



NTSB National Transportation Safety Board

Office of Highway Safety

Gray Summit, MO

Multivehicle Collision

August 5, 2010



NTSB National Transportation Safety Board

Office of Highway Safety

Opening Statement

Peter Kotowski

Investigator-In-Charge

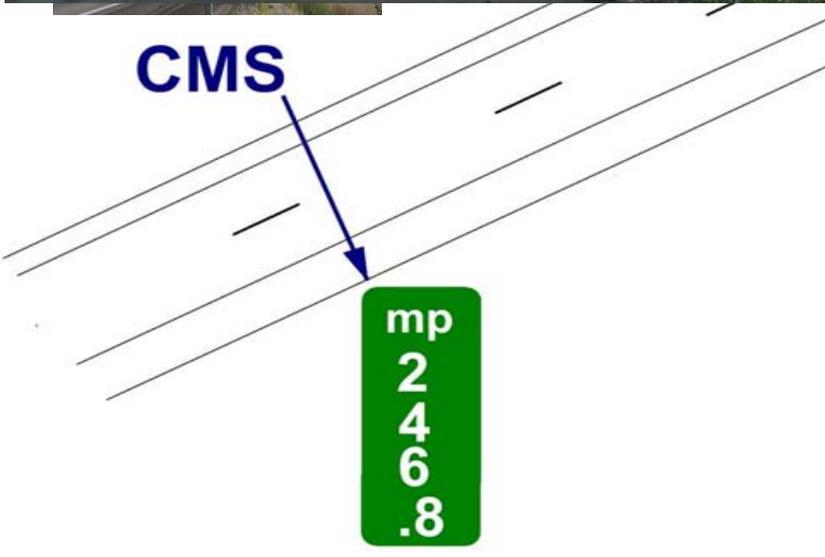
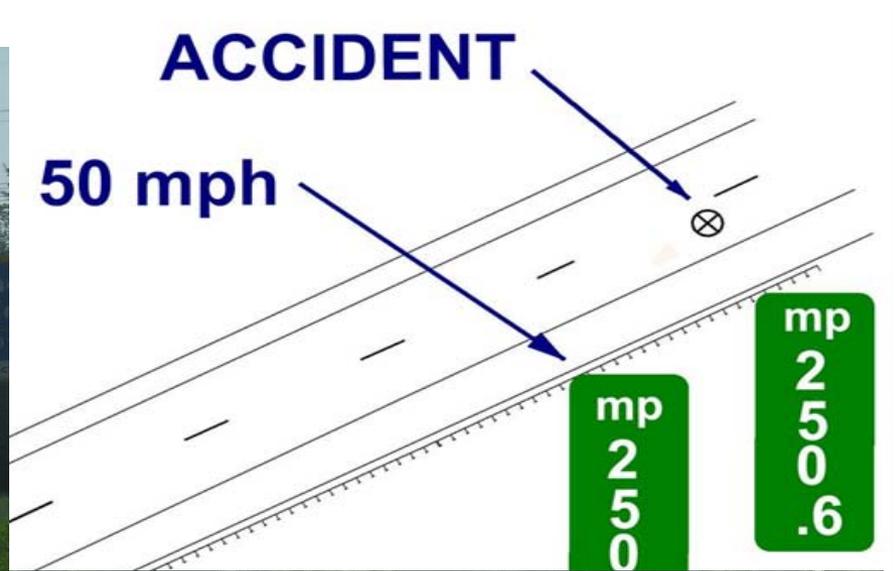
Introduction

- Accident description
- Safety issues
- Investigative/support staff
- Parties to investigation
- Introduction of presentations

