effects of marijuana, benzodiazepines, and other drugs that may have contributed to the crash.

2.3.3 Medical Impairment

The truck driver had an active diagnosis of depression and PTSD, which were treated with the medications escitalopram, prazosin, and clonazepam. His last documented evaluation for these conditions was on November 14, 2016, when the psychiatrist noted that the driver was doing well on the current medical treatment and was not a danger to himself or others. During postcrash interviews with the driver, he described no current problems with depression or PTSD and made no mention of feeling suicidal.

Although the driver was not wearing glasses at the time of the crash, his uncorrected distance visual acuity of 20/50 in the right eye and 20/40 in the left eye would not have caused the sustained reckless driving.

2.3.4 Alcohol Impairment

The FAA laboratory conducted forensic toxicology testing of a blood specimen collected from the truck driver at 2:20 p.m. on the day of the crash.[40] No ethanol was detected in the sample. Additionally, there was no evidence to suggest that the driver had consumed alcohol before the crash.

Based on the review of his sleep opportunity, medical condition, and toxicology results, the NTSB concludes that the truck driver was not sleep deprived, impaired by a medical condition, or impaired by alcohol at the time of the crash.

2.3.5 Drug Impairment

2.3.5.1 Marijuana. During an inspection of the truck following the crash, TxDPS troopers found two unburned marijuana joints, the remains of five partially smoked marijuana joints, and a package of rolling papers. Toxicology testing conducted by both TxDPS and the FAA laboratory detected THC at 7.1 ng/mL in a blood sample collected 2 hours postcrash. As discussed in section 1.6.2.4, THC is the primary potentially impairing psychoactive chemical found in marijuana.

Concentrations of THC vary depending on the potency of the marijuana and the way the drug is used; however, peak plasma concentrations of 100–200 ng/mL are routinely encountered shortly after smoking (NHTSA 2004). Plasma concentrations of THC decline rapidly and are often less than 5 ng/mL within 3 hours of ingestion (NHTSA 2004). Although the half-life of THC varies significantly based on frequency of use and body physique, controlled studies demonstrate that detectable THC blood levels decrease by an average of 90.3 percent from their maximum levels within 1.4 hours of last use (Hartman and others 2016).[41] It is likely that the driver's THC

[40] Toxicology testing included more than 1,300 substances; see the FAA WebDrugs website for a complete listing, accessed November 6, 2018.

[41] Half-life refers to the amount of time it takes the body to eliminate half of the concentration of a substance in the blood—in this case, THC.

level at the time of the crash was higher than the 7.1 ng/mL detected in his blood 2 hours postcrash. However, NTSB investigators could not determine when he last smoked marijuana, and the exact level of THC in his blood cannot be back-calculated.

Marijuana can affect the cognitive and motor skills critical to driving, such as vigilance, drowsiness, time and distance perception, reaction time, lane tracking, and coordination (Capler and others 2017; NHTSA 2017b; Strand, Gjerde, and Morland 2016). Simulator studies of the effects of marijuana on driving have found that drivers with an average THC level of 13 ng/mL demonstrated lane weaving similar to that of drivers impaired by alcohol at a blood alcohol concentration (BAC) of about 0.08 gram per deciliter (g/dL; Hartman and others 2015).

2.3.5.2 Clonazepam. The TxDPS laboratory detected 50 micrograms per liter (µg/L) of clonazepam in the truck driver's blood collected 2 hours postcrash. Because clonazepam metabolizes relatively slowly in the body (half-life ranges from 19 to 60 hours), the driver's blood level of 50 µg/L was likely only slightly higher at the time of the crash.[42] The prescription drug clonazepam is a potent sedative in the benzodiazepine class. It is commonly used to treat seizure disorders and panic disorder. Benzodiazepines can cause addiction after chronic clinical treatment and are often abused as a recreational drug (Tan, Rudolph, and Luscher 2011). Clonazepam carries the following warning:

> Since clonazepam produces CNS depression, patients receiving this drug should be cautioned against engaging in hazardous operations requiring mental alertness, such as operating machinery or driving a motor vehicle. They should be warned about the concomitant use of alcohol or other CNS-depressant drugs during clonazepam therapy.[43]

The most common side effects include dizziness, drowsiness, fatigue, problems with walking and coordination, depression, and problems with memory. As reported by Jones, Holmgren, and Kugelberg (2007), the average blood level of clonazepam found in 164 people arrested for drug-impaired driving was 50 µg/L—equal to the driver's clonazepam blood level 2 hours postcrash.

Epidemiological studies have consistently shown that benzodiazepines, such as clonazepam, are associated with an increased crash risk, with one meta-analysis reporting an increased risk of 1.6–1.8 times that of controls (Dassanayake and others 1998). Simulator studies have noted impaired behavior in drivers shortly after ingestion, with impairment continuing up to 3 weeks with certain types of benzodiazepines (Van Laar, Volkerts, and Van Willigenburg 1992). Among the behaviors noted are increased lane deviations, increased brake reaction times, tracking errors, and collisions.

Evidence acquired during the investigation determined that the truck driver routinely misused prescription medication by not taking it as prescribed.[44] Postcrash, he told a TxDPS

[42] See the FAA laboratory data sheet on clonazepam, accessed November 6, 2018.

[43] See the US National Library of Medicine DailyMed sheet on clonazepam, accessed November 6, 2018.

[44] "Misuse" applies to taking a medication in a manner or dose other than prescribed, taking someone else's prescription, or taking a medication to feel euphoria.

trooper that he had taken two clonazepam pills an hour earlier. (Two pills [2 milligrams] amount to double the prescribed dosage.) The driver admitted that the medication made him drowsy; furthermore, irregular use of clonazepam can increase adverse side effects. Additionally, text messages reviewed by NTSB investigators showed that the driver was trading and selling his prescribed medications.

2.3.5.3 Polysubstance Use. Clonazepam and marijuana (THC) are potent CNS depressants. Each drug enhances the depressant effects of the other and increases the risk of driver impairment.[45] The driver's poor control of his truck for the 15 minutes immediately before the crash provides evidence of significant impairment. His blood tested positive for THC, the active impairing compound in marijuana; and clonazepam was detected 2 hours postcrash at levels consistent with impairment. Additionally, the effects of clonazepam were likely exacerbated by the driver taking double the prescribed dose. Therefore, the NTSB concludes that the failure of the truck driver to maintain control of his vehicle was due to impairment stemming from his use of marijuana in combination with misuse of a prescribed medication, clonazepam.

2.4 Drug-Impaired Driving Countermeasures

Drug-impaired driving, also known as driving under the influence of drugs (DUID), refers to the operation of a motor vehicle while under the influence of or impaired by a psychoactive drug (including illicit substances, prescription medications, OTC medications, or a combination of substances and alcohol). Reversing the drug-impaired driving problem is particularly challenging due to the large number of substances with the potential to affect driving and increase crash risk, the variations in how drugs impair driving, the relative lack of information on potentially impairing drugs, and the differences in the ways that drugs can affect the body and behavior.

Vigorous enforcement is required to promote deterrence and to prevent crashes due to drug-impaired driving. Sections 2.4.1 through 2.4.3 examine measures to improve the detection of drug-impaired drivers and discuss the need for additional leadership at the local, state, and national levels to appropriately allocate limited resources, develop data-driven strategies, and identify effective countermeasures.

2.4.1 Detection of Drug-Impaired Drivers

Traffic law enforcement can influence driving behavior through both general and specific deterrence (NHTSA 2006). Central to the theory of general deterrence are assumptions about how drivers perceive the risk of engaging in prohibited behaviors. If drivers believe that impaired driving is likely to be detected and lead to arrest, many will choose not to drive while impaired. Specific deterrence relates to the individual experiences of those who have committed a crime and the type of punishment levied to discourage future criminal activity. Unfortunately, many drivers do not consider DUID a risk and perceive the likelihood of arrest as low (Holmes, Van Laar, and Robertson 2014). Some drivers assume that there is no accurate means to test for drugs such as marijuana during roadside enforcement stops.

[45] See the Lexicomp Online database for clonazepam and THC, accessed November 6, 2018.

When someone is stopped by law enforcement, it is up to the officer to determine whether the individual is impaired. However, many officers are not sufficiently trained to identify the signs and symptoms of driver impairment when illicit, prescription, or OTC drugs are involved (GAO 2015).[46] Compared to identifying drivers operating under the influence of alcohol, identifying drug impairment is much more complicated because of the large number of drugs and their unpredictable effects. Additionally, accurate roadside drug screening devices are not as widely developed or used as roadside test equipment for enforcing alcohol-impaired driving restrictions, such as portable breath test devices.

2.4.1.1 Law Enforcement Training. In the 4 years before the Concan crash, the truck driver interacted with law enforcement a minimum of eight times. In January 2015, he was involved in a police-determined at-fault collision in which he crossed into an opposing lane of traffic and crashed into an oncoming vehicle. In January 2017, he was stopped for equipment violations on two occasions; when the officer observed signs of nervousness, he conducted a consensual search of the truck. No contraband was located, and the driver was released with a warning. Neither the officer investigating the January 2015 collision nor the officer involved in the two January 2017 enforcement stops had advanced training in the recognition of drug-impaired drivers.[47]

Three tiers of training focus on educating law enforcement officers on the detection of impaired drivers:

- The basic training is the standardized field sobriety testing (SFST) protocol, which trains officers to identify and assess drivers suspected of being under the influence of alcohol. Since 2005, all law enforcement officers in Texas receive SFST during their basic academy training (Ennis and others 2015).

- The ARIDE (advanced roadside impaired driving enforcement) program, developed by NHTSA, was created to bridge the gap between SFST and a more advanced drug recognition program. This 16-hour curriculum trains officers to observe, identify, and articulate the signs of impairment related to alcohol and other drugs. Between 2009 and 2016, about 10.6 percent of officers nationwide (70,479 of 663,390) received ARIDE training (IACP 2017).[48] ARIDE penetration varies considerably, from most officers in some states to only a few in others (GHSA 2017). As of 2016, less than 5 percent of officers in Texas (3,079 of 63,380)—from the 2,690 entities that patrol

[46] The US Government Accountability Office (GAO) found that state prosecutors and highway safety officials reported a lack of knowledge among law enforcement officers about drug impairment in drivers. NHTSA, the Governors Highway Safety Association (GHSA), and the International Association of Chiefs of Police (IACP) maintained that the basic training on impaired driving enforcement is insufficient for identifying drivers who may be impaired by drugs.

[47] The level of training for law enforcement officers involved in the other interactions was not investigated.

