

Informal document **No. GRSG-93-27**

(93d GRSG, 23-26 October 2007,

Agenda item 3 (d))



Motorcoach Fire Safety Analysis

Department of Transportation

**Federal Motor Carrier Safety Administration
Vehicle & Roadside Operations Division**

Motorcoach Fire

Wilmer, Texas

- 🔥 Evacuation from Hurricane Rita
 - September 23, 2005
 - 1998 MCI motorcoach
 - Wheel fire
 - 23 elderly passenger fatalities



DRAFT-Do not quote or cite



Source: KTVT News

DRAFT-Do not quote or cite

00:10



DRAFT-Do not quote or cite

00:23



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Other Bus Fires

🔥 Charles Town, West Virginia

- July 15, 2003
- 989 MCI motorcoach
- Brake fire
- 3 senior citizens injured, 2 while exiting windows

Other Bus Fires



Source: James E. Knott

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Other Bus Fires



Source: James E. Knott

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Other Bus Fires

🔥 Meriden, Connecticut

- August 16, 2005
- 2002 Van Hool motorcoach with 45 passengers
- Right rear wheel fire
- Non-English-speaking driver
- No injuries

Other Bus Fires



Source: Meriden, CT Fire Dept.

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Other Bus Fires

🔥 Bass River, New Jersey

- October 23, 2005
- 1998 Dina Motorcoach with 40 passengers
- Left rear tag axle tire fire
- No injuries

Other Bus Fires



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Other Bus Fires

🔥 Banning, California

- December 6, 2005
- 2001 Van Hool motorcoach with 61 passengers
- Fire in rear of vehicle
- No injuries

Other Bus Fires



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Other Bus Fires

🔥 Bass River, New Jersey

- October 23, 2005
- 1998 Dina Motorcoach with 40 passengers
- Left rear tag axle tire fire
- No injuries

Other Bus Fires



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Purpose

- 🔥 Gather information regarding causes, frequency, and severity of motorcoach 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 to 2006

- 🔥 NHTSA Fatality Analysis Reporting System (FARS)
- 🔥 FMCSA Motor Carrier Management Information System (MCMIS)
- 🔥 USFA National Fire Incident Reporting System (NFIRS)
- 🔥 NHTSA State Data System
- 🔥 Selected passenger carriers
- 🔥 Selected insurance carriers
- 🔥 News reports: U.S. only
- 🔥 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, Dec. 2006
 - Involved vehicle VINs decoded for make, model, MY, engine

Data Collection Challenges

🔥 Database Queries

- 🔥 Databases not able to identify 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
- 🔥 Personal identifiable information issues

