Overview Presentation:

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

- The first and only comprehensive textbook on large truck safety!
- Published by the American Trucking Associations (ATA).
- Author: Ronald R. Knipling, Ph.D.
- Target audiences:
  - Carrier safety managers & other officials
  - Government & industry officials
  - Students
- Purchase at (866) 821-3468 or www.atabusinesssolutions.com/

Industry Acclaim for
Safety for the Long Haul

“Every truck safety professional in the country should read this book. And every trucking company owner or chief executive, upon whom the ultimate responsibility for safety lies, should be familiar with it. And so should the next chief of the Federal Motor Carrier Safety Administration. ... What Ron Knipling ... has attempted here is to put forth in one document, for the first time, the current best understanding of the theory and practice of truck safety ... Knipling’s style is straightforward and efficient, and he has a passion for the subject that carries him through.”


Safety for the Long Haul
Author: Ronald R. Knipling, Ph.D.

- 33 years in truck & traffic safety
  - 18 years in contract R&D, including seven years with the Virginia Tech Transportation Institute
  - 12 years in U.S. DOT, including FMCSA, NHTSA, & FHWA.
- Author of more than 200 truck safety reports & presentations
- Specialty areas include:
  - Crash data analysis
  - Crash causation (LTCCS)
  - Naturalistic driving
  - Driver fatigue
  - Onboard technologies
  - Carrier safety management
  - Risk avoidance
- Accomplished trainer & instructional developer.

A Truckload of Information!

The First Comprehensive Text on Truck Safety

- Multifaceted & eclectic: More than 100 topics covered
- Fact-filled but non-technical [~ college survey textbook]
- 620 pages
- 196 illustrations, schematics, & graphs
- 156 tables & textboxes on special topics
- 18 invited expert commentaries
- Glossary, reference citations, & index

Expert Commentators

- Dr. Greg Belenky, Wash. State University
- Dan Blower, UMTRI
- Roger Clarke, Alberta Transportation
- Dr. Leonard Evans; SSS
- Gov. Bill Graves, ATA
- Dr. Rich Hanowski, VTTI
- Bob Inderbitzen, REI Consulting
- Steve Keppler, CVSA
- Dr. Peter Kissinger, AAA Safety Foundation
- Dr. Jerry Krueger, Krueger Consulting
- Gordon Lambert, C. R. England
- Dr. Brenda Lantz, NDSU
- Dave Osiecki, ATA
- Don Osterberg, Schneider National
- Doug Pape, Battelle
- Dave Parker, Great West
- Larry Shelton, America’s Road Team
- Steve Williams, Maverick

Safety for the Long Haul
Book Purposes

Useful Information
- Summarize crash causation safety facts & principles
- Review & recommend crash countermeasures & interventions (carrier emphasis).

New Directions:
- Articulate the need & opportunity for a shift in our national approach to truck safety.
Chapter 1: Introduction & Overview

Crash Fundamentals & Trends

- Decline in Fatal Crash Involvement Rates

Basic Concepts: Risk & Causation

- Driver Risk vs. Driver Error
- Risk:
  - Situational (e.g., roadway, traffic)
  - Driver Personal:
    - Enduring
    - Temporary
- Driver Error: Misbehaviors vs. Mistakes.

Pros & Cons of Safety Research Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>Experiments</td>
<td>Determines causation</td>
<td>Narrow</td>
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<tr>
<td></td>
<td>Precise</td>
<td>Expensive</td>
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<tr>
<td>Crash Databases</td>
<td>Problem size</td>
<td>No control group</td>
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<tr>
<td></td>
<td>Conditions of occurrence</td>
<td>Superficial</td>
</tr>
<tr>
<td>In-Depth Investigation</td>
<td>In-depth, serious crashes</td>
<td>No control group</td>
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<tr>
<td></td>
<td>Error &amp; causal taxonomies</td>
<td>Small Ns</td>
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<tr>
<td></td>
<td>Multiple methods</td>
<td>Expensive</td>
</tr>
<tr>
<td>Case-Control, Correlational</td>
<td>Criterion-based</td>
<td>Association, not causation</td>
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<tr>
<td></td>
<td>Many diverse factors</td>
<td>Noisy data</td>
</tr>
<tr>
<td>Naturalistic Driving</td>
<td>Direct observation</td>
<td>Not serious crashes</td>
</tr>
<tr>
<td></td>
<td>Exquisite exposure data</td>
<td>Triggers are selective</td>
</tr>
<tr>
<td></td>
<td>Large Ns (e.g., driver risk)</td>
<td>Expensive</td>
</tr>
<tr>
<td>Surveys</td>
<td>Fast &amp; easy</td>
<td>Opinion</td>
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<td></td>
<td>Flexible</td>
<td>Representativeness problematic</td>
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</tbody>
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Chapter 2: The Science of Safety: Methods

- Experiments
- Crash Databases
- LTCCS & Other Investigative Studies
- Case-Control & Correlational Studies
- Naturalistic Driving Studies
- Surveys.