[48] Information on the number of officers was obtained from the US Bureau of Labor Statistics employment data for police and sheriff patrol officers.

the state's extensive roadway system—have been ARIDE trained (Ennis and others 2015; IACP 2017).[49]

- The international drug evaluation and classification (DEC) program, developed by the IACP and NHTSA, trains officers to become expert in identifying the signs and symptoms of impairment by various categories of drugs.[50] This program includes 72 hours of classroom training and 40–60 hours of field training. Law enforcement officers who complete the DEC program are certified to perform a 12-step evaluation protocol to assess subjects for drug impairment, which includes psychophysical tests and physical examinations.

  DREs are highly skilled in the detection and identification of drug impairment. Many courts will accept a DRE-trained officer as an expert witness on behalf of the prosecution. Much of the success of a DRE program depends on well-trained officers with strong SFST and ARIDE skills referring potentially impaired drivers for evaluation. As of 2016, about 1.2 percent (8,277 of 663,390) of all officers in the United States were trained as DREs (IACP 2017).

The state of Texas offers DRE basic certification training three times a year. As of 2016, 410 officers statewide were certified (0.65 percent of Texas law enforcement officers).[51] During calendar year 2016, these 410 officers completed 1,008 DRE evaluations—an average of 2.5 evaluations per certified officer (IACP 2017).[52] In 2015, the state evaluated its impaired driving program and found that the distribution of DREs failed to provide adequate statewide coverage (Ennis and others 2015). Only 99 of the state's 2,690 law enforcement agencies have certified DREs, with over 58 percent of those personnel assigned to city police departments (IACP 2017).

[49] In 2016, the state of Texas held 21 ARIDE classes, training 452 officers. By comparison, in 2016, the state of California held 107 classes, training 1,638 officers (IACP 2017).

[50] The Los Angeles Police Department originated this program in the early 1970s. A decade later, NHTSA began working with Los Angeles officials to develop DRE protocols, which led to the establishment of an international DEC program. See the IACP webpage on the DEC program, accessed November 6, 2018.

[51] In a recent state survey on drug-impaired driving, Texas responded that "Every stakeholder is aware of the need for more DREs. The chief impediment is that there is no police agency in Texas that is not strained to the breaking point for personnel resources. The DRE program training requires massive time away for personnel, the best and most productive personnel." (Fell, Kubelka, and Treffers 2018).

[52] For comparison, Pennsylvania has 179 DREs, who conducted 1,822 evaluations in the same time frame; Oregon: 211 DREs, 1,810 evaluations; Arizona: 294 DREs, 787 evaluations; New Jersey: 426 DREs, 1,589 evaluations; and California: 1,589 DREs, 7,367 evaluations.

2.4.1.2 Roadside Drug Testing. Several companies offer oral fluid drug screening devices to assist law enforcement in obtaining a preliminary indication of whether a laboratory toxicology test will likely yield a positive result for classes of drugs.[53] Point-of-contact drug testing devices can provide objective and scientific evidence similar to breath test devices for alcohol detection. The use of onsite oral fluid screening devices might prompt law enforcement officers to further investigate a driver for drug impairment.

Oral fluid devices detect the presence of classes of drugs (such as marijuana, stimulants, amphetamines, and sedatives) rather than specific individual drugs. A positive roadside oral fluid test can be used as evidence to support a request for blood testing to definitively identify potentially impairing drugs. A rapid screening test, followed by timely blood testing, reduces the chance that the intoxicating drug will be lost to the body's metabolism.

Several oral fluid drug screening devices are now available. Field tests have demonstrated that these devices could be a valuable tool for detecting drug use among drivers; however, their overall performance varies based on type of device and drug classes tested for (Kelley-Baker and others 2014; Beirness and Smith 2017; Logan, Mohr, and Talpins 2014).[54] NHTSA recently completed research on the accuracy, reliability, sensitivity, and specificity of these devices but has not yet released its results (NHTSA 2017b).

To reduce alcohol-impaired driving, NHTSA has established model specifications for testing devices, including evidential breath alcohol measurement devices, screening devices to measure alcohol in bodily fluids, and calibrating units for breath alcohol testers. NHTSA maintains a conforming products list for the devices that meet these specifications.[55] Due to the relatively recent availability of oral fluid drug screening devices, no model specifications for roadside drug testing equipment have been developed; and NHTSA offers no best practices guidance. NHTSA-developed specifications and guidance—and the creation of a conforming products list—would hasten the widespread implementation of equipment to improve the detection of drug-impaired drivers.

2.4.1.3 Safety Recommendations. The NTSB concludes that to better detect drivers operating under the influence of drugs, law enforcement officers need advanced training to identify the signs and symptoms of impairment as well as additional tools, such as roadside drug screening devices. After examining available roadside testing equipment, the NTSB concludes that oral fluid drug screening devices can improve the ability of law enforcement officers to detect drug-impaired drivers.

Although some states have engaged in pilot programs to test the reliability of roadside oral fluid drug screening devices, widespread implementation of the equipment is unlikely without NHTSA support. Therefore, the NTSB recommends that NHTSA develop and

[53] As of April 2018, 10 states—Arizona, California, Colorado, Kansas, Massachusetts, Michigan, Nevada, Oklahoma, Vermont, and Wisconsin—report that they have engaged in pilot programs on the use of oral fluid screening devices to detect drugs during enforcement contacts (Fell, Kubelka, and Treffers 2018).

[54] Some of the field studies were funded by the manufacturers of oral fluid drug screening devices.

[55] See the NHTSA webpage on alcohol measurement devices and calibration units, accessed November 6, 2018.

disseminate best practices, identify model specifications, and create a conforming products list for oral fluid drug screening devices.

The IACP and NHTSA continue to develop, promote, and evaluate the DEC and ARIDE programs and have been increasing training opportunities across the United States. However, based on a review of data for ARIDE- and DRE-trained officers in Texas, only a small percentage of officers have received advanced training in the detection of drug impairment. The Texas Highway Safety Office, managed by TxDOT, serves as the lead agency for overall program management of the state's highway safety program. The office assess municipal, county, and statewide needs; awards traffic safety grants to local government agencies; and funds impaired driving programs.[56] Thus, the NTSB recommends that TxDOT promote the importance of attending drug-impaired driving enforcement training and increase training access to meet the demands of local and state law enforcement.

2.4.2 Texas Impaired Driving Data and Countermeasures

2.4.2.1 State Impaired Driving Data. Texas is the second most populous and largest state in the contiguous United States. In 2015, the state had 24 million registered vehicles and more than 15.8 million licensed drivers (TxDOT 2017). NTSB investigators reviewed 2015 Fatality Analysis Reporting System (FARS) data in an effort to determine the extent of the drug-impaired driving problem in Texas.[57] In 2015, there were 453 fatally injured drivers with a positive drug test result, accounting for 47 percent of all fatally injured drivers with a valid test result.[58] In addition, Texas ranks fifth in the nation in the rate of alcohol-related fatalities per vehicle miles traveled. Thirty-eight percent (1,323) of the state's total traffic fatalities (3,516) involved an alcohol-impaired driver with a BAC of 0.08 g/dL or higher (TxDOT 2017).[59]

2.4.2.2 State Drug-Impaired Driving Laws. The *Texas Penal Code* 49.04 defines "driving while intoxicated" as committing an offense if a person is intoxicated while driving a motor vehicle in a public place. State code defines "intoxication" as not having the normal use of mental or physical faculties by reason of the introduction of alcohol, a controlled substance, a drug, a dangerous drug, a combination of two or more of those substances, or any other substance into the body. State highway safety plans address alcohol and other drug countermeasures together, and data are often comingled.

2.4.2.3 State Highway Safety Plans. Each year TxDOT submits a highway safety plan to NHTSA, outlining strategic safety goals, emphasis areas, countermeasure strategies, and performance targets for the coming year. The plan qualifies the state for federal grant money in

[56] In fiscal year 2018, TxDOT awarded more than $866,000 for impaired driving training courses.

[57] FARS data indicate the presence of drugs; they do not indicate if a driver was impaired by a drug at the time of a crash.

[58] See the supplemental data report on drug involvement in fatal crashes (2006–2015) in the NTSB public docket for this investigation (HWY17MH011).

[59] It is difficult to determine the number of alcohol-impaired drivers who were also impaired by drugs because of a low testing rate. In Texas, less than 25 percent of all drivers involved in fatal crashes are tested for drugs.

support of national highway safety goals to reduce motor vehicle-related fatalities (TxDOT 2017). In addition to the annual highway safety plan, TxDOT submits a multiyear strategic highway safety plan (SHSP) to the Federal Highway Administration (FHWA), which establishes statewide goals and objectives.

Establishing safety performance targets is a critical and required element of highway safety plans. The FHWA gives states the flexibility to use the target-setting methodology they deem most appropriate—encouraging states to review data sets and trends and to set realistic and attainable goals.[60]

In the SHSP for 2017–2022, the first sentence acknowledges that "Texas is facing a crisis in road safety." The SHSP states: "Texas envisions a future with zero traffic fatalities and serious injuries" (TxDOT 2016). Texas planners determined that targets should reflect a realistic assessment of the likely amount of exposure (vehicle travel) and population growth. As such, they set what they considered to be "realistic" performance targets rather than "aspirational" goals. The projected targets in the highway safety plan and the SHSP reflect an *increase* in the total number of traffic-related fatalities, traffic-related serious injuries, impaired driving fatalities, and rate of alcohol-related driving deaths per vehicle miles traveled (see table 6).[61] The SHSP projects that the rate will continue to rise, stating: "Unless significantly more resources are put toward countermeasures, it is unrealistic to believe this plan alone can significantly affect risk."[62]

Table 6. Texas highway safety plan and SHSP projections for traffic-related and impaired driving fatalities and for traffic-related serious injuries in 2022.

FARS Outcome Data	2015 Total	2022 Projection	2022 Target
Traffic-related fatalities	3,516	4,327	4,241
Traffic-related serious injuries	17,096	19,454	19,065
Impaired driving fatalities	1,323	1,653	1,620
Rate of alcohol-related driving fatalities per 100 million vehicle miles traveled	0.51	0.58	0.57

[60] See the FHWA webpage on safety performance management, accessed November 6, 2018.

[61] The SHSP describes the strategy as realistic and based on the premise that casualties are predominately the result of exposure to risk. Assumptions are that economic conditions will continue to reflect a growing economy, gas prices will not rise significantly, and motor vehicle crashworthiness and safety features will not significantly reduce risk. Targets reflect a 2 percent reduction against the current upward trend projections.

