

Truck Safety from the Human Perspective: Top Ten Statements

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 David Letterman

#10

“Truck safety is not just about trucks. It is about people – their behavior and choices, their performance and failings, and how they interact with a dynamic world.”

Safety for the Long Haul Large Truck Crash Risk, Causation, & Prevention

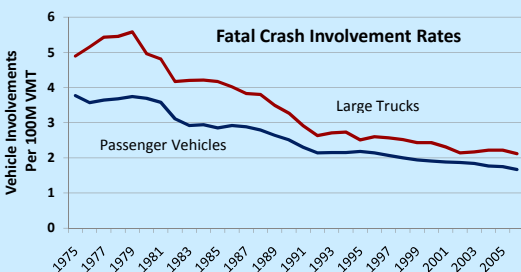
- First comprehensive textbook on large truck safety
- Human- & organization-centered
- Publisher: American Trucking Associations (ATA)
- **BIG BOOK:**
 - 619 pages
 - 13 chapters, 97 subchapters
 - 18 guest commentaries
 - ~350 figures, tables, & textboxes
- Info at www.safetyforthelonghaul.com



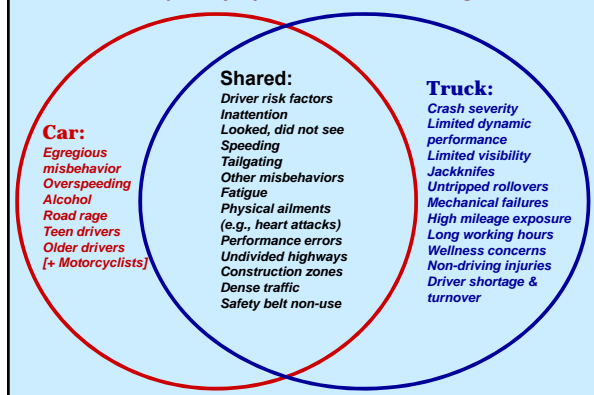
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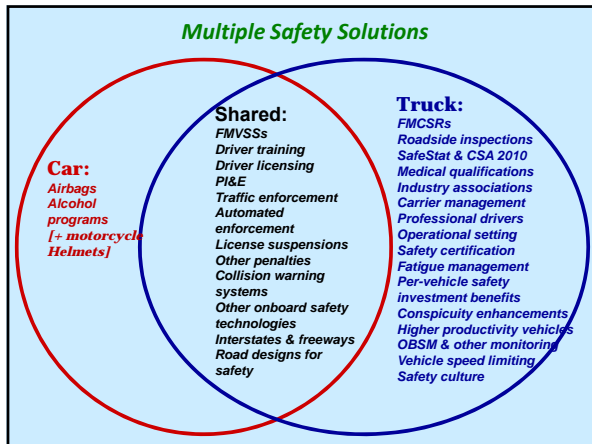
Truck safety has multifarious problems and solutions, many shared with traffic safety in general, but also many which are distinctive.

“A large portion of truck safety is rooted in the context of overall traffic safety.” Leonard Evans



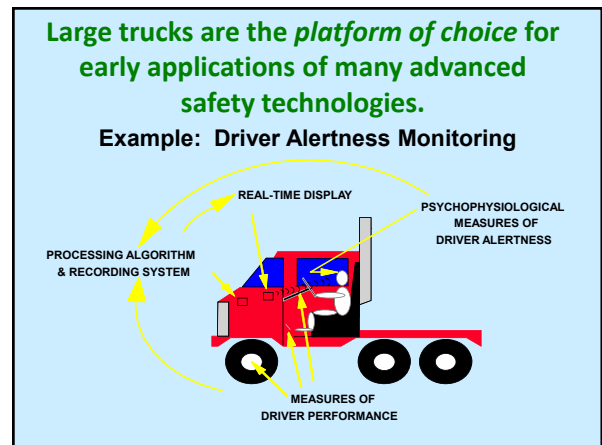
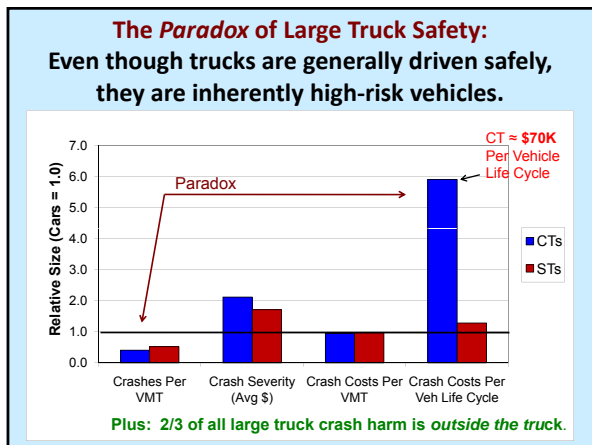
Multiple Safety Problems & Challenges





