

Surface Passenger Transportation Data Needs, Resources, and Issues

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The current and anticipated status of data related to surface passenger transportation is evaluated and improvements are recommended for the purpose of national policy development and decision making. The paper is based on a review of literature, discussions with those involved in current and past national transportation planning efforts and national decision making, and the findings of a TRB conference held in October 1989. The purpose of this meeting of the TRB Transportation Data and Information Systems Committee was to evaluate current data sources, data systems, and applications and to investigate the needs for data in the 1990s. The conference was organized into three areas of concern: urban area data needs, statewide data needs, and national data needs. This paper covers past and current national planning efforts, strategic planning and policy issues, major sources of data, gaps in the data, and recommendations for data improvement. The major data gaps recognized by comparing data needs and available data are data for measurement of congestion; data for system performance monitoring; data on longer trips (over 100 mi) for all modes; data on rural public transportation; data on intercity rail and bus operations, facilities, and infrastructure; data on new roads on new alignments; data on highways by subgeographies such as suburbs and core area; data on local road needs; and data on traveler attitudes and perceptions.

The purpose of this paper is to evaluate the current and anticipated status of data related to surface passenger transportation and to recommend improvements for the purpose of national policy development and decision making. The major focus of the paper is on highways and urban public transportation (bus and rail). Less emphasis is placed on intercity rail and bus, because of the ownership issues.

The types of data addressed in the paper are defined below:

- Equipment inventory, condition, and use;
- Carrier performance and condition;
- Passenger flows;
- Demographics and general economic activity;
- Safety and security; and
- Finance and program administration.

Data needs, availability, and gaps have been evaluated in terms of transportation system condition, performance, and use.

This paper is based on a review of literature, discussions held with those involved in current and past national transportation planning efforts and national decision making, and the findings of a TRB conference held in October 1989. The purpose of this mid-year meeting and conference of the TRB Transportation Data and Information Systems Committee was

to evaluate current data sources, data systems, and applications and to investigate the needs for data in the 1990s. The conference was organized into three areas of concern: urban area data needs, statewide data needs, and national data needs. The meeting was oriented to ground transportation with a concentration on highway and public transportation modes. The conclusions of the workshops held on urban, statewide, and national data needs are included, because they provide some direction to the determination of data needs for national planning and decision making. Appendix A is a select bibliography of surface passenger transportation data sources, and Appendix B contains reports of the TRB workshop sessions.

NATIONAL TRANSPORTATION POLICY STUDIES AND DECISION MAKING

National multimodal policy study and decision making are described for the period since 1966, when the U.S. Department of Transportation (DOT) was established. The nature of these efforts is important to consider when evaluating data needs for the future.

Two types of planning studies can be defined. Policy studies, often brief statements, were required by Congress and rarely developed much data or generated any significant research. Planning activities, the second type, are quantitative, analytical, and comprehensive. These are based on considerable analysis of data and some sort of a modeling process. The data come primarily from either a new data collection effort or secondary sources.

The national studies of interest here are

- 1972 DOT national transportation study
- 1974 DOT national transportation study
- 1976 DOT national transportation study ("Trends and Choices")
- 1978 national transportation policy study (by the National Transportation Policy Study Commission)
- Current DOT National Transportation Policy Team (NTPT) 2020 effort
- Current AASHTO 2020 effort

The 1972 and 1974 DOT national transportation studies and reports were based on special data collection efforts. For the 1974 study, the states and their local jurisdictions were requested to supply detailed information on

- Physical status of the system;
- System demand;

- Performance and level of service;
- Externalities of the system, such as noise and air pollution; and
- Costs of operating and maintaining the system.

The above information was reported by each state for the current situation, a 10-year program, and a 20-year plan.

These data were primarily surveys of state and local expenditure plans, which were very rigorous in definition so as to obtain a consistent and uniform reporting across the nation. A common framework was established with regard to future population, gross national product, and travel demand. Common mechanisms of needs assessment with regard to future inflation rates, interest rates, rates of return, and payback periods were established for all modes.

The national transportation studies produced uniform national reporting for all modes in all areas of the country (by state, major metropolitan area, and urban/rural area). This information included physical inventories with associated levels of service and financial requirements.

