NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering

Washington, D.C. 20594

February 27, 2009

Acceleration Data Study

NTSB Case Number:

HWY-08-MH012

A. ACCIDENT

Location:	Mexican Hat, UT
Date:	January 6, 2008
Time:	8:02 PM MST
Vehicle:	2007 MCI Model J4500, 56-Passenger Motorcoach

B. AUTHOR

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C. ACCIDENT SUMMARY

On January 6, 2008, at about 3:30 PM MST, a 2007 MCI 56-passenger motorcoach with 51 passengers on board departed Telluride, CO en route to Phoenix, AZ, as part of a 17-motorcoach charter. The motorcoach was returning from a three-day weekend of skiing. The vehicle was diverted to an alternate route that included US Routes 191 and 163 in Utah, due to the closure of Colorado State Route 145 because of snow. Colorado State Route 145 is the normal route used from Telluride to Phoenix.

At about 8:02 PM MST, the motorcoach was traveling southbound on US Route 163 descending a 5 percent grade leading to a curve to the left, 1,800 feet north of milepost 29. After entering the curve, the motorcoach departed the roadway at a shallow angle striking the guardrail with the right rear wheel about 61 feet before the end of the guardrail.

The motorcoach began rotating in a counterclockwise direction as it descended an embankment. It began to overturn and struck several rocks in a creek bed at the bottom of the embankment. The motorcoach came to rest on its wheels after overturning 360 degrees. During the rollover sequence, the entire roof of the motorcoach separated from the body, and 50 of the 52 occupants were ejected. As a result, nine passengers were fatally injured, and 42 passengers and the driver received various degrees of injuries from minor to critical.

The weather in Mexican Hat was cloudy and the roadway was dry at the time of the accident.

D. DETAILS OF INVESTIGATION

The purpose of this investigation was to estimate the speed of the motorcoach on the accident curve based on acceleration recorded by the lateral accelerometer inside the DriveCam II camera installed on the vehicle, and the radius of the curve.

The lateral accelerometer recorded low-frequency acceleration between –0.38 g and –0.37 g during the 0.58 seconds between camera times –4.03 seconds and –3.45 seconds. This was the highest acceleration magnitude prior to the accident that lasted over a relatively long period of time. During these 0.58 seconds, the motorcoach traveled about 75 ft. The steady low-frequency acceleration value over a relatively long distance indicated that this was centripetal acceleration rather than acceleration due to vibration of the vehicle and/or the camera.

Acceleration due to vibration of the vehicle and/or the camera was also present in the signal. It was at the frequency of about 12 Hz, with amplitude of up to 0.04 g, and zero mean. Thus, the combined signal could be represented as –0.375 ±0.04 g. The 12 Hz vibration component was not related to the centripetal acceleration and, therefore, the value of –0.37 g was accepted as the acceleration component due negotiation of the curve.

The centripetal acceleration *a* of a vehicle negotiating a curve with radius *R* at speed *V* is given by

$$a = \frac{V^2}{R} \qquad (1)$$

therefore, an estimate of the speed of a vehicle negotiating a curve with radius *R* and developing centripetal acceleration *a* is given by

$$V = \sqrt{aR} \qquad (2)$$

The radius of the curve was 1432 ft and the acceleration magnitude was 0.37 g. Therefore, the speed estimate is

$$V = \sqrt{0.37 \times 32.2 \times 1432} = 130.6 \text{ ft/s} = 89 \text{ mph} \qquad (3)$$

E. CONCLUSION

The speed of the motorcoach on the accident curve, just before road departure, was estimated based the radius of the curve and the lateral acceleration recorded by the DriveCam II camera. The estimated speed was 89 mph.