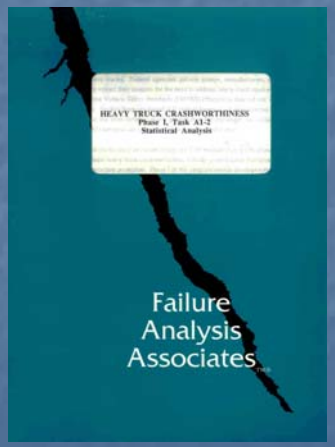
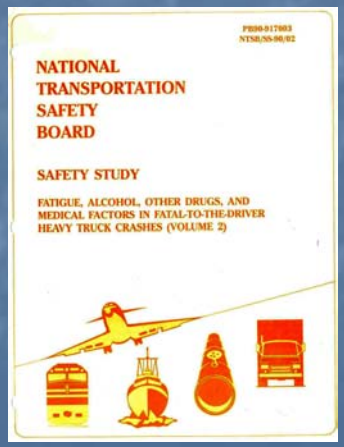
Heavy Truck Accidents in the U.S. Data Sources

FARS	Fatality Analysis Reporting System	SAE Study	1975>1989
Safety Study	NTSB/SS-90/02	NTSB Study	1987>1988
TIFA	Trucks involved in Fatal Accidents	UMTRI/FMCSA	1991>1994
FARS&GES	FARS & General Estimates System	NHTSA	2005

SAE	formally > Society of Automotive Engineers
NHTSA	National Highway Traffic Safety Administration
UMTRI	University of Michigan Transportation Research Institute
FMCSA	Federal Motor Carrier Safety Administration
NTSB	National Transportation Safety Board

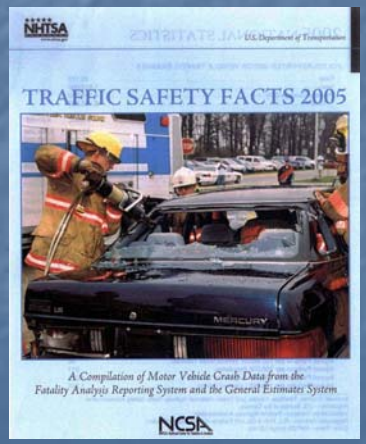


SAE



NTSB

UMTRI



NHTSA

Relationship between Fatalities and Class of Heavy Truck

U. S. NHTSA Defined GVW Classes	GVWR Kg (x1000 lbs)	% total U.S. Annual Sales of Vehicles in these Weight Ranges (2000-2002 avg)	% of all Truck Occupant Fatalities in Crashes (1984 FARS)*
3	4536 to 6350 (10-14)	20.8%	12.2%
4	6350 to 7257 (14-16)	9.6%	
5	7257 to 8845 (16-19.5)	5.4%	
6	8845 to 11793 (19.5-26)	9.7%	
7	11793 to 14968 (26-33)	19.8%	
8	Greater than 14968 (>33) Tractors Trucks	20.8% 13.9%	**83.0%** 4.8%

* Updated statistics will be obtained as soon as possible but approximate proportions shown are not expected to vary greatly

SAE – Crashworthiness Task Force

- Fatal Accident Recording System (FARS) 1975-1989 Database
- FARS data is based on information on every fatal accident within the defined years
- FARS is excellent for overall statistical information, not very useful for detailed information
- Cluster analysis performed to identify major accident modes

Fatal-to-Truck Driver Accident Cluster Distribution FARS Data 1975-1989

		Tractor Fatal Vehicle		
Rank	Cluster No.	Number	Percent	Event
1	6/10	2649	28	Rollover
2	4/8	1895	20	Struck fixed object, no rollover
3	12/13	1847	20	Struck or striking, no rollover
4	3/7	1741	18	Struck fixed object, rollover
5	11	685	7	Strike Vehicle, rollover
6	15	326	3	Struck non-fixed object
7	14	175	2	Struck or striking
8	5/9	142	2	Rollover, struck fixed object

- Three major accident modes identified
  - Rollover
  - Collision with fixed objects
  - Collision with vehicles in transport

Conclusions: Fatal-to-Truck Driver Crashes

- FARS 1975>1989 Database Conclusions
  - Accident clusters contain combinations of three major accident classifications
    - Rollover
    - Collision with motor vehicle
    - Collision with fixed object
  - Principal impact is frontal in nature for collisions
  - When rollover occurs, it frequently becomes the most harmful event
  - Cab style (COE vs. Conventional) did not alter statistical trends

National Transportation Safety Board 1987-1988 Fatal-to-Truck Driver Accident Studies

