



Virginia Commonwealth University

**Virginia
Multi-disciplinary
Crash Investigation Team**

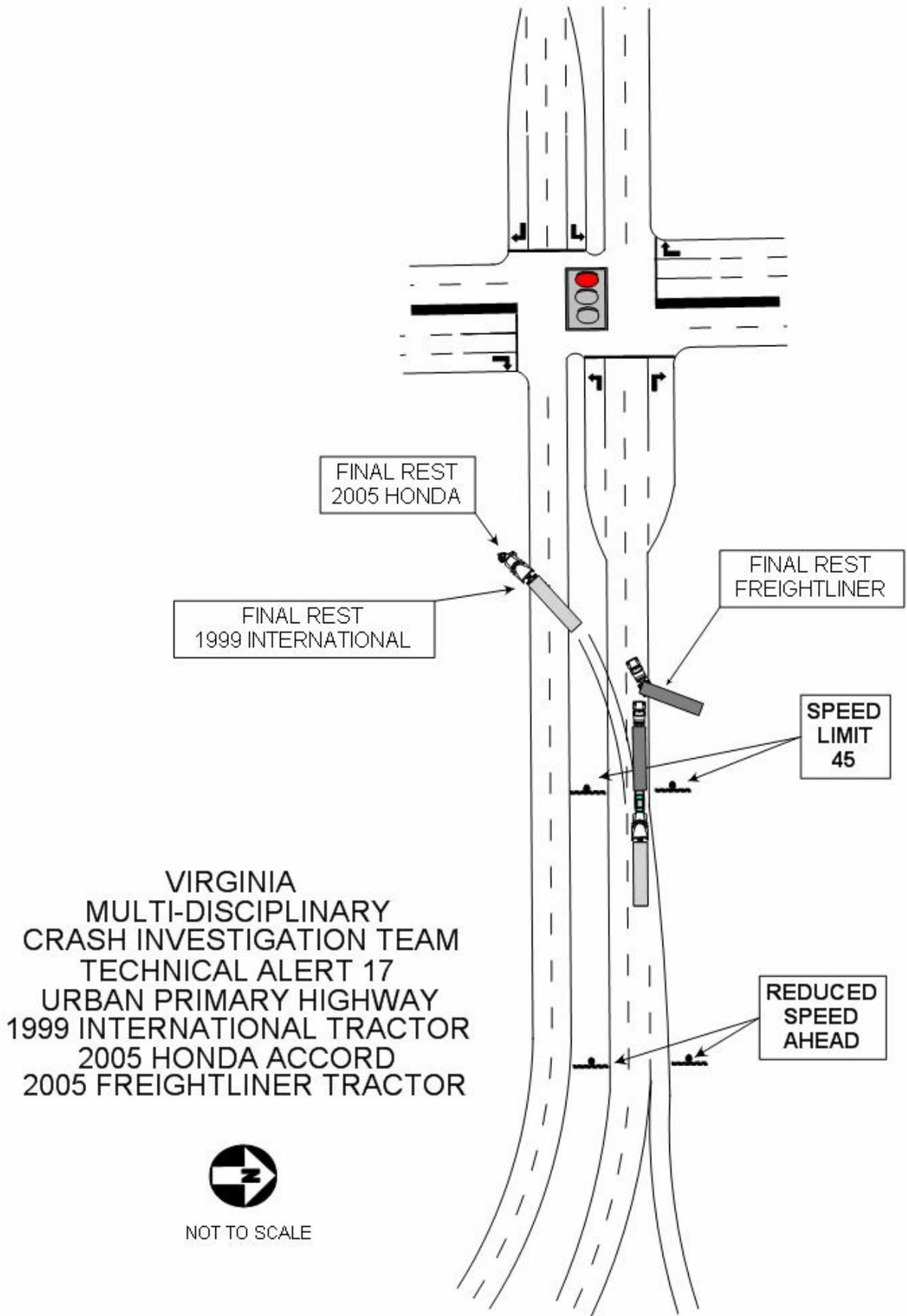
**Technical Alert: Number 17
Four Fatality Rear-end Collision at Intersection**

Date: January, 2008

This Technical Alert describes a rear-end collision that occurred when a tractor-trailer failed to slow for traffic stopped at an intersection. The tractor struck the back of a sedan, pushing it into the rear of another tractor-trailer. The crash resulted in four fatalities, all the occupants of the sedan, and one injury. Changes to the speed limit and additional signs approaching this heavily traveled location could better prepare drivers for potential backups and improve safety.

On a clear, dry Friday afternoon in late spring, a 2005 Honda Accord was headed west on a rural primary road. The 18 year old female driver was accompanied by her 45 year old father in the right front seat, her 17 year old brother in the left rear passenger seat and his 16 year old friend in the right rear passenger seat. The driver was not impaired by alcohol or drugs. All the Honda occupants wore lap/shoulder restraints. The group had left an urban area about an hour earlier and was headed to a family gathering in a nearby state.

