Chapter 7

Sources of Information for Evaluating Safety

Photo credit: California Department of Transportation

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Sources of Information for Evaluating Safety

An essential component of safety measurement and evaluation is a complete and accurate database containing relevant accident and exposure statistics. Such a database permits identifying causal factors contributing to accident frequency and severity, so that programs and priorities for improving safety can be established. No such database exists for motor carriers, although several public and private organizations collect motor vehicle accident data from which information on heavy truck accidents can be derived. In most instances, however, these reporting systems are designed for general traffic and safety analysis, and often do not provide detail on heavy truck accident characteristics.

This chapter describes and evaluates existing sources of information for evaluating safety, including Federal, State, and industry accident, inspection, and exposure data and motor carrier market entry, exit, and financial performance data. Gaps in information are identified, and options are presented for strengthening the validity of truck safety data and eliminating redundant efforts. Many interconnecting issues are pertinent to truck safety, and existing data could be used to meet both national and more focused needs. Accident and exposure data have several potential uses: 1) general level, time-history trend analysis, 2) analyses of the underlying causes and contributing factors of accidents, and 3) evaluation by Federal, State, and individual carrier management of their respective motor carrier safety activities.

FEDERAL ACCIDENT INFORMATION SYSTEMS

Because several Federal agencies have different responsibilities related to transportation safety, many accident databases have been developed. Each has different reporting requirements, and integrating information from the forms is not feasible currently.

Federal Highway Administration

The Office of Motor Carriers of the Federal Highway Administration (FHWA) has maintained a motor carrier accident database, the Motor Carrier Management Information System (MCMIS), since 1973. Prior to 1986, interstate carriers regulated by the Federal Government were required to report to MCMIS accidents resulting in a fatality, an injury, or property damage of $2,000 or more. In January 1986, the property damage criteria was increased to $4,200; and effective March 1987, increased again to $4,400. It will continue to increase in accordance with the gross national product deflator index to keep the reporting threshold consistent with inflation.

Accident reports are filed by carriers on Form 50-T (see figure 7-1), in a format that has remained relatively stable through the years. An FHWA analyst corrects erroneous data on the accident reports received and determines whether the accident meets the criteria for a reportable accident. The report is then forwarded to a contractor for input into the computer. During this phase of processing, validation checks are made for data field compatibility and data input errors.

Because of its design, MCMIS provides far more detail on truck accident characteristics than does any other national accident database. It includes carrier identification and address, location of the incident, characteristics of the event, contributing factors, information on the cargo, and consequences of the accident.

However, many operators in the trucking industry, including many private carriers and most intrastate carriers, are not subject to the Federal regulations that require them to report and are

Figure 7.1 .-Motor Carrier Accident Report Form—Page One

Original and two copies of MCS 50-T shall be filed with the Director, Regional Motor Carrier Safety Office, FHWA, as required by 394.9. Copy shall be retained in carrier's file. Circle or (X) appropriate boxes below.

1. Name of carrier (Corporate business name) (7-21)

2. Principal Address (Street ■■■ lo., City, State, ZIP Code.) (22-so)

3. Type of carrier (51–66) [A] Private, Employer ID No. (IRS) [B] ICC authorized, MC [C] Other (Specify) Employer ID No. (IRS)

4. Type of trip (67) [A] Over-the-road [B] Local pick-up and delivery operation

5. Place accident occurred (Nearest Town or City, State) (68–78)

5A. Type of district (79) [A] Residential [B] Rural [C] Primarily business

6. Street or highway (Route or Name) (7–16)

6A. Location if off highway (17–26)

7. Day of week (27) [A] M [B] T [C] W [D] TH [E] F [F] S [G] S

8. Date accident occurred ...../...../..... (28–33)

9. Time accident occurred (Military time to nearest hour) (34–35)

10. ACCIDENT TYPE (Primary Event)

10A. Collision (Check appropriate box) (36) [A] Not applicable [B] Collision with moving object [C] Collision with fixed or parked object

10B. Collision (Check other object involved) (37–45) [A] Not applicable [B] Commercial truck [C] Fixed object [D] Automobile [E] Pedestrian [F] Bus [G] Train [H] Bicyclist [I] Animal [J] Motorcycle [K] Other (Specify)

10C. Collision with another vehicle—Accident Classification (Check appropriate box) zzz [ ] not applicable

(46–48)	VEHICLES 1	2	3	ACTION	(46–48)	VEHICLES 1	2	3	ACTION
A				Slowing—Stopping	L				Intersection
B				Stopped	M				Passing
C				Parked	N				Changing Lanes
D				Rear-end	O				Sideswipe—Opposite Direction
E				Backing	P				Head-On—Crossed Into Opposing Lane
F				Making Right Turn	Q				Skidding
G				Making Left Turn	R				Vehicle Out-Of-Control
H				Making U-Turn	S				Roll-Away
I				Proceeding Straight	T				Controlled Railroad Crossing
J				Merging	U				Uncontrolled Railroad Crossing
K				Entering Traffic From Shoulder, Median, Parking Strip or Private Drive	V				Other (Specify)

10D. Non-collision (Check primary event) (49–57) [A] Not applicable [B] Ran off road [C] Jackknife [D] Overturn [E] Separation of units [F] Fire [G] Loss or spillage of cargo [H] Cargo shift [I] Other (Specify)

10E. If not primary event, did accident result in (58) [A] Not applicable [B] Spillage of hazardous cargo [C] Fire [D] Spillage of non-hazardous cargo [E] Explosion

11. DRIVER INFORMATION

11A. Name of your driver (59–72)

11B. Age (73–74)

11C. Social Security No. (7–15) / /

11D. How long employed as your driver (To nearest year) (16-17)

11k. Hours actually driving since last period of 8 consecutive hours off duty
[A] 1 hr. [C] 3 hrs. ❑ 5 hrs. ❑ 7 hrs. ❑ 9 hrs. [K] 11–12 hrs.
(18) ~ 2 hrs. ~ 4 hrs. ❑ 6 hrs. [H] 8 hrs. ❑ 10 hrs. ~ Not applicable

11F. Estimated hours of driving for entire trip or portion of trip, since last period of 8 consecutive hours off duty
1 hr. ❑ 3 hrs. ~ 5 hrs. ❑ 7 hrs. ❑ 9 hrs. ~ 11-12 hrs.
(19) @ 2 hrs. ~ 4 hrs. ~ 6 hrs. ~ 8 hrs. ~ 10 hrs. ~ Not applicable

11G. Condition of driver
~ Apparently normal ❑ Had been drinking ~ Medical wawer
(20–28) [B] Sick ❑ Dozed at wheel [F] Other (Specify)

11H. Date of last medical certificate (29-34) . . . . . /

Form MCS 50–T (Property-Carrying) (Rev. 8–72) Previous editions of this form are obsolete FORM APPROVED OMB NO 004-R2394 (over)

Figure 7-1.—Motor Carrier Accident Report Form—Page Two

12. CARRIER'S VEHICLE(S)

	Type (35-39)	Year (40-41)	y l ,d (42-43)	Make (44-53)	Model (54-63)	Company (64-69)	TYPE OF BODY (70-74) Van	Flat	Tank	Auto Carrier	Other (Specify)
A	Truck										
B	Tractor										
C	Semi-trailer										
D	Full trailer										
E	Full trailer (2nd)										
F	Other (Specify)___.—										

13. Total length of vehicle/comb. (7-9) Ft. | 13A. Total width of vehicle (10-11) x cargo Ft. | 13B. Weight (cargo) (12-17) Lbs. | 13C. Weight (gross) (1$-23) Lbs.