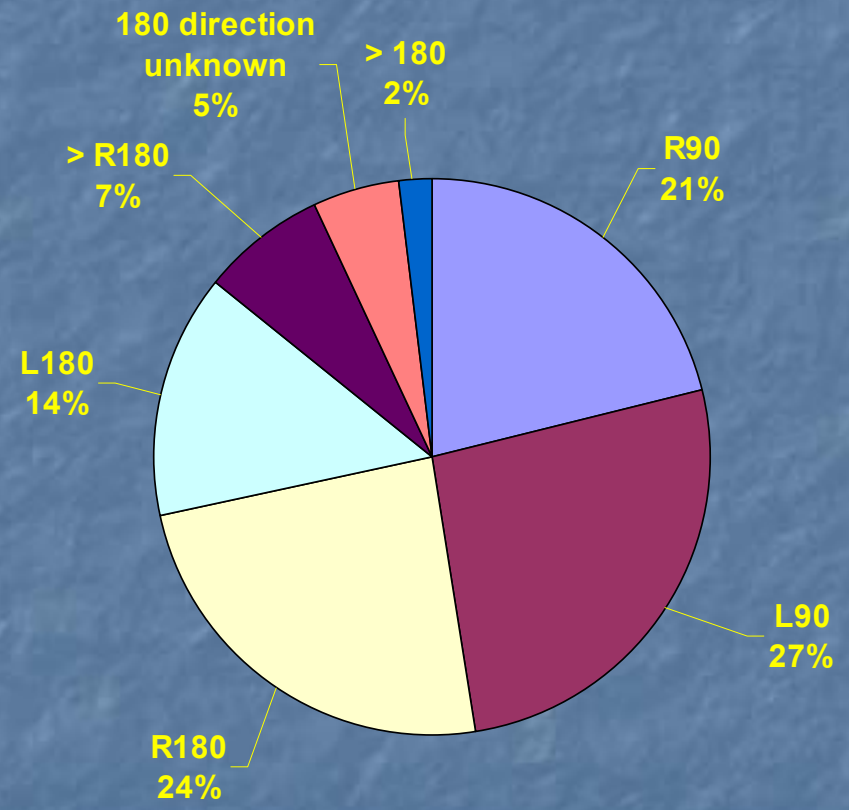
- FARS database good for statistics, poor detail information
- 1987-1988 NTSB study performed detailed heavy truck accident investigations
  - 182 fatal-to-driver accidents
  - 186 heavy trucks involved
  - 207 total fatalities
  - Every fatal accident in 8 US states over one year
  - NTSB data statistically comparable to FARS data base

Fatal-to-Truck Driver Cluster Distribution of 1987-1988 NTSB Study Cases

Rank	Cluster No.	Event	FARS	NTSB
1	6/10	Strike vehicle, rollover	28%	19%
2	4/8	Struck fixed object, no rollover	20%	8%
3	12/13	Struck or striking, no rollover	20%	25%
4	3/7	Struck fixed object, rollover	18%	18%
5	11	Rollover	7%	12%
6	15	Struck non-fixed object	3%	4%
7	14	Struck or striking	2%	2%
8	5/9	Rollover, struck fixed object	2%	11%

- FARS data roughly matches NTSB data
  - Under-representation of cluster 5/9 and 11 attributed to coding issues associated with the FARS database
  - 182 accidents reduced to 68 accidents with full details and these accidents roughly approximate statistical characteristics of FARS

Fatal-to-Truck Driver Direction and Degree of Roll



1987-1988 NTSB Case Studies

Fatal-to-Truck Driver NTSB Accident Scenarios

- Six Major NTSB Detailed Accident Scenarios
  - Head-on collisions
  - Rear-end collisions with other heavy trucks
  - Collisions with fixed objects
  - 90° rollover without a subsequent collision
  - 90° rollover with a subsequent collision
  - 180° rollover