The road is a four lane divided highway with an average pavement width of 24 feet, 8 feet of right shoulder and 3 feet of left shoulder. The lanes are separated by a wide grass median. The pavement is asphalt and is in good condition. The westbound lanes



VIRGINIA
 MULTI-DISCIPLINARY
 CRASH INVESTIGATION TEAM
 TECHNICAL ALERT 17
 URBAN PRIMARY HIGHWAY
 1999 INTERNATIONAL TRACTOR
 2005 HONDA ACCORD
 2005 FREIGHTLINER TRACTOR



NOT TO SCALE

are on a downgrade and curve to the left prior to the entrance ramp from a southbound primary road. They continue straight to the signalized intersection with a local road that leads to retail stores, gas stations and restaurants. Left and right turn lanes for both east and west travel directions provide access to these businesses. The road is controlled by pavement markings, signs and a traffic signal which are in good condition. Further west, an interstate highway runs beneath this primary road, with ramps for entrances and exits to the north/south artery.

Approximately one year before the crash, the Virginia Department of Transportation (VDOT) adjusted the speed limit from 55 mph to 60 mph for much of this primary highway, based on the results of an engineering study. However, this limit decreases from 60 mph to 45 mph approximately 1000 feet from the intersection, which is just west of the entrance ramp for the southbound primary road. Motorists are forewarned of this speed limit reduction by two “REDUCED SPEED AHEAD” signs posted approximately 550 feet prior to the 45 mph signs on either side of the westbound lanes.

As the Honda approached the intersection, it slowed for traffic that was queuing at a red traffic light. A tractor-trailer was stopping immediately ahead, in the same lane. This vehicle, a 2005 Freightliner tractor pulling an empty semi-trailer, was operated by a 65 year old male, who was headed to a destination about 60 miles away in a neighboring state. A 36 year old male driving a 1999 International tractor and pulling an empty semi-trailer was also traveling in the right lane, behind the Honda. This driver had been working since 4 a.m., making pickups and deliveries. He was traveling home, about 30 miles away. He negotiated the long left curve on the downgrade and passed the entrance ramp from the southbound primary road.

The International tractor driver failed to note that the traffic was slowing and forming a queue. He stated that he saw the truck stop and “hit my brakes.” In a later interview, he stated that he was “tapping” his brakes, not pumping them. There were no marks on the road to indicate that his brakes were ever engaged enough to cause skidding. As his vehicle was almost even with the 45 mph speed limit sign posted beside the road, his tractor collided with the rear end of the Honda. The larger, heavier vehicle overrode the trunk area of the Honda and pushed the car forward, into the rear of the trailer preceding it. The Honda was crushed between the two, killing all four occupants instantly, in spite of the fact that the vehicle was equipped with eight airbags, all of which deployed. The impact

was of such force that it broke the tandems from beneath the first trailer and caused it to turn onto its side. The International tractor, with the Honda still entangled in its front engine area, disengaged from the Freightliner's trailer and slid across the left lane and through the grassy median. The tangled vehicles crossed both eastbound lanes and came to rest on the south shoulder of the roadway, still locked together.

Witnesses notified law enforcement and emergency personnel, who arrived at the scene within minutes. The International tractor driver stated that someone assisted him by unbuckling his safety belt and helping him exit his vehicle from the passenger side. However, a witness who was directly behind his trailer reported that he stopped immediately and ran to provide assistance, finding the driver already sitting on the passenger side of his truck. When members of the Virginia Multi-disciplinary Crash Investigation Team (VMCIT) examined the vehicle, the driver lap/shoulder belt was buckled in place and the belt webbing showed no signs of stretching anywhere along its length. This would indicate that the driver was probably not wearing the safety restraints at the time of the crash. He suffered cuts and other injuries and was transported to a local hospital where he was treated and released several days after the crash.

A medical examiner was called and came to the scene after it became apparent that there were multiple fatalities. Initially, the make and model of the car, as well as the number of occupants, was unknown. The vehicle was removed to the city garage, where the bodies were extricated under the observation of the medical examiner. The actual fatality figure and the make, model and type of vehicle were determined after the wreckage was pulled apart. The bodies were transported to the District Office of the Chief Medical Examiner for autopsy. Once the Vehicle Identification Number (VIN) was located, the investigating officer was able to begin the process of identifying the vehicle and assisting the medical examiner in identifying its occupants. The other vehicles were towed and the scene was cleared after measurements were made and evidence documented.