14. Type of fuel ❑ Gasoline E Diesel ❑ L.P.G. ❑ Other (Specify)——— (24-29)

15. Cargo at time of accident *(Your vehicle)* *(30-38)*
[A] Hazardous materials in cargo *(Specify classification)* _____ [B] Non-hazardous materials in cargo

16. Check one of the following as principal type of cargo
[A] General freight [B] Household goods or uncrated furniture/fixtures [C] Metal: Coils, sheets, rods, plates, etc. [D] Heavy machinery or other large objects [E] Motor vehicles [F] Driveaway-towaway [G] Gases in bulk [H] Solids in bulk [I] Liquids in bulk [J] Explosives [K] Logs, poles, lumber [L] Empty [M] Refrigerated foods [N] Mobile home (39-44) [O] Farm products [P] Other *(Specify)* _____

17. Was your driver killed? 45) [A] Yes [B] No | 17A. Was driver injured? (46) [A] Yes [B] No | 17B. Was your relief driver killed? (47) [A] Yes [B] No [C] N/A | 17C. Was relief driver injured? (48) [A] Yes [B] No [C] N/A

18. Number of other authorized persons in your vehicle Killed _____ Injured _____ (49-50) | 18A. Number of unauthorized persons in your vehicle Killed _____ Injured _____ (51-52)

19. Total number of other persons killed___ injured___ (53-56) | 19A. Amount of total property damage in dollars $_____ (57-61)

20. Were mechanical defects or failures apparent on your vehicle at time of accident? [A] Yes [B] No (62)

21. Check appropriate boxes (Mechanical defects or failures) (63-69)
[A] Not applicable [B] Fuel system [C] Wheels and tires [D] Steering system [E] Suspension [F] Transmission [G] Driveline [H] Engine [I] Brakes [J] Lights [K] Coupling [L] Other *(Specify)* _____

22. Was your vehicle equipped with seat belts? [A] Yes [B] No (70)

23. Were seat belts in use by your driver(s) at time of accident? [A] Yes [B] No (71)

24. OTHER VEHICLES INVOLVED

24A. Company name or operator *(Vehicle #2)*	24B. Address	24C. Type of vehicle
24D. Company name or operator *(Vehicle #3)*	24E. Address	24F. Type of vehicle

25. Weather (7-12) [A] Rain [B] Clear [C] Snow [D] Fog/Smog [E] Cloudy/overcast [F] Sleet [G] Other *(Specify)* _____

25A. Light (13-18) [A] Day [B] Artificial lights [C] Dawn [D] Other *(Specify)* _____ [E] Dusk [F] Dark

26. Road surface (19-23) [A] Dry [B] Wet [C] Snowy [D] Icy [E] Other *(Specify)*____

26A. Total number of lanes (24) [A] One lane [B] Two lanes [C] Three lanes [D] Four or more lanes

26B. Type of highway (25) [A] Divided [B] Undivided

26C. Check appropriate box [A] Entrance ramp (Expressway) [B] Exit ramp (Expressway) [C] Not applicable (26)

27. Account of accident by carrier official

28. Name and title of person signing report	29. Signature
30. Telephone Number Area Code	31. Date report submitted (27-32) ...../...../.....

Form MCS 50-T (8-72) PUBLISHED BY: J.J. KELLER & ASSOCIATES, INC. - NEENAH, WISCONSIN 54956 Book No. 18

SOURCE: Federal Highway Administration

therefore not represented in the accident statistics. Furthermore, the accuracy and completeness of the accident reports to MCMIS are open to question, given Federal reliance on carriers to file reports and minimal attempts by FHWA to ensure reporting compliance. FHWA officials have publicly acknowledged that underreporting of accidents may be as high as 40 percent, and they look to the full implementation of SAFETYNET[1] and eventual completion of safety fitness ratings for all interstate carriers as remedies.[2]

A more recent initiative, started in 1983, is a special monitoring study under which FHWA has enlisted several States to collect data on accidents and exposure for all combination trucks operating on the designated Interstate and Federal-aid highway truck network. The goal is to acquire data for making comparisons between accidents among various truck types and across different road features. Under the program, State highway agencies report accident and exposure data to FHWA every 6 months. Data elements include vehicle-miles traveled by route, number of trailers and axles, accident involvement by vehicles involved, injuries and fatalities, width and type of lanes, shoulders and medians, degree of access control, and road curvature and grade.[3]

This approach represents a reasonable attempt to collect accident and exposure measures from the same population. However, the study is limited both by the relatively small number of participating States and by the accuracy of information provided, particularly the completeness with which truck characteristics are reported and the ways exposure data are estimated.

Currently being developed for FHWA is the Commercial Driver's License Information System. This system will eventually provide FHWA with information on persons holding commercial driver's licenses and will be tied to State systems like SAFETYNET.

National Highway Traffic Safety Administration

The National Center for Statistics and Analysis of the National Highway Traffic Safety Administration (NHTSA) maintains accident data on police-reported accidents, including those resulting in nonfatal injury and/or property damage. Initiated in 1979, the National Accident Sampling System (NASS) is a file of reported accidents that provides an automated, comprehensive, national traffic accident database. The accidents investigated in NASS are a probability sample of police-reported accidents in the United States; the investigations are carried out by NHTSA contractors. These data are subsequently weighted to represent all police-reported motor vehicle accidents occurring in the Nation during the year. To be included in NASS, an accident must: 1) be reported by police, 2) result in property damage and/or personal injury, and 3) involve a motor vehicle in transport on a roadway.[4] A NASS investigation is handled by field staff that examines the vehicle and scene, interviews vehicle occupants, and reviews medical and driver records. Approximately 12,000 cases are investigated each year by 50 teams.

The data collected for a NASS-investigated accident include over 300 variables describing characteristics of the accident, driver, occupants, and the vehicle. For heavy truck accidents, several data fields exist that describe truck operations in reasonable detail. They include carrier type; number of trailers and axles; body type; extent of Interstate Commerce Commission (ICC) regulation; type of brakes and cab configuration; cargo weight; gross vehicle weight; hazardous cargo; vehicle length and width; and jackknife, underride/override, or rollover involvement.

Although NASS has several strengths, such as sampling design and comprehensiveness of the accident investigation, one major deficiency is the relatively small number of heavy truck accidents that constitute the NASS sample in a given year. As a

[1] A comprehensive nationwide enforcement data system that will aid State inspection activities and provide additional accident and safety data.

[2] John MacGowan, U.S. Department of Transportation, Federal Highway Administration, personal communication, Oct. 17, 1986. Problems with reporting accuracy in transportation accident information systems are common, as noted in U.S. Congress, Office of Technology Assessment, *Transportation of Hazardous Materials,* OTA-SET-304 (Washington, DC: U.S. Government Printing Office, July 1986).

[3] Director, Federal Highway Administration, Office of Highway Information Management, "Monitoring Operations of Larger Dimensioned Vehicles," memo to Regional Federal Highway Administrators, Apr. 23, 1986.

[4] National Highway Traffic Safety Administration, *National Accident Sampling System (NASS): Analytical User's Manual* (Washington, DC: U.S. Department of Transportation, 1985).

result, questions may be raised about the representativeness of the NASS sample for a single year in evaluating national issues involving heavy truck safety, particularly issues that are narrowly focused and require considerable detail.

This problem may be further compounded by planned changes in the NASS data collection program. In 1988, two separate data collection systems will be implemented: 1) the Crashworthiness Data System (CDS), and 2) the General Estimates System (GES). CDS will include the more thorough accident investigation described previously, but it will be limited principally to accidents involving cars, light trucks, and vans towed from the accident scene. GES will provide national estimates of accident trends from sampled police reports, using a larger accident sample than in the past and will include all vehicle types. The new approach will meet NHTSA's objectives of preserving crashworthiness information for the vehicles that are most numerous on the highway, while reducing data collection costs. It will also portray more accurately annual trends in the number and severity of accidents involving heavy trucks, but will reduce the ability to conduct detailed analyses of motor carrier safety issues.

Accidents that result in the loss of human life are also classified separately in the Fatal Accident Reporting System (FARS), which has been in operation since 1975. FARS contains over 90 variables for describing accidents in which an accident-related death occurs within 30 days of the accident.' FARS is not a national sample; rather, it is a census of all fatal traffic accidents reported in the United States. This information is collected by each State, under contract to NHTSA. While FARS is generally accepted as the most complete database for fatal accidents, it is limited to this one category of accidents. Furthermore, because the investigation is not as extensive as that for NASS observations, details on truck operation and motor carrier type are not available.[6] For example, FARS distinguishes only between straight trucks and combinations, and only among several broad weight classes.[7] Details about accidents involving the trucks described in box 7-A could not be extracted, for example.

