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

HUMAN PERFORMANCE FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. CRASH INFORMATION

Location:	Lanetown Rd and Buckingham Branch Grade Crossing near Crozet, Albemarle County, Virginia
Vehicle 1:	2017 Freightliner refuse truck
Operator 1:	Time Disposal of Ruckersville, VA
Vehicle #2:	AMTRAK "Congressional Special Amtrak Train 923", consisting of 2 locomotives, 10 cars
Operator #2:	AMTRAK
Date:	January 31, 2018
Time:	Approximately 11:16 a.m. EST
NTSB #:	**HWY18MH005**

B. HUMAN PERFORMANCE FACTORS GROUP

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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 30-year-old male driver of the 2017 Freightliner refuse truck (hereafter the truck) and the engineer of AMTRAK Congressional Special AMTRAK train 923 (hereafter the train).

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1. Driver of the Truck

1.1. Driver Activities Prior to the Crash

Using the driver's timecard,[1] GPS information from Time Disposal,[2] and records from the driver's cellular service provider,[3] investigators generated a table of the driver's activities in the days prior to the crash. All times in the table are in Eastern Standard Time (EST).

Table 1. Driver Activities Prior to the Crash

Sunday, January 28, 2018		
Time	*Description*	*Source*
12:07 p.m.	Driver receives incoming text; first of day	Cell records
2:42 p.m.	Driver makes outgoing call; first call of day	Cell Records
4:03 p.m.	Driver receives incoming call; last call of day	Cell Records
Monday, January 29, 2018		
Time	*Description*	*Source*
~5:00 a.m.	Driver departs home for work (ESTIMATED)[4]	MapQuest
5:56 a.m.	Driver clocks in at Time Disposal	Timecard
6:01 a.m.	Driver receives incoming call, first call of day	Cell records
1:19 p.m.	Driver clocks out	Timecard
1:35 p.m.	Driver receives incoming text; first of day	Cell records
3:27 p.m.	Driver receives incoming text message; last of day	Cell records
7:52 p.m.	Driver receives incoming call; last call of day	Cell records
Tuesday, January 30, 2018		
Time	*Description*	*Source*
~5:00 a.m.	Driver departs home for work (ESTIMATED)	MapQuest
5:55 a.m.	Driver clocks in at Time Disposal	Timecard

[1] Motor Carrier Attachment: Accident Driver's Timecard
[2] Motor Carrier Attachment: GPS Spread Sheet of the Accident Trip
[3] Human Performance Attachment: Driver Cellular Telephone Records
[4] Estimate calculated by using MapQuest to provide driving time between the driver's residence and his workplace.

Tuesday, January 30, 2018 (continued)		
Time	*Description*	*Source*
7:56 a.m.	Driver receives incoming call; first call of day	Cell records
12:22 p.m.	Driver receives text message; first of day	Cell records
2:15 p.m.	Driver clocks out	Timecard
6:07 p.m.	Driver receives incoming call; last call of day	Cell records
8:00 p.m.	Driver receives text message; last of day	Cell records
Wednesday, January 31, 2018		
Time	*Description*	*Source*
~5:00 a.m.	Driver departs home for work (ESTIMATED)	MapQuest
5:57 a.m.	Driver clocks in at Time Disposal	Timecard
6:00 a.m.	Truck departs Time Disposal	GPS
6:12 a.m.	Truck makes first stop of day on Seminole Trail	GPS
7:11 a.m.	Driver receives incoming call; first call of day	Cell records
7:42 a.m.	Driver receives incoming call; last call before crash	Cell records
11:13 a.m.	Truck makes stop in 5600 block of Three Notched Road	GPS
11:16 a.m.	Truck GPS unit loses power/marks "END"	GPS
11:16 a.m.	**ESTIMATED TIME OF CRASH**	

1.2. Health Information

As the driver declined to speak with investigators, limited health information was available. Information was obtained from the driver's most recent commercial driver medical exam. Given the personal nature of medical information, it was not placed in the docket; instead, it was reviewed by an NTSB Medical Officer and the Human Performance Group Chairman for information relevant to this investigation. This review forms the basis of sections 1.3 to 1.5 of this report.

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

Commercial drivers in the United States, including school bus drivers, are required by the *Federal Motor Carrier Safety Regulations* (FMCSRs) to be medically certified as being physically qualified to drive a commercial vehicle.[5] 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;[6]
- 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;

[5] 49 Code of Federal Regulations §391.41.
[6] For more information on who must be examined and the examination process, please see 49 CFR §391.43 and 49 CFR §391.45.