[62] NHTSA data for calendar year 2016 show that impaired driving fatalities in Texas increased to 1,438, representing 38 percent of the state's 3,776 total fatalities. Nationwide, the percentage of alcohol-related driving fatalities is 28 (NHTSA 2017a).

In examining impaired driving arrests between 2012 and 2016, the state found a steady decline in arrests during grant-funded enforcement activities. Figure 13, extracted from the impaired driving section of the highway safety plan, shows the downward trend in arrests during such enforcement activities (TxDOT 2017). The plan reports that the state "will attempt to reverse this trend creating an increase in impaired driving arrests."

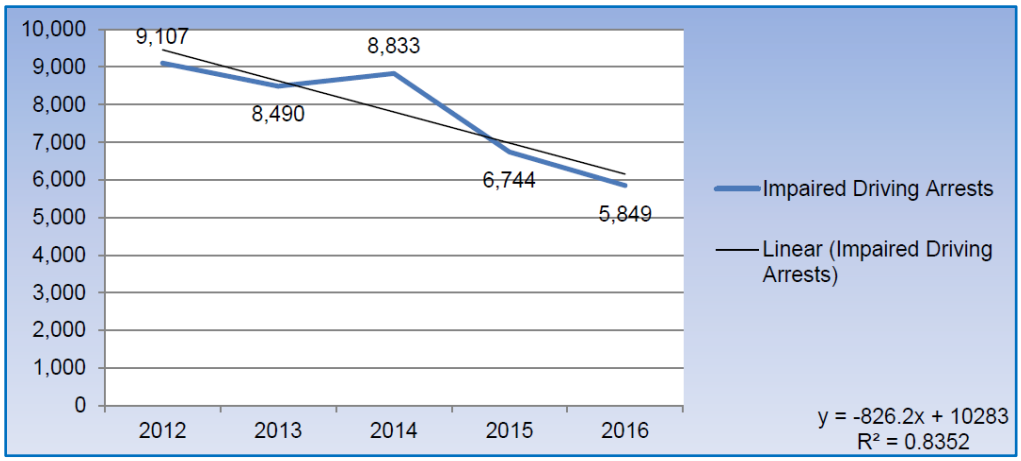

Figure 13. Impaired driving arrests during funded enforcement activities, 2012–2016. (Source: TxDOT)

With the fatality rate and impaired driving fatalities increasing, and the number of impaired driving arrests decreasing, the highway safety plan has established a number of goals and strategies to address the problem of alcohol and other drugs (see appendix D).

2.4.2.4 State Impaired Driving Program Assessment. In 2015, Texas requested NHTSA assistance in assessing its alcohol- and other drug-impaired driving countermeasure program (Ennis and others 2015). The assessment examined program management and strategic planning, prevention, criminal justice, communication, misuse of alcohol and other drugs, and program evaluation. Shortcomings and deficiencies in leadership, resources, and training were identified. Appendix E—which consists of excerpts from the NHTSA-funded highway safety plan—summarizes the 65 recommendations made by the assessment team and the ongoing actions of the Texas impaired driving task force and other stakeholders (TxDOT 2017).

2.4.2.5 Safety Recommendations. The NTSB acknowledges the efforts of strategic planners, Texas law enforcement, advocacy groups, and other stakeholders toward resolving the impaired driving problem. However, based on the SHSP-projected increases in fatalities, injuries, and crashes, additional action is needed. The assessment of the state alcohol- and other drug-impaired driving countermeasure program identified numerous deficiencies (Ennis and others 2015). One recommendation calls for additional engagement by the governor's office and the state legislature. Leadership from the top and a commitment to safety are needed to reverse the statewide trend of increasing fatalities and injuries due to impaired drivers.

The NTSB concludes that the state of Texas needs increased safety-focused leadership at the governor and state legislature level, additional resources, and data-driven strategies to prevent

tragedies such as the Concan crash and to reduce the number of fatalities and serious injuries caused by alcohol- and other drug-impaired drivers. Using the 2015 impaired driving program assessment as a resource, the NTSB recommends that the state of Texas conduct an executive-level review of its impaired driving program and implement data-driven strategies that result in a downward trend in the number of fatalities, injuries, and crashes involving alcohol- and other drug-impaired drivers.

2.4.3 National Efforts

2.4.3.1 The Problem. Nationwide, the use of legal and illicit drugs is increasing among drivers. FARS identified the presence of drugs in 30 percent of fatally injured drivers with valid drug test results in 2006, in 37 percent in 2009, and in 46 percent in 2015.[63] In a 2013–2014 national roadside survey, NHTSA tested more than 9,400 drivers for alcohol and other drugs at 300 locations across the United States (NHTSA 2015). The study focused on drugs with the potential to impair driving skills, including OTC, prescription, and illegal drugs. Potentially impairing drugs were found in 22 percent of all drivers tested.[64] In its survey of nighttime weekend drivers, NHTSA found that 15.2 percent of the drivers tested had illegal drugs in their systems, and 7.3 percent had prescription or OTC medications that could impair their driving. The prevalence of drugs in drivers had increased significantly from a similar roadside survey conducted in 2007 (NHTSA 2009). For example, illegal drug use increased from 12.4 percent in 2007 to 15.2 percent in the 2013–2014 survey. Marijuana use increased from 8.6 percent in 2007 to 12.6 percent in 2013.[65]

2.4.3.2 Drug Toxicology Testing. Postcrash drug toxicology testing is inconsistent among the states. There is currently no national guidance on a minimum set of drugs that should be tested for, recommended methods for drug testing, or reporting thresholds for crash databases. Collecting consistent postcrash drug data will provide policymakers with a better understanding of the prevalence of drug use among drivers, as well as the tools with which to assess the risks associated with various substances. National guidance would provide a more reliable marker of the effectiveness of laws, enforcement, education, and other countermeasures in addressing drug-impaired driving.

As a result of the NTSB forum on "reaching zero" crashes from substance-impaired driving, we recommended that NHTSA (NTSB 2013):

> Develop and disseminate to appropriate state officials a common standard of practice for drug toxicology testing, including (1) the circumstances under which

[63] See the supplemental data report on drug involvement in fatal crashes (2006–2015) in the NTSB public docket for this investigation (HWY17MH011).

[64] The national roadside survey was a voluntary and anonymous study. Data collectors asked participants for a breath test, an oral fluid sample, and a blood sample. Specimens were tested for 98 illegal, prescription and OTC drugs with the potential to impair driving.

[65] The presence of drugs does not necessarily mean that a driver is impaired. The lack of a clear link between impairment and drug concentrations makes it difficult to define impairment. Some drugs or metabolites may be present at low levels or remain in the body for days/weeks without any impairing effects.

tests should be conducted, (2) a minimum set of drugs for which to test, and (3) cutoff values for reporting the results. (H-12-33)

NHTSA has informed the NTSB that it is developing a recommended standard of practice for drug toxicology testing. In 2016, NHTSA provided support for the review and update of a set of recommendations developed by the National Safety Council–Alcohol, Drugs, and Impairment Division for toxicological investigation of drug-impaired driving cases and motor vehicle fatalities (Logan and others 2018). In 2018, NHTSA formed an expert working group focused on toxicology and data collection (see also section 2.4.3.5). Safety Recommendation H-12-33 is classified "Open—Acceptable Response."

2.4.3.3 GHSA Actions. The GHSA recently updated its guidance to assist states in managing the drug-impaired driving problem (GHSA 2017). The guidance covers laws, enforcement, adjudication, toxicology testing procedures, education, and data collection. A recent GHSA report examines the impact of marijuana and opioid use on driving and crash causation, and recommends state actions to address drug-impaired driving (GHSA 2018). Although the NTSB is pleased with these GHSA initiatives, state actions should be closely monitored to identify the most effective practices and countermeasures.

2.4.3.4 AAA-Sponsored Research. Section 2.3.5 (drug impairment) discusses the dangers of DUID, including the impairing effects of many prescription medications. The AAA Foundation for Traffic Safety, through the Virginia Tech Transportation Institute, sponsored a major research project on drug-impaired driving countermeasures. The project report, *Countermeasures Against Prescription and Over-the-Counter Drug-Impaired Driving*, is scheduled for release in October 2018. As another resource for states, researchers, and practitioners, the report discusses drug-impaired driving countermeasures in four major areas: pharmacy and medical, data recording and toxicology, law enforcement and judicial, and education and advertising.

2.4.3.5 National Leadership. Many states and local jurisdictions have developed legislation and policy and implemented countermeasures to address the increasing prevalence of drug-impaired driving. Moreover, highway safety organizations such as GHSA and AAA have developed related reports and recommended specific countermeasures. Again, however, it is critical that the effectiveness of state laws and countermeasures be closely monitored to identify and disseminate best practices.

In January 2018, NHTSA introduced an initiative to combat drug-impaired driving. Responding to the national opioid epidemic and the decriminalization of marijuana in many states, NHTSA announced that a top priority of the agency was to ensure that "U.S. roads, communities and families are safe from impaired drivers." A March 2018 call-to-action campaign brought together key stakeholders, safety partners, data and policy experts, law enforcement and criminal justice professionals, toxicologists, and drug experts. Summit participants agreed on the urgent need for a coordinated plan to address the drug-impaired driving problem. NHTSA committed to

seeking additional input through a series of regional meetings and to working closely with stakeholders in developing an action plan.[66]

When states develop highway safety plans, they frequently refer to *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices* to address critical safety issues, such as combating impaired driving (NHTSA 2018). Although the guide contains extensive information on countermeasures to reduce alcohol-impaired driving (including prevention, intervention, communication, and outreach campaigns), it includes relatively few science-based safety countermeasures to address drug-impaired driving. Through continued collaboration with stakeholders, NHTSA could provide a valuable resource to states by identifying those countermeasures proven to be the most effective in reducing drug-impaired driving.

2.4.3.5 Safety Recommendations. The NTSB concludes that because the use of legal and illicit drugs by drivers is increasing, national leadership is needed to help prevent drug-impaired driving crashes by identifying best practices, effective science-based safety countermeasures, and drug testing protocols. Therefore, the NTSB recommends that NHTSA evaluate best practices and countermeasures found to be the most effective in reducing fatalities, injuries, and crashes involving drug-impaired drivers and provide additional guidance to the states on drug-impaired driving in *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*.

Because more consistent postcrash data are needed to monitor the effectiveness of laws, enforcement, education, and countermeasures, the NTSB also reiterates Safety Recommendation H-12-33 to NHTSA.

