

Motor Vehicle Crash Investigation

- Be of good moral character and in good health.
- Be not less than twenty-one (21) years of age.
- Possess a valid driver's license against which no more than six driver demerit points have been assessed.
- Possess:
 - (a) a minimum of 60 college hours of credit or an associate's degree from an accredited college or university; or
 - (b) a high school diploma with at least 2 years of active military duty or in law enforcement; or
 - (c) 2 years' experience as a full-time, sworn law enforcement officer.

Those who meet the qualifications are eligible to apply to the KSP academy. The application process to be accepted into the academy includes a written exam, a physical agility test, an interview, a background investigation, and a polygraph test. The physical agility test is made up of five events [KSP, no date (a)], including:

- Bench press (based on body weight percentage)
- 2 minute sit-up test
- 300 meter run
- 2 minute push-up test
- 1.5 mile run

All new recruits and active troopers must attend the KSP Academy for basic training. The cadets spend 23 weeks and more than 1,000 hours in a military-style program, training on firearms, defensive tactics, criminal investigations, emergency driving, counter ambush, as well as other aspects of law enforcement [KSP, no date (b)]. Although a standalone class in traffic incident management (TIM) is not included in the academy curriculum, the TIM concepts are included in the week-long driving course and the 40-hour collision training.

After graduation, troopers remain on probation for 1 year. Probationary troopers must complete 8 weeks of field training at their assigned post, under the supervision of a field training officer (FTO). During the remainder of the probation period, the troopers are shadowed by their FTO; the troopers operate alone but their shadow will randomly review police reports completed by the trooper and follow up with him or her if necessary.

KSP has a Law Enforcement Accelerated Program (LEAP) for peace officers of other Kentucky law enforcement agencies who would like to become a KSP trooper. The length of the accelerated class is 11 weeks. To be eligible for the LEAP class, the officers must be currently working or have not been separated or retired for more than 12 months from the other Kentucky law enforcement agency [KSP 2002].

The KSP academy also provides advanced training for KSP troopers. All sworn, Kentucky law enforcement officers (LEOs) are required to attend at least 40 hours of training annually.

ROAD AND WEATHER CONDITIONS

The roadway was an asphalt-surfaced federal highway with one lane in each direction, eastbound and westbound. A double, solid, center line divided the lanes; a 12-foot-wide shoulder and guardrails were located on the outside of both lanes. The posted speed limit was 55 mph.

The crash occurred in a curve with a radius of 665.24 feet, measured from the middle of the westbound lane. Single, yellow and black, left chevron arrow warning signs were posted to indicate approaching a curve;

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VEHICLES INVOLVED

The patrol unit involved in the crash was a 2010 Ford Crown Victoria. The vehicle was equipped with front and side impact airbags as well as shoulder/lap safety harnesses. Modifications such as emergency light bar, sirens, and mobile data terminals (MTDs) were installed aftermarket. A blue light emitting diode (LED) emergency light bar was affixed to the top of the patrol unit. All maintenance was up to date. At the time of the crash the trooper was wearing his shoulder harness and the emergency light bar was activated.

A 2015 Freightliner Cascadia tractor pulling a 2003 Dorsey box trailer was also involved in the crash. The vehicle had a raised roof sleeper. The tractor was equipped with a shoulder/lap safety harness and a fire extinguisher. At the time of the crash, no leaks or damage was detected with the air brakes. All tire tread measurements on all five axles of the tractor and trailer were within the acceptable limits as per Code of Federal Regulations Title 49 subpart 393.75 Tires. The driver was wearing his shoulder/lap safety harness when the crash occurred.

INVESTIGATION

At approximately 1725, Dispatch received complaints of a reckless driver from two separate witnesses. The trooper received the request for service by radio, activated his emergency lights, and traveled toward the location of the reckless driver. One of the complainants stayed on the phone line with Dispatch, providing updates of the reckless driver's location and erratic behavior; in turn, Dispatch continued to update the trooper, who continued traveling westbound trying to catch up to the reckless driver.

