RESEARCH CHALLENGES IN DRIVER EDUCATION AND DRIVER LICENSING

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•WE ARE all aware of the reality and the enormity of the problem that we face in highway safety today. I need not review the statistics that illustrate the magnitude and the seriousness of the highway safety problem in terms of the losses in lives and property sustained each year across this country. The national 2 percent down-turn in lives lost through highway crashes in 1970—about 1,100 fewer deaths in 1970 than in 1969—is heartening but scarcely provides an opportunity to relax our research and program efforts.

Some will argue that driver education, driver licensing, and other aspects of the precrash phase of a total loss-reduction plan hold little potential. Indeed considerable attention and emphasis must be given to the crash and post-crash phases in order to reduce the frequency and severity of injuries sustained in crashes that do occur; this was not widely accepted until recent years.

The precrash phase deserves research and program attention as well. All crashes averted in the first instance represent a gain for the entire loss-reduction program. Driver education and driver licensing represent potential payoff areas of considerable magnitude provided that appropriate research and program challenges are identified and met. I hope to identify some of these challenges in this presentation.

As a base I suggest two central challenges: (a) to develop through research driver-education programs that will enable the states to prepare safe, effective drivers and (b) to develop through research driver-licensing and driver-control programs that will enable states to identify and control drivers who, for whatever reason, are a hazard to themselves or others on the nation's roads.

Our orientation and our efforts should be responsive to these central challenges. Our research must be directed to provide the scientific and technical basis that will enable the states to meet these challenges. One thing is clear: The highway safety problem is a "here-and-now" problem, and the programs in education and licensing are programs that are in operation now. This leads to other challenges that are discussed in the remainder of this paper.

CHALLENGE 1

The challenge is to make certain that research efforts in these areas provide useful answers to the programs with which they are concerned.

For many understandable reasons, it is easy for researchers to get sidetracked onto questions that, however interesting they may be or however far they may advance the frontiers of science, produce no useful output for the programs that they are intended to support. This is not to say that we should not pursue research that has long-term payoff. Clearly, such research is needed in a balanced program. The challenge is to keep an appropriate portion of our research effort relevant and useful. Our response to this challenge must be a continual soul-searching and frank self-evaluation in answer to the question: Does this research have payoff potential in terms of solving real problems in existing or contemplated programs in driver education or licensing?

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CHALLENGE 2

The challenge is to build the required base to determine the payoffs of driver education and driver licensing and, at the same time, to provide vital, near-term products to improve ongoing programs in these areas.

The establishment of a base on which to build and demonstrate the highway safety benefits of driver education and licensing is not something that can be done on an overnight basis. I shall presently describe research to analyze the driving task and to identify its elements; this project is an essential building block in our program. It is also fundamental to note that effective data systems are necessary to give us essential information. Tools and techniques must also be developed that will enable operational personnel in education and licensing to render objective, valid measurements of driving proficiency, in terms of both driving safety and driving effectiveness. Clearly, all of these are needed before we can really measure the effectiveness of driver education or licensing with any precision.

Nevertheless, we cannot duck the issue that driver-education programs and driver-licensing activities are operating in every state today. Thus, while we conduct the complex and detailed research necessary for scientifically valid advances, we must also provide key personnel with the information they require to plan and upgrade their current programs.

Our answer to this challenge is straightforward. Initially, we must use what we have. We must consolidate the existing knowledge, which is sometimes based on no more than "expert opinion." Such opinion may ultimately be proved sound through research. Until that time, however, it can only be regarded as our best guess.

With this consolidation as background, we can perform analyses that will enable us to specify (and pass on to the state program personnel) the first step forward in an iterative process that will eventually allow us to increase significantly the cost-effectiveness of education and licensing activities. Let me given an example.

The analysis of the driving task that I will describe in greater detail later is extremely valuable to researchers; it also has substantial value for program people, who will now have an inventory list with which to work. This will enable them to ask questions such as, What fraction of the total driving task is being taught by my state's driving-education program? It will also enable license examiners to have a better picture of how much of the driving task is tapped by the written and road tests.

Obviously, each research project cannot be molded so that it can yield products that will be immediately useful to state program operations. Nevertheless, if in the planning stages of all research we consciously seek to maximize the useful output to ongoing programs, major benefits will be realized on the near-term basis; and the programs will, themselves, evolve more gracefully and easily toward their ultimate form.