National Transportation Safety Board

The National Transportation Safety Board (NTSB) conducts multimodal, on-scene investigations of transportation accidents. NTSB's jurisdiction for conducting an investigation is based on the definition of a major vehicular accident for each mode, as described in the Code of Federal Regulations, Part 49.

An NTSB investigation begins with a multiple-day field investigation involving the shipper, carrier, government agencies, associations, and other interested parties. Its subsequent report goes through several cycles of review and comment before it is final. A major advantage of the NTSB process is that the investigations involve other participants besides the carrier, are extremely thorough, and take place over a longer time frame so that the full impact of the accident can be more accurately identified. Because of the resources required to conduct such a thorough investigation, the number of accidents that are examined is relatively small and findings often cannot be generalized to the national population.

Recently, NTSB has embarked on an extended special study of heavy truck safety.[8] The study covers a minimum of 200 accidents involving heavy trucks that meet the following criteria: 1) the accident involves a truck of greater than 10,000 pound gross vehicle weight rating, and 2) the truck receives damage sufficient to require towing away from the scene. NTSB plans to document thoroughly the accident characteristics related to the driver, vehicle, roadway, and motor carrier. This will provide valuable information. However, the NTSB special study will include a static file of 200 cases rather than a continuous database.

[5] National Highway Traffic Safety Administration, *Fatal Accident Reporting System: 1986 Coding and Validation Manual* (Washington, DC: U.S. Department of Transportation, 1986).

[6] Joel Dandrea, *Truck Accident and Exposure Data* (Washington, DC: American Trucking Associations, June 1986).

[7] National Academy of Sciences, Transportation Research Board, *Truck Accident Data Systems: State-06 the-Art Report,* Transportation Research Circular 231, ISSN 0097-8515 (Washington, DC: September 1981).

[8] National Transportation Safety Board, "NTSB Heavy Truck Study: Status Report of NTSB Cases," presented at the National Motor Carrier Safety Workshop, Washington, DC, Mar. 11, *1987.*

BOX 7-A.—Hot Shot Trucks

Hot Shot Trucks are relatively new phenomena, appearing over the past 5 years as large freight vehicles.[1] Hybrid trucks **that do not fit within standard industry classifications, Hot Shots are often modified pickup trucks pulling 48-foot trailers. While heavier trucks are increasingly being built to serve as Hot Shots, some weighing as much as 26,000 pounds, no average weight has been established. They are** used to haul light-weight freight, such as insulation, plastic piping, or construction materials.

Economics are the major attraction for these vehicles. A Class 8 tractor-trailer purchased for $100,000 may require $1 a mile to move the same load that a Hot Shot, initially costing $50,000 or less, can move for 35 cents. Hot Shots offer the advantages of weights that allow them to avoid Federal Highway Use taxes levied on trucks with taxible gross weights over 55$000 pounds and truck tractor Chassis Excise tax imposed at the time of first retail purchase on vehicles over 33,000 pounds gross vehicle weight rating.[2]

While no reliable numbers exist on how many of these vehicles are on the roads, experts estimate that they currently number less than 10,000. Sales of Hot Shots are projected to increase 125 percent over the next 5 years.

Because no type of classification exists for these vehicles, no industry or Federal safety standards have been established. Hot Shots have lower centers of gravity than standard tractors, and observers have noted more complete air brake systems, diesel engines, and sturdier suspension systems in recent purchases. Because the trucks do not fall into readily recognizable categories, accident report forms do not have identifying classes for them. Consequently, accumulating data on how many accidents Hot Shots are involved in and how many miles they are driven is next to impossible.

[1]Henry Seiff, Motor Vehicle Manufacturer's Association and William Snow, National Highway Traffic Safety Administration, personal communication% July 22, 1988.
[2]Brady Collins, American Trucking Associations, personal communication, Aug. 10, 1988.

State Databases

State accident data generally do not use a common threshold for reporting and therefore do not easily lend themselves to aggregation on a national basis." However, because manv State reports inelude more detail on certain types of accidents, analysis of State accident data is extremely useful. Furthermore, as a significant proportion of heavy truck accidents occur in the several large States that have considerable heavy truck populations, analyses of accident data from these States are probably representative of the characteristics of most heavy truck accidents. Finally, because State accident files include reports on accidents of varying injury severity, the full range of accident consequences may be examined.

A limitation of State databases is that they are gathered from police reports, which in turn depend partly on drivers' statements. Drivers ma, not know the answers to some specific questions or may be reluctant to admit violations or noncompliance with regulations.[10] Furthermore, police have important responsibilities on the scene related to administering emergenc, first-aid and maintaining traffic flow, often making it difficult to be thorough when completing accident reports. Moreover, few enforcement officers are well trained in accident investigations.

NHTSA maintains a directory of State accident reporting systems.[11] State reporting systems show wide variation in accident reporting thresholds, reporting variables, and definition of variable fields, particularly for items related to heavy truck safety analysis, where detail on truck configuration and use is essential.

To create some consistency in accident reporting at the State level for crash avoidance research purposes, NHTSA developed the Crash Avoidance Research Datafile (CARDfile). It consists of automated police accident reports of six States (Indiana, Maryland, Michigan, Pennsylvania, Texas, and Washington). All data contained in CARDfile have been coded in a common format, regardless of the particular format employed by the State from which

[10]National Academy of Sciences, op. cit., footnote 7, p. 3.
[11]Ibid.

[11]National Highway Traffic Safety Administration, *State Accident Report Forms Catalog 1985*, DOT HS 806 884 (Washington, DC: U.S. Department of Transportation, 1986).

the information originated.[12] The file contains information on accident, vehicle, and driver characteristics. However, because States do not yet use common data elements and include limited information about truck configuration and operations, analysis that can be based on CARDfile is limited.

The Commercial Vehicle Safety Alliance (CVSA) is working to establish uniform accident reporting through the design of a report form that includes standard variables and variable fields that all States would use.[13] (See figure 7-2.) This has proven to be difficult, since each State has different means of collecting accident data, different agencies charged with collecting data, and different forms on which the information is reported. Nonetheless, CVSA anticipates that agreement can be reached on data items that focus on issues of major concern.[14]

The National Governors' Association is also developing recommendations and guidelines for States to adopt for uniform reporting of heavy truck accidents. Their focus includes both reporting criteria and data elements for the accident report form. A preliminary list of 19 data elements has been proposed, covering driver, carrier, vehicle, accident, highway, and environmental characteristics, as well as any hazardous cargo. A survey of existing State accident reporting systems revealed that for *every* State in the Nation, the *majority* of data elements are either not presently collected or are not currently collected as prescribed.[15]

Industry Sources

Many medium and large carriers maintain detailed records of their drivers and vehicles that permit the identification of characteristics affecting truck safety. Carrier accident data has several advantages over public domain databases, particularly because it allows analysis of accidents over time and provides consistent exposure data for determining accident rates. Also, some issues, such as driver hours-of-service and training, are likely to be more accessible and accurate in the carrier database.

However, carrier concerns about confidentiality must be respected, and generalizing the results of such studies to the trucking industry nationwide is risky. Analysis of an individual carrier represents a single data point within the industry.

Trade associations, such as the American Trucking Associations and the Private Truck Council of America, periodically collect accident rate statistics from their member carriers. However, this information is reported only as an aggregate rate for the industry (and carrier type), and no information is available for examining an individual accident, its contributing factors, or its severity.

Other Relevant Databases

Insurance companies that underwrite motor carriers maintain detailed financial and statistical data on insurance policies and claims. Much of this information is also transmitted in aggregate form to the Insurance Services Offices, Inc. (ISO), a nonprofit corporation that makes available advisory rating, statistical, actuarial, policy form, and related services to U.S. property/casualty insurers.[16] The statistical data collected by ISO are quite detailed and permit the investigation of several industry characteristics, such as driver age, vehicle age, size of claim, geographic location, vehicle weight, and zone rating (distance-based). The primary statistic used for safety analysis is a loss ratio.[17] However, because information is reported in aggregate form to ISO, and the insurance industry is interested in financial performance rather than accident causes, this database does not provide useful information for safety analyses.

The University of Michigan Transportation Research Institute

The University of Michigan Transportation Research Institute (UMTRI) has developed a database

[12] National Highway Traffic Safety Administration, *File Structure: Crash Avoidance Research Datafile* (Washington, DC: U.S. Department of Transportation, May 29, 1986).