- The driver is found not to meet the standards.

1.3.1. Previous CDL Medical Exams

Investigators located previous CDL medical exams for the truck driver performed in 2015, 2013, and 2010. In all three prior exams, the driver indicated no health history, conditions, or medications. His physical examinations including vision, hearing, pulse rate, blood pressure, and urinalysis were normal. The driver was qualified for a two-year certificate with no restrictions following each exam.

1.3.2. Current CDL Medical Exam

Investigators located the driver's September 19, 2017 medical exam. In that exam, the driver indicated no health history or other health conditions. He indicated no to any surgery and no to taking prescription, over-the-counter, herbal, or diet medications. The driver's blood pressure, pulse rate, vision, hearing, and urinalysis were within regulatory standards. His height was listed as five feet seven inches and his weight was listed as 145 pounds.

The truck driver was found to meet the standards in 49 CFR §391.41 and was issued a two-year certificate. The medical professional that performed this exam was listed on the national registry of certified medical examiners.

1.4. Medical Providers

Due to the driver declining to speak to investigators, limited information on his medical providers was available. Investigators located one provider, a dentist; records from the dentist were reviewed but found to contain no information relevant to this crash.

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

No information on medications he was taking was provided by the driver. Investigators located records of two prescriptions in the driver's name, prescribed by a dentist. The medications were typical for pain management following dental procedures. The driver would have completed taking the course of medications long before the crash.

1.6. Drugs and Alcohol

In his 2010 CDL medical exam, the driver indicated he occasionally drank alcohol. No additional information on the driver's use of drugs and alcohol was available.

During their post-crash inspection, law enforcement officers found two lunchboxes and plastic bags containing food. Officers determined one of the lunchboxes and the plastic bags belonged to the two passengers. The remaining lunchbox was found on the driver's side floorboard and contained marijuana. When asked, the driver's wife claimed she did not recognize the lunchbox. The driver declined to speak with law enforcement and provided no information on the owner of the lunchbox.

1.7. Post-Crash Toxicology

Following the crash, the Albemarle County Police Department (ACPD) obtained a blood specimen from the driver for the purposes of toxicological testing. The sample was drawn at 4:09 p.m. (approximately 5 hours after the crash). Testing of that sample by the Commonwealth of Virginia Department of Forensic Science Laboratory found the following substances:

- Tetrahydrocannabinol (THC), at 6.6 ± 1.5 ng/mL;[7]
- THC Carboxylic Acid, at 59 ± 11 ng/mL; and
- Gabapentin, at 2.2 ± 0.3 mg/L.

Alcohol and additional drugs/drug classes were not detected in the blood sample.[8]

1.7.1. Classification and Effects of Tetrahydrocannabinol (THC)

Marijuana is a potent central nervous system (CNS) depressant listed as a Schedule I controlled substance under Title 21 USC 812.[9] Tetrahydrocannabinol (THC) is the primary active chemical in marijuana with reported therapeutic levels as low as 1.00 ng/ml. Blood concentrations of THC are very dependent on pattern of use as well as dose.[10] Concentrations vary depending on the potency of marijuana and the way the drug is used; however, peak plasma concentrations of 100-200 ng/mL are routinely encountered shortly after smoking. Plasma concentrations of THC decline rapidly and are often less than 5.00 ng/mL at 3 hours. While the half-life of THC varies significantly based on frequency of use and body habitus, controlled studies demonstrate that detectable THC blood levels decrease by an average of 90.3% from its maximum level within 1.4 hours of last use.[11,12]

Most behavioral and physiological effects return to baseline levels within 3-5 hours after drug use, although some studies have demonstrated residual effects in specific behaviors up to 24 hours, such as complex divided attention tasks. In long term users, even after periods of abstinence, selective attention (ability to filter out irrelevant information) has been shown to be adversely affected with increasing duration of use, and speed of information processing has been shown to be impaired with increasing frequency of use.[13] Furthermore, studies of the effects of cannabis on

