

June 23, 2020



RE: Matthew Rushin

I am a forensic engineer and traffic collision reconstructionist with more than thirty-three years of experience supported by a Master of Science degree in the major of Mechanical Engineering. I was contacted by Ms. Terra Vance to consult on the details of a traffic collision involving Mr. Matthew Rushin that occurred on January 4, 2019, in Virginia Beach, Virginia.

Specifically, Ms. Vance wanted to know, based on the data available and used in a court case which has already been litigated, whether the data was more indicative of a suicide attempt or an accident. The data I have received includes the Virginia Beach Police Traffic Collision Report No. 2019000563, photographs of the scene showing the vehicles involved at their position of rest, the Bosch Diagnostics Crash Data Retrieval (CDR) reports from a 2008 GMC Tahoe driven by Mr. Rushin and a 2017 Ford Explorer driven by Mr. George Cusick, a summary of body cam transcripts from the night of the incident, court transcript excerpts containing witness testimony, and the police diagram of Mr. Rushin's estimated route preceding the collision.

The CDR Report is used to supplement-- not circumvent-- conventional collision reconstruction methodologies, like crush analysis, energy methods, conservation of momentum, tire skid length analysis, surveillance video analysis, time-position analysis, etc. Besides using the CDR Report, and the witness's impressions of the evening's events, I am not aware that the Virginia Beach Police Department using any other evidence or methods of analysis to support and/or independently validate their theory that Mr. Rushin intended to drive into oncoming traffic and collide with a southbound vehicle.

The generation of Dephi Sensing and Diagnostic Module (SDM) in the Tahoe provides only 2.5 seconds of pre-crash data, and there is no steering data stored at all. That means, the CDR Report doesn't reveal beyond 2.5 seconds before impact if Mr. Rushin was even stepping on

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the accelerator pedal, or applying the brakes. Therefore, making judgements with regard to his intention (i.e., vehicle operation) solely using the CDR Report can be misleading. And the CDR Report alone does not support the theory of suicide or attempted vehicular homicide.

This collision may be classified as a collinear (i.e., the vehicle centerlines are approximately parallel), offset frontal collision where the left front corner of the Tahoe impacted the left front corner of the Explorer with approximately 16 inches of vehicle overlap. Given the fact that the closing speed (the combined speed of Mr. Rushin's vehicle and Mr. Cusick's vehicle) was approximately 100mph, clearly if one wanted to cause harm to one's health or another, a headon impact directed at the vehicle centerline would have increased the collision severity and the risk of injury. However, by contrast, the narrow-overlap offset nature of the collision increased the duration of contact (approximately 170 milliseconds), and correspondingly decreased the peak vehicle accelerations. In response, the Tahoe deformed, slid past and rotated counterclockwise relative to the Explorer. Likewise, the Explorer, too, deformed and rotated counterclockwise, coming to rest at the west curb. Mr. Rushin was able to self-extricate.

The CDR Report of the Explorer reveals pre-impact right-then-left steering wheel input by Mr. Cusick within the last one second before impact, but this steer input alone was not the reason the collision was offset. An approximate half-second steer input would only move the Explorer at most about a foot and a half to the right. As such, the crash was offset, because Mr. Rushin did not steer directly toward the southbound lane #1 of First Colonial Road. Rather, Mr. Rushin's vehicle appears to have narrowly missed the south end of the raised center median, and was straddling the solid line separating lane #1 from the designated left turn lane. And, Mr. Cusick appears to have reacted too late to completely avoid the collision.

Beyond Mr. Rushin's steadfast account of his actions before impact, and due to the lack of corroborating surveillance video depicting his vehicle's movement along First Colonial Road, the CDR Report remains the single piece of evidence providing details of Mr. Rushin's vehicle operation before the collision. At approximately 2.5 seconds to 1.5 seconds before impact, Mr. Rushin was pressing on the accelerator pedal at 100-percent, because the CDR Report quantifies this application as a percent of the pedal range. In response to this input, the CDR Report shows the Tahoe speed increased from 60 to 65mph.

At approximately 1.0 second before and up to impact, Mr. Rushin's foot came off the accelerator pedal. And during the entire 2.5 seconds before impact, Mr. Rushin never applied the service brake before impact. However, this was likely not his intention.

Mr. Rushin explained multiple times that he estimated he was traveling at about 50mph, less than 55mph. If he was doing 50 to 55mph, and he was pressing on the accelerator while believing it was the brake pedal, then this would explain his impact speed of approximately 65mph.

Mashing the brake pedal to the floor when one's vehicle is heading uncontrollably into oncoming traffic is a reasonably anticipated driver response. At the scene and during interrogation, Mr. Rushin consistently stated that he was on his brakes. Mr. Rushin thought he was depressing the brake pedal, likely became confused by the lack of anticipated vehicle response (i.e., slowing), and was instead depressing the accelerator at 100-percent. According to Pollard and Sussman (1989), the most frequent cause of crashes wherein the throttle was fully depressed at or shortly before the point of impact is pedal misapplication errors. An intentional collision would likely have indicated that the accelerator was depressed up to the moment of impact. Because the accelerator pedal is depressed at 100% and then released (i.e., 0%), this behavior is more indicative of someone attempting to repeatedly slam on the brakes.

