NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, D.C.

HUMAN PERFORMANCE FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. CRASH INFORMATION

Location:	Rail crossing, Main Street, Biloxi, Harrison County, Mississippi
Vehicle #1:	2016 Van Hool CX45 Motorcoach
Operator #1:	Echo Transportation of Dallas, Texas
Vehicle #2:	CSX Freight Train, consisting of 3 locomotives, 27 loaded cars, 25 empty cars
Operator #2:	CSX Transportation
Date:	March 7, 2016
Time:	Approximately 2:12 p.m. CST
NTSB #:	**HWY16MH014**

B. HUMAN PERFORMANCE FACTORS GROUP

Dennis J. Collins, Human Performance Factors Investigator, Group Chairman
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C. CRASH SUMMARY

For a summary of the crash, refer to the *Crash Summary Report* in the docket for this investigation.

D. DETAILS OF THE HUMAN PERFORMANCE FACTORS INVESTIGATION

The Human Performance factual investigation focused on the behavioral, medical, operational, and environmental factors associated with the driver of the 2016 Van Hool motorcoach and the engineer and conductor of the CSX freight train.

1. Driver of the 2016 Van Hool Motorcoach

1.1. Activities Prior to the Crash

Using the charter/tour plan,[1] interviews with passengers and the driver,[2] the driver's logbook,[3] cellular telephone records,[4] and hotel records,[5] investigators developed the following table of the motorcoach driver's activities in the days prior to the crash. Times in the table are Central Standard Time (CST).

Table 1. Motorcoach Driver Activities Prior to the Crash.

Saturday, March 4, 2017		
Time	*Description*	*Source*
8:13 p.m.	Driver receives incoming call; last activity of day	Cell Records
Sunday, March 5, 2017		
Time	*Description*	*Source*
6:00 a.m.	Driver awakes	Interview
6:00 a.m.	Driver log on-duty, not driving	Log Book
6:30 a.m.	Driver logs driving status	Log Book
6:45 a.m.	Driver logs on-duty, not driving	Log Book
6:45 a.m.	Driver arrives in Bastrop to get his passengers	Interview
7:30 a.m.	Driver loads passengers in Bastrop, TX	Itinerary
7:45 a.m.	Driver logs driving status	Log Book
8:00 a.m.	Motorcoach departs Bastrop	Itinerary
9:15 a.m.	Driver makes outgoing call; first activity of day	Cell Records
10:00 a.m.	Stop to load passengers in Sealy, TX	Itinerary
10:15 a.m.	Motorcoach departs Sealy	Itinerary
10:45 a.m.	Driver logs on-duty, not driving	Log Book
11:15 a.m.	Driver logs driving status	Log Book
~12:00 noon	Stop at rest stop for lunch	Itinerary

[1] Available in the docket for this investigation as an attachment to the Motor Carrier Group Factual Report.
[2] Human Performance Attachment: Narratives and Transcripts of Investigative Interviews.
[3] Available in the docket for this investigation as an attachment to the Motor Carrier Group Factual Report.
[4] Human Performance Attachment: Motorcoach Driver Cellular Telephone Records.
[5] Human Performance Attachment: Motorcoach Driver Hotel Records.

Sunday, March 5, 2017 (continued)		
Time	*Description*	*Source*
1:00 p.m.	Driver logs on-duty, not driving	Log Book
1:15 p.m.	Driver logs off duty	Log Book
1:30 p.m.	Driver logs on-duty, not driving	Log Book
1:45 p.m.	Driver logs driving status	Log Book
3:30 p.m.	Driver logs on-duty, not driving	Log Book
3:45 p.m.	Driver logs off duty	Log Book
~4:45 p.m.	Arrive at the Ramada in Lafayette, LA	Itinerary
5:45 p.m.	Driver logs on-duty, not driving	Log Book
6:00 p.m.	Driver logs driving status	Log Book
6:15 p.m.	Driver logs on-duty, not driving	Log Book
6:15 p.m.	Take tour group to dinner	Itinerary
6:30 p.m.	Driver logs off duty	Log Book
7:30 p.m.	Driver logs on-duty, not driving	Log Book
7:45 p.m.	Driver logs driving status	Log Book
8:00 p.m.	Driver logs on-duty, not driving	Log Book
8:15 p.m.	Driver logs off duty for remainder of day	Log Book
10:00 p.m.	Driver goes to bed	Interview
10:15 p.m.	Driver makes outgoing call; last activity of day	Cell Records
Monday, March 6, 2017		
Time	*Description*	*Source*
12:00 mid	Driver begins day in off-duty status	Log Book
6:00 a.m.	Driver awakes	Interview
8:00 a.m.	Driver makes outgoing call; first activity of day	Cell Records
~8:00 a.m.	Tour group has breakfast	Itinerary
8:15 a.m.	Driver logs on-duty, not driving	Log Book
8:57:45 a.m.	Last GPS unit ping at Lafayette, LA hotel	GPS Data
9:00 a.m.	Driver logs driving status	Log Book
9:00 a.m.	Motorcoach departs Lafayette, LA	Itinerary
11:00 a.m.	Driver logs on-duty, not driving	Log Book
11:15 a.m.	Driver logs off-duty	Log Book
12:30 p.m.	Driver logs on-duty, not driving	Log Book
12:45 p.m.	Driver logs driving status	Log Book
1:30 p.m.	Driver logs on-duty, not driving	Log Book
1:30 p.m.	Arrive at Hollywood Casino Gulf Coast	Itinerary
2:00 p.m.	Driver logs off-duty	Log Book
2:40 p.m.	Driver keys into room at Hollywood Casino	Hotel Records
~6:00 p.m.	Tour group has a buffet dinner	Itinerary
7:45 p.m.	Driver keys into hotel room – last door activity of day	Hotel Records
~10:00 p.m.	Driver goes to bed	Interview
10:17 p.m.	Driver receives incoming call; last activity of day	Cell Records

