Minimizing the Distraction-Related Crash Risk from In-Vehicle Technologies

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National Traffic and Motor Vehicle Safety Act of 1966

General Requirements: “The Secretary of Transportation shall establish by order appropriate Federal motor vehicle safety standards. Each such FMVSS shall be practicable, shall meet the need for motor vehicle safety, and shall be stated in objective terms.”

“Motor Vehicle Safety means the performance of motor vehicles or motor vehicle equipment in such a manner that the public is protected against unreasonable risk of accidents occurring as a result of the design, construction or performance of motor vehicles…”
Key Distraction Research Questions

• What motor vehicle equipment is distracting?
• Does distraction increase crash risk?
• If ‘yes’, what distraction risk is unreasonable?
• How should a reasonable distraction risk be achieved?
Potentially Distracting Equipment
Does distraction increase crash risk?

Crash Probability

Degree of Driver Attention to Devices
Possible Criteria to Limit Risk:

• Increased crashes due to device use
• Acceptability to public
• Industry best practices
• Benchmarks
  – Performance at legal Alcohol Level
  – Performance tuning Radio
Increased Crashes:
Use of device should not increase crash rate beyond some amount

- Most direct safety measure, but...
- “After the fact” measure
- Driver reports can be unreliable
- No exposure measure to assess degree of risk
Public Acceptability:
If drivers will accept lockouts, don’t allow operation while driving

Would you purchase a system that prevents you from entering a destination address while the vehicle is in motion?

481 responses from NHTSA Distraction Internet Forum, 2000
Public Acceptability

**Advantages**
- Gives users what they want
- Democratic
- Could use info to set system default to 85 %ile
- Info obtained easily through interviews

**Disadvantages**
- Drivers’ opinions influenced by using technology
- Difficult to apply in early design stages-need working prototype
- Drivers misperceive risk
Industry Best Practices:
Performance using device should be as good as best designs being sold

Minimum and Maximum Number of Key Presses to Enter a Destination in Navigation System

From NHTSA Inventory of In-Vehicle Technologies, 2002
## Best Practices Approach

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• Conceptually easy to understand</td>
<td>• Too design oriented</td>
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<tr>
<td>• Similar to setting stopping distances for brake system standard</td>
<td>• Not suited to new devices still in development</td>
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<td></td>
<td>• Which design parameters to limit?</td>
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Benchmark Approach

• Compare driving performance using distracting device to performance that is at *acceptable* limits

• Example benchmarks are
  – Legal alcohol limit
  – Tuning a radio
Alcohol Benchmark

• Performance using new technologies should be no worse than performance when at the legal alcohol limit (Burns et al)
  – Compared object detection, speed control, reaction times, etc. on simulated driving tasks
  – Performance with hand held phone worse than with alcohol, which was worse than normal driving
Alcohol Benchmark

**Advantages**
- Accepted limit of dangerous risk
- Can experimentally quantify and compare driving performance

**Disadvantages**
- Legal limit changes over time
- Impairments from alcohol may not be the same as distraction
- Exposure to risk different—time, population, driving conditions
Radio Tuning Benchmark

• Performance on new devices should be no more demanding than effort to tune radio (Tijerina, Alliance of Auto Mfg)
  – Current practice permits tuning radio, which can be distracting and a crash risk
  – Driving task performance associated with radio tuning is basis for deciding to lock out new devices while driving
Radio Tuning Benchmark

**Advantages**
- Tuning task similar to some new technology tasks
- Metrics can be applied at various stages of product development
- Publicly acceptable risk level

**Disadvantages**
- Radio tuning has little cognitive component
- Implementation issues: what radio?
- Drivers may trade off secondary task performance for driving performance
- Not applicable to multiple devices
What is NHTSA Doing?

• Measuring distracted driver performance on test tracks and simulators
  – Workload Metrics development (CAMP)
  – Existing telematics/infotainment devices
  – Voice interface characteristics
  – Wireless phone use

• Analysis of naturalistic driving data to compute distraction risk
  – Determine risk associated with task completion time and eyes-off-road time.

• Monitor distraction directly to warn drivers or limit information accessibility
  – Adaptive interfaces, workload managers