Accident Location



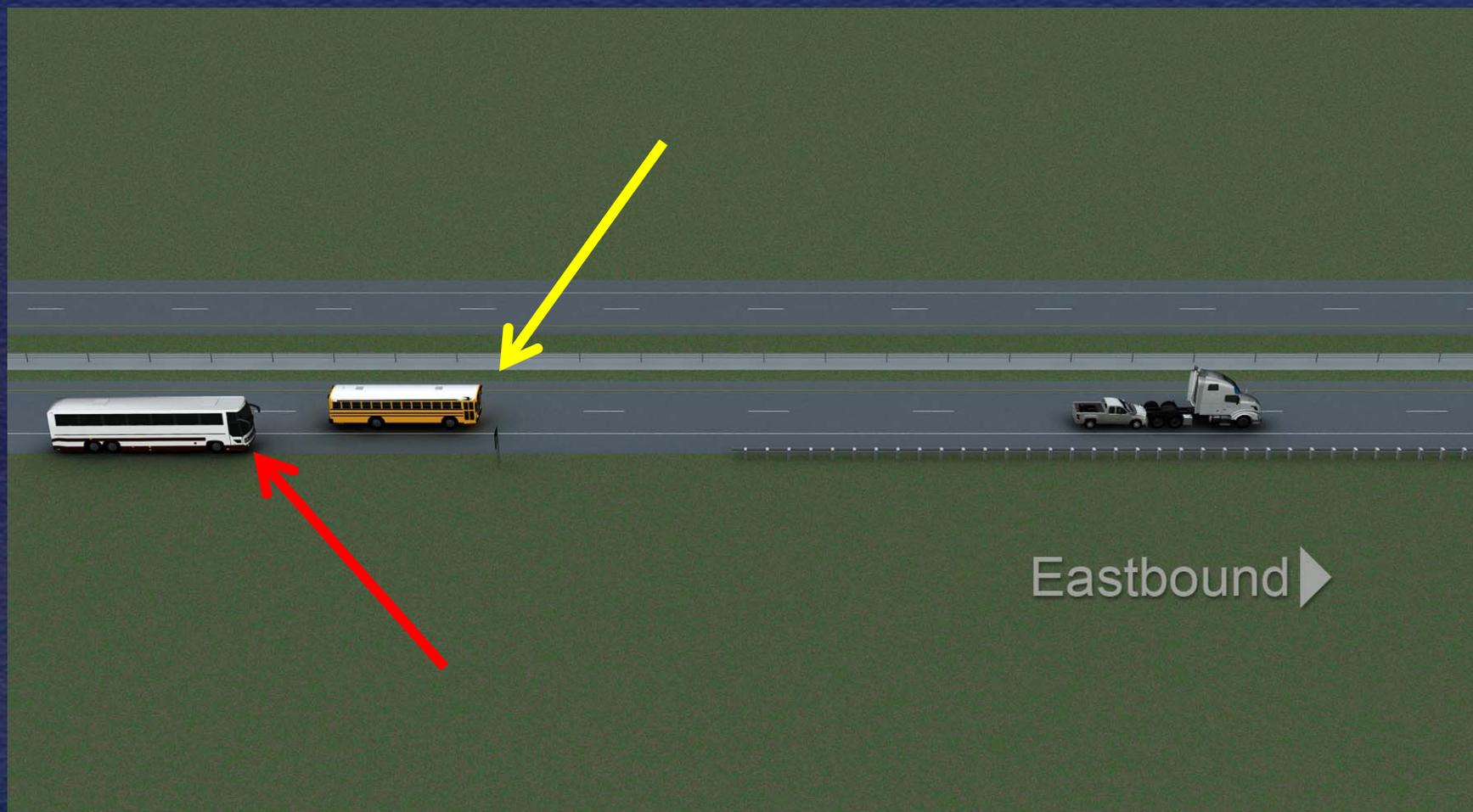
Highway Construction Zone



Collision #1



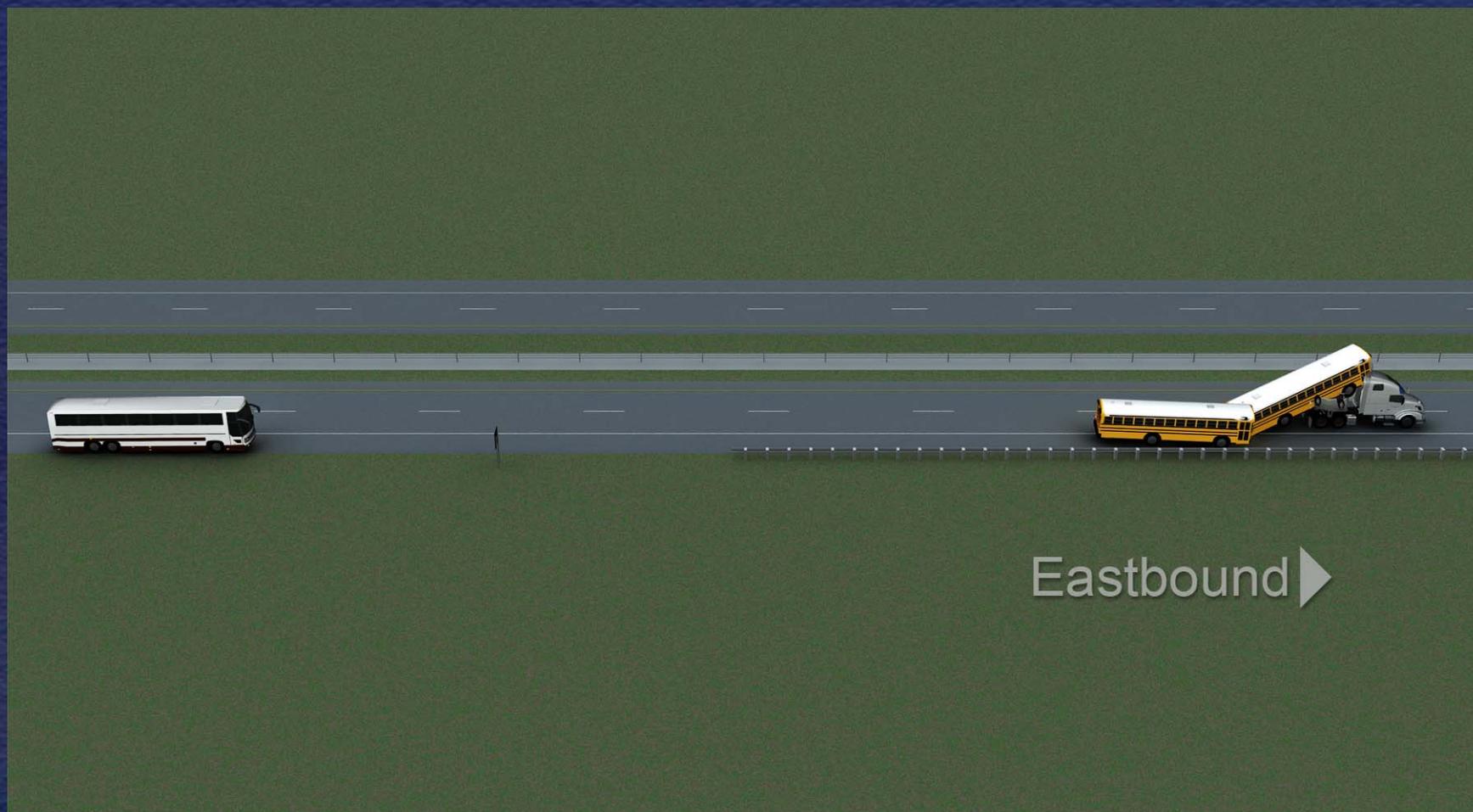
Collision #2



Collision #2



Collision #3



Scene Photos



Image courtesy of Boles Fire Protection District

Scene Photos



Image courtesy of Boles Fire Protection District

Scene Photos



Image courtesy of Boles Fire Protection District

Injuries

- 2 fatal injuries
 - Driver of pickup truck
 - Rear passenger lead bus
- 38 injured
 - 35 passengers
 - 2 school bus drivers
 - Driver of truck tractor

Safety Issues

- Video event recorder monitoring
- Driver distraction due to use of portable electronic device
- Medical oversight of interstate commercial vehicle drivers
- Missouri oversight and inspection of motor carriers in pupil transportation

