DaimlerChrysler

Safety Benefits of Flashing Brake Lights

Dr. Joerg Breuer
USA: 5% of all fatal crashes occur in rear end collisions, economic cost $18.3 Billion per year (NHTSA)

Japan: 34.2% of all accidents are rear end collisions (1999), numbers increased 1995-1999 by 4.2%
Goals

- Comparison of Reaction Times in emergency braking situations
  - conventional brake lights
  - conventional brake lights + hazard warning lights
  - flashing brake lights
    - flashing frequency 4 Hz
    - flashing frequency 7 Hz
- Experiments on test track and in laboratory (08/2002)
Test Track Experiment

- 39 subjects aged 18 - 63 (Ø 36) years, 39% female
- car following task, different driving maneuvers
- preceding vehicle performed sudden emergency braking maneuvers (brake assist activation)
- measurement of reaction times and acceptance
Test Track Experiment
Reaction Times: Baseline Values

- measured after driving tests in stationary vehicles (distance = 40m)
- reaction time = time between activation of brake lights in lead vehicle and first activation of brake pedal in subject vehicle

Dr. Jörg Breuer (EP/ GFS)
Frequency Distribution of Reaction Times*

Dr. Jörg Breuer (EP/ GFS)

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* standardized by subtraction of baseline value of reaction time to brake lights (stationary vehicles)
Reaction Times* (first emergency braking)

Flashing brake lights significantly reduce mean reaction times by up to 0.2 s.

* standardized by subtraction of baseline value of reaction time to brake lights (stationary vehicles)
Safety Benefit of Earlier Brake Reaction*

* estimation based on deceleration of 8 m/s²
Other Factors

Weather effect (test track):
- longer reaction times in rainy conditions
- biggest increase for hazard warning lights (mean: 0.12 s)
- lowest increase for flashing brake lights (mean <0.06)

Distraction (secondary task, laboratory):
- longer reaction times when performing secondary task (ca. 0.1 s)
- significantly shorter reaction times for flashing brake lights (7 Hz)

Acceptance
- flashing brake lights are most preferred
Summary

- Flashing Brake Lights
  - indicate emergency situation (flashing red)
  - non-ambiguous, intuitive
  - reduce reaction times by up to 0.2 s compared with conventional brake lights

- Hazard warning lights
  - serve as attention getter but
  - do not significantly reduce reaction times in emergency braking situations