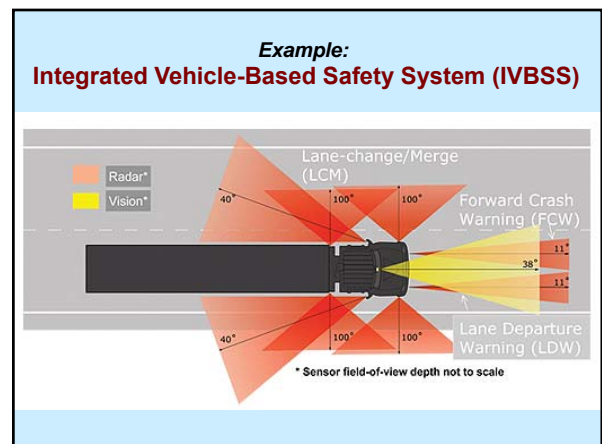
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An safety investment in trucks or truck drivers generally has far greater benefits than the same investment in cars or car drivers.



#7

These safety technologies have tremendous potential for human and economic benefits.



Large Truck Safety Technologies: Estimated Benefit-Costs*

Vehicle-Based Crash Avoidance System	Median ROI per \$1.00	Median Payback Period
Forward Collision Warning	\$4.28	23 months
Lane Departure Warning	\$3.96	23 months
Roll Stability Control	\$5.51	18 months

* FMCSA Benefit-Cost Analysis of Onboard Safety Systems.
Tech Brief No. FMCSA-RRT-09-023 based on ATRI research.
February 2009.

13

#6

The state of truck driver health & wellness is deplorable, but that is largely the fault of drivers themselves.

Two Divergent American Cultures in Regard to Health and Lifestyle



Truck drivers are among the unhealthiest Americans.

- Diet
- Exercise
- Weight
- Hypertension
- Smoking
- Sleep Apnea



**International Conference on
Commercial Driver Health and Wellness**
November 8-10, 2010; Baltimore, Maryland

www.TRB.org/conferences/2010/HealthWellness

Abstracts
Due
April 9, 2009

#5

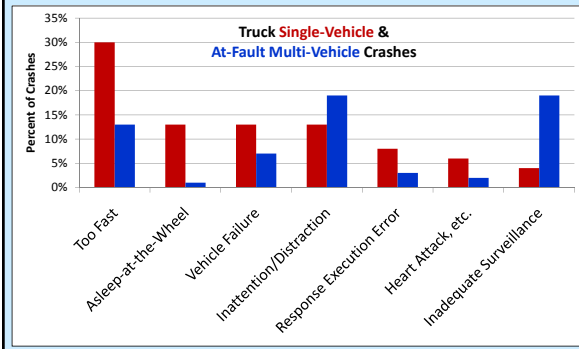
*Driver fatigue has been exaggerated
as a cause of truck crashes, and
Hours-of-Service over-rated as a
crash countermeasure.*

1990 NTSB Fatal-to-the-Driver Study

- NTSB Finding: Driver fatigue was principal cause of **31%** of 182 FttD crashes investigated.
- *What NTSB didn't tell you:*
 - Only **1 in 7** fatal crashes & **1 in 700** crashes is FttD.
 - The police-reported FttD crash fatigue rate is **5x** higher than other fatal crashes & **30x** higher than all crashes.
 - NTSB's in-depth investigation finding of 31% is just **2.7x** the police-reported **10.6%** for FttD crashes.
 - Applying the same 2.7x "correction factor" to **0.36%** of all crashes reported by police to be fatigue-related yields **0.97%**.
 - Thus, based on NTSB's in-depth investigation findings, one can surmise that **~1%** of all police-reported large truck crashes are primarily fatigue-related.