Safety Issues

- Standards for collision warning systems
- Design of school bus emergency windows
- Lack of pretrip safety briefing

On-Scene Investigative Staff

Vice-Chairman Chris Hart – Member on Scene

Member Earl Weener – Member on Scene

David Rayburn – Highway Factors

Dennis Collins – Human Performance Factors

Jim LeBerte (Ret) – Motor Carrier Operations

Ron Kaminski – Survival Factors

Jennifer Morrison – Vehicle Factors

Dan Filiatrault – Vehicle Factors

On-Scene Investigative Staff

Chris Voeglie (Ret) – Recorders

Max Green – TDA

Elias Kontanis – TDA

John Whitener – Computer Support

Pete Kotowski – Investigator-in-Charge

Report Development Staff

Rafael Marshall – Project Manager

Gary Van Etten – Motor Carrier

Steve Prouty – Vehicle Factors

Dan Horak – Computer Simulation

Alice Park – Computer Animation

Christy Spangler – Computer Animation

Julie Perrot – Safety Recommendations

Elisa Braver – RE

Debbie Stocker – Editor

Avis Clark – Audio/Visual

Parties

- Missouri State Highway Patrol
- Missouri Department of Transportation
- Federal Motor Carrier Safety Administration
- Federal Highway Administration
- Fred Weber (construction contractor)
- Bluebird Corporation
- General Motors Company
- Boles Fire Protection District
- Meramec Ambulance District
- St. James School District



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Human Performance

Dennis Collins

Issues

- Commercial driver medical oversight
- GMC driver fatigue
- Portable electronic device distraction / distracted driving
- Driving-related concerns
- Following distance
- Forward collision warning systems
- Video event recorders

CMV Driver Medical Oversight

- Volvo driver
 - 5 years experience
 - Current license, medical certificate
 - Driver had disqualifying condition
 - Did not report, got medical certification
 - Not a factor in this accident
 - No reporting/protection in some states



GMC Driver Fatigue

- Current license
- No accident history
- 5.5 hours average / less than 5 hours August 4
- Driver had sleep debt; may have affected driving performance

Portable Electronic Devices

- Texting conversation while driving
- Driver's movement, lack of braking
- Driver distracted by texting

Texting Direction

Cell Phone Records (REDACTED)

08/05/10	09:58A	-----	-----	-----	-----	-----	IN
08/05/10	09:58A	-----	-----	-----	-----	-----	OUT
08/05/10	10:03A	-----	-----	-----	-----	-----	IN
08/05/10	10:03A	-----	-----	-----	-----	-----	OUT
08/05/10	10:04A	-----	-----	-----	-----	-----	IN
08/05/10	10:05A	-----	-----	-----	-----	-----	OUT
08/05/10	10:06A	-----	-----	-----	-----	-----	OUT
08/05/10	10:07A	-----	-----	-----	-----	-----	IN
08/05/10	10:08A	-----	-----	-----	-----	-----	OUT
08/05/10	10:08A	-----	-----	-----	-----	-----	OUT
08/05/10	10:09A	-----	-----	-----	-----	-----	IN

Last message

Distracted Driving

- 5,500 fatalities and 450,000 injuries
- “Texting” – a specific distraction
 - Safety-critical events 23x more likely;
degrades many aspects of driving
- Safety-critical events 6.7x reaching/using
- Other portable electronics



Combating Distracted Driving

- Handheld phone bans alone
 - Decreased use in some states
 - No decrease in insurance claims in others
 - Problematic enforcement
- Laws, enforcement, education
 - “Click it or ticket”
 - “Over the limit, under arrest”
- Role of manufacturers



Driving-Related Concerns

- Lead bus driver
 - Current license
 - Current medical certificate
 - Attended to motorcoach on shoulder
 - Long attention away from roadway increases crash risk
 - Can be addressed through training



