VEHICLE FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

Biloxi, Mississippi

HWY17MH010

(9 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, D.C.

VEHICLE FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. CRASH INFORMATION

Location:	Rail crossing, Main Street, Biloxi, Harrison County, Mississippi
Vehicle #1:	2016 Van Hool CX45 Motorcoach
Operator #1:	Echo Transportation
Vehicle #2:	CSX Freight Train, consisting of 3 locomotives, 27 loaded cars, 25 empty cars
Operator #2:	CSX Railroad
Date:	March, 7, 2017
Time:	2:12 p.m. CST
NTSB #:	**HWY17MH010**

B. VEHICLE FACTORS GROUP

Brian Bragonier, Vehicle Factors Investigator, Group Chairman
NTSB Office of Highway Safety
490 L'Enfant Plaza East, S.W., Washington, DC 20594

C. CRASH SUMMARY

For a summary of the accident, refer to the Accident Summary report, which is available in the docket for this investigation.

D. DETAILS OF THE VEHICLE FACTORS INVESTIGATION

This document is a collection of factual information obtained during the detailed inspection of the accident vehicle. The 2016 Van Hool Motorcoach was inspected between March 8th and 11th, 2017 at the Biloxi, Mississippi Police Department Impound Yard located at 1654 Popps Ferry Road, in Biloxi.

All major mechanical systems on the motorcoach were examined, including the steering, braking, and suspension systems. Overall collision damage, along with any damage or anomalies within major vehicle mechanical systems were documented. Supporting photographs, vehicle specifications, maintenance records, and prior inspection reports were collected and reviewed. The Engine Control Module (ECM) was also removed from the motorcoach, and forwarded to the NTSB recorders laboratory for further examination and analysis.

The lead locomotive of the accident train was inspected at the CSX Railroad Maintenance Facility in Waycross, Georgia on March 11, 2017. For a detailed account of the mechanical condition of the locomotive, refer to the Rail Mechanical Factors Group.

E. VEHICLE INSPECTIONS

1. Vehicle #1: 2016 Van Hool CX 45 Motorcoach

1.1. GENERAL INFORMATION[1]

VIN[2]:	YE2XC81B8G3******
Manufacturer:	Van Hool
Model:	CX 45, 56 passenger Motorcoach
Manufactured:	November, 2015
Company Unit#:	8421
Mileage[3]:	62,421.2
GVWR[4]:	54,000 lbs.
GAWR[5] · Axle #1:[6]	17,640 lbs.
GAWR · Axle #2:	27,575 lbs.
GAWR · Axle #3:	17,640 lbs.
Engine:	Detroit Diesel DD13, 500 Horsepower, Diesel, Serial #: 47193450339152
Transmission:	Allison, WTB500 09, Automatic
Steering Gear:	ZF, Model: 8098955771
Brake System:	Wabco ABS, Knorr 6-wheel air operated disc brakes

1.2 Damage Description

The Van Hool Motorcoach showed significant contact damage to the left side.[7] The damage area began approximately 196 inches from the rear of the motorcoach, and was approximately

[1] Refer to *Vehicle Attachment 1 – 2016 Van Hool Motorcoach Vehicle Specifications*.
[2] Vehicle Identification Number (VIN) with the last six characters redacted.
[3] According to the odometer located on the dash of the motorcoach.
[4] Gross Vehicle Weight Rating (GVWR) is the total maximum weight that a vehicle is designed to carry when loaded, including the weight of the vehicle itself, plus fuel, passengers, and cargo.
[5] Gross Axle Weight Rating (GAWR), is the maximum distributed weight that a given axle is designed to support.
[6] For consistency in describing the axles of the motorcoach, the front (steer) axle will be referred to as Axle #1, the forward drive axle as Axle #2, the rear tag axle as Axle #3.
[7] See *Vehicle Photograph 1 – Motorcoach – Overall Motorcoach Damage Facing Left Front Corner*

112- inches wide. In the contact area, there were multiple tears in the sheet metal siding of the bus. In the upper portion of the contact area, just below the window frames were two rectangular impressions in the metal bus siding.[8] These were both located at the same height on the side of the bus. The rectangular impression closest to the rear of the bus was approximately 13 -inches wide and 2- inches high. The second impression was approximately 12 -inches to the left of the first. This impression was approximately 21- inches wide and 6-inches high. To the right of the rectangular impressions was a 16-inch by 15-inch circular area with yellow paint transfer. Below the impressions were several tears in the sheet metal bus siding varying in size from approximately 4-inches square to 12-inches square.