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[7] Conversion of units from mg/L to ng/ml done for comparison to published studies.
[8] For a complete list of the drugs/drug classes looked for, please see the Department of Forensic Science Certificate of Analysis, available in the docket as an attachment to this report.
[9] U.S. Department of Justice, Drug Enforcement Administration, Office of Diversion Control, http://www.deadiversion.usdoj.gov/21cfr/21usc/812.htm Accessed 5/31/2018.
[10] Federal Aviation Administration. CAMI toxicology Drug Information for: Marijuana http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=154 Accessed 05/31/2018.
[11] Baselt RC Disposition of Toxic Drugs and Chemicals in Man, 10th Edition. Tetrahydrocannabinol. Pages 1948-1952 Copyright 2014, Biomedical Publications, Seal Beach, California.
[12] Hartman RL et al. Effect of Blood Collection Time on Measured Δ9-Tetrahydrocannabinol Concentrations: Implications for Driving Interpretation and Drug Policy. Clin Chem 2016; 62:2: 367–377
[13] National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Marijuana. https://www.wsp.wa.gov/breathtest/docs/webdms/DRE_Forms/Publications/drug/Human_Performance_Drug_Fact_Sheets-NHTSA.pdf. Accessed 5/31/2018

driving found drivers with an average THC level of 13.0 ng/mL demonstrated lane weaving similar to that of drivers with a breath alcohol of 0.08 g/210L (blood alcohol of about 0.08%).[14]

1.7.1.1. Commonwealth of Virginia Marijuana Laws

On January 31, 2018, the possession and/or sale of marijuana was illegal in Virginia. There were no provisions at that time for medical or recreational use.[15] Virginia does not have a per se marijuana law for driving; however, Virginia law does allow for conviction of driving under the influence if a person is proven to be under the influence of drugs.[16]

According to the Governor's Highway Safety Association, as of January 2018, 12 states have zero tolerance traffic laws for non-commercial drivers with findings of tetrahydrocannabinol (THC, the active component in marijuana) or a metabolite; 3 states have zero tolerance traffic laws for THC but no restriction on metabolites; 5 states have specific per se limits indicating impairment while driving for THC (ranging from 1ng/ml to 5 ng/ml), and 1 state (Colorado) has a reasonable inference law for THC set at 5 ng/ml.[17]

1.7.1.2. Federal Motor Carrier Safety Administration Marijuana Regulations

In the United States, commercial drivers are subject to prohibitions and regulations regarding controlled substance use. 49 CFR 382.213 states in part:[18]

> "(a) No driver shall report for duty or remain on duty requiring the performance of safety sensitive functions when the driver uses any drug or substance identified in 21 CFR 1308.11 Schedule 1."

As described above, marijuana, is a Schedule 1 substance. Recently, some states have passed laws allowing the use of marijuana for medical or recreational purposes. However, the DOT has not allowed an exception to 49 CFR 382.213 for either medical[19] or recreational[20] use.

1.7.2. Classification and Effects of THC Carboxylic Acid (THC-COOH)

THC Carboxylic Acid (THC-COOH) is an inactive metabolite of THC. Concentrations of THC-COOH are very dependent on pattern of use as well as dose. As an inactive metabolite, THC-COOH does not cause any performance effects.

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[14] Hartman RL et al. Cannabis Effects on Driving Lateral Control with and Without Alcohol, Drug Alcohol Depend. 2015 Sep 1; 154: 25–37.
[15] https://www.ghsa.org/sites/default/files/2018-01/marijuanalaws_jan2018.pdf, accessed June 1, 2018. Virginia did pass a bill allowing the use of marijuana oil in March of 2018, but the possession of marijuana remains illegal.
[16] Virginia Code 18.2-266 DUI/DWI/Driving while intoxicated.
[17] Governors Highway Safety Association, Drug Impaired Driving Issues. http://www.ghsa.org/state-laws/issues/Drug-Impaired-Driving Accessed 06/1/2018.
[18] https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&ty=HTML&h=L&mc=true&=PART&n=pt49.5.382#se49.5.382_1213, accessed 6/8/2018.
[19] https://www.transportation.gov/odapc/medical-marijuana-notice, accessed 6/8/2018.
[20] https://www.transportation.gov/odapc/dot-recreational-marijuana-notice, accessed 6/8/2018.

1.7.3. Classification and Effects of Gabapentin

Gabapentin is an anti-seizure medication that is also used to treat chronic pain and is marketed under various names including Neurontin.[21] It is a central nervous system depressant and may cause somnolence, dizziness, ataxia, nystagmus, and fatigue. It carries the warning "Prescribers and patients should be aware that patients' ability to assess their own driving competence, as well as their ability to assess the degree of somnolence caused by gabapentin, can be imperfect."[22] It is not a scheduled substance but is only available by prescription.

