NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

December 28, 2015

Heavy Vehicle Onboard Electronics

Specialist's Factual Report
By Jane Foster

1. EVENT SUMMARY

Location:	Chattanooga TN
Date:	June 25, 2015
Vehicle:	Peterbilt Tractor
VIN:	1XP5DB9X07D672468
Operator:	Cool Runnings Express, Inc.
NTSB Number:	HWY15MH009

For a summary of the accident, refer to the *Crash Summary Report*, which is available in the docket for this investigation.

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following Electronic Control Units (ECUs):

Recorder Manufacturer/Model:	Bendix EC-60 Controller
Recorder Serial Number:	0117064715
Recorder Manufacturer/Model:	Caterpillar Engine Control Module (ECM)
Recorder Serial Number:	11066340JX

The Bendix Anti-lock Braking System (ABS) module was removed from the vehicle by NTSB staff and the available data was imaged with assistance from Bendix engineers at a Bendix facility. NTSB investigators were present to observe the imaging process.

2.1. Bendix EC-60 Controller Description

The Bendix EC-60 Controller is an ABS module that monitors the brake application and improves brake characteristics. The EC-60 uses wheel speed sensors, brake pressure modulators, and steering wheel sensor deflection sensors to perform its functions.

The EC-60 will log events and fault codes that can include: "Wheel Speed Sensor" (WSS) and "Pressure Modulator Values" (PMV). The fault code WSS can occur when the wheel speed sensor, slowly over time, eventually moves too far away from the wheel where it then needs to be repositioned closer to the wheel to continue accurate readings. Inactive ABS faults are cleared by 255 power cycles.

2.1.1. Bendix EC-60 Data Recovery

The device was located behind the center console in the vehicle's cab and removed by on-scene investigators and brought back to the NTSB Vehicle Recorder Laboratory. NTSB investigators were present for the download of the device at the Bendix manufacturing facility in Elyria, Ohio on August 20, 2015.

A diagnostic bench top rig was prepared for the device. The rig was set up to not induce errors or erase any existing data or internal faults. The imaging of the device's internal memory was successful using the manufacturer's recommended procedures.

2.1.2. Bendix EC-60 Data Description

A history report was produced that contained the product's information, lifecycle data, and the device's active/inactive internal faults.

A WSS fault code was triggered around the time of the accident at an engine hour time of 41981.1 hours, consistent with the total engine operating time with the ECM. The vehicle's velocity was 67 mph when the fault code was produced and the power up time was greater than 1 hour. Also at the engine hour time of 41981.1 hours, a PMV fault code was produced and the vehicle's velocity was 62 mph with a power up time of greater than 1 hour.

No hard brake application data was recorded before or after the accident sequence. The data associated with the Bendix EC-60 Controller is included as Attachment 1 to this report.

2.1.3. Bendix EC-60 Engineering Unit Conversions

The engineering units conversions used for the data contained in the EC-60 are based on documentation from the manufacturer of the device.

2.2. Caterpillar Engine Control Module Description

The Caterpillar ECM is an electronic control and data storage system for Caterpillar engines. The ECM stores vehicle parameters and has the capability to record trip activity, including daily, monthly, and lifetime engine data. The ECM interfaces with many onboard sensors that help monitor and perform its functions.

2.2.1. Caterpillar Engine Control Module Data Recovery

The Georgia Highway Patrol imaged the ECM.

2.2.2. Caterpillar Engine Control Module Data Description

The ECM was calibrated to have a road speed governed brake horsepower (BHP) of 475, a governed revolutions per minute (RPM) of 2100, and a governed road speed of 80 miles per hour (MPH).

A Caterpillar ECM will capture and record historical details of the vehicle's hard brake event only if that feature is enabled after the vehicle is purchased. This particular tractor and engine, does not have the feature enabled on the ECM.

A Caterpillar ECM will capture and store fault code data. Located in the fault code data, is the RPM that the engine was running at the time of the fault code capture. The Caterpillar ECM that was imaged captured a fault code with the same date and time as was captured the day of the imaging. The fault code was an external trigger that recorded a speed of 56 miles per hour, at 1329 RPM, utilizing 55% throttle.

The data associated with the Caterpillar ECM is included as Attachment 2 to this report.