One of the main questions in this crash related to the International tractor driver's actions that day. He had begun work at 4:00 a.m. and indicated that he had inspected his truck before driving it that morning. He did not keep an accurate log of his trips, but he had been delivering and picking up loads during the day. He stated that he had stopped to eat a couple of hours prior to the crash. Although he was nearing the end of his normal work day, he had not exceeded the hours he was allowed to work under Federal Motor

Carrier regulations and he did not report being sleepy or impaired. This individual was familiar with his truck and with the road, traveling the area daily as part of his normal work route. He should have anticipated that traffic might be backed up at the intersection he was approaching, since this is a common occurrence. Instead, he did not appear to be aware that there was a vehicle between his tractor and the trailer ahead. Although he did state that he was getting ready to move into the left lane and was waiting for a car to pass him on the left, he never reported seeing the silver Honda directly ahead, even after he struck it. While the cause of his inattention is indeterminate, he failed to accurately assess the slowing traffic as he approached the intersection, or to even identify the vehicles in his direct path of travel, with tragic consequences.

A review of this man's driving record revealed that he had been licensed in Virginia only since early 2006. A driver history from shortly after the crash showed that he had +5 points. However, it also revealed that this individual had eight convictions in the Commonwealth in the three years prior to acquiring his Virginia driver's license. Five of these convictions were for offenses that occurred while operating a commercial motor vehicle, including two for speeding (one for 1-9 mph above the speed limit and one for 10-14 mph above the limit in a 55 mph zone). The other commercial motor vehicle convictions involved improper equipment and exceeding weight limits. While driving a private vehicle, he had also been convicted of speeding 10-14 mph above the 55 mph limit and operating an uninspected vehicle. Because of these infractions, this driver should not have been assigned a +5 point rating when he received his Virginia driver's license. The Department of Motor Vehicles (DMV) only considers an applicant's driving history for the previous two years when determining points and, since during that time frame this driver had only two infractions which did not have points associated with them, he should have had a balance of 0 points. After the case was brought to the attention of DMV representatives, the driver's record was corrected to reflect a balance of 0 points. Several months after this crash, a grand jury returned a true bill against this driver and he faces trial in a circuit court on one count of reckless driving and four counts of involuntary manslaughter.

According to the FR300 Accident Reports from VDOT for the period January 1, 2004 through June 8, 2007, 17 crashes occurred at this intersection involving vehicles traveling westbound. With regard to types of crashes, there were:

- 12 rear-end collisions
- 4 angle collisions and
- 1 sideswipe-same direction crash.

With regard to crash outcomes:

- 4 fatalities occurred (all in this crash)
- 17 people were injured and
- 8 crashes resulted in property damage only.

A cursory analysis of this data shows a high proportion of rear-end crashes, with half resulting in injury or death. This indicates that drivers are not adequately prepared to slow or stop for traffic as they approach the intersection. The combination of higher speed limits, often up to the area where traffic is queuing, combined with a long downgrade and generally heavy traffic, may lead to errors of judgment regarding speed and stopping distances.

Discussions with VDOT personnel and a subsequent e-mail indicated the following:

- A recent study at the site showed that the 85th percentile speed was approximately 46 mph in the 45 mph zone. This means that 85% of drivers were traveling at 46 mph or slower and 15% of the drivers were traveling faster.
- The signal timing at the intersection was adjusted to give more green time for the primary route at the intersection in order to help with the traffic backup in the westbound lanes, which is the site of this crash.
- “SIGNAL AHEAD” and “REDUCED SPEED AHEAD” signs have been installed on the westbound lane, prior to the entrance ramp for the southbound primary road.
- Rumble strips will be installed in the near future prior to and near the entrance ramp, giving motorists advance warning to be alert.

In addition to the above changes, the VMCIT recommends that the 45 mph reduced speed zone be extended to prior to the overpass over the north/south primary road. The signs should be minimum expressway sizes (Manual on Uniform Traffic Control Devices for Streets and Highways, 2003) and installed on both sides of the roadway. Consideration should be given to installing warning beacons on the “REDUCED SPEED AHEAD” signs. These engineering changes, in addition to the ones already implemented, will help improve

driver attention to traffic conditions and create an expectancy to slow or stop at an earlier point in the approach to the intersection. Increased enforcement of speed limits by local and state officers would reinforce compliance and vigilance in this area.

The VMCIT also suggests that VDOT generally consider other primary roads where speed limits have been increased from 55 to 60 mph, and where reduced speed limit zones are implemented, especially approaching intersections. A decrease from 60 to 45 mph may be more difficult to accomplish within a short travel distance than a reduction from 55 to 45 mph, both physically and psychologically on the part of the driver. Providing more time and distance, as well as more varied methods of warning, may help improve drivers' alertness to travel conditions that warrant the reduction in speed, as well as greater compliance with the posted speed limit. Greater vigilance and slower speeds in high risk areas may prevent tragic crashes, such as the one described in this Technical Alert.

REFERENCES

Federal Highway Administration, U.S. Department of Transportation (2003). *Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition*.