The 1976 "Trends and Choices" effort relied heavily on the data collected in the 1972 and 1974 efforts. National networks for all modes were developed and loaded with simulated national trip tables based on secondary source information.

The work of the National Transportation Policy Study Commission (1978) was intensive in a modeling sense, seeking to produce a series of multimodal investment needs responsive to long-range forecasts of passenger and freight travel. Capital investment forecasts were produced for 19 modal categories for two time periods and three alternative growth scenarios.

Even more detailed forecasts were produced, based on scenarios of demography, economy, and lifestyle. These included such statistics as multimodal travel forecasts, energy consumption and flow forecasts by energy type, and export and import trade flows by coastal district.

More than 10 years elapsed between the last big national planning efforts and the current 2020 planning activities. The current activities of DOT and AASHTO are efforts that are partially quantitative and analytical; however, they have also broken new ground by having the general public and transportation system users and providers participate in the planning effort.

By and large, these efforts rely on available data and have not produced new data or research. The surface passenger analyses relied heavily on the FHWA Highway Performance Monitoring System (HPMS) and on UMTA's National Urban Mass Transportation Statistics (Section 15 reporting), as well as on sources such as the Nationwide Personal Transportation Study (NPTS) and the decennial census.

In reviewing the above efforts, some conclusions may be drawn:

- Early national efforts were based on collecting a uniform reporting of information by state, major metropolitan areas, and urban/rural disaggregation. The states and urban areas defined their own 10-year programs and 20-year plans.
- The current efforts of AASHTO and DOT are largely based on the use of secondary sources for data and on a consensus building through input from the general public and system users and suppliers.

- One of the major weaknesses in the efforts reported above is the lack of continuity in the planning efforts. The information and data of the earlier efforts are basically lost.

OVERVIEW OF NATIONAL STRATEGIC PLANNING AND POLICY ISSUES

In "Building the National Transportation Policy," Volume 1 of the report *Moving America—New Directions, New Opportunities*, DOT lists major policy issues. For the intercity passenger market, the issues include meeting travel demand, funding system improvements, safety, and competition within and among modes and intermodal operations. The urban/suburban market issues presented are congestion, infrastructure financing, special transportation needs, the environment, and safety.

The three workshops (urban, statewide, and national) of the mid-year TRB conference on data and information systems further defined national planning data needs. Three major markets were identified:

- Urban/suburban,
- Rural, and
- Intercity.

In the urban/suburban market, the following major policy issues were identified:

- Congestion,
- Operational and management improvement of systems,
- Infrastructure rehabilitation and expansion,
- Funding flexibility and road pricing,
- Transportation and land use linkages,
- Mobility and intermodalism,
- Safety, and
- Investment payoffs (equity, economic development, and environmental impacts).

In the rural market, the following major policy issues were identified:

- Infrastructure preservation,
- Local rural road needs,
- Rail and bus service reduction,
- Mobility, and
- Safety.

With regard to intercity passenger issues, the following issues were identified:

- Access to intermodal facilities (i.e., airports),
- Major corridor congestion,
- Substitution of modes in specific markets,
- New intercity air/rail technology (i.e., MAGLEV),
- Funding flexibility, and
- Safety.

A major problem identified is congestion. Polls sponsored by AASHTO, the media, and government all point to conges-

tion as one of the top issues. All parts of the nation are experiencing the effects of congestion, and there is currently a need for more solid, consistent data to assist in effectively analyzing it.

The questions being asked include the following:

- Are things getting worse as fast as everyone believes?
- Which areas of the country have the biggest problems?
- How bad are the problems?

The weaknesses in the information systems do not, for the most part, stem from lack of monitoring at the local level. Most large metropolitan areas, and many rural areas as well, have continuing counting problems or have scheduled programs that, while not always definitive, do provide a sense of trend. Toll facilities and transit operations keep and publish relatively current data on revenues and operations. Some of this is well covered in the local press, some not. But it rarely makes its way into national attention, unless something dramatic happens. The problem lies at the national level, where local periodic, anecdotal evidence has not been assembled in a useful way. The key weaknesses in this area include

- The failure to assemble data from selected representative points to provide a centralized snapshot of national and sub-national trends,
- The failure to assemble data on a timely basis so that "current" (i.e., quarterly and monthly) statistics are made available, and
- The failure to develop a means or measuring congestion that can inform and "move" the press and public officials.

