National Transportation Safety Board

Washington, D.C. 20594

Highway Accident Brief

Accident Number:	HWY-04-MH-012
Accident Type:	Tanker truck overturn and fire
Location:	Interstate 895 southbound, near Elkridge, Maryland
Date and Time:	January 13, 2004; 2:45 p.m.
Vehicles:	2003 Freightliner tractor cargo tank semitrailer combination unit 2003 Freightliner tractor dry van semitrailer combination unit 1999 International tractor flatbed semitrailer combination unit 1998 Ford Crown Victoria sedan 1987 Chevrolet pickup truck
Owners/Operators:	Petro-Chemical Transport, Inc. Swift Transportation PGT Trucking, Inc. Private owner Private owner
Fatalities/Injuries:	4 fatalities

Accident Description

About 2:45 p.m.[1] on January 13, 2004, a 2003 Freightliner truck tractor in combination with a 2000 Heil cargo tank semitrailer (tanker) was traveling southbound on Interstate 895 (I-895) near the city of Elkridge, in Howard County, Maryland. The vehicle was being operated by a driver traveling to Bethesda, Maryland, to deliver 8,800 gallons of premium grade gasoline. The weather was cloudy, and the roadway was dry.

Tire scuff marks indicate that as the tanker approached an overpass (bridge) to Interstate 95 (I-95), it departed from the right traffic lane and went onto the adjacent shoulder.[2] (See figures 1 and 2.) Scrape and gouge marks on the pavement, roadside barrier, and bridge rail further indicate that as the vehicle traveled along the shoulder, it collided with and mounted these roadside barriers before falling 30 feet over the bridge rail and onto the northbound traffic lanes and median of I-95. The vehicle's speed prior to the accident most likely did not exceed 49 mph based on physical evidence and postaccident tests.

[1] Unless otherwise indicated, all times in this brief are eastern standard time.

[2] Scuff marks are caused by tires that are simultaneously rotating while sideslipping. These marks began as thin, heavy lines and progressively increased in width. The darkest portions of the scuff marks were along the outside of the arc created as the vehicle moved from right to left. The marks indicate that the vehicle's brakes were not locked; the driver probably had been attempting to steer back into the travel lanes.

Figure 1. Aerial view of I-895 overpass, showing the accident location. (Courtesy of Maryland Transportation Authority Police Department)

Figure 2. View of tire scuff marks leading to the overpass.

An explosion and large fire ensued, and four vehicles traveling northbound on I-95 drove into the fire. After firefighters had extinguished the fire (see figure 3), they found five vehicles at final rest positions within the burned area of I-95: the accident tanker, a 2003 Freightliner tractor dry van semitrailer combination unit, a 1999 International tractor flatbed semitrailer combination unit, a 1998 Ford Crown Victoria sedan, and a 1987 Chevrolet pickup truck.

Figure 3. Firefighters responding to the fire caused by the accident. (Courtesy of Maryland Transportation Authority Police Department)

The drivers of the accident tanker, the 2003 Freightliner dry van semitrailer, the Ford sedan, and the pickup truck sustained fatal injuries. The driver of the 1999 International tractor escaped uninjured from his burning vehicle.

Driver Information

The 64-year-old accident driver held a valid Maryland class A commercial driver's license, as well as a current medical certificate. His license carried no restrictions and included endorsements for operating a combination vehicle with a cargo tank, for transporting hazardous materials, and for operating double and triple trailers. His driving history did not indicate any violations, suspensions, or revocations.

Records from the driver's employer indicated that the driver had been employed by Petro-Chemical Transport, Inc. (PCT), since 1993 and had 18 years' experience driving commercial vehicles, including 12 years driving cargo tank semitrailers. Additionally, PCT

reported that the driver was familiar with the accident route and had driven it numerous times before the accident.

Examination of the driver's 72-hour history indicated that he had been off duty for 3 days prior to the accident. According to the driver's wife, his off-duty routine was to go to bed between 11:00 p.m. and 12:00 a.m. and to wake between 10:00 a.m. and 11:00 a.m. She reported that the night before this trip, he went to bed a little past 9:00 p.m. and awoke about 3:45 a.m. Table 1 lists his significant activities on the day of the accident.

Table 1. Driver's activities prior to accident. Tilde (~) indicates approximate times.

