PURPOSE AND STATUS OF THE MULTIMODAL COMMODITY AND PASSENGER FLOW SURVEYS

Report of the
Bureau of Transportation Statistics
U.S. Department of Transportation
to the Committees on Appropriations
of the United States Senate
and U.S. House of Representatives

Pursuant to the report of the Committee on Appropriations, United States Senate, to accompany the Department of Transportation and Related Agencies Appropriations Bill, 1993 (Report 102-351)

May 28, 1993

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NOTE:
Several design modifications to the Commodity Flow Survey have been made and the Passenger Flow Survey has been renamed the American Travel Survey since this report was prepared. The discussion of purposes and applications remains current.

U.S. Department
of Transportation

**Bureau of
Transportation Statistics**

400 Seventh St., S.W.
Washington, D.C. 20590

The Honorable Frank R. Lautenberg
Chairman, Subcommittee on Transportation
and Related Agencies
Committee on Appropriations
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

As requested by the Report of the Committee on Appropriations, United States Senate, I am pleased to submit the Purpose and Status of the Multimodal Commodity and Passenger Flow Surveys as prepared by the new Bureau of Transportation Statistics.

This status report details the critical needs for information on multimodal commodity and passenger flows, and outlines the steps being taken by the Bureau of Transportation Statistics to meet those needs. The report presents a schedule of activities identifying milestones and current and future expenditures.

I trust that this report will answer your questions concerning the multimodal commodity and passenger flow surveys. An identical letter has been sent to Chairman Carr.

Sincerely,

Robert A. Knisely
Deputy Director

U.S. Department
of Transportation

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PURPOSE AND STATUS OF THE MULTIMODAL COMMODITY AND PASSENGER FLOW SURVEYS

Executive Summary

Because transportation exists to move people and goods, information on the quantity and characteristics of commodity and passenger movements between and within regions is essential to the development of informed transportation decisions. Information on commodity and passenger flows also supports analyses of regional economic activity and social interaction.

The Transportation Research Board of the National Academy of Sciences identified commodity and passenger flows as the highest priority subject of data collection in *Data for Decisions: Requirements for National Transportation Policy Making* (Special Report 234, 1992).

While extensive data are collected on terminal-to-terminal flows of people and goods using for-hire carriers and single modes, very little current data exist on:

-- the true origins and destinations of passenger movements and commodity flows that involve more than one mode;

-- the dependence of rail, water, pipeline, and air modes on highways and the interdependence of rail, water, and pipeline modes to reach true origins and destinations from intervening terminals;

-- the total quantity and geography of flows by either private passenger vehicles or shipper-owned trucks;

-- the geography of flows by for-hire trucks;

-- the costs of transportation by market served;

-- the domestic origins and destinations of international trade;

-- the provision of ground transportation services for domestic trade by nationality of carrier; and

-- the characteristics of travellers and shippers and the purposes of their movements that explain and predict passenger and commodity flows.

The last comprehensive efforts to collect these data were conducted in 1977, before the geography of transportation was radically altered by deregulation, new transportation technologies, changing transportation costs, the growth of international trade, structural changes in the economy, and new logistical requirements (such as just-in-time delivery).

Section 5002 of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 requires the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation (DOT) to collect the needed data. The BTS has responded with two major undertakings:

-- The Commodity Flow Survey is being conducted by the Bureau of the Census in 1993 to provide data on the flow of goods among States and regions by mode of transport. The Commodity Flow Survey continues statistics collected by Census from 1963 through 1977, but includes major improvements in methodology, sample size, and scope. The Commodity Flow Survey will capture data on between 20 and 24 million shipments by all modes of transport from about 200,000 establishments. The major data products will be subjected to extensive quality control and are planned for release in 1995.

-- The Passenger Flow Survey will collect data on travel among States and regions by mode of transport. The likely size of the Passenger Flow Survey sample will dictate the use of either mailout-mailback travel diaries or computer-aided telephone interviews. The DOT's Volpe National Transportation Systems Center has conducted a design study to develop preliminary specifications and options for the survey. The BTS will devote significant staff time to resolving design issues surrounding the Passenger Flow Survey for the remainder of 1993. Extensive customer input will be sought through meetings and correspondence. Under current plans, a detailed survey design will be completed in 1994, and the survey will be conducted by Census or a private contractor throughout calendar year 1995 in conjunction with the National Personal Transportation Survey. Data products will be released under this schedule in 1996.

Direct costs of the Commodity Flow Survey include $12.6 million from the DOT and $3 million from the Bureau of the Census. Census is also providing extensive in-kind contributions, such as the Standard Statistical Establishment List for the sample frame and customized outputs from the 1992 Economic Census.

Direct costs of the Passenger Flow Survey are estimated at $4 million, but could be substantially higher if required to meet the most cost-effective combination of sample size, geographic specificity, and respondent-friendly survey instrument.

Funding of the multimodal commodity and passenger flow surveys was initiated in fiscal year 1992 by the Federal Highway Administration (FHWA), which transferred $6 million to Census and $0.6 million to Oak Ridge National Laboratory for initial work on the Commodity Flow Survey. The scoping study for the Passenger Flow Survey was funded by the FHWA, Federal Railroad Administration, Federal Transit Administration, Federal Aviation Administration, and Research and Special Programs Administration. All subsequent funding of the commodity and passenger flow surveys will be provided by the BTS from its ISTEA authorizations.

