

Dublin Police Department Accident Reconstruction Report

Det. Erik Gilleland#161, Traffic Crash Reconstructionist, A.C.T.A.R.#1336

Incident# 17-172

Crash Date: 01/23/2017

Victim: Duane Brodman

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I. Background

On 01/23/2017, Dublin Police were called to the eastbound ramp from US33 to northbound IR 270 on a tanker fire. The tanker was fully engulfed in fire through the tractor and on its passenger side in the roadway. The driver, Duane Brodman, died as a result of the crash.

II. Methodology

I will illustrate using accepted scientific principles and techniques how and why this accident occurred. These conclusions are based on my review and analysis of the crash scene, coroner's findings, witness statements, vehicle and exemplar inspections, and associated paperwork.

III. Crash Scene

This crash occurred on the exit ramp from US 33 east bound to IR 270 north bound starting just west of the bridge over IR 270. The vehicle came to rest entirely on the bridge deck. The roadway was wet with light rain falling.

The ramp consists of two lanes separated by a dashed line. The right side is protected by a steel guardrail and the left side is protected by a concrete parapet. At the bridge deck, the roadway become concrete with grooves in the direction of the roadway and has a concrete parapet on both sides. The roadway curves from right to left and is earth supported asphalt up to the bridge deck on both sides of the bridge linearly. The ramp has been open for less than a year. After the bridge is a lane merge with the left lane merging into the right. The posted speed limit is 55 mph. The elevation crests at approximately the beginning of the bridge deck and from there begins to decline with a super elevation from right to left throughout the turn. There is a 40 mph suggested speed sign approximately ¼ mile prior to the ramp on the right side of the roadway.

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The right guardrail is damaged for approximately 50 feet before the connection point to the concrete parapet on the right side. The damage appears to be from the top down with folding and paint rubs. The supporting posts have been forced to the outside of the roadway in their respective holes. There is a concrete curb approximately 20 feet west of the parapet which appears to be pushed from inside to the outside of the roadway and is cracked in several places.

At the end, the guardrail is noticeably charred and at the connection point to the parapet has contact damage.

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At approximately the first point of damage to the guardrail, there are roadway markings that are rotational and are consistent with the diameter of a commercial wheel and tire. At the same point, there are straight line gouges that are inline but inside of the rotational marks. These rotational markings start from the edge of the roadway and get consistently bigger as they travel through the right fog line. They are at their largest point approximately the size of a commercial vehicle truck tire. The gouges start from approximately half way through the apron and travel to the fog line. Where the rotational markings end, a set of wide scrapes begin traveling in the right lane of travel.



The bridge is a concrete structure with grooves along the longitudinal axis of the roadway. Approximately halfway through the bridge, the deck concrete begins to spall and at places has rubble approximately 2 inches deep. This spalling continues the length of the concrete, goes from side to side, and is evident on both sides on the parapets. There is black charring on the left (inside) wall along the spalling. The inside wall has significantly more damage than the outside wall.

Starting prior to the parapet, large scrapes are seen from the right edge of the roadway and beginning near the bridge start to slide from right to left. Discolorations consistent with erasure

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marks are seen from right to left into the rubble pile. These are consistent with the tractor's final rest point.



The truck tractor is on its passenger side straddling the center of the roadway with the front end toward the outside and the back tandem wheels toward the inside of the roadway. There is catastrophic damage from fire which appears to be from both the crash and from heat deforming the cab. The entire contents of the cab have been destroyed by the fire except for items made from steel. The seat, seat belts and support have been destroyed. Fire suppression foam is throughout the scene. The tires have burnt away to the cords and the wheel rims and hubs have heat damage. Both saddle tanks have melted. A cellphone was found approximately 6 feet away from the cab at the outside edge of the roadway.

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The tanker has melted and is all but destroyed except for the side on the roadway. The rear tandems appear to have fallen from their initial sideways orientation to being upside down which is consistent with the support of the tanker itself no longer being there due to the melting of the aluminum. The tires have been burnt down to the cords and the rims and wheels have been damaged by the heat of the fire. Several of the brake chambers have failed due to the fire and the springs are distributed throughout the scene.



