

Federal Motor Carrier Safety Administration  
Office of Bus & Truck Standards & Operations



# **FMCSA Motorcoach Fire Safety Analysis: Final Results**

Data gathering and analysis conducted by the  
Volpe National Transportation Systems Center,  
which is a part of the U.S. Department of  
Transportation-Research and Innovative  
Technology Administration

**Volpe Investigators: Greg Ayres, Neil Meltzer**

**FMCSA Technical Representative: Luke Loy**



# The Wilmer Accident

- ◆ On September 23, 2005, a motorcoach operated by Global Limo, Inc., caught fire on Interstate 45 near Wilmer, Texas. The motorcoach was transporting 44 assisted-living-facility residents and nursing staff to Dallas as part of the evacuation in advance of Hurricane Rita. When the fire broke out in the right-rear wheel well, the driver stopped the bus. Heavy smoke and flames entered the bus interior. As a result, 23 passengers died, two were seriously injured and 19 passengers and the driver received minor injuries.



## Questions were raised:

- ◆ How many motorcoach fires happen annually in the U.S.?
- ◆ How many fatalities/injuries due to motorcoach fires?
- ◆ Where on the motorcoach are fires happening?
- ◆ What are the fire ignition points?
- ◆ What can State and Federal Inspection programs do to reduce the incidence of motorcoach fires?



# Presentation Outline

- ◆ Purpose
- ◆ Data sources
- ◆ Method
- ◆ Analysis
- ◆ Discussion
- ◆ Findings
- ◆ Recommendations



# Purpose of Analysis

- ◆ Gather information regarding causes, frequency, and severity of motorcoach specific (non-collision) fires
- ◆ Identify potential ways to prevent, reduce severity, or mitigate consequences of motorcoach fires
  - Assess the adequacy of current motorcoach operational inspection practices for fire prevention
  - Assess the effectiveness of currently available fire detection and suppression systems in common motorcoach fire scenarios



## Data Sources: 1995–2006

- ◆ National Highway Traffic Safety Administration (NHTSA) Fatal Analysis Reporting System (FARS)
- ◆ FMCSA Motor Carrier Management Information System (MCMIS)
- ◆ U.S. Fire Administration National Fire Incident Reporting System (NFIRS)
- ◆ NHTSA State Data System
- ◆ Selected passenger carriers
- ◆ Selected insurance carriers
- ◆ News reports: U.S. only



## Data sources: 1995–2006 (cont.)

### ◆ Selected States

- Crash Reports: CA, FL, IL, NC, OH, WI, NJ
- Bus Fire Report: NY

### ◆ R.L. Polk & Co.

- In-use vehicle counts by make, model, model year (12/2006)
- Involved vehicle VINs decoded for make, model MY, engine



# Method: Data Collection

- ◆ Query and compile records in Volpe MCF Database
- ◆ FARS
  - Query data using event type, vehicle type fields
- ◆ MCMIS
  - Query data using event type, vehicle type fields
  - Manually identify motorcoaches by VIN or carrier name
- ◆ NFIRS
  - Query data using event type, vehicle type fields
  - Manually identify motorcoaches by VIN



# Method: Data Collection

- ◆ State crash reports
  - Query data using vehicle type, event type where available
  - Manually identify motorcoach fires by reviewing crash reports
- ◆ R.L. Polk data
  - Query data for all Class 7 & 8 non-school buses
  - Manually identify motorcoaches by make, model names



# Data Collection Challenges

## ◆ Database Queries

- NFIRS, MCMIS, some states: no code for motorcoach
- VIN or carrier name not available in all cases
- Some states: no code for non-collision fire

## ◆ Incident Narratives

- Available only in news reports, some crash reports, some NFIRS records
- Ignition point and location of origin details vary
- Personally Identifiable Information issues

