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TRUCK-ACCIDENT DATA SYSTEMS: STATE-OF-THE-ART REPORT

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This Transportation Research Circular summarizes the proceedings of the workshop held on May 4-5, 1981, to consider truck safety issues and truck safety data. Among the questions workshop participants addressed were (a) What important issues should guide the collection of truck safety data? (b) What data are now available to help study those issues? (c) How good in quality and how complete are existing data? and (d) What are potential sources of additional data?

The workshop was sponsored by the National Highway Safety Administration (NHTSA) of the U.S. Department of Transportation and was conducted by the Transportation Research Board (TRB). Invited participants were practitioners from enforcement agencies, state highway and transportation agencies, driver organizations, the trucking industry, truck manufacturers, truck insurers, and safety organizations. Each participant has direct practical experience with some aspects of the truck safety problem and is knowledgeable about sources of data on truck accidents. A list of workshop participants and their affiliations is presented in the final section of this report.

Discussion among participants took place mainly in four workshop groups, each of which considered a different facet of truck safety. Each participant was assigned to one of these groups:

1. The overview of truck accidents--characteristics, trends, and forecasts;
2. Highway environment factors in truck accidents;
3. Vehicle factors in truck accidents;
4. Driver factors in truck accidents.

In the final sessions of the meeting, participants met as a whole to hear, discuss, and add to the reports of the four groups. The topical summaries contained in this report represent composites of the group and the plenary discussions in each subject area.

I. BACKGROUND

Heavy-truck accidents are a serious highway safety problem, and many result in fatalities. Data collected through NHTSA's Fatal Accident Reporting System (FARS) indicate a general upward trend in the involvement of heavy trucks in fatal accidents and in the total number and relative proportion of fatalities that result from such accidents.

According to the FARS data, the proportion of all traffic deaths that resulted from heavy-truck accidents increased from 11 percent in 1976 to 13 percent in 1979. Heavy-truck accident fatalities increased 34 percent during this period compared with 12 percent for all traffic accidents. (1980 FARS data show an 11 percent drop in truck-related fatalities.) Passenger-car occupants represent about half of these deaths; a little less than one-fourth are occupants of the heavy trucks; and the remainder are occupants of light trucks or other vehicles, motorcycle riders, and pedestrians.

The increased involvement of heavy trucks in fatal accidents may be due in large measure to an increase in relative exposure in recent years. Car vehicle miles of travel are decreasing, while heavy-truck mileage is either the same or increasing. These trends may be expected to continue. According to William Scott, Director of the NHTSA's National Center for Statistics and Analysis, heavy trucks may be involved in 20 to 25 percent of all fatal highway accidents sometime between 1985 and 1990.

Truck Safety Data Project

The U.S. Senate Committee on Appropriations, concerned about the present and projected involvement of heavy trucks in fatal accidents, has directed the U.S. Secretary of Transportation to learn more about the causes of heavy-truck accidents in order to develop effective countermeasures. NHTSA was assigned the lead role and was instructed to work with a broad cross section of relevant government agencies, industry, and the research community to make a comprehensive analysis of data on truck accidents. The project is to be limited to data on large trucks, which were defined by the Appropriations Committee as those trucks with a gross vehicle weight exceeding 10,000 lb.

Because the project report to Congress is due on January 15, 1982, no new accident data-collection efforts are possible. Nonetheless, a variety of substantive federal and state data sources were utilized in the preparation of this report. These data sources are described here.

1. FARS. Since 1975, NHTSA has collected and aggregated state reports on fatal accidents. These reports include accident cause, vehicle defects, driver drug use, and other variables.

2. Bureau of Motor Carrier Safety (BMCS) Accident Reports. Since 1973, BMCS has required regulated carriers to fill out reports on accidents involving their trucks. The Bureau then aggregates the data furnished in the report. The reports include descriptive data on the vehicle and the highway environment as well as on the accident circumstances and injuries.

3. National Accident Sampling System (NASS). The NASS, which began collecting data in 1979, currently operates a network of 30 traffic accident research teams in selected sites across the country. Researchers study the environmental, vehicular, and human factors associated with a carefully chosen random sample of accidents involving pedestrians, automobiles, motorcycles, bicycles, buses, and trucks. The investigations focus on information such as vehicle crash protection, driver characteristics, roadside hazards, and injury severity. These data are compiled into national totals based on geography, population, and type of roadway.