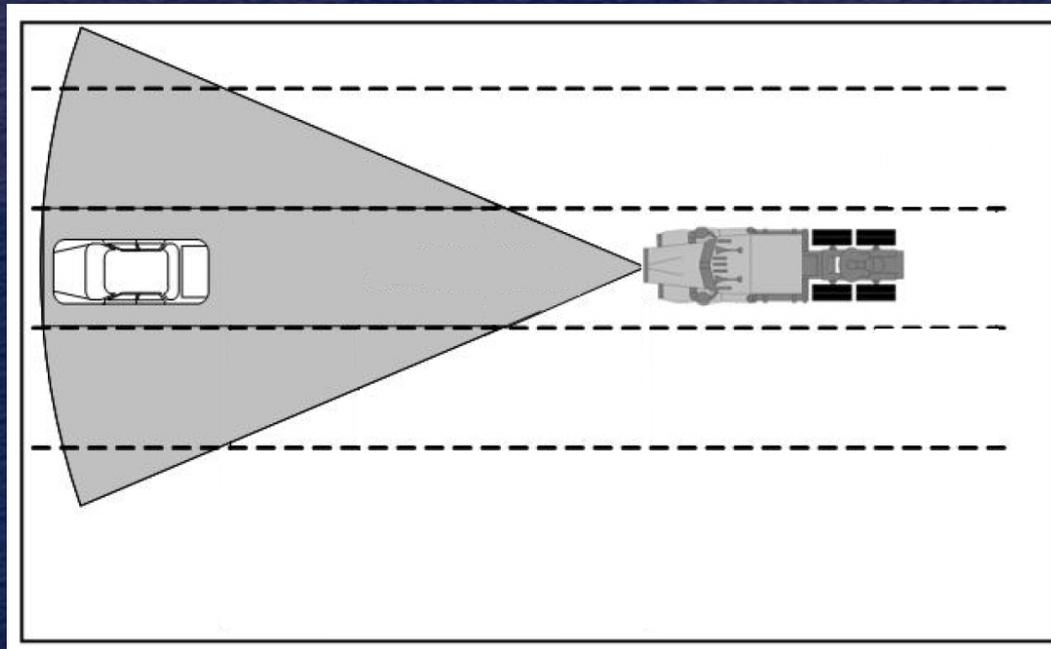
Following Distance

- Following bus driver
 - Current license
 - Current medical certificate
 - Less than recommended minimum separation
 - Also can be addressed through training



Forward Collision Warning

- FCW systems currently available as options
- Safety benefits shown in research
- Previous NTSB recommendations
- Likely benefit for vehicles in this accident



Video Event Recorders

- Following bus had surveillance; useful in investigation
- VERs capture video, other data on operator and vehicle performance
- Utility as prevention tool
- 2010 recommendations



Summary

- Medical oversight of CMV drivers
- GMC driver distracted by “texting”
- Laws, enforcement, public information
- Inattention caused GMC / lead bus collision
- Following bus less than minimum recommended following time
- VERs enhance investigations, prevent accidents



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Vehicle Factors

Jennifer Morrison

Vehicle Factors

- No vehicle issues
 - Volvo tractor
 - GMC pickup truck
- Vehicle issues
 - Bluebird school buses
 - Hydraulic brake systems

