Special Investigation Report
Wrong-Way Driving
Overview of Investigations

Mark Bagnard
Major Investigations

- Baker, CA  March 7, 1968
- Dulles, VA  June 9, 1970
- Carrollton, KY  May 14, 1988

- 49 Fatalities
- 60 Injuries
- Wrong-way driver BAC 0.15 or more
SIR Investigations

- Arlington, TX
- Fountain, CO
- Carlisle, PA

- Dallas, TX
- Beloit, WI
- Fernley, NV

- 8 Fatalities
- 8 Injuries
- Wrong-way driver BAC 0.18 or more
SIR Investigations

- Examination of human performance issues
- Highway design issues
  - Interchange design
  - Lane management
- Traffic control devices
  - Type in use
  - Number of devices
Crash Elements vs. Data Results

- Majority of wrong-way drivers were intoxicated
- Older drivers
- Potential medical impairment
- Improper ramp use
- Crash severity typically resulted in fatalities
Fountain, Colorado
Beloit, Wisconsin
Arlington, Texas
Investigative Team

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- Dennis Collins
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- David Rayburn
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Report Development Team

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- Jana Price, Ph.D.  Project Manager
- Dan Filiatrault  Project Manager
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- Ivan Cheung, Ph.D.  FARS Analysis
- Jefferson McMillan  FARS Analysis
Safety Issues

• Driver impairment
• Highway design and traffic control devices to prevent wrong-way movements, and wrong-way driver monitoring programs
• Wrong-way navigation alerts in vehicles
Data Analysis

Ivan Cheung, Ph.D.
Office of Research and Engineering
Fatality Analysis Reporting System (FARS)

- National Highway Traffic Safety Administration data
- Between 2004 and 2009, there were 1,566 wrong-way fatal crashes on high-speed divided highways
- 2,139 fatalities
- 1,566 wrong-way drivers and 1,934 right-way drivers
Alcohol Impairment Among Wrong-Way Drivers, 2004–2009

Analysis based on 1,150 wrong-way drivers with reported BAC results
Alcohol Impairment Among Wrong-Way Drivers, 2004–2009

69% BAC ≥ 0.08
Wrong-way drivers

11% BAC ≥ 0.08
Right-way drivers

Analysis based on 1,150 wrong-way and 612 right-way drivers with reported BAC results
Over-Representation of Older Drivers, 2004–2009

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<th>Driver’s Age</th>
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Over-Representation of Older Drivers, 2004–2009

Number of drivers

Driver’s Age

≥80  4  119
70-79  47  114
60-69  82  136
50-59  153  284
40-49  222  398
30-39  314  413
20-29  314  486
<20  67  129

15% versus 3%

Right-way driver
Wrong-way driver
Driver Impairment

Jana Price, Ph.D.
Overview

• Alcohol impairment
  • Alcohol ignition interlock devices
  • Emerging in-vehicle alcohol detection technologies
• Older drivers
Alcohol Impairment

• Leading factor in wrong-way driving collisions
  • 7 of 9 had BAC \( \geq 0.15 \)
  • 60–70% of all wrong-way drivers impaired by alcohol

• 10,228 people died in crashes involving alcohol-impaired drivers in 2010
  • 31% of all highway fatalities
Eliminating Substance-Impaired Driving

- On NTSB Most Wanted List
- Over 120 safety recommendations since 1968
- 2012 Forum on Actions to Eliminate Substance-Impaired Driving
Alcohol Ignition Interlocks

- Prevent engine start until breath sample is analyzed
- Running retests ensure driver remains unimpaired
- Reduce recidivism; use by all offenders estimated to save over 1,000 lives/year
- 17 states and 4 California counties require interlocks for all offenders

Source: www.dui-usa.drinkdriving.org
New In-Vehicle Alcohol Detection Technologies

• Most fatal alcohol impairment accidents involve drivers with no prior DWIs
• Driver Alcohol Detection System for Safety (DADSS) Program
  • Breath-based system
  • Touch-based device
• Prototype research vehicle currently in development
Older Drivers

• Drivers over age 70 over-represented in fatal wrong-way crashes
• Aging associated with loss of functional abilities such as visual processing and cognition
• Drivers retaining licenses longer
Older Drivers

• NHTSA Program Guideline #13
  • Medical review
  • Education
  • Roadway design
• MAP-21
Summary

- Alcohol impairment is the primary cause of wrong-way collisions
  - In-vehicle technologies can prevent driving based on driver BAC level
- Drivers over 70 are over-represented in wrong-way collisions
  - Guideline #13 provides comprehensive approach to older driver safety
Highway Design, Traffic Control Devices, and Wrong-Way Driver Monitoring Programs

Dan Walsh, P.E.
Overview

• Where wrong-way maneuvers occur
• Traffic control devices used to discourage wrong-way movements
• Improvements to signage and exit ramp design
• FHWA role
Wrong-Way Signage

- Standard signage in the MUTCD to deter Wrong-Way Entry
  - ‘ONE WAY’ sign
  - ‘DO NOT ENTER’ sign
  - ‘WRONG WAY’ sign
Wrong-Way Pavement Markings

- Standard pavement markings in the MUTCD to deter Wrong-Way Entry
  - Wrong-Way Arrow
  - Turn Lane-Use Arrow
  - Turn/Through Lane-Use Arrow
Improvements to Signage

- State DOT and local jurisdiction improvements to signage at exit ramps
  - Lowering sign height
  - Using oversized signs
  - Mounting multiple signs on the same post
  - Implementing standard wrong-way sign package
  - Applying red retro-reflective tape to the vertical posts
Improvements to Signage

Courtesy of the New York State Department of Transportation
Improvements to Exit Ramp Design

- Majority of wrong-way entries occur at partial cloverleaf interchanges
- Change ramp geometrics
  - Obtuse angle
  - Sharp corner radii
  - Non-traversable medians
- Provide roadway lighting
Wrong-Way Monitoring Programs

- States that have conducted projects to monitor wrong-way drivers on freeways
  - California
  - Texas
  - Arizona
- Provided an effective means of identifying wrong-way accident trends
FHWA Role

- FHWA has taken a limited role on the issue of wrong-way driving
  - Primarily has focused on guidance in the MUTCD and Green Book
- Identify the approaches by which states assess wrong-way driving
  - Identify problematic intersections
  - Identify countermeasures
Summary

• Improvements to highway signage and highway design
  • Reduce the incidence of wrong-way accidents
• Better and more visible signage
• Resource manual would help state efforts to counter wrong-way entry
  • Proven strategies to prevent wrong-way movements
Wrong-Way Navigation Alerts

Steven Prouty
Overview

- Global Positioning System (GPS) and detailed map-based systems that alert drivers to wrong-way movement
- Need for consistent and intuitive messages and alerts from all devices
GPS-Based Navigation Alerts

- Geospatial position data
- Detailed map data
- Navigation systems
  - Built-in navigation systems
  - Aftermarket navigation systems
- Audible and visual warnings
Summary

• Use existing GPS navigation technologies to provide wrong-way movement alerts

• Provide consistent messages or alerts that are intuitive to the driver