4. Truck Inventory and Use (TIU) Survey. The TIU is a statistical sample of all trucks registered in the United States. The U.S. Bureau of the Census conducted this survey in 1963, 1967, 1972, and 1977, and will do so again in 1982. Though TIU is not a source of accident data, it does offer exposure data that to some extent match the BMCS data. The TIU data for heavy trucks describe such characteristics as miles traveled, cargo weight, number of trailers, model year, and size of carrier operation.

5. The states also collect data from police accident reports, and some carry out special studies of specific problems. Also, NHTSA Standard 18, promulgated under Section 402 of the Highway Safety Act of 1966, provides for state multidisciplinary accident-investigation teams, which are to follow up specific accidents and provide in-depth reports on them. These reports generally include detailed descriptions of the accident scene, vehicles involved and injuries sustained.

It is certain that other sources of data pertaining to truck accidents exist. Although they would not be national in scope, the statistics that insurers, carriers, safety organizations, safety researchers, and others collect for their own purposes might help NHTSA learn more about the major causes of truck accidents. One of the tasks of the truck safety data project, then, involves unearthing and evaluating these data sources.

The preanalysis phase of the project involves three approaches to discovering existing research and data on truck accidents. All three are proceeding simultaneously. One approach is a comprehensive literature review that will identify research results bearing on heavy-truck accident experience and causation and on the causes of injuries in truck accidents. A contractor, Wagner-McGee Associates, is responsible for this activity. A second approach is a review by NHTSA of existing truck accident and exposure data bases that federal agencies, state transportation or highway departments, insurance companies, and the trucking industry have developed. The workshop, held May 4-5, 1981, is the third element of the data-discovery phase of the truck safety data project.

An interagency coordinating committee, composed of representatives from NHTSA and the Federal Highway Administration (FHWA), is directing this project. The committee has three responsibilities: to coordinate project activities, to provide technical expertise about and access to information about truck safety, and to review the project's progress and output. A working group of several committee members carries out the committee's day-to-day activities.

Scope of Workshop Deliberations

In the workshop's opening session, NHTSA officials explained how NHTSA and FHWA are developing the report to the Senate, what the workshop is expected to contribute to the project, and where the boundaries of the workshop's discussions should lie.

NHTSA Administrator, Raymond A. Peck, Jr., asked the workshop participants to accomplish three tasks:

1. To identify major issues concerning truck safety,
2. To suggest existing sources of data bearing on those issues, and
3. To evaluate the validity and adequacy of that data.

Peck stressed that the project's time constraint does not permit the development of new data sources, even though many gaps exist in our knowledge about truck accidents. However, Peck asked workshop participants to help identify these deficiencies and to suggest sources of existing data that NHTSA might not otherwise know about.

Douglas Robertson, Chief of the Systems Development Branch of NHTSA's Accident Investigation Division and project manager for the truck safety study, detailed NHTSA's organization and plans for the study and the workshop's role in it. He suggested that a first order of business for the workshop should be to identify major issues in truck safety. Then, participants should identify and evaluate sources of data that might shed light on those issues.

The workshop participants were divided into four groups. The overview group was to deal with descriptive data on truck accidents. The other three groups were to concern themselves with causal factors that might lie in highway design and conditions, in the trucks themselves and the way they are operated, and in the drivers and their driving practices. The remainder of this report is based on the deliberations of these four groups.

II. OVERVIEW OF TRUCK ACCIDENTS

James O'Day, chairman;	Sue Partyka, recorder
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Several state and federal systems compile data on truck accidents. The federal data present an aggregate view of changes in truck accidents over time. The state data are more detailed than the national data and, hence, are more likely to shed some light on causation. Both types of data have some limitations.

Truck-Accident Data Issues

Two general concerns with respect to existing data are their lack of detail on truck characteristics and the improper interpretation of data that do exist.

Truck Characteristics. Although the distinction between heavy trucks--those weighing more than 10,000 lb.--and pickups and vans is important, it is also important for accident analysis to distinguish among different types of heavy trucks. Truck safety may well differ among trucks according to their size, weight, use, configuration, and other characteristics. Dimensions significant in any comparison of heavy-truck accident rates include cab style (cabover versus conventional), body type (box, flatbed, tanker, other), total length and width, number of trailers, straight trucks versus combinations, and perhaps the types of cargoes carried.