Fatal-to-Truck Driver Crashes Most Harmful Event TIFA Data 1991 > 1994

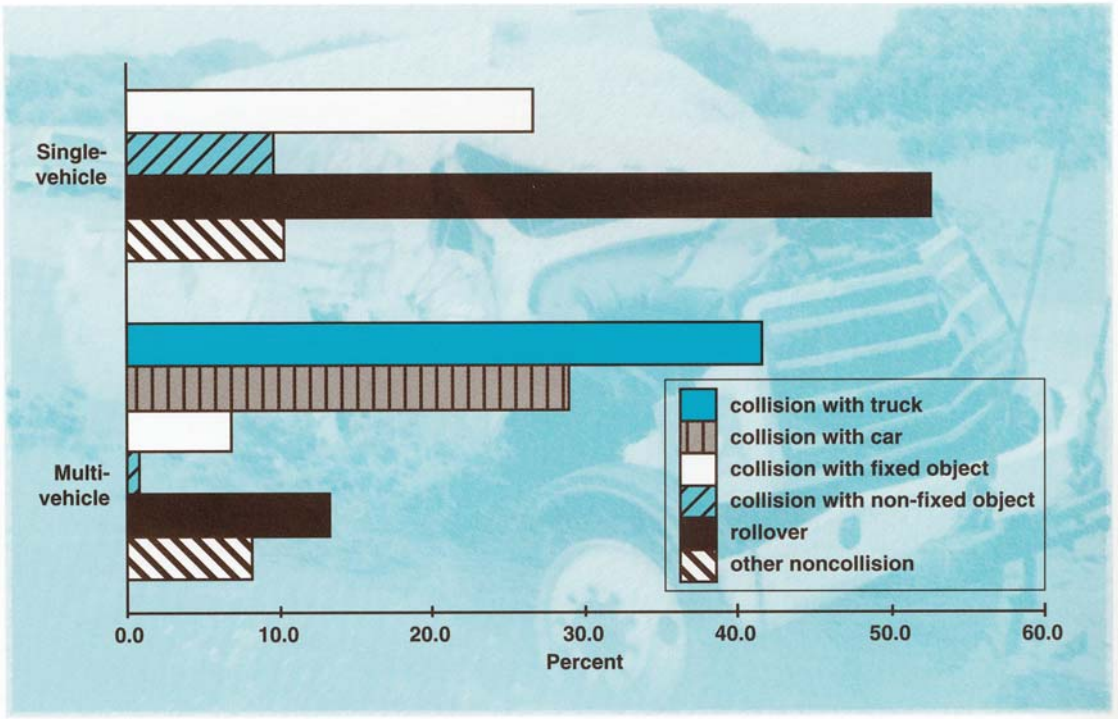


Figure 12. Truck driver fatals: most harmful event in single and multiple vehicle accidents: TIFA, 1991-1994