No one data collection can answer the information needs of decisionmakers. The Commodity Flow Survey and the Passenger Flow Survey are closely coordinated with other data collections (such as the Nationwide Truck Activity Survey, the Rail Waybill Statistics, Waterborne Commerce, and the Nationwide Personal Transportation Survey) to get a complete picture of the transportation system and its consequences while minimizing cost and respondent burden.

Even with this coordination, the cost of the surveys is significant compared to the DOT's past data collection efforts. The size of each survey is necessarily large to obtain the geographic and other detail essential for adequate and reliable public information on complex policy issues.

The cost of the surveys is not imposing when compared to the decisions that the resulting information will affect. The information will be used to develop and analyze legislation affecting billions of dollars in user charges, infrastructure investments, new technology initiatives, and productivity of the transportation industry. The information will also be used by private companies of all sizes to find markets and target activities to survive and prosper in a dynamic economy. The cost of the multimodal flow surveys is a tiny fraction of the costs and benefits of these public and private decisions.

The Bureau of Transportation Statistics was established in part to provide the most basic transportation information needed by governments and industry for planning and investment. The multimodal commodity and passenger flow surveys are the centerpiece of the Bureau's program to establish the fundamental information base to support informed decisionmaking.

PURPOSE AND STATUS OF THE MULTIMODAL COMMODITY AND PASSENGER FLOW SURVEYS

The report of the Committee on Appropriations, United States Senate, to accompany the Department of Transportation and Related Agencies Appropriations Bill, 1993 (Report 102-351), states the following on page 101:

> The Committee's allowance includes $3,000,000 for multimodal commodity and passenger surveys, $1 million less than provided in fiscal year 1992. The Committee directs FHWA to prepare an interim report detailing the purposes, objectives, and current and expected progress of this effort. The report should detail in understandable terms exactly why this research is critical to the Department, identify the anticipated role of the new Bureau of Transportation Statistics in this activity, and present a schedule with current and future expenditures and milestones for this activity. The report should be submitted to both the House and Senate Appropriations Committees no later than March 1, 1993.

The Department's response is provided by the BTS rather than the FHWA because the Bureau has assumed management of the surveys.

The Critical Need for Multimodal Commodity and Passenger Flow Information

Informed public decisionmaking requires an understanding of the relationships among transportation activity, passenger flows, commodity movements, logistical requirements of economic activities, international trade, safety, and the condition of the Nation's transportation system (as well as competing and complementary systems throughout North America):

-- to identify characteristics of current and anticipated transportation system use that affect interstate commerce, international trade, and the cost of personal and business logistics;

-- to assess the effects of proposed Federal legislation and Federal and State regulations on the Nation's transportation system and its use;

-- to evaluate the cost-effectiveness of alternative levels of investment in existing transportation infrastructure and new transportation technologies;

-- to determine whether user charges are adequate and equitable;

-- to determine whether subsidies are efficient and effective;

-- to analyze and oversee operating restrictions on transportation services (such as truck size and weight limits) that affect interstate commerce, international trade, and safety; and

-- to make Federal programs responsive to national goals beyond mobility and safety, such as economic development, environmental protection, social justice, and defense.

The requisite understanding can no longer be based solely on past experience, since transportation services are responding in unprecedented and often unpredictable ways to deregulation, new transportation technologies, changing transportation costs, the growth of international trade, structural changes in the economy, and new logistical requirements (such as just-in-time delivery). Information is needed to identify emerging and desired relationships among patterns of transportation system use, the availability and quality of transportation facilities and services, demographic and social conditions, the economy, national security, and the environment.

Applications to Transportation Policy Issues

Information on door-to-door, interregional commodity and passenger flows is essential for the analyses of several key transportation issues:

-- *Analyze existing transportation facilities for national significance*. Many Federal transportation programs and policies are targeted for facilities of national significance. Commodity and passenger flow data are needed to identify the relationships between international, intercity, and local traffic on a given facility to determine the facility's national significance.

-- *Identify markets (typically multistate intercity corridors) that are candidates for public investments or other policy actions*. Public investments and policies to encourage private investments are frequently proposed to reduce congestion and enhance other aspects of transportation system performance. Multistate, corridor-level data are required to evaluate proposals for major highway expansions, to forecast future airport and aviation system capacity requirements, and to assess the feasibility of investments in alternatives such as high-speed rail and tilt-rotor.

-- *Identify needs for intermodal transportation programs*. Improved intermodal connections have stimulated major increases in the productivity and efficiency of the Nation's transportation system. Data

on commodity and passenger flows between ultimate origin and destination, as well as between terminals, are needed: (1) to forecast how well these connections will function as international trade continues to grow; (2) to evaluate proposals for Federal involvement in intermodal facilities, such as national programs to improve harbor and airport access; and (3) to estimate the impacts of other policies such as environmental regulation on the effectiveness of intermodal facilities of national significance.

-- *Estimate the impacts of truck size and weight restrictions, highway and waterway user charges, railroad and aviation mergers, and other subjects of Federal policy on the economic viability and productivity of competing modes*. The impacts of a Federal policy for one mode on competing modes depends on the quantity, value, and geographic dispersion of passenger or freight traffic. These analyses require data on the size and economic characteristics of commodity and passenger movements between ultimate origin and destination as well as between intervening terminals.