## ◆ Inspection Histories

- MCMIS VIN field is not well populated
- No inspections > 4 years old available



# Volpe MCF Database

- ◆ 539 motorcoach fire records captured
- ◆ 47 states plus D.C., 1995-2006



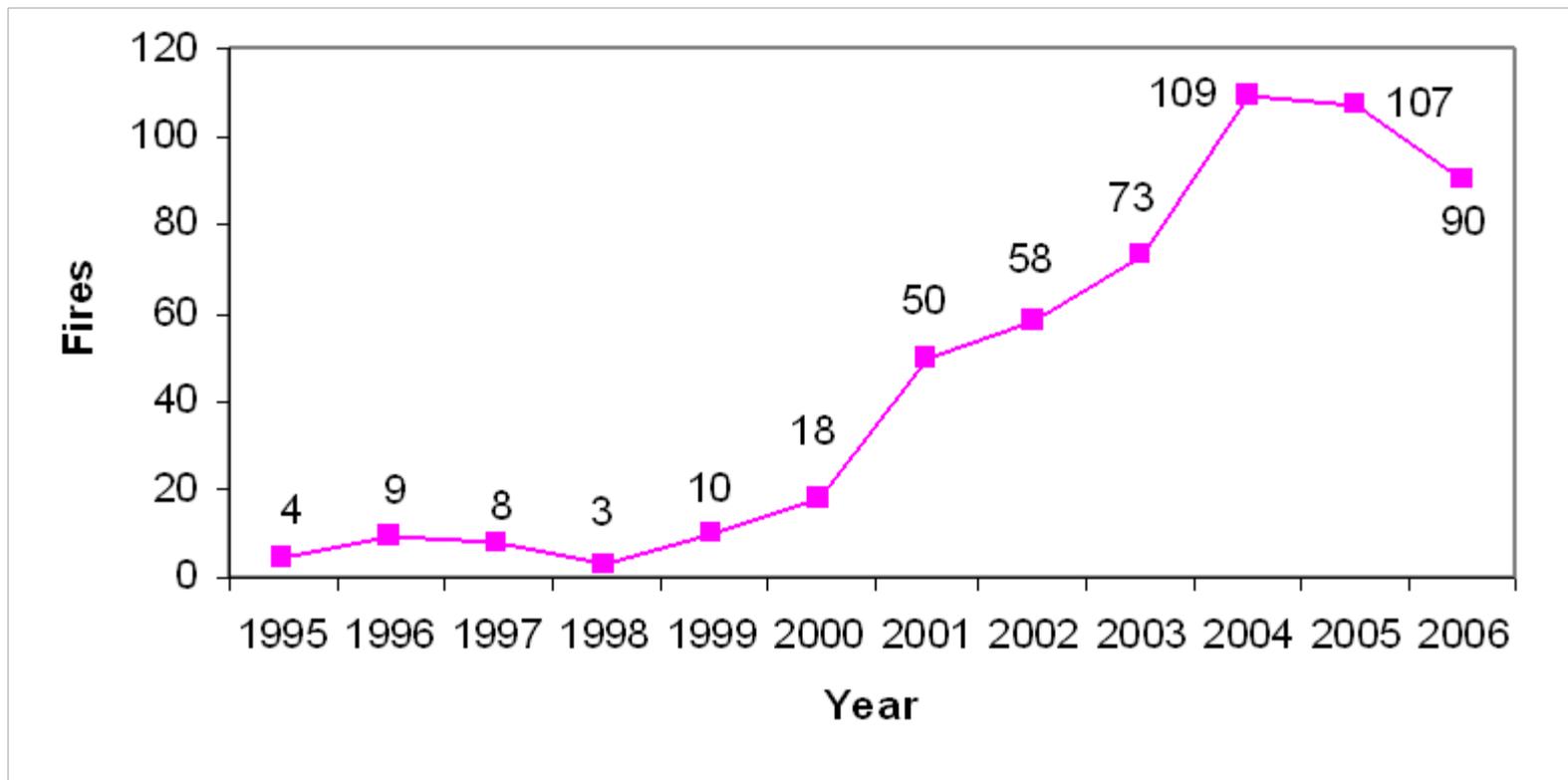
# Volpe MCF Database – Key Analysis Fields

- ◆ Vehicle Identification Number (263 records)
- ◆ State where fire occurred (388 records)
- ◆ Fire origin location (410 records)
- ◆ Fire ignition point (289 records)
- ◆ Injuries/fatalities (340 records)
- ◆ Damage value (236 records)
- ◆ Fire detection/suppression systems, identifiable (2 records)
- ◆ Inspection histories (83 records)