Beyond congestion issues are those issues relating to obtaining a greater capacity and efficiency from existing facilities, including operational and management improvements for highways and transit. The ability to evaluate the effectiveness and consequences of various supply-and-demand "management" schemes is a critical need for the current planning process. The growing need to solve non-work-related travel and congestion emphasizes the need for comprehensive planning rather than simply commuter-related planning.

Safety is an important issue identified for future planning and decision making. Accident data that will support modal decision making in a way that is more meaningful than is currently possible is required. On the highway side, there is the difficulty that law enforcement officials experience in gathering onsite accident data and the difficulty in analyzing such data with regard to cause-and-effect relationships. With a more than doubling of vehicle miles traveled (VMT) expected over the next decades, it is important to obtain and analyze the appropriate data to further reduce the highway death rates.

On the transit side, both safety and security are important issues. In terms of the safety information needed for national strategic planning, although accident and fatality data are being collected under the auspices of Section 15, little national information is available on accident causes and incidents of crime, particularly as related to substance abuse. In addition, there is no consistency between the data collected for Section 15 and that available from other federal accident and safety

reporting systems, such as NHTSA's Fatal Accident Reporting System (FARS) and National Accident Sampling System (NASS).

Without a more comprehensive set of data on accidents and their causes and crime against transit passengers, personnel, and property, it is difficult to properly identify important safety and security problems, formulate potential responses at the federal (and other) levels, and evaluate them. The first attempt at improving this situation will be a redesign of the safety-related data being collected for Section 15 purposes. A semiannual drug program reporting system is also being established under UMTA's new drug rule.

Mobility planning, as opposed to planning for individual modes, will become increasingly important. In urban areas, effective monitoring is basic to analyzing mobility needs. In the intercity market, data are needed, for example, to evaluate intermodal concepts such as substitution of high-speed rail for air or auto travel in trips under 400 mi. FRA is evaluating MAGLEV for this market and finds that, in obtaining trip information for city-to-city movements, origin-destination (O-D) data can be obtained for air and rail but is lacking for the highway mode, both for automobile and bus travel.

Rehabilitation and replacement will become increasingly important across all modes. In the wake of the great wave of public takeovers of private transit operators in the late 1960s and early 1970s, a large number of new maintenance and operating facilities were constructed for all modes. In the mid-to late 1970s and on into the 1980s, a large number of new rail systems began operation. Beginning with the first gasoline crisis in 1973 and accelerating after the second in 1979, transit fleets were expanded. Applying any set of rules or standards on facility updating and equipment and vehicle replacement to the transit systems whose history is briefly noted above suggests that the 1990s will mark the beginning of a significant period of transit rehabilitation and replacement. The precise implications for federal transportation programs are somewhat unclear.

Rail transit modernization requirements were examined as part of a congressionally directed rail modernization study, which was completed in 1987. However, the basic thrust of that study was to determine the cost of bringing the nation's then existing rail transit systems, most of which had originally been built decades earlier with nonfederal funds, to modern standards.

To assess the magnitude of future rehabilitation and replacement activities for all modes and how they will be distributed in time and by geography requires a significant amount of system condition data. Unfortunately, these data are not now routinely collected at the national level and much of it may not even be available locally.

MAJOR SOURCES OF SURFACE TRANSPORTATION DATA

The major sources of available information found most useful by those involved in the current national planning efforts of DOT and AASHTO are

- *For highways:* HPMS (FHWA),
- *For transit:* Section 15 reporting (UMTA),

- For passenger travel: NPTS (FHWA), and
- For demographics: census reporting.

These data sources have the following common characteristics:

- They are collected on a recurring basis.
- They are standard among reporting units (transit operators, states, etc.).
- They are national in scope.
- They are collected mainly for purposes other than national multimodal planning.

As background, a short description will be provided for each of the above.