-- *Identify critical links between transportation investments and economic productivity at national and regional levels.* Data on commodity and passenger flows are essential to measure the role of transportation in improving international competitiveness and regional economic development, especially given the growth in traffic across the international borders within North America. Passenger flow data are included in part because tourism and business travel have become critical economic activities in several States.

-- *Evaluate economic productivity of the transportation sector*. The U.S. Bureau of Labor Statistics uses passenger miles of travel and ton miles in measuring the productivity of the for-hire transportation industry. Questionable estimates of ton miles contribute to suspect productivity measures, and have triggered proposals to fix industry problems that may be statistical rather than real.

-- *Evaluate the consequences of the North American Free Trade Agreement (NAFTA) and other international accords on the transportation system and the economy*. The proposed agreement calls for the signatories to evaluate the impacts of NAFTA in the fifth, seventh, and ninth years following implementation to determine whether the pace of liberalization should be increased or slowed. Commodity and passenger flows are essential inputs to that evaluation, and must be measured soon to provide a base line upon which to identify NAFTA-inspired change in transportation and economic activity. Similar data will be required to monitor the affects of other international accords.

-- *Determine the capacity of the domestic transportation system to respond to national security requirements and natural disasters.* Contingency planning for responses to major emergencies requires data on commodity and passenger flows to determine the base level of demand for transportation above which capacity must be provided or other actions taken to meet emergency logistical needs effectively. These data are also essential to analyze economic and social impacts of emergencies and to determine the cost-effectiveness of planned countermeasures.

-- *Evaluate safety trends and programs*. Data on commodity and passenger flows provide the denominators for accident statistics and estimates of population exposure to risk. Data on hazardous materials movements are especially critical to the Department's safety initiatives.

-- *Evaluate environmental and energy concerns.* Commodity and passenger flow data are essential to forecasts of transportation demand that are used in turn to estimate energy dependence, the transport sector's contribution to air quality and similar environmental problems, and the amount of traffic that contributes to the risk of oil spills and incidents involving hazardous cargo. These data also illuminate the growing demand for long-haul transportation in the disposal of municipal solid waste.

-- *Provide regional and multistate corridor flows for local planning studies and intermodal management systems.* State, regional, and local transportation planners require information on total flows within, into, out of, and through their planning areas to provide control totals for more detailed local studies, to compare local needs and conditions with other localities, and to place local needs and conditions in a national context. These data needs are central to effective implementation of the intermodal, congestion, and other management systems required by recent Federal legislation.

Applications to Highway Policy Issues

Information on door-to-door, interregional commodity and passenger flows are particularly important for the analyses of highway-specific policy issues:

-- *Forecast future freight and passenger traffic to estimate user revenues and calculate cost responsibility*. Commodity and passenger flow data are essential to forecasts of traffic by vehicle type, which in turn affect estimates of:

- revenues to the Highway Trust Fund,
- damage to the Federal-aid highway system, and
- cost responsibility among different classes of highway users.

-- *Identify the role of highways and highway-related policies to intermodal transportation.* Data on commodity and passenger flows between true origins and destinations as well as between the intervening terminals are needed to evaluate proposals for Federal involvement in intermodal facilities, such as a national program to improve airport access. Data are also needed to determine the impact of highways on the performance or feasibility of other intercity modes, since highway access often determines the hinterland of an intercity terminal and can significantly affect door-to-door traveltimes (even of transcontinental trips).

-- *Support highway functional classification*. The theoretical underpinnings of highway classification into major arterials, minor arterials, collectors, and so forth is based on the frequency and distance of trips. While vehicle counts can provide an effective measure of the former, direct measures of--or good surrogates for--the latter do not presently exist. Trip distance data are needed to evaluate the system of highway classification and develop good surrogates for future classification efforts. This need is critical because functional classification is a basis for defining and funding Federal-aid highway programs.

-- *Provide a basis for evaluating Federal involvement in the intercity bus industry*. Section 18(i) of the Federal Transit Act (as amended through June 1992) makes funds available from the Mass Transit Account of the Highway Trust Fund for development and support of intercity bus transportation. Eligible projects include planning and marketing, capital grants for shelters, joint-use stops and depots and operating grants (through purchase of service contracts), user side subsidies and demonstration projects, and coordination of rural connections between small transit operations and intercity bus carriers. Unless the Governor certifies that intercity bus service needs are adequately met, the State must allocate at least 5 percent of section 18 funds for these purposes. Furthermore, intercity bus facilities may be eligible for FHWA capital grants. FHWA also is responsible for safety regulation of this industry. Basic travel demand information is needed for the proper management and evaluation of these new Federal programs.

Applications to Issues Beyond Transportation Policy

The value of commodity and passenger flow information extends well beyond issues of concern to transportation decisionmakers in the public sector. Both economic theory and practice suggest that markets without adequate information become distorted, and resource distribution becomes inefficient. The requisite information is not limited to data on financial transactions. Information on physical transfers of goods and movement of people is also important to a well-functioning marketplace.