🔥 Inspection Histories

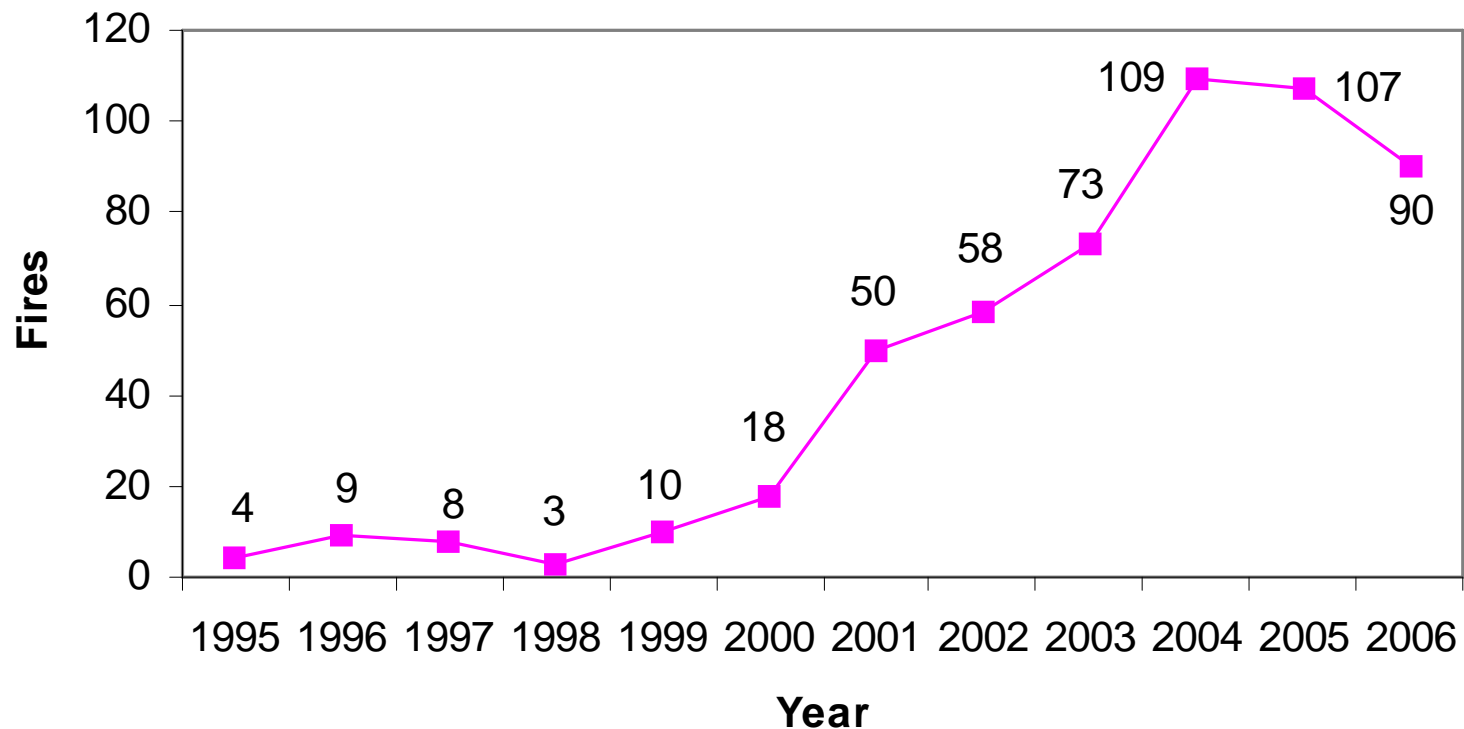
- 🔥 MCMIS VIN field is not well populated
- 🔥 No inspections > 4 years old available