2.5 Medium-Size Bus Seat Belt Systems

The Concan crash was a severe offset head-on collision that resulted in fatal injuries to the bus driver and 12 bus passengers. In the course of the collision, the pickup truck overrode the bus, intruding into the driver seating area and the second row of passenger seats. Ultimately, the override resulted in 5 feet of intrusion into the bus on the driver side, severely compromising survival space for the driver, the front passenger, and the first and second row passengers.[67]

Despite the severity of the crash, one passenger survived. She was seated farthest from the point of impact and away from the intrusion area. In addition, aft of the intrusion zone, the passenger seats remained intact, undamaged, and attached to the vehicle structure—which did not buckle.

[66] In August 2018, NHTSA initiated a public affairs safety campaign to combat alcohol- and other drug-impaired driving with the message, "If you feel different, You drive different. Drive high, Get a DUI." See NHTSA press release dated August 14, 2018, accessed November 6, 2018.

[67] The unbelted truck driver survived the crash with serious injuries. The deployment of the air bag, the driver's age (20 years), and the vehicle crash dynamics—which moved his body toward the passenger side of the truck, away from the collapsing vehicle structure—were all factors in his survival.

2.5.1 Lap Belt Design and Safety

2.5.1.1 Seat Belt Usage. The bus was equipped with lap/shoulder belts at both the driver and front passenger seats. Although the bus was not required to have passenger restraint systems, it was equipped with traveling retractor lap belts at eight of the 12 rear seats (rows 1–3) and with manually adjustable lap belts at the four seating positions in the last row. All 14 bus occupants were restrained. The vehicle examination revealed physical evidence of loading, with areas of heat abrasion and cupping to all seat belts found in the bus at the time of inspection. Additionally, the autopsy reports noted abrasions and contusions to the abdomen and hips of most bus occupants, which indicates belt usage.

2.5.1.2 Lap Belt Effectiveness. Surviving a severe crash is dependent on maintaining space around the occupant and controlling body motion, such that each person can ride-down crash forces as the vehicle decelerates and avoid injury-causing contact with the structure or other occupants. In this crash, survival space was available for occupants in rows 3 and 4 of the bus. Although the seating positions in these rows were equipped with lap belts to maintain occupants within the seating compartment, the lap belts restrained only the pelvis area and did not limit upper body flailing.

The NTSB has a history of studying occupant protection and seat belts in both passenger cars and buses. After investigating 26 frontal crashes of passenger vehicles for a safety study on the use of lap belts versus lap/shoulder belts, the NTSB concluded that the crash performance of lap belts in these cases was very poor (NTSB 1986). Among the 50 persons using a lap-only belt, at least 32 would have fared substantially better had they been wearing lap/shoulder belts. The NTSB further concluded that, in severe crashes, lap belts induce minor-to-fatal head, spine, and abdomen injuries due to upper body flailing.

Other passenger car studies have substantiated these conclusions. One study found that—in frontal crashes—lap-belted back seat occupants have a higher torso injury risk than unrestrained occupants (Kahane 1987). A later study concluded that back seat lap belts induce abdominal injuries in all crashes, not just frontal crashes (Cooper and others 1994). Seat belt bruising near the abdominal area, fractures of the lumbar spine, and serious closed head and facial injuries are often the result of an occupant body jackknifing over the lap belt (from the waist) during a collision (Agrawal, Inamadar, and Subrahmanyam 2013). In these conditions, the lap belt applies extreme force to the abdomen along the pelvis. Securing the waist without securing the upper torso leads to increased acceleration of the head and neck, which can cause serious head and neck injuries. Figure 14 depicts the movement of a lap-belted occupant body during a frontal collision.

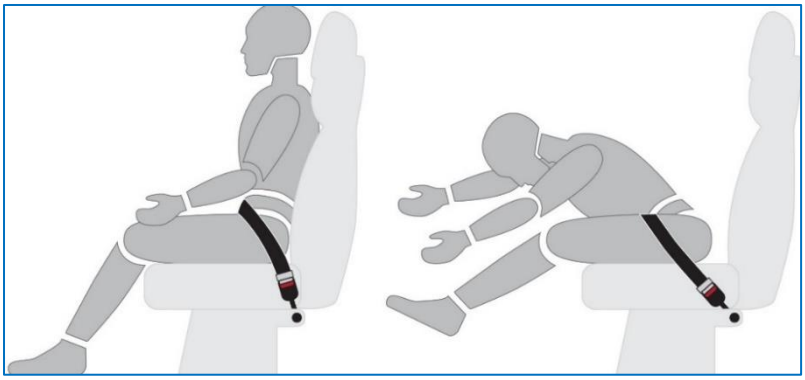

Figure 14. Depiction of motion of lap-belted occupant in frontal collision.

2.5.1.3 Lap Belt Design. During postcrash inspection of the bus, NTSB investigators found other issues with the installed lap belts. In row 4, the anchorage points for the lap belts were extremely narrow (6.5 inches; see figure 6). Although FMVSS 210 allows anchorages for a seat belt assembly to be a minimum of 6.5 inches apart laterally, in this crash, the high forces and narrow anchorage points resulted in pelvic and spinal injuries due to the pinching action of the belt webbing during the rapid deceleration. The seat manufacturer, Freedman Seating, informed the NTSB that it has increased the width of lap belt anchorage points to an average of 10.5 inches.

2.5.1.4 Injury Causation. Injuries to the bus driver, the front passenger, and the passengers in the first and second rows of the bus on the driver side consisted of severe blunt force trauma associated with intrusion and significant loss of survival space. Figure 15 depicts the area of intrusion on the bus.

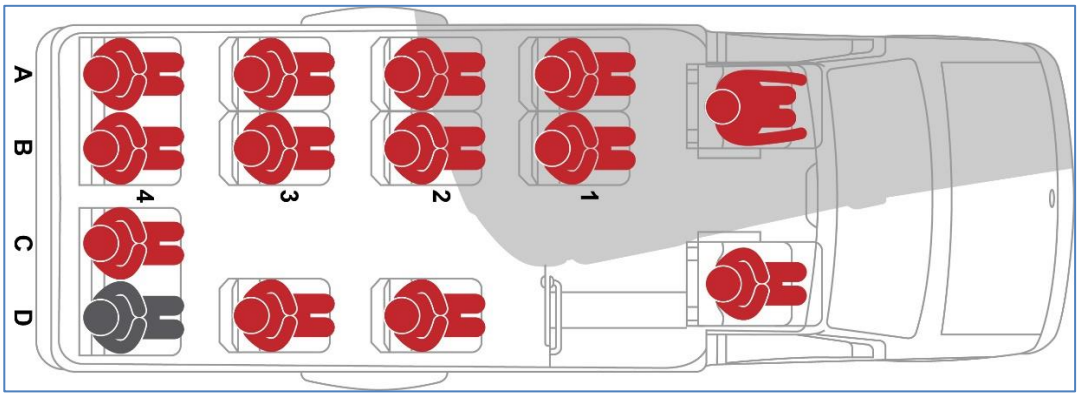

Figure 15. Bus seating chart showing area of intrusion, shaded, with occupant fatalities depicted in red and seriously injured occupant depicted in gray.

Outside the intrusion zone, passengers sustained multiple blunt force injuries to the head, neck, abdomen, and pelvis. Multiple passengers had evidence of injuries from upper body flailing and abdominal and pelvic injuries from forward excursion over the lap belts. Additionally, passengers in row 4 had severe lateral abdominal and pelvic injuries, and one passenger's fatal injuries were in the abdominal and pelvic region. During rapid deceleration, as the passengers

were displaced forward and the upper body flailed over the lap belt, the narrow anchorage points on the row 4 lap belts caused a pinching/scissoring action of the belt webbing on the abdomen and pelvis, resulting in extensive injury.

2.5.1.5 Safety Recommendations. Based on bus occupant injury patterns, the NTSB concludes that the lap belts provided insufficient protection for the passengers seated in the rear of the bus. The NTSB also concludes that the narrow anchorage points for the lap belts contributed to the severity of injuries to passengers seated in row 4 of the bus. Although Freedman Seating has advised that it no longer manufactures seats with narrow lap belt anchorage points, FMVSS 210 allows seat belt anchorage points to be spaced as close as 6.5 inches apart. Therefore, the NTSB recommends that NHTSA amend FMVSS 210 to increase the minimum anchorage spacing for individual seat belt assemblies, taking into account the dynamic testing of seat belt designs, seat belt fit, and vehicle configuration.

2.5.2 Lap/Shoulder Belt Requirement

2.5.2.1 Federal Motor Vehicle Safety Standards. Federal regulations require that the medium-size bus provide occupant protection for the driver seating position only. Because NHTSA considers medium-size buses to be a separate vehicle class, they are excluded from the rule requiring that all buses meeting the motorcoach, or over-the-road bus, definition be equipped with lap/shoulder belts at the driver and all passenger seating positions by November 2016.[68] The rulemaking was based in part on NHTSA estimation of the effectiveness of lap/shoulder belts, which showed that they can reduce the risk of fatal injuries in rollover crashes by as much as 77 percent when installed on motorcoach and other large bus passenger seats. In addition, NHTSA found that lap/shoulder belts provide greater restraint of the upper body and distribute the belt loading over a larger surface area, reducing the risk of injury. Figure 16 depicts the difference between a lap belt and a lap/shoulder belt system when a vehicle is involved in a frontal crash.

[68] According to the final rule, an "over-the-road" bus is characterized by an elevated passenger deck located over a baggage compartment. The requirement for all large buses exceeding a GVWR of 26,000 pounds excludes school buses, transit buses, and prison buses. See 78 *Federal Register* 70415–70474, November 25, 2013.

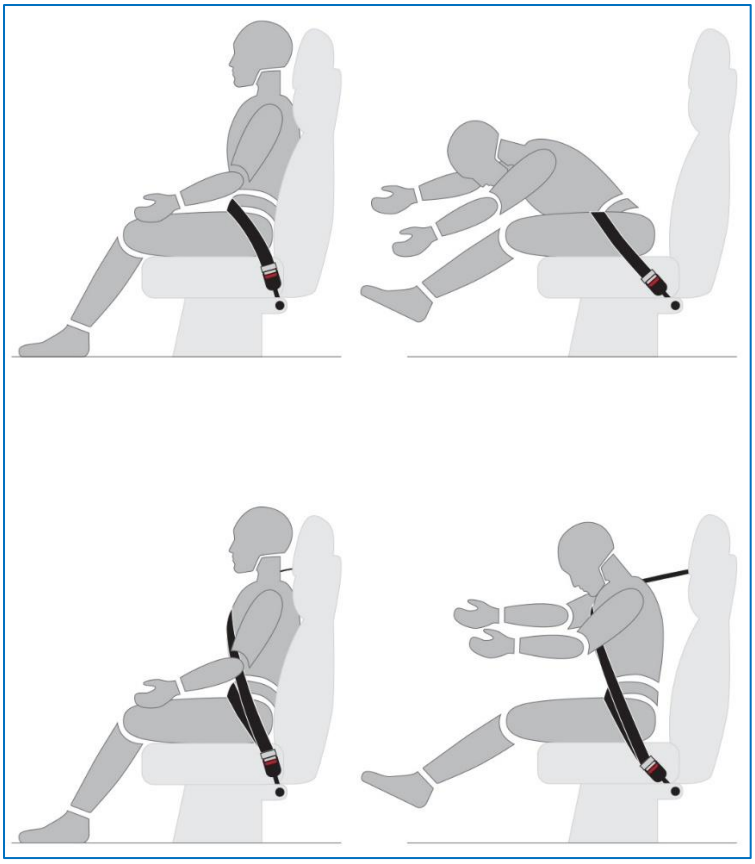

Figure 16. Depiction of motion of lap-belted occupant in frontal collision compared with lap/shoulder-belted occupant.

