ACCIDENT RESEARCH ISSUES FACED BY THE NATIONAL TRANSPORTATION SAFETY BORAD

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The biggest problem faced by the National Transportation Safety Board (NTSB) in its attempts to improve the efficiency of the highway safety field is the lack of sound research data that are available to the agency. This lack of data results both from the size of the samples of raw data that are available to the agency and from the lack of good information that can be gleaned from other research reports. Basically, the problem facing the highway hardware community is that we cannot support what has been done in the past to Congress. The community cannot "prove" the benefit of the millions of dollars that have been spent on highway design (and in part on the roadside). We cannot specifically define which countermeasures are the best to apply, and the degree to which they are better than cheaper alternative countermeasures. Currently, information to make these judgments does not exist.

To better understand how this problem affects NTSB, the following information related to how the agency operates is presented. The NTSB is a small independent agency. It has a staff of approximately 350 people, some of whom are located in the headquarters office in Washington, D.C., with the remainder located in field offices across the nation. The NTSB has no regulatory authority per se but, instead, has as its primary role the oversight of the various modes of transportation. In the past, the majority of work has been done in the air transportation field. The NTSB's mandate involves assessing how well the various transportation agencies are using the technology that they have available to them, both in the sense of how well they are managing this technology and in the sense of how well they are finding and correcting failures in the technology. Thus, the basic headquarters and staff involvement is in both direct accident investigation and in studies of management of safety programs.

In the accident investigation area, each year approximately 15 of the total number of highway accidents that occur across the nation are investigated. Major investigations are conducted on approximately eight accidents per year. Thus it is obvious that conclusions drawn from accident investigations are not "statistical" conclusions, but instead must be characterized as "clinical" in nature. The agency in its investigation is attempting to determine the source of failure of a given system and then to use the data to convince the appropriate agency to correct this failure. The accidents to be investigated are selected on several criteria including "public interest" in the accident that has occurred, the size of the accident (in terms of number of fatalities or potential fatalities) or the degree to which an accident fits into a category where NTSB staff feels that a problem exists. In the major accident investigations, the staff is usually looking at a variety of issues to determine the probable cause of the accident. In the field accident investigations carried out in certain circumstances, only one major issue is usually examined.

An example of a series of accident investigations that were carried out because of a predefined problem involved the National Driver Register, a computerized multistate register of driving offenses. In relation to this specific problem, NTSB has investigated a number of large truck accidents involving drivers who had licenses revoked in various states, but were continuing to drive on licenses valid in other states. A second example of a problem area investigated by NTSB staff involves the safety of construction zones. Here a number of years' efforts were involved in documenting the problems related to roadway striping, timber barricades and other hazards in locations. Until a major accident occurred that involved fatalities, however, the Board itself was not convinced that a problem existed. This failure to recognize the problem existed not only because of the limited number of accidents that could have been investigated by NTSB staff, but because there were no good studies by other highway researchers indicating this to be a problem. The one sound study that did exist, the California study, was referenced extensively in NTSB's position paper. A final problem area that has existed for a number of years and continues to plague the roadside safety area is in the traffic barrier area. Here, NTSB has collected data for nine years concerning the failure of various traffic barrier designs beside the roadway. A problem exists in that while NTSB feels this to be a problem, FHWA has disagreed with the magnitude of the problem based on the low percentage of failures and the overall number of hits found in large-scale data bases (i.e., the problem has not been proven to be major when mass accident data sets are examined).

In terms of the outlook for the future of the highway safety field as related to the development and use of good research data in decisionmaking, one would have to conclude that the picture is rather bleak for a number of reasons. First, FHWA does not have a good enough grasp of the highway-related problems that exist to be able to prioritize these problems in a good management scheme. This lack of priority will hurt the agency, and thus the national program, in selling the program to Congress in the future. Second, good data are not being collected, recorded or used in many of the state highway agencies. While most states require police investigation of at least some accidents, some states do not computerize the needed data and even more states fail to carry out well done evaluations. Very little meaningful research is now ongoing. Not only are the states and the nation not developing new technology, but we are not even applying what we know to be good designs. This results in designs, which are inherently unsafe, continuing to be placed onto the roadsides, even in new construction areas. Many of these are designs that no knowledgeable highway engineer would allow in the field. While the issue of tort liability may press some states into improving their programs, it may also have the adverse effect of causing some highway engineers to decide to do less research in order to "not know" what problems exist and thus use ignorance as an excuse in court.