Data

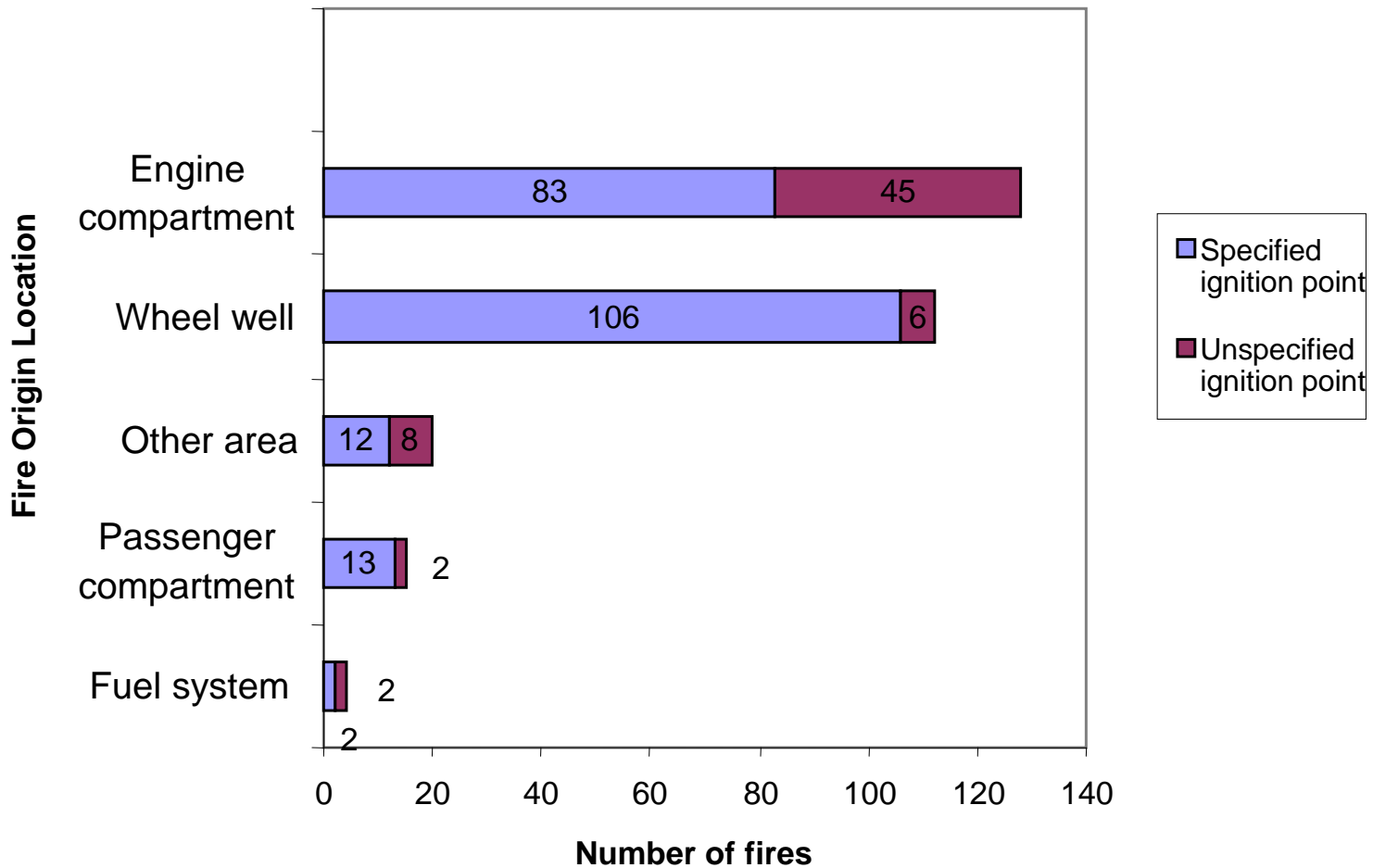
- 🔥 Database: 539 records
- 🔥 47 states plus D.C., 1995-2006
- 🔥 Key Analysis Fields
 - 🔥 Vehicle Identification Number (263 records)
 - 🔥 State where fire occurred (388 records)
 - 🔥 Fire origin location (410 records)
 - 🔥 Fire ignition point (289 records)
 - 🔥 Injuries/fatalities (340 records)
 - 🔥 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