-- *Trade and market analysis*. Geography has a profound effect on the sale of manufactured goods and services. This effect manifests itself in trade patterns and market areas. The private entrepreneur needs to know whether competing products are being consumed, and from where the competition is coming. The private entrepreneur also needs to know how the market geography might metamorphose as transportation system performance changes and new transportation technologies are implemented. The public official responsible for economic growth has similar information needs, as indicated in the previous discussion of NAFTA. Market areas and potential competitors can be identified by the geographic patterns of commodity flows, measured by weight and value. (The relationships of markets to transportation can be identified by linking the commodity flows to the mode of transport used.) Foreign markets can be understood from commodity movements identified at the border, but domestic markets (and the penetration of foreign competitors into regional domestic markets) requires information on domestic commodity flows.

-- *Interregional and intersectoral linkage analysis*. The structure of the economy is traditionally measured in dollar transactions among sectors of activity and among regions. The movement of material and people can be both a surrogate for the traditional measures and an alternate method of characterizing the input-output structure of the economy. Some structural changes in the economy, such as the replacement of warehousing with just-in-time delivery, can only be understood from both the financial and physical perspectives. Economic productivity estimates in transportation and other industries are often inadequate or misunderstood because the physical transactions are less robustly measured than the financial transactions. Effective understanding of the physical component is essential to effective strategic planning in the private sector and to public decisionmakers who deal with international competition, employment stimulation, and similar issues that extend well beyond the transportation sector.

-- *Tourism promotion and management*. Information on passenger flows is essential to the effective promotion of tourism and development of facilities and services related to both business and nonbusiness travel. Information on passenger flows is also essential to the development of plans to manage visitor impacts on sensitive natural and cultural locales. Volumes of visitation are both economic engines and environmental problems in States such as Hawaii and Florida, and the importance of tourism to other parts of the Nation will increase as the economy continues to shift from a manufacturing to services base.

-- *Resource management for national defense and emergency preparedness*. In addition to transportation system capacity, defense and emergency preparedness planners are concerned with estimating the ability of civilian industries to support military missions, as well as local economies to withstand the impacts of natural and manmade calamities (including military base closings). Information on the physical interactions among domestic industries and regions, as reflected in commodity and passenger flows, is central to these estimates.

The ISTEA

The Congress has affirmed the needs for commodity and passenger flow information in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 (PL 102-240). Section 6006 (105 Stat. 2172) creates the Bureau of Transportation Statistics with a number of responsibilities, including:

> (2) IMPLEMENTING LONG-TERM DATA COLLECTION PROGRAM. -- Establishing and implementing, in cooperation with the modal administrators, the States, and other Federal officials a comprehensive, long-term program for the collection and analysis of data relating to the performance of the national transportation system.

Specific subject areas are identified in subsection (1) of the same section and include: productivity in various parts of the transportation sector; traffic flows; travel times; vehicle weights; variables influencing traveling behavior, including choice of transportation mode; travel costs of intracity commuting and intercity trips; availability of mass transit and the number of passengers served by each mass transit authority; frequency of vehicle and transportation facility repairs and other interruptions of transportation service; accidents; collateral damage to the human and natural environment; and the condition of the transportation system.

The ISTEA also creates an Office of Intermodalism within the Office of the Secretary of Transportation, and provides the following instructions in Section 5002 (105 Stat. 2158) to the Director of the Office:

> (4) INTERMODAL TRANSPORTATION DATA BASE. -- The Director shall develop, maintain, and disseminate intermodal transportation data through the Bureau of Transportation Statistics. The Director shall coordinate the collection of data for the data base with the States and metropolitan planning organizations. The data base shall include-
>
> (A) information on the volume of goods and number of people carried in intermodal transportation by relevant classification;
>
> (B) information on patterns of movement of goods and people carried in intermodal transportation by relevant classification in terms of origin and destination; and

> (C) information on public and private investment in intermodal transportation facilities and services.

The ISTEA does not limit data concerns to the Federal level. Section 1034 (105 Stat. 1977) requires the establishment of six management systems by States and metropolitan planning organizations for pavement, bridges, highway safety, traffic congestion, public transportation facilities and equipment, and intermodal transportation facilities and systems. In particular:

> (e) INTERMODAL REQUIREMENTS.--The management system required under this section for intermodal transportation facilities and systems shall provide for improvement and integration of all of a State's transportation systems and shall include methods of achieving the optimum yield from such systems, methods for increasing productivity in the State, methods for increasing use of advanced technologies, and methods to encourage use of innovative marketing techniques, such as just-in-time deliveries.

Multimodal commodity and passenger flow data are essential output measures of yield and productivity, and are essential for identifying markets for intermodal services and facilities.

Required Data Elements to Meet ISTEA and Related Needs

Informed responses to diverse policy issues--as well as the specific ISTEA mandates--require a common base of information on the quantity and the modal, spatial, and temporal distributions of commodity and passenger flows. Specific data elements involving both commodity and passenger flows include, for example:

-- the true geographic origins and destinations of shipments and trips (and not just locations of intervening terminals);

-- the frequency and distance of shipments and travel;

-- the transportation services consumed and the conveyances and facilities used;

-- the port of embarkation or arrival for international movements; and

-- the transportation costs to the shipper or traveller, including accidents and damage.

Additional data elements involving commodity flows include:

-- volume by commodity type and hazard class, measured by shipment weight and value;

-- containerization and other packaging characteristics; and

-- characteristics of the shipper and receiver that generate--or are affected by--commodity flows.

Additional data elements involving passenger flows include:

-- the purposes and duration of the trip;

-- the demographic and economic characteristics of the traveller and the traveller's origins and destinations that generate--or are affected by--passenger flows.