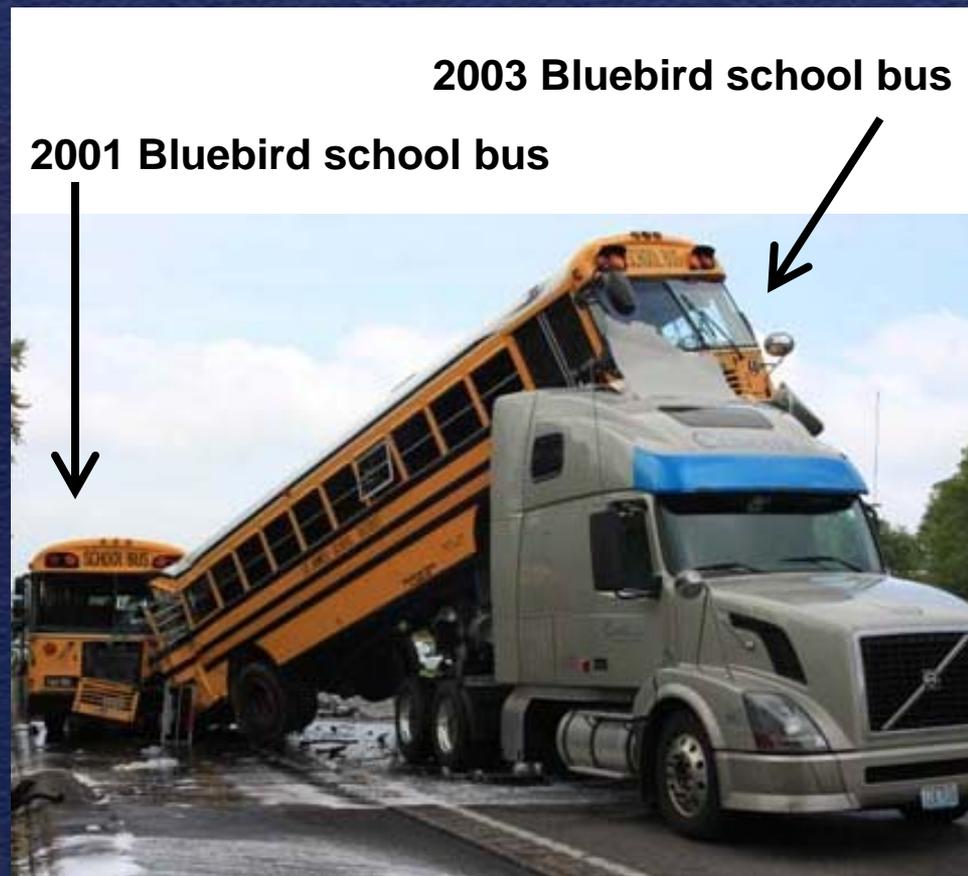
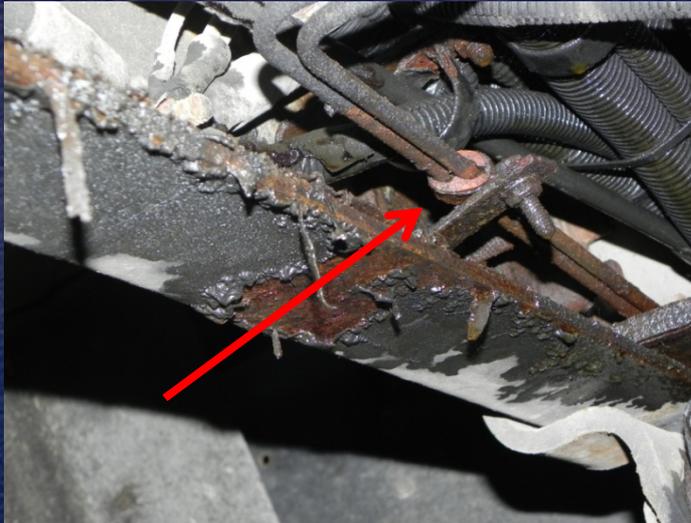


