Freight Transportation Data Needs, Resources, and Issues

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Current sources of data related to freight transportation in the United States are examined and improvements are recommended that would enhance the ability to make informed decisions on national transportation strategy and policy development. The major focus of the paper is on intracity freight transportation via rail, highway, water, and air. Two key trends are having a major impact on the collection and use of freight transportation data in the United States: the continuing deregulation of freight transportation carriers and the increasing importance of freight transportation to the shipper community. However, a "planning gap" is developing between the public and private sectors in freight transportation. Private companies are increasing their spending on information to ensure efficient movement of goods worldwide, while public agencies are reducing information development commitments for freight transportation right-of-way and facility planning. This paper identifies six key information gaps that need to be filled to meet emerging national freight transportation planning and policy analysis needs: modal/route/facility operating performance data, shipper logistics patterns by industry, intercity freight flows by mode, hazardous materials tracking, intracity freight movements, and emerging shipper needs. Finally, the paper recommends possible data collection options for each information gap and suggests a private sector/public sector "partnership" for freight transportation data collection in the 1990s.

The purpose of this paper is to examine current sources of data related to freight transportation in the United States and to recommend improvements, thus enhancing the ability to make informed decisions on national transportation strategy and policy development. The major focus of the paper is on intercity freight transportation via highway and air. Rail and water transportation (as well as intracity freight transportation) are also considered, but with less emphasis because of ownership and jurisdictional issues.

Key freight information needs and resources examined in this paper include

- Facilities,
- Transportation equipment,
- Carriers,
- Flows, and
- Users.

Information requirements, availability, and gaps have been evaluated relative to the U.S. transportation system user needs, capacity, and performance. The analyses in this paper were based on a thorough evaluation of existing freight transportation information sources (see Appendix A), the results of a workshop on freight transportation data conducted by TRB and the Transportation Research Forum (TRF) (see Appendix B), and numerous conversations with transportation analysts and policy makers who frequently use freight transportation data in their work.

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BACKGROUND

Two key trends are having a major impact on the collection and use of freight transportation data in the United States:

- The continuing reregulation of freight transportation carriers, and
- The increasing importance of freight transportation to the shipper community.

Over the past decade, transportation reregulation in the United States has steadily shifted from the economic regulation of carrier rates, services, and financial condition toward safety and environmental regulation. Public data collected to monitor and control transportation has also moved away from carrier and related economic information (e.g., finances, freight volumes, and rates) toward safety and environmental data (e.g., hazardous materials, traffic accidents and incidents, and Occupational Safety and Health Administration (OSHA) reporting). In addition, the declining federal role in freight transportation regulation (along with the search for new revenue sources) has led many state and local governments to track freight carrier activities more closely within their jurisdictions.

The expectation is that the 1990s will see a continued transfer of freight transportation regulatory responsibilities to the state and local level. States and localities will require information on the volumes and types of freight moving to, from, and within their regions. This information will be necessary for both planning new right-of-way capacity (e.g., highways and airports) and monitoring safety and environmental issues (e.g., hazardous materials flows and air quality). Unfortunately, consistent programs across state and local governments are not in place to collect such information on an ongoing basis.

The globalization of the U.S. economy, coupled with growing competition for markets, is enhancing the importance of freight transportation to companies. Instead of having large product inventories in numerous warehouses across the country, shippers are increasingly substituting direct plant-to-customer freight shipments for multi-echelon distribution systems. Such strategic changes are requiring companies to intensify their use of transportation carriers and to use information

and enhanced control procedures to better manage freight flows.

Improved freight flow management implies better information about where the products are in the plant-to-customer supply chain. Freight carriers and shippers are currently investing millions of dollars in enhanced freight tracking systems. These systems provide close-to-real-time shipment status information, including location, status (e.g., in-transit, in-process, or in-inventory), and delivery time estimates. Many leading-edge companies (such as Federal Express) can tell customers where their material and product shipments are in the vendor-to-plant-to-customer supply chain. Shippers are also maintaining extensive inbound and outbound freight flows and rates by carrier, route, and product class for competitive distribution analysis. In one decade, the U.S. economy has effectively "privatized" the collection and use of freight transportation data by carrier, route, and shipment type. Unfortunately, this information is not available to public agencies involved in transportation planning.

Figures 1 and 2 illustrate the current status of shipper logistics systems development and freight transportation data collection in the United States. Figure 1 details a global distribution operation of a typical U.S. company. Materials are shipped from vendors in the United States, Europe, and the Far East. These materials move in a multimode environment from vendors to company plants and distribution centers. Products are produced and shipped domestically as well as to European markets, again in a multimode environment. Leading-edge companies are monitoring and controlling most, if not all, of these movements, often on a real-time basis. At minimum, they track freight flows by route, mode, and shipment type on an exposte basis.

Figure 2 shows U.S. freight movements from a public data collection perspective. At present, due to continuing economic regulation of U.S. foreign trade, data are collected on movements by mode and product to and from the United States. As worldwide economic barriers decline, foreign trade data collection is likely to decrease in the 1990s. For freight flows moving in the domestic transportation system, little, if any, public information is available on a timely basis. For right-of-way or safety planning purposes, transportation analysts generally do not know what products are moving where by what carrier.

This results in a curious paradox for national freight transportation planning and policy analysis during the 1990s. Individually, private firms have substantially increased their collection and use of origin-destination freight flows and carrier performance data to enhance global competitiveness. Many federal, state, and local transportation authoritics, on the other hand, have substantially reduced freight flow and carrier data collection activities. As a result, most private companies are planning freight movements under the assumption that modal capacity will be available in the 1990s, while public agency transportation planners have little or no information