These and other data elements are combined to forecast future passenger and commodity flows, determine how well the current transportation system serves current and future flows, and to evaluate the consequences of those flows for economic, social, and environmental goals.

Existing Information on Multimodal Commodity and Passenger Flows

Existing information on multimodal commodity and passenger flows is either out of date or lacks required geographic specificity, modal coverage, and other attributes. The severe inadequacies of existing information are recognized by Section 5002 of the ISTEA and documented by the Transportation Research Board of the National Academy of Sciences in *Data for Decisions: Requirements for National Transportation Policy Making* (Special Report 234, 1992).

Sources of Data on Multimodal Flows

The 1977 Economic Census included the last national data collections of commodity and passenger flows that covered all modes, provided geographic specificity, and were not limited to terminal-to-terminal moves. Commodity flows were measured by the Commodity Transportation Survey, and passenger flows by the National Travel Survey.

The Commodity Transportation Survey was last conducted by the Bureau of the Census in 1977 with limited funds. A subsequent evaluation of the survey determined that the data collection methods were inadequate, and that reliable data could be collected only by scaling back survey coverage to unacceptable levels or by increasing the budget five-fold to $11 million. Since neither Census nor DOT had funds available in the 1980s, the program was cancelled.

The National Travel Survey was also last conducted by the Bureau of the Census in 1977 for approximately $2 million. The Census Bureau canceled the 1982 National Travel Survey because an inadequate level of funding was available to support a sample size needed to obtain useful statistical information. General budget reductions made it impossible for the Office of the Secretary and the Research and Special Programs Administration to provide the Census Bureau with supplemental funding for the survey, as had been planned.

The only multimodal flow data to survive throughout the 1980s and to the present are collected by the U.S. Customs Service on shipments that cross the border. The commodity data are processed into foreign trade statistics by the U.S. Bureau of the Census. Reported transportation and geographic data concern the international movement of the commodities, but not the domestic leg of the journey. Efforts to measure the domestic movement of exports and imports between the port and inland origin or destination using export declarations and import entry documents have proven impractical. These movements were last measured in the 1976 Survey of Domestic and International Transportation of U.S. Foreign Trade, sponsored by the DOT, the Army Corps of Engineers, and the Maritime Administration (which was then in the Department of Commerce).

Other Sources of Data on Commodity Transportation

Existing statistical programs specific to domestic commodity transportation are limited to single modes, and cannot be added up to show total commodity flows among parts of the country. For example:

-- The Federal Railroad Administration (FRA) currently obtains information through the Rail Waybill Sample on shipments between rail terminals. The waybills do not show the true origin and destination of many shipments that are carried on more than one railroad or that travel significant distances by truck or water to reach the railroad.

-- The Corps of Engineers obtains information on all domestic waterborne shipments, but knows very little about the modes used to carry the shipments to and from the waterways or the locations involved beyond the waterways.

-- The Department of Energy obtains information on pipeline flows at the State level, but knows very little about the modes used to carry the shipments to and from the refineries and pipeline terminals.

-- The FHWA obtains trip information on sample days for a sample of commodity carrying trucks through the Nationwide Truck Activity Survey. This survey indicates relationships between truck activity and other modes at the national level, but the sample size is too small and the commodity classification is too broad to provide needed geographic and commodity detail.

Other Sources of Data on Passenger Travel

Data on passenger flows between regions are available only for passenger movements between terminals on for-hire air carriers and Amtrak. These flow data do not include trips by highway and general aviation, and provide little information on the traveller, the purpose of the trip, and segments of the trip between the airport or train station and the actual origin and destination of the trip.

The principal source of information on multimodal passenger travel, the National Personal Transportation Survey (NPTS), is not designed to measure flows among States or regions. It is important to ensure compatibility of the definitions and travel concepts used in NPTS and intercity travel surveys. However, the nature of intercity travel and its relative infrequency as compared to typical daily household tripmaking routines, require that a different methodology be used to effectively collect information on intercity travel.

There are other useful but limited sources of intercity passenger travel information developed in both the private and public sectors. These surveys cannot substitute for a comprehensive Passenger Flow Survey; in fact, often they are dependent on a comprehensive national survey to provide the measure of the total universe of passenger travel on which to base their more limited survey approaches.

The private sector's National Travel Survey is produced annually by the U.S. Travel Data Center of the Tourism Industry Association. This is a very effective tool for monitoring trends in overall travel patterns, but its small sample size does not permit significant geographic identification. Historically, the industry has strongly supported the concept of a national passenger flow survey as a benchmark and guide to the industry's continuing survey activity. Other private industry sources do travel activity surveying, as well. The potential sources of data to the DOT program will be carefully reviewed as part of the Passenger Flow Survey design process.

Another important possible source of intercity travel information is the Consumer Expenditure Survey of the U.S. Bureau of Labor Statistics. This survey is potentially a very rich source of data on travel expenditures and overall travel activity. Its main limitation is its focus on consumer expenditures, including only travel paid by households and not by businesses. This seriously limits the utility of the data for transportation applications, but can provide a useful adjunct to any DOT survey design.

Purposes, Objectives, and Designs of the Multimodal Commodity and Passenger Flow Surveys

Transportation patterns have changed significantly since 1977 by factors such as deregulation, the growth of international trade, and structural changes in the economy (including the shift from manufacturing to services). The paucity of current and adequate information inspired the DOT initiative in fiscal year 1992 to collect multimodal data, and was one reason for the creation of the Bureau of Transportation Statistics.