Using a cell phone, the trooper called Dispatch at approximately 1738 and requested additional information on the reckless driver. It is unknown whether the trooper was holding the phone or using a hands-free method. The dispatch operator asked the trooper to hold while he retrieved the information from the dispatch officer speaking with the witness. The dispatch operator returned and reported the location. While on the phone with Dispatch, the trooper passed a motorist on a straight stretch of the roadway; by using the audio from Dispatch and the power control module from the patrol unit, it was determined that the trooper was traveling 90–100 miles per hour (mph) as he overtook this vehicle. At this time, the trooper determined the reckless driver was too far ahead of him to catch and was going to disregard the call. The trooper, still on the phone with Dispatch, re-entered the westbound lane, slowed down to an estimated speed of 83 mph, and began to enter a left-handed curve.

As the trooper entered the curve, a tractor trailer driver traveling eastbound at 45 mph observed the trooper lose control of the patrol unit. Yaw marks from the front and rear passenger side tires indicated that this occurred approximately 1.25 feet from the fog line of the westbound lane. The tractor trailer driver stated that at this time the patrol unit had made a 180-degree rotation and was still rotating and skidding toward the tractor trailer. The tractor trailer driver applied his brakes, leaving 70 feet of skid marks, and steered toward the shoulder in an attempt to avoid the patrol unit.

The patrol unit continued rotating for 205 feet, revolving 270 degrees counterclockwise before ending in the eastbound lane with the driver's side door in front of the oncoming tractor trailer (see Diagram 2). Upon impact with the tractor trailer, the body of the patrol unit was torn from its frame and the driver's side was pushed into the passenger side (see Photo). At the deepest point, the intrusion of the driver's side measured approximately 58 inches. After impact, the tractor trailer continued traveling east 16.3 feet, and the patrol unit came to rest 19.7 feet east of impact in the eastbound lane, facing north.

When the trooper had entered the turn, he was still on his cell phone. The dispatch operator heard the trooper shout; he called out to the trooper but got no response. After a short period of silence, he heard people talking in

the background over the trooper's cell phone. The dispatch operator called out to the trooper and to those in the background; however, no one heard his voice and he could not determine what was occurring at that time.

Dispatch started receiving 911 calls at approximately 1752, advising of a crash that involved a state trooper. The motorist the trooper had passed witnessed the crash and stopped to offer assistance. The motorist stated he saw the driver of the tractor trailer moving so he ran straight to the patrol unit but could get no response from the trooper. Multiple emergency response units responded to the scene, including several law enforcement agencies, EMS, rescue, and fire departments. The driver of the tractor trailer received minor injuries and was able to exit his vehicle without assistance. The trooper was trapped inside the patrol unit; emergency responders used vehicle rescue equipment to remove the door and extricate the trooper, who was pronounced dead at the scene.



Photo. Patrol unit at scene, post-crash.
(Photo courtesy of Kentucky State Police.)

