



## **ANALYSIS OF ECM DATA SHOWED TRUCK DRIVER PROPERLY MANEUVERED ON AN ICY ROADWAY**

Analysis of the ECM data confirmed the driver was operating his tractor-trailer in a reasonably safe manner and, when faced with unexpected black ice, responded consistent with the methods described in the Commercial Driver Handbook. The criminal charges against the driver were subsequently dismissed.

### **SITUATION**

A truck driver lost control of his tractor-trailer on an undivided, multi-lane highway after unexpectedly encountering black ice while descending a grade at night. During the loss of control, the tractor rotated counter-clockwise and entered the oncoming lane. While sliding sideways down the incline, the tractor-trailer collided with a pickup truck traveling in the opposite direction. The driver of the pickup truck died as a result of the crash. The truck driver was charged with Criminally Negligent Homicide.

**Practice:** Commercial Vehicles

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#### **Services Utilized:**

- Heavy Truck Accident Reconstruction
- Photographic Analysis
- Crash Data Retrieval and Analysis
- Commercial Driver Handbook Review

#### **About ESi**

For over 30 years, ESi has leveraged its multidisciplinary team of engineers, scientists, and professional technical staff to investigate many major accidents and disasters. Our technical expertise, hands-on experience and state-of-the-art facilities, combined with diagnostic, analytical and physical testing capabilities create an ideal environment for quickly identifying and interpreting the facts of a case.

#### **Contact ESi**

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## SOLUTION

ESi was retained by the criminal defense team to review the police investigation and reconstruction of the crash. The review of the reconstruction included analysis of the data retrieved from the truck tractor's engine Electronic Control Module (ECM). The ECM data contained event information specifically related to the subject crash. The ECM on this engine captured two minutes of data at a rate of one data set per second. The data included vehicle parameters useful in reconstructing the motion of the vehicle and operator inputs such as vehicle speed, brake application, accelerator pedal application, and engine speed, among others. The data was used by ESi to determine the control inputs by the driver to the vehicle in his failed attempts to regain control. This allowed for a comparison of the inputs relative to the guidance provided in the state's Commercial Driver Handbook.

Time Rel. to Stop, m:ss	Ind. Veh. Speed, mph	Engine Speed, RPM	Brake Status on/off	Throttle %	Dist. to Stop, feet	Dist. to Stop, miles	Description
-1:44	52.5	1,438	off	41.6	8,359.6	1.58	beginning of Last Stop data, uphill grade
-1:32	52.5	1,444	off	73.2	7,453.2	1.41	passing exit ramp to S. Century Dr., uphill grade
-1:13	58.5	1,608	off	55.6	5,891.2	1.12	crossing beneath S. Century Dr., uphill grade
-0:58	58.0	1,597	off	46.0	4,609.0	0.87	passing entry ramp from S. Century Dr., at crest of hill
-0:44	56.0	1,534	off	0.0	3,454.7	0.65	accelerator pedal released, downhill grade
-0:12	56.0	1,541	on	0.0	809.6	0.15	brakes applied, downhill grade
-0:11	56.0	1,542	on	0.0	727.5	0.14	brakes applied, downhill grade
-0:10	55.5	1,514	on	0.0	645.7	0.12	brakes applied, downhill grade
-0:09	55.0	1,489	off	0.0	564.7	0.11	brakes released, downhill grade
-0:05	50.0	1,331	off	0.0	254.5	0.05	brakes released, downhill grade
-0:04	48.5	1,281	off	0.0	182.2	0.03	brakes released, downhill grade
-0:03	41.0	1,012	on	0.0	116.6	0.02	Hard Brake #2 triggered by braking, downhill grade
-0:02	36.0	729	on	0.0	60.1	0.01	tractor braking, downhill grade
-0:01	23.0	490	on	0.0	16.9	0.00	speed change due to wheel slip, eng. below idle
0:00	0.0	268	on	5.2	0.0	0.00	tractor side-slipping, not at rest, downhill grade
+0:01	0.0	0	off	2.0			Last Stop triggered, tractor side-slipping, eng. stalled
+0:02	4.5	206	off	0.4			tractor yawing, downhill grade
+0:03	6.0	145	off	0.8			tractor yawing, diagnostic code(s) active
+0:04	4.0	0	off	0.8			tractor yawing, diagnostic code(s) active
+0:05	1.0	0	off	0.8			tractor yawing, diagnostic code(s) active
+0:06	0.0	0	off	1.2			tractor at rest, diagnostic code(s) active

## RESULTS

Numerical integration of the tractor's speed-versus-time data was used to calculate the tractor's distance from where the crash occurred, versus time. These calculated distances allowed the tractor's speed and the driver's accelerator pedal and brake pedal applications to be correlated to the tractor's locations on the roadway leading up to the crash. This correlation showed that the speed of the tractor-trailer as it crested the hill was 58 mph. The correlation also showed that fourteen seconds after cresting the hill, the driver released the accelerator pedal to allow coasting to slow the tractor-trailer as it descended the grade, while minimizing wheel slip.

Thirty-two seconds after releasing the accelerator pedal, the driver applied the brakes for 3 seconds, released the brakes for 3 seconds, then reapplied the brakes, slowing the tractor to 36 mph. During the second brake application, the tractor's drive wheels began to slip causing the tractor to begin to yaw. The driver released the brakes 2 seconds after the start of the yaw, but he was unable to regain control of the tractor-trailer. The oncoming pickup truck collided with the right side of the truck tractor as the tractor-trailer slid sideways down the incline, across all of the travel lanes.

ESi concluded that the driver was traveling below the posted speed limit of 60 mph prior to the crash and the driver had applied and released his brakes consistent with his state's Commercial Driver Handbook. In addition, after cresting the incline, the driver was suddenly faced with road and weather conditions significantly different than those he had experienced along his route of travel prior to cresting the incline. The criminal charges pending against the driver were subsequently dismissed.



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and Forensic Investigation

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**WHY ESi.** ESi's Commercial Vehicles Team investigates and reconstructs, on-road and off-road accidents related to commercial transport, construction, mining, agriculture, and industrial-use vehicles. Our Forensic Accident Strategic Team (FAST) can be dispatched to the scene of any accident within hours to preserve physical evidence using state-of-the-art laser scanning systems, UAS (drone), and other technology. Our facilities around the country include technology needed for vehicle testing, crash simulation, accident reconstruction, laboratory testing, computer animation and 3D modeling, component fabrication, and extensive lab and industrial testing and analysis.