It should also be obvious that, if current programs need near-term answers, we should be able to support all the research that can provide such answers.

CHALLENGE 3

The challenge is to convince legislators that adequate financing is needed and is justified to fund research that will upgrade ongoing programs in driver education and driver licensing.

This country spends more than $0.25 billion each year on its driver-education and driver-licensing programs. Yet in 1971, the federal research budget was such that the National Highway Traffic Safety Administration could allocate $600,000 for research to support these program areas. Even if the total amounts spent by the states for research were added, I would suggest to you that this amount of money is simply not adequate to upgrade ongoing major national programs. Aggressive research in these areas not only is needed but also has, ultimately, high payoff potential for all involved. We know, for example, that the U.S. Coast Guard loses many more man-days to the highways than it does to the high seas. Similar problems face industry. Insurance companies surely would like to minimize the amounts they pay out to hospitalize and heal and even to bury casualties of traffic accidents. Funds needed

for research and development of these programs should be increased as an investment in program improvement.

CHALLENGE 4

The challenge is to determine the effect of driver education on subsequent driver performance and, at the same time, to upgrade the cost-effectiveness of these programs.

In large part, the impetus and the direction of the Administration's research programs in driver education (and also driver licensing) have been influenced by the Moynihan Report. Indeed, the challenge that I cited is a paraphrasing of a criticism offered by the Moynihan Report: There is no scientifically sound evidence that shows that driver education provides significant benefits that in any way justify its cost. Clearly, we cannot take refuge in the companion statement of the Moynihan Report, which stated that there is no sound evidence to show that driver education does not do any good. In the National Highway Traffic Safety Administration, we have taken what we feel is a constructive, positive orientation in answering this challenge. We simply cannot afford to take the risks of curtailing all driver-education programs until they can be thoroughly researched. We are, therefore, moving to develop the data base, the controlled conditions, and the measurement techniques that will enable us accurately to depict the effects of driver-education programs. At the same time, we cannot in good conscience fail to explore and implement promising new teaching techniques, technology, and various devices and facilities proposed to improve training effectiveness. Admittedly, it is more difficult to show the effects of driver education if driver-education techniques are continually being modified. Nevertheless, we can and we are establishing controlled exposures to various driver-education techniques under the circumstances where we can also obtain fairly complete data during a number of years to ascertain the effectiveness of these techniques.

CHALLENGE 5

The challenge is to establish controlled field research projects in education and licensing and to develop a system to gather and retrieve criterion data.

Obviously, we must have some means at our disposal for testing the effectiveness of different methods of teaching and of different devices, such as simulators, for use as teaching aids. To make such comparative evaluations, we must have at our disposal some means for controlling exactly what is taught and what devices are used for teaching. We also must have some means to obtain valid records of the subsequent driving performance of individuals educated by the use of various techniques. Until this is possible, we are left in the same morass that the Moynihan Report noted when it indicated that there was no good evidence to show the effectiveness of driver education in the United States. Similarly, the same controlled exposures in the same follow-up of road records must be available to assess the effectiveness of various improvements in modifications to licensing process. The National Highway Traffic Safety Administration is trying to answer this challenge in 2 programs, one in driver education and one in actual record collection.

In the first of these, we have a joint program with the U.S. Coast Guard at its Cape May Training Center. Here we are using a specialized research team that is teaching selected driver-improvement techniques to coast guardsmen entering the Cape May facility. Most of the recruits will receive this training, but a randomly selected group will not. In this way, we will have a comparable control group, against which we can compare the effectiveness of the techniques used. Special provisions have been established to acquire accident and violation reports during the recruits' entire enlistments. Clearly, with this real-world laboratory, we can assess the benefits of this training exposure as well as compare the relative effectiveness of different techniques.

When we know what types of data should be collected and when we have resolved the question of control groups, we will be able to approach the various states and solicit their cooperation in a joint program where the results of this program would be extended to a high school setting.

We are working on means to upgrade the quality of accident investigation and to increase the reliability of reporting, retaining, and retrieving data. This is essential if we are to evaluate the effectiveness of any of our safety countermeasures. One glaring lack in the data that are collected currently is the identification of the at-fault driver. Ideally, for those accidents that are caused by driver error, we would like to know and be able to retrieve exactly what the driver error was. Obviously, this kind of information has great significance in pointing our education and licensing programs in more effective directions.

CHALLENGE 6

The challenge is to achieve a consensus on the makeup of the driving task.