Tuesday, March 7, 2017		
Time	*Description*	*Source*
12:00 mid	Driver begins day in off-duty status	Log Book
1:15 a.m.	Driver's room door is opened from the inside	Hotel Records
1:46 a.m.	Driver keys into hotel room	Hotel Records
~7:30 a.m.	Tour group has breakfast at Hollywood Casino	Itinerary
8:20 a.m.	Driver's room door is opened from the inside	Hotel Records
9:00 a.m.	Driver awakes	Interview
9:35 a.m.	Driver's room door is opened from the inside	Hotel Records
10:30 a.m.	Driver keys into hotel room	Hotel Records
10:39 a.m.	Driver's room door is opened from the inside	Hotel Records
10:41 a.m.	Driver keys into hotel room	Hotel Records
11:12 a.m.	Driver receives incoming call; first activity of day	Cell Records
12:00 noon	Driver goes to coach and does pre-trip inspection	Interview
12:00 noon	Driver logs on-duty, not driving	Log Book
12:01 p.m.	Driver's room door closes (last activity before crash)	Hotel Records
12:45 p.m.	Driver pulls up to hotel to load passengers	Interview
1:17:04 p.m.	Last GPS unit ping at Hollywood Casino	GPS Data
1:30 p.m.	Depart for Boomtown Casino, Biloxi, MS	Itinerary
1:53 p.m.	Driver makes outgoing call; last activity before crash	Cell Records
2:11:08 p.m.	Last GPS unit ping before crossing	GPS Data
2:11:20 p.m.	First GPS unit ping on crossing	GPS Data
2:11:51 p.m.	Last GPS unit ping on crossing	GPS Data
2:12 p.m.	**CRASH OCCURS**	

The driver was on duty for a total of 11 hours on March 5th, for a total of 4.5 hours on March 6th, and had been on duty for approximately 2.25 hours at the time of the accident on March 7th.

1.2. General Health

At the time of the crash, the driver of the motorcoach was 60 years old. When interviewed by NTSB investigators following the crash, he described his general health as good. He denied having any on-going medical conditions or regularly seeing a physician. He told investigators he suffers from seasonal allergies. He stated he was not having any health issues on the day of the crash.

He told investigators that he sustained multiple broken ribs and a punctured lung on the left side during the crash. He was unsure what part of the coach caused his injuries.

1.3. Vision and Hearing

When interviewed, the driver described his vision and hearing as good. He does not need glasses to drive, but does have reading glasses for small print. He stated he did not have any problems with either his vision or his hearing on the day of the crash.

1.4. Medical Providers

The driver provided information on his primary care physician and investigators obtained his records. A canvas of pharmacies around the driver's home resulted in historical prescription information for the motorcoach driver. These medical records were reviewed by the Board's Medical Officer; she noted visits for minor health issues and orthopedic complaints. No evidence of significant chronic medical problems or regular medication use was found.

1.5. Medical Examination Report for Commercial Motor Vehicle Driver Fitness Determination (CDL Medical Exam)

Commercial drivers in the United States are required by the *Federal Motor Carrier Safety Regulations* (FMCSRs) to be medically certified as being physically qualified to drive a commercial vehicle.[6] These examinations result in one of four outcomes with respect to medical qualification:

- The driver is found to meet the standards in 49 *Code of Federal Regulations* (CFR) §391.41 and is given a 2-year certificate;[7]
- The driver is found to meet the standards, but requires periodic evaluation for one or more conditions and is qualified for 3 months, 6 months, or 1 year;
- The driver is temporarily disqualified due to a condition or medication; or;
- The driver is found not to meet the standards.

Investigators located the motorcoach driver's most recent CDL medical exam, conducted in January of 2017. In that exam, the driver marked "NO" to all items in the driver health section except #28, pertaining to broken bones, and #29 pertaining to tobacco use. The examiner noted that neither item would limit the driver's ability to safely operate a commercial motor vehicle. The driver indicated he was not taking any prescription medications. His blood pressure, pulse rate, urinalysis, vision, and hearing were all within normal ranges. The physical exam of the driver noted no abnormalities in any body system.

The motorcoach driver was found to meet the standards in 49 CFR §391.41 and was issued a two-year certificate.