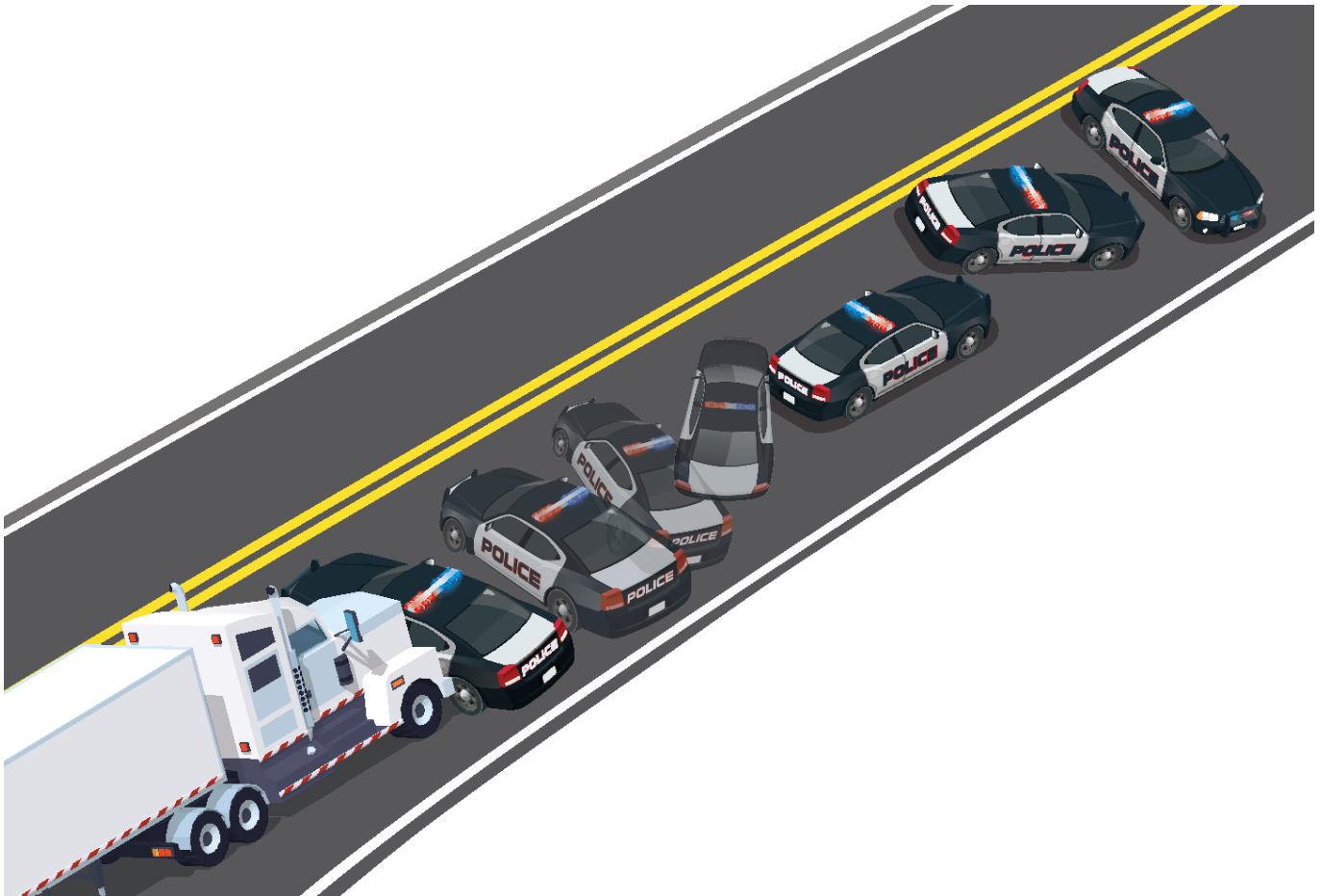


Diagram 2. Counterclockwise rotation of patrol unit as trooper lost control and was struck by oncoming tractor trailer.

At approximately 1815, the KSP Collision Analysis Team was notified to investigate and reconstruct the incident. The investigators computed the radius of the curve in the westbound lane. Then using the yaw marks made by the patrol unit, computed the radius for the passenger-side tire path and adjusted for the tire track width. Next, the investigators used a computerized instrument for measuring tire-to-road friction to obtain the coefficient of friction (*cof*), which was determined to be 0.8. The roadway had no superelevation or degree of grade. Superelevation is the tilting or banking of the roadway along a horizontal curve to help reduce centrifugal forces that develop as a vehicle goes around a curve [MichiganTech, no date]. The radius, *cof*, and superelevation are necessary to compute the critical speed, which is defined as “the speed at which a vehicle will lose lateral control on a given roadway curve” [Glennon 2006]. The following formula is used to calculate the critical speed (*S*):

$$S = 3.86 \sqrt{\text{Radius} (\text{cof} \pm \text{superelevation})}$$

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INVESTIGATOR INFORMATION

This incident was investigated by Jamie L. Lancaster and Paul H. Moore of the Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH, located in Morgantown, West Virginia. This report was authored by Jamie Lancaster. Field assistance and report review was provided by De Anna McIntosh, Kentucky Fatality Assessment and Control Evaluation Program. A subject matter expert review was conducted by Nick Breul and Don Upright of the National Law Enforcement Officers Memorial Fund.

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