The accepted half-life of gabapentin is from 5 to 9 hours and the therapeutic range is from about 2 to 20-30 mg/L.[23,24] According to Wolter Kluwer Clinical Drug Information, gabapentin can have an additive effect when combined with other CNS depressants resulting in enhanced sedative, psychomotor, respiratory, and other effects of CNS depressant drugs.[25] In a study of cases positive for gabapentin submitted to the Washington State Toxicology Laboratory between January 2003 and December 2007. The concentrations of gabapentin in blood from impaired driving cases (n = 137) ranged from less than 2.0 to 24.7 mg/L with a mean of 8.4 ± 5.4 mg/L and a median of 7.0 mg/L. The driving population was 50% male with a mean age of 43.0 ± 10.9 years (range 23–73). Of the cases studied, only 7% were positive for gabapentin alone with the remaining 93% indicative of polydrug use. Drug Recognition Expert reports from four cases in which the only drug detected likely to be causing impairment was gabapentin were examined. The blood drug concentration in these cases ranged from less than 2 to 15.5 mg/L.

NTSB investigators were unable to locate a prescription for gabapentin in the driver's name.

1.8. Psychological Factors

The truck driver is married with five children. No additional information on stress factors is available.

1.9. Sleep Habits

No information on the driver's sleep habits or quantity and quality of sleep was available. Based on the available information, investigators generated a table detailing the driver's opportunity for rest in the days preceding the crash.

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[21] National Institute of Health, National Library of Medicine (U.S.). *DailyMed* 2018. Bethesda, MD. Neurontin - gabapentin. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ee9ad9ed-6d9f-4ee1-9d7f-cfad438df388 Accessed 06/06/2018.

[22] Drugs.Com, Gabapentin and Alcohol / Food Interactions http://www.drugs.com/food-interactions/gabapentin.html Accessed 1/26/2017

[23] Baselt RC Disposition of Toxic Drugs and Chemicals in Man, 10th Edition. Copyright 2014, Biomedical Publications, Seal Beach, California. Gabapentin, Page 925.

[24] Schulz M. et al. Therapeutic and toxic blood concentrations of nearly 1,000 drugs and other xenobiotics. Schulz et al. Critical Care 2012, 16:R136

[25] UpToDate, Waltham, MA, 2018. Wolter Kluwer Clinical Drug Information, Lexicomp® On-line Drug Interactions. Accessed 04/26/2018

Table 2. Truck Driver's Opportunity for Rest

From		To		
Date	*Time*	*Date*	*Time*	*Elapsed*
January 28	4:03 p.m.	January 29	4:30 a.m.	12 hours 27 minutes
January 29	8:00 p.m.	January 30	4:30 a.m.	8 hours 30 minutes
January 30	8:00 p.m.	January 31	4:30 a.m.	8 hours 30 minutes

1.10. Licensing and Driving History

At the time of the crash the driver held a Class "B" Virginia commercial driver's license issued in April 2013, with no endorsements or restrictions. A check of the National Driver Register (NDR) Problem Driver Pointer System (PDPS) indicated no revocations or suspensions for this driver.[26]

Records from the Virginia Department of Motor Vehicles (DMV) show the driver was involved in a property-damage only crash in December of 2016 and was convicted of driving without the proper endorsements in May of 2010.[27]

1.11. Criminal History

In February of 2011, the driver was arrested for possession of marijuana with intent to sell or distribute. He was found guilty and sentenced to 30 days in jail with 26 days suspended. Additionally, his driver's license was restricted to travel to/from work and to/from ASAP (Alcohol Safety Action Program) meetings.[28]

1.12. Training/Experience

The driver applied to work at Time Disposal in October of 2010. In that application, he indicated two years' experience driving box trucks. According to his employer, the driver was familiar with the truck and the route.

1.13. Distractions Inside the Vehicle

According to the owner of Time Disposal, the truck was equipped with an AM/FM radio and a CB (Citizens' Band) radio. It is unknown if either of these were in use at the time of the crash. Cellular phone records indicate the driver was not making a call or texting at or near the time of the crash.

[26] Human Performance Attachment: NDR PDPS Check.
[27] See CIDLIS report, available in the docket as an attachment to the Motor Carrier Group Factual Report.
[28] Human Performance Attachment: Truck Driver Traffic/Criminal Case Details (Available in the Official Use Only portion of the docket).