The driver is located under the driver's seat near the back window with the seat pressing down upon the torso. The chest is located supine behind the seat at the rear window with the legs at the approximate passenger door crease. The arms and legs have been partially cremated. The remains are essentially from the shoulders to halfway through the femurs. Franklin County Coroner's Investigators located a surgical plate with seven screw holes and part of the mandible in the cab. The remains were transported to the Franklin County Coroner's office.

The roadway sloping away from the crash scene was fire damaged for several hundred feet. The super elevation in the roadway caused the flow of the fuel to run down onto the roadway underneath through the joint at the bridge deck end. The roadway at the end of the bridge deck transitions to asphalt. The inside guardrail, support posts and roadway are all fire damaged. This

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damage is consistent with the flowing and burning fuel with regard to the super elevation. The parapet from the final rest location down and away from the scene is heavily spalled from the fire. The earthen support has vast scorched areas from the burning fuel flowing downhill. Under the bridge deck on the north side, there are scorch marks at the joint at the beginning of the bridge deck and scorch marks on the outside of the parapet consistent with burning fuel coming over from the deck on to the roadway below. On the south side of the bridge at the end joint of the bridge deck, there are scorch marks consistent with the flow of burning fuel from the final rest position.

IV. Vehicle Examination

In addition to the description listed in the crash scene section of this report, Ofc S. Brown and I went to Lykins Energy and photographed a similar trailer and the sister tractor to this crash. Paint removed from the guardrail was compared to the logos from the truck and trailer. Heights of the logos in reference to the ground were photographed. They appear to be similar.

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The 1996 Heil trailer is a four-compartment liquid hauler with a central distribution point at the passenger side. The shell appears to be made of aluminum. Each compartment is separated by a welded dead space bulkhead perpendicular to the linear axis of the next adjacent compartment. The capacities are #1-3500 gallons, #2-2300 gallons, #3-1100 gallons and #4-2600 gallons. These capacities are marked individually on the fuel manifold outlets. The compartments are from front to rear. The tanker has a vapor capture system. There are two rectangular aluminum boxes on the passenger side below the tanker; one in front of the rear wheels and one in front of the fuel manifold behind the landing gear. There is one box on the driver's side just in front of the rear wheels.



Exemplar tanker photo

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I also inspected the tractor at the Rusty's drop yard. The steering linkage to include the steering shaft, steering box, Pittman arm and links and shafts appear to be intact. All the visible lugs from all three axles appear to be intact. The Transmission linkage appears to be intact. The braking system and wheels were destroyed in the fire. The damage on the right front of the bumper is caused by the vehicle's removal as it is not apparent in the original scene photos. The passenger side step does not have any apparent front to back damage. The outside of the 2nd axle passenger wheel rim is intact and has no visible impact damage. The castle nuts and cotter pins on the steering wheels are intact. The leaf springs appeared to be intact and connected. The Engine Control Module appears to have been destroyed in the fire.



V. Occupant Kinematics

I am not completing an analysis of kinematics and injury analysis in this case due to the lack of injuries available to compare any predictive kinematic analysis.

VI. Statement Analysis

After clearing the scene, Ofc. Borton and I proceeded to the address for Mary Brodman in Auglaize County. I contacted the Auglaize County Sheriff's Office and requested a unit to the

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scene for the notification. I notified Mary Brodman of the potential of Duane Brodman's death. She confirmed that she was married to him and that he had left that morning. She had last received a text from him at 0946 that morning which she shared with me. Photographs were taken of the texts. She had not heard from him since. She had tried to call him several times. She provided an electric razor and his toothbrush so they could be compared for DNA with the remains. She stated that he did not regularly go to a physician but did have several surgical plates from a motorcycle accident from over 20 years ago. She believes that he had a plate put in approximately 15 years ago at a hospital in Columbus however, she could not remember the doctor or hospital. He would have been referred by an Asian doctor who practiced with Dr. Farmer in Upper Sandusky. She provided his cell phone number and his carrier information as Verizon wireless. He regularly used a CPAP.