The NTSB has investigated several crashes involving medium-size buses and, in many cases, found that a lack of occupant protection contributed to the severity of injuries. Following a seven-fatality medium-size bus rollover crash in Dolan Springs, Arizona, the NTSB recommended that NHTSA—in its rulemaking to improve motorcoach roof strength, occupant protection, and window glazing standards—include all buses with a GVWR above 10,000 pounds, other than school buses. (Safety Recommendation H-10-3; NTSB 2010). However, the 2013 NHTSA rule for occupant protection on motorcoaches does not include all buses with a GVWR above 10,000 pounds. Safety Recommendation H-10-3 is classified "Open—Unacceptable Response."

The Concan crash again highlights the need for lap/shoulder belts on buses. Given the significant increase in the production of medium-size buses over the past decade, NHTSA should take definitive action to improve the safety of this class of vehicle.

2.5.2.2 Medium-Size Bus Manufacturers. Most medium-size bus manufacturers offer passenger lap/shoulder belts as an option. Industry representatives have informed the NTSB that the demand for lap/shoulder belts is increasing, and they are considering installing them as standard equipment on all new buses—even though this is not a requirement. According to data provided by the Mid-Size Bus Manufacturers Association, the annual production of medium-size

buses has increased from about 10,000 in 2002 to more than 15,000 in 2016.[69] In comparison, about 2,141 motorcoaches were produced for the North American market in 2015 (Metro 2018).[70]

In addition to voluntary, safety-focused action by bus manufacturers, seat manufacturers can play a pivotal role in ensuring that all medium-size buses are equipped with passenger lap/shoulder belts by installing the more robust systems as standard equipment in their seat systems.[71]

2.5.2.3 Safety Recommendations. The NTSB continues to pursue improved occupant protection strategies for medium-size buses—particularly because their size and weight more closely match the passenger car fleet, making them more likely than large motorcoaches to be subjected to high crash forces. The NTSB concludes that because lap/shoulder belts provide a greater level of occupant protection than lap belts, they should be installed as standard equipment on medium-size buses**.** FMVSS 208 specifies performance requirements for the protection of vehicle occupants in crashes. Because NHTSA excluded medium-size buses from the requirement for installing passenger lap/shoulder belts, the NTSB recommends that NHTSA amend FMVSS 208 to require lap/shoulder belts for each passenger seating position on all new buses with a GVWR of more than 10,000 pounds but not greater than 26,000 pounds.

Furthermore, the NTSB recommends that medium-size bus manufacturers install lap/shoulder belts in all seating positions as standard, rather than optional, equipment in all newly manufactured medium-size buses.[72] Additionally, the NTSB recommends that the bus seat manufacturers Freedman Seating Company and HSM Transportation Solutions supply seating systems equipped with lap/shoulder belts as standard, rather than optional, equipment for medium-size buses.

[69] The Mid-Size Bus Manufacturers Association represents 80–90 percent of all medium-size bus production in the United States and Canada. See the medium-size bus production and sales supplemental report in the NTSB public docket for this investigation (HWY17MH011).

[70] The cost of a new motorcoach is typically $500,000.

[71] The Freedman Seating Company and HSM Transportation Solutions supply 90–95 percent of all seating in medium-size buses.

[72] Medium-size bus manufacturers include ARBOC Specialty Vehicles, LLC; Coach & Equipment Manufacturing Corporation; REV Group, Inc. (Champion Bus, Inc., and ElDorado); Diamond Coach Corporation; Forest River, Inc. (Elkhart Coach, Glaval Bus, Starcraft Bus, and Turtle Top); Girardin Blue Bird (Micro Bird Inc.); SVO Group, Inc.; and Thomas Built Buses.

3 Conclusions

3.1 Findings

1. None of the following were factors in the crash: (1) bus or truck driver qualifications or familiarity with vehicles and roadway, (2) medical condition or fatigue of the bus driver, (3) bus driver cell phone distraction, (4) bus driver impairment by alcohol or other drugs, (5) mechanical condition of either vehicle, (6) highway condition, or (7) weather.

2. Considering the rural location of the crash, the emergency response efforts were timely and adequate.

3. The truck driver operated his vehicle erratically on US Highway 83 for more than 15 minutes, including extended periods of travel off the right road edgeline and multiple incursions across the highway centerline—which culminated in a head-on crash in the opposing lane of travel.

4. It is possible that the truck driver was glancing at or manipulating his cell phone at the time of the crash, but this action would not explain the prolonged and continuous erratic driving behavior seen in the witness video recording leading up to the crash.

5. The truck driver was not sleep deprived, impaired by a medical condition, or impaired by alcohol at the time of the crash.

6. The failure of the truck driver to maintain control of his vehicle was due to impairment stemming from his use of marijuana in combination with misuse of a prescribed medication, clonazepam.

7. To better detect drivers operating under the influence of drugs, law enforcement officers need advanced training to identify the signs and symptoms of impairment as well as additional tools, such as roadside drug screening devices.

8. Oral fluid drug screening devices can improve the ability of law enforcement officers to detect drug-impaired drivers.

9. The state of Texas needs increased safety-focused leadership at the governor and state legislature level, additional resources, and data-driven strategies to prevent tragedies such as the Concan crash and to reduce the number of fatalities and serious injuries caused by alcohol- and other drug-impaired drivers.

10. Because the use of legal and illicit drugs by drivers is increasing, national leadership is needed to help prevent drug-impaired driving crashes by identifying best practices, effective science-based safety countermeasures, and drug testing protocols.

11. The lap belts provided insufficient protection for the passengers seated in the rear of the bus.

12. The narrow anchorage points for the lap belts contributed to the severity of injuries to passengers seated in row 4 of the bus.

13. Because lap/shoulder belts provide a greater level of occupant protection than lap belts, they should be installed as standard equipment on medium-size buses.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the Concan, Texas, crash was the failure of the pickup truck driver to control his vehicle due to impairment stemming from his use of marijuana in combination with misuse of a prescribed medication, clonazepam. Contributing to the severity of the injuries was the insufficient occupant protection provided by the lap belts worn by passengers seated in the rear of the medium-size bus.

4 Recommendations

4.1 New Recommendations

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

To the National Highway Traffic Safety Administration:

Develop and disseminate best practices, identify model specifications, and create a conforming products list for oral fluid drug screening devices. (H-18-56)

Evaluate best practices and countermeasures found to be the most effective in reducing fatalities, injuries, and crashes involving drug-impaired drivers and provide additional guidance to the states on drug-impaired driving in *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*. (H-18-57)

Amend Federal Motor Vehicle Safety Standard 210 to increase the minimum anchorage spacing for individual seat belt assemblies, taking into account the dynamic testing of seat belt designs, seat belt fit, and vehicle configuration. (H-18-58)

Amend Federal Motor Vehicle Safety Standard 208 to require lap/shoulder belts for each passenger seating position on all new buses with a gross vehicle weight rating of more than 10,000 pounds but not greater than 26,000 pounds. (H-18-59)

To the state of Texas:

Conduct an executive-level review of your impaired driving program and implement data-driven strategies that result in a downward trend in the number of fatalities, injuries, and crashes involving alcohol- and other drug-impaired drivers. (H-18-60)

To the Texas Department of Transportation:

Promote the importance of attending drug-impaired driving enforcement training and increase training access to meet the demands of local and state law enforcement. (H-18-61)

To medium-size bus manufacturers ARBOC Specialty Vehicles, LLC; Coach & Equipment Manufacturing Corporation; REV Group, Inc.; Diamond Coach Corporation; Forest River, Inc.; Girardin Blue Bird; SVO Group, Inc.; and Thomas Built Buses:

Install lap/shoulder belts in all seating positions as standard, rather than optional, equipment in all newly manufactured medium-size buses. (H-18-62)

To seat manufacturers Freedman Seating Company and HSM Transportation Solutions:

> Supply seating systems equipped with lap/shoulder belts as standard, rather than optional, equipment for medium-size buses. (H-18-63)

4.2 Previously Issued Recommendation Reiterated in This Report

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

To the National Highway Traffic Safety Administration:

> Develop and disseminate to appropriate state officials a common standard of practice for drug toxicology testing, including (1) the circumstances under which tests should be conducted, (2) a minimum set of drugs for which to test, and (3) cutoff values for reporting the results. (H-12-33)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

ROBERT L. SUMWALT, III
Chairman

BRUCE LANDSBERG
Vice Chairman

EARL F. WEENER
Member

T. BELLA DINH-ZARR
Member

JENNIFER HOMENDY
Member

Adopted: October 16, 2018

Members Weener and Dinh-Zarr filed the following statements.

Board Member Statements

Member Earl. F. Weener, Ph.D.
Concurring (October 24, 2018)

I am glad that we are directing attention to the concerning trends of drugged driving crashes in Texas and across the entire nation. While our conversation at the Board Meeting involved the interesting topic of presumptive impairment based on specific level of THC in the blood of a driver, I am less concerned about what science is still learning than with what we already know. Marijuana is one of a host of drugs, including alcohol, that can cause dangerous impairment for drivers. Drug impairment is detected primarily through the observations of police officers who use tools such as DRE evaluations and toxicology tests as additional evidence in the prosecution of impaired drivers.

Drug testing is a post-arrest procedure. By and large, by the time a police officer gives a driver a blood test, sufficient evidence has already been gathered to place the driver under arrest. The results of blood testing may take weeks or months and generally serve to confirm or negate the observations of the arresting officers and other witnesses regarding the driver's impairment.

Saliva testing, were it ever to become admissible and widely used, would be a more immediate test. However, saliva testing is confirmatory, not quantitative. It would also be employed only after a patrol officer detected signs of impairment.