Occupant Status – Most Harmful Event
Traffic Safety Facts - 2005

Table 70

Vehicle Occupants Killed or Injured, by Vehicle Type and Most Harmful Event

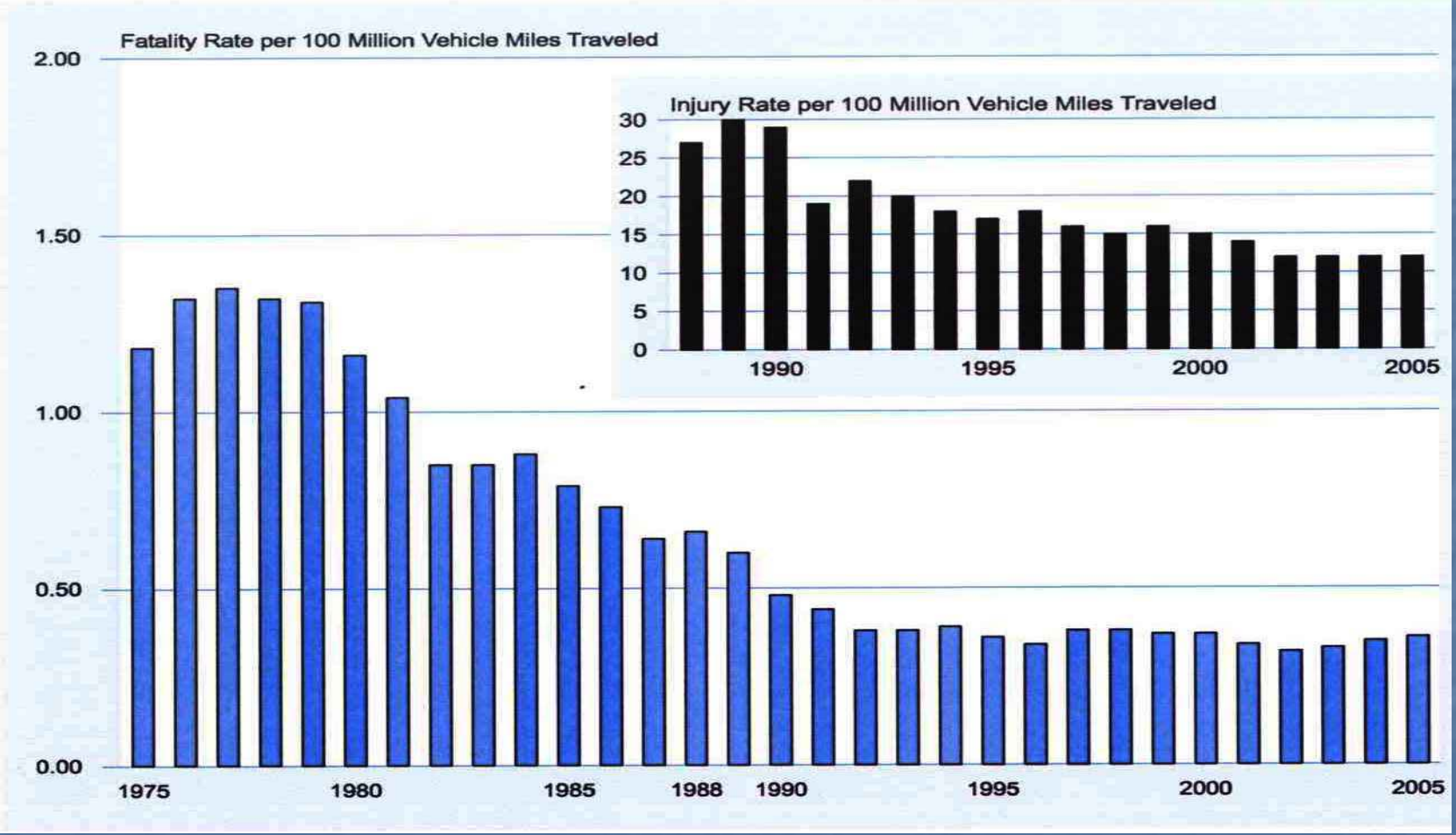
Vehicle Type	Most Harmful Event								Total	
	Collision with						Noncollision			
	Motor Vehicle in Transport		Object Not Fixed		Fixed Object					
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Occupants Killed										
Passenger Car	9,596	52.0	449	2.4	4,823	26.2	3,569	19.4	**18,440**	**100.0**
Light Truck	4,290	33.1	308	2.4	2,813	21.7	5,562	42.9	**12,975**	**100.0**
Large Truck	185	23.0	49	6.1	157	19.6	412	51.3	**803**	**100.0**
Bus	13	22.4	9	15.5	6	10.3	30	51.7	**58**	**100.0**
Other/Unknown	221	28.9	26	3.4	163	21.3	207	27.1	**765**	**100.0**
Subtotal	*14,305*	*43.3*	*841*	*2.5*	*7,962*	*24.1*	*9,780*	*29.6*	***33,041***	***100.0***
Motorcycle	*2,293*	*50.4*	*204*	*4.5*	*1,222*	*26.8*	*829*	*18.2*	***4,553***	***100.0***
Total	**16,598**	**44.2**	**1,045**	**2.8**	**9,184**	**24.4**	**10,609**	**28.2**	***37,594**	**100.0**
Occupants Injured										
Passenger Car	1,244,000	79.1	34,000	2.2	216,000	13.7	79,000	5.0	**1,573,000**	**100.0**
Light Truck	624,000	71.5	18,000	2.0	113,000	12.9	118,000	13.5	**872,000**	**100.0**
Large Truck	15,000	56.1	1,000	2.2	3,000	9.4	9,000	32.3	**27,000**	**100.0**
Bus	11,000	95.3	**	3.3	**	0.2	**	1.2	**11,000**	**100.0**
Other/Unknown	4,000	37.4	**	3.8	2,000	19.9	4,000	38.9	**10,000**	**100.0**
Subtotal	*1,898,000*	*76.1*	*53,000*	*2.1*	*333,000*	*13.4*	*210,000*	*8.4*	***2,494,000***	***100.0***
Motorcycle	*37,000*	*42.0*	*4,000*	*5.1*	*7,000*	*8.2*	*39,000*	*44.7*	***87,000***	***100.0***
Total	**1,935,000**	**75.0**	**57,000**	**2.2**	**340,000**	**13.2**	**249,000**	**9.6**	**2,581,000**	**100.0**

*Includes 158 fatalities with unknown most harmful event.