At the center of the contact damage area, approximately 270- inches from the rear of the motorcoach, was a 17-inch long by 5-inch wide fold in the metal. This fold was in one of the luggage bay doors. The luggage bay door immediately to the left of this door was missing, and there was damage to the bus body where the top of the door would have been. The luggage bay door to the right was intact.

Six of the seven left side windows were missing. The side window near the driver's seat was partially broken. The left side of the windshield was broken out and missing. The right side of the windshield was intact. One of the right-side windows was shattered and missing from its frame.

The right side of the motorcoach was bowed out in the area opposite of the impact on the left side.[9] Near the right rear of the motorcoach, above the rear axle, there was a 32-inch long by 6 ½ -inch wide rectangular crease in the sheet metal.[10] On the right side of this rectangle, the siding of the motorcoach was torn through on the top and bottom. This damage started approximately 79-inches from the rear of the vehicle and was 62-inches from the ground.

There were scratches on the right rear corner and taillight of the motorcoach. The bumper was slightly pulled away from the body in this area as well. The door to the luggage compartment just aft of the rear axle was missing and the floor area was displaced upward. The rear exit door of the motorcoach had been removed during the passenger extrication process.

The frame of the motorcoach was displaced to the right in the area of impact, with several of the support structures fractured and shifted as well. The floor of the luggage bay was damaged with large holes throughout. The right side of the bottom frame rail showed discoloration and evidence of heat buildup in several locations in the area opposite of the left side contact area.

The interior floor of the motorcoach was buckled and was no longer completely intact. The luggage compartment below the interior floor was visible through a void which had been torn open by the impact.[11]

1.3 Measurements

[8] See *Vehicle Photograph 2 – Motorcoach – Overall Damage Facing Left Side*
[9] See *Vehicle Photograph 3 – Motorcoach – Overall Damage Facing Right Front Corner*
[10] See *Vehicle Photograph 4 – Motorcoach – Showing Damage to Right Rear of Motorcoach*
[11] See *Vehicle Photograph 5 – Motorcoach – Interior Floor Damage*

Hand measurements were taken of the motorcoach. **Figure 1** shows a side profile of the motorcoach with select dimensional information added. The ground clearance of the motorcoach at the loading door was 12-inches from the ground to the bottom step of the stepwell.

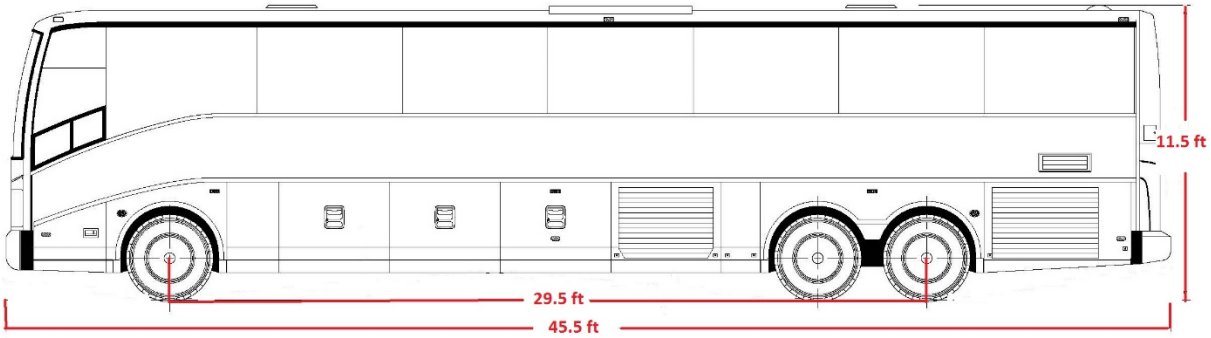

Figure 1: Profile View of Motorcoach with Dimensions Added

1.4 Driver's Controls

The driver's seat was intact and in place in the motorcoach. The driver's lap/shoulder seatbelt was found unbuckled, retracted, and hanging from the upper attachment point to the left of the driver's seat location. Located approximately 16-inches in front of the driver's seat was the steering wheel, which was found to be undamaged following the collision, and was 17 ¾- inches in circumference. The tilting steering wheel was mounted on a steering column that was adjustable for angle and height. The turn signal stalk was located on the left side of the steering column, and also controlled the high beam headlamps.