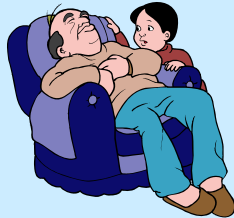
19

Large Truck Crash Causation Study (LTCCS) Asleep-at-the-Wheel in Injury/Fatal Crashes: 7% of At-Fault Crashes, 4% of All Crashes



Driver Fatigue "Gang of Four" Four Primary Factors Affecting Alertness

- Amount of sleep
- Time awake (> 16 hours)
- Circadian peaks & valleys
- Individual susceptibility.

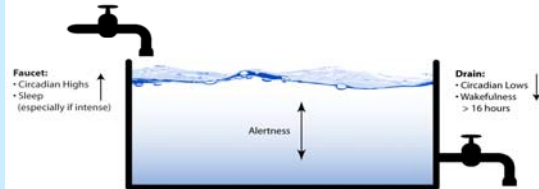


Time working/driving: **Not** a major factor in alertness!₂₁

"Bathub" Model of Alertness Changes

Daily Factors Affecting Alertness:

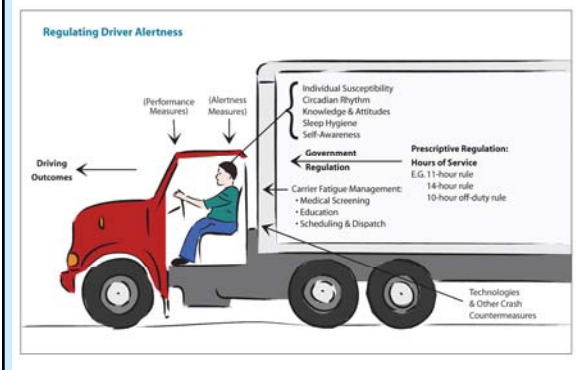
- Sleep
- Hours of wakefulness (>16 hours)
- Circadian high & low times.



Crash Risk Factors Apparent (and Not Apparent) in the LTCCS

- "Risk" assessed by comparing at-fault (especially single-vehicle) crashes to not-at-fault crashes.
- Non-fatigue-related factors included driver non-belt use, unfamiliarity with roadway, & vehicle maintenance problems.
- Fatigue-related factors included <6 hours sleep & early morning driving (4-7am).
- Fatigue-related *non*-factors included hours on-duty, hours of working, & hours of driving.
- ~70% of crashes in first 5 hours of driving
~85% of crashes in first 7 hours of driving.

Limitations of HOS (& Other!) Prescriptive Rules



Quotations to Ponder

Hours-of-Service = Fatigue Management for Dummies.
 Top Canadian provincial transportation official
 (off the record)

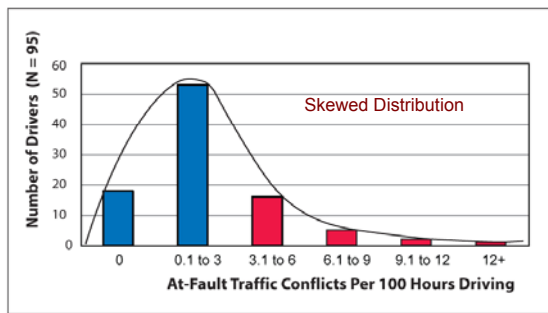
People need to take off their enforcement hats and think about how to provide a structured environment that propels everyone toward a virtuous outcome.
 Dr. Michael Belzer