The FARS data distinguish only between straight trucks and combinations and among several broad weight classes. The BMCS data identify trucks, tractors, and trailers, but they do not indicate cab style and usually do not include the vehicle identification number. The identification number of trucks may be of limited value in tracing vehicle characteristics, however, because many trucks undergo major modification (e.g., new bodies or additional axles) after leaving the factory.

State accident reports vary in the amount of truck-characteristic detail they compile and in their definitions of heavy trucks. California, for example, defines large trucks as those with three or more axles. Maryland assigns different license plate numbers to four categories of heavy trucks and thus could retrieve some information about body style and other characteristics. Such inconsistencies among state data preclude aggregating them to produce detailed national statistics by type of truck. Ideally, police agencies should have a common set of truck codes for designating size, weight, model, and other truck characteristics in their accident reports.

Interpretation of Data. Proper presentation, interpretation, and use of the truck accident data that are collected are matters for some concern. For example, accident rates that are reported without reference to actual numbers can be misleading. For sampled data, such as that gathered through NASS, variance is also important. Variance is less

critical for census-type data, such as FARS collects. Some analysts argue, however, that because one or two years of time-series data may be viewed as a sample of the whole set, analysts should compute statistical bounds for short-term data, just as for any other sample.

Collection and use of data that have inherent limitations constitute another interpretation problem. For example, the "out-of-service" statistics that FHWA collects on trucks that do not pass inspection are influenced by the practice of choosing to inspect those trucks that appear most likely to fail. Such data may be of value, but analysts should take selectivity into consideration and should qualify their interpretations accordingly.

In order to minimize statistical misinterpretation, analyses of truck accident data should include a full discussion of possible errors and uncertainties in the data. Results should be presented in the scientific literature or in forums such as those TRB provides. Such arrangements for peer review would permit the challenging of results that are not properly supported.

National Data Bases

A limitation of all national data on truck accidents, for purposes of meeting NHTSA's congressional mandate, is that they are more useful for tracking accident rates over time than for suggesting useful countermeasures for truck accidents. Another limitation is that these data systems are only as reliable as the reports that are fed into them, and many such reports are inconsistent with one another, limited in coverage, or possibly inaccurate.

FARS. The FARS is generally accepted as the most complete data base for fatal accidents. The present file structure permits a variety of analyses not possible a few years ago, but it cannot identify truck characteristics such as body style, configuration, cargo, or weight. FARS depends on state reporting, but all states do not necessarily report on all variables, and categories and definitions also vary among the states.

BMCS Accident Reports. The BMCS data base carries a commendable level of detail about accidents that meet certain criteria, but it does not include all truck-involved accidents. Because the BMCS data include primarily regulated, interstate carriers, they cannot be considered to represent the total population of trucks weighing more than 10,000 lb.

The ability of the BMCS data to help establish causality may be limited to some degree by their dependence on carrier self-reporting. Carriers may not know some specifics about their trucks at the time of an accident. It is unlikely that safety violations are fully reported. BMCS does issue follow-up questionnaires to subsets of the accident population, and these allow further study of specific problems.

During the next six months BMCS expects to modify its truck accident report form to include new causation categories. The modified forms may produce data useful for within-file analysis that will help identify problems and evaluate programs.

NASS. In 1979, the NASS program was operating at only a fraction of the level planned for it. Of the projected 75 accident investigation teams, 10 were in operation, and they collected data on about 300 heavy-truck accidents. These numbers are increasing. At present, there are 30 teams in operation. Eventually this data base will be capable of producing a representative sample of police-reported truck accident data in considerable detail. These data should permit analysis of truck accident characteristics.

TIU. The 1977 TIU exposure data on trucks do not completely match the BMCS data on accidents. For example, TIU reports the usual or typical gross vehicle weights for a particular truck, whereas BMCS data are based on the actual weight of a vehicle at the time of an accident. The 1982 TIU survey will report empty, typical, and maximum weights for each truck, which should improve the accuracy of accident rates computed by combining TIU and BMCS data. Of course, uncertainties about the reliability of reporting under either system will still remain.

State Data

State accident data generally do not use a common threshhold for reporting accidents and thus do not lend themselves to aggregation on a national basis. Nevertheless, state data could be useful in problem identification. Most heavy-truck accidents occur in the several large states that have considerable heavy-truck populations, and aggregated truck accident data from those states would probably adequately represent the characteristics of most heavy-truck accidents.