Image courtesy of Boles Fire Protection District

Lead Bus Brake Issues

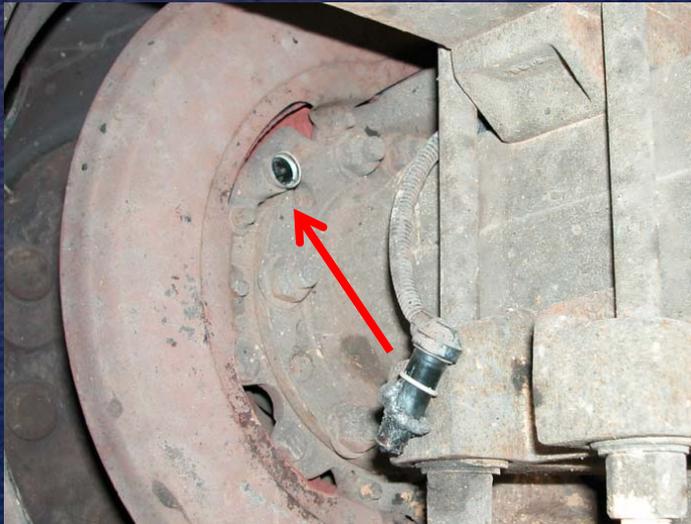


- Wet / leaking master cylinder
- Leak in hydraulic brake line from master cylinder to ABS unit
- Warning light inoperative
- Cracked/ missing brake pads
- Skid testing
- Hospital parking lot accident

Following Bus Brake Issues



- Fabricated spring assembly used for brake pedal return
- Out-of-place ABS sensor
 - Active ABS fault code
 - No ABS for right rear wheel



Issue Areas

- Maintenance at Copeland Bus Services
- Oversight of Copeland Bus Services
- School bus inspections in Missouri

Maintenance & Oversight

- INTRASTATE carrier
- Main transportation provider for St. James schools for past 50 years
- Fleet of 23 school buses
- No organized maintenance schedule or maintenance records
 - single spiral-bound notebook
- Lack of scheduled maintenance = brake conditions found
- No effective oversight

Missouri School Bus Inspections

- Required twice a year
 - Once by MHSP
 - Once by state-certified inspection station
- Comply with MMVIRs:



- For ALL vehicles
- Not specific to school buses
- \$12 vehicle inspections
- Requirements for stations, inspectors, mechanics, forms, and decals

Accident Bus Inspections

- Preaccident Inspections

July 27, 2010 (10 days prior)

- Ray's Tire, state-certified inspection station
- 20 minutes, no defects noted

March 25, 2010 (5 months prior)

- MSHP fleet inspection
- **100% approval**, award given

- Postaccident Inspections

- NTSB multiple brake system defects
- MSHP, **dropped to 60% approval**
- Ray's Tire license revoked

Inadequacies in MMVIRs

MISSOURI Motor Vehicle Inspection



REGULATIONS

PASSENGER CAR AND TRUCK INSPECTION

11 CSR 50-2.150 Brake Performance17
11 CSR 50-2.160 Brake Components19
11 CSR 50-2.170 Air and Vacuum Brake Systems22

SCHOOL BUS INSPECTION

11 CSR 50-2.320 School Bus Inspection51
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- No Sections Pertaining to Brakes -

- (1) The standards and procedures prescribed for the inspection of a motor vehicle as set out in the rules of the Motor Vehicle Inspection Division, shall apply to Types A–D school buses. In addition, the items listed in this rule will be inspected on all school buses.

One wheel must be removed for inspection of brake components **EXCEPT** for vehicles with dual-rear wheels
(like most school buses)

Inspection Form Inadequacies

- Missouri Form

- Example Form

Missouri Motor Vehicle Inspection
APPROVAL NOTICE

*****SEE INFORMATION ON REVERSE SIDE*****

VEHICLE OWNER'S NAME: SAMPLE TIME INSPECTION STARTED: 0900

STREET: _____ TIME INSPECTION ENDED: 0920

CITY: _____ COUNTY: _____

VEH YR MAKE MODEL ODOMETER READING (REQUIRED) LICENSE NUMBER

VEH ID NO. 1 A B C D E F G H J K 1 2 3 4 5 6

BODY STYLE: Car School Bus Truck (GVW < 8500 lbs.) SUV Motorcycle Truck/Bus (GVW = 8500+)

FUEL TYPE: Gas Diesel Gas/LPG Other (Explain) LPGA Electric Hybrid

CODE	DEFECTIVE PART	PART COST	LABOR COST	TOTAL
	<u>None</u>			<u>\$0.00</u>

ID / OD VERIFICATION TRAILER VERIFICATION

INSPECTION STATION: SAMPLE STATION NUMBER: M01234

CITY WHERE INSPECTED: _____ DATE INSPECTED: 12/13/2011

INSPECTOR'S PERMIT NUMBER: XX12345 INSPECTOR'S SIGNATURE: X

REPAIR AUTHORIZATION
I realize total repair cost is an estimate and repairs are not required to be performed at this station, but I authorize the above establishment to repair my vehicle.