The FHWA requested funds in fiscal year 1992 for *Multimodal Commodity and Passenger Flow Studies* in response to recommendations by a DOT-wide committee on the Department's data requirements. Similar recommendations were made by the Transportation Research Board's *Data for Decisions* (Special Report 234). The DOT data committee and the Transportation Research Board recommended that nationwide data collections be initiated to obtain essential information for analyses of policy issues such as investments in congested intercity corridors, user charges, safety, international economic competitiveness, and national defense.

The DOT requested $15 million over 2 years; the Congress appropriated $4 million for the surveys in fiscal year 1992 and $3 million in fiscal year 1993. These funds were used to begin conducting the Commodity Flow Survey and to initiate planning for the Passenger Flow Survey. Of the funds provided, $250,000 was set aside in fiscal year 1992 for a study of trucking data as directed by the House Committee on Appropriations (House Report 102-156, page 87).

The Commodity Flow Survey

The Commodity Flow Survey is designed to provide data on the flow of goods and materials by mode of transport. It continues statistics collected in the Commodity Transportation Survey from 1963 through 1977, but includes major improvements in methodology, sample size, and scope. The 1993 Commodity Flow Survey is being conducted by the Bureau of the Census as a regular part of the quinquennial Economic Censuses. The DOT is funding the commodity and geographic detail.

Objectives

The Commodity Flow Survey is designed to capture the maximum amount of tonnage shipped by domestic business establishments; to identify the flows of that tonnage by type of commodities, shipment size, and shipment value among and within States and multicounty regions; and to identify mileage by the modes or intermodal combinations of transportation used to carry those flows. These shipment attributes can also be linked with characteristics of the shippers to determine the relationships of commodity transportation and general economic activity.

The design of the Commodity Flow Survey also captures the preponderance of interregional commodity movements by truck. This will provide the only source of nationwide origin-destination patterns for for-hire and private trucking.

The Commodity Flow Survey is being conducted by the Bureau of the Census to develop general economic indicators, serving the purposes described previously as applications beyond transportation policy. These applications of flow data explain the numerous and diverse statements of support by agencies outside of the DOT for the Commodity Flow Survey that were submitted to the Office of Management and Budget. Census and

Congressional recognition of the broad application of commodity data is not new; commodity surveys were conducted as a regular Census program from 1963 through 1977.

Survey Plan

The Commodity Flow Survey will obtain a representative sample from all domestic shipments, plus selected export shipments, by most sectors of the economy. The Commodity Flow Survey has been designed by a joint Census-DOT planning group to survey U.S. domestic shippers in manufacturing, mining, wholesaling, warehousing auxiliaries of multi-establishment companies, and selected other industries. The Commodity Flow Survey will not cover farms and fisheries, governments, households, foreign establishments, and most establishments in retail and services. The largest anticipated missing pieces of domestic ton miles include:

-- movements between over three million farms and agricultural assemblers, virtually all of which are by truck, are typically over short distances, and could be measured by a separate survey such as the Nationwide Truck Activity Survey;

-- imports from the port of entry to the manufacturer's or wholesaler's facility, which is often within the port city;

-- landbridge movements in which foreign shipments cross the United States and depart for foreign destinations;

-- shipments by governments, such as municipal garbage and transfers of munitions among military bases;

-- waste shipments by manufactuers, some of which are hazardous; and

-- household goods movements.

Methods for estimating the magnitude and geography of these missing pieces are being investigated.

Approximately 200,000 establishments have been selected from a universe of about 900,000 establishments to capture information on 20 to 24 million sampled shipments. This large sample is needed to support statistically reliable tabulations of tons, miles, ton-miles, and value by commodity type, mode of transportation (including intermodal combinations), shipment distance, shipment size, and combinations of origins and destinations.

Origins and destinations are defined by State and 89 National Transportation Analysis Region (NTAR). NTARs are DOT-designated aggregations of the 183 Bureau of Economic Analysis (BEA) Economic Areas. NTARs and BEA Economic Areas reflect functional geography and frequently cross State lines.

Publication of aggregate information by responses to the hazardous materials, containerization, and export items will depend on the quality of actual responses. The Commodity Flow Survey sample was not designed to produce publication-quality results at subnational levels for these items.

During the fourth quarter of 1993, a subsample of establishments will be asked for information on their transportation equipment and access to shipping facilities. This information will be available at the U.S. level.

Relationships to Existing Data Resources

The Commodity Flow Survey will measure total freight movements between regions by mode used and shipment characteristics. The resulting data will identify how much of total commodity flows are represented in existing data programs, and how those flows relate to transportation facilities and services and to general economic activity. The 1993 survey will also provide a highly useful data base for research on movements of hazardous materials.

The proposed survey builds upon--rather than replaces--existing data collection programs such as the Rail Waybill and the Nationwide Truck Activity Survey. The existing programs provide essential data on detailed characteristics of transportation users, economic activities served, type of vehicles and carriers used, and other information that cannot fit on the Commodity Flow Survey. The Commodity Flow Survey will obtain extensive required geographic and commodity detail that is beyond the design constraints of the Nationwide Truck Activity Survey and related programs. As a consequence, support of the Rail Waybill and the Nationwide Truck Activity Survey must be maintained.