# Analysis: Fire Frequency

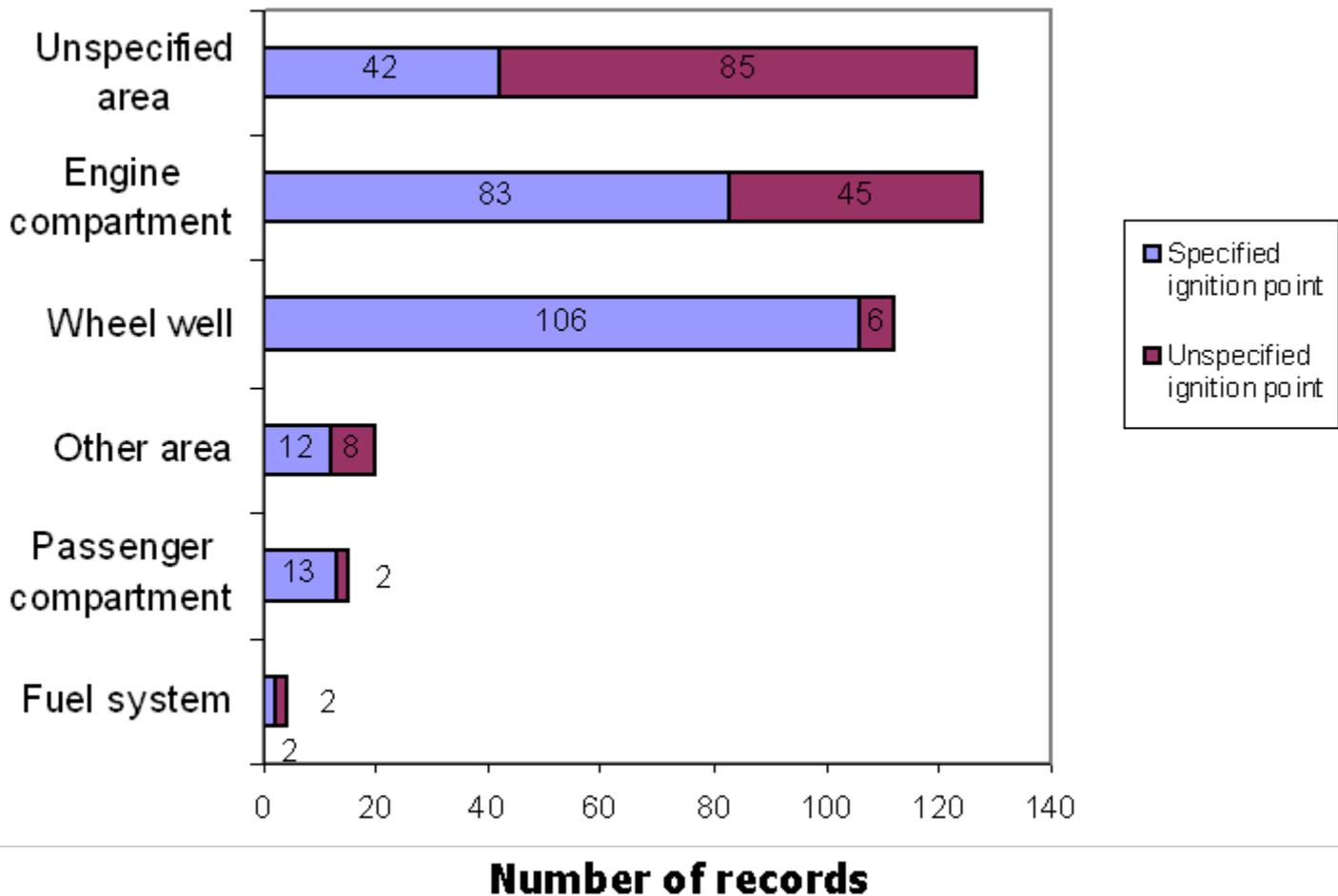
*Recent years have more sources and thus more fire records than earlier years*