[13] At a minimum, this would include common use of essential data fields, with each State having the latitude to retain additional data fields for its own use. For further information on the Commercial Vehicle Safety Alliance, see ch. 3.

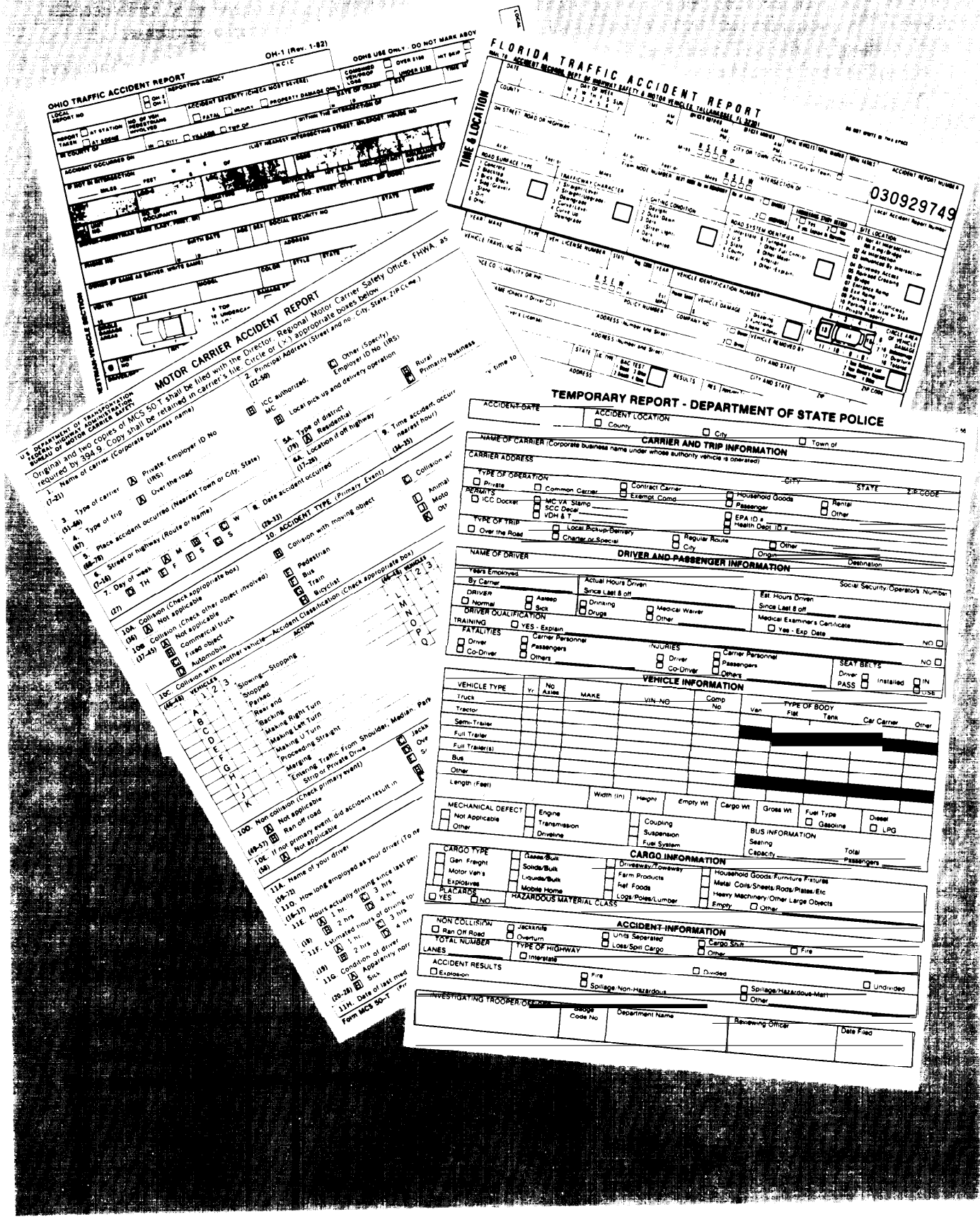
[14] Rick Owens, chairman, Commercial Vehicle Safety Alliance Data Collection Committee, memo to committee members, Sept. 12, 1986.

[15] National Governors' Association, Center for Policy Research, "Report 2 of the Motor Carrier Accident Reporting Committee," unpublished manuscript, January 1988.

[16] Not all U.S. insurers recognize and participate in Insurance Services Office, Inc. data collection.

[17] Ann Lavie, Insurance Services Office, Inc., personal communication, Apr. 10, 1987.

Figure 7-2.—A Sample of State Accident Report Forms



that combines the coverage of FARS with the detail of the FHWA motor carrier accident database. All heavy truck accidents in the FARS database (beginning with 1980) are identified and the records matched with the FHWA records for accidents in which a fatality occurred. Police reports of the accidents are reviewed and a single accident record created that includes information from all sources.[18] Because of different definitions of industry coverage and missing items in many FARS reports, a considerable amount of post-accident investigation has been undertaken by UMTRI to complete the information in the database. Followup investigation is handled primarily through telephone conversations with owners of the involved trucks, a painstaking and labor-intensive process.

All of the FHWA data and most of the post-accident information depends on the accuracy of the responses provided by the owners. Furthermore, the UMTRI database includes only accidents involving a fatality—less than 2 percent of the overall roadway accidents involving heavy trucks. Thus, while this database represents the most severe occurrences, it may produce findings unrepresentative of most truck accidents occurring in the United States.[19] (See table 7-1 for a summary of accident reporting databases.)

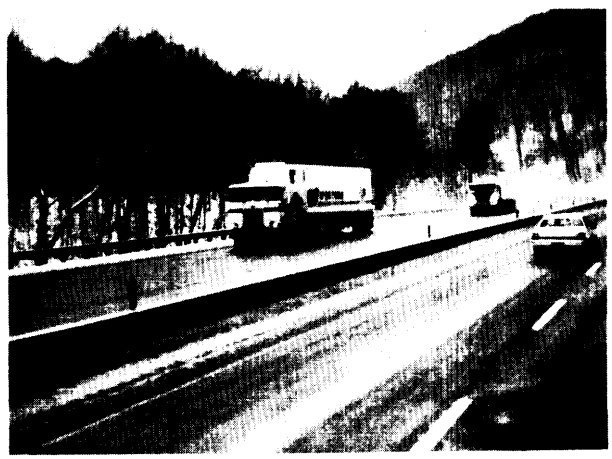
[18]University of Michigan Transportation Research Institute, *Trucks Involved in Fatal Accidents, 1983,* UMTRI-86-24 (Ann Arbor: University of Michigan, May 1984).

[19]Federal Highway Administration, *Development of a Large Truck Safety Data Needs Study Plan* (Washington, DC: U.S. Department of Transportation, February 1986).

EXPOSURE DATA

To address the truck safety question comprehensively, it is important to derive estimates of both accidents and exposure. Exposure data serve as a denominator in establishing accident rates, and are necessary for determining whether increases in accidents are due to a deterioration in safety practices or an increase in the amount and type of truck travel.

Compared with other freight modes, trucking has the poorest available shipment data. Two principal databases are available publicly for analyzing trucking sector flows: the Truck Inventory and Use Survey (TIUS) and the Commodity Transportation Survey (CTS). Neither presents a complete picture of the trucking sector. These databases and other sources of exposure information are described in this section.



Phofo credit: Michael Hines, OTA Staff

Exposure data are essential for interpreting and understanding highway accident statistics.

Truck Inventory and Use Survey

The TIUS has been conducted roughly every 5 years by the Bureau of the Census as part of the census of transportation. It includes sample data on the physical characteristics and operational use of commercial and private trucks in the United States, but does not show year-to-year changes or trends. The 1982 TIUS contains data on the character and use of slightly over 120,000 trucks (including light trucks, pickups, and vans), drawn from an estimated total of 33.8 million. The sampling rate is skewed toward large trucks (approximately 5.6 million vehicles) to enhance that portion of the data, but the sample size is still quite small. Among the specific items contained in the TIUS are vehicle identification number, operator class, range of operation, vehicle design characteristics, annual mileage, and commodities carried.

