

Crashes that Result in Fires

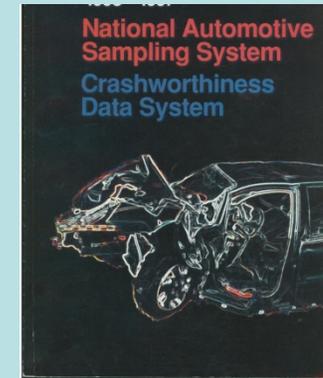
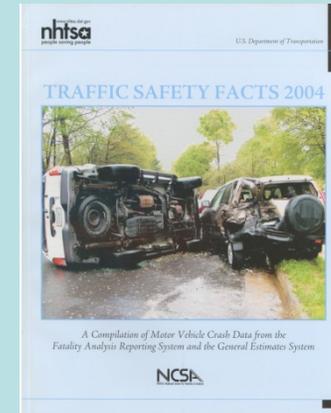
Kennerly H. Digges

**Motor Vehicle Fire Research
Institute**

MVFRI

Data Sources

- The Fatality Analysis Reporting System (FARS) years 1979 to 2005
- The National Automotive Sampling System - Crashworthiness Data System (NASS/CDS) 1997-2006



Definitions

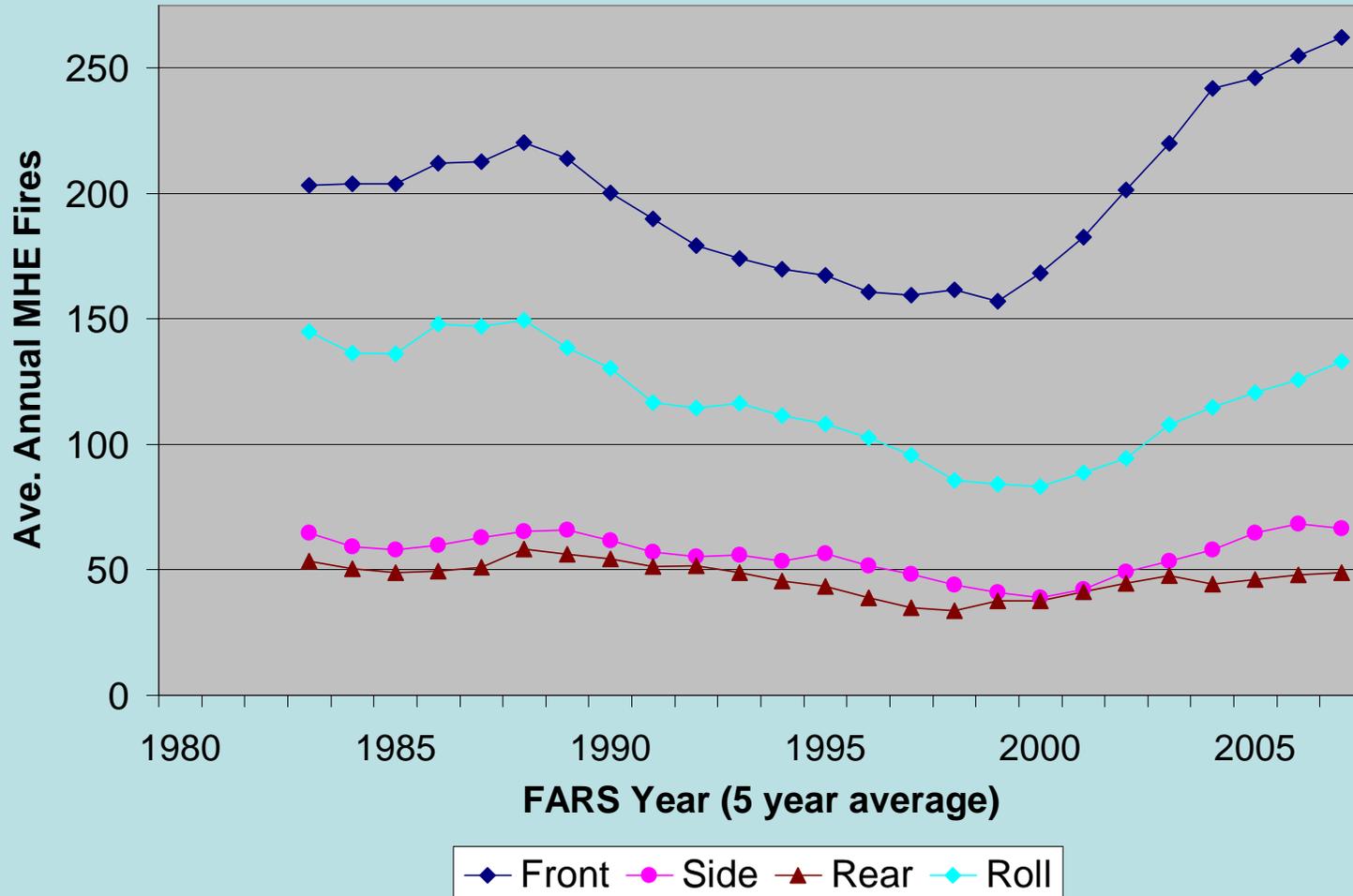
- *FARS Fires* – Any vehicle in the FARS file where there was both a fatality and a fire.
- *FARS MHV (Most Harmful Event) Fires* – The FARS cases where fire was the most harmful event that occurred to the vehicle.
- The MHV does not necessarily apply to the people in the vehicle. Therefore, one can not assume that the most harmful event for a vehicle was the cause of the death or injury for any specific individual within the vehicle.
- *NASS Major Fire* – Any NASS case where fire enters the occupant compartment
- *NASS Minor Fire* – Any NASS case where fire does not spread within the occupant compartment

