

ABSTRACT

Human Factors in the Moving Merge Process. (May 1969)

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The objective of this research was to investigate the importance of some independent environmental variables in the moving merge process utilizing human factors as indices of driver comfort in such a dynamic situation. The stress producing situation chosen for the evaluation of the sensation of "well being" in an automobile driver was the routine urban task of entering a freeway. A technique of this type could serve as a design tool for the traffic engineer in the modification of present facilities and the design of future roadways.

Six variables were investigated as to their importance in a moving merge operation. They were 1) ramp approach speed, 2) velocity on the freeway, 3) backsight available to the driver, 4) advice to the ramp driver as to the velocity on the freeway, 5) posted speed limits on frontage road and freeway and 6) the driver. An experimental design involving these elements was composed using the random balance design technique. The formulated design was such that each factor could be studied individually in order to be able to evaluate the capability of each index to differentiate between con-

ditional levels of the variables.

The test site was a simulated freeway facility laid out on a concrete surface area at the Texas A&M Research Annex. The facility included a three lane section of freeway with a six hundred foot curved on-ramp. An acceleration lane of three hundred and fifty feet in length was also provided in compliance with present day principles of on-ramp design. All vehicle velocities were recorded through the use of induction loop detectors located on the ramp and the outside freeway lane.

An instrumented vehicle, developed by the Ford Motor Company, was used as the ramp vehicle and the data collection system. The sensing devices of this vehicle permitted the accumulation of data pertaining to time, speed, distance, hearthead and galvanic skin response. The information was recorded on magnetic tape in digital form which was analyzed and output as the driver's performance by the Systems Research Office of the aforementioned company.

The data collected were evaluated by two different techniques. The initial analysis was performed through the use of scattergrams. Freeway velocity, backsight and drivers were indicated as the important variables by the two physiological factors. The results obtained by graphical analysis were confirmed by individual factor analysis of variance. Each evaluation technique made evident that heart rate and GSR selected the important variables from those being investigated, but did not

necessarily agree in every case.

The conclusion of the investigation was that two physiological factors were not sensitive enough to evaluate all variables involved in a moving merge operation. However, they could distinguish the variables of importance which should be studied in more detail. Indications are that more sophisticated methods of measurement and an increased number of human factors are required to properly evaluate driving tasks of less than one minute duration.