HPMS

HPMS was established by FHWA in 1978 in response to a series of one-time special national studies requested earlier by Congress. The system was established as an ongoing and continually updated statistical data base and has many uses. One primary use is to provide basic information for the biennial reports to Congress titled *The Status of the Nation's Highways and Bridges*. Another use is a source for the annual mileage and travel tables for the publication *Highway Statistics*. A report, *Fatal and Injury Accident Rates on Public Roads in the United States*, was also prepared using HPMS data. Before the HPMS was established, each congressionally mandated study required the collection of massive amounts of data for one point in time. It was difficult to develop any trend data from these studies because definitions, categories, standards, and geographical detail were different in each of the studies. Routine statistical reports were out of date and lacked correlation among the many data items. It was determined that a continuous, comprehensive, and comparable data system was necessary.

The HPMS provides basic information on all roadway mileage in the nation, such as extent, functional classification, jurisdictional responsibility, and the like. Detailed information concerning extent, performance, operating characteristics, usage, pavement type, composition, and condition is obtained for a sample of about 102,000 arterial and collector roadway sections. Additional information is reported by the states in the form of areawide summary data, which includes fatal and injury accident data and a mileage and daily travel summary. HPMS data is reported by all states and is stratified into three substate components: rural, small urban, and urbanized. Six functional systems within each substate component are sampled separately. HPMS provides consistent and accurate information for national purposes. It can and has been supplemented for substate areas in a number of states.

In addition to information on the physical highway system, FHWA collects truck weight, vehicle classification, and traffic count data. Each month, the states provide information on traffic volumes by hour of the day, day of the week, and month of the year from over 3,500 permanent traffic counters throughout the United States. Annually, the states provide

information on the vehicle classes and the weight of the trucks using the nation's highways.

Section 15 Reporting

The Section 15 data set, collected by UMTA, includes, for each transit operator in the country, data describing the size and composition of the vehicle fleet, the extent of fixed guideway facilities, levels of service provided, accidents and fatalities, operating and maintenance costs, ridership and revenue, subsidies, and employment. These data can be stratified in a number of ways, such as by operator size and mode.

Information is provided by metropolitan planning organizations (MPOs) and transit operators. MPO-provided information, for example, includes linked trips. The transit operator's system generates information for internal use in managing their operation as well as input to the Section 15 reporting system.

The Section 15 data have been used successfully for the past 9 years for national analyses of transit productivity, efficiency, and effectiveness. Many of these studies were used in preparation of the biannual reports to Congress on the current performance and condition of public mass transportation systems required by Section 308 of the Urban Mass Transportation Act.

The analytical categories of Section 15 information are as follows:

- Facilities and equipment levels;
- Resource utilization: vehicles, manpower, and energy;
- Financial structure and condition: capital expenditures, operating expenditures, and revenues;
- Service supplied;
- Passenger use of service;
- Operating performance: efficiency, relationship of passenger use to service, relationship of operating costs to passenger use, revenue generation capability, safety, and maintenance.

NPTS

The NPTS is a nationwide inventory of households to determine the residents' travel characteristics on a typical day. The travel characteristics collected include all person-trips for all lengths by all modes. However, since long trips over 100 mi represent only 0.7 percent of all trips, they are not well represented in the NPTS. The sample, distributed over each day of the week for a full 12-month period, also contains an inventory of the motor vehicles available to the households and their use in the previous year. Various other socioeconomic and demographic data related to the travel characteristics are also obtained. The NPTS is the only nationwide continuing and comprehensive survey of personal travel, and it is used by researchers, policy development staff of various organizations, national associations, other federal agencies, state and local governments, students, and private sector organizations concerned with the relationship of travel to demographics. It is an excellent source of current personal travel characteristics and, because of its relative consistency and

similarity from survey to survey, it is a valuable tool for assessing trends in these travel characteristics over time.

The next survey is expected to commence in February 1990, with data collection involving 20,000 households spread over a 12-month period. All household members age 14 and above will be personally interviewed by telephone, with proxy interviews for household members 5 to 13 years of age.

Previous surveys in 1969, 1977, and 1983 were conducted by the U.S. Bureau of the Census through personal interviews in the home. Two significant changes were introduced for the 1990 survey. The survey will be conducted by a private contractor, and a computer-assisted telephone interview technique known as CATI will be used.

