

STATUS OF NCHRP RESEARCH ON THE SAFETY ASPECTS OF STUDDED TIRES

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•THE primary objection to the use of studded tires has been an economic one, that is, the high cost of the additional highway maintenance required to repair the damage they cause. Visual evidence of this damage exists, and means are available for estimating the probable cost. Information is lacking on the safety benefits that should be weighed against these costs for making decisions on the future of studded-tire use. Three problem areas are still to be addressed:

1. The direct effect of studded tires on accident frequency and severity,
2. The potentially deleterious effect of studded tires on accident frequency and severity because of their capacity to modify pavement surfaces, and
3. The potential of studded tires for accelerating the loss of pavement markings.

NCHRP Project 1-13 (Effects of Studded Tires on Highway Safety) is directed toward providing the quantitative information required in the first problem area. NCHRP Project 1-13(2) (Effects of Studded Tires on Highway Safety—Nonwinter Driving Conditions) is a first step in a series of several that probably will be needed if a significant amount of quantitative information in the second and third areas is to be obtained.

Project 1-13 was undertaken by Cornell Aeronautical Laboratory (now Calspan) of Buffalo, New York, in April 1971 and is scheduled for completion late in 1973.

An earlier completion date was originally anticipated, but some inconsistencies in the taped data that required rectification midway in the study slowed progress. As its title suggests, Project 1-13 addresses the problem of identifying and quantifying the overall effects of the use of studded tires on the incidence and severity of traffic accidents. The immediate objective of the project is to measure, by a study of accident records, accident investigations and to study the effect of studded-tire use on the incidence and severity of accidents occurring under winter driving conditions. The exposure of vehicles with and without studded tires to accident occurrence is a consideration.

Both Minnesota and Michigan have made data available for the study. The discontinuance of the general use of studded tires in Minnesota before the 1971-72 winter has provided a unique and valuable opportunity for a "before-and-after" investigation that adds measurably to the value of the study.

The essential data elements for the frequency studies are accident occurrence, type of tire (studded or unstudded), and type of driver (user or nonuser of studded tires before the ban). A second group of accident variables (those required for specific sub-studies) are injuries, road cover condition, location, and date.

Accidents included in both the Minnesota and Michigan studies have been limited to those reported by police.

The desired data are being obtained from various sources including accident records, magnetic-tape storage, license and vehicle registration files, and questionnaire returns. The data are then integrated to provide the required data sets.

For the Minnesota before study, data for the winter portions of 1970 have been used. For the after study, data for the winter of 1971-72 have been used. Details for more than 18,000 vehicle involvements for the before condition, and more than 20,000 for the after condition, are available for analysis.

Although the specific level of quantification that can be achieved in the project results will not be known until the data have been studied, the quantity of data available for

analysis favors an expectation that the major results can be presented at levels no lower than percentage of change.

Results that are reported at the percentage-of-change level can be used in estimating the probable change in accident cost that can be expected to result from the banning of studded tires.

The primary function of the Michigan before study is to establish a broader data base to allow a greater generality of results. To do so, data collected in Michigan reflect the same variables studied in Minnesota. The collection period was January through March 1972. Data on 52,000 accidents that occurred during the period have been used in the study.

Although the analysis of the Michigan data is incomplete (as of January 1973), a sufficient amount of analytical work has been done to show that, if the present trend continues, the final results will indicate a minor safety advantage for studded tires.

Project 1-13(2) was undertaken by the Highway Safety Research Institute of the University of Michigan in February 1972 and was scheduled for completion in November 1972. The purpose of this project has been to formulate a plan of attack for determining the magnitude of the effects on highway safety of pavement wear and lane-marking wear by studded tires. This is apart from the economic issue of extra maintenance cost due to pavement wear and from the issue of safety under icy pavement conditions.

The relations that exist among the factors involved in the nonwinter safety aspects of studded tires are complex, and the present project is only an initial step toward an assembly of the body of knowledge needed for quantification of the nonwinter effects of studded tires.

Project 1-13(2) has included a synthesizing of present knowledge of the nonwinter driving effects of studded tires, generally qualitative modeling of these effects, and the preparation of experimental plans for exploring areas where present knowledge is lacking.

The effects that were determined to have the greatest hazard potential, listed in the order of estimated decreasing hazard, are as follows:

1. Tire hydroplaning and wet skid,
2. Road repair and maintenance hazard (the result of pavement surface and pavement marking restoration),
3. Splash and spray,
4. Vehicle lateral placement shifting,
5. Vehicle transverse force and steering effects,
6. Driver fatigue resulting from noise and vibration,
7. Ejected studs thrown from high-speed vehicles, and
8. Vehicle component degradation.

As had been expected, existing information was found to be insufficient for determining the magnitudes of these hazards. Of much importance among the missing information are accident data adequate for differentiating studded-tire effects on nonwinter driving conditions. Experimental research has been recommended for several of the effects that appear to have greatest significance.