We cannot make definitive statements concerning exactly what to teach in driver education or what to examine in assessing student performance or what to measure in driver licensing until the driving task has been clearly and completely described and all of its elements are identified.

The lack of this consensus was very pointedly brought home to us by initial studies, which the Administration supported, to define the status of driver education and licensing. As a result, we undertook a program in early 1969 to analyze the driving task and to develop a taxonomy of its elements.

The task analysis was built on a consolidation of past work combined with the detailed systems analysis of the driving task. This product was subsequently reviewed and refined by a multidisciplinary team, including specialists in driver education, driver licensing, and human factors. The task analysis is extremely valuable to researchers. It also has substantial value for program people, who will now have an inventory list of critical tasks with which to work. These can be used to determine (a) which driving task elements are taught in the state's driving-education program; (b) what driving tasks are tapped by the written and the examination road tests in licensing; and (c) which driving-task elements can be presented in simulators or ranges.

As these examples indicate, we plan that this taxonomy of driving-task elements can be used, in its present form, as a basis for evaluation and improvement of driver-education courses, of the licensing process, and of devices and facilities used in these programs. As additional data are made available as a result of its use and its evaluation, the task analysis will be validated and updated further, improving its usefulness to the states and their program development.

Within the past year or two there has been new direction shown in the area of driver-education curriculum development. The Automotive Safety Foundation's Driver Education Curriculum Study and Development Project, the several state curriculum guides (e.g., Illinois, Maryland, Massachusetts, and Colorado) that have spun-off from the ASF project, and other similar ventures have brought a new rationale and system to driver-education curricula. When combined with a scientifically derived driving task analysis, the day should be close at hand when instructional programs will be based on more relevant content and presented in ways permitting a higher order of measurement and evaluation.

CHALLENGE 7

The challenge is to develop objective criteria for safety and for flow.

The basic challenge in establishing criteria for safety and flow is not in defining what they are but in obtaining useful measures that relate to an individual driver and that can be used to support the basic program objectives already discussed. Clearly, crashes, particularly those involving fatalities and bodily injuries, are easy to establish as an ultimate criterion regarding unsafe drivers. Traffic volume as related to highway capacity is also a reasonably clear criterion of flow. However, because of the infrequency of accidents and the unreliability of the all-too-few data that are reported in the event of an accident, most accident records are currently unsatisfactory for use in judging the effectiveness of an individual's education or licensing. Even with good accident records, we would still need some index of driving safety that we can use without having to wait the months and years necessary to obtain a reliable accident

index on an individual. In addition, we simply have no generally accepted, valid measures to assess how effective a driver is in terms of his contributions to the flow of traffic.

In terms of the first area, we have been trying to improve the accident investigation and records system. Multidisciplinary teams have been established throughout the country to conduct in-depth studies of highway crashes. State driver-licensing files are being updated and automated, and this should help in the analysis and retrieval of accident-related information. Indeed, the automation of driver-licensing files has accounted for about 20 percent of all 402 funds expended to date. Utilization of the combined effects of these systems and research efforts should improve our understanding of accidents and help refine the measurement of the accident criteria by relating it to causative factors.

If we are to use accident data as an ultimate criterion for determining program effectiveness, we must improve the reporting of these accidents. Many studies have shown that there are definite biases in accident records. One recent study indicates that females, middle-aged individuals, professionals, and semiprofessionals report only one-third of reportable accidents compared with other groups that report two-thirds. There is, therefore, a need to consider ways of improving the reporting of accidents if we are to use the data to measure effectiveness.

However, because an accident may never occur during the life of some drivers, intermediate criteria of driving proficiency must be developed and be predictive of such potential occurrences. The infrequency of accidents, their low correlation with traffic citations, and the absence of such measures during assessment of an individual's performance in driver education and licensing dictate the need for intermediate criteria. Obviously, to be valid, these measures must relate to the ultimate criteria of traffic accidents or flow data or both.

Intermediate criteria are needed and are being developed for on-the-road performance as well as for performance in the classroom, in simulators, and on ranges. A comprehensive study of on-the-road driver performance is currently being performed by Michigan State University. The focus of the study is the identification of behavior that is indicative of safe and unsafe drivers. Clearly, the real test of the validity of such intermediate criteria will be the extent to which they predict (or are indicative of) subsequent real-world, on-the-road driver performance. Once these intermediate criteria have been developed, we must have or develop practicable means for operational personnel to measure driving performance reliably and validly.