Chapter 3: Driver Risk

Relative Exposure & Risk for High & Low Risk Groups

- Worst: 19%
- Rest: 81%
- Risk Odds Ratio = 4.9

Risk Odds Ratio = 4.9
Major Factors Underlying Driver Risk

- Age & gender
- Physical & medical
- Personality
- Behavioral disorders
- Behavioral indicators

Source: ATRI Driver Crash Prediction Study

Chapter 4: Driver Error

Convergence of Events Causing Crashes

The “Swiss Cheese” Causation Model

Adapted from Reason (1990) and Short et al. (2007).

Chapter 5: Driver Fatigue

Causes of Fatigue:
the “Gang of Four”
- Individual Susceptibility
- Three Temporal Factors:
  - Circadian valleys
  - Inadequate sleep
  - Excessive time awake

Daily Temporal Factors Affecting Fatigue:
Sleep-Performance “Bathtub”
- Circadian highs & lows
- Sleep
- Hours of wakefulness (>16 hours).

Chapter 6: 4-Wheelers

Note: Fault is distributed more evenly in less severe crashes.

Source: Blower, 1998
### 4-Wheeler Misbehaviors

**Alcohol Use in Fatal Car-Truck Crashes**

Plotted from Blower & Campbell, 1998

### Chapter 7: Vehicle Design & Technologies

**Truck Systems & LTCCS Rear-End Crash Involvements**

Plotted from Blower & Campbell, 1998

### Collision Warning Systems; e.g., Side Object, Forward, & Lane Departure

**Integrated Vehicle-Based Safety System (IVBSS) Truck Configuration**

### Chapter 8: Roadway & Traffic Environment

**Risky Locations & Conditions:**
- Curves & ramps
- Grades
- Undivided roadways
- Work zones
- Dense traffic; e.g., urban rush hours
- Adverse weather

### High-Risk Roadway Locations & Conditions; e.g., Undivided Highways

**Relative Exposure & Risk: Undivided & Divided Highways**

Risk Odds Ratio = 5.3

### Night Driving: Generally Safe for Trucks

**24-Hour Fatal Crash Rate Patterns: CTs & Light Vehicles**

Source: Hendrix, 2002
Chapter 9: Focus: Selected Crash Types

- Road Departure*
- Head-On
- Rollovers
- Jackknifes
- Rear-End*
- Lane Change/Merge*
- Backing
- Crossing Path (intersection)

* = “Big 3”

Chapter 10: Carrier Safety Management

Relation Between Selection Scores & Employee Job Performance for Hypothetical Job

Correlation Coefficient (r) = +0.68

Chapter 11: Special Topics in Carrier Operations

How Improved Retention Also Improves Safety (& Vice-Versa)

Increasing Safety Belt Use

Rear-End Crashes

Lead-Vehicle Stopped (LVS) & Lead-Vehicle Moving (LVM)

Greatest Source of Carrier Liability

RE-LVS CRs:
- Recognition failures (31%)
- Degraded braking (19%)
- Physical impairment (10%)
- Following too closely (8%)

RE-LVM CRs:
- Following too closely (33%)
- Too fast (25%)
- Recognition failures (20%)
- Other vehicle at-fault (16%)

Safety Management Performance Matrix

Contributed by Greer Woodruff, J. B. Hunt
Chapter 12: What About Regulation, Enforcement, & Compliance?

Limitations of Prescriptive Rules

Chapter 13: Beyond Compliance

The Safety Mountain

Watchwords for our drivers . . .

Safety for the Long Haul Seminars

- Dr. Knipling has provided Safety for the Long Haul training to both Con-way Freight and J. B. Hunt for their safety manager training. This seminar series is available to other carriers and trucking associations. If interested, contact Dr. Knipling at (703) 533-2895 or rknipling@verizon.net. The basic series consists of the six modules listed below, though the program can be customized to client needs.

- Basic Seminar Topics:
  - Module A: Introduction & Overview
  - Module B: Crash Risk Factors
  - Module C: Crash Causes
  - Module D: Driver Fatigue & Alertness
  - Module E: Carrier Safety Management

Thanks for your interest! To order, call (866) 821-3468 or go online at www.atabusinesssolutions.com

For additional information on the book or related training or consultation, visit www.safetyforthelonghaul.com or contact the author at rknipling@verizon.net.
As coal mine operations expand, haul distances to coal wash facilities can lengthen from two or three kilometers to upwards of 10 km. That's when Mayfield Equipment PTY LTD, of Singleton, NSW, Australia, likes to specify Haulmax 3900 trucks, with their proven ability to operate off-road in soft underfoot and nearly all weather conditions. Their rigid, eight-meter long by 4.9 meter bodies enable them to be loaded in two passes right at the coal face using a large-mouth loader bucket, without any rehandling. Large wheel loaders with wide, seven meter, 40 ton coal buckets load into these trucks easily. Of course, for safety reasons, we still drive to suit the conditions. We typically drive at about 70 percent of our normal speed when it's wet underfoot. Getting a long haul flight ready for departure is literally an event. There are so many people and processes involved and you only need one process to fail or the smallest issue to arise and the flight will go late, this is compounded by capacity issues at Heathrow whereby it is quite usual to close the doors on time and ask for push and start only to be told we have a start up delay. With the PA our company requires us to state several items as mandatory requirements including introducing the flight crew team and my companies policy on safety and security which includes the recommendation for customers to keep their seat belts fastened whilst seated even when the seat belt sign is off.