Vehicle Interior after Major Fire



Source of fire frequently difficult to detect.
Severity of crash injuries vs. fire injuries are sometimes difficult to separate.

Fatalities with Fire as MHE in FARS

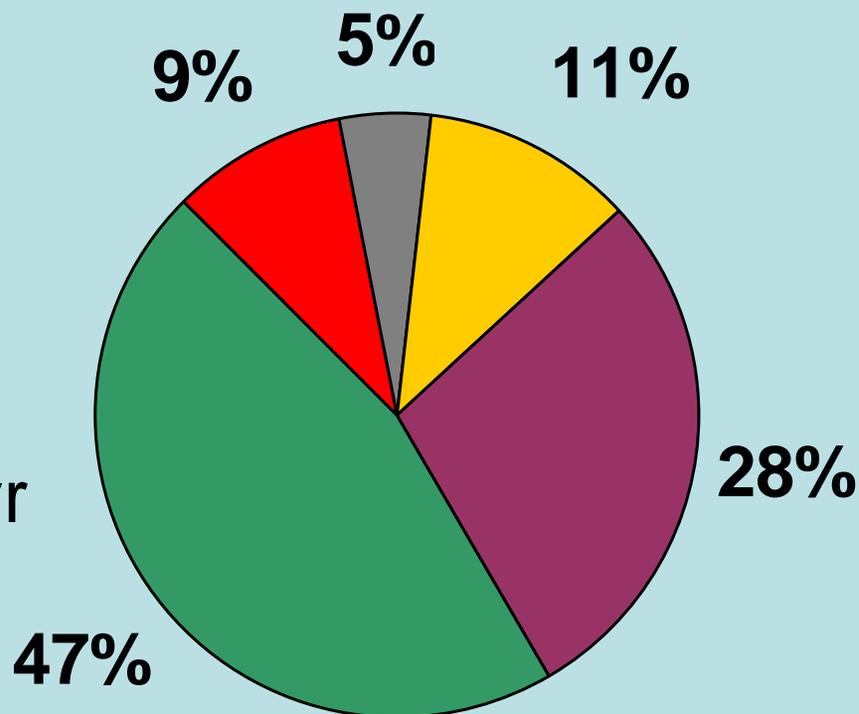


Distribution of Fatalities with Fire as MHE by Location of Vehicle Damage – FARS 2000-2005

