Mitigating Wrong-Way Driving Crashes

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Texas Statewide
Impaired Driving Forum
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What is Wrong-Way Driving (WWD)?

An event where a driver, inadvertently or deliberately, drives in the opposite direction.
Nationwide WWD Crashes

• 3% of all crashes on freeways
• About 270 fatal crashes per year
• Results in 360 fatalities per year

Photo courtesy of Watchara Phomicinda/AP
Findings from NTSB 2012 report & ITE Journal Article in August 2014
### US WWD Fatalities By State (2004-2011)

<table>
<thead>
<tr>
<th>State</th>
<th>Average Frequency</th>
<th>Percent of US Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>51</td>
<td>14</td>
</tr>
<tr>
<td>California</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>Florida</td>
<td>28</td>
<td>8</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Missouri</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td></td>
</tr>
</tbody>
</table>

Findings from ITE Journal Article in August 2014
Texas WWD Crashes (2007-2011)

<table>
<thead>
<tr>
<th>Functional Class</th>
<th>Number of Crashes</th>
<th>Percent of Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>1409</td>
<td>21</td>
</tr>
<tr>
<td>Frontage Road</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>4392</td>
<td>68</td>
</tr>
<tr>
<td>Unknown</td>
<td>664</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>6503</td>
<td>100</td>
</tr>
</tbody>
</table>
Texas WWD Crashes on Freeways

- About 237 WWD crashes/year since 2010
- More than half resulted in fatality or injury
Texas WWD Crashes on Freeways*

86%

59%

14%

30%

* 1187 crashes on Texas freeways from 2010 to 2014

Texas A&M Transportation Institute
Texas WWD Crashes by Time of Day*

* 1409 crashes on Texas freeways from 2007 to 2011
Blood Alcohol Concentration*

* Only reported for 71 out of 228 drivers that were tested from 2010 to 2014

Average BAC level was 0.18
A Few More Things to Consider

• Majority of specific entry points unknown
  – Primary origin is entering an exit ramp in the wrong direction
  – Other origins include u-turns on main lanes, u-turns at entrance ramp, and crossing median

• More WW movements (events) than crashes
San Antonio Area WWD Data

Avg. 33 Crashes/year*

Avg. 447 Events/year**

* CRIS data from 2010 to 2014
** SAPD data from 2011 to 2015
Alcohol-Impaired Driver Study

• Conducted at night on a closed-course

• Phase 1 study objectives
  – Determine where alcohol-impaired drivers look
  – Determine impact of alcohol on sign color recognition
  – Determine impact of alcohol on sign legibility distance

• Phase 2 study objective
  – Assess conspicuity of select WWD countermeasures using alcohol-impaired drivers
Where Do Alcohol-Impaired Drivers Look?

- Look more at pavement in front of vehicle
- Concentrate glances in a smaller area
Other Research Findings

• At higher BAC levels must be closer to sign to
  – Identify sign background color
  – Read sign legend

• At higher BAC levels drivers misidentified red sign background color as orange

• At higher BAC levels takes longer to find signs and arrow pavement markings
Big Picture

• Variety of countermeasures and mitigation methods needed to combat WWD
  – Low-cost traffic control devices are effective
  – Some WW drivers will still enter freeway

• Need capability to detect, monitor, and warn
  – Limitations with current capabilities
  – Connected vehicles (CVs) provide a new approach
2011 Texas Manual on Uniform Traffic Control Devices (MUTCD)
Signing Countermeasures

TxDOT
Signing Countermeasures, cont.

56% reduction in WWD events
Signing Countermeasures, cont.

32-38% reduction in WWD events
Marking Countermeasures
Marking Countermeasures, cont.
Marking Countermeasures, cont.
Warning Messages for DMS

• **WARNING**
  – Conveys urgency
  – Distinguishes from traffic safety messages

• **WRONG WAY DRIVER**
  – Do not split phrase onto two lines
  – Location implied
  – Non-specific driving action implied

• **REPORTED**
  – Validation that ongoing event
Key CV System Features

• Reduce the time from detection to alerting the right way drivers and law enforcement

• Ability to provide warning message in-vehicle in addition to broadcasting to DMS
How Do CVs Work?

• Dedicated short range communication (DSRC)
  – Roadside unit (RSU)
  – Onboard unit (OBU)

• Basic safety message (BSM)
  – Position
  – Direction
  – Speed

• Roadside alerts (RSA)

• Map message
Types of In-Vehicle Messages

- Wrong-Way Warning Message
- Alert Message to Right-Way Vehicle
- Alert Message to Law Enforcement
Contact Information

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