The Commodity Flow Survey will both fill a critical data gap and allow DOT to make more complete use of existing data. The survey will show how characteristics measured in existing programs fit within the universe of freight transportation, and also will provide information needed to link characteristics measured in separate, existing data collection programs.

The Passenger Flow Survey

The strategic needs for the Passenger Flow Survey are clear, but detailed objectives and methodology for the survey are still being established. An ad hoc DOT planning group has initiated preliminary discussions, and the DOT's Volpe National Transportation Systems Center has conducted a design study to develop preliminary specifications and options for the survey. Consideration of these options are moving forward under the BTS. The BTS intends to conduct the survey through Census or a private contractor in 1995 to coincide with the National Personal Transportation Survey.

During the development of the 1977 and planned 1982 National Travel Surveys, consultation with other non-DOT Federal agencies indicated that

the data would be useful to several of them, including the Bureau of Economic Analysis, the U.S. Travel and Tourism Administration, National Park Service, and the Department of Energy. Efforts will be made to coordinate the Passenger Flow Survey with these and other Federal agencies.

Objectives

The Passenger Flow Survey is being designed for DOT-wide purposes to determine:

-- the origins and destinations of door-to-door (rather than terminal-to-terminal) passenger flows among States and multicounty regions, capturing movements by private motor vehicles and general aviation as well as by for-hire carriers;

-- all transportation services and facilities utilized for the trip, including mode of access to terminals such as airports and railroad stations; and

-- the basic demographic and economic characteristics of the traveller or the trip that generate those flows, to determine the relationships between the passenger's social and economic characteristics, party size, purpose and length of the trip, and the modes used for each major intercity corridor.

The purposes of the survey are particularly important to each of the DOT's modal administrations, which have no other source of information on the interregional flows of passenger travel by private motor vehicle to determine the role of highways in intermodal trips and in meeting economic and social needs of passenger travel. The Passenger Flow Survey can also provide more robust estimates of long distance motor vehicle travel than available from other sources, since long distance trips account for a disproportionately large share of total travel but are infrequent among households and over time. Better estimates of trip length distributions for long-distance travel will also provide a better empirical basis for the principals of highway functional classification.

Design Issues

The design of the Passenger Flow Survey is far less developed than its commodity counterpart. Basic issues to be resolved include content, geography, and survey instrument.

In order to meet both DOT-wide and FHWA needs, the Passenger Flow Survey is being designed to measure characteristics of travel for each trip captured by the survey such as the following:

-- origin, destination, locations of each change of mode, and location of each overnight stop;

-- modes used (private motor vehicle, rented motor vehicle, for-hire bus, other for-hire motor vehicle, scheduled air carrier, other for-hire air

carrier, other aircraft, Amtrak, other railroad, for-hire water carrier, other);

-- purposes of the trip;

-- number of nights away from home or other measure of trip duration;

-- number of miles travelled in private or rented motor vehicle during the trip;

-- number in party;

-- whether the fares paid for for-hire carriers required advanced reservation, were bonuses for frequent travel, or were regular rates, and whether the individual or the individual's business paid for the trip;

-- age, sex, education, occupation, and industry of the traveller; and

-- traveller's household size, number of earners, income, and number of vehicles available.

The ability to capture all of these characteristics and measure the frequency distribution of long distance travel depends on the survey instrument employed, the sample size, and other trade-offs to achieve adequate coverage and statistical reliability with minimum respondent burden.

The Passenger Flow Survey will clearly require a large sample to capture the geographic diversity of long-distance travel and to deal with the problem that an individual's accurate recall of travel deteriorates quickly over time. A large sample is needed because most households make very few long-distance trips each year, and the probability of sampling the household soon after the trip is low. A large sample is also needed to capture the few households that account for a very large share of long-distance travel (such as participants in frequent flyer programs). Opportunities to reduce sample size are limited by the absence of information upon which to base a more targeted survey without introducing bias into the results.

The past National Travel Surveys and other collections of detailed data on passenger travel were based on home interviews. While this "survey instrument" was effective for obtaining extensive information with a high degree of reliability, the cost of conducting home interviews has become prohibitive for surveys with large samples.

The likely size of the Passenger Flow Survey sample will probably require the use of either mailout-mailback travel diaries or computer-aided telephone interviews. Each of these approaches has significant strengths and weaknesses that must be considered in the survey plan.

Relationships to Existing Data Resources

The Passenger Flow Survey will build upon--rather than replace--existing programs such as the NPTS and the airline ticket sample. The NPTS provides the daily pattern of local travel by households with extensive detail on the trips taken, the modes of transportation used, the economic and social purposes of the trip, and demographic and economic characteristics of the traveller. The Passenger Flow Survey will provide less trip and traveller detail, but will capture the extent and geography of long-distance travel that is less frequent but consumes a substantial share of transportation resources.

No single survey can capture the needed information on passenger travel. Since long distance travel is infrequent and may respond to quite different economic and social forces than local travel, the NPTS has a semi-autonomous battery of questions and a different response period to deal with long distance travel. The NPTS could be simplified significantly and its sample improved in efficiency if it concentrated solely on sample day activity and left its section on longer period activity to a separate survey. The NPTS would still capture long distance trips that occur on the sample day and contribute to the aggregate universe of travel, but would only measure the total distance and mode of those long distance trips. Two separate surveys would reduce burden to individual respondents, thus improving response rates, respondent accuracy, and therefore data quality.

