The Effects of Motor Vehicle Fleet Daytime Running Lights (DRLs) on Motorcycle Conspicuity

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Introduction

- Motorcycles are often involved in crashes in which the other driver turns left in the motorcycle’s path
- Two hypotheses for this crash configuration: poor motorcycle conspicuity, and poor speed-spacing judgment of other drivers
  - Speed-spacing judgment: driver’s accuracy at estimating closing rate of approaching vehicle
  - Conspicuity: “…the degree to which an object can be distinguished from an environmental display, that is its visual prominence due to its physical characteristics1”

Introduction

This study included two evaluations of several types of motorcycle DRLs:

- Participant’s judgments of last safe distance to turn left in front of an oncoming motorcycle on a test track
- Gap size of unalerted driver's left turn in front of test motorcycle under different levels of fleet DRL use
Test Track Evaluation

- Speed-spacing Judgment
- Goal: To investigate how conspicuity treatments affect drivers’ perceptions of last safe gap to turn left in front of an oncoming motorcycle

Test Set-up
- Test track: over 275 m of straight roadway
- Twenty-five subjects, none were motorcycle riders
- Subjects sat in stationary vehicle, pressed button at “last safe gap.” Subjects also subjectively ranked treatment conspicuity
Test Track Evaluation

1. Motorcycle start point
2. Path of Motorcycle
3. Participant Vehicle
4. Intersection
## Test Track Evaluation

- **Results: Gap Distance and Subjective Ranking**

<table>
<thead>
<tr>
<th>DRL Treatment</th>
<th>Distance (m)</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Car</td>
<td>95.0*</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>Driving Lights with Lower Beam</td>
<td>84.4</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lower Beam</td>
<td>83.9</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Reduced Intensity Upper Beam</td>
<td>83.7</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fork Lights with Lower Beam</td>
<td>81.4</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Dual Lower Beams</td>
<td>81.4</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Enhanced Parking Lamps with Lower Beam</td>
<td>81.2</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Modulating Lower Beam</td>
<td>79.1*</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Results: no motorcycle treatment(s) was clearly better than others

- It is expected that some of the treatments could be enhanced to show greater performance, e.g., brighter fork lights

The following treatments were selected for on-road study based on practical considerations:

- Modulating Lower Beam
- Driving Lights
- Reduced Intensity Upper Beam
- Lower Beam (baseline)
On-road Evaluation

Lower Beam (baseline)
Modulating Lower Beam
Reduced Intensity Upper Beam
Driving Lights with Single Lower Beam
On-road Evaluation

- Goals: To determine whether the level of fleet DRL use affects motorcycle conspicuity, which treatments are most effective at each level

- Methodology
  - Dual approach: measure gap spacing for unalerted drivers turning left across path of test motorcycle, then interview observed drivers
    - 438 drivers in US, 448 drivers in Canada
    - Also recorded gap afforded to passenger fleet (baseline)
  - Tests performed in US site (Buffalo, NY) and Canadian site (London, OT)
    - Control background for turn with confederate vehicle (DRL, no DRL)
On-road Evaluation

View of Driver

Confederate Vehicle

Mall

Motorcycle
On-road Evaluation

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Current Status

- We are currently conducting additional analyses of the data
- The full report will be available on the NHTSA website early 2006