Many state reports include a level of detail on specific types of accidents, not now collected on a nationwide basis, that could be useful in analyzing causes of those particular accidents. For example, mountainous states may specifically identify downhill runaways, whereas this event is not common enough in all states to reach the FARS file. States also collect data on nonfatal accidents, which the FARS file would not include.

A limitation of state data bases is that they are gathered from police reports, which in turn depend partly on drivers' statements. Drivers may not know the answers to some specific questions or may be reluctant to admit violations or noncompliance with regulations. This could result in underestimating causality associated with certain factors.

State Bilevel Studies. Many states conduct bilevel studies in conjunction with their normal police accident-reporting programs. California, for example, has collected such supplementary reports in connection with truck accidents, and Colorado has collected supplementary reports for downhill runaways.

State MDAI Team Reports. The number of heavy-truck accident reports completed by federally sponsored multidisciplinary accident investigation (MDAI) teams is relatively small, although some (South Carolina, for example) may have carried out several such investigations. These reports include such details as cause and type of occupant injury and details of crash damage. Many of these reports follow the format developed for federal MDAI studies and thus could probably be aggregated.

Other State Data. Most states have conducted specific studies of highway accident problems for use within their own jurisdictions. (For example, see R. Zeiszler, Accident Experience in Double Bottom Trucks in California, Department of California Highway Patrol, April 1973.) Many were published privately in limited quantities, however, and so are not generally available. A survey of state highway departments to discover the existence of

such studies might yield substantial amounts of information about truck accidents.

Several states (some in conjunction with BMCS) have truck inspection teams that have collected information on the physical condition of trucks. California, for example, has compiled statistics on vehicle condition, including a relatively detailed examination of braking systems.

III. HIGHWAY ENVIRONMENT FACTORS

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Michael D. Freitas — Paul Stalknecht
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Truck weight and type are significant determinants of the extent to which the highway environment contributes to truck accidents. This is because different trucks may respond differently under the same highway conditions. In order to understand these differences, accident data should be separately identified by truck characteristics. At least two weight groups would be appropriate: 10,000 to 26,000 lb. and more than 26,000 lb. Truck type is also important. Combinations account for 90 percent of the heavy trucks involved in fatal accidents, and NHTSA's study should separately identify and emphasize these vehicles. Individual states have developed exposure data (vehicle miles of travel) for combination trucks, which could be used to calculate and examine accident rates specifically for those trucks.

Data that NHTSA could use to relate truck accidents to highway deficiences or to highway design are generally lacking. It is probable that highway design standards, such as those for geometrics, pavement structure, stopping-sight distances, and acceleration-deceleration lanes, do affect truck safety, albeit indirectly. Existing data bases do not permit analysis of the relationship of these standards to truck accidents, however.

Highway type may also be a significant contributory factor in truck accidents. For example, in Illinois, interstate travelway routes--highways that are used during construction of an interstate route--have much higher truck accident rates than do other interstate routes, but no data have been collected to help explain this difference.

Highway appurtenances, such as New Jersey barriers, guard rails, and crash cushions, are important factors in the severity of truck accidents. Although additional data are necessary to develop design improvements, some engineering data exist now, and additional pertinent information is being developed. (For example, see C.E. Kimball, M.E. Bronstad, J.A. Michie, J.A. Wentworth, and J.G. Viner, Development of a Collapsing Ring Bridge Railing System, Southwest Research Institute, FHWA-RD-76-39, January 1976.) The present design of New Jersey barriers may afford more protection to cars than to trucks, but new barrier designs are being tested and these may prove satisfactory for trucks. FHWA has already developed a guardrail standard that adequately protects both cars and trucks, but the cost of such rails in prohibitive for many states. More engineering data are needed to discover whether crash cushions now in use absorb enough energy to reduce adequately the severity of accidents involving very heavy vehicles.

Maintenance and construction areas on highways are problems for trucks, particularly the "S" curves at median crossovers and short detours. FHWA standards address this problem, and uniform application and enforcement of those standards should reduce truck accidents at these points. Data are lacking that would indicate the extent to which drop-offs at the edges of paved highways, which are sometimes severe during construction, are a serious cause of truck accidents.