**Less than 500.

Figure 6

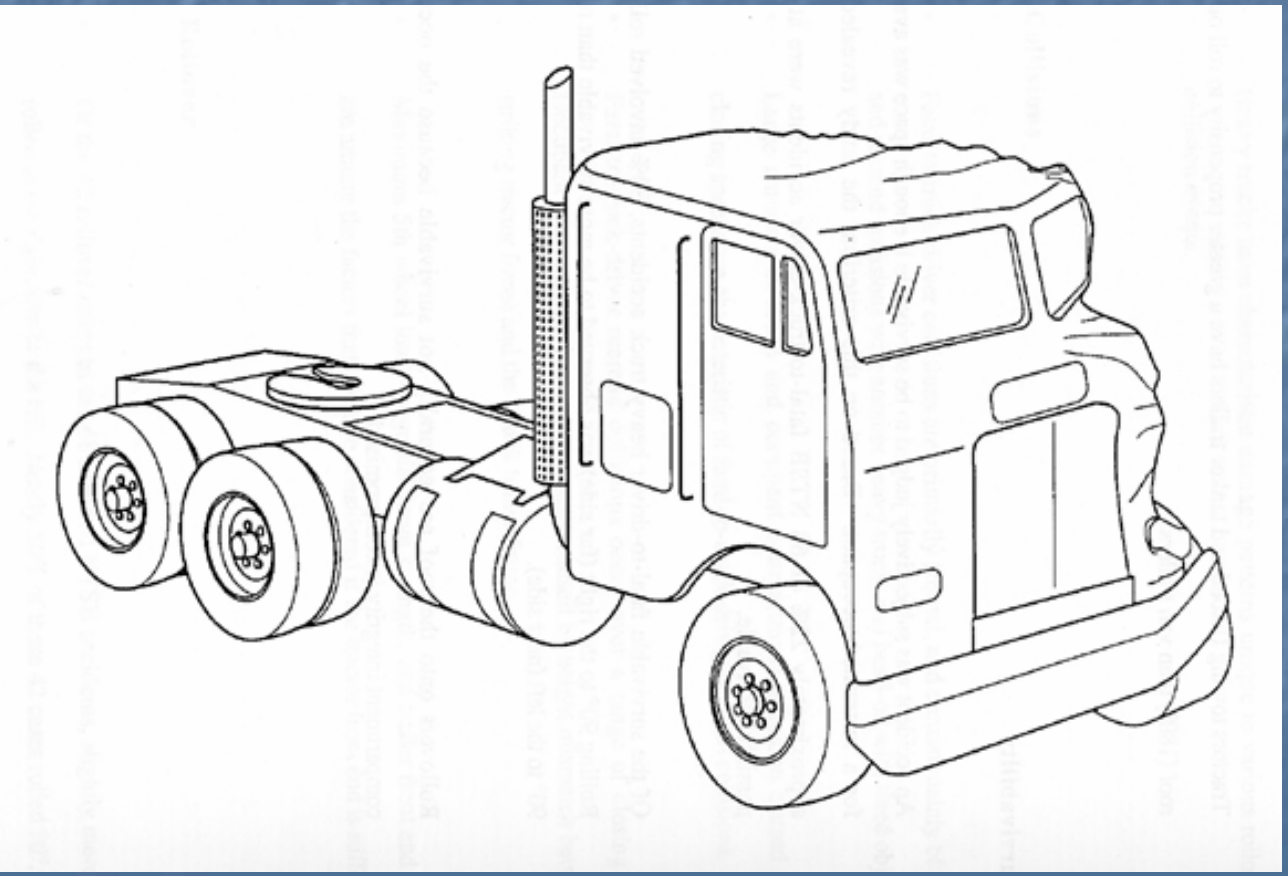
Large Truck Occupant Fatality and Injury Rates per 100 Million Vehicle Miles Traveled, 1975-2005