Never tell people how to do things. Tell them what to do and they will surprise you with their ingenuity.
 General George Patton

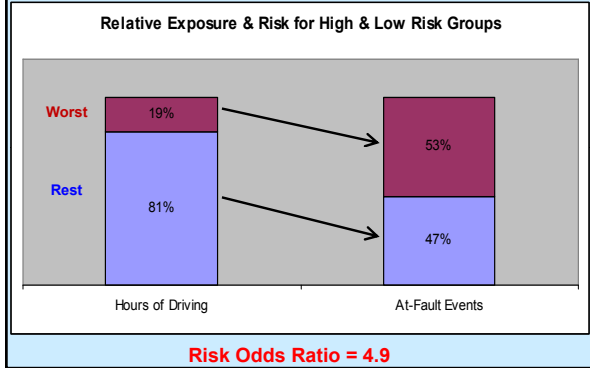
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There are profound individual differences in driver risk; 10-15% of truck drivers are responsible for 35-50% of at-fault crashes.

Plotted Frequency Distribution: At-Fault Traffic Conflicts of Among 95 Drivers in VA Tech Naturalistic Driving Study



At-Fault Traffic Conflicts Among 95 Drivers in VA Tech Naturalistic Driving Study

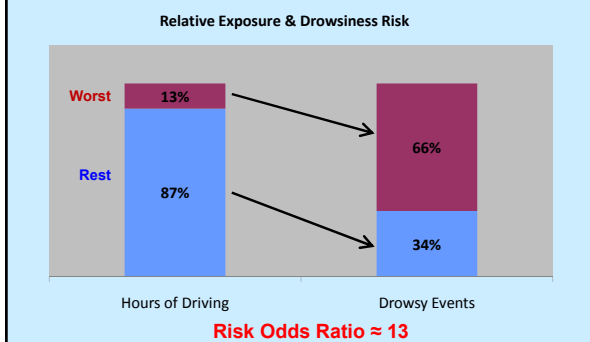


Major Factors Underlying Enduring Driver Risk

- Age (18-25 highest risk)
- Physical & medical
- Personality
- Psychiatric & behavioral disorders
- Behavioral history





Extreme Differential Fatigue Susceptibility Events With High Drowsiness: High- & Low-Risk Groups



Safety Belt Non-Use as a "Red Flag" for Driver Risk

- **LTCCS Crash-Involved, Non-Belt Using Drivers:**
 - 30% more likely to be "at-fault" in their crashes
 - 84% more likely to be in single-vehicle crashes (relative to multi-vehicle crashes).
- **VTTI Naturalistic Driving Study:** Rate of **high-drowsy** safety-critical events (incidents, near-crashes, crashes) **70% higher** for non-belt users than for belt users. *(Why?)*

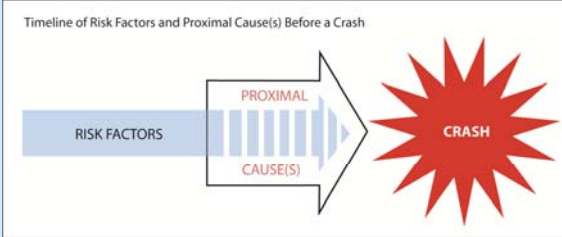
31

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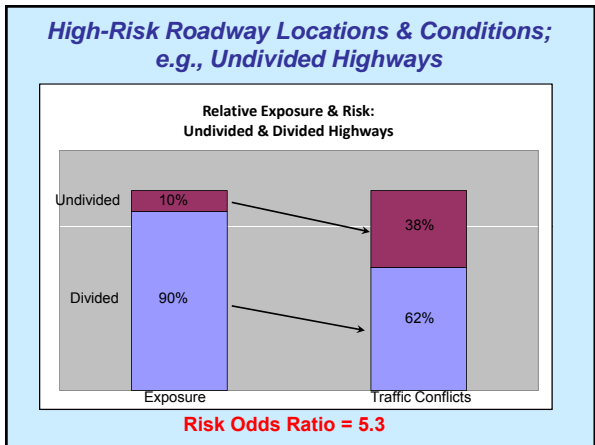
A Risk-Cause Model is a simple, elegant, and useful conceptualization of crash causation and prevention.