CHALLENGE 8

The challenge is to develop useful, objective, valid measuring techniques and tools to assess driving proficiency.

A critical step toward improving driving proficiency is the placement of cost-effective means of measurement in the hands of education and licensing specialists. Such means may be provided by new or refined techniques or by new or refined tools. For example, we may find that observing the behavior of a driver at an intersection is a good intermediate criterion of safety performance. However, unless we can also develop a technique (or tools) that will enable a reliable measure of this behavior, the technique will not be useful or valid. The word "reliable," in this case, simply means the extent to which 2 independent observers will rate a particular segment of driver behavior in the same way. A number of techniques can be used to increase the reliability of such measures. These include simplifying the measures, making them more objective, using special instruments to sense and display the values measured, or developing automatic devices that sense, display, and record the values of interest.

Of course, the most difficult task for both the educator and the license examiner is to determine, by observing an individual driver's performance, when he is competent to enter the traffic system or whether he requires additional practice or training at skills in which he is deficient. If either of them is to do this, he must have valid and reliable techniques and tools at his disposal. The program at Michigan State University is intended to provide just such techniques for making these assessments.

Parallel activities are concerned with developing and using instrumented vehicles to obtain the kinds of objective, reliable measures of driver performance to which I referred earlier. Of course, the variables we measure must also be shown to be valid. The capability of an instrumentation package that can record in a vehicle a variety of variables has vast potential for education, for licensing, and for research. For education, it can be used to provide both the student and the instructor with unbiased, objective, accurate feedback about the student's performance, and we know this will accelerate learning. For licensing, it will provide an unbiased, objective recording of performance to assist the examiner in his determination of whether he is willing to allow a driver to be licensed. For research, it provides objective, accurate data in a form that can easily be analyzed with EDP equipment and thus free the researcher from a very time-consuming and noncreative element of his work.

CHALLENGE 9

The challenge is to identify the most appropriate roles for various devices and facilities in the education and licensing process.

At the present time, a wide variety of simulators, ranges, instrumented vehicles, skid pans, and other specialized facilities and devices are being used in research, education, and licensing activities. Further, the state and the federal governments are continually being solicited by manufacturers who feel that their new devices and ideas offer additional advantages not contained in the present generation of facilities and devices. Many of these devices are very expensive and, as such, could represent extremely significant commitment of funds for most programs to purchase, operate, and support them over the years.

The Administration is meeting this challenge by undertaking a program to assess, first on an analytical basis and then on an empirical basis, the utility of many of these devices as training aids. We are carefully examining the potential utility of simulators, ranges, instrumented vehicles, and other devices as teaching aids. The extent to which the skills learned on these devices are transferred by the student into the real-world driving situation will be the ultimate measure that will be employed to determine their effectiveness. At the same time, our joint program with the U.S. Coast Guard will provide a unique opportunity to determine, in a carefully controlled field research situation, the utility of various driving range configurations, and even the utility of any range exposure at all, when measured against long-term driving performance records.

In the field of driver licensing, several state programs are designed to determine the utility of simulators in the license-examining process. For example, Project METER in the state of Washington was an evaluation of the usefulness of computer-based "simulators" for driver-knowledge and driver-performance testing. Project DRIVER conducted in Oklahoma represents another program concerned with evaluating automated devices in the license-examination process. The current studies in North Carolina on the application of instrumented vehicles represents another approach to measuring driver proficiency in the licensing process. Based on these programs, and others like them, the role of various devices will become more clearly delineated, and suggested guidelines will be prepared for their incorporation into the licensing procedure.

CHALLENGE 10

The challenge is to define the relevant data set that must be gathered in the licensing process.

In their current licensing activities, all states collect a variety of data that describe their driving populations. In addition to serving the screening function, these are frequently used as the basis from which predictions are made concerning an individual's anticipated driving performance. Clearly, if this process is to be effective, we must assure ourselves that we collect the relevant data, that we make provisions for adequately storing and updating the data, and that we have an effective means for assessing or retrieving the information when required.

With these goals, the National Highway Traffic Safety Administration undertook a program in 1969 to define what biographic, demographic, and medical data should be collected during the licensing process, to determine the most valid sources of these data, and to recommend appropriate storage and retrieval systems. This program has been completed and guidelines have been made available to the states. We must, of course, realize that this set of guidelines is the first product of an iterative process. It reflects expert opinions combined with the latest research data available. As we improve our accident data stores, we will be able to refine our specifications of licensing data to be stored, so that the stored information will be of greater value, both in diagnosing and in predicting, to license program personnel.