1.6. Medications (Prescription, Over-the-Counter, Other)

A number of prescription medication bottles in the driver's name were recovered from the motorcoach during a post-crash inspection. The medications were:

[6] 49 Code of Federal Regulations §391.41.
[7] For more information on who must be examined and the examination process, please see 49 CFR §391.43 and 49 CFR §391.45.

- *Vitamin D*, which promotes calcium absorption and maintains adequate serum calcium and phosphate concentrations. As a prescription, it is used to treat Vitamin D deficiency;[8]
- *Etodolac*, an anti-inflammatory drug used to treat moderate pain and help relieve the symptoms of arthritis;[9]
- *Amoxicillin*, a penicillin antibiotic used to treat infections;[10]
- *Ibuprofen,* an anti-inflammatory used to treat mild to moderate pain and help relieve the symptoms of arthritis;[11]
- *Cyclobenzaprine,* a muscle relaxant used to treat pain, stiffness, and discomfort;[12] and
- *Meloxicam*, an anti-inflammatory used to relieve the symptoms of arthritis.[13]

All prescriptions in the name of the driver recovered from the motorcoach were prescribed several months before the crash.

During the post-crash inspection of the coach, a pill keeper containing several pills and tablets was recovered from the driver's seating area. At the time of the inspection, it was unclear if the pills belonged to the driver. To help determine if they belonged to the driver, the pills were sent to the Federal Aviation Administration (FAA) Bioaeronautical Research Sciences Laboratory for testing. Examination identified the following prescription or over-the-counter medications: [14]

- *Citalopram*, used to treat depression;[15]
- *Glyburide*, used to treat high blood sugar;[16]
- *Hydrochlorothiazide*, used to treat high blood pressure;[17]
- *Hydroxycut*, a dietary supplement marketed as a weight loss aid;[18]
- *Lisinopril*, used to treat high blood pressure and heart failure;[19]
- *Omeprazole*, used to treat the symptoms of GERD;[20] and
- *Simvastatin*, used to treat high cholesterol.[21]

Examination of seven additional pills/tablets in the pill keeper were inconclusive for prescription or over-the-counter medications.

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[8] https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/
[9] http://www.mayoclinic.org/drugs-supplements/etodolac-oral-route/description/drg-20069756
[10] http://www.mayoclinic.org/drugs-supplements/amoxicillin-oral-route/description/drg-20075356
[11] http://www.mayoclinic.org/drugs-supplements/ibuprofen-oral-route/description/drg-20070602
[12] http://www.mayoclinic.org/drugs-supplements/cyclobenzaprine-oral-route/description/drg-20063236
[13] http://www.mayoclinic.org/drugs-supplements/meloxicam-oral-route/description/drg-20066928
[14] Human Performance Attachment: Final Forensic Toxicology Non-Fatal Accident Report, Van Hool Driver.
[15] http://www.mayoclinic.org/drugs-supplements/citalopram-oral-route/description/drg-20062980
[16] http://www.mayoclinic.org/drugs-supplements/glyburide-and-metformin-oral-route/description/drg-20061991
[17] http://www.mayoclinic.org/drugs-supplements/quinapril-and-hydrochlorothiazide-oral-route/description/drg-20069162
[18] https://www.hydroxycut.com/
[19] http://www.mayoclinic.org/drugs-supplements/lisinopril-oral-route/description/drg-20069129
[20] http://www.mayoclinic.org/drugs-supplements/omeprazole-oral-route/description/drg-20066836
[21] http://www.mayoclinic.org/drugs-supplements/simvastatin-oral-route/description/drg-20069006

When interviewed, the driver stated he does not regularly take any prescription medications or over-the-counter supplements. When asked, the driver specifically denied the pill keeper was his. He stated he did take aspirin for a headache two days before the crash.

1.7. Drugs and Alcohol

When interviewed, the driver stated he consumes alcohol socially, usually in the form of beer. The driver denied using illicit drugs.

1.8. Post-Crash Toxicology

Per Federal Motor Carrier Safety Regulations, the driver's employer required him to undergo post-crash drug and alcohol testing. A urine sample was collected from the driver at 5:10 p.m. the day of the crash. The sample tested negative for amphetamines, cannabinoids, opiates, cocaine, and phencyclidine. A breath alcohol test was administered to the driver at 4:35 p.m. using a CMI Intoxilyzer 240. The reading from that test was 0.000.[22]

The remaining portions of blood and urine samples taken from the driver in the hospital were sent to the Federal Aviation Administration (FAA) Bioaeronautical Research Sciences Laboratory for additional testing. That testing was negative for ethanol (alcohol). None of the identified medications from the pill keeper described above were detected in the driver's blood.[23]

1.9. Psychological Factors

When interviewed, the motorcoach driver stated he had not experienced any significant life events[24] in the weeks prior to the crash. When asked, the driver stated he loves his job.

1.10. Sleep Habits

When interviewed, the motorcoach driver described the quality of his sleep as good. He does not take any medications to help him fall asleep. He may take naps during the day, when not working, if his other activities make him tired. He told investigators that he occasionally wakes during the night.