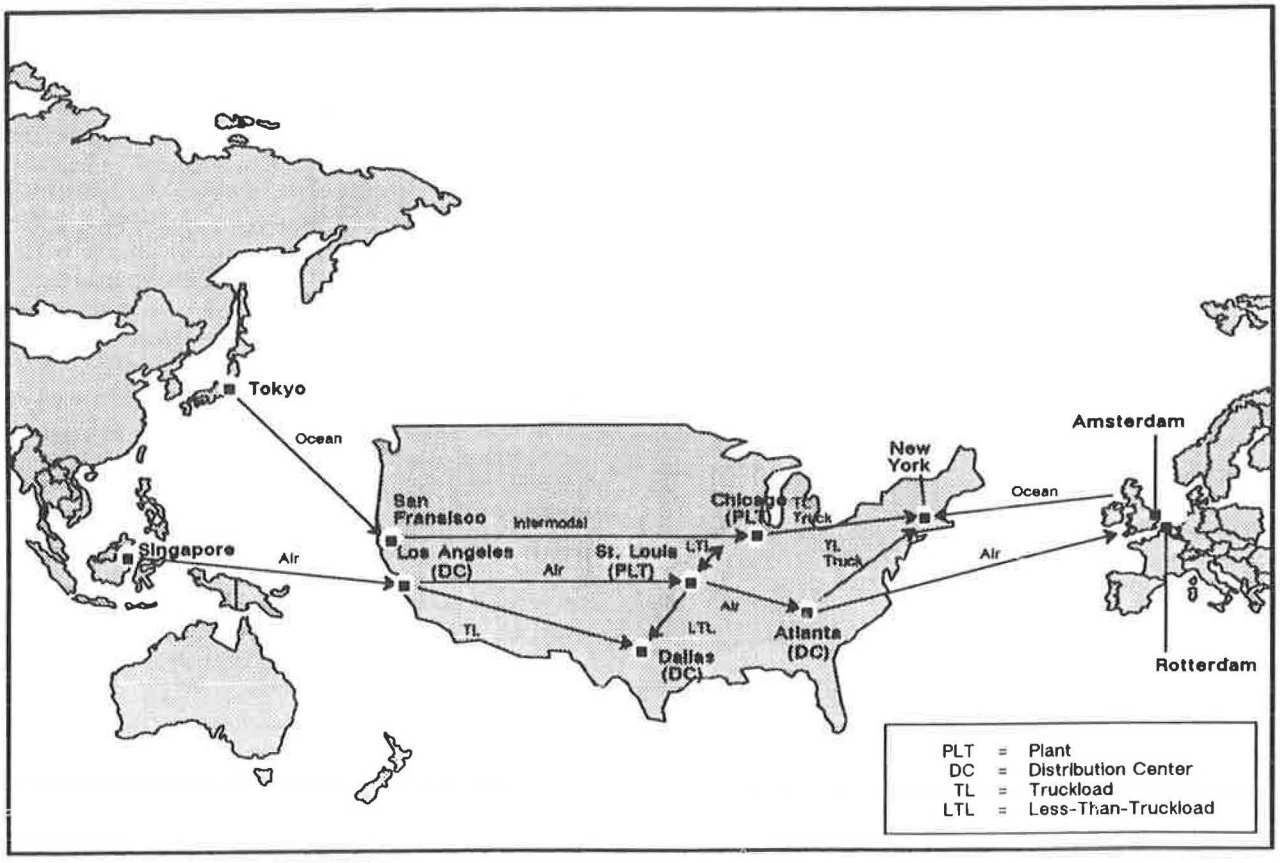

FIGURE 1 U.S. freight movements: shipper perspective.

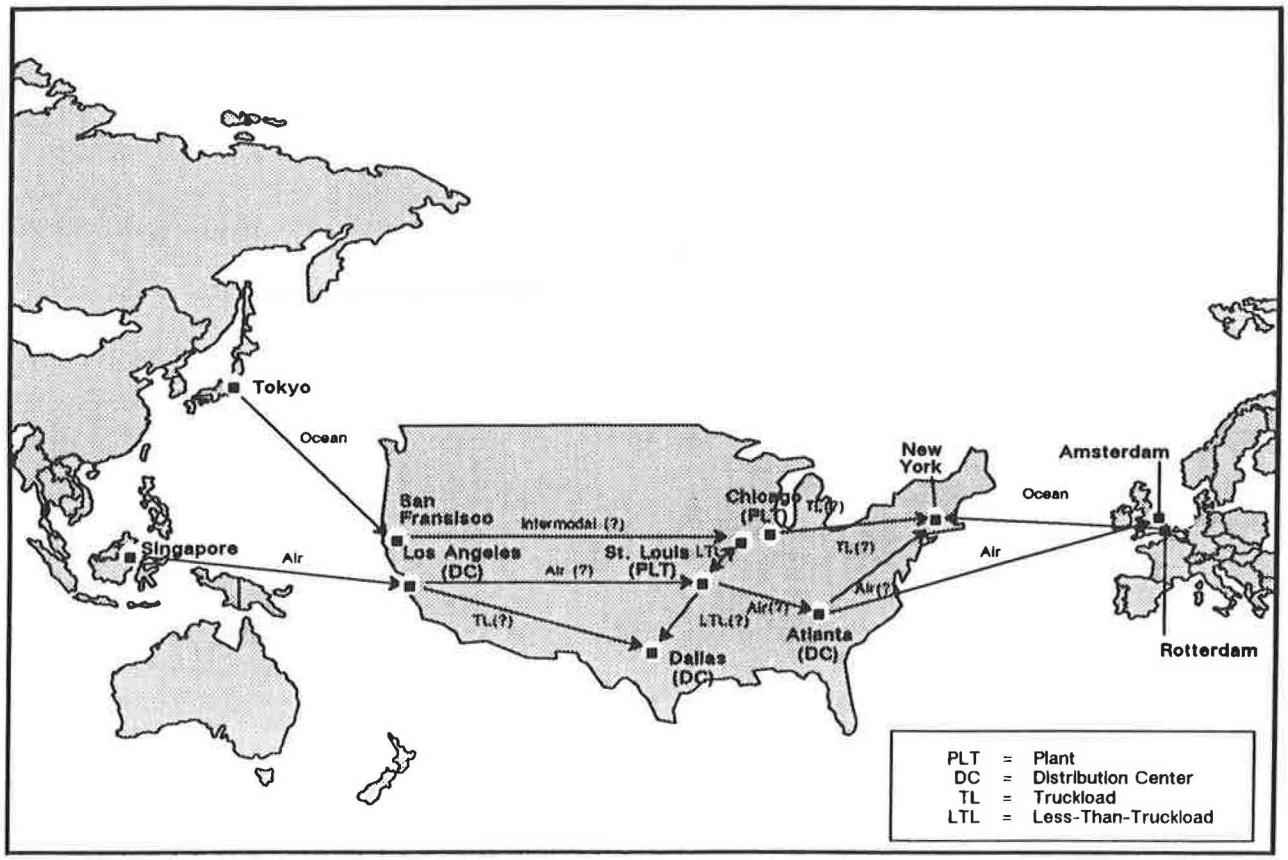

FIGURE 2 U.S. freight movements: public data perspective.

on which to base plans for emerging right-of-way and facility capacity requirements.

Freight transportation is a growing and important contributor to national economic development and global competitiveness. In addition, as Tables 1 and 2 indicate, the fastest modal growth in freight shipments is occurring in areas dependent on public rights-of-way and facilities. Between 1980 and 1988, total truck ton-miles grew by 27 percent and air ton-miles grew by 80 percent, compared with an overall freight ton-mile growth of only 12 percent (see Table 1). In addition, shippers are willing to pay higher truck and air rates to ensure timely shipments. During that same period, highway carrier revenues grew by 55 percent, while air revenues grew by 150 percent, compared with an overall model revenue growth of 47 percent (see Table 2).

The net result is a "planning gap" between the public and private sectors in freight transportation. Private companies are spending more of their information and distribution resources on ensuring the effective and efficient movement of products worldwide, while public agencies are reducing information development commitments for freight transportation right-of-way and facility capacity, safety, and environmental planning.

