RESEARCH PAYS OFF

REAR GUARD

Additional Brake Lamps Help Prevent Rear-End Crashes

Problem

According to statistics recorded by accident reporting systems, a large proportion of traffic accidents involve rear-end crashes. An analysis of National Accident Sampling System data for 1979 and 1980, for example, revealed some 3,500,000 crashes per year that involved a vehicle striking the rear end of a passenger vehicle. Of these incidents, 77 percent occurred in urban areas and 23 percent in rural areas.

Deficiencies in rear-end vehicle lighting appeared to be a contributing factor in these crashes. In the late 1960s, the U.S. Department of Transportation funded six projects that were the first steps of a program to improve vehicle rear lighting systems. Targets of the research included definition of driver information needs, and design, development, and testing of various rear signal systems, as well as development of simulation techniques that would allow researchers to make design recommendations. The economic, legal, and technical aspects of changing vehicle rear lighting systems were also examined. The eventual goal of the work was an improved rear lighting system.

Solution

In response to the results of the original studies, two field research programs began in the early 1970s. This field work established the possibility of reducing the response times of following drivers and the potential benefits of supplemental brake lights. One promising brake light design was the center high-mounted stop lamp (CHMSL).

On the basis of this early research, DOT's newly founded National Highway Traffic Safety Administration sponsored large-scale field studies to demonstrate the safety benefits of rear lighting and signaling improvements. In the first study, which began in 1975, a fleet of 2,100 Washington, D.C., area taxicabs tested four systems:

System 1. Original vehicle equipment plus a CHMSL,

System 2. Original equipment plus two high-mounted brake and turn indicators,

System 3. Conventional low-mounted dual-compartment lamps modified to separate the running lights from the brake and turn signals, and

System 4. Original equipment alone.

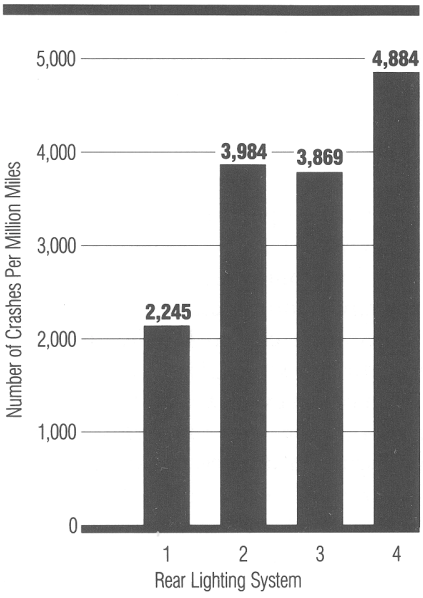

FIGURE 1 Rate of rear-end accidents for the tested lighting systems.

In the tests, the CHMSL system demonstrated an average 50 percent reduction in accident numbers, accident rate (Figure 1), and collision severity.

NHTSA's 12-month follow-up study involved 5,400 passenger cars owned by a telephone company. The drivers in this group, who were better representatives of the general population, produced a 53 percent reduction in the number and severity of rear-end crashes in a comparison of experimental and control groups. In both studies, the reduction was most pronounced at dawn and dusk and through the night. An independent evaluation by the Insurance Institute for Highway Safety, in which the test subjects were New York City taxicab drivers, yielded comparable reductions.

NHTSA conducted a final study to evaluate whether CHMSLs that flashed to signal deceleration would be more effective than unvarying lamps. Results of tests on San Francisco taxicabs demonstrated that the deceleration information given by these stop lights did not add to crash reduction.

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

Center high-mounted stop light on 1986 Mercury Lynx L.

Application

The research results led to the modification of a federal regulation, Federal Motor Vehicle Safety Standard 108, "Lamps, Reflective Devices, and Associated Equipment." All new passenger cars built after September 1, 1985, were required to have CHMSLs.

Benefits

On the basis of the field studies, NHTSA researchers estimated that some 900,000 of the 4,000,000 rear-end crashes each year could be eliminated by using CHMSLs. The savings gained from this 22 percent reduction were estimated at $434 million per year for car repairs alone. Costs of the new lamps were assumed to be $15 per car at first and $4 per car as production increased. This latter cost produced an estimated yearly expense of $40 million, giving a savings of close to $400 million per year in property damage alone.

After CHMSLs became standard vehicle equipment, NHTSA conducted an evaluation based on crash records for 1986 and 1987 car models in 11 states. The records for these CHMSL-equipped vehicles were compared with those for 1980-1985 vehicles. For cases in which the back of the car was damaged and stop lights had been activated, rear impacts had been reduced by an average of 17 percent.

The new study indicated that the CHMSLs were more effective during the day (20 percent reduction), especially at dawn and dusk, than at night (8 percent). The center-mounted lights were especially effective at preventing chain collisions involving three or more vehicles. Results were consistent throughout all 11 states.

Actual costs of the CHMSLs turned out to be $10.50 per new car (1987 dollars), or $105 million per year for new cars sold in the United States. NHTSA now estimates that when most cars are equipped with the lights (in about 10 years), 126,000 reported crashes will be avoided and $910 million in property damage will be saved each year. The $2 million cost of the entire research program plus the $3 million cost of the regulatory program will be recouped easily through reduced accidents, crash costs, and pain and suffering.

For more information, contact Robert M. Nicholson, Deputy Assistant Administrator for Traffic Safety Programs, National Highway Traffic Safety Administration, TSP-01, 400 7th St., S.W., Washington, D.C. 20590 (telephone 202-366-1755).

Suggestions for "Research Pays Off" articles are welcome.

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