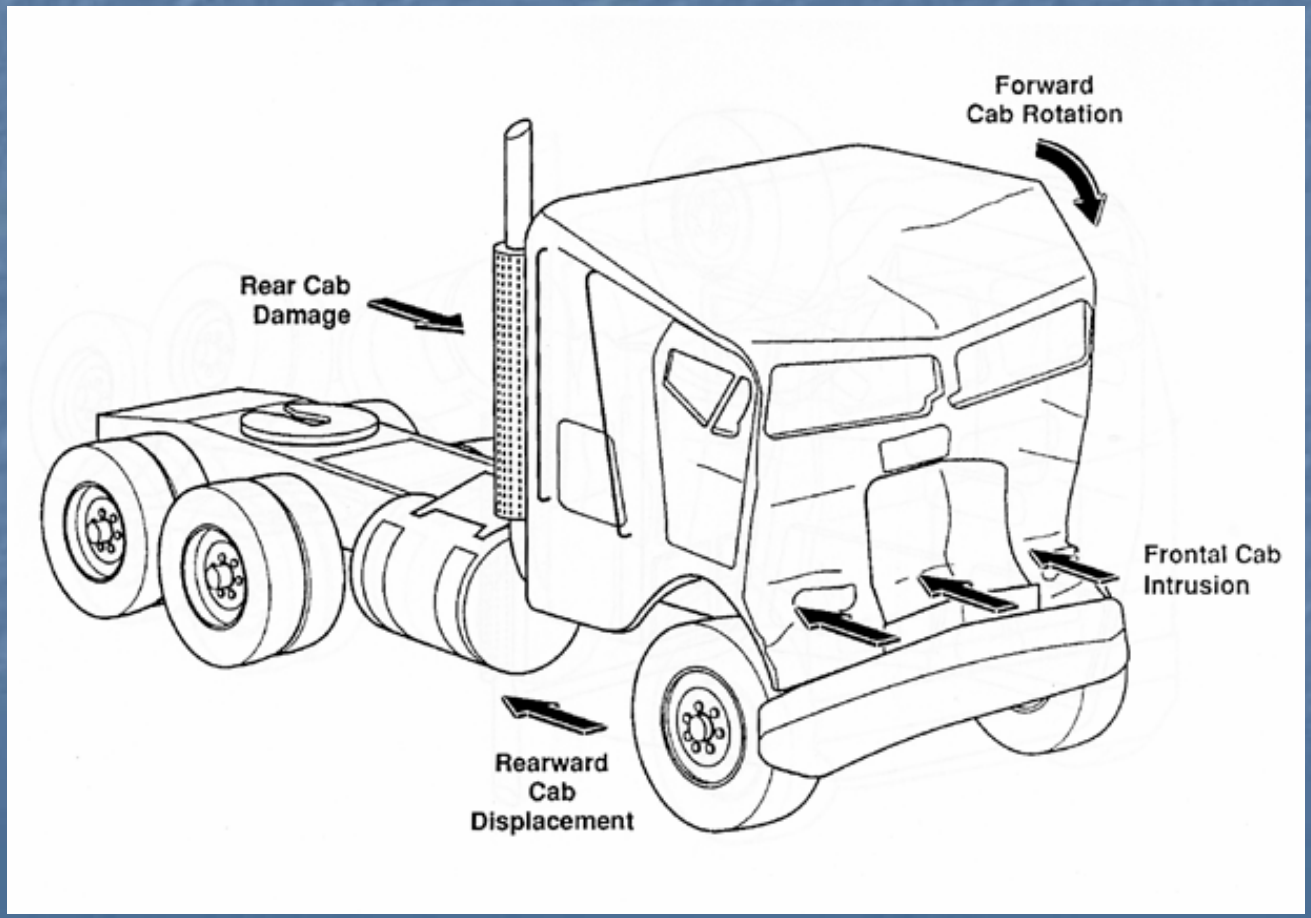
Fatal-to -Truck Driver Crash Scenarios

- Detailed Accident Scenarios
  - Head-on collisions with other trucks
  - Collisions with fixed objects
  - Rear-end collisions with other heavy trucks
  - 90° rollover without a subsequent collision
  - 90° rollover with a subsequent collision
  - 180° rollover

Fatal-to-Truck Driver Crashes Typical Damage - Frontal Collisions Head-on with Other Trucks



Fatal-to-Truck Driver Crashes Typical Damage Frontal Collision with Rear End of Other Trucks



Fatal-to-Truck Driver Crashes Frontal Collisions

Head-on collisions

- Angle -Generally frontal – approximately 0 degree
- Height above ground - Bumper up
- Degree of overlap - Large amount of offset – 50% or less
- Vehicle side - Drivers
- Impact energy - Unknown – generally very high
- Deformation - Accident dependent– can be excessive