Crash Risk & Causation

Timeline of Risk Factors and Proximal Cause(s) Before a Crash

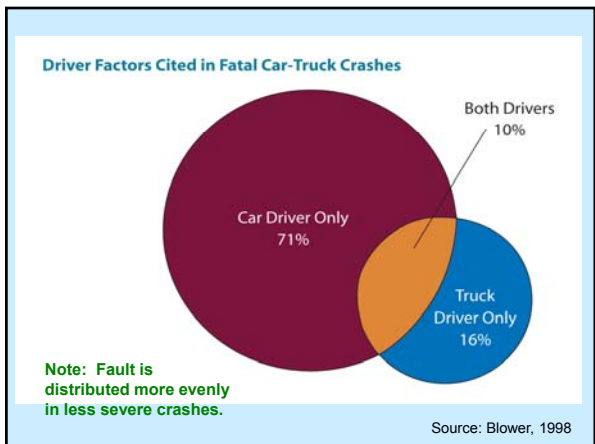


- Risk Factor vs. Proximal Cause
- Risk Factors:
 - Situational (e.g., roadway, traffic)
 - Driver Personal:
 - Enduring
 - Temporary.



Top LTCCS Truck Critical Reasons (CRs)

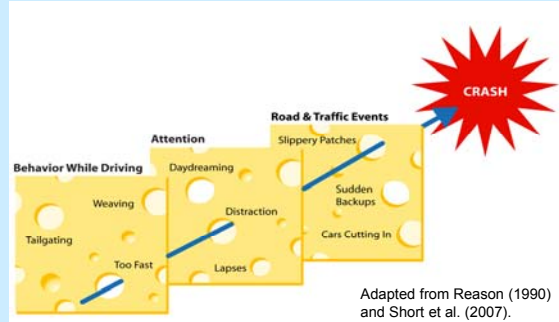
Critical Reasons (Proximal Causes)	Truck Single-Vehicle	Truck At-Fault Multi-Vehicle
Too fast for conditions or curve	30%	13%
Inattention (e.g., distraction, daydreaming)	13%	19%
Inadequate surveillance ("looked but did not see")	4%	19%
Vehicle failure (e.g., cargo shifts, brakes, tires)	13%	7%
Asleep-at-the-wheel	13%	1%
Response execution error	8%	3%
Physical impairment (mostly heart attacks)	6%	2%



#2

Proximal crash genesis can often be understood as a convergence of driver error with random bad luck; e.g., the “Crash Trifecta.”

Understanding Driver Error; e.g., Convergence of Events Causing Crashes



Causation “Trifecta” Frequently Seen in Crashes & Near-Crashes



1. **Misbehavior: Unsafe pre-event behavior**
2. **Mistake: Transient driver inattention**
3. **Unexpected traffic event.**

Crash Example

(Truck Rollover)

Near-Crash Example

(Car)

Behavioral Safety Management Focus: *Reduce At-Risk Behaviors*



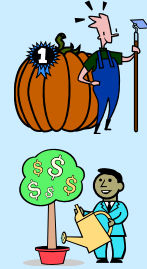
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The strongest carrier and driver safety motivators are internal and “beyond compliance.”

What motivates carrier safety?

TRB Safety Culture Synthesis Study*
Safety Manager Survey Results

1. Reduce crashes
2. Set high industry safety standard
3. Decrease insurance costs
4. Avoid costly lawsuits
5. Avoid enforcement issues
6. Attract drivers
7. Attract customers.



* Short, J. et al. Synthesis 14: The Role of Safety Culture in Preventing CMV Crashes. TRB Truck & Bus Synthesis Program, 2007.

The Safety Journey to “Beyond Compliance” External → Internal Motivation



Carrier Compliance Hierarchy



Watchwords for our drivers . . .



Thanks for your attention!

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www.safetyforthelonghaul.com

Thanks