Continued public agency planning for freight transportation needs is necessary if the United States expects to remain competitive in the global economy. Methods of collecting the data to support these planning activities is the subject of the rest of this paper.

OVERVIEW OF NATIONAL STRATEGIC PLANNING AND POLICY ISSUES IN FREIGHT TRANSPORTATION DATA

A recent U.S. Department of Transportation (DOT) report details a number of major issues facing the intercity and international freight markets, including infrastructure, economic efficiency and performance, competition, safety, and government regulatory roles (*1*).

Three key national planning and policy issues will dominate freight transportation requirements analysis in the 1990s:

1. Ensuring adequacy of right-of-way and facility capacity to reduce congestion and support more rapid growth in freight volumes,
2. Enhancing public safety through closer monitoring of hazardous material flows and freight vehicle design and operation, and
3. Protecting the environment through air quality enhancement programs that include freight transportation impact considerations.

Primary federal government responsibilities for maintaining and expanding rights-of-way and facilities used by freight transportation include

- Interstate and intrastate highways and road/bridge infrastructure;

TABLE 1 U.S. FREIGHT REVENUES BY MODE ($ BILLIONS)

	1980	1985	1988	% Change 1980-1988
Highway	155	209	240	55%
%	73%	76%	77%	
Railroads	28	29	30	7%
%	13%	11%	10%	
Water	15	18	20	33%
%	7%	7%	6%	
Pipeline	7	8	8	14%
%	3%	3%	3%	
Air	4	7	10	150%
%	2%	3%	3%	
Other[1]	3	3	4	25%
Total	212	274	312	47%
% of GNP	7.8%	6.8%	6.4%	

[1] Includes freight forwarder and other shipper costs.

Source: ENO Foundation for Transportation, 1989.

- Air traffic control systems and cargo handling facilities; and
- Coastal, inland, and Great Lakes ports and waterways, including terminal interfaces with other modes.

Currently, the public role in rail and pipeline right-of-way/facility investment is minimal. As stated earlier, shipper trends in modal use imply that highway and air carriers will experience the largest increase in freight traffic during the 1990s. Public agency transportation planning resources will need to focus on enhancing freight haulage right-of-way and facility capacity for these modes.

As both total freight volumes and hazardous material movements increase during this decade, safety issues related to shared passenger/freight rights-of-way and facilities will increase in importance. An improved understanding of freight flow patterns will be required to address these issues, whether they involve real-time hazardous material shipment tracking capabilities or controls over vehicle design and operation.

Finally, environmental considerations, especially air quality, may require rerouting, time-of-day movement restrictions, or banning of certain freight movements. Understanding the role of freight flows in the development of both regional and national economies will be necessary to ensure companies can conform to these potential restrictions.

EVALUATION OF EXISTING INFORMATION SOURCES

Existing freight transportation data sources are characterized by the following trends:

- Data collection activities are continuing to shift to the private sector.
- Data types collected have lagged behind emerging national transportation planning and policy issues.
- Data collection methodologies, especially those related to freight flows, have not kept pace with changing shipper logistics systems or transportation analysis and planning requirements.

During the 1980s, freight transportation data collection activities steadily shifted to private sources. Although DOT, the U.S. Army Corps of Engineers, and the U.S. Department of Commerce have continued to be major sources of certain air, highway, and water-related data, Appendix A indicates that the Association of American Railroads and the Eno Foundation for Transportation (as well as Standard & Poor's and Dun & Bradstreet) have become primary sources for rail data and freight carrier financial information. The possible "sunset" of the Interstate Commerce Commission (ICC) will

TABLE 2 DOMESTIC INTERCITY TON-MILES BY MODE (BILLIONS)

	1980	1985	1988	% Change 1980-1988
Rail	932	895	1031	11%
%	37%	36%	37%	
Truck	555	610	703	27%
%	22%	25%	25%	
Pipeline	588	564	604	3%
%	23%	23%	22%	
Water	407	382	434	7%
%	16%	15%	15%	
Air	5	7	9	80%
%	<1%	<1%	<1%	
Total	2,487	2,458	2,781	12%

Source: ENO Foundation for Transportation, 1989.

cause further reshuffling and reevaluation of their data collection activities, especially in the motor carrier realm. The net result is that private freight transportation data collection will continue to evolve toward information more useful for investors (e.g., carrier financial information) as well as shippers (e.g., freight flows and carrier performance) and less useful for national transportation planning (e.g., right-of-way capacity analysis).

The types of freight transportation data collected have tended to lag behind information needed to address emerging national transportation planning and policy issues. For example, detailed information on hazardous materials flow patterns (which is critical for positioning regional emergency accident response capabilities) is only partially available and is not generally route specific. Similarly, overall freight flow requirements relative to economic growth and development needs are poorly understood, hindering route capacity planning analysis. Priority setting for data collection, especially within DOT and the U.S. Department of Commerce, has favored established information acquisition projects—ones that may not help answer emerging planning and policy issues.

Finally, data collection methodologies, especially those related to freight flows, do not reflect how shippers move goods within the United States. Nonmanufacturers (retailers and distributors, for example) are major U.S. shippers whose activity is not captured by the existing public freight flow data collection process. Similarly, intermodal movements are poorly reflected in existing data sources, making modal linkage analysis (for capacity planning) very difficult. Entirely new freight transportation data collection procedures must be developed to correctly reflect rapidly changing shipper product flow requirements.

Tables 3 through 7 reflect current freight transportation data availability from a national planning and policy analysis perspective. Selected state and local governments often collect detailed information on freight carriers operating within a region, including vehicle activity by route. However, no consistent collection process (either from a data or timing perspective) is used. It is not the purpose of this paper to judge the usefulness of such data for state or local planning, rather it is to address the issue of the role of data in national freight transportation planning capabilities.

Table 3 details the availability of national freight transportation facility data. For public right-of-way information (especially highways, air, and water), the federal government maintains a partial inventory of facilities and some operating characteristics. Railroads maintain their own rights-of-way as well as extensive, though private, data bases on these facilities. No consistent modal network performance data are collected nationwide, which makes congestion- or growth-related capacity enhancement priority setting difficult.