1.14. Distractions Outside the Vehicle

Investigators examined the scene of the crash. No billboards or non-highway signs were present. No reflections or large reflective surfaces were noted.

1.15. Crash Trip

At the time of the crash, the driver was conducting refuse pickup. He made his first stop of the day at 6:12 a.m. and his last stop prior to the crash was at 11:13 a.m.

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2. Train Engineer

The engineer at the time of the crash was a 43-year-old male.

2.1. Engineer Activities Prior to the Crash

Using the information from interviews with the engineer and other crew members,[29] hotel records,[30] and cellular provider records,[31] investigators generated a table of the engineer's activities in the days prior to the crash. All times in the table are in Eastern Standard Time (EST).

Table 3. Engineer Activities Prior to the Crash

Monday, January 28, 2018		
Time	*Description*	*Source*
12:41 a.m.	Engineer makes outgoing call	Cell records
9:37 a.m.	Engineer receives incoming call	Cell records
10:50 p.m.	Engineer makes outgoing call; last activity of day	Cell records
Monday, January 29, 2018		
Time	*Description*	*Source*
7:00 a.m.	Engineer awakes	Interview
8:13 a.m.	Engineer receives incoming call; first activity of day	Cell records
9:16 p.m.	Engineer makes outgoing call; last activity of day	Cell records
10:30-11 p.m.	Engineer goes to bed	Interview
Tuesday, January 30, 2018		
Time	*Description*	*Source*
7:00 a.m.	Engineer awakes	Interview
8:24 a.m.	Engineer receives incoming call; first activity of day	Cell records
4:30 p.m.	Engineer arrives in Charlottesville, VA	Interview
8:45 p.m.	Engineer sends outgoing text message	Cell records
10:00 p.m.	Engineer goes to bed	Interview
10:09 p.m.	Room key used to open room door	Hotel records
11:13 p.m.	Engineer makes outgoing call; last activity of day	Cell records

[29] Available in the docket as an attachment to the Rail Operations Group Factual Report.
[30] Human Performance Attachment: Hotel Records.
[31] Human Performance Attachment: Engineer Cellular Telephone Records

Wednesday, January 31, 2018		
Time	*Description*	*Source*
7:00 a.m.	Engineer awakes	Interview
7:16 a.m.	Room key used to open room door	Hotel records
9:20 a.m.	Engineer, road foreman leave hotel	Interview
9:21 a.m.	Engineer makes outgoing call; last before crash	Cell Records
9:30 a.m.	Engineer arrives at Charlottesville, VA train yard	Interview
10:00 a.m.	Engineer participates in job briefing	Interview
10:50 a.m.	Train arrives at Charlottesville, VA train yard; crew boards	Interview
10:57 a.m.	Train departs station	Interview
11:16 a.m.	**ESTIMATED TIME OF CRASH**	

2.2. Health Information

Information on the engineer's health was obtained from the engineer during an interview investigation and from his employer. The information provided basis of sections 2.3 to 2.5 of this report. In general, the engineer described his health as good and indicated he is allergic to iodine. He specifically described his vision and hearing as okay and denied having issues with either on the day of the crash.

2.3. Medical Certification of Railroad Engineers

Per Title 49 *Code of Federal Regulations* (CFR) Part 240.121, triennially, railroad engineers are required to meet vision and hearing standards.

In addition to FRA requirements, Amtrak requires that each of its locomotive engineers undergo a medical evaluation before employment and pass annual medical evaluations. These evaluations consist of a medical history, a medication review, sleep apnea screening, determination of vital signs, a physical examination by a licensed health care provider, vision testing, an audiogram, a urine dip test, a urine drug screen, and an electrocardiogram.[32]

2.3.1. Current Medical Exam

According to occupational medicine records, the 43-year-old engineer's most recent medical examination was dated August 17, 2017. The records from that exam documented he was 5 feet 8 inches tall and weighed 200 pounds. No abnormalities were noted on the hearing test. Vision testing revealed the operator's uncorrected visual acuity was 20/20 in both eyes, 20/20 in right eye and 20/20 left eye.[33] No** abnormalities were noted in visual fields or color vision testing. He reported the use of medications for anxiety. In accordance with Amtrak guidance, he

[32] The Amtrak periodic medical examination and its DOT compliant drug testing program screen for the same classes of drugs: marijuana, cocaine, opiates (including only morphine, codeine, and heroin), amphetamines (including methamphetamines and ecstasy (MDMA, MDA and MDEA)), and phencyclidine (PCP).