01/25/17- Cpl. Patrick reports concerning the ODOT cameras: *"I reviewed both videos and a red Tractor can be seen pulling a fuel tanker as it gets onto US33 east from Post Rd (10:30.32am). The Tuttle Crossing video doesn't appear time stamped so I don't know the exact time of occurrence. I don't see a flash but smoke does begin to rise near the top right portion of the video."*

Also, I checked our back parking lot camera that shows traffic on US33 to see what time the tanker passed by, however, that very small portion appears to skip and doesn't show the tanker."

01/27/16-I interviewed and recorded William Hunter over the phone who was a witness at the scene. Hunter indicated that he was driving a semi-tractor trailer approximately 200-300 feet behind and was going to use the same ramp as the crash. He stated that he saw the truck head to the right and strike the guard rail and the driver over corrected when coming back into the roadway. The vehicle then rolled over onto its right side and the fire began from around the middle of the trailer. He stated that the driver did get his four-way flashers on. He remembers they were on after the tractor was over on its side and on fire.

01/30/17-I interviewed Troy Barr who stated that he was northbound on 270 approaching the bridge and was exiting onto the ramp for 33 west. He states he saw the trailer on fire as it was moving across the bridge. As he passed under the bridge, his vehicle was hit in the windshield by fire coming from above the bridge.

I received an email from Jim Gerht who stated that he was in an office at 655 Metro Place S. and witnessed the crash. He states: *"I saw it occur out my window. There was no traffic. The truck appeared to hit the guardrail, turn on its side and split the tanker in half over the cement embankment and engulf in flames across the overpass. I don't know what caused the driver to hit the guardrail (tire blow, checking text, etc.?) – I have no idea. I wish I could help further."*

02/06/17- I spoke with Chad Snouffer with CITGO Petroleum Corp. in Dublin where the truck had fueled and was coming from. Snouffer indicated that at the request of the PUCO, he

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reviewed the video from the date in question of Brodman fueling the tanker. He stated that he saw no indication of fatigue or medical issues for Brodman and that the tanker was filled without incident. They do not have information as to the disbursement of the fuel into the separate compartments.

I spoke with Larry Owens who is the Safety Director with Lykins Energy. They do not have an electronic copy of the load sheet or information as how the load would be distributed into the compartments. He stated that the fuel load was likely going to one drop point and that the driver would have loaded the compartments using his experience to correctly balance the load for weight distribution.

VII. Reconstruction Limitations

The catastrophic damage that was caused by the fire and suppression of the same in this incident eradicated many possible potential points of evidence including roadway and vehicle equipment both mechanical and electronic. Several of the rescue and responding vehicles were in the scene upon arrival. There is no known video of the crash.

VIII. Additional Analysis

01/24/17-I went to the Franklin County Coroner's office for the autopsy. No identifiable number was located on the surgical plate to compare past surgeries. Items from the Brodman residence and the FTA card were taken to CPD Crime Lab for DNA identification. Toxicology is able to be completed.

02/06/17- I received confirmation from CPD crime lab of the DNA comparison to items know to have been from Duane Brodman to the DNA standard taken from the decedent.

I examined the recovered cell phone and found it to be a LG phone Model VS-980 with an FCC ID# of ZNFVS980. I contacted Verizon's Law Enforcement Response Team who stated that Brodman's provided personal phone number should be a Samsung phone. Larry Owens of Lykins Energy stated that Brodman's issued work cell phone was a Model LG G2 (VS980).

An initial report to the media stated that this incident, which turned out to be a vehicle that had gone off the roadway and was stuck in the mud, may have been a contributing factor to the tanker fire crash. I went to the scene. The vehicle was off the roadway not impeding traffic in any way.