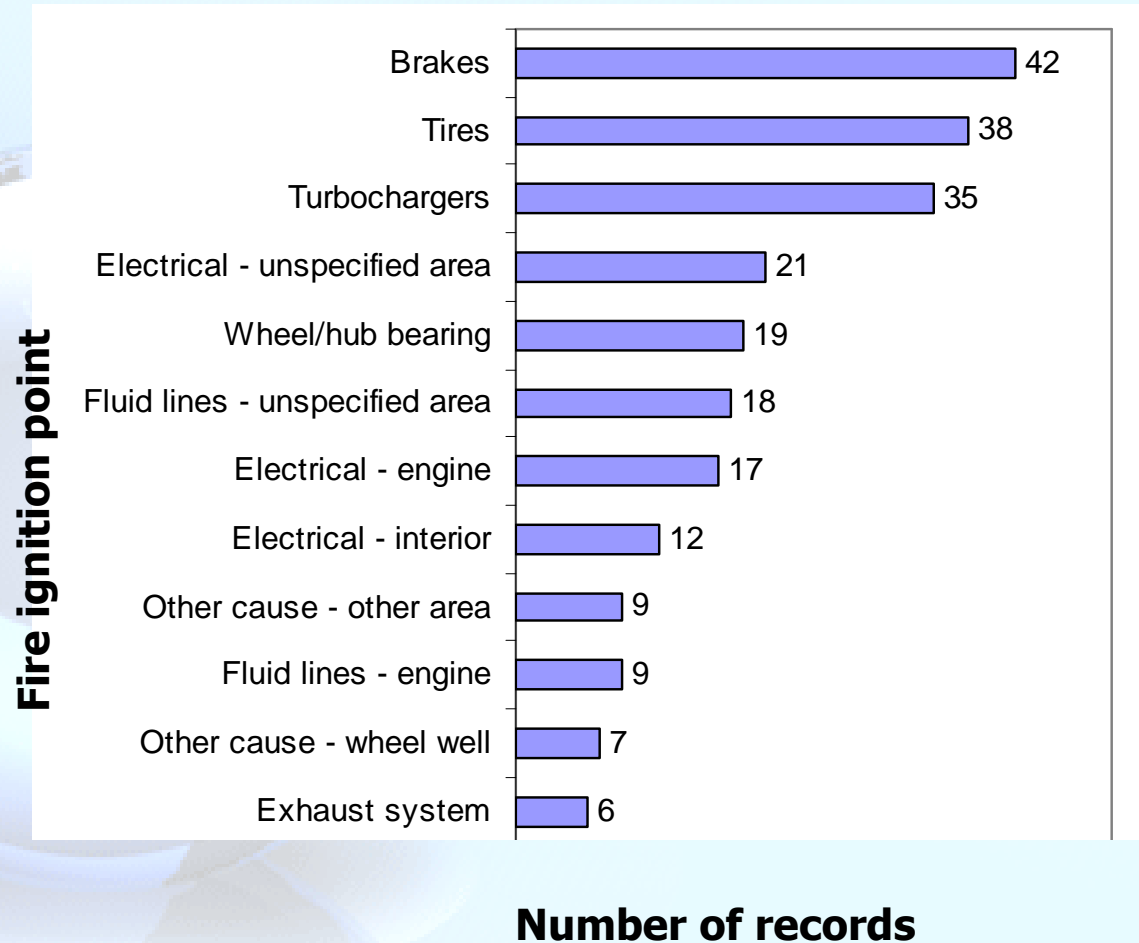


Analysis: Fire Origin Location



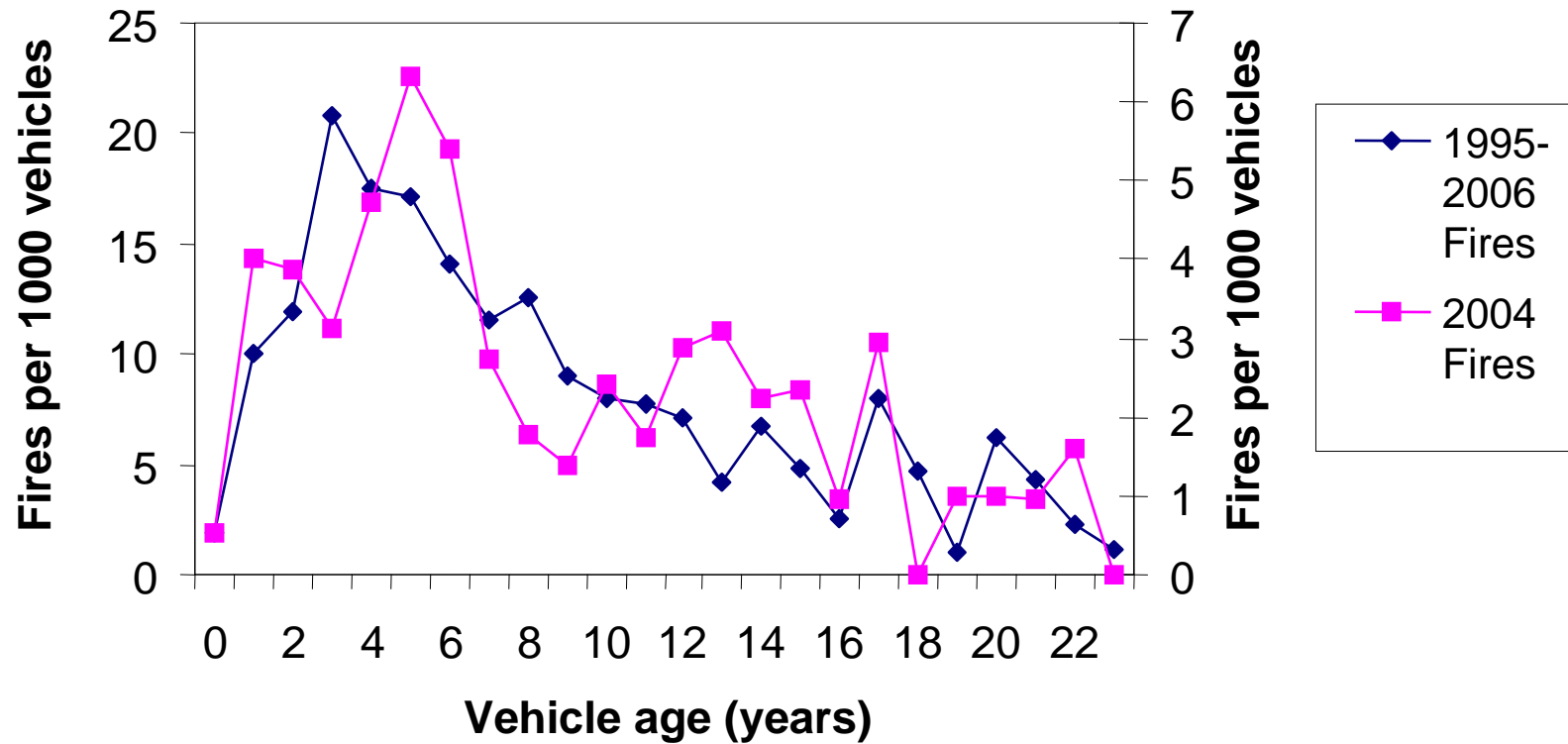
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Analysis: Fire Ignition Point