[33] According to 49 Code of Federal Regulations Part 240.121(c), Each person shall have visual acuity that meets or exceeds the following thresholds: (1) for distant viewing either
(i) Distant visual acuity of at least 20/40 (Snellen) in each eye without corrective lenses or
(ii) Distant visual acuity separately corrected to at least 20/40 (Snellen) with corrective lenses and distant binocular acuity of at least 20/40 (Snellen) in both eyes with or without corrective lenses.

had a complete physical examination and the record documented he met medical standards for employment.

2.4. Medical Providers

When interviewed, the engineer identified his primary care physician as well as one physician that treated him post-crash. His last rail medical examination was on August 17, 2017.

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

When interviewed, the engineer stated he takes Prozac because of previous fatalities involving trains he was operating.

2.6. Drugs and Alcohol

When interviewed, the engineer stated he occasionally consumes alcohol, with the last time being three or four weeks before this crash. He denied taking illicit drugs.

2.7. Post-Crash Toxicology

2.7.1. Law Enforcement Testing

Following the crash, the Albemarle County Police Department (ACPD) obtained a voluntary blood sample from the engineer for the purposes of toxicological testing. Testing of that sample by the Commonwealth of Virginia Department of Forensic Science found Fluoxetine at 72 ± 20 mg/L. [34]

Alcohol and additional drugs/drug classes were not detected in the blood sample.[35]

2.7.1. AMTRAK Testing

AMTRAK policy allows for the testing of employees following an accident or injury:

> "Amtrak Post-Accident Testing. Any employee(s) involved in an accident or injury under circumstances that suggest possible use or influence of drugs or alcohol may be directed to submit to a drug and/or alcohol test.
>
> Amtrak tests conducted under Amtrak authority that require breath alcohol collections should be conducted within two hours of the event and no later than eight hours after. Drug test collections for these same events cannot exceed 32 hours from the time of the incident (accident/injury or rule violation). For CDL/CMV holders alcohol use is prohibited for up to eight (8) hours following an accident or until the driver undergoes a FMCSA post-accident test."

[34] Conversion of units from mg/L to ng/ml done for comparison to published studies.
[35] For a complete list of the drugs/drug classes looked for, please see the Department of Forensic Science Certificate of Analysis in the docket.

The results of the AMTRAK testing[36] were negative for major drugs and drug classes of abuse.[37]

2.7.2. Classification and Effects of Fluoxetine

Fluoxetine is an anti-depressant marketed under the name Prozac. It is used to treat major depressive disorder, bulimia nervosa, obsessive-compulsive disorder, panic disorder, and premenstrual dysphoric disorder. [38] It carries the "black box" warning that anti-depressants may increase the risk of suicide and suicidal thoughts. It is not a scheduled substance but is only available by prescription.[39] It is generally not considered to be sedating and its use is permitted in pilots.[40] The accepted half-life of fluoxetine is from 1 to 3 days for acute administration and 4 to 6 days for chronic administration.[41] Its therapeutic range is from about 25 to 450 ug/L. [42]

2.8. Psychological Factors

When interviewed, the engineer denied recently experiencing any life stressors. He stated he enjoys his job.

2.9. Sleep Habits

When interviewed, the engineer described his sleep as good and stated he sometimes needs an alarm clock to wake and sometimes can do so on his own. He denied having a history of sleep problems. He stated he left well rested when he awoke on the day of this crash.

Based on the available information, investigators generated a table detailing the engineer's opportunity for rest in the days preceding the crash.

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[36] Human Performance Attachment: AMTRAK Testing Results.
[37] The AMTRAK testing checked for amphetamines, barbiturates, benzodiazepines, cocaine metabolites, marijuana (THC), methadone, ecstasy, opiates, 6-monoacetylmorphine, oxycontin, and phencyclidine (PCP).
[38] Drugs.Com, Food and Drug Administration, Professional Information, . http://www.drugs.com/pro/fluoxetine.html Accessed 6/5/2018.
[39] National Institute of Health, National Library of Medicine (U.S.). *DailyMed* 2018. Bethesda, MD. Prozac - fluoxetine. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c88f33ed-6dfb-4c5e-bc01-d8e36dd97299, accessed 06/6/2018.
[40] Federal Aviation Administration, Guide for Aviation Medical Examiners, Decision Considerations - Use of Antidepressant Medications. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/app_process/exam_tech/item47/amd/antidepressants/, accessed 6/6/2018
[41] https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2010-PI-04098-3&d=20180605161146224 83, accessed 6/5/2018.
[42] Baselt RC Disposition of Toxic Drugs and Chemicals in Man, 10th Edition. Copyright 2014, Biomedical Publications, Seal Beach, California. Fluoxetine, Pages 881-884.