# Analysis: Fire Origin Location

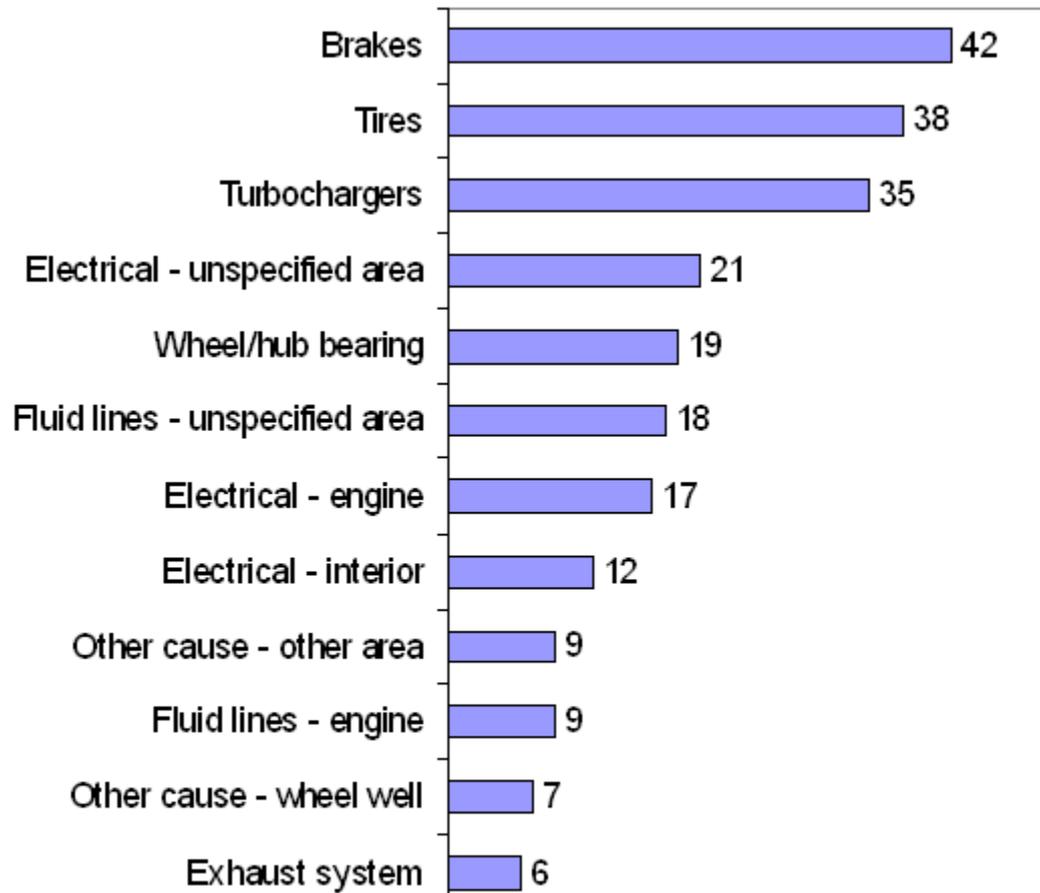
**Fire Origin Location**





# Analysis: Fire Ignition Point

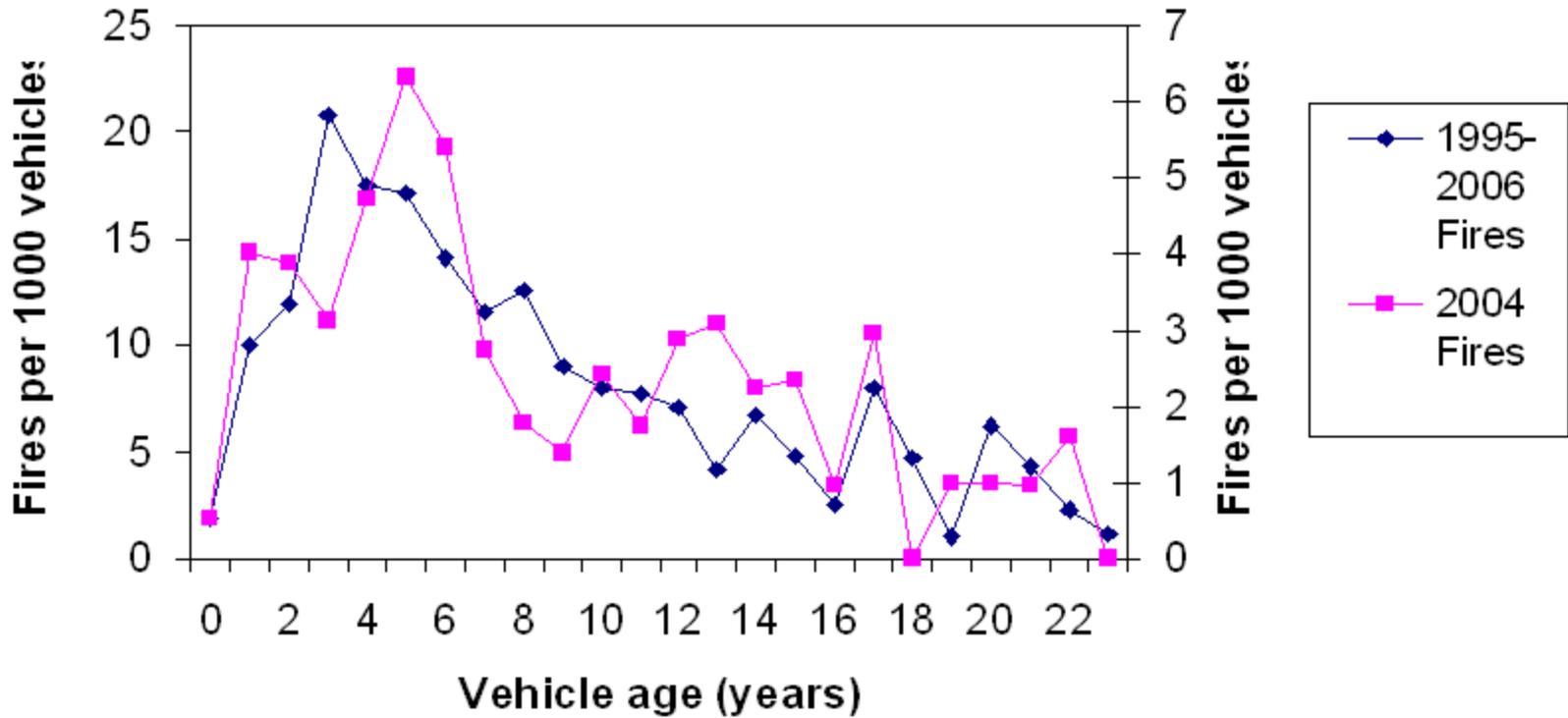
**Fire ignition point**



**Number of records**

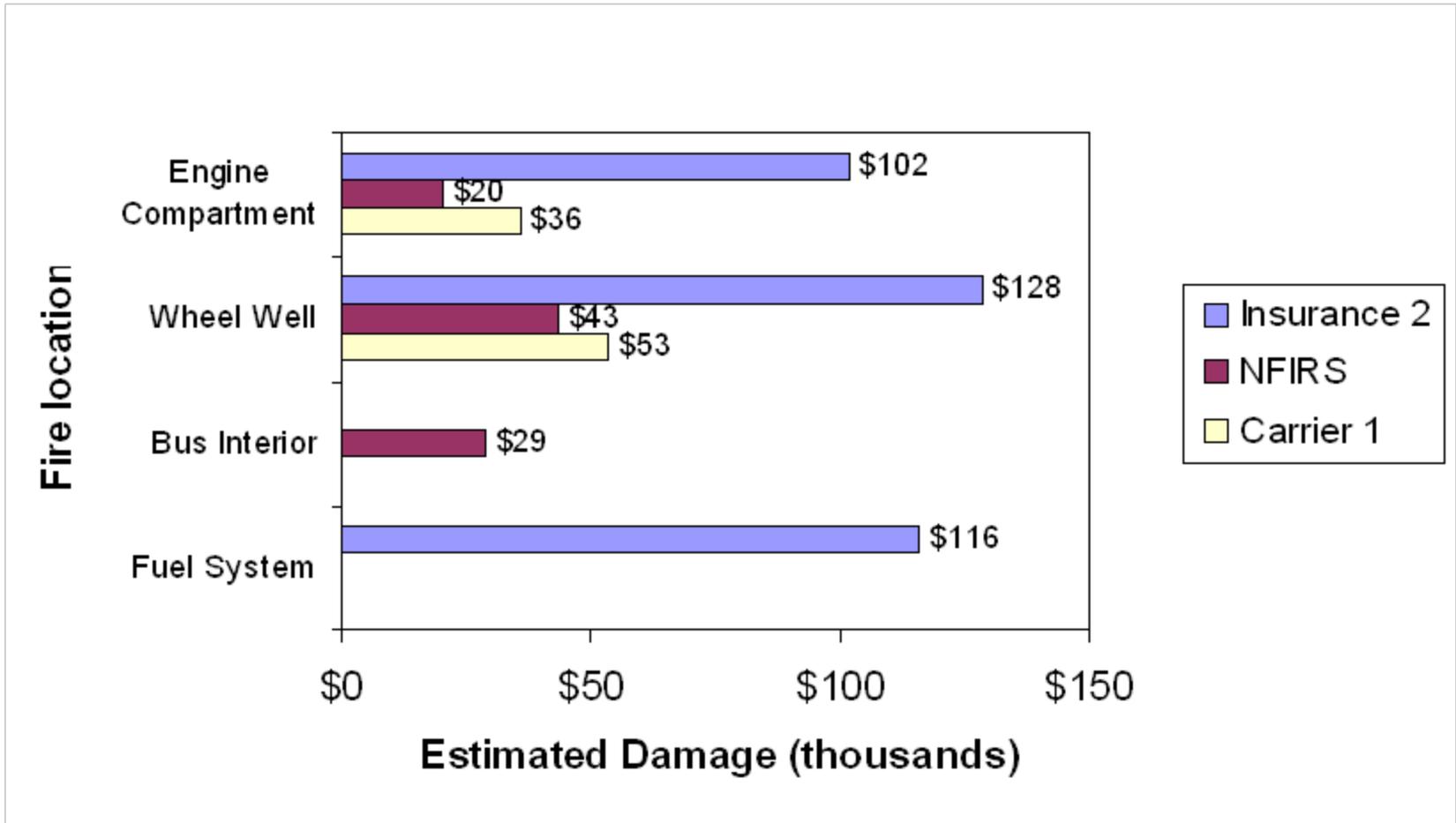


# Analysis: Vehicle Age





# Analysis: Estimated Damage



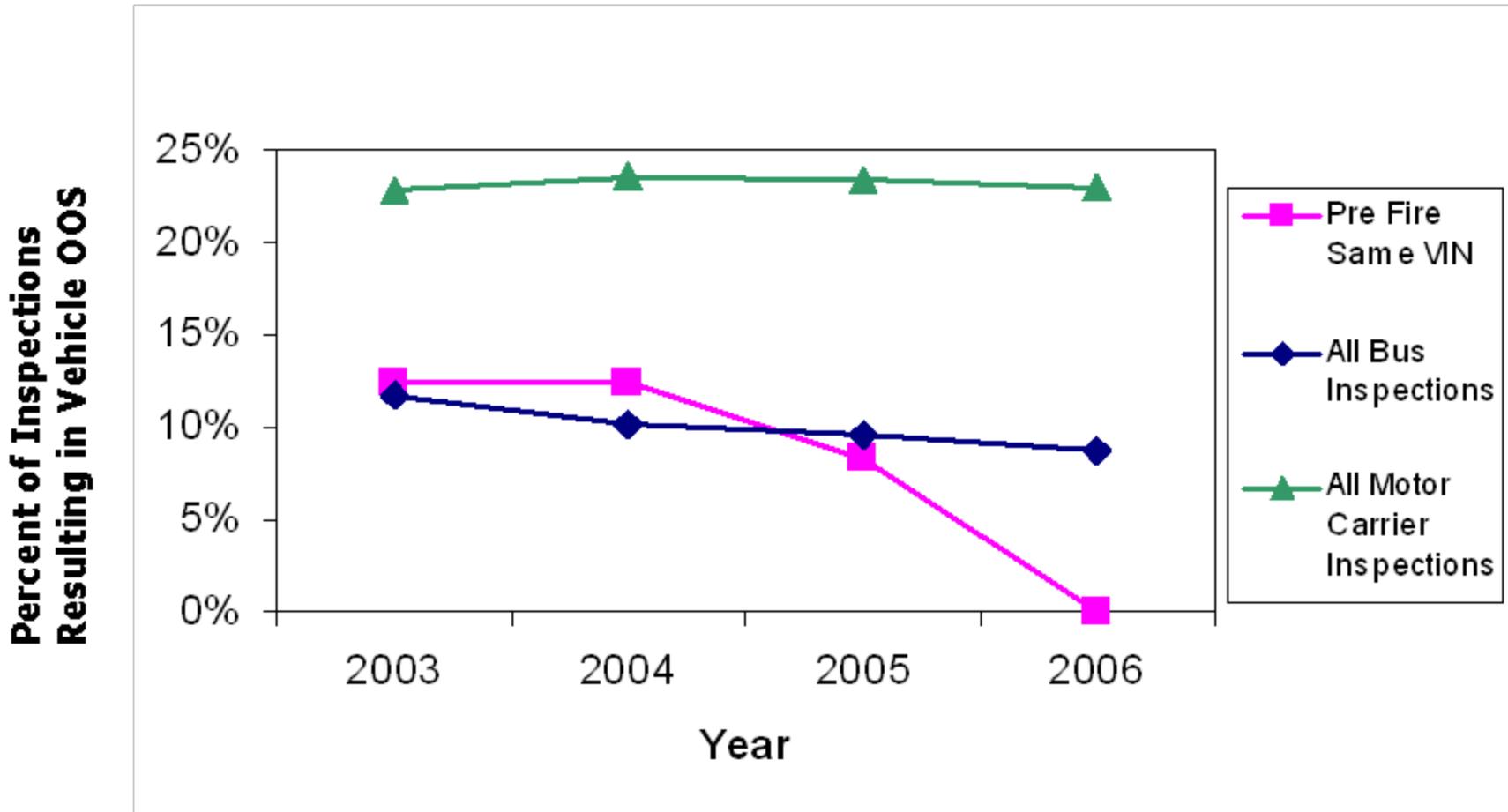


# Analysis: Deaths & Injuries (1995-2006)

Fire Origin Location	Total direct fatalities	No. of Incidents	Total Direct Injuries	No. of Incidents
Unknown	0	0	2	2
Engine	0	0	6	4
Wheel Well	23	1	24	5
Bus Interior	0	0	0	0
Fuel System	0	0	0	0
<b>Total</b>	<b>23</b>	<b>1</b>	<b>32</b>	<b>11</b>



# Analysis: Roadside Vehicle Out of Service Rates





# Fire Detection & Suppression

- ◆ Automatic Fire Detection & Suppression