The TIUS provides a global assessment of both the number of trucks in use and the mileage they

Table 7-1 .—Truck Safety Information Resources (Accident Data)

Database	Kept by	Years	Strengths	Weaknesses
50-T (part of) MCMIS)	FHWA, Office of Motor Carriers	1973 to present	• Good detail on truck accident characteristics • Exclusive truck focus	. Missing several portions of the truck population . Accuracy and completeness of reports not consistent . Relies on carrier participation
FHWA, Special Monitoring Study	FHWA, Office of Highway Information	1983 to present	. Involves accident and exposure data . Exclusive truck focus	• Restricted to aggregate accident reporting . Limited number of participating States • Missing some truck detail
NASS	NHTSA, National Center for Statistics and Analysis	1979 to present	. Statistical sampling design • Comprehensiveness of accident investigation . Reasonably good detail on truck accident characteristics . National estimates of accident frequency	. Small number of heavy truck accidents in database • Detailed causal analysis sometimes difficult
FARS	NHTSA, National Center for Statistics and Analysis	1975 to present	• Census of all fatal accidents . Comprehensiveness of accident investigation	. Limited details on truck configuration and operation . Nonfatal accidents not represented
NTSB	NTSB	1986 to 1987, single collection	• Comprehensiveness of accident investigation • Good detail on truck characteristics . Exclusive truck focus	. Limited sample of accidents under investigation, not representative of truck crashes generally
State databases	Various State regulatory agencies		• Census of all accident types	• Based solely on police reports at scene . Varying detail on truck accident characteristics . Lack of uniformity from State to State
CARDfile	NHTSA	1982 to present	• Census from several States • Uniformity in reporting format	• Limited truck detail due, in part, to limited uniform variables listed . Based solely on police reports at scene . Limited to a few States
Motor carrier industry	Individual carriers, trade associations		• Some individual carriers maintain excellent detail on accidents and movements . Exclusive truck focus	. Individual carrier represents single observation in industry • Access to individual carrier records is not in the public domain . Trade associations report accident rates but not details on accident characteristics
insurance companies	Individual companies, ISO		• Detailed financial and statistical data on truck insurance policies and claims	. Aggregate reporting of information by insurers . Primary concern over loss ratio rather than accident causation
UMTRI	UMTRI	1980 to present	. Combines coverage of FARS with detail of 50-T . Post-accident investigation to complete missing information . Exclusive truck focus	. Reliance on information provided by carrier during past-accident investigation . Restricted to fatal accidents

KEY: MCMIS - Motor Carrier Management Information System.
FHWA - Federal Highway Administration.
NASS = National Accident Sampling System.
FARS - Fatal Accident Reporting System.
CARDfile = Crash Avoidance Research Datafile.
NTSB = National Transportation Safety Board.
NHTSA = National Highway Traffic Safety Administration.
ISO = Insurace Services Offices, Inc.
UMTRI = University of Michigan Transportation Research Institute.

SOURCE: Office of Technology Assessment, 1998.

accumulate, but lacks any origin-to-destination flow information or precise definition of commodities. The TIUS is based on voluntary responses from the owners of the vehicles selected; a 90 percent response rate has been achieved in the past. Since the TIUS focuses on aggregate activity based on typical yearly vehicle use, it does not provide information about the driver, vehicle cargo weight, number of trailers, road class, and time of day. The TIUS can be a useful source for static data, such as model year and size of carrier operation. Results from the TIUS now under way are projected to be ready in summer 1989.[20]

Commodity Transportation Survey

The CTS was collected by the Bureau of the Census in approximately 5-year intervals starting in 1963. It contains flow data for commodities shipped by manufacturing establishments selected from several hundred industries. Each record lists the total tons shipped from a given origin to a given destination for a specific commodity, mode of transport, weight, and value. The data are based on voluntary responses from approximately 16,000 establishments to which survey forms are sent. Data are checked against the Census of Manufacturers Survey using the value of shipment information to ensure that the expanded value of shipments made corresponds closely to the value of commodities produced.[21]

While the census' main strength is its multimodal nature, it has real limitations. Shipment data on waste materials, agricultural products, and raw materials are not reported. The CTS also reflects shipments only from point of manufacture to first destination (which many analysts claim is typically a warehouse), missing all subsequent movements in the distribution chain. Data submission is voluntary, creating unknown biases due to nonreporting. Furthermore, the scope of the survey is heavily dependent on Federal budget decisions, and the questions asked are not consistent between surveys, making trend analyses on some issues difficult. Finally, the data are released only at the State-to-State or production area-to-production area level; the Bureau omits any flows that would compromise the confidentiality of the survey's respondents.

Motor Carrier Census File

As part of its MCMIS, FHWA maintains the Motor Carrier Census File. This database contains a basic description of each commercial motor carrier and/or shipper known to FHWA. The unique number assigned to each carrier is included in all forms and records used in the MCMIS.

While this database is used primarily to monitor carrier safety and identify problem motor carriers, it could be used to develop measures of carrier activity and travel pattern indicators. The database contains information on each carrier's State base of operations; States served; type of commodities carried; carrier classification; miles operated; number of drivers; and number of trucks, truck tractors, and trailers, segmented by type of ownership. Unfortunately, the database is incomplete, owing to the many carriers FHWA has yet to evaluate and locate, as well as to those carriers that are not presently subject to Federal motor carrier safety regulations and FHWA oversight.

Highway Performance Monitoring System

The Highway Performance Monitoring System (HPMS) is a combined effort of Federal, State, and local governments to collect national data that provide current statistics on the mileage and characteristics of various highway systems. The annual database is derived from general statistics provided by States for their total system and from more detailed data for a prescribed sample of their highway systems. The sample sections were established using a statistically-designed sampling plan. The plan was based on the random selection of road sections within predetermined average, annual, daily traffic volume groups for each functional highway classification.[22]

The primary purpose of this database is to obtain very specific highway and traffic data for a sample

[20] Robert Crowther, Bureau of the Census, Business Division, personal communication, Aug. 9, 1988.

[21] Bureau of the Census, *Commodity Transportation Survey: Summary,* TC77-CS (Washington, DC: U.S. Government Printing Office, June 1981).

[22] Federal Highway Administration, *Highway Performance Monitoring System Field Manual* (Washington, DC: U.S. Department of Transportation, January 1984).

of different highway types. Although area-wide vehicle classification data are reported by the number of axles of single-unit, single-trailer, and multiple-combination vehicles, other vehicle characteristics are not reported. The estimates of truck volumes for these categories are sometimes less accurate for lower functional highway classifications.[23]

Truck Weight Study

The Truck Weight Study (TWS) is compiled annually by FHWA from information collected voluntarily by the States. It is composed of vehicle classifications and truck weight data, which are collected at preselected sites where such operations can be accommodated. Each State has between 10 and 20 sites, and locations remain relatively constant from year to year. In total, more than 10 million vehicles are classified, and more than 200,000 trucks are weighed on an annual basis.

Classification counts are conducted for three 8-hour shifts that cover all hours of the day, but are not necessarily consecutive. At each location, all of the vehicles in the traffic stream are counted and classified. Several truck types are included, and for each type, the number of axles and axle configurations are recorded. Weighing operations are a separate activity that occur immediately upstream or downstream from the point of classification. Each surveyed vehicle is described by vehicle type, body style, fuel type, class of operation, loaded status, commodity carried, and axle spacing. In those States using weigh-in-motion equipment, survey data are limited to axle spacing and weights, vehicle type, and body type; however, a census of trucks is not always taken, particularly at high-volume locations. In these cases, the more frequently occurring truck types are weighed during one or more 10- to 15-minute intervals in an hour. Less common types are fully sampled.[24]

The main deficiency of the TWS for exposure analysis in the past has been that the counting sites are not statistically representative of the States' highway systems and cannot be used to estimate vehicle-miles traveled by vehicle type. Also the collection stations tend to be oriented toward the Interstate and rural primary systems. Furthermore, many trucks operating in violation of weight standards travel on circuitous routes to avoid weigh stations. FHWA is currently investigating ways to address these concerns and to establish a data collection scheme consistent with the HPMS approach.[25] Evidence of progress to date is the recent FHWA decision to modify TWS site selection guidelines so that States are encouraged to sample from HPMS locations.[26]

The method of collection for TWS data is imprecise—using one or more observers to classify vehicles moving in the traffic stream can pose problems in high-volume locations, poor lighting, and bad weather. Furthermore, since each State determines its method for establishing vehicle classification and truck weight (see figure 7-2), the error in the estimates may vary.