The motorcoach driver described a typical diurnal wake/rest cycle. The time he goes to bed is affected by his work schedule; if he must report to work earlier in the day, he goes to bed earlier. His bedtime when he does not have to work can be after 10:00 p.m.

Based on the available information, staff could estimate the amount of time available for rest the motorcoach driver had in the days preceding the crash. That information is summarized in Table 2.

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[22] Human Performance Attachment: DOT Post-Crash Testing Results, Motorcoach Driver
[23] Human Performance Attachment: Final Forensic Toxicology Non-Fatal Accident Report, Motorcoach Driver
[24] For the purposes of this report, significant life events were defined as births, deaths, marriages, divorces or separations, marital problems, financial concerns, loss of employment, new employment, change of residence, and major health changes.

Table 2. Motorcoach Driver Time Available for Rest

From		To		
Day/Date	**Time**	**Day/Date**	**Time**	**Elapsed Time**
Saturday, March 4	8:13 p.m.	Sunday, March 5	6:00 a.m.	9 hrs 47 min
Sunday, March 5	10:15 p.m.	Monday, March 6	6:00 a.m.	7 hrs 45 min
Monday, March 6	10:17 p.m.	Tuesday, March 7	1:15 a.m.	3 hrs
Tuesday, March 7	1:46 a.m.	Tuesday, March 7	8:20 a.m.	6 hrs 34 min

1.11. Licensing

At the time of the crash the driver of the motorcoach held a Class "B" Texas driver's license with an issue date in March of 2015 and expiring in March 2021. There were no restrictions on his license. He held the "P" (passenger) and "S" (school bus) license endorsements.

A check of the National Driver Register (NDR) for this driver indicated no revocations or suspensions on the Problem Driver Pointer System (PDPS).[25]

1.12. Training/Experience

When interviewed, the driver stated he had some experience driving heavy equipment and the trucks that transported that equipment while in the United States Naval Construction Battalions ("Seabees") in the 1970's. He next drove commercial vehicles beginning in June of 2006 for the Fort Worth Independent School District (ISD); the ISD provided all the initial training for him to obtain a commercial driver's license and the "P" and "S" endorsements as part of hiring him to be a school bus driver.

The motorcoach driver worked for the ISD until September of 2012, when he left to drive a roll-off truck for Waste Management. The driver did not find his work with Waste Management to his liking, so after five months, he went to work for Gotta Go Trailways as a motorcoach driver. Gotta Go Trailways was purchased by and became part of Echo, Transportation. After a verbal confrontation with another employee in February of 2015, he was terminated by Echo and the driver went to work for Roadrunner Charters. In September of 2015, after further investigation of the confrontation, Echo determined the driver had not violated policy and asked him to return to the company. He has been a driver with Echo since.

1.13. Distractions Inside the Vehicle

According to the driver, he was not using his cell phone at or near the time of the crash. Records from his provider indicated that while he did occasionally use his cell phone while driving, his last cell activity was approximately 19 minutes before the crash. The driver stated the motorcoach radio was off. The driver did not report being distracted by passengers or anything else inside the vehicle.

[25] Human Performance Attachment: NDR PDPS Check.

1.14. Distractions Outside the Vehicle

When asked, the motorcoach driver stated there was nothing outside the vehicle that he found to be distracting or unusual as he approached the grade crossing. He did tell investigators that his attention was drawn to cross-traffic as he approached the crossing (see section 1.15).

1.15. Crash Trip

At the time of the crash, the driver was operating a charter. The charter was bringing senior citizens from Bastrop, Texas on a tour of casinos and attractions in the Biloxi, Mississippi area. Per the itinerary, at the time of the crash, the motorcoach was going from the Hollywood Casino Gulf Coast in Bay St. Louis to the Boomtown Casino in Biloxi. The motorcoach had been scheduled to depart the Hollywood casino at 1:30 p.m. and arrive at the Boomtown casino at 2:30 p.m.

When interviewed, the driver stated he was using his GPS[26] when he departed Hollywood Casino. Prior to departing Hollywood Casino, the driver programmed the GPS with the destination of Boomtown Casino, indicating he was driving a tractor-trailer[27] and entering vehicle dimensions of 11 feet 6 inches high, 45 feet long, and 8 feet wide. The GPS unit originally routed him along Interstate 10 (I-10, the route specified on the tour plan); however, as they were travelling, one of the tour leaders asked him to take the scenic route (U.S. Route 90). He stated that making this sort of deviation for a customer was not unusual. The driver began to proceed along U.S. 90, heading away from I-10, and shortly thereafter the GPS unit automatically recalculated the route, taking the coach along U.S. 90. The GPS unit eventually instructed him to make a left on Main Street in Biloxi.[28]

As the motorcoach approached the crossing the driver noted the humped crossing warning, describing it as depicting a truck with a "lowboy" trailer, but told investigators most of his attention was on a fast-moving vehicle on Esters; the driver was concerned that vehicle would not stop. After that vehicle stopped, the motorcoach driver turned on his flashers, and eased up to the crossing, stopping at the stop bar. He noted the incline leading over the tracks and flipped a switch to raise the rear of the coach.[29] He told investigators he stopped, looked both ways, and did not see a train in either direction. He then proceeded over the crossing.