Several specific types of truck accidents, though not necessarily directly caused by highway conditions, may be influenced by the highway environment. In such cases, highway modifications and improvements might reduce the likelihood that other, nonhighway factors will cause accidents. For example, speed plus large size in trucks may be directly associated with rollover accidents on freeway ramps; nevertheless, changes in ramp design might help reduce the probability that a heavy truck, going too fast, will roll over.

Some engineering data are available on the freeway rollover problem. We know, for instance, that combination trucks roll over with lower "g" forces than automobiles (R.D. Ervin, The Dynamic Stability of Fuel-Carrying Double-Tanker Trucks in Michigan, Highway Safety Research Institute, June 1978). Computerized data on the specifics of actual rollover accidents on ramps are not available, however. Sufficient data of this type exist at the state level, which, if collected and combined, might provide a basis for determining relationships among ramp configuration, speed, truck weight, and other factors.

Several special studies exist that also might include some data on ramp accidents. Studies that Dynamic Science conducted for BMCS probably include some data on rollover accidents on ramps (R.L. Anderson, R.A. Nicky, G. McCormick, and F. Russoniello, Control of Large Commercial Vehicle Accidents Caused by Front Tire Failures, Dyn Sci-2320-75-130, Dynamic Science Division, Ultrasystems, Inc., Phoenix, AZ, August 1975). FHWA studied about 10,000 accidents during a 10-year period on 8,000 to 9,000 miles of the Interstate system in 16 states, which might include quantitative data on rollovers on ramps and permit calculation of rollover frequency as a function of curvature and length of ramp (J.A. Fee (nee Cirillo), R.L. Beatty, S.K. Dietz, D.F. Kaufman, and J.G. Yates, Interstate System Accident Research Study-1, U.S. Department of Transportation, FHWA, October 1970).

The highway environment also influences jackknife accidents. Highways with tight curves and pavements with low skid resistance contribute to such accidents. Unsafe maneuvers, such as high speed or sudden changes in speed, can lead to jackknifing. Data showing the relationships among truck characteristics, driving practices, highway conditions, and jackknifing may exist, but they apparently have not been collected and analyzed.

A frequent type of truck-involved accident is the collision of cars into truck rear ends. These accidents happen most often in the traveled lanes of highways, but they also occur in other locations such as on highshoulders or in climbing lanes. Existing data are probably sufficient to support analysis of why these car-truck rear-end accidents happen.

IV. VEHICLE CHARACTERISTICS AND OPERATION

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Gerry Davis — Jame O'Steen
Claude Harris — Donald W. Vierimaa
Farrel L. Krall — Wallace E. Whitmer
William W. Neuman

Like the highway environment, vehicle-related factors are rarely cited as direct causes of

truck accidents. Nevertheless, the maintenance, operation, and design of vehicles and the way the vehicles and drivers interact are important to accident avoidance and to mitigation of injury should a crash occur.

Vehicle Safety Factors

Vehicle-related factors that might contribute to heavy-truck accidents and that should be a focus for further study include:

1. Improper maintenance of brakes, tires, lighting systems, handling and stability systems (suspension, tire inflation, etc.), and steering systems;
2. Improper operation, such as excessive speed or splash and spray, poor loading practices, and exceeding the performance capabilities of a specific vehicle;
3. Poor driver visibility, both of the road and of controls, and cab environmental factors; and
4. Design elements (e.g. size, weight, and configuration of the truck), brake performance and maintainability, and tire traction, wear properties, and load sensitivity.

Design factors that may help mitigate the severity of injury to the driver in a crash would include the use of seat belts for the driver, windshields and doors to help prevent ejection, rollover crush protection for the driver, coupling system integrity, proper load retention, and fuel systems that will minimize postcrash fire potential.

It may be possible to demonstrate in laboratory or test environments the relationships between safety and vehicle design, but in practice, it is difficult to separate vehicle design from driving practices, highway environment, and other factors in accident causation. National data bases, such as FARS or BMCS, lack the detail to demonstrate what changes in vehicle design might reduce the likelihood of accidents or help avoid serious injuries or fatalities. In-depth accident investigation may provide sufficiently detailed data about a few accidents, but these few may not be nationally representative and findings based on them could not be generalized to the whole truck population.

Because of the limitations of any one of the existing data-collection systems, it may be necessary to combine accident and exposure data, engineering tests, and field evaluation results in order to make sound decisions about countermeasures that involve vehicle characteristics.