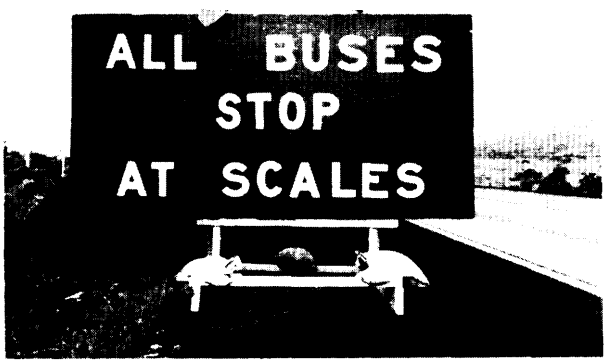


Photo credit: California Department of Transportation

Data on vehicle weights are often based on statistics from unsophisticated and temporary State weigh stations.

Industry Sources

Trade organizations generally do not keep commodity flow or truck population and mileage data. The American Trucking Associations (ATA), for example, keeps only aggregate statistics on tons and

[23] Federal Highway Administration, op. cit., footnote 19.

[24] Ibid., p. 20.

[25] Federal Highway Administration, *Development of a Statewide Traffic Counting Program on the Highway Performance Monitoring System* (Washington, DC: U.S. Department of Transportation, March 1984),

[26] These guidelines have been included in the Federal Highway Administration, *Traffic Monitoring Guide* (Washington, DC: U.S. Department of Transportation, June 1985).

ton-miles derived from reports filed with ICC. The firms that submit the data are principally less-than-truckload common carriers, so the data lack information about bulk shipments and private carriage operations. Shipper organizations, like the American Petroleum Institute and the Chemical Manufacturers Association, are in much the same position as ATA. The Motor Vehicle Manufacturers Association maintains statistics on truck registrations derived from self-reported factory sales data provided by truck manufacturers.

Some individual carriers, however, do keep data on their own movements. Large trucking firms generally keep computerized traffic databases that include origin, destination, commodity (by a variety of codes), shipment weight, and shipment date. Major shippers, like the large chemical and petroleum companies, also keep computerized data on their truck shipments.

National Motor Truck Data Base

Started under contract with the Association of American Railroads in 1977, the National Motor Truck Data Base contains information on approximately 36,000 movements per year. The data are collected at 18 selected truck stops, typically in the West and Midwest, in an attempt to sample long-haul moves selectively. For the shipments it covers, the database includes origin city and State, destination city and State, commodity, vehicle and operator characteristics, and an operator profile. The data are sometimes cross-checked against fuel sales at the truck stops and against volume counts on selected Interstates.[27]

Concerns over the utility of this database focus on the sampling approach and the survey design. The survey deals primarily with driver perceptions and statements about what they do and believe; it is thus subject to question as an indicator of actual behavior.

National Truck Trip Information Survey

UMTRI has recently developed an independent survey—the National Truck Trip Information Survey (NTTIS)-based on information at the trip level rather than at the level of a vehicle's annual mileage. The owner of each vehicle in the survey is contacted by telephone four times a year and asked about the vehicle's usage on a random day. The information includes trailer usage, cargo and cargo weight, and driver age for each trip. The trips are split into daytime and nighttime mileage, and each trip is mapped to distinguish urban and rural highway use. Roads are also divided into limited access highways, other major highways, and other roads.

By summing the data for all trips, annual mileage can be estimated by company type, power unit, number of trailers, trailer type and body, cargo, actual cargo weight, actual combination gross weight, driver age, and highway type. A sample of 8,144 vehicles was originally drawn from State registration files maintained by a national data firm, R.L. Polk, from which a subsample of 5,000 vehicles was used for the mileage survey. Response rates have been averaging 85 percent, roughly similar to response rates achieved by the TIUS.[28]

Preliminary analysis of the aggregated NTTIS data yields estimates that are roughly comparable to the TIUS in the total number of heavy trucks, configuration, and cab style, validating results of the TIUS and thus providing valuable information. The average daily mileage from TIUS data is slightly higher than similar estimates derived from NTTIS data.

[27] Office of Technology Assessment, op. cit., footnote 2, p. 48.

[28] University of Michigan Transportation Research Institute, The *UMTRI Research Review, vol.* 17, No. 1, July-August 1986.

INSPECTION AND ENFORCEMENT DATA

Government oversight activities directed at carrier, driver, and vehicle qualifications have grown considerably in recent years, particularly at the State level. In support of these activities, a large amount of data has been collected and maintained for monitoring compliance. This information is also useful in assessing safety in the industry.

Federal Activities

Inspection, compliance, and enforcement actions taken by FHWA are included in MCMIS. Inspection activities consist of two separate reporting procedures, one for driver-vehicle roadside inspections and the other for motor carrier safety audits.[29]

The driver-vehicle inspection report documents findings of roadside inspections of drivers and vehicles conducted by FHWA field personnel and State personnel under the Motor Carrier Safety Assistance Program (MCSAP). The inspection program and reporting form have undergone considerable change since their inception in 1968, making the data inconsistent, a problem compounded by the unequal quality of information collected. For example, the information obtained from drivers is sometimes incorrect and/or obsolete, and many other fields in the report are incomplete, because of the limited information available to investigators at the time of inspection.

As of October 1, 1986, safety management audits have been handled through a three step process to 1) provide technical assistance and evaluate safety fitness; 2) assess compliance with recommended changes; and 3) pursue enforcement actions if compliance is unsatisfactory. The new system replaces the previous safety management audit and includes several reporting forms that are coded into MCMIS for later use.

The first step, a safety review, is compiled on form SR-1. Carriers are selected using sampling techniques to improve program efficiency and increase the number of safety contacts made annually. The SR-1 is used to determine whether the company has an adequate safety program in place. Additionally, the SR-1 is used to establish "safety fitness ratings" for the approximately 185,000 motor carriers that have not been previously evaluated by FHWA.

To assure the close monitoring of companies identified as having safety problems and to pursue enforcement actions, a selective compliance and enforcement program has also been established. Companies with unacceptable safety fitness ratings are subject to a compliance review, using form CR-1. The compliance review is a followup, on-site assessment to determine if a new rating is warranted or whether enforcement action is necessary. If enforcement action is required, such action is recorded on form 33B. Data from this form supplement an enforcement file, which FHWA has been using for years to track the status of legal actions taken against motor carriers or shippers in noncompliance with the safety regulations. This program also includes a component for monitoring companies that are in compliance, but are overrepresented in carrier/driver/vehicle at-fault accidents. The goal is to identify problem areas and implement safety countermeasures that could reduce at-fault accidents.

State Programs

Several States conduct roadside inspections as part of MCSAP. To satisfy reporting requirements to FHWA, these States maintain aggregate records on the vehicles inspected and on related findings. The information collected includes the number of inspections; driver violations, such as hours of service and medical certificate; vehicle defects, such as brakes, coupling devices, and exhaust systems; and proper adherence to hazardous materials regulations. Violations requiring immediate out-of-service action are tracked separately. As MCSAP continues to grow, it will also be possible to track inspection findings to support trend analyses. **The level of sophistication in storing and maintaining these data varies considerably across States.**

A second MCSAP-supported State activity is the conduct of safety management audits (Federal SR-1 and in-depth safety audits) by State inspection personnel. Fewer States conduct audits than do roadside inspections; however, increased emphasis is now being placed on terminals. States with exemplary

[29] R.P. Landis, Federal Highway Administration, personal communication, Apr. 17, 1987.

Photo credit: California Department of Transportation

State inspectors are vital contributors of highway safety data.

terminal audit programs include Washington, Oregon, Idaho, and Alaska, participants in a pilot Federal program. In Oregon, for example, the audit database includes the number of vehicles each carrier operates, the type of payroll system used by each carrier, time documents or logbooks, hazardous materials transport violations, and maintenance functions. These data are cross-checked to make sure that the companies are not passing off fictitious paperwork as true safety programs. Trucks can be traced and cross-referenced in the database either by their vehicle license numbers or by the Oregon Public Utilities Commission plates of all vehicles based in Oregon.[30] The current MCMIS has capabilities similar to the Oregon system's, with the exception of some design specifications included in Oregon to accommodate State-specific needs.