As the motorcoach crested the crossing, the driver became aware of how steep it was on the other side; however, by this time, the coach had become hung up on the crossing. The driver tried to pull forward off the crossing, then tried to reverse off the crossing; neither attempt was successful. As the driver realized the coach was stuck, as passenger told him a train was approaching. The driver looked, saw the train, and told the group leader that everyone needed to get off the coach. He opened the door and passengers began to exit the coach. The driver was

[26] The GPS unit was the driver's personal unit, a Garmin dēzl 570. He stated it had a commercial vehicle mode which he would use when he was driving through cities and towns. It was his normal practice to enter the height and length of his vehicle and the GPS would warn him of low clearance areas.
[27] Per the driver, the GPS unit had two settings, car or tractor-trailer. Selecting tractor-trailer allows the entry of vehicle dimensions and weight.
[28] Main Street goes directly from U.S. 90 to the Boomtown Casino.
[29] The driver was unclear on how the rear of the coach was raised, but stated it was his normal practice to do so if he thought there might be clearance problems, including at grade crossings and steep driveways.

unsure how many passengers were able to evacuate the motorcoach before it was struck by the train.

When the train struck the motorcoach, the impact drove him back into the driver's compartment. He described the train as "pushing" the coach. When the coach came to rest, he called his dispatch to report the crash. People began to board the coach and help people off; the driver was helped off and lay on the ground until assessed and transported to the hospital.

2. Engineer of the CSX Train

The engineer of the CSX locomotive was 47 years old at the time of the crash.

2.1. Activities Prior to the Crash

Using an interview with the engineer[30] cellular telephone records,[31] and Federal Railroad Administration (FRA) Hours of Service (HOS) Reports,[32] investigators developed the following table of the train engineer's activities in the days prior to the crash. Times in the table are Central Standard Time (CST) unless otherwise noted.[33]

Table 3. Train Engineer Activities Prior to the Crash

Saturday, March 4, 2017		
Time	*Description*	*Source*
	ENGINEER IS OFF DUTY ALL DAY	
7:55 p.m.	Engineer receives text message; last of day	Cell Records
8:27 p.m.	Engineer receives last incoming call of day	Cell Records
Sunday, March 5, 2017		
Time	*Description*	*Source*
	ENGINEER IS OFF DUTY ALL DAY	
8:00 a.m.	Engineer awakes	Interview
8:02 a.m.	Engineer sends outgoing text message; first of day	Cell Records
10:12 a.m.	Engineer receives first incoming call of day	Cell Records
8:00 p.m.	Engineer goes to bed	Interview
8:26 p.m.	Engineer receives last incoming call of day	Cell Records
8:58 p.m.	Engineer receives incoming text message; last of day	Cell Records
Monday, March 6, 2017		
Time	*Description*	*Source*
2:04 a.m.	Engineer receives first incoming call of day	Cell Records
4:00 a.m.	Engineer begins his shift	FRA HOS
4:15 a.m.	Engineer receives text message; first of day	Cell Records
4:30 a.m.	Train departs Mobile, AL for Gentilly Terminal New Orleans, LA	Interview
4:59 p.m.	Engineer ends his shift	FRA HOS
~5:00 p.m.	Engineer de-trains in Gentilly Terminal New Orleans, LA	Interview
8:14 p.m.	Engineer receives text message; last of day	Cell Records
8:43 p.m.	Engineer receives last incoming call of day	Cell Records
Tuesday, March 7, 2017		
Time	*Description*	*Source*
5:22 a.m.	Engineer receives first incoming call of day	Cell Records
5:30 a.m.	Engineer receives call from dispatch; call wakes him	Interview

[30] Human Performance Attachment: Narratives and Transcripts of Investigative Interviews.
[31] Human Performance Attachment: Engineer Cellular Telephone Records.
[32] See Engineer Hours of Service Record in the docket.
[33] When interviewed, the engineer gave times in "CSX time", which corresponds to Eastern Time. All times in this table and report were adjusted to Central Time.

Tuesday, March 7, 2017 (continued)		
Time	*Description*	*Source*
6:27 a.m.	Engineer sends outgoing text message; first of day	Cell Records
7:30 a.m.	Engineer reports to the Gentilly Terminal in New Orleans	Interview
8:53 a.m.	Train departs the Gentilly Terminal	Train Sheet
12:52 p.m.	Engineer sends outgoing text message; last before crash	Cell Records
12:53 p.m.	Engineer makes outgoing call; last call before crash	Cell Records
2:12 p.m.	**CRASH OCCURS**	

2.2. General Health

The engineer described his health as "pretty good". He stated he does not have any medical conditions or allergies. He gave his height as 6 feet 2 inches and his weight 230 pounds. He stated he was tested for, but does not have, Obstructive Sleep Apnea (OSA).