Table 4 details national freight transportation equipment data. Private organizations, primarily the Association of American Railroads (AAR) and Avmark, collect and maintain data on rail and air transportation equipment by type, capacity, and condition. The U.S. Army Corps of Engineers collects some equipment data for waterborne carriage. In addition, the U.S. Department of Defense monitors modal equipment availability for certain modes (primarily rail and air), although these data are not publicly available. Truck

TABLE 3 U.S. FREIGHT TRANSPORTATION FACILITIES

Data / Modes	Right-of-Way/ Network/ Facility Inventory	Ownership	Operating Costs	Capacity	Speed/Transit Times	Condition
Rail	ICC (partial)	ICC (partial)	ICC (partial)	N/A	N/A	N/A
Truck	FHWA (public) N/A (private)	N/A	ICC (partial)	N/A	N/A (truckload) LTL (service days)	N/A
Waterborne	U.S. Army Corps. of Engineers (public)	N/A (private)	N/A	U.S. Army Corps of Engineers (partial)	U.S. Army Corps of Engineers (partial)	N/A
Air	FAA (public-partial) N/A (private)	N/A	FAA (partial)	N/A	N/A	N/A
Pipeline	Dun & Bradstreet (private)	Dun & Bradstreet (private) Federal Energy Regulatory Commission	N/A	Dun & Bradstreet (private)	N/A	N/A

N/A = Not readily available.

equipment availability data are only maintained at the carrier level, although the Truck Inventory and Use Survey provides overall (state-level) information on truck ownership and operating characteristics. In general, freight equipment data (especially vehicle condition data) are most useful in monitoring hazardous materials flows.

Table 5 shows U.S. freight carrier data availability. Although public agencies (such as ICC) still collect some major rail, highway, and air carrier financial/operating data, private sector sources (such as Standard & Poor's or Dun & Bradstreet) have taken over much of the responsibility. Such data collection activity is oriented toward investor analysis rather than national transportation planning. Only minimal operating data (e.g., traffic volumes, costs, and products carried) are generally available, and then only by the major (top 50) carriers by mode.

Table 6 details national freight flow data collection activity. In general, no consistent, timely collection procedures exist to determine what is moving on what routes and through which facilities. The Census of Transportation Commodity Transportation Survey (now discontinued) focused primarily on manufacturer originations of freight traffic and did not effectively sample distribution, retail, and imported product shipments. Overall, insufficient freight flow data exist for right-of-way capacity planning at the regional or national level. In addition, existing data collection activities are biased by incorrect methodologies, leading to potential problems in freight flow analyses (*2*).

Table 7 details available data on U.S. freight shippers. Overall, little information is collected on how shippers (by industry type, size, or operating strategy) choose to move freight to, from, and within the United States.

TABLE 4 U.S. FREIGHT TRANSPORTATION EQUIPMENT

Data / Modes	Type/ Number	Ownership	Miles Traveled	Condition	Operating Costs	Capacity	Speed/ Transit Times
Rail	AAR (Railine)	AAR (Railine)	N/A	AAR (Railine)	AAR (Railine)	AAR (Railine)	N/A
Truck	N/A	N/A	FHWA (aggregate estimates)	N/A	N/A	N/A	N/A
Waterborne	U.S. Army Corps. of Engineers (partial)	N/A	N/A	N/A	N/A	N/A	N/A
Air	Avmark, Inc.	Avmark, Inc.	N/A	N/A	N/A	Avmark, Inc.	N/A
Pipeline	N/A	Federal Energy Regulatory Commission	N/A	N/A	N/A	N/A	N/A

N/A = Not readily available.

ANALYSIS OF INFORMATION GAPS

The following six key information gaps must be filled to meet emerging national freight transportation planning and policy analysis needs:

1. Modal, route, and facility operating performance data;
2. Shipper logistics patterns by industry;
3. Intercity freight flow patterns by selected modes, commodities, and origin-destinations;
4. Hazardous material movement tracking of all modes and all domestic origin-destinations;
5. Intracity freight movement requirements and commodity movements (by route and vehicle type); and
6. Emerging shipper requirements, especially supply channel processing and storage/handling needs.

Understanding current modal, route, and facility (public) operating performance characteristics is a critical first step toward improving freight transportation planning capabilities at the national level. Congestion, especially in urban areas, has consistently been identified by users as a major (and growing) problem in freight transportation. Delays in receiving shipments are particularly troublesome when firms are operating in a just-in-time (JIT) environment. Collection of information such as estimated transit times by route segment and time of day, as well as operating capacity (flights per hour) at airport facilities, needs to be evaluated. Only by understanding where critical modal network constraints exist can workable solutions be developed.

National freight transportation planning and policy analysts need to better understand how shipper logistics strategies by industry determine freight flow patterns in the United States.

TABLE 5 U.S. FREIGHT CARRIERS

Modes \ Data	Finances	Ownership	Market Coverage	Employees	Services Offered	Freight Types/ Volumes
Rail	ICC/AAR (major RRs only)	Moody's (major RRs only)	Moody's (major RRs only)	Moody's (major RRs only)	N/A	N/A
Truck	ICC/States (partial)	Moody's (major carriers only)	N/A	Moody's (major carriers only)	N/A	N/A
Waterborne	Moody's (major carriers only)	Moody's (major carriers only)	N/A	Moody's (major carriers only)	N/A	N/A
Air	Moody's (major carrier only)	Moody's (major carriers only)	Moody's (major carriers only)	Moody's (major carriers only)	N/A	N/A
Pipeline	Dun & Bradstreet	Dun & Bradstreet	Dun & Bradstreet	Dun & Bradstreet	N/A	N/A
Other Third Parties (forwarders, brokers)	Moody's (limited)	Moody's (limited)	N/A	Moody's (limited)	N/A	N/A

N/A = Not readily available.

Data on network development and resultant freight flow requirements can be generated through direct shipper surveys or by reorienting current data collection activities.

Intercity freight flow patterns by product, mode, route, and type of shipper and receiver need to be developed for modes that use public rights-of-way (especially highways and air). Such data are crucial for planning public right-of-way and facility needs. Although state and local governments collect some related data, the national nature of industry freight shipment decisions often precludes effective collection procedures at the regional level.

A hazardous materials monitoring and control system needs to be developed, preferably by the private sector. The system would allow local emergency response teams to deal correctly with hazardous material accident or spill situations.

Intracity freight movement data are sporadically collected by state and local agencies to aid in transportation planning; however, they are a critical input to defining emerging time-of-day (or related) freight traffic restrictions in urban areas. Certain businesses, such as small convenience stores, require multiple daily deliveries because of a lack of storage space. Similarly, service businesses may require frequent deliveries of air express parcels during a working day. Understanding how companies use freight transportation services in an urban environment is critical for setting freight traffic restriction priorities to enhance air quality during the 1990s.

TABLE 6 U.S. FREIGHT FLOWS

Data / Modes	Volume (total)	Volume by Commodity	Volume by O/D and Commodity	Value (total)	Value by Commodity	Value by O/D and Commodity	1977, 1983 Census of Transportation*
Rail	AAR (major RRs only)	AAR (major RRs only)	Federal Rail Administration Rail Waybill Sample (one percent only)	Federal Rail Administration Rail Waybill Sample (one percent only)	Federal Rail Administration Rail Waybill Sample (one percent only)	Federal Rail Administration Rail Waybill Sample (one percent only)	Manufacturer Originations by Mode and Commodity
Truck	Eno Foundation	N/A	N/A	Eno Foundation	N/A	N/A	Manufacturer Originations by Mode and Commodity
Waterborne	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers	N/A	N/A	N/A	Manufacturer Originations by Mode and Commodity
Air	Eno Foundation	N/A	N/A	Eno Foundation	N/A	N/A	Manufacturer Originations by Mode and Commodity
Pipeline	Eno Foundation	U.S. Department of Energy	N/A	Eno Foundation	N/A	N/A	N/A

N/A = Not readily available.
* Private data bases, such as Reebie Associates TRANSEARCH, DRI's FreightScan are also sources of modal commodity flow data.