Table 4. Engineer's Opportunity for Rest

From		To		
Date	*Time*	*Date*	*Time*	*Elapsed*
January 28	12:41 a.m.	January 28	9:37 a.m.	8 hours 56 minutes
January 28	10:50 p.m.	January 29	7:00 a.m.	8 hours 10 minutes
January 29	10:30 p.m.	January 30	7:00 a.m.	8 hours 30 minutes
January 30	11:13 a.m.	January 31	7:00 a.m.	7 hours 47 minutes

2.10. Licensing

At the time of this crash, the engineer was certified by AMTRAK as a locomotive engineer. His last certification was in November of 2017 and will expire in November of 2020.

2.11. Training/Experience

The worked for CSX Railroad from 1994 until 2013. For the first six months with CSX, he worked as a brakeman. The then completed training to be an engineer. He was an engineer for the rest of his time with CSX. He joined AMTRAK in 2013, where he spent two years running trains out of Huntington, WV. He then went to Florence, SC, then came back to Huntington.

2.12. Distractions Inside the Vehicle

When interviewed, the engineer stated AMTRAK has a policy of no cell phones in the cab; they should be off and stowed. The engineer's phone was off and stored, per policy, at the time of the crash. When asked, he stated there were no in-cab distractions at the time of the crash. Records indicate the engineer was not making a call or texting at or near the time of the crash.

2.13. Distractions Outside the Vehicle

When asked, the engineer stated there were no external distractions at the time of the crash.

2.14. Crash Trip

At the time of the crash, the train was going from the station in Charlottesville, Virginia, to the station in White Sulphur Springs, West Virginia, the second leg of a trip that began at Union Station in Washington, D.C. The train departed Union Station at 8:45 a.m., arrived in Charlottesville at 10:50 a.m., and departed Charlottesville at 10:57 a.m. It was scheduled to arrive in White Sulphur Springs at 2:50 p.m.

The total distance of the trip from Washington to White Sulphur Springs was approximately 247 miles by rail. The distance from Washington to Charlottesville was approximately 115 miles by rail and the distance from Charlottesville to White Sulphur Springs was approximately 132 miles by rail. The distance by rail from the Charlottesville station to the crossing where the crash occurred is approximately 14.4 miles. Rail distances and times are summarized in Table 5.

Table 5. Rail Distances and Times

Location	Segment Distance	Total Distance	Time	Notes
Washington D.C. Union Station (WAS)	0 mi	0 mi	8:45 a.m.	Scheduled departure
Charlottesville, VA Union Station (CVS)	115 mi	115 mi	10:50 a.m.	Arrival
Charlottesville, VA Union Station (CVS)	--	115 mi	10:57 a.m.	Departure
Lanetown Road crossing Crozet, VA (#22470E)	14.4 mi	129.4 mi	11:16 a.m.	CRASH
White Sulphur Springs, WV White Sulphur Springs (WSS)	117.6 mi	247 mi	2:50 p.m.	Scheduled arrival

3. Other Factors

3.1. 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: 38° 4’ 38.4024” N

Longitude: 78° 43’ 0.2676” W

3.2. Weather

Data from weather station KVACROZE6 (Crozet Elementary) in Crozet, Virginia for the date of this crash – January 31, 2018 - was downloaded from the Weather Underground, http://www.weatherunderground.com.[43] Data for observations closest to the time of the crash are shown in Table 6.

[43] Human Performance Attachment: Weather Data

Table 6. Weather Data from KVACROZE6 for January 31, 2018.

Time (EST)	11:13 a.m.	11:18 a.m.
Temperature	32.9° F	33.6° F
Dew Point	10° F	12.4° F
Humidity	38%	41%
Wind Dir.	SW	SW
Wind Speed	2.9 mph	4.9 mph
Wind Gust Speed	3 mph	5 mph
Pressure	30.35 in	30.35 in
Precipitation Rate	0	0
Precipitation Total	0	0
UV	11.1	11.1

3.3. Sight Distance Observations

Using an exemplar truck and train engine, NTSB investigators conducted sight distance observations at the crash scene. Using Differential GPS, the location and coordinates of several points were recorded.[44] Table 7 describes those points of interest to the human performance investigation. All points are based on the exemplar driver's perceptions. Figures 1 through 3 are photographs taken from the exemplar truck at the indicated points.