The wealth of information potentially available for State inspection activities will be pooled by FHWA into a national database as part of SAFETYNET, the Motor Carrier Safety Information Network. SAFETYNET is a database management system designed to support MCSAP. The first component of the system will allow States to manage data collected during the inspection process. The key to the system is the development of a standardized format that permits individual States the flexibility to include additional data to satisfy specialized information needs. In theory, an individual State will be able to retrieve from the database a complete record on a carrier that also operates in other States. SAFETYNET is envisioned as a more comprehensive system that could potentially include accident and safety management information.[31]

[30] Larry Koeneke, State of Oregon, personal communication, April 1987.

[31] *Safety Network News, vol. 1, No. 1,* fall 1986.

MARKET AND FINANCIAL DATA

Under the present deregulated environment, tracking carrier entry into and out of the marketplace and tracking the impact of financial performance on safety investment are important for ensuring safety. Several useful sources of information are available for these purposes.

Interstate Commerce Commission

ICC has long had primary responsibility for monitoring economic activities in the interstate trucking industry. Prior to 1980, ICC required annual reports from virtually all motor carriers of property, Classes I, 11, and 111. Very small Class III carriers, those with annual revenues under $500,000, were exempted from the annual report filing requirement. Over time and through rulemaking, ICC has reduced reporting requirements for motor carriers of property. Also, revenue levels for the various carrier classes (see below) have been raised over time, also reducing reporting requirements. Further, since ICC no longer analyzes these data on many of the

carrier segments, it has granted exemptions from the reporting requirements to many firms simply because they asked to be exempted.[32]

The first change in reporting requirements affected Class III carriers, and by 1981, Class III firms were no longer required to file any financial reports. In dropping these requirements, ICC relinquished any possibility of tracking progress made by these firms, even if they subsequently grew to Class 1 or II status. All motor carriers granted their initial ICC operating authority are originally classified as Class III. Thus, virtually no data exist for new entrants.[33]

Also, in 1980a number of other changes affected reporting requirements. First, ICC raised carrier revenue limits. Class I carriers were redefined from annual revenues of $3 million or more to $5 million or more. Class II revenue levels were raised from the $500,000 to $3 million range to a $1 million to $5 million range. Class III, previously under $500,000 in revenues, was raised to under $1 million. Because of this change, a number of firms previously filing the Class I and II annual report fell back to the (exempt) Class III group. It is estimated that some 500 carriers were "lost" as a result.[34]

During this time, ICC also began granting exemptions to Class I and II carriers from the annual reporting requirements. In 1980 alone, 324 Class 1 and 11 carriers were exempted, and more have been added to this list in recent years.

At one time, the data from annual reports provided sufficient detail to track freight activities at several levels by type of carrier, commodities carried, services provided, size of operation, expenditures and income, and vehicle utilization. However, ICC has reduced the amount of information required on the report form as well as reducing the reporting population. At the present time, annual report data are collected only from Class I and 11 carriers (those not given exemptions). A recent initiative by ICC to dispense with its accounting system and to reduce annual report forms to one page was contested vigorously by several interest groups. **However, ICC's proposed rulemaking effectively reduced the number of motor carriers reporting to ICC from 2,500 to 950 and permitted carriers to use alternatives to the uniform accounting system. Since January 1, 1987, the annual report form has contained only 10 pages, a considerable reduction over previous requirements, although the requirements are under review.[35] ICC data are maintained by the American Trucking Associations and include extensive error-checking programs to verify the accuracy of reported information.**

Dun & Bradstreet

The actual number of companies entering and leaving the trucking industry is tracked by Dun & Bradstreet. New entries are monitored by Dun & Bradstreet through sources such as requests made to ICC for operating authority. Carrier failures are monitored by Dun & Bradstreet reporters, who are assigned to local jurisdictions to examine court records daily concerning bankruptcy filings. Companies are categorized by the Standard Industrial Classification system, although the reliability of the process used to assign trucking companies to appropriate classifications is a concern. Because of the structure of the database, mergers and changes in ownership cannot be identified through Dun & Bradstreet.[36]

The Insurance Industry

The insurance industry is understandably concerned about the financial solvency of the motor carriers its members consider for coverage. Although some financial records exist in-house, the industry also contracts with outside firms to gather additional financial data. This information is drawn from several State regulatory agencies where carriers are registered and from the more limited data available through ICC.[37]

[32] Ronald D. Roth, American Trucking Associations, personal communication, Mar. 24, 1987.
[33] Ibid.
[34] Ibid.
[35] *Traffic World*, "Agency Eases Rules on Accounting, Reporting for Regulated Truck Lines," Apr. 6, 1987; and Ronald D. Roth, American Trucking Associations, internal memo, Jan. 15, 1988.
[36] Tiziana Mohorovic, Dun & Bradstreet, persona] communication, July 21, 1987.
[37] Andrew Schindel, Central Analysis Bureau, personal communication, July 21, 1987.

CONCLUSIONS AND POLICY OPTIONS

Accurate, uniform, and representative information about heavy vehicle safety matters is essential, so that effective programs for improvements can be developed. However, OTA finds **that with few exceptions, existing information systems have deficiencies that limit their value in supporting safety policies and programs. In general, data collected are of questionable usefulness for one or more of the following reasons: 1) poor data element design and lack of uniformity, 2) little or no quality control of the data collected, or 3) poor or nonexistent data handling and storage systems. Although it is virtually impossible to design and collect the "perfect" database, and some of the existing data are useful for analyzing narrow, specific truck safety issues, truck safety information systems lag considerably behind their modal counterparts in coverage and accuracy.**

Accident Data

None of the national accident databases is ideally suited for addressing all the important motor carrier safety issues (see table 7-1). The MCMIS accident file lacks adequate information on the accident experiences of most intrastate carriers. The FARS database is a census for only one small subset of accidents (fatal accidents), and it does not distinguish all truck types.

NASS offers the advantage of selecting accidents by a statistically based sampling scheme, permitting the derivation of national accident totals and annual trends. However, the changes made to NASS for 1988 are likely to make it more difficult to conduct detailed motor carrier accident causality studies using this database.

State accident reporting systems present several promising alternatives because they can represent a census of accidents, and many States have begun to include additional fields for truck details. However, the lack of uniformity between States' data presents problems for extrapolating findings to the national level. The efforts of NHTSA in establishing the CARDfile, and of CVSA and the National Governors' Association in striving for more uniform State accident reporting practices are commendable.

OTA finds that a NASS-style approach could be a cost-effective base for a truck accident data system, for it allows a sampling of truck operations by both geography and road use. To provide accurate and comprehensive information, each accident investigation could be handled by a field staff that examines the vehicle and the accident site, interviews vehicle occupants, and reviews medical and driver records. Finally, the report form could include the necessary detail on truck vehicle and operating characteristics to permit the type of study needed for performing component safety analyses. For this option to be effective, additional funds will be needed both to restore the original approach and to expand the system to meet truck safety concerns. **Furthermore, OTA concludes that training field teams in truck accident investigation so that vehicle-related factors are examined thoroughly will be necessary.**

Another alternative is the development of a completely independent truck accident data collection system patterned after the NASS design. This approach would permit selection of sampling units solely on truck criteria rather than for all motor vehicles. Such a program would be more costly because a new, independent system would have to be developed. However, the system could provide the type of detail needed to support better analysis of motor carrier safety needs. NHTSA's advice and expertise would be valuable regardless of whether NHTSA or FHWA took the lead on such an initiative.

Congress may wish to consider requiring the Department of Transportation to focus on coordinating and improving existing accident databases and to take steps to develop a NASS focused on heavy vehicles. At a minimum, FHWA programs that encourage States to expand accident report forms to accommodate truck detail and to establish uniform reporting thresholds and forms for a minimum core of data elements could be aggressively pursued. This would improve available truck safety information and would move toward a national census of accident history that could be used for analysis. **OTA concludes that NHTSA analysis of motor carrier accident data has not been sufficient to support regulatory initiatives, particularly**

those related to the key areas of driver training and performance. This shortcoming is serious, given the preponderance of human error among accident causal factors. Congress may wish to require DOT to address this issue. Coordination between FHWA and NHTSA is essential.