Economic and Regulatory Influences on Vehicle Design

State statutes limit overall vehicle length, width, height, and total and individual axle weights. Certain truck design features reflect attempts to maximize the revenue-generating capability of trucks within size and weight constraints. It is possible that some of these features might have concomitant safety consequences, but data to support causal judgments are lacking.

For example, the cab-over-engine truck tractor allows more length to be devoted to the trailer, thus increasing cargo space. It may offer other advantages as well--easier maintenance, better driver visibility, and greater maneuverability. It has been claimed, however, that this design is less comfortable for drivers and offers them less crash protection than a conventional cab-behind-engine design, but data are not available to support or refute this claim.

Low vehicle tare weight is also desirable in order to maximize cargo weight within state-imposed weight limits. This consideration, along with cost, must be considered in the decision to add certain safety devices to trucks. If a designer contemplates adding a safety device, such as a rear underride protection system, to a truck, the designer must consider whether the potential safety benefits of the device are sufficiently great to offset adverse cost, weight, or operational consequences. Thus, unless such devices have proven safety effectiveness, designers may be reluctant to incorporate them into new truck designs.

Truck width also affects safety, and in the United States width is generally limited to 96 in. This limitation constrains cargo-carrying capacity, and pressures exist in the United States to increase this standard. Proponents point out that Canada allows 102-in. truck widths and that increased width could reduce a truck's rollover threshhold and increase its lateral dynamic stability. The safety consequences of occupying more road space are unknown, however. Perhaps Canadian data on the net safety cost or benefit or increasing truck widths could be examined.

V. DRIVER CHARACTERISTICS AND PRACTICES

Livia Li, chairman; Charles Overbey, recorder

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The role of the driver in heavy-truck accidents is particularly difficult to assess. There is no easy way to trace a specific driver's record of accidents and violations from one state to another. There is also no easy way to determine a driver's physical and psychological status at the time of an accident. Exposure data are also lacking.

Driver Issues

Several driver characteristics appear significant in heavy-truck accidents. Age and driving experience, for example, are important correlates of such accidents. Because young drivers and inexperienced drivers have higher accident rates than do others, some carriers set minimum age and experience requirements in hiring drivers. A problem in analyzing the causal significance of these two variables in heavy-truck accidents, however, is that age and experience are highly correlated. The causal relationship of age to accidents and experience to accidents may be quite different in nature, but it would be difficult to assess them separately.

An additional problem is that good information on driving experience is hard to obtain. Although driver age is routinely reported on most accident forms, driver experience may or may not be reported. Even if experience is recorded, its definition is elusive. "Experience" may refer to years with a particular carrier or to years of driving a particular truck. NHTSA has an ongoing project that addresses this problem (See Analysis of Age, Experience, Licensing Status, and Accident/Violations of Drivers of Heavy Vehicles, DTNH 22-80-C-00733. This project is being carried out by the National Institute for Safety Research, Inc., Rockville, MD).

Driver training, as distinguished from experience, is also a likely factor in heavy-truck accidents, but it is one about which little is known. Some trucking companies have training programs for their drivers, but many drivers

acquire their training through commercial schools, through apprenticeship with an experienced driver, or through self-teaching behind the wheel. Acting on the supposition that training is indeed an important safety factor, BMCS is attempting to improve heavy-truck driver training by developing a model curriculum and guidelines for certifying driver-training schools.

Drivers' attitudes toward driving, their rest and off-duty habits, and their life-styles also affect accident potential. Intuitively, drivers who feel a professional responsibility toward their jobs, their employers, and the public should be more likely than others to observe safety regulations, exhibit good driving practices, and avoid situations likely to cause accidents. This thesis has not been thoroughly researched, however, and the role of driver attitude in heavy-truck accidents cannot yet be quantified.

Economic pressures also affect some drivers and may influence their driving practices. Those who are paid by the mile may resist taking adequate time off for meals and rest, and the fatigue that results may increase the likelihood of their being in an accident. Some owner-operators, pressed by inflation in operating costs and high interest rates on their truck loans, also may drive too long without sufficient rest. Information directly relating driver economics to accident experience is needed to help develop solutions to these problems.