  - Currently available only for engine fires
  - Heat or flame sensor triggers warning to operator
  - Fire suppressant delivery (automatic or manual)
- ◆ Insufficient Data in Volpe MCF Database
  - Systems available only since 2004 model year
  - Full VIN is needed to verify equipment
  - Only 2 motorcoach fire records qualify



# Discussion: Fire Safety Standards

- ◆ Transit buses must meet APTA Standard Bus Procurement Guidelines
  - Fire retardant/low-smoke materials: passenger compartment, insulation, wheel well, passenger lighting
  - Fire detection systems: at least 2 temperature sensors in engine compartment, warning bells for driver
  - Firewalls: a fireproof bulkhead separating the passenger and engine compartments
  - Evacuation: 2 door exits, 1 escape hatch, others
- ◆ No such standards for motorcoaches



# Findings

- ◆ Most complete year in Volpe MCF database has 109 fires (2004)
- ◆ Data quality varies from state to state
  - Fire origin location and ignition point reporting
  - Full Vehicle Identification Number (VIN) reporting
  - NFIRS comment fields
- ◆ Engine compartment and wheel-well dominate fire origin locations
- ◆ Brakes, tires, turbocharger, electrical system, and wheel/hub bearings dominate ignition points



# Findings

- ◆ Wheel well fires more costly, injurious than engine
- ◆ Peak vehicle age for fires is 3-5 years
- ◆ Vehicle OOS violation rates for motorcoaches in Volpe MCF database are about the same as rate for all buses (9-12 %)
- ◆ Compliance Review ratings for carriers in Volpe MCF database are mostly satisfactory (72-74 %)
- ◆ Compliance Review violations for carriers in Volpe MCF database are mostly for bad recordkeeping (70 %)



# Findings

- ◆ Gaps Identified in Operational Inspection Criteria
  - Brakes
  - Turbochargers
  - Tires
  - Electrical
  - Wheel/hub bearings
  - Fluid lines
  - Air conditioners
  - Combustible fluid accumulation
  - Exhaust systems
  
- ◆ Some are being addressed by CVSA Passenger Carrier Committee



# Recommendations

- ◆ FMCSA published Regulatory Guidance for Recording of Commercial Motor Vehicle Accidents Involving Fires (July 24, 2007)
- ◆ FMCSA intends to discuss possible NFIRS enhancements with US Fire Administration to improve data quality and access to comment fields
- ◆ FMCSA funding Thermal Imaging Inspection Research
- ◆ Motorcoach Design Changes (design vs packaging)