Attitudes must be changed, both at a local, state and federal level. Failure to do so will continue to hurt the program and thus the driving public for years to come. The United States is moving into an era in which less emphasis will be placed on new construction and less emphasis will be placed on spot improvement along our roadside. Less money will be available for safety work in general. Because of the influx of small vehicles mixed with even larger trucks, the fatality and injury curves are accelerating more rapidly than in the past. Without a change in our roadside hardware and our total highway picture, the United States will be in much worse shape 10 years from now than it is today. Without a change in our research methodology and the data we are using, we will still not know the answer to many of the questions that will be

asked 10 years from now.

The only bright spot in this overall picture appears to be the NASS system. Here highway researchers must begin to specify the data that need to be collected and to supplement this system to get them collected. Special studies must be used more often and, when used, these studies need to be better designed. The NTSB feels that this NASS system can be one of the more innovative and beneficial changes that have been made in the highway safety research area in years.

PROBLEMS IN ACCIDENT DATA

The second major area where problems arise in field evaluations of highway hardware is in the data themselves. For discussion purposes, this major topic was further subdivided into (a) police data and (b) accident reconstruction data--the NASS system.

PROBLEMS ASSOCIATED WITH POLICE-LEVEL ACCIDENT DATA IN EVALUATION OF ROADSIDE APPURTENANCE PERFORMANCE

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Police data have long been used in a variety of ways in highway accident research including use in the identification of problems and the evaluation of countermeasures. Yet, problems exist in these data sets, particularly with reference to location identification, definitions and reporting criteria, accident data elements and environmental data elements.

Location Identification

Inaccurate location information is one of the major problems associated with police-level accident data. The main problem does not lie with the specification of route number, but with the estimated distance from a reference point. Rounded estimates (e.g., 500 ft., 1000 ft., 0.5 mi., 1 mi., etc.) are often used.

While this results in problems in many studies, two specific examples involve accidents on bridges and accidents in interchange areas. In regard to bridges, since the average length of a bridge is only 0.03 mi., the above noted rounding error results in very poor bridge-related accident data. In the interchange area, the same problem plagues the researcher trying to identify accidents that occur within specific parts of the total interchange (e.g., in the gore area of exits).

Definitions and Reporting Criteria

While poor definitions, the failure to use the proper terminology and failure to consistently utilize the specified reporting criteria can bias a given data set, the major problems arise when data sets from different jurisdictions have to be combined in a research study. Great care must be taken to transform all of the data to a common set of definitions and to a common reporting threshold. This may or may not be possible with a given set of jurisdictions.

Accident Data Elements

While researchers often complain about not having sufficient detail on the accident data to properly conduct a study, this problem is particularly acute with crashes involving roadside appurtenances, particularly where the object of the research is to carry out what might be referred to as a "clinical" study in which detailed information on the crash-related performance of the appurtenance is needed. Because the items "object struck" or "first harmful event" are generally so coarsely categorized, and because the incorrect use of nomenclature is so prevalent, it is very difficult and sometimes even impossible to segregate out the particular roadside appurtenance of interest. A specific example of this is in a study of luminaires where the terms "utility poles" and "luminaires" are often used interchangeably by police. In such clinical studies, in addition to knowing what roadside appurtenances have been struck, the researcher studying barrier impacts, for example, would also be interested in knowing:

1. What part of the barrier was struck?
2. What are the impact conditions (e.g., impact speed, impact angle, vehicle yawing, etc.)?
3. Did the barrier contain and redirect the impacting vehicle or did the vehicle penetrate, override or vault over the barrier?
4. What damages were sustained by the barrier and what damages were sustained by the vehicle?
5. What were the separation conditions (e.g., separation angle and speed, vehicle snagging, vehicle rotation, etc.)?
6. What happened after the vehicle was redirected?

Unfortunately, very little of this information would be available from police accident files.

A related problem in accident data elements is the problem of poor scales for vehicle damage and occupant injury severity. While an occupant injury-severity rating using K, A, B, C and No Injury is reasonably accurate in distinguishing between no injury, injury and fatal accidents, it is a very poor indicator of the severity of an injury. A more refined and accurate measure is required in much accident research.

Environmental Data Elements

In addition to the specific accident information noted above, additional environmental elements would also be needed by the researcher. Using the same example, the barrier study, one would also need information on

1. What type of barrier was struck and what are its physical and design characteristics?
2. What are the roadway and roadside characteristics (presence of curb, lane and shoulder widths, etc.)?
3. What were the horizontal and vertical alignments when the vehicle left the highway?

In summary, this paper has painted a rather bleak picture of police-level accident data, data that have many limitations. However, because such police-level data are the only tool (and thus the best tool) that researchers interested in the real world have to work with, it must continue to be used and strengthened. While the following papers specify some ways the police data can be strengthened, I feel that perhaps one of the most important ingredients to good police data is engineering input. While necessary, we, as engineers, very seldom ensure that our needs are met by the police by taking the time to work with them on their report forms or in their training. While this work on our