The dash in front of the driver's seat contained numerous gauges, indicator lights, and switches. The gauges included: oil pressure, engine speed (RPMs), vehicle speed (mph & km/h), coolant temperature, fuel level, and electrical system voltage. The switches contained on the dash and their positions at the time of the examination include the following:

- Cruise Control – On
- Fog Lights – Off
- Passenger Compartment Lights – Off
- Cornering Lights – Off
- Sidewalk Lighting – Off
- Fan - #1 Position
- Recirculation Fan – On
- Cab Lighting – Off
- Passenger Compartment Climate Control – On
- Wheelchair Lift – Off
- Power Sun Blinds – Mid Position
- Engine Retarder – Off
- Bus Kneeling – Off
- Trailing Axle Unloading System – Off
- Luggage Bay Light – Off

1.5 Steering and Suspension

No damage was noted to any of the steering linkage or steering system components. All connections were solid and free of wear or excessive play. Full rotation of the steering wheel from far left to far right resulted in movement of the front axle tires without restriction or binding.

The suspension on each side of the steer axle (axle #1) of the motorcoach consisted of a shock absorber, air springs, upper and lower control arms. The motorcoach was equipped with a kneeling system to provide a lower step well height at the passenger door. This system raises and lowers the vehicle using the air springs located at the steer axle. The kneeling system is controlled by the driver using a switch on the dash of the vehicle.

Drive axle (axle #2) suspension consisted of forward and rear shock absorbers, forward, center, and rear air springs, a stabilizer bar and connecting links, as well as upper and lower torque arms and left and right axle beams. This motorcoach has a rear raising system installed which enables the driver to increase the height of the rear suspension air spring in relation to normal ride height by means of a dash switch. Activating this system will raise the motorcoach approximately 4-inches at the rear axles.

The suspension on each side of the tag axle (#3) of the bus consisted of a shock absorber, and air springs, a stabilizer bar and connecting links. A trailing (tag) axle unloading system was installed on this vehicle. Using a switch on the dash, the driver is able to use the air suspension system to decrease the load on the tag axle, which increases the load on the drive axle to improve traction on slippery surfaces.

The air suspension system of the motorcoach functioned as designed with no air leaks or damage noted. The low air audible and visual warnings were operational for both the primary and secondary air systems.

1.6 Brakes

The motorcoach was equipped with pneumatic anti-lock disc brakes on all axles. The vehicle was started and the airbrake system was allowed to build to the pressure cut-off level. No air leaks or damage were noted in the system. Application of the brake treadle valve resulted in all six of the disc brakes on the motorcoach functioning as designed. All rotors, pads, calipers, and other brake components were in good condition and met minimum regulatory requirements. The motorcoach was equipped with a Meritor WABCO ABS system which initialized and cycled properly with the application of power to the ABS circuit. ABS wheel speed sensors were in place on all of the axles.

1.7 Tires and Rims

According to the tire specification placard located near the driver's seat, it was recommended that all axles be equipped with size 315/80R22.5, tires mounted on 22.5 x 9 rims with a cold inflation pressure of 125 pounds per square inch (psi). Each of the rims on the bus was equipped with a tire pressure monitoring system transmitter. **Table 1** includes information on the

motorcoach tires as they were found at the time of the examination. Tire tread depth measurements were taken at no less than four locations in each of the major tread grooves of each tire. The smallest tread depth measured is displayed in the table, and represents a minimum tread depth value for that tire. The minimum tread depth regulation for commercial motor vehicle tires is $^{4}/_{32}$ in. on the steer axle, and $^{2}/_{32}$ in. for all other axles.[12] All of the tires on the motorcoach had tread depths that were greater than required. All of the rims were checked for welds and elongated lug nut holes, neither of which were found on any of the rims. No non-collision related defects were found on any of the rims.

Table 1: Van Hool Tire Information

Axle 1	**Left**		**Right**	
Tire Make	Bridgestone R249		Bridgestone R249	
Tire Size	315/80R22.5		315/80R22.5	
Pressure	120PSI		Flat	
Tread Depth	14/32”		14/32”	
DOT #				
Axle 2	**Left**		**Right**	
	Outside	**Inside**	**Outside**	**Inside**
Tire Make	Bridgestone R249	Bridgestone R249	Bridgestone R249	Bridgestone R249
Tire Size	315/80R22.5	315/80R22.5	315/80R22.5	315/80R22.5
Pressure	110PSI	UNK	114PSI	UNK
Tread Depth	12/32”	12/32”	13/32”	12/32”
DOT #	2C4D4P73316		2C4D4P73016	
Axle 3	**Left**		**Right**	
	Outside	**Inside**	**Outside**	**Inside**
Tire Make	Goodyear Marathon LHS II	N/A	Bridgestone R249	N/A
Tire Size	315/80R22.5		315/80R22.5	
Pressure	106PSI		30PSI	
Tread Depth	5/32”		13/32”	
DOT #	NJ72CE1W5014		2C4D3P72815	