As in the case of the Commodity Flow Survey, the proposed Passenger Flow Survey would both fill a critical data gap and allow DOT to integrate different data sets and make more complete use of existing information resources. The proposed survey would show how characteristics measured in existing programs fit within the universe of passenger transportation, and would provide information needed to link characteristics measured in separate, existing data collection programs, so that the whole of the resulting information base is greater than the sum of its parts.

Role of the Bureau of Transportation Statistics

Funding of the multimodal commodity and passenger flow surveys was initiated in fiscal year 1992 under the FHWA because the Bureau of Transportation Statistics did not yet exist. The FHWA was able to initiate the effort, and had a significant need for the data since freight and passenger flows by motor vehicle are the least known of the flows by intercity modes.

Now that the BTS exists, the Bureau has assumed responsibility to manage and complete the multimodal surveys for the entire Department. The Bureau has the general mandate to initiate a long term program of data collection under Section 6006 of the ISTEA, and is specifically directed to undertake

such surveys with respect to intermodal transportation by Section 5002 of the ISTEA. The ISTEA provides the BTS with the budget resources necessary to complete the surveys.

Milestones and Anticipated Budget

DOT staff resources were focussed initially on the Commodity Flow Survey so that it could be conducted in conjunction with the 1992 Economic Census. The Commodity Flow Survey depends on the 1992 Census for expansion of the sampled shipments to a universe of flows. Time between the conduct of the Economic Census and the Commodity Flow Survey must be minimized so that expansion factors are not undermined by the births and deaths of establishments and by other changes in the economy.

The Commodity Flow Survey design was completed in roughly 15 months, even though surveys of that size normally take 3 years to develop. Extensive input from potential customers was obtained both through governmental channels and through organizations such as the Transportation Research Board. The Office of Management and Budget approved the Commodity Flow Survey in 1992, and the first questionnaires were mailed to respondents by the beginning of calendar year 1993.

With the Bureau of the Census conducting the survey, attention of the DOT-Census design team has shifted to developing detailed specifications of standard and special data products, as well as to research projects to supplement findings of the Commodity Flow Survey and to evaluate the effectiveness of the survey's implemented design. A conference of anticipated data users was held April 28, 1993, to obtain the maximum customer input to the design of data products and related research.

Data will be collected throughout calendar year 1993. The resulting 20-24 million shipment records will undergo a year of processing, quality control, and data analysis. The major data products will be available in 1995.

The BTS will devote significant staff time to resolving design issues surrounding the Passenger Flow Survey for the remainder of 1993. Extensive customer input will be sought through meetings and correspondence. Under current plans, a detailed survey design will be completed in 1994, and the survey will be conducted throughout calendar year 1995 in conjunction with the National Personal Transportation Survey. Data products will be released under this schedule in 1996.

Direct costs of the Commodity Flow Survey include $12.6 million from the DOT and $3 million from the Bureau of the Census. Census is also

providing extensive in-kind contributions, such as the Standard Statistical Establishment List for the sample frame and customized outputs from the 1992 Economic Census. The FHWA has transferred $6 million to Census and $0.6 million to Oak Ridge National Laboratory from the fiscal year 1992 and 1993 line items for multimodal commodity and passenger flow surveys. The balance will be paid by the BTS from its ISTEA authorizations.

Direct costs of the Passenger Flow Survey are estimated at $4 million, but could be substantially higher if required to meet the most cost-effective combination of sample size, geographic specificity, and respondent-friendly survey instrument. The initial scoping study by the Volpe National Transportation Systems Center was conducted with funds from the FHWA, FRA, Federal Transit Administration, Federal Aviation Administration, and Research and Special Programs Administration. All subsequent funding will be provided by the BTS from its ISTEA authorizations.

Conclusion

The multimodal commodity and passenger flow surveys will provide key information on the impacts of transportation on the national economy, society, and environment. Data from these surveys will also provide a basis for forecasting public responses to new modes of transportation, as well as to major improvements to existing modes. The program of data collection is consistent with the ISTEA and other mandates for broader-based policies and for improved data to support informed decisionmaking.

No one data collection can answer the information needs of decisionmakers. The Commodity Flow Survey and the Passenger Flow Survey are closely coordinated with other data collections (such as the Nationwide Truck Activity Survey, the Rail Waybill Statistics, Waterborne Commerce, and the Nationwide Personal Transportation Survey) to get a complete picture of the transportation system and its consequences while minimizing cost and respondent burden.

Even with this coordination, the cost of the surveys is significant compared to the DOT's past data collection efforts. The size of each survey is necessarily large to obtain the geographic and other detail essential for adequate and reliable public information on complex policy issues.

The cost of the surveys is not imposing when compared to the decisions that the resulting information will affect. The information will be used to develop and analyze legislation affecting billions of dollars in user charges, infrastructure investments, new technology initiatives, and productivity of

the transportation industry. The information will also be used by private companies of all sizes to find markets and target activities to survive and prosper in a dynamic economy. The cost of the multimodal flow surveys is a tiny fraction of the costs and benefits of these public and private decisions.

The Bureau of Transportation Statistics was established in part to provide the most basic transportation information needed by government and industry for planning and investment. The multimodal commodity and passenger flow surveys are the centerpiece of the Bureau's program to establish the fundamental information base to support informed decisionmaking.