At the time of the crash, Ofc. J. Stoll was approximately ½ mile father down the ramp on a reported injury crash. Since he responded lights and siren to the incident, his cruiser camera has been activated. I reviewed the camera video due to its proximity in location and time. The video

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showed wet roadways and light rain for the weather conditions. Ofc Stoll had come to that location from an adjacent ramp and was not positioned on the affected ramp. Neither the lights from the cruiser nor the vehicle itself could be seen from the crash location due to view obstructions. A medic had arrived on the scene after Ofc. Stoll's arrival and had already spoken to the involved party. Finally, Ofc. Stoll had been on the scene of his incident for several minutes when the crash occurred. I went to the area of the scene and photographed the view back to the tanker crash location. The view is completely obstructed. Ofc Stoll provided a statement and drew a map indicating his location in relation to the crash scene. I do not believe that this incident directly or indirectly had any effect on the tanker crash.

I put out a request through the Public Information Officer for all photos and videos available. Numerous videos and photos were reviewed from social media, YouTube and building security video systems. None of the media contained the crash per se but were all post-crash. The media did show the immensity of the resulting fire. The ODOT camera at IR 270 was moved at 10:36:57 to the crash location and the fire was fully involved. At 10:37:17, the camera was moved to the roadway just prior to the crash scene and showed the proximity of witness William Hunter to the bridge. His location had a clear unobstructed view of the scene and roadway.

The local network media outlets were contacted for any provided video and on scene coverage. All refused to volunteer the requested media without subpoena.

03/23/17-I spoke with Maria Kuehl who is the certified physician's assistant who provided Brodman's last DOT Physical. She stated that he was in good health and only reported Sleep Apnea as an ailment. She faxed a copy of his examination form.

03/29/17- Ofc Borton and I interviewed Mary Brodman at her home. She stated that usually Duane was a weekday driver but in January he had been working overtime if the dispatchers called him for the weekend. She was shown the timesheet the Lykins energy provided for January showing the three previous Saturdays that he had driven. She stated that he would have taken the overtime but never exceeded his driving hours. He was off the day before the accident. In the mornings before he would leave to start his shift, he would spend less than 15 minutes to feed his livestock.

Concerning his health, she stated that he had not been to the doctor in many years but that he had his DOT physical checkup when required and no issues came up. He also completed his annual employee benefits wellness program without issues. He did have Obstructive Sleep Apnea but was compliant with wearing his CPAP nightly. He saw Dr. Hiten Shah for this. I contacted Dr. Shah's office and confirmed he was last seen on 07/08/16. Although he wore glasses, he had not been to the eye doctor since 2012 when they moved back to Ohio from Nebraska. He had not been having any issues with his eyesight that she was aware of.

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The morning of the accident, he woke up between 4:00 and 4:30 am. His truck was parked within a few minutes drive from the house at a nearby restaurant. He routinely preloaded his tanker for his first delivery of the day.

04/03/17-I received the Coroner's report. The cause of death is listed as a burn injury with the manner of death as accidental. Toxicology shows only caffeine. Per a phone conversation with Toxicologist Dan Baker, Cardiac enzymes are not viable post mortem and cannot be tested for.

04/07/17-Per Lykens Energy Larry Owen, there is no safety mechanism on the tankers that would automatically activate the hazard flashers if the tanker rolls over. As to an inquiry as to the results of Brodman's annually check up for the company's wellness benefit would be available, Owens states that the information is not shared with the company and stays between the vendor and the insured parties. It is not available.

04/13/17-Call logs received from the Brodman family confirm no calls were made on his personal phone after 09:37 am.

05/10/17-Lykens Energy confirms that no calls or texts were made on Brodman's work phone on the date in question.

IX. Conclusions

Duane Brodman finished loading his assigned tanker on 01/23/17 at 10:20am at 6433 Cosgray Rd Dublin, Ohio 43016. He was carrying slightly over 8000 gallons of gasoline with approximately 1000 of that being premium. Per the Bill of Lading, the product had been sold to HUSKY/MEIJER/CONT/OH DEL so Brodman would likely be heading north out of The Columbus Area.

In walking the roadway, there is no indication of pre-crash steering or braking evident in the roadway.