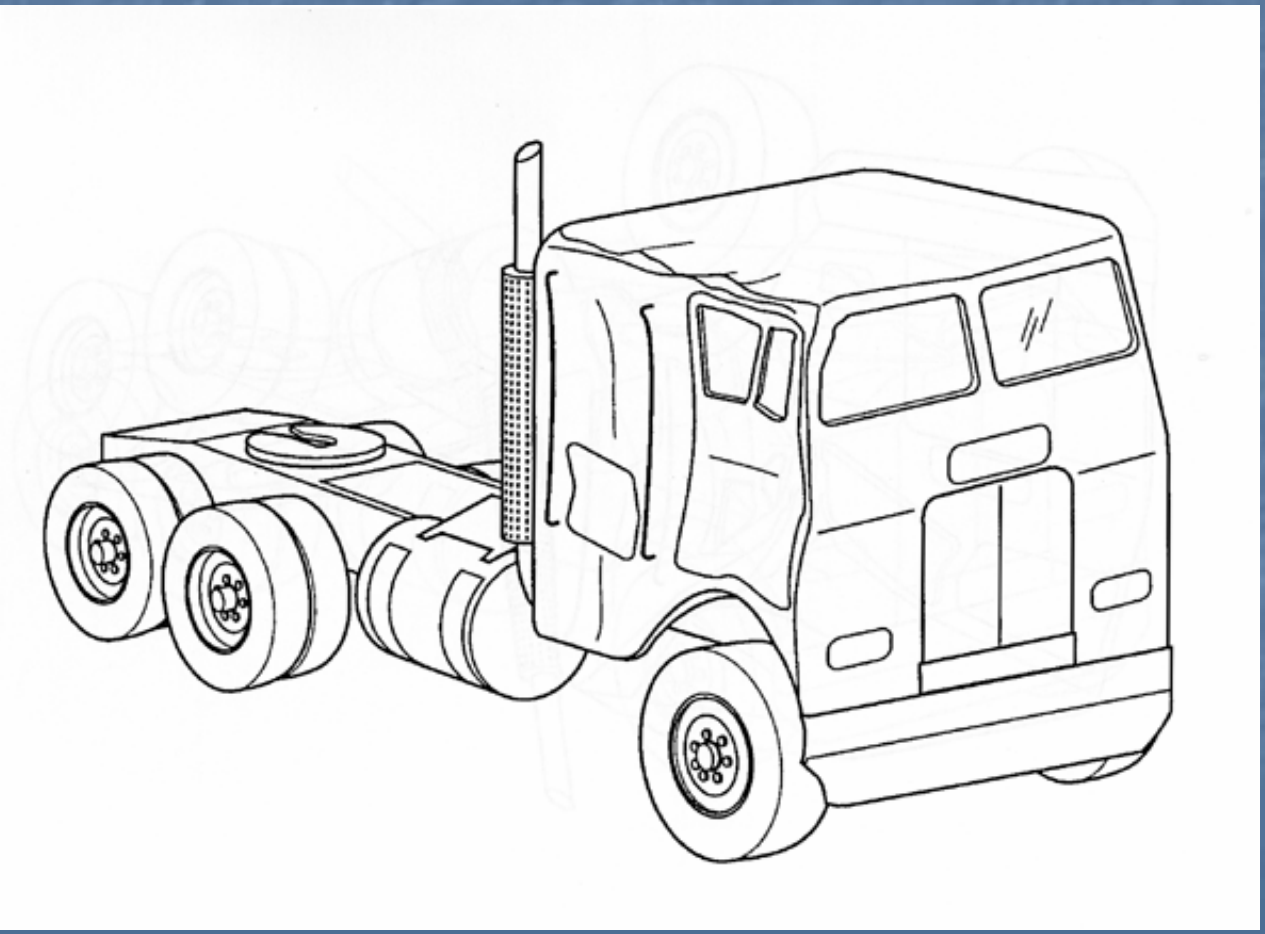
Collisions with massive fixed objects

- Angle - Generally frontal – approximately 0 degree
- Height above ground - Bumper up
- Degree of overlap - Very dependent on item hit
- Vehicle side - Either
- Impact energy - Accident unknown – generally very high
- Deformation - Accident dependent– can be excessive

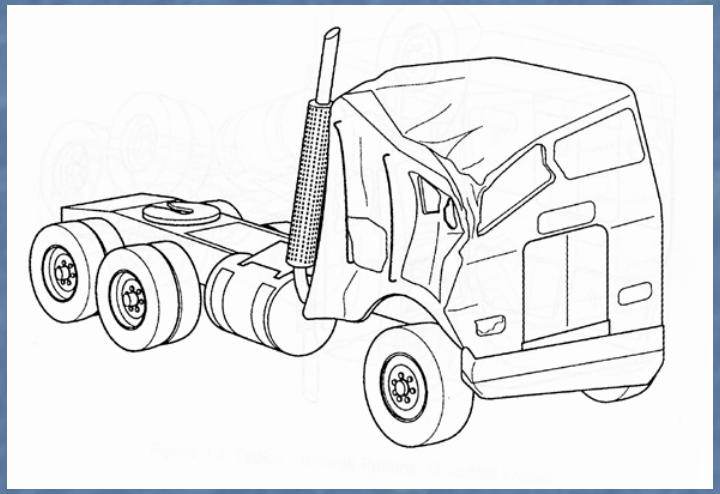
Rear-end collisions with other heavy trucks ADDRESSED BY OICA

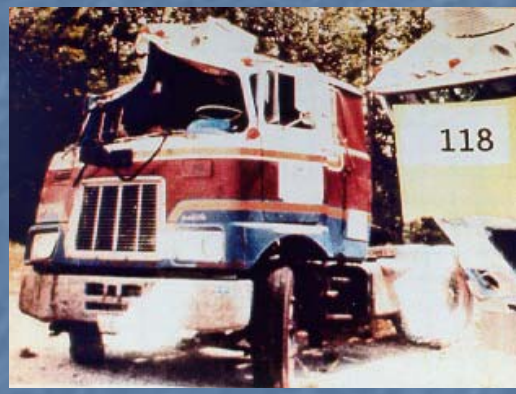
- Angle - Generally frontal – approximately 0 degree
- Height above ground - Generally trailer height -
- Degree of overlap - Full Frontal 100% overlap
- Vehicle side - Both
- Impact energy - Accident unknown –
- Deformation - Cab impacted at trailer height

Fatal-to-Truck Driver Crashes Typical Damage - 90° Rollover Without a Subsequent Impact