Another project we are funding seeks to define the requirements for visual tests during the licensing process and to recommend a standardized technique for their administration. We are also supporting an effort to develop an improved standardized driver-knowledge test. This is being undertaken by the University of Michigan to form a national data bank of knowledge items. The intent is to develop effective knowledge-testing procedures for screening, diagnosing, and educating applicants. A key element in this study is the application of knowledge requirements identified by the driving-task analysis. Early findings of the study indicate that questions about many critical driving tasks are not in current licensing examinations.

Objective measures of road performance are being obtained by using instrumented vehicles in work by Campbell in North Carolina. These studies will systematically determine the correlation between objectively measured performance of both young and old drivers and their subsequent driving records.

All of these classes of information will be validated against appropriate measures of driver performance and records. The California research program, in which knowledge tests were administered only to a portion of the renewal applicants, should help to determine what contribution, if any, is made by "knowledge tests" to predicting driver performance.

Once we have designed techniques to assess acceptable driving performance, we must then develop techniques to identify problem drivers and techniques to improve their performance on the highway.

CHALLENGE 11

The challenge is to make license enforcement activities more effective.

The ultimate control that any state can exercise over its drivers is that the state can, and will, revoke a driver's license if the driver demonstrates a driving record that indicates he represents an unreasonable threat to his own safety or the safety of others. Although accurate data are nearly impossible to obtain, it is suspected that a significant percentage—some estimates are as high as 60 percent—of the drivers who have had their licenses revoked or suspended operated a motor vehicle on public roads during the period of their license suspension. Clearly, if we cannot enforce the requirement that all drivers must possess a valid, current operator's license, the effectiveness of the threat of suspension is largely negated.

Under our present licensing system, it is highly improbable that a "well-behaved" driver will be checked to verify that he has a license. This occurs for many reasons, not the least of which is the understandable reluctance of police officials to detain the traveler, disrupt the flow of traffic, or otherwise interfere with drivers who are apparently exercising good driving practices. This is particularly true in most states today where, because of limited communication and data retrieval systems, the time required to check a license is excessive and the probability of a "hit" is small. A broad attack on this problem has been initiated in California through the introduction of digital communication systems and high-speed data retrieval. Using this system, an officer can check out a license in a few seconds rather than the much longer time periods that it takes by using most other systems.

There is still what I consider to be a serious limitation in that the officer must stop a motorist before he can check his license. If the officer were able to make knowledgeable preliminary screening of drivers and then stop only the select few whom he had

good reason to suspect of being in violation, we would have a significantly improved system. We recently sponsored a research project where many alternative solutions were examined that included broad policy changes at the management level of communities and police departments and new detection and surveillance techniques. To follow through on these findings, we intend to pursue the research and demonstrations necessary to establish those systems and procedures that would enable and upgrade enforcement action without unduly bothering the vast majority of validly licensed drivers.

CONCLUSION

I have mentioned only a few of many research challenges in driver education and driver licensing. To the extent that these and other challenges are met, there can be important contributions realized. I would like to conclude by issuing a final challenge, one with an organization-management flavor. That challenge is to develop and improve a coordinated program of research and exchange of research information to serve operational needs at all appropriate levels of government.

Because of limited resources—money, people, and time—traffic crashes will be reduced only if we cooperate in a continuing program of research, evaluation, and implementation. The useful tools, techniques, and procedures that are under development at the state or federal level should be shared with other states and regions at the earliest possible time. There is a definite need for communication of research and development activities within and between states.

In the National Highway Traffic Safety Administration we feel we have a responsibility to uncover and disseminate the status of research, development, test, and evaluation; we are currently studying plans that will help us to meet that responsibility more fully. We would welcome any suggestions. Our intent is simply to help ensure that data developed in one state or community is made available to others who could profit from it through program improvement to better serve highway safety needs. We seek to close the gap between researchers and practitioners. We also seek to lessen the time lag from generation of research findings to the adaptation of those findings to ongoing operational programs.

As qualified professionals concerned with highway safety devote their energies and talents to meeting challenges such as these, we can look with optimism toward further reductions in the nation's highway crash losses.

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