As a general proposition for impaired driving enforcement, drug testing is confirmatory information, collected after a police officer has stopped a driver and observed impairment. The presence of impairing substances such as alcohol and other drugs—be they illicit, prescription, or over-the-counter—can ultimately be used during the litigation of an impaired driving case in totality with all the other evidence collected, including officers' observations, to establish guilt.

Similarly, a DRE evaluation generally is a post-arrest process. While specially trained Drug Recognition Experts or DRE officers are valuable tools called in to provide additional supportive observations in impaired driving cases, they typically become involved after another officer has made sufficient observations of impairment to place a driver under arrest. Of note, it is much easier for large local or statewide agencies to divert officers from patrol duties for weeks of training, and this may not be possible for very small agencies found in large states with significant rural populations.

The reason I make these clarifications is to emphasize the importance of having a sufficiently large law enforcement presence comprised of officers willing to conduct basic traffic enforcement and ready to detect and arrest impaired drivers. Non-specialized patrol officers can and do apprehend drugged drivers successfully every day. Officers equipped

with a thorough understanding of the Standardized Field Sobriety Tests and committed to road safety make a difference.

It is also vital to understand that there is no single cure for this problem, and, as staff explained during the Board Meeting, drugged driving is not a problem enforcement alone can resolve.

Further, there is no one-size-fits-all solution that will succeed equally across the nation.

Each state is unique and will face its own obstacles as it works towards the goal of zero fatal crashes. Texas has its own, particular challenges. Moving forward, Texas leaders should consider fundamental questions to address the impaired driving problem holistically. What new issues will the rapid population growth bring? Looking at national averages, does Texas have a high enough patrol officer per citizen ratio? Has Texas addressed the core issue of citizen drug use, particularly considering the laws of some of its closest neighbors? Can more be done to improve post-crash transport and treatment for better injury outcomes? If DUI arrests are decreasing, why are fatalities increasing? Are officers supported with adequate training and encouraged to make traffic stops? Does Texas do enough to educate its citizens regarding the dangers and consequences of impaired driving? Are there road infrastructure measures specific to crash prevention or mitigation that can be employed? As Texas leaders continue to make strides addressing this statewide danger, they should work with those actively involved in impaired driving enforcement, such as police and prosecutors, to get their valuable input for solutions.

Impaired driving, whether from alcohol, other drugs, or a combination of substances, represents a significant and growing public health threat. I commend the Texas highway safety office staff, police, prosecutors, and other safety stakeholders who work on this problem every day. I encourage them to work with their leaders to continue to prioritize this safety issue so events like this tragic crash can be prevented.

Vice Chairman Landsberg and Member Dinh-Zarr joined this statement.

Notation 58470: Pickup Truck Centerline Crossover Collision with Medium-Size Bus on US Highway 83, Concan, Texas, March 29, 2017

Member T. Bella Dinh-Zarr, Concurring (October 25, 2018)

The investigation of this tragic crash, in which 13 persons were killed while returning from a church retreat, brings into sharp relief the ongoing severe problem of traffic crashes on our highways, and especially those caused by drivers impaired by drugs of all types.

As we note in this report, reversing the drug-impaired driving problem is particularly challenging due both to the large number of potentially impairing substances, and to the differences in the ways that these substances can affect a person's behavior. And, drugs are often found in combination with alcohol, making it difficult to discern their separate effects. NHTSA and the states need to improve their practices for testing and reporting the presence of drugs in fatally injured drivers. We must develop processes that enable all positive driver drug test results (and test refusals) to be captured in FARS or another similar national database.

But, while there's much that we don't know about best practices for deterring drug-impaired drivers, there is also much that we do know. Vigorous and publicized enforcement provides specific deterrence for those who are caught, and the general deterrence that is essential to any long-term solution. Experienced law enforcement officers are able to identify drivers who are impaired, even if they can't determine what substance is causing the impairment. Judicial mechanisms such as effective prosecutors and DWI drug courts can make a difference.

We need to provide greater support for these systems. While law enforcement agencies must constantly balance many important responsibilities, impaired driving and other traffic law enforcement must always be a top priority. Political leaders must give the law enforcement community the resources that it needs. This includes both financial and technical support, along with political permission to make highway safety a recognized priority.

"Texas is facing a crisis in road safety." These words come from Texas' 2017-2022 strategic highway safety plan, and our investigation found much to support that statement. Almost 3,800 people died in crashes on Texas' roads in 2016, a 5 percent increase from the previous year.

Texas' 2015 impaired driving assessment found shortcomings in leadership, resources, and training in the state's efforts to address this deadly problem. The assessment led to 65 recommendations for actions by various agencies. However, at least 14 of the recommendations call for legislative action. It appears that they haven't been addressed. The very first recommendation calls for creating a Governor's Executive Committee made up of senior level policymakers in the state. However, that recommendation is "not being addressed currently," according to the Texas Department of Transportation. Road safety must be addressed at the highest level in Texas, by the Governor and by the Texas Legislature's leadership during its 2019 session. NTSB has recommended that this begin with an executive-level review of impaired driving and the programs currently seeking to address it. That review can begin with the recommendations from the 2015 assessment. Most importantly, however, government and community leaders must clearly demonstrate that preventing impaired driving deaths of Texans is a priority, both through their words and their actions.

Chairman Sumwalt, Vice Chairman Landsberg, and Members Weener and Homendy joined this statement.

Appendix A: Investigation

The National Transportation Safety Board (NTSB) was notified of this crash on March 29, 2017, and an investigative team was dispatched to the scene. Groups were established to investigate human performance, highway, vehicle, and survival factors. The NTSB team included staff from the Office of Research and Engineering.

Parties to the investigation were the Texas Department of Public Safety, the Texas Department of Transportation, and Freedman Seating Company.

Appendix B: Witness Video Still Images

A witness traveling in a vehicle behind the pickup truck recorded a 14-minute 27-second video of the erratic driving. National Transportation Safety Board (NTSB) investigators reviewed the video and determined that the truck was visible for 12 minutes 48 seconds of the recording. The still images below (figures B-1 through B-12) were obtained from the cell phone video and offer examples of 12 separate occasions when the truck traveled outside the US Highway 83 north travel lane.

Figure B-1. Still image of truck at time 0:13 of witness video.

Figure B-2. Still image of truck at time 0:48 of witness video.

Figure B-3. Still image of truck at time 3:24 of witness video.

Figure B-4. Still image of truck at time 3:48 of witness video.

Figure B-5. Still image of truck at time 6:32 of witness video.

Figure B-6. Still image of truck at time 6:57 of witness video.

Figure B-7. Still image of truck at time 7:17 of witness video.

Figure B-8. Still image of truck at time 10:06 of witness video.

Figure B-9. Still image of truck at time 10:59 of witness video.

Figure B-10. Still image of truck at time 13:00 of witness video.

Figure B-11. Still image of truck at time 13:36 of witness video.

Figure B-12. Final still image of truck at time 14:27 of witness video, with truck about 2,300 feet from crash location.

Appendix C: Emergency Response Timeline

Table C-1. Emergency response timeline, March 29–30, 2017.

Time	Responding Agency[a]	Action
12:19 p.m. (March 29)	Real County Sheriff's Office	Receives notification of crash from 911 system
12:20	Frio Canyon EMS	Arrives on scene and reports crash to Real County Sheriff's Office
12:40	Utopia VFD	EMS unit 26 arrives on scene
12:48	Concan VFD	Rescue 1 arrives on scene
12:49	Utopia VFD	Arrives on scene
12:54	Utopia VFD	Rescue 1 arrives on scene and begins extrication
12:57	San Antonio medevac helicopter	AirLife 5 arrives on scene
1:01	Concan VFD	Rescue 2 arrives on scene to assist with extrication
1:01	Reagan Wells VFD	Arrives on scene to assist with extrication
1:10	Uvalde VFD	Chief arrives on scene and assumes incident command
1:20	Uvalde VFD	Engine 2 arrives on scene
1:28	San Antonio medevac helicopter	AirLife 5 departs scene with 84-year-old female patient to University Hospital in San Antonio
1:30	San Antonio medevac helicopter	AirLife 4 arrives on scene
1:32	Uvalde VFD	Rescue 4 arrives on scene with additional extrication tools
1:33	Medevac helicopter service	AirEvac 71 arrives on scene
1:50	San Antonio medevac helicopter	AirLife 4 departs scene with 20-year-old truck driver to University Hospital in San Antonio
1:57	San Antonio medevac helicopter	84-year-old passenger in AirLife 5 goes into cardiac arrest before 2:02 p.m. arrival at hospital; expires at 2:25 p.m.
1:59	Medevac helicopter service	AirEvac 71 departs scene with 64-year-old female patient to Brooks Army Hospital in San Antonio
12:07 a.m. (March 30)	TxDPS	US-83 reopens to traffic

[a] EMS = emergency medical services; VFD = volunteer fire department; TxDPS = Texas Department of Public Safety.

Appendix D: Texas Highway Safety Plan Goals and Strategies for "Alcohol and Other Drug" Safety Emphasis Area

Table D-1. Texas highway safety plan goals and strategies for alcohol and other drugs.

Goals
Reduce number of alcohol-impaired and driving under the influence of alcohol- and other drug-related crashes, fatalities, and injuries
Reduce number of driving while intoxicated (DWI)-related crashes where the driver is under age 21
Strategies
Educate public and stakeholders on use of interlock devices and other alcohol-monitoring technologies for DWI offenders
Improve adjudication and processing of DWI cases through improved training for judges, administrative license revocation judges, prosecutors, and probation officers
Improve and increase training of law enforcement officers
Improve anti-DWI public information and education campaigns, including appropriate bilingual campaigns
Improve blood alcohol concentration testing and reporting to state crash records information system
Improve DWI processing procedures
Improve education programs on alcohol and driving for youth
Increase and sustain high visibility enforcement of DWI laws
Increase enforcement of DWI laws for minors
Increase intervention efforts
Increase public education and information, concentrating on youth ages 5–13 and 14–20, including parent education on drinking and driving
Increase number of law enforcement task forces and coordinated enforcement campaigns
Increase use of warrants for mandatory blood draws
Increase training for anti-DWI advocates

Appendix E: Texas Highway Safety Plan Impaired Driving Assessment Recommendations

Table E-1. Program management and strategic planning recommendations.