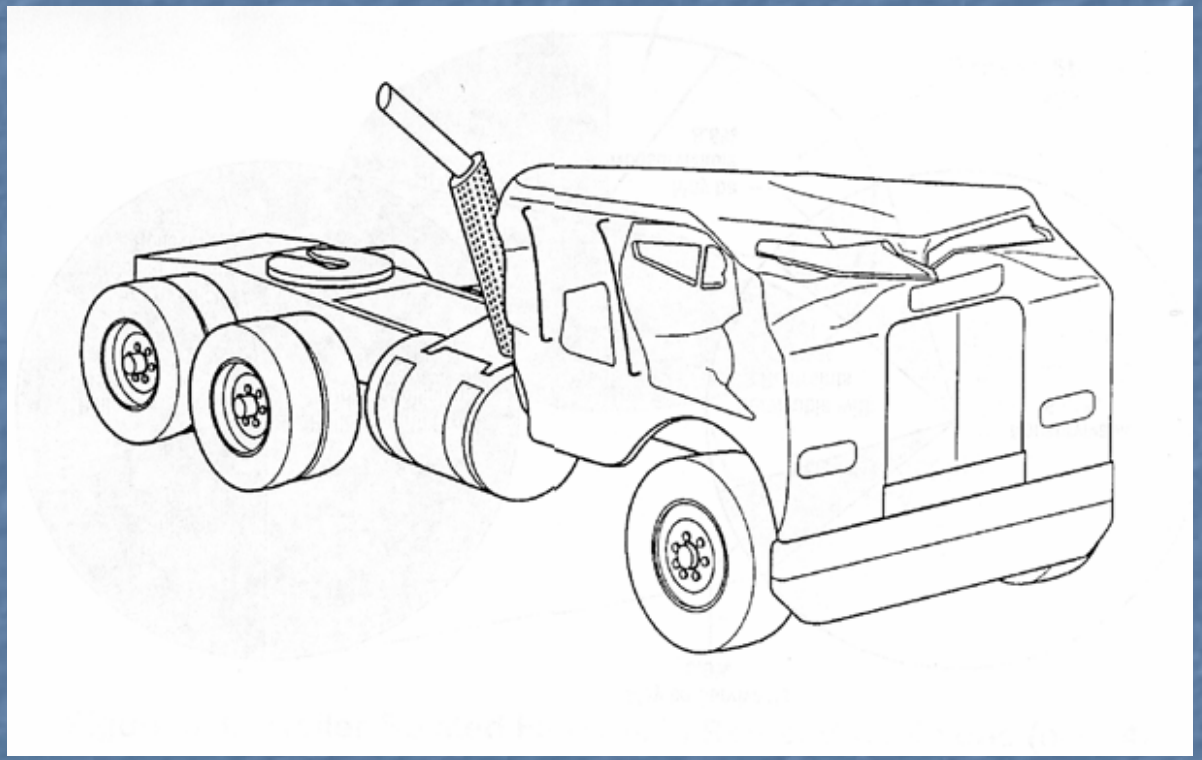


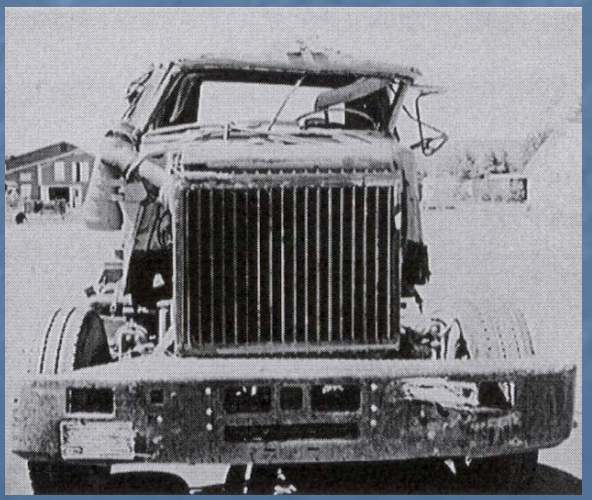
Fatal-to-Truck Driver Crashes Typical Damage - 90° Rollover with Subsequent Collision





Fatal-to-Truck Driver Crashes Typical Damage - 180° Rollover





Fatal-to-Truck Driver Crashes ROLLOVERS

90 ° rollover without a subsequent collision

- Angle - Lateral – 90 degree
- Height above ground - Roof edge on the side of the cab
- Degree of overlap - NA
- Vehicle side - Either
- Impact energy - Accident unknown
- Deformation - Generally minor

90 ° rollover with a subsequent collision ADDRESSED BY OICA

- Angle - Lateral – 90 degree & fore/aft at upper front corner
- Height above ground - Roof edge on the side of the cab & upper front corner
- Degree of overlap - NA
- Vehicle side - Either
- Impact energy - Accident unknown
- Deformation - Accident dependent -upper corner deformation can be excessive

180 ° rollover ADDRESSED BY OICA

- Angle - Generally frontal – approximately 0-degree
- Height above ground - Roof edge on the side of the cab and top of roof
- Degree of overlap - NA
- Vehicle side - Either
- Impact energy - Accident unknown
- Deformation - Accident dependent – roof deformation can be excessive