Time	Event	Location
~3:45 a.m.	Driver rises after being in bed for approximately 6.75 hours	Finksburg, MD
8:09 a.m.	Driver is on duty and driving	Glen Burnie, MD
8:55 a.m.	Driver arrives at the entrance gate of the CITGO terminal	Baltimore, MD
9:32 a.m.	Driver leaves the CITGO terminal after loading fuel	Baltimore, MD
~11:00 a.m.	Driver delivers a load to Ryder Truck Rental, Inc. (Ryder), facility	Landover, MD
12:41 p.m.	Driver calls Ryder for help after locking keys in his truck[a] Driver calls wife and states that he is running behind schedule	Baltimore, MD
~1:30 p.m.	Ryder mechanic arrives and unlocks the truck	Baltimore, MD
~1:45 p.m.	Driver arrives at CITGO terminal to load truck Driver sees a friend and mentions that he is running late	Baltimore, MD
2:25 p.m.	Driver leaves the terminal and heads toward Bethesda, MD	Baltimore, MD
2:45 p.m.	Accident occurs on I-895	Elkridge, MD

[a]PCT leased the accident vehicle from Ryder.

According to his wife, the driver was not taking any over-the-counter medications at the time of the accident. The investigation revealed that the driver had routinely filled prescriptions for three non-performance-impairing medications.[3] Postaccident testing performed by both the Civil Aerospace Medical Institute and the State of Maryland showed no evidence of illicit drugs or alcohol in the driver's blood.

According to the driver's medical history, in 1999, an otolaryngologist (ear, nose, and throat physician) suggested that the driver participate in a sleep study to determine whether he had sleep apnea, after he complained of snoring at night with "snorting." The driver's wife stated that he never underwent the sleep study; therefore, investigators could not determine whether the driver had sleep apnea or whether the effects of the disease might have contributed to this

[3] These medications were amlodipine, which is used to treat high blood pressure; tamsulosin, which is used to treat benign enlargement of the prostate; and lansoprazole, which is used to treat and prevent conditions caused by excessive stomach acid.

accident. The driver's wife described her husband as a normal sleeper who was not restless, occasionally snored, and had no problems sleeping.

The driver's medical records indicated that he had high blood pressure (a risk factor for heart disease) and was under treatment for the condition. Nothing in the driver's medical records indicated that he had ever complained of cardiac-related symptoms. The autopsy showed no evidence of recent or past myocardial infarctions (heart attacks).

The driver was diagnosed with chronic kidney failure in 2002. A kidney specialist had seen the driver approximately 2 months before the accident and did not find signs of end stage kidney disease or complications from chronic kidney failure. The police and National Transportation Safety Board (NTSB) investigators interviewed Ryder employees and the friend from the CITGO terminal[4] who had contact with the driver on the day of the accident, and none recalled any signs that the driver was ill or feeling unwell that day. Additionally, the tire scuff marks on the shoulder showed evidence of steering input by the driver, indicating that he was conscious and not incapacitated at the time of the accident. Due to the lack of evidence regarding the accident driver's condition, demeanor, or actions immediately prior to the accident, investigators were unable to pinpoint conclusively the factors that might have caused him to lose control of his vehicle.[5]

Motor Carrier Information

PCT (USDOT #192679) is registered with the Federal Motor Carrier Safety Administration (FMCSA) as an interstate for-hire bulk carrier of liquids, gases, coke, and hazardous materials. The carrier, which was founded in 1946, is headquartered in Addison, Texas, and has 70 satellite locations in 24 states. At the time of the accident, the PCT Baltimore satellite location from which the accident driver worked operated with 5 tractors, 5 semitrailers, and 14 drivers. Table 2 shows PCT's out-of-service rates and the national averages for those rates based on roadside inspection data from the FMCSA Motor Carrier Management Information System for the 24 months prior to the accident.

Table 2. PCT out-of-service rates from January 2002 to January 2004 and the national averages for commercial carriers.

	PCT	National Average
Vehicle out-of-service rate	13.3	22.9
Driver out-of-service rate	0.5	7.2
Hazmat out-of-service rate	1.1	5.7

The FMCSA gave PCT a satisfactory rating following a March 2003 compliance review.[6] PCT again received a satisfactory rating in February 2004, after a postaccident compliance

[4] The friend was an Eastern Petroleum driver who spoke to the accident driver at the CITGO terminal about 1:45 p.m.