Recommendation	Status	Comments
I. Program Management and Strategic Planning		
A. State and Tribal DWI Task Forces and Commissions		
Create and convene a Governor's Executive Committee of the Impaired Driving Task Force chaired by a Texas Department of Transportation Commissioner (appointed by the Governor) with a membership consisting of the Attorney General, six State Senate members (appointed by the Lt. Governor), and six House members (appointed by the Speaker of the House) meeting in even numbered years to discuss legislative recommendations provided by the full administrative support from the Traffic Operations Division-Traffic Safety Section (TRF-TS)	Not Being Addressed Currently	The TIDTF submitted a support letter for the establishment of the Governor's Executive Committee to the Texas Transportation Commissioner in FY 2016.
B. Strategic Planning		
Develop and fund a driving under the influence/driving while intoxicated (DUI/DWI) tracking system that would link Texas criminal justice agencies databases in order to create a network containing offenders criminal history, arrests, warrants, photographs, and fingerprints, to ensure access to offenders previous and/or current DUI/DWI history	In Progress	TTI received a FY 2017 grant to assess the feasibility of a DWI tracking database in Texas. A final report is forthcoming and will be shared with the Task Force.
C. Program Management		
Conduct a study to determine the Texas Highway Safety Office's needs for better and more accurate impaired driving data	Not Being Addressed Currently	A call for a formal study has not been made by TxDOT to pursue this recommendation. However, as part of ongoing program efforts, subgrantees are performing annual statewide impaired driving crash analyses that pertain to the state's need for identifying impaired driving data.
D. Resources		
Evaluate impaired driving programs to determine if resources are being allocated in the most effective manner	Complete and Ongoing	This activity is performed at the State level by TxDOT. Program partners do not participate at this level unless directed to do so by TxDOT. This does not preclude an independent investigation of resources effectiveness as part of a larger project related effort.
Establish private/public partnerships to increase funding for the impaired driving program	Complete and Ongoing	Funding and in-kind contributions are being provided from the private sector to support various local and state programs being implemented in the state. For example, AAA DWI March for Change.
Support initiatives that will encourage the Governor and legislature to enact legislation that increases driving while intoxicated fines to generate funding for the impaired driving program	Not Being Addressed Currently Requires Legislative Action	Program partners are unable to pursue, promote, or lobby legislative activity at any level.

Table E-2. Prevention recommendations.

Recommendation	Status	Comments
Enact a $ .10 per drink excise tax increase and dedicate a portion of new revenues to alcohol abuse and impaired driving prevention and treatment	Requires Legislative Action	While use of fees to support project self-sufficiency is a priority for program partners, there is concern that taxes, fees, and charges will have opposition. The excise tax is not calculated according to a % of the price of the alcohol but rather by the gallon. The dime a drink is used by partners to simplify the discussion of the strategy. There is no discussion of changing the methodology of the tax but to raise the tax per gallon. In 2015, Texans Standing Tall created a report entitled "The Effects of Alcohol Excise Tax Increases on Public Health and Safety in Texas." TST recently commissioned Baselice & Associates to conduct a statewide public opinion survey on report content as it related to increasing alcohol excise taxes. Results show that 65% of registered voters support increasing the alcohol excise tax to improve public health and safety.
Implement high visibility underage drinking enforcement, including party patrols and compliance checks, supported by media campaigns	Complete and Ongoing	TxDOT and the traffic safety partners address underage drinking enforcement through different projects that address the problem through alcohol retail stings, media campaigns, and high visibility enforcement projects.
Enact a strict social host liability statute holding all individuals liable for damages resulting from over service of alcohol to guests	Requires Legislative Action	Texas Alcoholic Beverage Code regulates this issue which allows the State or private citizen to hold accountable those individuals or establishments that overserve alcohol to individual guests or patrons. Administrative and Criminal actions can be levied against individual servers or an establishment that over sells or overserves. Texans Standing Tall provides education to local communities on how to address social access and social hosting through local, civil social host ordinances. Research indicates local civil social host ordinances are a more effective means to address youth social access to alcohol and underage drinking parties. As of April 30, 2017, three cities in Texas have adopted such ordinances.
B. Community Based Programs		
1. Schools		
Provide schools with current, Texas-specific impaired driving information for inclusion in health and other curricula	Complete and Ongoing	TxDOT traffic safety partners provide a variety of impaired driving information and educational programs at secondary schools statewide. Much of this effort is led by Texas Education Agency through TxDOT-sponsored and other non-sponsored projects. The Education Subcommittee of the TIDTF actively works toward the ongoing effort of providing schools with current and accurate information. The Subcommittee is currently developing a resource booklet on alcohol awareness programs that will be distributed to schools.
Coordinate school- based impaired driving activities with evidence-based alcohol and substance abuse prevention programs	Complete and Ongoing	In FY 2016, the TIDTF compiled a list of evidence based programs and activities for schools that addresses alcohol and substance abuse prevention. The list of projects is a resource for TxDOT and impaired driving program partners to promote prevention at elementary, middle and secondary education institutions. The list continues to be expanded upon, and will be incorporated into a reference book the Education Subcommittee is compiling that will include other programs that are successful but may not be evidence-based.

Recommendation	Status	Comments
2. Employers		
Continue and expand the Our Driving Concern: Texas Employer Traffic Safety Program	Complete and Ongoing	TxDOT continues to support and fund the National Safety Council's program that addresses impaired driving within occupational settings. The State also supports other program partners for their effort in educating organizations about impairment as it relates to occupational settings.
3. Community Coalitions and Traffic Safety Partners		
Conduct an assessment of community based coalitions that address alcohol and substance use to determine the extent and nature of impaired driving prevention strategies and areas for potential collaboration with the traffic safety community	In Progress	In FY 2017, Texans Standing Tall received a grant to conduct an assessment of community-based coalitions and their efforts with the goal of developing a searchable database. This database will be used to increase opportunities for collaboration on reducing impaired driving.
Coordinate highway safety plans and programs with substance abuse prevention plans and programs	Not Being Addressed Currently	
4. Transportation Alternatives		
Ensure that all designated driver programs stress "no use of alcohol" messages for the designated driver	Complete and Ongoing	TxDOT and program partners promote this message through PI&E messaging using a wide variety of program media campaigns and blitz efforts. These efforts will continue as a foundation for promoting a no use policy for the designated driver.
Ensure alternative transportation programs do not encourage or enable excessive drinking	Complete and Ongoing	TxDOT and program partners promote this message through PI&E messaging using a wide variety of program media campaigns and blitz efforts.
Ensure that both designated driver and safe ride programs prohibit consumption of alcohol by underage individuals and do not unintentionally promote over-consumption	Complete and Ongoing	TxDOT and program partners promote this message through PI&E messaging using a wide variety of program media campaigns and blitz efforts.

Table E-3. Criminal justice recommendations.

Recommendation	Status	Comments
III. Criminal Justice System		
A. Laws		
Enact reasonable constitutional guidelines through one or more politically accountable governing bodies regarding driving while intoxicated (DWI)/sobriety checkpoints	Requires Legislative Action	Bills relating to sobriety checkpoints have been introduced to the legislature during the last several sessions without success. Texas has taken an alternative approach to address the problem of impaired driving with no refusal programs in multiple counties throughout the state.
Utilize driver license checkpoints, pursuant to Texas Transportation Code 521.025, to monitor compliance with motor vehicle statutes related to safe operation on Texas streets and highways in the absence of legislation authorizing sobriety checkpoints	Not Being Addressed Currently	At present, impaired driving checkpoints are not supported and as such using a license checkpoint as a pretext for impaired driving is not legal nor is it ethical.
Codify driving while intoxicated (DWI) deferral, diversion, and pretrial intervention programs so as to provide uniform statewide guidelines, requirements, and procedures that regulate the implementation, operation, and applicability of such programs	Requires Legislative Action	TxDOT, TDCAA, and program partners are exploring how these programs impact impaired driving and examining processes being used to better understand the practice as a countermeasure. Standards and policy for driving the practice are being explored, however, there does not appear to be a clear path toward standardizing the practice yet.
Enact a statute that establishes a uniform statewide driving while intoxicated case tracking system in which all DWI charges are required to be charge on specifically numbered uniform traffic citations, the disposition of which must be reported to a central record keeping system regardless of whether the offense is refiled as an information, indictment, or results in a dismissal, deferral, diversion, amendment, or reduction of the original citation to a non-alcohol related offense	In Progress	TTI received a FY 2017 grant to assess the feasibility of a DWI tracking database in Texas. A final report is forthcoming and will be shared with the TIDTF.
B. Enforcement		
Expand development and deployment of the driving under the influence (DUI) report writing programs to reduce processing time	Complete and Ongoing	As part of the LEADRS expansion, the program will continue to focus on the report writing process.
Enact a statute that allows well planned and fairly executed sobriety checkpoints	Requires Legislative Action	Bills relating to sobriety checkpoints have been introduced to the legislature during the last several sessions without success. Texas has taken an alternative approach to address the problem of impaired driving with no refusal programs in multiple counties throughout the state.
Continue Standardized Field Sobriety Tests (SFST) refresher training programs for patrol officers	Complete and Ongoing	The statewide effort for SFST update training is continued through a TxDOT grant.
Expand utilization of Drug Recognition Expert (DRE) officers in driving while intoxicated (DWI) mobilizations and fatal collision investigations	Complete and Ongoing	DREs are incorporated into mobilizations, no refusal enforcement activities, and fatal crash investigations (when available).