2.3. Vision and Hearing

When interviewed, the engineer described his hearing as fair, and stated he was not experiencing any issues with this hearing at the time of the crash. He described his vision as "close to 20/20" and denied having any issues with his vision at the time of the crash.

2.4. Medications (Prescription, Over-the-Counter, Other)

During his interview, the engineer stated he takes an aspirin a day and "Ambien" (zolpidem)[34] as needed. He did take the aspirin as usual in the days preceding the crash; he did not take the Ambien.

2.5. Drugs and Alcohol

When interviewed, the engineer stated he occasionally consumes alcohol, but did not consume any in the days preceding the crash. He denied using illicit drugs.

2.6. Post-Crash Toxicology

U.S. Department of Transportation (DOT) regulations[35] specifically prohibit toxicological testing of railroad employees following a collision between rolling railroad stock and a motor vehicle or other highway conveyance at a rail/highway grade crossing.

[34] A central nervous system (CNS) depressant used to treat insomnia and other sleeping problems. http://www.mayoclinic.org/drugs-supplements/zolpidem-oromucosal-route-sublingual-route/description/drg-20068261.
[35] See *49 Code of Federal Regulations, Part 219.201(b)*.

2.7. Psychological Factors

When interviewed, the engineer stated he had not experienced any significant life events[36] in the weeks prior to the crash.

2.8. Sleep Habits

In his interview, the engineer described a normal, diurnal schedule. He described going to bed and arising at approximately the same times each day, subject to some variation as a requirement of his reporting times. He stated the quality of his sleep was good.

Based on the available information, staff was able to estimate the amount of time available for rest the engineer had in the days preceding the crash. That information is summarized in Table 4.

Table 4. Engineer Time Available for Rest

From		To		
Day/Date	**Time**	**Day/Date**	**Time**	**Elapsed Time**
Saturday, March 4	8:27 p.m.	Sunday, March 5	8:00 a.m.	11 hrs 33 min
Sunday, March 5	8:58 p.m.	Monday, March 6	2:04 a.m.	5 hrs 6 min
Monday, March 6	8:43 p.m.	Tuesday, March 7	5:22 a.m.	8 hrs 39 min

2.9. Training/Experience

The engineer began his career with CSX in 2000 and became an engineer in 2004. He has operated in several rail territories but has spent the majority of his career based out of Mobile, Alabama. He has had regular runs along the section of track where the crash occurred since 2007 or 2008. He currently makes three round trips along this track a week.

2.10. Distractions Inside the Vehicle

When asked, the engineer stated his phone was off and stowed in his bag, in accordance with CSX policy.[37]

2.11. Distractions Outside the Vehicle

In his interview, the engineer described the trip as ordinary, with no visibility issues.

[36] For the purposes of this report, significant life events were defined as births, deaths, marriages, divorces or separations, marital problems, financial concerns, loss of employment, new employment, change of residence, and major health changes.

[37] CSX policy states that crew members should have their cell phones turned off and stowed when operating the train. Although Table 3 shows cell phone activity at 12:53 p.m., the train's event recorder shows the train stopped at 12:48 p.m. and resumed moving at 1:16 p.m., approximately 56 minutes before the crash.

2.12. Crash Trip

At the time of the crash, the train was going from New Orleans, Louisiana, to Mobile, Alabama. According to the engineer, he had clear signals as he approached the crossing of the crash. He estimated his speed as approximately 28 MPH and stated the speed limit in the area was 45 MPH. The train was travelling below the speed limit due to a computer-controlled slowdown in preparation for the drawbridge approximately 2 miles ahead. He stated he was monitoring up to three crossings ahead, with more of his attention on the closest crossing, as that was where the most immediate hazards would be.

The engineer noted the coach on the crossing but did not see it enter the crossing. He estimated that he first saw the coach approximately 15 seconds prior to impact. The engineer did not immediately react to the coach as it was normal to see vehicles in crossings, waiting to turn onto streets parallel to the track. The engineer put his hand on the emergency brake, still expecting the coach to move. As the engineer realized the coach was not going to move he put the train into emergency. The engineer stated he continued to expect the coach to move all the way to impact.

After impact, the engineer made an emergency call to dispatch and had the conductor call the trainmaster. The engineer remained on the train to handle radio traffic until the coach was moved from the front of the locomotive.

3. Conductor of the CSX Train

The conductor of the CSX locomotive was 37 years old at the time of the crash.