Driver use of alcohol does not appear to be a major factor in truck accidents. In fact, existing data indicate that in car-truck accidents it is more often the car driver than the truck driver who is "under the influence" (L.S.S. Lohman and P. Waller, Trucks: An Analysis of Accident Characteristics by Vehicle Weight, Highway Safety Research Center, University of North Carolina, Chapel Hill, September 1975). A NHTSA contractor is currently studying this issue (Identification and Testing of Countermeasures for Specific Alcohol Accident Types and Problems, NHTSA Contract No. DOT-HS-9-02085, Calspan Field Services, Inc., Buffalo, NY). The influence that driver medical conditions have on accident probability is also an unknown. BMCS requires interstate drivers to have periodic medical checkups, but whether this has helped to prevent accidents has not been determined empirically.

Data Sources and Limitations

Some data exist on drivers who are involved in accidents, but few could be used to establish causation.

BMCS. The BMCS files contain some information about drivers of trucks involved in accidents. The information is limited, of course, to drivers operating in interstate commerce. Further, because it relies on self reporting, the information on safety belt use, hours of driving, physical condition, and other potential lapses could be inaccurate. Information or analysis is needed to determine whether inaccurate reporting is sufficiently frequent to cause any appreciable skewing of the aggregate data.

FARS. The state reports which the FARS files are based vary in their inclusion of questions about drivers involved in fatal accidents. Therefore, although the FARS data might offer some information on causality, they would not necessarily be nationally representative.

NASS. As the NASS program expands, it could provide very detailed information on the drivers of heavy trucks that are in accidents, if appropriate data elements were added to the report forms.

State Files. Although data on regulated, interstate drivers are available through the BMCS records on drivers, state files are the only source of records on intrastate drivers and these files vary considerably in quality. They rely on police reports of accidents, which generally do not include detailed information on the drivers. A driver's history within a particular state may be available, but usually it would not be in the same file as information on the accident in which the driver is involved. The two data sets would have to be matched in order to relate driving history to a particular accident.

Exposure Data. Researchers have attempted to conduct driver surveys at roadsides and truck stops (For example, see D.D. Wyckoff, Truck Drivers in America, Lexington Books, Lexington, MA: D.C. Heath and Co., 1979). It is suspected that drivers avoid such surveys, however. Further, there is no guarantee that the surveys will produce representative samples of all types of heavy-truck drivers. Driver exposure data are necessary, however, in order to study accident-involvement rates by driver characteristic. New methods are needed to gain this information.

None of the existing data files provides all the information needed for all types of heavy-truck drivers. It is important for purposes of causal analysis of driver-related factors in truck accidents that drivers be identified by type--regulated or unregulated, interstate or intrastate, company driver or owner-operator. Beyond this breakdown, a distinction should be made among owner-operators. Some operate under permanent leases to larger carriers and must abide by the same rules and regulations as drivers for those companies; some trip-lease to regular carriers; some obtain their loads through brokers; and some obtain their own loads. Both accident and exposure data by types of drivers are needed to compare accident rates for each group.

Potential Sources of Data

It is possible that some other data sources might supplement present ones to produce additional information on the role of drivers in heavy-truck accidents. Some likely sources are noted below.

Trucking Companies. Many carriers keep very detailed records on their drivers, and these records may permit identification of some driver characteristics that affect truck safety. For example, Yellow Freight System, Inc., conducts ongoing studies of vehicular accidents on a monthly and yearly basis. One study completed at the conclusion of 1980 indicated that because of economic conditions (lay-off of many drivers with seven years or less seniority) and less highway exposure, Yellow Freight System experienced a 47 percent reduction in road accidents for 1980 compared with 1979.

By identifying companies that have good driver record systems and obtaining permission to use their records (assuring them of individual confidentiality), it may be possible to learn more about the relative importance of various driver characteristics in safe driving.

Insurance Companies. Companies that insure heavy-truck drivers must have some basis for setting insurance rates. These companies could be contacted for permission to examine the records they use for rate setting.

Special Data Bases. Private researchers have conducted heavy-truck studies that may include information on drivers (For example, see Vallette et al., op cit.; K. Perchonok and T.A. Ranney, Analysis of Truck, Tractor/Trailer Accident Data, Final Report ZN-5926-V-1, Calspan Corporation, Buffalo, NY, June 1976; and T.A. Ranney, Analysis of Heavy Truck Accident Data, Calspan Field Services, Inc., Buffalo, NY, September 1978). These special studies may suggest hypotheses to investigate in future special studies or when additional data become available. A literature search could unearth these sources.