Table 7. Location and Description of Points of Interest

Identifier	Latitude	Longitude	Description
P1	38.07749498	-78.715702	Illuminated red crossing light first visible
P2	38.07749275	-78.71580892	Illuminated lowered crossing arm first visible
P3	38.07741448	-78.71666135	Stopping point with best view of tracks

[44] For additional information on drone support for this investigation, please see the *UAS Aerial Imagery Report* in the docket.

Figure 1. Illuminated Crossing Light Visible from Exemplar Truck


Figure 2. Illuminated Crossing Arm Visible from Exemplar Truck

Figure 3. View Along Tracks from Truck at "Best" View

3.4. Illumination and Distractions Outside the Vehicle

According to the U.S. Naval Observatory Astronomical Applications Department, for the accident location on January 31, 2018, civil twilight was at 6:52 a.m. and sunrise was at 7:20 a.m.[45] At the time and location of the crash, the sun was at an azimuth of 159.5 degrees east of true north and at an altitude of 32.1 degrees above the horizon. The sun's position is depicted graphically in Figure 4.

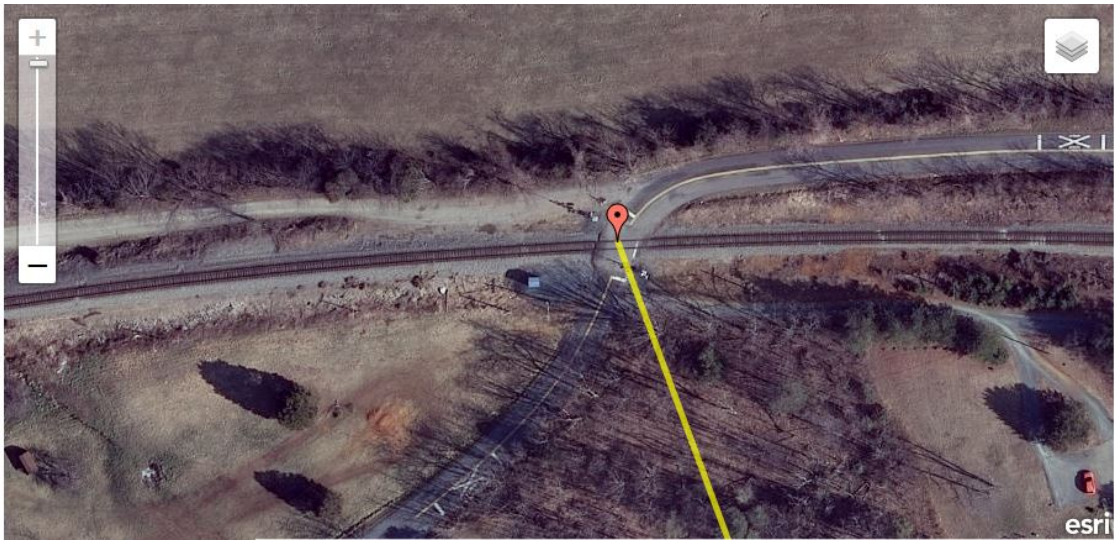

Figure 4. Sun Position (Graphically)

[45] Human Performance Attachment: Astronomical Data.

E. DOCKET MATERIAL

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

LIST OF ATTACHMENTS

Human Performance Attachment - Driver Cellular Telephone Records

Human Performance Attachment - Commonwealth of Virginia Department of Forensic Science Certificate of Analysis

Human Performance Attachment: Truck Driver Traffic/Criminal Case Details

Human Performance Attachment - NDR PDPS Check

Human Performance Attachment - Hotel Records

Human Performance Attachment - Engineer Cellular Telephone Records

Human Performance Attachment - AMTRAK Testing Results

Human Performance Attachment - Weather Data

Human Performance Attachment - Astronomical Data

LIST OF PHOTOGRAPHS

Human Performance Photograph - Illuminated Crossing Light Visible from Exemplar Truck

Human Performance Photograph - Illuminated Crossing Arm Visible from Exemplar Truck

Human Performance Photograph - View Along Tracks from Truck at "Best" View

END OF REPORT

Dennis J. Collins
Senior Highway Investigator (Human Performance)