Recommendation	Status	Comments
Increase the use of Texas Alcoholic Beverage Commission agents in Selective Traffic Enforcement Program activities	Not Being Addressed Currently	TxDOT sponsors many STEP enforcement projects that address impaired driving. TABC is not one of the agencies that participate in STEP activities as a sub-grantee. There could be better coordination between TxDOT and TABC to communicate which communities receive STEP funding, enabling TABC to use the information for coordinating their operations. Growth in this area could allow for TABC to provide assistance in licensed premises investigations when serious injury crashes are investigated as part of a local police STEP grant or for individual or ride along support for STEP activities. However, TABC has increased the number of undercover operations that are funded through TxDOT grants (which include minor sting and over-service operations).
Continue regular Advanced Roadside Impaired Driving Enforcement (ARIDE) training classes that incorporate a refresher of the SFST and Introduction to Drugs that Impair Driving.	Complete and Ongoing	The statewide effort for ARIDE and SFST update training is provided through training through a TxDOT grant.
Conduct additional Drug Recognition Expert (DRE) training classes to achieve and maintain an adequate contingent of DREs statewide	Complete and Ongoing	The statewide effort for DRE training is provided through a training grant supported by TxDOT.
Expand statewide partners for DRE training through regional training teams	Complete and Ongoing	TxDOT's program partner continues to expand the DRE program and its partnership with other criminal justice constituents by using DRE regional coordinators to provide assistance and information.
Update Drug Recognition Expert (DRE) protocols to require a copy of the face sheet be provided with the blood sample submitted for testing	Complete and Ongoing	The Drug Evaluation and Classification Program Coordinator currently works with TxDPS to remind all the DREs to submit face sheets.
Provide regular, ongoing, training for prosecutors and members of the judiciary on the principles, effectiveness, and accuracy of SFSTs, the DRE program, and approved breath testing instrumentation	Complete and Ongoing	Training and seminars are being conducted through TxDOT at the local district and statewide levels.
Enact a statute establishing per se levels for controlled substances	Requires Legislative Action	
Provide training to law enforcement officers to enable them to properly enforce the Texas ignition interlock device statute	In Progress	In FY 2017, TTI received a grant to provide training to law enforcement – and other stakeholders – on ignition interlock devices and related statutes.
C. Prosecution		
Review the organization, operation, and budget of the Office of the Traffic Safety Resource Prosecutor (TSRP) to determine if additional TSRPs should be funded for purposes including on-site assistance to prosecutors, particularly in rural jurisdictions, in the trial of complex DWI felonies and assistance in argument of motions with significant statewide implications	Complete and Ongoing	TDCAA and TxDOT provide ongoing internal and external assessment with regard to potential for expanding the TSRP program and staff. TDCAA provides ongoing technical assistance through e-mail and outreach to prosecutor offices, law enforcement officers, and other traffic safety professionals. However, there is potential for growth in the area of preparation and assistance at trial.

Recommendation	Status	Comments
Encourage prosecutors and county attorneys to request judges not to permit DWI pleas for jail time in lieu of probation and to urge judges to place convicted DWI defendants on probation with supervision requirements of undergoing drug/ alcohol assessment and treatment where indicated	Complete and Jurisdictional Condition	This is currently performed on a case-by-case basis by prosecutors who can request more punitive sanctions upon conviction. Attorney discretion should be strongly considered, but it should be recognized that acceptable plea bargains depend upon the culture of the community.
Convene a meeting of the prosecutors and county attorneys to develop and recommend specific uniform statewide guidelines, standards, and requirements for the operation of DWI Pre-Trial Intervention programs	Complete and Ongoing	TDCAA program partners continue to work with their internal task force and state attorney's offices regarding standards for pre-trial diversion programs.
Adopt statutory guidelines for the operations of pre-trial deferral, diversion, and intervention programs	Requires Legislative Action	
Educate Law Enforcement and other criminal justice stakeholders on how driver license checkpoints can be constitutionally operated and utilized	Not Being Addressed Currently	At present, impaired driving checkpoints are not supported and as such using a license checkpoint as a pretext for impaired driving is not legal nor is it ethical.
Enact rules of professional conduct and disciplinary rules that either totally prohibit assistant prosecutors from engaging in civil law practice or that limit such civil practice to matters that do not involve issues related to pending criminal matters	Requires Legislative Action	
D. Adjudication		
Convene a task force to investigate and report to the Governor and legislature the current deficient state of DWI record keeping and DWI case disposition practices so that appropriate remedies, statutory or otherwise, can be fashioned to address and cure such deficiencies	Not Being Addressed Currently	The TIDTF drafted and submitted a support letter for the establishment of the Governor's Executive Committee to the Texas Transportation Commissioner in FY 2016.
Continue funding for the further establishment and expansion of DWI/Drug Courts and for the training of judges, prosecutors, and other personnel needed to operate such courts	Complete and Ongoing	The Bexar County Commissioners Court is performing DWI court programs. The Texas Center for the Judiciary provides training for new and continued education for existing DWI courts. There is room for growth in this area specifically for creating drug courts and for establishing additional DWI and Drug courts at the statewide level.
Encourage judges to not permit DWI defendants to avoid probation where the best interest of the defendant and the public would be served by requiring the defendant to be supervised to complete assessment for alcohol and/or drug addiction and possible referral for treatment.	Complete and Jurisdictional Determination	There is currently education related to appropriate sentencing, but it is left up to the individual judge to determine appropriate sentencing.
Monitor pending caseloads in those jurisdictions in which there are delays exceeding 24-months in the disposition of DWI cases	Complete and Ongoing	MADD participates in the Take-The-Wheel Program which provides training for court monitoring and assessment of trial outcomes. Participants monitor court cases in multiple jurisdictions around the State, including Smith, Gregg, El Paso, Bexar, Harris, Montgomery, Travis, Dallas, Cameron, and Hidalgo Counties.

Recommendation	Status	Comments
Enact a driving while intoxicated (DWI)/Drug Court judges, upon motion from the prosecutor, reward those who successfully complete a DWI/ Drug court program of one year or longer in duration, by waiving surcharges/fines	Requires Legislative Action	The Department of Public Safety is responsible for the surcharge program which is part of the Driver Responsibility Program. Surcharges are administered post-conviction and sanctions are mandated under Chapter 708 Transportation Code. However, the presiding judge has the ability to waive surcharges if finding of indigence.
E. Administrative Sanctions and Drivers Licensing Programs		
1. Administrative License Revocation and Vehicle Sanctions		
Ensure that ignition interlock monitoring is effective and that information about violations has some impact on the non-compliant user	In Progress	In FY 2017, TTI received a grant to provide training to law enforcement – and other stakeholders – on ignition interlock devices and related statutes.
Notify and/or train law enforcement officers about the ignition interlock program and license so that they are able to recognize an interlock-restricted license and take appropriate action for non-compliance	In Progress	In FY 2017, TTI received a grant to provide training to law enforcement – and other stakeholders – on ignition interlock devices and related statutes.
Resolve the continued concern about the administrative hearings' negative impact on criminal cases based on a study the interaction of administrative and criminal proceedings	Not Being Addressed Currently	
Conduct a study of the effect of the Responsible Driver Act surcharge on subsequent compliance and re-licensure of drivers to determine if alternative source of revenue should be sought	Not Being Addressed Currently	
Provide accountability for the ignition interlock program by specifying in law or policy to whom responsibility for review of driver behavior and sanction of non-compliance belongs	Requires Legislative Action	Compliance should fall to the court that ordered the ignition interlock. Notification of the court should come from CSCD personnel responsible for the oversight of the convicted violator in cases where ignition interlock was a condition of supervision.
Enact a law that allows vehicle sanctions to be used for DWI convictions	Requires Legislative Action	
2. Driver Licensing Programs		

Table E-4. Communications program recommendations.

Recommendation	Status	Comments
Develop a communications plan that includes a well thought out plan to deliver life-saving highway safety messages to the intended audiences and traffic safety partners	Complete and Ongoing	TxDOT impaired driving programs utilize a wide mix of media campaigns and media blitz in association with focused mobilization efforts. State strategic highway safety plan, state highway safety plan, and ongoing PI&E campaigns promote lifesaving safety messages to the motoring public and safety partners.
Evaluate the highway safety office marketing to ensure its messages are reaching target audiences	Complete and Ongoing	TxDOT audits the statewide marketing effort as well as associated campaigns and marketing that is encompassed in program projects.

Table E-5. Alcohol- and other drug-misuse recommendations.

Recommendation	Status	Comments
V. Alcohol and Other Drug Misuse: Screening, Assessment, Treatment, and Rehabilitation		
A. Screening and Assessment		
1. Criminal Justice System		
Develop and implement a DWI tracking system	In Progress	TTI received a FY 2017 grant to assess the feasibility of a DWI tracking database in Texas. A final report is forthcoming and will be shared with the TIDTF.
Require the use of uniform and standardized screening protocols in community supervision (probation)	Not Being Addressed Currently	Input from Community Supervision leadership is necessary to ensure there is no adverse impact on their ability to perform their functional role.
Require the use of uniform and standardized screening protocols in all driving while intoxicated education programs	Not Being Addressed Currently	Input from TEA leadership is necessary to ensure there is no adverse impact on their ability to perform their functional role.
2. Medical or Health Care Settings		
Implement screening, brief intervention, referral to treatment procedures in healthcare settings throughout Texas	Not Being Addressed Currently	Input from health care administrators is necessary to ensure there is no adverse impact on their ability to perform their functional role.
Implement screening, brief intervention, referral to treatment procedures on college campuses throughout Texas	Not Being Addressed Currently	Input from college administration is necessary to ensure there is no adverse impact on their ability to perform their functional role.
B. Treatment and Rehabilitation		
Expand the availability of DWI courts in Texas	Complete and Ongoing	The Bexar County Commissioners Court is performing DWI court programs. The Texas Center for the Judiciary provides training for new and continued education for existing DWI courts. There is room for growth in this area specifically for creating drug courts and for establishing additional DWI and Drug courts at the statewide level. As part of sanctioning, drug and alcohol treatment opportunities are being explored.
Require the use of uniform and standardized screening protocols in all DWI education programs	Not Being Addressed Currently	Input from Texas Department of Licensing and Regulation is necessary to ensure there is no adverse impact on their ability to perform their functional role.

Table E-6. Program evaluation and data recommendations.

Recommendation		Status	Comments
VI. Program Evaluation and Data			
A. Evaluation			
Include in the electronic crash system a list of appropriate factors which contributed to the crash from which the officers can select, to include a means of designating which factor was the primary one		Complete and Ongoing	The TxDOT Crash Records Information System Database has primary factor assignment designation. Designation of primary factor is defined in the crash reporting instruction manual (CR-100) Section 4.6.1.2.
Engage the Traffic Records Coordinating Committee to develop the database needed for impaired driving enforcement evaluation from the core data systems of the State Records System, Including citations/ adjudication, driver, vehicle, roadway, crash and injury surveillance		In Progress	In FY 2017, TTI received a grant to assess the feasibility of a Core Traffic Records database. A final report will be produced in September 2017.
B. Data and Records			
Develop a DWI tracking system to enable analysis of the impaired driving problem in the state		In Progress	TTI received a FY 2017 grant to assess the feasibility of a DWI tracking database in Texas. A final report is forthcoming and will be shared with the TIDTF.
Engage the Traffic Records Coordinating Committee in determining the source and location of various data elements that are needed in an effective DWI tracking system		In Progress	TTI received a FY 2017 grant to assess the feasibility of a DWI tracking database in Texas. As applicable to the project, TTI will work with the TRCC to gather data. A final report is forthcoming and will be shared with the TIDTF.
Provide funding for an eCitation system such as the one proposed by the Texas Office of Court Administration		In Progress	The Texas Office of Court Administration is assessing the feasibility of such a system.
C. Driver Records Systems			
2015	Enact legislation that prevents removal of DWI conviction data from the driver history	Requires Legislative Action	

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