3.1. Activities Prior to the Crash

Using an interview with the conductor[38] and Federal Railroad Administration (FRA) Hours of Service (HOS) Reports,[39] investigators developed the following table +of the conductor's activities in the days prior to the crash.[40] Times in the table are Central Standard Time (CST) unless otherwise noted.[41]

Table 5. Train Conductor Activities Prior to the Crash

Sunday, March 5, 2017		
Time	*Description*	*Source*
	CONDUCTOR IS OFF DUTY ALL DAY	
~9:00 a.m.	Conductor awakes	Interview
~11:00 p.m.	Conductor goes to bed	Interview
Monday, March 6, 2017		
Time	*Description*	*Source*
4:00 a.m.	Conductor begins his shift	FRA HOS
4:30 a.m.	Train departs Mobile, AL for New Orleans, LA	Interview
~5:00 p.m.	Engineer de-trains in New Orleans, LA	Interview
5:01 p.m.	Conductor ends his shift	FRA HOS
~9:00 p.m.	Conductor goes to bed	Interview
Tuesday, March 7, 2017		
Time	*Description*	*Source*
5:30 a.m.	Conductor awakes	Interview
6:15 a.m.	Conductor gets out of bed	Interview
7:30 a.m.	Conductor goes on duty	Interview
2:12 p.m.	**CRASH OCCURS**	

3.2. General Health

The conductor described his health as good. He stated he does not have any medical conditions or allergies and does not see a physician regularly. He gave his height as 5 feet 10 inches and his weight 255 pounds.

[38] Human Performance Attachment: Narratives and Transcripts of Investigative Interviews.
[39] See Conductor Hours of Service Record in the docket.
[40] Cell phone records for the conductor were not utilized as the conductor was not in control of the vehicle at the time of the crash and the information would have been redundant with that provided by other sources.
[41] When interviewed, the conductor gave times in "CSX time", which corresponds to Eastern Time. All times were adjusted to Central Time.

3.3. Vision and Hearing

When interviewed, the conductor described his hearing as pretty good, and stated he was not experiencing any issues with this hearing at the time of the crash. He described his vision as "close to 20/20" and denied having any issues with his vision at the time of the crash.

3.4. Medications (Prescription, Over-the-Counter, Other)

During his interview, the conductor stated does not regularly take any prescription, over-the-counter, or herbal medications. He did not take any medications in the days preceding the crash.

3.5. Drugs and Alcohol

When interviewed, the conductor described his alcohol consumption as social and estimated he consumes approximately 2 a week. He did not consume any alcohol in the days preceding the crash. He denied consuming illicit drugs.

3.6. Post-Crash Toxicology

U.S. Department of Transportation (DOT) regulations[42] specifically prohibit toxicological testing of railroad employees following a collision between rolling railroad stock and a motor vehicle or other highway conveyance at a rail/highway grade crossing.

3.7. Psychological Factors

When interviewed, the conductor stated he had not experienced any significant life events[43] in the weeks prior to the crash.

3.8. Sleep Habits

In his interview, the conductor described a normal, diurnal schedule. He described going to bed and arising at approximately the same times each day, subject to some variation as a requirement of his reporting times. He stated the quality of his sleep was good.

3.9. Training/Experience

The conductor began his career with CSX in 2008. He is certified as both an engineer and a conductor. He normally works with the engineer he was working with at the time of the crash. He regularly operates along this stretch of track.

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[42] See *49 Code of Federal Regulations, Part 219.201(b)*.

[43] For the purposes of this report, significant life events were defined as births, deaths, marriages, divorces or separations, marital problems, financial concerns, loss of employment, new employment, change of residence, and major health changes.

3.10. Distractions Inside the Vehicle

When asked, the conductor stated his phone was off and stowed in his bag, in accordance with CSX policy.

3.11. Distractions Outside the Vehicle

In his interview, the conductor described the trip as ordinary, with no visibility issues.

3.12. Crash Trip

In a written statement given after the crash, [44] the conductor stated he first saw the motorcoach on the tracks after the train passed rail milepost 727.[45]

[44] Human Performance Attachment: Crew Statements.
[45] The rail milepost at the crossing is 726.610; therefore, the conductor first saw the motorcoach when the train was less than 0.390 miles (2,059 feet) from the crossing.

4. Other Factors

4.1. Global Positioning System Location

NTSB investigators used the data contained in the Federal Railroad Administration (FRA) crossing database to determine the following coordinates for the crash location (investigators verified the coordinates while on-scene):

Latitude: 30° 23’ 56.84” N

Longitude: 88° 53’ 8.38” W

4.2. Weather

Data from weather station KBIX (Kessler Air Force Base) in Biloxi, Mississippi for the date of this crash - March 7, 2017 - was downloaded from the Weather Underground, http://www.weatherunderground.com.[46] Data for observations closest to the time of the crash are shown in Table ZZ.

Table 6. Weather Data from KBIX.

Time (CST)	1:58 p.m.	2:23 p.m.
Temperature	72.3° F	71.6° F
Dew Point	65.7° F	66° F
Humidity	79%	83%
Pressure	30.17 in	30.16 in
Wind Dir.	S	SSW
Wind Speed	11.5 mph	8.1 mph
Wind Gust Speed	N/A	N/A
Precipitation	N/A	N/A

[46] Human Performance Attachment: Weather Data.

4.3. Illumination and Distractions Outside the Vehicle

According to the U.S. Naval Observatory Astronomical Applications Department, sunrise was at 6:06 a.m. and sunset was at 9:17 p.m. for the crash location. At the time and location of the crash, the sun was at an azimuth of 225.8 east of true north and at an altitude of 43.6 degrees above the horizon.[47] The sun's position at the time of the crash is depicted graphically in Figure 1. The red marker indicates the crash location and the yellow line indicates the direction of the sun.