[5] Investigators obtained cellular telephone records for the tanker driver and were able to determine that he was not using the cellular telephone immediately prior to the accident.

[6] The result of a compliance review is a safety rating. A rating of *satisfactory* for a carrier means the carrier has sufficient safety management controls in place to meet the safety fitness standards in the Federal regulations. A

review uncovered no critical or acute violations. PCT's accident rate per million miles traveled was .058, well below the upper limit of 1.5 for a satisfactory rating in that category.

Vehicle Information

The tractor-semitrailer consisted of a 2003 Freightliner conventional "day-cab" design tractor, in combination with a 2000 Heil 406 43-foot-long elliptical cargo tank semitrailer. (See figure 4.) PCT operated the tractor, which it leased from Ryder. Ryder conducted all maintenance and repair work on the leased vehicle.

During the postaccident inspection, NTSB investigators found no mechanical defects on the tractor or semitrailer that would have adversely affected the driver's ability to control the truck. The accident vehicle was equipped with an electronic control module (ECM); however, it did not survive the fire.

Figure 4. Exemplar of accident truck.

The posted speed limit for I-895 was 55 mph. An advisory speed limit sign denoting a recommended vehicle speed of 45 mph was located approximately 792 feet before the accident location. NTSB investigators and PCT employees jointly conducted speed studies with an exemplar vehicle traversing the upgrade along I-895 on the southbound approach where the accident occurred to determine the probable speed of the accident vehicle. The studies used an exemplar tractor and semitrailer loaded with the same amount of gasoline that the accident vehicle had carried. The exemplar truck was operated along the approach to the accident overpass in several different gear positions to determine the most likely gear position and vehicle speed attained by the accident vehicle. The tractor's gear position and speedometer readings

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conditional safety rating means the carrier does not have sufficient safety management controls in place and could be in violation of the safety fitness standards. An *unsatisfactory* rating means the carrier does not have adequate safety management controls in place and has violated the safety fitness standards. If a carrier receives an unsatisfactory rating, it must take the necessary corrective actions specified within 30 days or its operating authority will be revoked.

were documented, and Doppler radar was used to record the vehicle's speed. The test results were as follows:

- *Transmission in 8th gear* – The vehicle was capable of easily traversing the approach, and a top speed of 39 mph was obtained. Vehicle speed was limited due to the engine's reaching peak rpm as controlled by the engine's ECM.
- *Transmission in 9th gear* – The vehicle was able to traverse the approach at a speed between 47 and 49 mph.
- *Transmission in 10th gear* – The vehicle was able to traverse the approach at approximately 45 mph. The engine labored considerably, and the tractor had difficulty maintaining speed.

Additional results from this testing revealed that, regardless of the gear selected, the exemplar vehicle was at no time capable of exceeding 49 mph while traversing the approach.

Highway Information

The accident occurred on the left-hand horizontal curve of an elevated direct connection ramp between I-895 and I-95. The ramp was designed to allow southbound traffic on I-895 to access the southbound lanes of I-95 by first passing over both the north- and southbound lanes of I-95 via a bridge. The horizontal curve had a radius of about 954 feet and began approximately 740 feet before the overpass. (See figure 1.) The curve ended approximately 402 feet beyond the overpass.

The accident sequence began in the right traffic lane of southbound I-895 at the approach to the overpass. In this area, I-895 consisted of two 12-foot-wide traffic lanes. A 4-foot-wide shoulder bordered the left lane, and a 10-foot-wide shoulder bordered the right lane. The right shoulder transitioned from 10 feet wide to 4 feet wide at the roadway/bridge junction. Also, a blocked-out W-beam barrier[7] guardrail was located adjacent to the right shoulder. The grade of the southbound lanes of I-895 before the overpass was a positive 4-percent upgrade.

The overpass was a one-way, two-lane structure consisting of two 12-foot-wide traffic lanes, each of which was bordered by a 4-foot-wide shoulder. The two lanes of this structure merged into a single lane within the horizontal curve and on the down slope before merging with the southbound lanes of I-95. These design characteristics were not in conformance with current American Association of State Highway and Transportation Officials (AASHTO) guidelines,[8] which state the following:

> The [lane] reduction should not be made so far downstream that motorists become accustomed to a number of lanes and are surprised by the reduction.... Desirably, the

[7] A blocked-out W-beam barrier consists of a W-beam rail that is separated (blocked) from the guardrail posts by timber, steel, or recycled plastic. This configuration minimizes the likelihood of a vehicle's snagging on or vaulting over the posts.