Preference given to rollovers

Entrapment ~ 25%

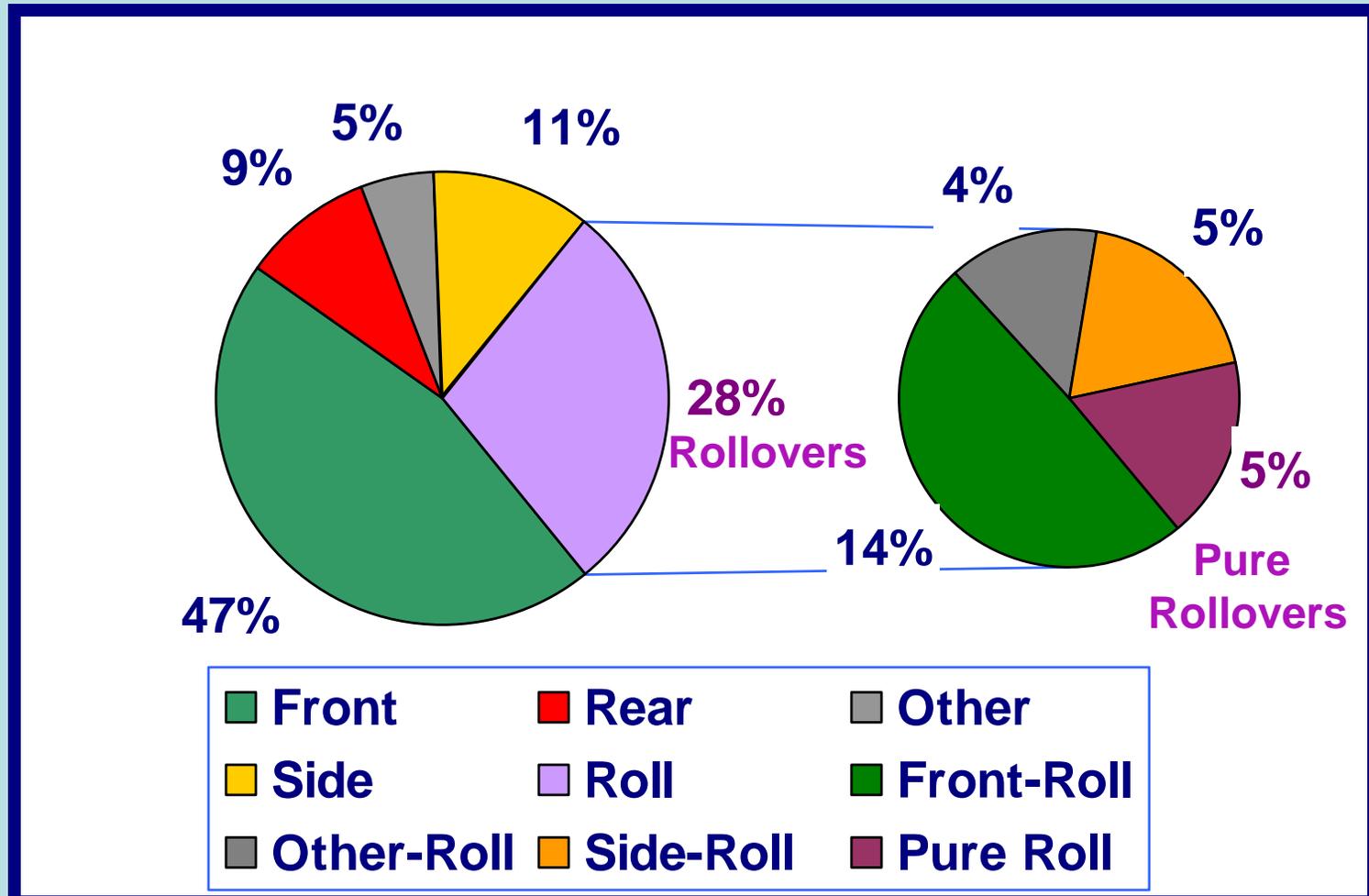
N ~ 500 deaths per yr



Front Rear Other Side Roll

Distribution of Fatalities with Fire MHV by Crash Direction

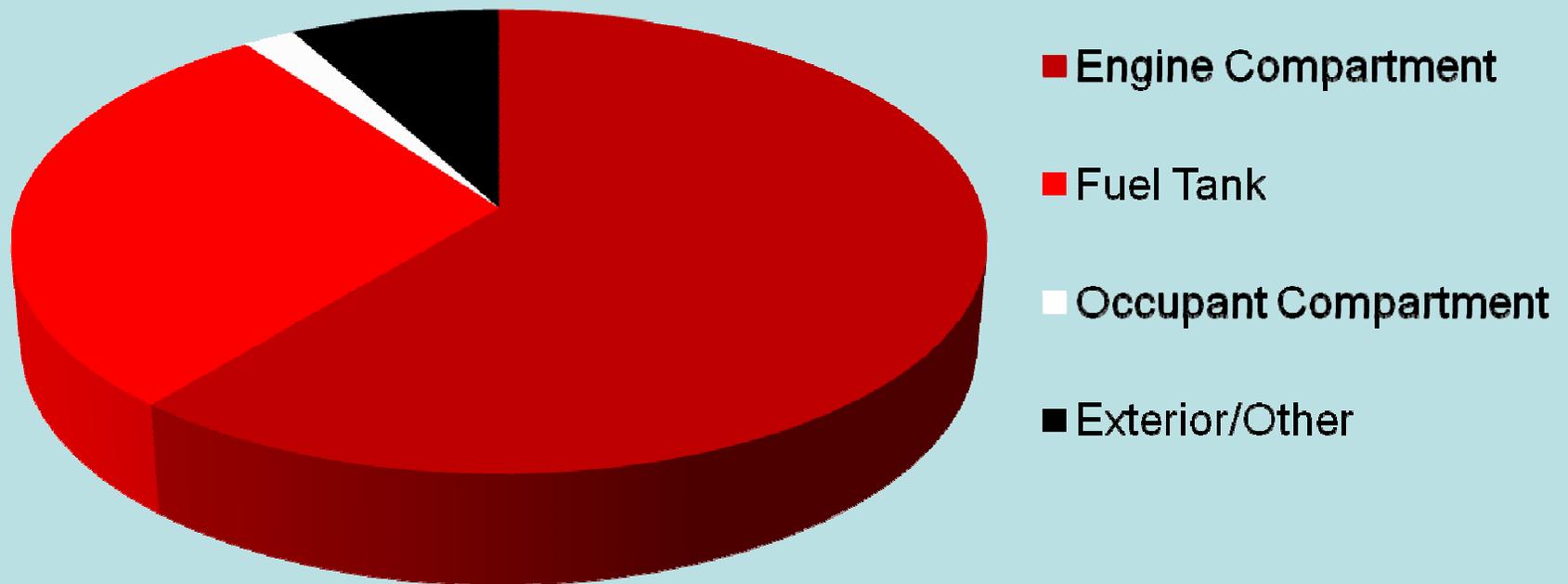
FARS 2001-2005



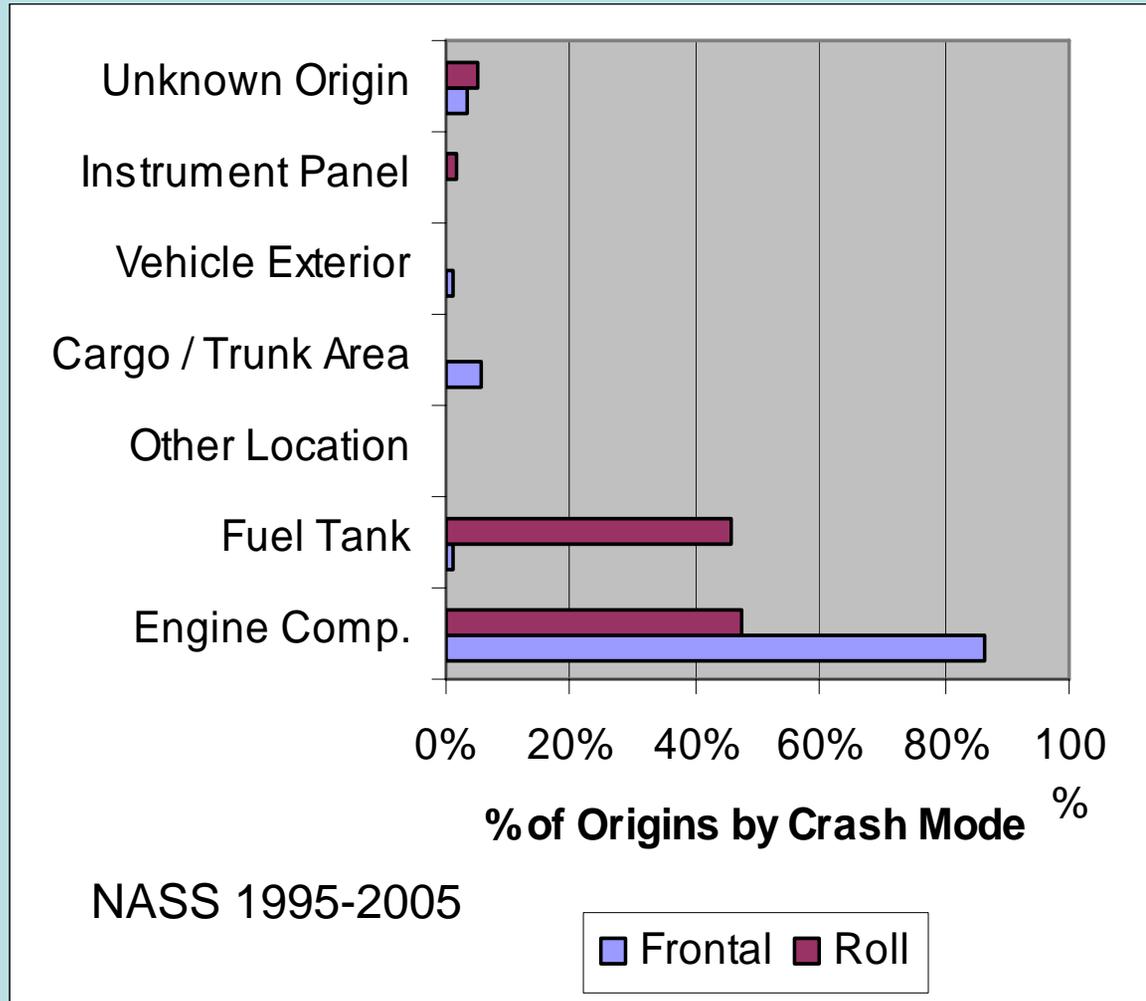
Fire Origin in NASS 1995-2005