Finally, shippers are increasingly depending on freight carriers, warehouse owners, and related third-party logistics providers to repackage, assemble, reconfigure, and even further manufacture the product once it leaves a company plant or distribution center. Responsibility for determining the method and timing of freight movements will increasingly shift to carriers and third parties as "contract logistics" becomes more common in the United States during the early 1990s. As a result, freight carriers and warehouses need to be included in the data collection process, both as sources of information and as key decision makers in the freight transportation system.

KEY INFORMATION FINDINGS AND ISSUES

This section examines the freight information development requirements and issues that need to be considered in Phase 2 of the TRB project.

Although adequate information exists on total freight movements in the United States (refer to Tables 1 and 2), a knowledge of what products move where during certain times and by what mode is woefully inadequate for national transportation infrastructure, safety, or environmental quality planning. Certain "private" freight movement data sources, such as FreightScan, the National Motor Truck Data Base, and the TRANSEARCH data base, have been developed to fill these gaps, but they are often inadequate in terms of detail (e.g., data are available only on a state-to-state or comparable basis) and methodology.

Following are suggested methods of collecting data on the six information gaps identified in the previous section:

- A national operating performance data system should be developed that monitors average transit times, time-of-day congestion, and capacity by key highway and air route segment and major urban area and airport. Quarterly reporting to a national clearinghouse from ongoing surveys by state

TABLE 7 U.S. FREIGHT SHIPPERS

Data / Modes	Companies by Industry	Type of Products (I/B)	Types of Products (O/B)	Modes & Equipment Used (I/B)	Modes & Equipment Used (O/B)	Distribution Network	Inventory Policies/ Locations
Rail	Standard & Poors/ Dun Bradstreet (among others)	N/A	N/A	N/A	N/A	N/A	N/A
Truck	Standard & Poors/ Dun Bradstreet (among others)	N/A	N/A	N/A	N/A	N/A	N/A
Waterborne	Standard & Poors/ Dun Bradstreet (among others)	N/A	N/A	N/A	N/A	N/A	N/A
Air	Standard & Poors/ Dun Bradstreet (among others)	N/A	N/A	N/A	N/A	N/A	N/A
Pipeline	Standard & Poors/ Dun Bradstreet (among others)	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not readily available.

I/B = Inbound

O/B = Outbound

and local governments would be one method for collecting the data.

- Detailed information on how shippers plan to move products, both inbound to and outbound from their operations, should be developed on an industry basis. One option would be to establish a national advisory task force made up of freight shipper representatives in each industry to construct and update a profile of various types of freight logistics operations within an industry sector.
- The Census of Transportation Commodity Transportation Survey should be revived and modified to focus on collecting highway and air freight flows by linked logistics pattern rather than by point-to-point segment. For example, the collection methodology should clearly reflect product movement throughout the vendor-to-customer supply chain. Better representation of distributors and retailers also needs to be considered in the data collection process.
- A hazardous material tracking system must be developed to aid state and local governments in planning for and reacting to hazardous material shipping problems. Private industry, including chemical/petroleum manufacturers and freight carriers, in conjunction with ShipNet, Inc., a Chicago-based third-party logistics management company, is beginning development of such a system. Governments should encourage a private sector, as opposed to a legislated, solution to this problem.
- Intraurban freight flow data collection efforts must be reexamined. The absence of effective information on the type of freight moving within urban areas is seriously hindering the nation's ability to enhance infrastructure and reduce

congestion. One option would be to have state and local governments develop a common methodology and collection process with data sent to a national clearinghouse, allowing improved priority setting for allocating scarce federal funding.

- Finally, freight carriers and third-party logistics providers (who will increasingly influence freight routing and related decisions in the 1990s) need to be included in the effort to improve freight transportation data. One option would be to include them on a national freight transportation data advisory task force.

Procedural recommendations for filling key freight information data gaps are divided into both short-term (1990 to 1995) and long-term (1995 and beyond) categories.

In the short term, collection of freight transportation data by public agencies should be reoriented towards filling the six key information gaps. To accomplish this, consistent, accurate data collection methodologies need to be developed in conjunction with both private and public sector groups. Understanding how shipper logistics strategies determine freight flow patterns by mode and route is an important first step in redefining these collection methodologies. Finally, consistent funding should be appropriated to the collection of necessary transportation planning data.

In the long term, freight transportation data collection should evolve into a joint public/private sector process. Shippers and carriers will begin to realize the importance of sharing freight flow information (from enhanced shipment management data bases currently under development) with public agencies to enable them to better plan right-of-way and facility capacity expansion. Substantial (and consistent) U.S. freight flow information should be readily available to public agencies in the post-1995 period, assuming dialogue begins soon between the public and private sectors on the importance of making the data available.

Key freight information collection issues that remain to be addressed in Phase 2 include the following:

- Willingness of public agencies to change their data collection procedures and methodologies,
- Willingness of the private sector to cooperate with public agencies in freight data collection activities,
- Role of federal, state, and local governments in enhancing freight-related infrastructure development,
- Capability of governmental agencies to enhance freight system capacity through both structural and nonstructural solutions, and
- Willingness of the private sector to accept limitations or logistics operations (e.g., time-of-day movement limits) relative to expected benefits.

REFERENCES

1. *Moving America—New Directions, New Opportunities*. Volume 1: *Building the National Transportation Policy*. U.S. Department of Transportation, 1989.
2. D. Anderson and W. Rennicke. The Contestable Market Defense: Measuring Competition in Freight Transportation. *Transportation Practitioners Journal*, Vol. 54, No. 2, Winter 1987.

APPENDIX A
U.S. Freight Transportation Data Sources

Air Transport Association of America

Air Transport (published annually)

Statistics cover freight ton-miles for U.S. scheduled airlines.

Association of American Railroads

AAR Railroad Cost Indexes (published quarterly)

- Scope of AAR indexes,
- Cost components,
- Index weights,
- Railroad cost recovery (RCR) indexes,
- All-inclusive indexes (AII), and
- Rail cost adjustment factors (RCAF).

AAR Trends (published weekly)

Carloads originated, by commodity group, on major U.S. railroads. Intermodal traffic originated (trailers, containers). Estimated ton-miles (class 1 railroads).