[8] AASHTO, *A Policy on Geometric Design of Highways and Streets*, 5th edition (Washington, DC: AASHTO, 2004) 818.

lane-drop transition should be located on tangent horizontal alignment and on the approach side of any crest vertical curve.

A 32-inch-high concrete safety shape barrier bridge rail was located adjacent to each shoulder along both sides of the overpass. (See figure 5.) The right shoulder had a 10-foot-long, concrete parapet at the beginning of the southbound approach to the overpass. The concrete parapet was 32 inches tall on the approach side and sloped up to a plateau height of 42 inches. It served as a transition between the W-beam barrier guardrail located along the approach roadway and the concrete bridge rail of the overpass. Both the concrete parapet and the W-beam barrier guardrail transition were flared away from the traffic lanes. This guardrail transition was an acceptable design when the overpass was constructed in 1973, but it did not conform to the design criteria in the 2002 AASHTO *Roadside Design Guide*,[9] which state that the guardrail transition should align with the concrete bridge rail to prevent the likelihood of a vehicle's becoming snagged in the area immediately adjacent to the concrete parapet.

Figure 5. I-895 overpass barrier system.

The physical evidence indicates that the driver's efforts to regain control of his vehicle were hampered by the reduction of the right shoulder width from 10 feet to 4 feet near the overpass and by the flared layout of the parapet and W-beam guardrail transition. This reduction in shoulder width essentially forced the driver to steer abruptly back toward the travel lanes to avoid striking the guardrail or concrete parapet. As he attempted to steer back toward the travel lanes, his truck struck the flared W-beam guardrail transition and concrete parapet, which failed to redirect the truck back into the travel lanes. The orientation of the parapet allowed the truck to mount the barrier and vault over the adjoining bridge rail so that the vehicle fell onto the roadway below.

Since the accident, the shoulder, lane alignment, and guardrail transition have been modified so that drivers who find themselves traveling on the shoulder are not forced to steer quickly back onto the roadway to avoid striking the guardrail or the concrete parapet. The modifications to this section of the roadway are discussed in the next section of the report.

[9] AASHTO, *Roadside Design Guide* (Washington, DC: AASHTO, 2002).

Postaccident Modifications

Following the accident, the Maryland Transportation Authority (MTA) made several highway modifications at the accident location. The MTA relocated the merge point of the two southbound overpass lanes away from the horizontal curve to a tangent section of roadway about 3,168 feet before the overpass. Merging the two southbound lanes before the overpass and on the approach side of the vertical curve made this roadway comply with current AASHTO guidelines and increased the width of the right shoulder along the elevated portion of the overpass.

The MTA made additional modifications to the roadside barrier along the southbound lanes of I-895. The MTA removed the flared transition from the roadside barrier to the concrete parapet, providing a smooth and continuous transition, as recommended in the *Roadside Design Guide*.[10] The MTA strengthened the roadside barrier by replacing the existing guardrail with a new strong post blocked-out W-beam barrier that has decreasing post spacing and increasing post size from the guardrail to the concrete parapet. Also, the new W-beam barrier is "nested" (one section has been placed over another to create a double thickness). (See figure 6.)

Figure 6. Postaccident modifications to the I-895 overpass barrier system.

[10] See AASHTO's 2002 *Roadside Design Guide*, 5-31.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the January 13, 2004, accident in Elkridge, Maryland, was the failure of the tanker driver to maintain control of his vehicle for undetermined reasons. Contributing to the accident was the narrowed shoulder at the beginning of the overpass and the outdated design of this section of the roadway, including the flared concrete parapet and guardrail transition, which led the tanker to mount the parapet and vault the concrete safety shape barrier bridge rail so that the vehicle fell from the overpass onto the roadway below.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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STEVEN R. CHEALANDER
Member (former)[11]

Adopted: July 30, 2009

[11] Steven R. Chealander resigned as an NTSB Board Member effective February 28, 2009. Member Chealander cast his vote in favor of adoption of this report before leaving the agency.