Figure 1. Graphic Representation of Sun Position at Time of Crash (image from NOAA Solar Calculator)

4.4. Environment

NTSB investigators drove through the accident scene at conditions similar to those present at the time of the crash. No billboards were noted. All visible signage was typical for this type of roadway and grade crossing. No reflections or large reflective surfaces were noted. It must be noted that while conditions were approximately the same as those at the time of the collision, an exact duplication was not possible due to astronomical and weather limitations. The signage at the crossing that was visible to the motorcoach driver is shown in Figure 2.

[47] Human Performance Attachment: Astronomical Data.

Figure 2. View of Crossing from Motorcoach Approach Direction

NTSB investigators took a video recording of the approach to the grade crossing from an exemplar locomotive.[48] A CSX boom truck was placed on the crossing to simulate the presence of the motorcoach.[49] The locomotive approached the crossing at a speed between 10 and 15 miles per hour. The engineer of that train could tell that a vehicle was on the crossing at 3,852 feet.[50]

Using an exemplar motorcoach and experienced driver, NTSB investigators took video of the motorcoach's approach to the crossing.[51] The recording ends when the coach stops at the white stop bar. Investigators also took still photographs of the driver's view down the tracks at the stop bar. The motorcoach was slowly advanced from the stop bar to a point just prior to the undercarriage contacting the crossing surface.

The driver of the exemplar coach was asked to provide his professional assessment of the crossing. He stated he considered the crossing to be safely traversable until he was beyond the stop bar. He further stated that he believed that under normal acceleration from the stop bar it would be difficult for a driver to detect the extreme nature of the far side of the crossing in time to stop a motorcoach before grounding.

[48] Available in the docket as Video of Train Approach to Crossing.
[49] A boom truck was used due to concerns that an exemplar motorcoach would become hung up on the crossing and sustain damage.
[50] This number represents a best-case scenario, in that the engineer operating the train (who was not the engineer involved in the crash) was aware the crash had occurred and had been told a vehicle was present in the crossing.
[51] Available in the docket as Video of Motorcoach Approach to Crossing.

4.5. Garmin dēzl 570 Global Positioning Unit

As described previously, the motorcoach driver told investigators he was using a Garmin dēzl Global Positioning Unit (GPS) for navigation between the Hollywood Casino and the Boomtown Casino. The unit was damaged during the crash and could not be used to determine what information and warnings were presented to the driver; however, investigators could download data from the unit after the crash.[52] Data from the download indicated the driver's GPS was running version 4.3 of the GPS software. Investigators from the Biloxi Police Department, using a Gamin nuvi 1300 running version 4.3 of the GPS software, drove from the Hollywood Casino to the Boomtown Casino and were also routed down Main Street.

To determine what information on the Main Street crossing, if any, was available to the driver through his GPS unit, NTSB investigators contacted HERE Technologies, a company that partners with Garmin to provide the geospatial map data used in many of Garmin's products. Per HERE,[53] they render a rail crossing by first gathering data on the road network using a variety of techniques, including driving and government data. They then use rail data sources to digitize the rail network. The data from both the road and rail networks are combined; crossings occur were the centerline of a road intersects the centerline of the rail. The crossing where this crash occurred (#340185W) is present in HERE's data. The crossing has attribute coding that indicates it was a protected crossing (equipped with a gate) and there was a risk of grounding (a low clearance warning sign was present). HERE's data indicate the risk of grounding attribute was entered in August 2013 and the protected attribute was entered in January of 2015. HERE provides updates at least quarterly, but may do so more frequently, depending on content. It is then up to Garmin to choose what to render in their navigation systems and when to compile a new version of the software.

NTSB investigators also inquired about the quality of the data in the Federal Railroad Administration's grade crossing database. HERE indicated that while they do look at the database, they have found old and incomplete information, including inaccurate centerlines and crossing locations.

[52] For details on the GPS unit and the downloaded data, please see the Recorders Group Report in the docket.
[53] Human Performance Attachment: Narratives and Transcripts of Investigative Interviews.

E. DOCKET MATERIAL

The following attachments and photographs are included in the docket for this investigation:

LIST OF ATTACHMENTS

Human Performance Attachment: Narratives and Transcripts of Investigative Interviews

Human Performance Attachment: Motorcoach Driver Cellular Telephone Records

Human Performance Attachment: Motorcoach Driver Hotel Records

Human Performance Attachment: DOT Post-Crash Testing Results, Motorcoach Driver

Human Performance Attachment: Final Forensic Toxicology Non-Fatal Accident Report, Motorcoach Driver

Human Performance Attachment: NDR PDPS Check

Human Performance Attachment: Engineer Cellular Telephone Records

Human Performance Attachment: Crew Statements

Human Performance Attachment: Weather Data

Human Performance Attachment: Astronomical Data

LIST OF PHOTOGRAPHS AND VIDEO

Human Performance Video: Video of Train Approach to Crossing

Human Performance Video: Video of Motorcoach Approach to Crossing

END OF REPORT

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