AAR Freight Commodity Statistics (published quarterly and annually since 1980)

National and regional data showing gross freight revenues, tonnage, and carload originations and terminations to the 5-digit standard transportation commodity code (STCC) level for class 1 railroads).

AAR Freight Station Directory (published annually)

Alphabetic and numeric lists of freight stations showing number, name, and state or province, along with standard point location code (SPLC).

Railinc Corporation, Universal Machine Language Equipment Register (UMLER)

Computerized data base of characteristics of all railcars operating in the United States.

NOTE: Other AAR publications on class 1 railroad finances and operating statistics are available by subscription.

Avmark, Inc.

Information on U.S.-operated aircraft by type (passenger, cargo), including specifications/capacity.

Data Resources, Inc.

FREIGHTSCAN (updated annually)

Commodity flows by product and mode and O-D pair (state and Bureau of Economic Analysis [BEA]).

Dun & Bradstreet, Inc.

Moody's Transportation Manual (published annually)

Covers the transportation industry with selected statistical data. Includes railroads as well as other fields of transportation such as airlines, steamship companies, bus and truck lines, oil pipe lines, bridge companies, and automobile and truck leasing and rental companies, covering nearly 1,000 railroads and transportation enterprises. Includes maps of many of the larger railroad systems, route maps of a number of large airline companies, and maps for certain other transportation companies. Facts and figures mostly based on information obtained directly from corporations or stockholders' reports, ICC reports, and Securities and Exchange Commission reports and registrations.

Pipeline Data Base

An on-line data base with information on petroleum and natural gas.

Eno Foundation for Transportation, Inc.

Transportation in America (published annually, with 6-month updates)

- Current transportation traffic indicators,
- Transportation outlays vs. gross national product,
- National economic vs. transport trends,
- Nation's freight bill,
- Nation's passenger bill,
- Domestic intercity ton-miles by mode,
- Domestic intercity tonnage carried by mode,
- Domestic intercity travel by mode,
- Domestic intercity passengers carried,
- Revenues of federally authorized domestic carriers,
- Domestic transportation of petroleum by modes,
- Expenditures for new plants and equipment,
- Federal and state transport user taxes and fees, and
- Transportation vs. total fatalities from accidents.

International Air Transport Association (IATA)

World Air Transport Statistics (published annually)

A digest of world air transport statistics including individual IATA member airlines' fleets, operating and financial statistics, international regional statistics, safety figures, and traffic and capacity data on Atlantic and intra-European routes.

International On-Flight Origin-Destination Statistics (published annually)

Provides air freight traffic performance between regional pairs and subregional pairs.

Freight Traffic Forecasts (published annually)

Total freight traffic forecasts, by O-D pair, 5 years out.

Interstate Commerce Commission, Bureau of Accounts

Transport Statistics in the United States (published annually, 1987 to present)

Detailed data on traffic, operations, equipment, finances, and employment for carriers subject to the Interstate Commerce Act. For example, data on class I freight railroads includes

- Statement of changes in financial position, by district;
- General balance sheet, by district;
- Results of operations and retained income, by district;
- Classification of tracks, by district;
- Railway operating expenses, by district;
- Depreciation of subaccounts, by district;
- Equipment in service, by district;
- Railway operating income, by class of service and by district;
- Railway operating expenses, by class of service and by district; and
- Railway operating statistics, by type of service and by district.

A-300 Wage Statistics of Class I Freight Railroads in the United States (published annually)

Number of employees, service hours, and compensation by occupational group: executive, officials, and staff assistants; professional and administrative; maintenance of way and structures; maintenance of equipment and stores; etc.

Large Class I Motor Carriers of Property Selected Earnings Data (published quarterly)

Operating revenues, net carrier operating income, net income, revenue tons hauled, operating ratio, and rate of return.

Class I Freight Railroads Selected Earnings Data (published quarterly)

Railway operating revenues, net railway operating income, income before extraordinary items, net income, revenue ton-miles of freight, and rate of return.

Large Class I Motor Carriers of Passengers Selected Earnings Data (published quarterly)

Operating revenues, net carrier operating income, net income, revenue passengers carried, operating ratio, and rate of return.

Large Class I Household Goods Carriers Selected Earnings Data (published quarterly)

Operating revenues, net carrier operating income, net income, revenue tons hauled, operating ratio, and rate of return.

M-350 Preliminary Report of Railroad Employment, Class I Line-Haul Railroads (published monthly)

Number of employees at middle of month, group totals.

Journal of Commerce

Port Import-Export Reporting System (PIER)—specific shipper foreign trade statistics including inland origin-destination, overseas destination or origin, commodity, volume shipped, price, etc.

Oil Pipeline Research Institute

Pipeline Carrier Statistics

Federal Energy Regulatory Commission information on finances and performance of domestic pipeline carriers.

Reebie Associates, Inc.

TRANSEARCH data base, including commodity flows by mode and product type (updated annually).

TRAM, Inc.

National Motor Truck Data Base (updated monthly)

Truck commodity flow data base by origin-destination.

U.S. Army Corps of Engineers, Water Resources Support Center (Navigation Data Center)

Waterborne Statistics of the United States (published annually, latest data 1986)

- National summaries;
- Domestic inland traffic—areas of origin and destination of principal commodities; and
- Water carriage ton-miles.

Waterborne Transportation Lines of the United States (published annually)

Contains information on vessel operators and their American flag vessels operating or available for operation in the transportation of freight and passengers. Information includes

- Operators and addresses;
- Type and construction of vessels, net registered tonnage, length, breadth, draft, horsepower, carry capacity, etc.; and
- Description of operations, type of service, principal commodities carrier, and localities served.

Port Series (published irregularly)

Data on port and harbor conditions and facilities, including an index of piers, wharves, and docks, for all principal U.S. land/coastal/Great Lakes ports.

Performance Monitoring System

Provides transit time and related waterway performance data for inland waterways by lock and waterway segment.

U.S. Department of Agriculture, Agricultural Marketing Service

Summary of Fresh Fruit, Vegetable, and Ornamental Crop Movements by Mode and Commodity (published weekly)

Reports origin by state or county, including 23 cities of arrival, and piggyback and export by rail. Piggyback may be reported separately.

Fruit and Vegetable Truck Operating Costs (published monthly)

Lists fixed and variable costs, in cents per mile, of truck fleet operators and owner-operators.

Fruit and Vegetable Truckload Rates Between Growing Areas and Cities (published weekly)

U.S. Department of Commerce, Bureau of Census

Census of Transportation (published every 5 years—1977, 1982, and 1987)

Truck Inventory and Use Survey (TIUS) provides data on the physical and operational characteristics of the nation's truck population.

Nationwide Truck Activity and Commodity Report (NTAC) provides physical characteristics of commodity movements on the nation's highway network (under contract to DOT—results available in 1991).

Commodity Transportation Survey (CTS) provides physical characteristics and geographical distribution commodity shipments from manufacturers along with means of transport. Discontinued (some 1983 data available).