weighted data

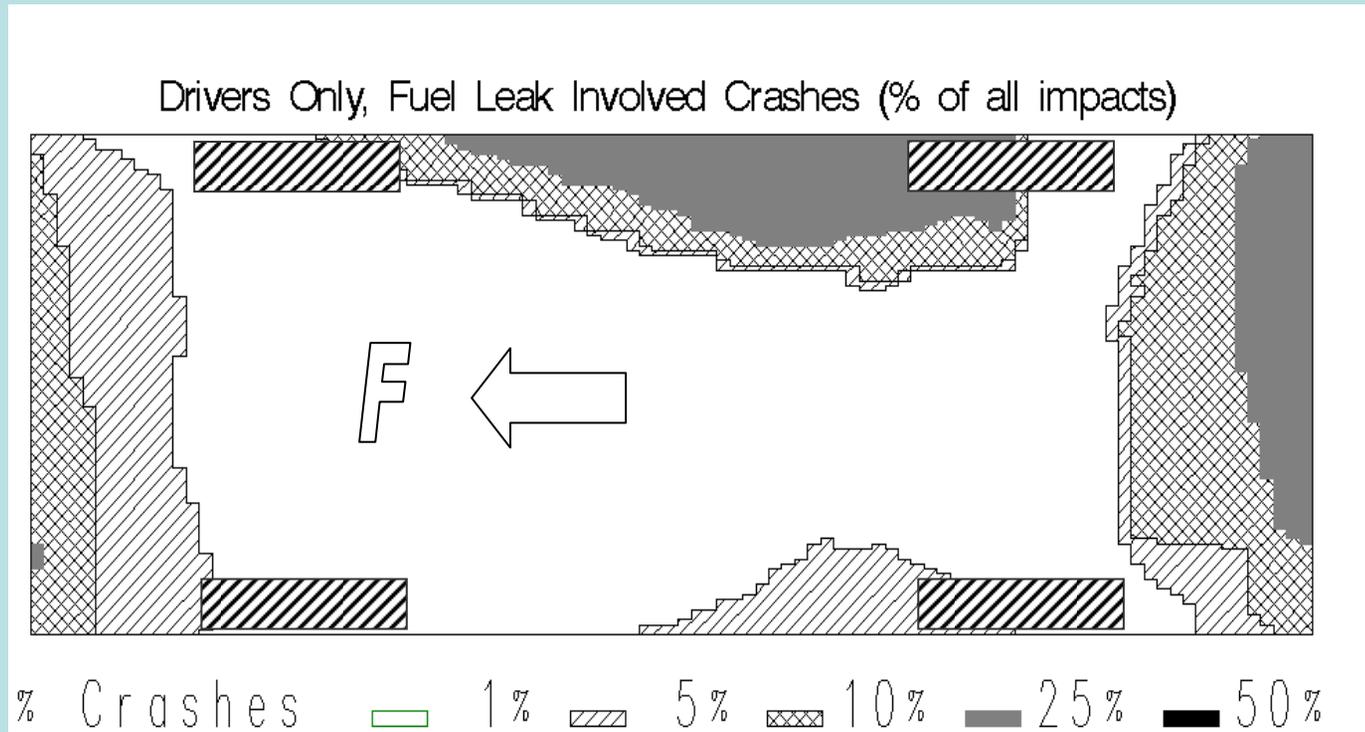
Major Fires



Fire Origin in Frontal and Rollover Crashes –



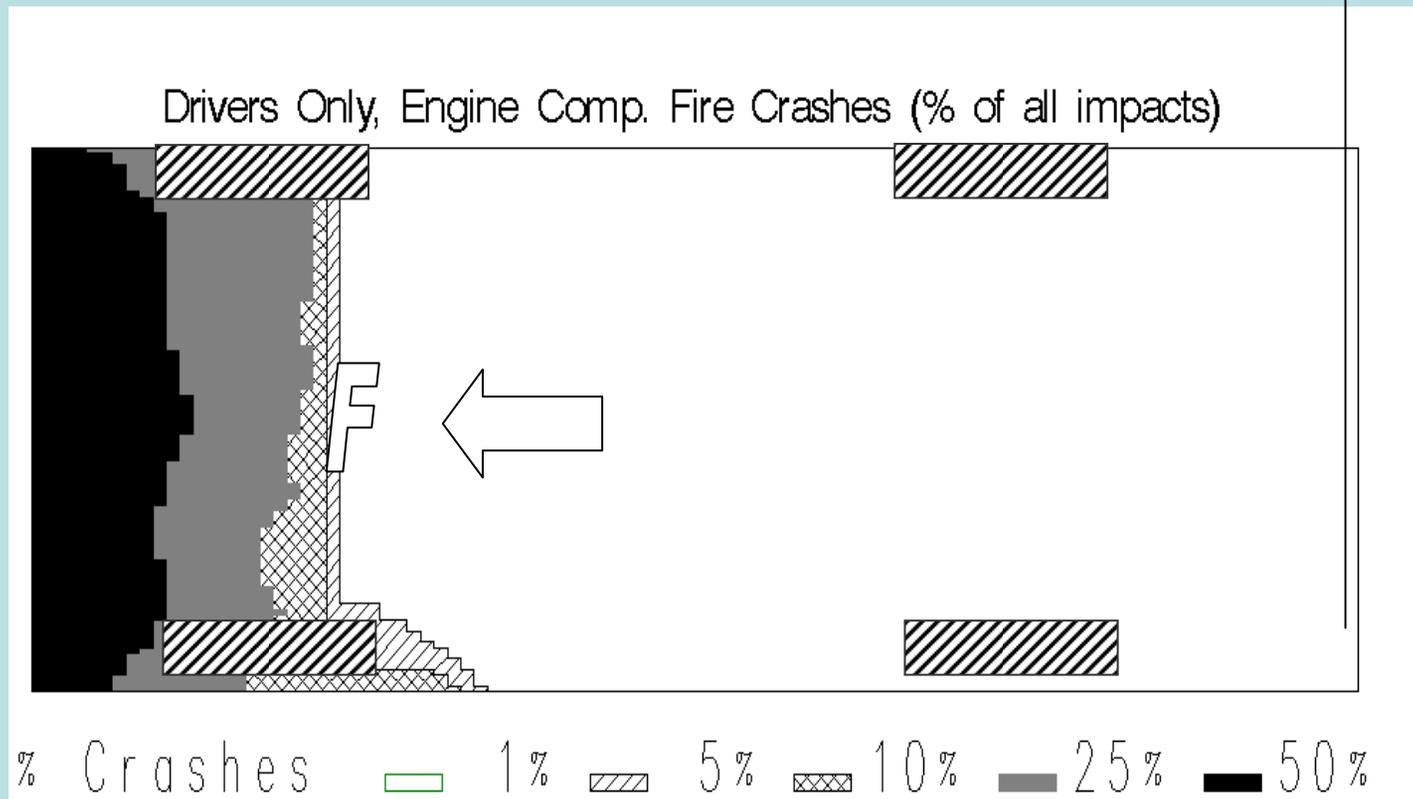
Damage Patterns where Fuel Leakage Occurred



Frequency that damage occurs in a given location

From Paper SAE 2006-01- 0789 by G. Bahouth

Damage Patterns for Engine Compartment Fires



Damage patterns where Fire Origin is in the Engine Compartment

Typical NASS Rollovers with Major Fires and Engine Compartment Origin



About 50% of vehicles in NASS with major fire were in pure rollovers.

Conclusions

- The most frequent crash modes for major fires and fatalities: **Frontals and Rollovers**
- The frequency of FARS MHE Fire fatalities is increasing for frontal and rollover crashes
- Entrapment occurs in about 25% of FARS MHE Fire fatalities
- The most frequent fire origin: **Engine Comp.**
- For more than 50% of major engine compartment fires, vehicles have less damage than in the NCAP test.

Countermeasures for Engine Compartment Fires

- Increased use of fire resistant materials in the engine compartment
- Improve the firewall for passenger compartment
- Control the post-crash leakage of all flammable fluids
- Provide post-crash battery disconnect
- Provide post-crash occupant egress
- Provide rapid rescue response notification (ACN)



The End

