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Tire Pressure Monitoring Systems

VRTC CRASH AVOIDANCE RESEARCH

BACKGROUND In the TREAD Act of November 1, 2000, Congress required the National Highway Traffic Safety Administration (NHTSA) to develop a rule requiring all new motor vehicles to be equipped with a warning system to indicate to the operator when a tire is significantly underinflated. In response to this requirement, NHTSA undertook an evaluation of existing OEM and aftermarket tire pressure monitoring systems for light vehicles. In this evaluation NHTSA determined the capabilities of existing technologies and the methods of warning the driver that were under consideration by system manufacturers. Based on this evaluation, NHTSA determined the minimum system performance criteria that were technically feasible and provided the most useful information to the driver for preventing unsafe conditions.

RESULTS OF EXAMINATION OF EXISTING TIRE PRESSURE MONITORING SYSTEMS

Through its testing, NHTSA found that systems that use sensors to directly measure tire pressure (pressure-sensor based systems) were better able to detect underinflation, had more consistent warning thresholds, and were quicker to provide underinflation warnings than the systems that infer tire pressure from monitoring wheel speeds (wheel-speed based systems). Training the systems presented at least some level of problem for both system types. Wheel-speed based systems were found to be easier to maintain since there are no battery life concerns and the fact that sensors are not exposed to tire mounting and roadway hazards.

An examination of driver interfaces for existing TPMS showed significant variation in methods of visual warning presentation. Visual displays were frequently difficult to see or comprehend, or both. The variation in visual warning presentation demonstrated the need for standardization of the visual warnings of tire underinflation to avoid driver confusion. Icon comprehension testing, which examined the ability of two ISO icons and 13 alternative icons to communicate the message of low tire pressure, showed that the ISO icons performed worse than all of the other icons. Six of the alternative icons received 100 percent comprehension. One of the icons was identified as most likely to be successful as an indication of significant underinflation.

A complete description of the methods used and results of this examination are contained in the NHTSA report, "Examination of Existing Tire Pressure Monitoring Systems".

- [Download the NHTSA Final Report: "Preliminary Findings of the Effect of Tire Inflation Pressure on the Peak and Slide Coefficients of Friction"](#). (Adobe Acrobat format, 2.1 MB)
- [Download the NHTSA Final Report: "Examination of Existing Tire Pressure Monitoring Systems"](#). (Adobe Acrobat format, 2 MB)
- [Download the Human Factors and Ergonomics Society \(2001 Annual Meeting\) paper: "Development of an Automotive Icon for Indication of Significant Tire Underinflation"](#). (Adobe Acrobat format, 210 KB)

[Other NHTSA Sites](#) [Safercar.gov](#) [TrafficSafetyMarketing.gov](#) [EMS.gov](#) [911.gov](#) [StopImpairedDriving.org](#) [Distraction.gov](#) [Cars.gov](#)

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