Waterborne Freight (published annually)

Foreign trade from Census-defined merchandise (bonded and export) coming into the United States and collected from customs declarations. U.S. waterborne exports and imports by trade area, district, port, type of services, and U.S. flag.

Modal (Motor, Water, Air, Rail) Carriers of Property (published every 5 years)

Location, number of establishments, revenue, payroll, and employment by carrier.

U.S. Department of Energy

Monthly Petroleum Report

Crude and product movements by pipeline among Petroleum Administrative Districts (PADs).

U.S. Department of Transportation, Federal Aviation Administration

Airport Activity Statistics of Certified Air Carriers (published annually)

Details total air freight tons and ton-miles by carrier and airport.

U.S. Department of Transportation, Federal Highway Administration

Highway Statistics (published annually)

Mileage by characteristics, vehicle registrations, VMT (vehicle miles traveled), truck weight, speed trends, fuel consumption, safety, etc. (to be completed).

Motor Carrier Census, by Carrier (updated daily)

Area of operation, commodities hauled, miles operated, and number of vehicles driven.

U.S. Department of Transportation, Federal Railroad Administration (published annually)

Rail carload waybill statistics, territorial distribution, traffic, and revenue by commodity class for major U.S. railroads.

Statistics presented on carloads, tons, revenues, ton-miles, car-miles, and various ratios.

U.S. Department of Transportation, Office of the Secretary

Operating Statistics by Cargo Air Carrier (annually)

Ton-miles by flight stage, aircraft miles, revenue, and airborne hours.

U.S. Department of Transportation, Research and Special Programs Administration

National Transportation Statistics, Annual Report

A summary of selected national transportation statistics from a wide variety of government and private sources. Features cost, inventory, and performance data describing passenger and cargo operations of the following modes: air carrier, general aviation, automobile, bus, truck, local transit, rail, water, oil pipeline, and natural gas pipeline. Illustrates basic descriptors of U.S. transportation, such as operating revenues and expenses, number of vehicles and employees, vehicle miles and passenger miles, etc. Supplementary sections include Transportation and the Economy: Energy in Transportation, which is divided into Energy Consumption, Energy Intensiveness, Energy Transport, and Energy Supply and Demand. Also includes operating costs of automobiles of different sizes.

Modal Profiles

- Modal profile source references and percent change calculation,
- Air carrier profile,
- General aviation profile,
- Highway profile,
- Automobile profile,
- Bus profile,
- Truck profile,
- Local transit profile,
- Water transport profile,
- Rail profile (A. class I railroads and B. Amtrak),
- Oil pipeline profile, and
- Natural gas pipeline profile.

Selected Passenger and Cargo Performance Indicators by Mode

Transportation Trends

- Section I. Performance,
- Section II. Safety, and
- Section III. Sales and Production.

Supplementary Data

- Section I. Transportation and the Economy; and
- Section II. Energy in Transportation:
  - —Part 1. Energy Consumption,
  - —Part 2. Energy Intensiveness,
  - —Part 3. Energy Transport, and
  - —Part 4. Energy Supply and Demand.

APPENDIX B
Special Conference on Freight Transportation Data—Summary of Discussions

On November 14 and 15, 1989, the Task Force on Freight Transportation, TRB, and the Washington chapter of TRF sponsored a conference to provide an opportunity for input on freight transportation data needs and issues for the DOT National Transportation Policy Study.

First Day

Keynote Address

The conference keynote address was given by Commissioner Karen Phillips of ICC. Commissioner Phillips underscored the ongoing need for freight transportation data collection in the United States, citing continued transportation decision-making requirements, especially in infrastructure development, tax policies, and deregulation impacts. In particular, she focused on the need for data on the performance and financial situation of U.S. transportation industries to monitor ongoing regulatory changes, both at the federal and other government levels. She stated that the government should continue to have a role in data collection (due primarily to data confidentiality issues).

Session 1: Need for Freight Transportation Data in a Deregulated Environment (Part I)

Harvey Levine of the Association of American Railroads stated that railroads continue to be regulated and continue to collect substantial amounts of financial, traffic flow, cost, rate, and performance Class I railroad data, including the only available Class III railroad data base. He believes government should focus on data quality, not quantity, and feels there is a lot of room on the railroad side to consolidate/reduce data required by regulatory groups.

Russell Capelle of the Regulator Common Carrier Conference (RCCC) spoke about the RCCC Motor Carrier Safety Survey (a survey of truck drivers done over the past 4 years). He discussed the American Trucking Associations (ATA)/RCCC petition to ICC to improve the quality of motor carrier financial data, especially for Class III operators, and to improve Class I and II motor carrier data quality/underreporting. He also discussed the University of Michigan Transportation Research Institute's Trucks In Fatal Accidents (TIFA) data base (developed by the Center for National Truck Statistics) and the National Accident Sampling System (NASS).

Kuing Wu Kang of the Port Authority of New York and New Jersey spoke about the data collection efforts for intra- and interurban freight movements involving the New York metropolitan area, including ongoing truck surveys on modal commodity movements. He believes government needs to focus on key data collection needs to avoid wasting energy and money.

Gerald D. Muskin of the Transportation Consulting Group discussed the paradox that, as the ability to manage freight

and the private sector has pushed data collection aside. He feels this is good in some situations (for example, the AAR success story) but bad in others (for example, multi-billion-dollar decisions made with no data). He believes a data collection policy will be generated by DOT, but a lack of support/funds within the agencies may hinder actual collection activities. He stated that the "data hangover" is a real problem (in other words, too much was asked for in the past) and that a new recognition of infrastructure development requirements and resultant data needs is necessary. He cited the AAR model as a good example. He said the ENO Foundation is also supporting transportation data collection, but these efforts must be better coordinated.

The question-and-answer session focused on who has the right to use/resell public data. Many in the audience responded that, when value is added, then reselling is correct. The point was made that collecting and revising data is very expensive and only well-heeled private companies can pay for it.

Second Day

Session V: Review of U.S. Bureau of Census Data Collection Efforts

Chuck Waite of the U.S. Bureau of Census explained that the bureau's highest priority is expanding information in the service industries, including transportation. He reviewed truck use surveys and economic census data (latest 1987) on transportation companies and discussed the bureau's most recent effort: the Nationwide Truck Activity and Commodity Survey (NTACS), which will provide detail on a truck's specific size, weight, materials, and all stops made (beginning in 1991). Other relevant data sources discussed included the Motor Freight Transportation Warehousing Survey: an annual sample of 1,500 for-hire trucking firms (1984–1987 data) regarding revenues, expenses, equipment, and products hauled. Waite also spoke about the 1992 Census of Transportation, which will include all modes. He explained that this census will be the largest expansion in 40 years and will focus more on transportation establishments. He also spoke about how to enhance existing data collection efforts through better federal/state/local cooperation. He discussed the discontinued commodity flow survey, stating that it was too expensive for the bureau to continue and that alternatives were being considered. Finally, he suggested the development of a Center for Transportation Statistics, indicating that the bureau supported the concept, and stated that it should be located in DOT.