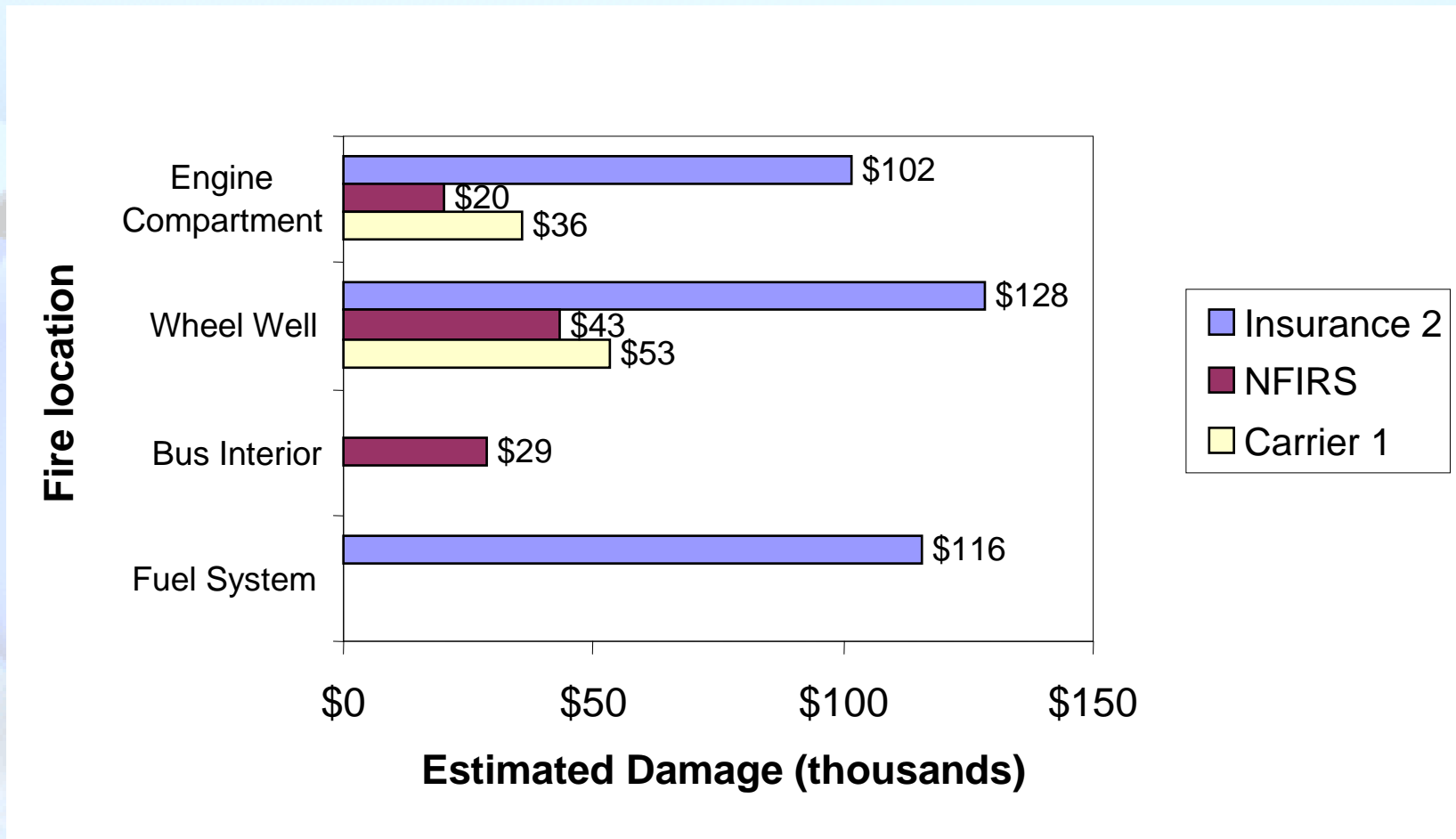
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Analysis: Vehicle Age