Exposure Data

OTA finds that uniformity between accident and exposure data, and accuracy in estimating truck movement independent of accident rate formulation (see table 7-2) are priority needs. Each existing exposure database has a different limitation. However, FHWA's work with the States on exposure has promise. For example, the HPMS and TWS could be merged to form a national exposure data collection system that still meets the original objectives of each database. The level of detail collected by HPMS and TWS is sufficient for a truck exposure database, provided that information on the driver is included in the survey. FHWA is already in the process of resolving some of the issues involved in developing such an exposure system.[38]

TWS data could be collected from sample sites drawn from each HPMS functional classification stratum. Classification counts could be scheduled to take place at each site around the clock at periodic intervals. Truck weight sites would be selected from sites identified for vehicle classification, recognizing that some sites are more conducive than others for vehicle weighing and survey administration. Such a program would allow derivation of national exposure estimates by road type, vehicle, carrier, and driver. Also, if the statistical design for both the accident and exposure databases were properly formulated, accident rates could be established without necessarily having the same accident and exposure reporting sites.

As an initial step, Congress may wish to consider extending FHWA's reporting requirements to inelude all motor carriers, including intrastate and those currently exempt from Federal reporting requirements. Using SAFETYNET as a model, a Federal-State cooperative truck registration database could be developed. State vehicle registration requirements could incorporate carrier identification and exposure information for entry into the database.

An alternate approach could include a Federal requirement for a brief annual report by intra- and interstate carriers to FHWA. Useful information would include carrier's name, address, telephone number, the number of trucks and buses with identifying numbers, categories of vehicles, and miles traveled annually. The cost to the Federal Government would be minimal; additional staff would be required for information processing. The information would provide valuable data about exposure and distribution. Congress may wish to consider legislation enabling DOT to implement this reporting requirement.

The cost of both accident and exposure data collection programs is a function of the desired precision in the estimates. The variance of recorded measures both within and between sampling units has an impact on the number of units and observations required. To achieve reasonable confidence levels for accident rates between truck types, close to 300 sampling units would be required at a total annual cost of close to $2 million. Furthermore, the logistical demands of establishing and maintaining cooperative arrangements with each jurisdiction are formidable.

If these obstacles are insurmountable, more economical alternatives can be considered, focusing primarily on expanding existing data collection instruments, such as the Motor Carrier Census, that are producing some useful information. However, the deficiencies that are associated with each of these approaches are likely to persist. OTA concludes that the importance and scale of activity of the trucking industry, and the high costs associated with heavy vehicle accidents make these important issues for Congress to weigh.

Inspection and Enforcement Data

A wide range of inspection and enforcement data is being amassed (particularly at the State level) that will provide useful information for safety analyses (see table 7-3). Although the process by which vehicles and companies are targeted for inspection varies between States, the inspection results are reported in a uniform way. SAFETYNET must ma-

[38] Federal Highway Administration, op. cit., footnote 25.

Table 7-2.—Truck Safety Information Resources (Exposure Data)

Database	Kept by	Years	Strengths	Weaknesses
TIUS	Bureau of the Census	Every 5 years, most recently in 1982	• Covers all trucks used in the United States • Sample biased toward heavy trucks • Exclusive truck focus	• No commodity flow data • Only rudimentary commodity information • Reflects tractor use, not trailer use • Based on owner response
CTS	Bureau of the Census	Since 1983, every 5 years	• Multimodal • Cross-checked against the Census of Manufacturers • Provides flow data	• Shipment data on some products are missing • Only shipments from point of manufacture to first destination are reported • Nonuniformity between surveys • Voluntary data submission
Motor Carrier Census File (part of MCMIS)	FHWA	Most recent 5 years	• Comprehensive listing of carriers and truck fleet operators • Exclusive truck focus	• Many carriers missing from data base • No commodity flow data
HPMS	FHWA	Annually	• Statistical sampling design • Detail on roadway characteristics	• Limited truck classification detail
TWS	FHWA	Annually	• Truck classification and weight data • Exclusive truck focus	• Counting sites are not statistically representative • Method of data collection varies and is subject to observer error
Motor carrier industry	Individual carriers, trade associations		• Aggregate statistics on tons, ton-miles, and truck registrations • Detail flow records from individual carriers and shippers; can merge with similar accident records • Exclusive truck focus	• Truck data are based principally on LTL carriers • Individual carrier represents single observation in industry • Access to individual carrier records is not in public domain
NMTDB	Transportation Research and Marketing (consulting firm)	1977 to present	• Focuses on long-distance truck movements • Good truck and operator classification detail • Exclusive truck focus	• Purposely excludes short-haul truck movements, especially in Northeast • Not in public domain
NTTIS	UMTRI	1988 to 1987, single collection	• Good truck and operator classification detail • Disaggregate and aggregate analysis possible • Exclusive truck focus	• Relatively small number of observations • Single collection

KEY: TIUS = Truck Inventory and Use Survey.
CTS = Commodity Transportation Survey.
MCMIS = Motor Carrier Management Information System,
FHWA = Federal Highway Administration.
HPMS = Highway Performance Monitoring System.
TWS = Truck Weight Study.
LTL = less-than-truckload.
NMTDB = National Motor Truck Data Base.
NITIS = National Truck Trip Information Survey.
UMTRI = University of Michigan Transportation Research Institute

SOURCE: Office of Technology Assessment, 1988.

Table 7-3.—Truck Safety Information Resources (Inspection and Enforcement)

Database	Kept by	Strengths	Weaknesses
MCMIS (driver-vehicle inspection review, enforcement)	FHWA, Office of Motor Carriers	• Part of comprehensive safety information system • New program initiated in 10/86 will add safety management audit activities • Exclusive truck focus	• In the past, quality of information collected has been poor • Quality of new program data collection unknown
State programs	Various State regulatory agencies (MCSAP)	• Roadside and safety management audits • Development of uniformity to permit interface at a national level through SAFETYNET • Exclusive truck focus	Ž Not all States currently participate • Successful implementation of SAFETYNET unknown at this time

KEY: MCMIS = Motor Carrier Management Information System.
FHWA = Federal Highway Administration.
MCSAP = Motor Carrier Safety Assistance Program.

SOURCE: Office of Technology Assessment, 1988

ture before its information can be available in an automated form on a national scale. The new procedure developed by FHWA for handling safety management audits is such a recent development that the contribution of this effort to the quality of available information is largely unknown. OTA concludes that an enforcement information database will provide a valuable resource for Federal and State safety oversight. Congress may wish to continue Federal support for this program.

Market Entry, Exit, and Financial Data

Little information is publicly available on the financial condition of motor carriers, and the direction in the past 8 to 10 years has been toward curtailing reporting requirements (see table 7-4). OTA concludes that the ICC reporting system no longer adequately monitors carrier market entry, exit, and financial performance. The current lack of information presents a significant problem for both safety-related and broad policy decisions. A data collection effort that includes Class III carriers, scrutinizes requests for exemptions, and maintains sufficient detail in the data elements to track financial performance would serve a useful purpose for evaluating truck safety.

Table 7-4.-Truck Safety Information Resources (Market Entry, Exit, and Financial Performance)

Database	Kept by	Strengths	Weaknesses
ICC	**ICC**	• Primary source of financial data on carriers • Excellent historical detail • Exclusive truck force	• Intrastate carriers not included; elements of interstate market missing owing to exemptions and changes in reporting requirements • Little concern over reporting compliance • Diminishing financial detail with new reporting requirements
Insurance industry	Individual insurers, Central Analysis Bureau	• Collectively utilizes best financial information available for each carrier under evaluation • Exclusive truck focus	• Relies on developing composite picture from variety of sources
Dun & Bradstreet	Dun & Bradstreet	• Monitored based on filings for operating authority and bankruptcy • Exclusive truck focus	• Aggregate data reporting, classification problems • Merger and change in ownership cannot be identified

KEY: ICC = Interstate Commerce Commission.

SOURCE: Office of Technology Assessment, 1988.