MDAI Approaches. In-depth investigations of heavy-truck accidents could help identify driver factors involved in those accidents. The University of Indiana has used this approach to study causes of passenger-car accidents (J.R. Treat, N.S. Tumbas, S.T. McDonald, D. Shinar, R.D. Hume, R.E. Mayer, R.L. Stanisfer, and N.J. Castellan, Trilevel Study of the Causes of Traffic Accidents, Final Report, Vols. 1 and 2, Institute for Research in Public Safety, Bloomington, IN, March 1977), and that model might be used for heavy trucks, as well.

VI. SUMMARY

Workshop participants generally agreed that data that could be valuable in helping to examine heavy-truck accident causation do exist in a variety of sources. The task ahead is to locate, examine, and--where possible--collate such data.

Major Data Issues

Two important areas of data deficiency surfaced in most of the workshop group discussions and in the colloquy that followed delivery of the group reports.

The first general issue was the role of economic factors in truck operations and driving practices. Little is known about how general economic conditions, such as inflation, and special ones, such as strikes, affect trucking operations. Data that might indicate whether present economic incentives encourage dangerous practices in trucking and how deregulation might change these incentives are generally lacking.

The second way in which most truck accident data are deficient is that they are categorized too coarsely for meaningful causal analysis. Finer breakdowns are needed of exposure and accident experience of vehicles, drivers, and carriers, by type. "Heavy trucks", for instance, include a multiplicity of sizes, weights, and configurations, and these differences are relevant to safety performance. The owner-operator category also conceals significant variations. Some operate as individuals; others are under contract to major carriers. Although both must meet federal equipment and driving standards, assuring compliance is much more difficult in the case of individual operators.

Each of the workshop groups also noted major issues within its area of concentration. The overview group stressed the importance of careful analysis and interpretation of the data that are available and of open publication for peer review of research results. The highway environment group's main concern was that, although highway conditions undoubtedly pose potential safety problems, these problems cannot be isolated by using present statistical data and methodologies. The vehicle factors group noted the same data difficulty as the highway group. It suggested that it may be necessary to combine the results of accident data analysis, engineering tests, and field evaluations in order to make sound decisions concerning vehicle-related countermeasures. The driver factor group observed that, although drivers and driving practices are responsible for a large proportion of the safety problem, these are the factors that are least amenable to change. If driver problems could be identified more precisely, however, it might be possible to ameliorate some of them directly through careful driver selection or indirectly through changes in vehicles and/or highways that would minimize driver limitations.

Potential Data Sources

The workshop generated suggestions for several sources of data on heavy-truck accidents that NHTSA might examine. These sources are generally varied in scope, in emphasis, in definitions, and in form, and data from them could probably not be aggregated. Nevertheless, they should be useful in helping to identify major safety problems in heavy trucking. These sources include:

1. Insurance company data. Insurance companies that insure carriers must have records that help them determine which companies to insure and at what rates. The insurance companies' criteria for granting insurance and the data on which those criteria are developed could help guide further investigation of specific problems.

2. In-depth investigations of specific accidents. State MDAI reports, such as those South Carolina has produced, also could provide important insights to heavy-truck accident causality, particularly if those reports included questions related to suspected problem areas that broader data sources do not address.

3. Other state data. Many states have made special studies and reports on types of accidents that are particular problems in those states but might not reach national accident data systems. Mountainous states' studies of truck runaways would be examples of such reports.

4. Federal agencies concerned with transportation--FHWA, NHTSA, BMCS, the Interstate Commerce Commission, and perhaps others--have carried out or contracted for projects that could be sources of information on truck accidents. Other such projects may be in progress or have been completed by universities, associations, or safety organizations. Even though some of these projects may not be confined to heavy-truck accidents, they may contain information on them.

5. It is in the carriers' interest to understand why their trucks have accidents, and they undoubtedly investigate the accidents that do happen. In addition, many keep consistent records over time, like those of the Yellow Freight System, that might help in problem identification. These could prove to be a valuable resource, particularly of information on driver factors--an area in which few data are currently available.

Though no one of these data resources could be considered complete or definitive, they do offer a potential for patching together a much wider and deeper picture of heavy truck accidents than we now have.

VII. OTHER PARTICIPANTS

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