During the tire examination, damage was noted to the right front rim and tire.[13] The damage is referenced to a clock position with the valve stem being at 12:00. The tire and rim damage observed during the examination included the following:

- Axle 1 Right

[12] According to 49 CFR 393.75, tread depth shall be measured in a major groove at any location on the tire and not where tie bars, humps, or fillets are located.
[13] See *Vehicle Photograph 6 – Motorcoach – Right Side Steer Axle Tire*

- Tire was found deflated due to damage, and was partially off the rim to the inside
- 2:00 – sidewall tear to the outer sidewall, approximately 5 inches in total length
- 5:00 – gouge and scrape to the outside of the rim
- 2:00 – gouge to tread near outside shoulder, approximately 2 inches long

No damage was noted to the other motorcoach tires and rims.

1.8 Event Data

The Detroit Diesel engine was controlled by an Engine Control Module (ECM) that controlled engine timing and fuel injection, based on various engine and sensor inputs. This module is also capable of diagnostics associated with engine and/or sensor faults, which may then illuminate warnings on the dash, as well as record vehicle speed, engine speed, and other various parameters during triggered events. The ECM was imaged by the NTSB Recorders Specialist and data retrieved will be noted in their reports. The Wabco ABS module was removed from the vehicle for later analysis and evaluation. Any information retrieved via the module will also be noted in the Recorders Specialist's reports.

1.9 Maintenance and Inspection History

One year of vehicle maintenance files, 90 days of Daily Vehicle Inspection Reports (DVIR's) and annual inspection records for the 2016 Van Hool were obtained from Echo Transportation. The last annual inspection of the motorcoach had been completed on April 7, 2016. No defects or maintenance items were noted. The service records for the motorcoach indicated the only non-scheduled maintenance that had been performed on the vehicle involved repairing a faulty air conditioner, replacing a belt tensioner, and a windshield. No mechanical defects were noted in the provided DVIR's.

The motorcoach was inspected by Texas Department of Public Safety (TXDPS) Commercial Vehicle Enforcement officers at the Echo Transportation terminal in Dallas, Texas, on December 12, 2016. No violations were discovered during this inspection. On January 24, 2017, TXDPS officers stopped and inspected the motorcoach roadside and again found no violations or maintenance items.

1.10 Documented Recalls and Warranty Claims

A search of the safety recall database maintained by the National Highway Transportation Safety Administration (NHTSA), found that there was one safety recall campaign which would have affected the motorcoach involved in the collision.[14]This recall involved the replacement of a faulty front steering knuckle carrier due to the potential of the part failing and allowing a wheel to separate from the vehicle, increasing the risk of a crash. According to manufacturer records, the

[14] The safety recall database was accessed via the NHTSA safety recall website. http://www-odi.nhtsa.dot.gov/recalls/reacallsearch.cfm

motorcoach was inspected and it was found that the casting numbers on the front axle members were outside the window of the affected axles, so no further action was required.

F. CRASH DOCKET MATERIAL

The following attachments and photographs are included in the docket for this investigation:

LIST OF ATTACHMENTS

Vehicle Attachment – 2016 Van Hool Vehicle Specifications

Vehicle Attachment – TXDPS 2016 Annual Inspection

Vehicle Attachment – MSDPS Post-Crash Inspection Report

Vehicle Attachment – TXDPS Level 5 Inspection

Vehicle Attachment – TXDPS Level 3 Inspection

Vehicle Attachment – Preventative Maintenance Inspection Records

LIST OF PHOTOGRAPHS

Vehicle Photograph 1 – Motorcoach – Overall Motorcoach Damage Facing Left Front Corner

Vehicle Photograph 2 – Motorcoach – Overall Damage Facing Left Side

Vehicle Photograph 3 – Motorcoach – Overall Damage Facing Right Front Corner

Vehicle Photograph 4 – Motorcoach – Showing Damage to Right Rear of Motorcoach

Vehicle Photograph 5 – Motorcoach – Interior Floor Damage

Vehicle Photograph 6 – Motorcoach – Right Side Steer Axle Tire

END OF INFORMATION

Brian Bragonier
Vehicle Factors Investigator