Session VI: Institutional Opportunities and Constraints for Data Collection

Linda Morgan, general counsel of the Senate Commerce Committee, stated that real challenges exist in data collection and transportation policy analysis. She said the continuing problems in monitoring deregulation in the rail and air industries (for example, monitoring leveraged buyouts and their impact on carrier safety) imply a need to reconsider the freight data availability issue.

Fritz Kahn, an attorney, reviewed the ICC decision to eliminate unnecessary data collection from carriers. He stated that carriers now want confidentiality with freight transportation data, but the reason is competition, not the laws. He feels laws such as the Sherman Antitrust Act do not apply in these cases.

Paul Bugg of the Office of Management and Budget explored data collection and dissemination issues inside the federal government and at state/local levels. He believes problems exist and that they are important. He thinks a larger data budget would help but is not available, according to OMB.

Edith Page of the Office of Economic Assessment explored reasons why data are needed to answer federal transportation policy questions. The difficulties and costs associated with getting the required data were also discussed. She suggested that local/state groups and industry can help but federal leadership is necessary.

The question-and-answer session focused on data confidentiality problems and inadequate data availability for federal transportation decision making.

APPENDIX C
Select Bibliography on Freight Transportation

NCHRP Report 177: Freight Data Requirements for Statewide Transportation Systems Planning. TRB, National Research Council, Washington, D.C., 1977.

NCHRP Report 260: Application of Statewide Freight Demand Forecasting Techniques. TRB, National Research Council, Washington, D.C., 1983.

Special Report 206: Proceedings of the National Conference on Decennial Census Data for Transportation Planning. TRB, National Research Council, Washington, D.C., 1984.

Transportation Research Board. *Identification of Transportation Data Needs and Measures for Facilitation of Data Flows*. U.S. Department of Transportation, 1981.

transportation data has increased, its availability has shrunk. He believes better freight-related data are needed for safety, public policy, and competitive analysis across all modes. He also noted that private freight-related data are often derived from government data, which are dwindling.

David Licky of the U.S. Army Corps of Engineers, Navigation Data Center, discussed in detail the freight-related data available on inland coastal waterways and ports, especially the waterborne traffic statistics and performance monitoring system. He also indicated that it was the Corp's policy to get data ready within 4 months of year end.

The question-and-answer period focused on the availability of intermodal data and the problems with determining the true origin-destination of commodity flows.

Session II: Need for Freight Transportation Data in a Deregulated Environment (Part II)

Ben Lieberman of the Maryland Port Administration spoke about various data sources used by the ports, including internal data (collected from port tenants on rents, etc.), U.S. Army Corps of Engineers data, the Journal of Commerce Port Import-Export Reporting (PIER) system, and Census Bureau foreign trade statistics. He also discussed the problems with each (for example, the wrong inland origin or destination on some PIERS data).

Jeff Gutterman of the World Bank discussed freight transportation needs in developing countries, growing dissatisfaction with large data-intensive freight modeling activities, and reasons why developed and developing countries need better freight-related data.

Michael Bronzini of Pennsylvania State University stressed the need for developing detailed O-D commodity flow data by mode, traffic density data, accident and incident data, operating costs, performance and rates for planning studies, operational (hazardous materials) analysis, energy policy, new facilities development, and contingency planning. The need for intraurban traffic data was also discussed. Bronzini believes government should collect traffic flow, traffic density, and accident data but that cost/rate data should be collected by the private sector.

The question-and-answer period included a discussion of Eastern Europe, Europe 1992, and Canadian/U.S. free trade and the impact of each on data needs.

Session III: Coverage and Quality Problems with Existing Data Resources for Freight Transportation

David Green of the Oak Ridge National Laboratory evaluated truck freight data for national policy analysis and highway planning. He focused on what is needed—trucks, truck miles, and commodity trips by state and highway class, truck configuration, and carrier type. He noted that there are many sources for the data and spoke about the sampling problems of FHWA data, the Truck Inventory and Use Survey, and the National Truck Activity and Commodity Report Survey.

Paul Roberts of Trans-Mode Consultants stated that it would not be possible to satisfy any of the conference attendees in terms of their freight data needs because their needs are very different. He identified three types of data needed for freight analysis: demand (commodity flows), facilities/equipment, and financial. The demand category requires data on shipment size, packaging, date and time of pickup, origin-destination, carrier, type of service, and cost. Regarding facilities, the types of data needed include the network by mode, a system definition, equipment data, physical attributes, capacity utilization, and condition. For operating entities, carrier financial and performance data are needed. Roberts stated that these data are decreasing in availability, especially intermodal and commodity origin-destination data, and believes the solution is to define what is needed more precisely, then fund the development of these data.

Rolf Schmitt of DOT stated that data quality problems are rampant; for example, no one even knows how many trucks are operating in the United States. He believes this situation will not improve because money is tight for data collection. Schmitt feels the aviation companies did a better job of protecting data under deregulation than the ground transportation industry did. He said paperwork reduction is causing data to disappear and believes the absence of data on the contents of containers is a problem. He feels the role of brokers and potential double-counting of loads is also an issue. He believes new techniques for in-motion weighing will provide more data on volume/trips for trucks.

Frank Smith, a consultant, explained that his approach has been to work with what he has and estimate the remainder. He reviewed the quality of data sources across modes and stated that substantial variation exists in the level, timing, and availability of freight-related data sources.

Session IV: Alternatives to Public Data Sources

Bill Oderwald of ALK Associates discussed the enhancement of the ICC rail waybill sample (ALK adds distances and other codings), discussed data problems found as the waybill file was enhanced, and related the data to actual network linkages. He also stated that ALK maintains complete digitized rail/highway networks on its system and can perform many traffic analyses (e.g., hazardous material routings).

Joe Riker of Reebie Associates spoke about the TRANSEARCH data base—U.S. domestic freight movements among 285 BEA market areas by four-digit STCC commodity and seven modes of transportation, including Canadian traffic. He relies heavily on public information sources and now uses a modeling effort to replace Census of Transportation data. He sees the private sector increasingly taking over the role of data collection but foresees problems (e.g., a proprietary data release by carriers on commodity flows).

Forrest Baker of TRAM spoke about the National Motor Transportation Data Base, which interviews 25,000 long haul truck drivers per year at 20 truckstop locations across the United States. He collects data on trailer type, commodity, origin, and destination (among others) and focuses on the equipment used rather than on commodity flows. He has been gathering data since 1977 and has developed the most complete basic profile of the U.S. trucking industry available.

Alan Pisarski, a consultant, stated that institutions have failed in data collection and that the focus on deregulation