Brodman's vehicle was travelling east bound on the ramp from US33 east to IR270 north. His vehicle went off the right side of the roadway. It is unknown what caused the truck to leave the travelled part of the roadway. This does not exclude the possibility of a vehicle pulling in front of the truck, a medical issue for Brodman, Brodman falling asleep, mechanical failure or other driver inattention. Based on the lack of contact damage to the front bumper of the truck and the fact that the trailer clearly rolled over onto the outside guard rail, it is my opinion that a steering input was initiated by Brodman to put the truck back into the lane of travel. This steering input would have been to the left as the vehicle was travelling.

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This tanker has a capacity of 9500 gallons but due to the nature of gasoline, its expansion and weight distribution concerns of the truck, these individual tanks were likely not loaded to the individual capacities. There is no record of how the tanks were loaded as the distribution is solely up to the driver. The bill of Lading shows "Gallons Loaded" as 8030, roughly 1500 gallons under capacity. Gasoline weighs approximately 6 pounds per gallon which creates a live load of approximately 48,000 pounds. The tractor and trailer are registered at a combined unladen weight of 26,140 pounds and are authorized at 80,000 pounds CGVWR. With the estimated fuel load at approximately 48,000 pounds, the combined weight would have been under the 80,000 pound total weight limit. This does not however account for axle limits or inner bridge weight limits.

While the trailer has bulkheads front to back, there are no baffles within the tanks to limit the lateral movement of the load within the tank. The base of the tanks are approximately 4 feet off the ground. Any significant lateral motion would cause lateral force and due to the load's high center of gravity, cause a high propensity to roll for this tanker loaded in this configuration. The steering input to bring the truck back onto the roadway in a left curve would have caused a fluid load shift or "slosh" toward the outside of the roadway and in this case I believe that was the action that caused the tanker to roll. This is supported by the folding of the guardrail from top to bottom and from inside to outside.

The blue markings on the guardrail appear to be consistent with the logo on the exemplar vehicle and at a distance from the ground of over 6 feet, consistent with the tanker being on its side in a rollover.

The damage from the guardrail is consistent with the circular roadway markings showing rotation. I believe that these markings are consistent with the rear tandem tires' sidewalls contacting the pavement as the trailer overturned marking the roadway. There are observable linear scrapes and gouges in the roadway that are consistent with other non-rotating parts of the trailer scraping the roadway in line with the travel of the roadway as it began to slide on its side. Approximately 40 feet before the parapet start, the rotating markings diminish and the scrapes become much wider. At this point, I believe that the trailer is on its side. Since the tolerance between the king pin and 5th wheel assembly is small, the trailer rolling would pull the tractor over as well. This is also consistent with the orientation of the trailer and remains of the tanker at final rest.

At the beginning of the bridge parapet, there is damage consistent with contact damage in the direction of the crash. This is at a place in the crash where the tanker would have been on its side. This damage is of such a nature as it could have caused the rupture of the tanker's outer shell. Since the tanker was on its side, steel from mechanical components of the truck would be scraping along the ground and had the potential to create sparks. At this point, there is a scorch mark at the end of the guardrail. Since this is at a high point for the crash, and unlikely that burning fuel would have flowed to that area, I believe this is the probably area of ignition for the fire.

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Scrapes in the roadway, up until the roadway becomes so degraded from fire, are consistent with the vehicle sliding on its side to final rest. The vehicle is travelling according to the direction of travel and the slope of the roadway. Parts in the roadway are consistent with items coming off the truck/trailer.

These conclusions are consistent with the two witness statements from individuals that reported seeing the crash as it happened. Witness Hunter report that the trailer's hazard lights were on after it had rolled indicates the driver was able to activate the lights either during or post vehicle roll. I confirmed with the Lykins Safety Director that the vehicle has no automated system to illuminate these warning lights.

The Coroner's findings and toxicology show no significant toxicological findings. Driver impairment by alcohol or tested drugs is not a factor in this crash.

Fault for this crash is undetermined.

This is my opinion as of May 10th, 2017 based on the facts available this date.



X. Appendices

CITGO Bill of Lading Report

Brodman Medical Certificate 07/12/2016

Heil Trailer Bulkheads schematic

IRP Cab Card

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Tractor Annual Inspection Report 2016

Trailer Annual Inspection Report 2016

Trailer External Visual Inspection Report 2016