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Analysis: Estimated Damage



Bus Fire Data

- 🔥 Most fires start in the engine compartment or wheel well
- 🔥 Brake, turbocharger, tire, and electrical problems are the top fire causes

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
Total	23	1	32	11

Fire Detection & Suppression

- 🔥 Automatic Fire Detection & Suppression
 - 🔥 Currently available only for engine fires
 - 🔥 Heat or flame sensor triggers warning
 - 🔥 May also trigger suppressant delivery
- 🔥 Insufficient Data in Database
 - 🔥 Systems available only since 2004 model year
 - 🔥 Full VIN is needed to verify equipment
 - 🔥 Only 2 records qualify

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 %)
- 🔥 CR violations for carriers in Volpe MCF database are mostly for bad recordkeeping (70 %)

Safety Compliance

- 🔥 Federal agencies, States, manufacturers and carriers work together to ensure carrier safety.
- 🔥 NHTSA sets component performance requirements for: *tires, rims, lights, vehicles controls, displays, etc.* as well as overall performance such as *braking, number and size of emergency exits, etc.*
- 🔥 FMCSA determines the safety fitness of interstate motor carriers, and assigns DOT and grants operating authority to interstate carriers. Set standards for interstate motorcoach safety equipment and inspections.
- 🔥 States sets requirements, either by adopting the Federal rules or by establishing their own rules, for intrastate passenger carriers operating in that State. Important State roles are conducting vehicle inspections and participating in setting standards for inspection criteria.
- 🔥 Carriers and manufacturers often cooperate voluntarily in identifying solutions for safety-related problems and training carriers' staff.

Recommendations

🔥 Data collection

- 🔥 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 field

🔥 Fire prevention

- 🔥 Proper inspection criteria for pre-trip and post-trip
- 🔥 Inspector and technician training
- 🔥 Enhance vehicle and component design
- 🔥 Automatic failure detection systems (tire pressure monitoring systems, turbocharger failure warning systems)
- 🔥 Motorcoach Design Changes (design vs packaging)

Recommendations

🔥 Fire mitigation:

- Safety equipment: increase size and effectiveness of motorcoach fire extinguishers to adequately address the large proportion of wheel well and engine compartment fires.
- Vehicle Design: keep fire from wheel well and engine from entering passenger compartment; improve emergency exit windows to address the needs of mobility-impaired passengers.
- Automatic Fire Detection and Suppression Systems: provide detection and suppression for engine and wheel well areas.
- Reduce material flammability