OWNER'S SIGNATURE: _____ DATE REINSPECTED: _____

REINSPECTOR'S PERMIT NUMBER: _____ STICKER / DECAL NUMBER: _____

REINSPECTOR'S SIGNATURE: _____ CONTROL NUMBER: P 2786021

SHP-699L MWI-2 02/07

Check all that apply: Bus Passenger Van Car Initial Inspection Re-inspection

DOT No. (Bus Only) SAMPLE

Date 12/13/11 Seating Capacity 111 County _____

Facility/Home _____

Address _____

Phone No. _____

Liability Insurance _____

Chassis Make _____ Year _____ Mileage _____

Body Make _____ Year _____ Bus _____

Vehicle Identification Number (V.I.N.) 1 A B C D E F G H J K 1 2 3 4 5 6

Tag Number _____ FL _____

	P	R	N/A		P	R	N/A
1. Headlights	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24. Sideview Mirror	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Parking Lights	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25. Crossover Mirror	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Tail Lights	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	26. Fire Extinguisher	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Brake Lights	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	27. First Aid Kit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Directional Signals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	28. Emergency Warning Devices	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Hazardous Warning Signals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	29. Windshield	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Clearance Lamps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30. Windows	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Side Marker Lamps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	31. Rub Rails	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Identification Lamps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	32. Bumpers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Reflectors	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	33. Pupil Warning Lamp System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Brakes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	34. Stop Arm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Steering System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	35. Drive Shaft Guards	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Suspension	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	36. Neutral Safety Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Windshield Wipers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	37. Tires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Horns	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	38. Wheels	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Exhaust System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	39. Seating + Driver Seat Belt	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Fuel System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	40. Interior Lights	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Engine Compartment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	41. Unsecured Items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Service Door	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	42. Bus Condition	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Emergency Door	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	43. Electrical System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Emergency Exits	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	44. Tag + Registration	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Inside Rearview Mirror	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	45. Tag Light	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Outside Rearview Mirror	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	46. Liability Insurance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Code: P=Pass R=Rejected N/A=Not Applicable

Comments: SAMPLE

Inspected By: X ID #: _____ Date of Inspection: _____

Business Name: _____ Business Phone No.: _____

Address: _____

Approved Rejected Passed Reinspection
 Unsafe Vehicle - Do Not Transport Children

NO CERTIFICATE WILL BE ISSUED UNTIL ALL ITEMS ARE FOUND SATISFACTORY FOR SAFE OPERATION AS PROVIDED IN CHAPTER 316, FLORIDA STATUTES.

Certificate Number: _____
Dist 2 ChildCareLic

Component listing and check boxes



Summary

- School bus brake deficiencies
 - Not causal or contributory
- Inadequacies in:
 - Oversight, maintenance, and inspections
- To state of Missouri:
 - Require periodic oversight
 - Audit vehicle inspection program
 - Modify MMVIRs
 - Revise vehicle inspection form



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Survival Factors

Ronald Kaminski

Issues

- Emergency exit window design
- Pretrip evacuation instruction

Emergency Evacuation

Front View



Rear View



Images courtesy of Boles Fire Protection District

2003 Bluebird Emergency Exits



Emergency Exit Window Design

- FMVSS 217
- NHTSA lab test
- NCST supplement to FMVSS 217

Emergency Evacuation Briefings

- Missouri requires emergency evacuation drills, K-6 grades
- St. James requires drills, 7-8 grades
- No pretrip briefings prior to school sports or sponsored events
- Previous safety recommendation to NASDPTS

Summary

- Modify FMVSS 217
- Pretrip briefing prior to activity and field trips
- NCST member organizations informing members of these events and circumstances



NTSB