When drivers make pedal misapplication errors, they frequently repeat the error believing they are correctly pressing the brake when they are actually depressing the accelerator. This is referred to as "efference copy," wherein the sensory system responsible for motor movements and muscle memory associates the act of engaging a movement that the body recognizes to be familiar (Schmidt, 1989). Lococo, Staplin, Martel, and Sifrit (2012) explain this phenomenon as follows:

To relate this theory to unintended acceleration, because the highest central nervous system levels have correctly ordered a movement toward the brake pedal, under certain circumstances the efference copy may substitute for actual feedback from the leg/foot; this indicates a correct movement (toward the brake pedal) even though the actual movement deviates and contacts the accelerator. This would be consistent with a driver "knowing" his or her foot was on the brake, when it actually pressed the accelerator.

These errors of subconsciously repeating a mistake, known as perseveration errors, are particularly common among people with neurological and cognitive disabilities and can be observed in Mr. Rushin's post-crash testimony in his speech. Despite ADHD and ASD, it is unsurprising that Rushin had difficulty speaking on scene. Someone who had just experienced a frontal crash with a velocity change of ~32mph as an unbelted driver with airbag deployment into his face and upper torso would have difficulty being oriented and composed for hours after an impact event like this.

Pedal misapplication is common among certain demographics. A 2012 study performed by the National Highway Traffic Safety Administration (NHTSA) on pedal misapplication errors crashes queried by age shows a significant over-involvement by the young (ages 16 to 20) and oldest (ages 76 and older). That is, pedal misapplication is more prevalent in young and older drivers. Furthermore, people with certain diagnoses, such as those with ADHD or autism, are prone to such errors, as well (Lococo, et al., 2012). Mr. Rushin disclosed in his post-accident interview with the responding officers that he was diagnosed with both autism and ADHD, so his age and his cognitive profile would make him a driver predisposed to making pedal misapplication errors.

Further, "startle events" frequently precede pedal misapplication. According to Schmidt, Young,

Ayers, and Wong (1997), the majority of pedal misapplication occur during turning maneuvers or when the driver has been startled by an unexpected circumstance. Startle events occur when someone has experienced a sudden, unexpected circumstance that causes stress. The post-collision statements delivered by Mr. Rushin indicate that during a U-turn maneuver, he was startled when he saw a no U-turn sign.

From the transcript summary of the body camera footage, Mr. Rushin consistently described this U-turn as the point wherein he began to lose control of his vehicle. As this was both a turning maneuver and a startle event, it is reasonable to conjecture that this would be the precipitating circumstance for pedal misapplication error. Therefore, pedal misapplication is consistent with the totality of evidence presented in this case and the likely cause of this collision.

Of note, the vast majority of vehicular suicides are single-car collisions into a fixed object, and those incidents involving another vehicle are almost exclusively heavy-operations vehicles like semi-trucks (Pompili, 2012). In Mr. Rushin's trajectory, wherein he would have had the time and distance to reach a higher speed and the maneuverability to direct his vehicle, he made a U-turn away from the large centerline bridge abutment for the overcrossing of Interstate 264 to the south. Making this U-turn almost immediately before the crash is counter-indicative of a suicide attempt, as he made a maneuver that greatly diminished his velocity shortly before impact.

Given the totality of evidence that I have reviewed thus far, the vehicle data and statements do not support the theory of suicidal behavior or attempted homicide. On the contrary, the evidence presented strongly suggests pedal misapplication as the primary collision factor. Further, the angle of impact given the velocity and specifications of the 2008 GMC Tahoe he was driving suggests that Mr. Rushin was trying to avoid a collision rather than cause one.

Schmidt (1993) and Lehouillier, Holmes, and German (2013) note that in events wherein individuals report that mechanical failure of the brakes was the cause of an unintended acceleration event, the majority of collisions were actually caused by pedal misapplication. Further, Schmidt and Young (2010) note that those who have made pedal misapplication errors are unlikely to realize the cause of collision and will continue to believe that they were depressing the brake.

Pedal misapplication is a common cause of crash collisions among those age 16-20 and those with poor executive functioning, as is common in autism and ADHD (Lococo, et al., 2012). And, pedal misapplication is not so infrequent that it is beyond consideration of law enforcement investigators when attempting to determine the cause of a crash.

In conclusion, it is my expert opinion that the available evidence does not support that Mr. Rushin's collision was a result of intentionality; rather, the evidence strongly suggests pedal misapplication and attempting to avoid a collision. In short, the evidence supports that this collision was an accident.

Should you need further information, please do not hesitate to contact me.

Sincerely,

Kurt D Weiss

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