Census Data: Demographics and Journey to Work

The decennial census provides considerable information regarding population and housing that is of use in national planning activities. Information on the journey to work is also collected. A special transportation planning package has been made available for the past several decennial censuses, providing data for urbanized areas. This package will be available for all urban areas and on a statewide basis for the 1990 census and should, as such, be of expanded use for national planning purposes. Data items include the number of work trips, work location, work trip time and departure time, mode traveled, carpool used, auto occupancy, and vehicle type.

The decennial census provides the longest time series of U.S. demographic data. It was first taken in 1790 and was broadened in 1810 to include other subjects. In 1960, the format was changed so that the majority of the population had only to answer a limited set of questions (short form), and a sample of the population had to answer a more detailed set of questions (long form). Journey-to-work and other transportation questions are included on the long form.

Other Data Sources

In addition to the above major data sources, numerous other data sources have played a lesser role in national planning. The Highway User and Finance System collects comprehensive data on the economics of the highway system; these data have been reported by the states and are published in the annual *Highway Statistics*. Highway finance data encompass complete and comprehensive information on receipts and disbursements for highways by all units of government. This includes 43 years of data and provides a continuing baseline of information for state and national policy deliberations. Other data in the highway user component of this series include motor fuel, vehicle registrations, and licensed drivers. Motor fuel data, reported monthly, are used for many purposes including estimates of federal Highway Trust Fund receipts attributable to each state.

The Annual Housing Survey (AHS) consists of a national sample of approximately 75,000 households and a metropolitan area sample of about 140,000 households spread over 20 standard metropolitan statistical areas (SMSAs). These 20 SMSAs constitute one-third of a list of 60 SMSAs that are

sampled on a 3-year cycle, so that about 420,000 metropolitan households are surveyed in a 3-year period. The AHS includes questions that provide detailed information on journey-to-work trips.

The Eno Foundation publishes *Transportation in America*, a summary statistical analysis of transportation in the United States. This has been published every year since 1980. The report summarizes transportation traffic indicators, transportation outlays, the nation's transportation bill, intercity travel, fatalities, and user taxes and fees. These data are provided for all modes.

Although no national data bases have been developed for the intercity rail and bus modes, there is some information on these operations, such as that reported in the Amtrak and Greyhound annual reports. Likewise, O-D information can be obtained for rail through ticket sale information. The ability to obtain such information in a readily used format, however, is questionable.

NASS is based on a sampling of all highway accidents by accident investigation teams under contractual agreement with NHTSA. These investigators visit the accident scene, locate the vehicles involved, interview drivers and others involved, and procure appropriate records. This information is coded on NASS forms and provides annual files available to the public. FARS gathers data on all fatal highway accidents. FARS analysts gather, interpret, codify, and transmit data on all fatal accidents using police, medical examiner/coroner, and emergency medical services reports as well as state vehicle registration, driver licensing, highway department files, vital statistic documents, and death certificates.

The last source described here is data collected for local and statewide planning that can provide characteristics useful to national planning. These include O-D surveys, traffic counts, classification studies, speed studies, forecasts of demographic and travel characteristics, etc. A good summary of such characteristics is contained in *Characteristics of Urban Transportation Demand*, available from DOT. The basic problem with much of the data collected locally is the lack of consistency in definitions between areas.

GAPS IN DATA AVAILABILITY

The material in this section has been developed through conversations with those involved in DOT and AASHTO national planning efforts, staff involved in the collection of national data sources such as the HPMS, and, most important, the October 1989 conference of the TRB Transportation Data and Information Systems Committee.

The results of three workshops held at the conference on urban, statewide, and national transportation data needs provide a good framework for discussing data requirements for national planning and decision making. The findings are reported herein, along with material from the other sources mentioned.

Data Gaps

In evaluating data gaps, it may be worthwhile to array the current data sources (previously described) by market and by

TABLE 1 MAJOR DATA SOURCES SUMMARY

Market	Sources
Urban/suburban	
Highway	HPMS; FARS/NASS; HUFSS
Public transport	Section 15
All modes	Census; AHS; NPTS
Rural	
Highway	HPMS; FARS/NASS; HUFSS
Public transport	—
All modes	Census; AHS; NPTS
Intercity	
Highway	NPTS; HPMS
Rail	NPTS; Ticket Data Amtrak
Bus	NPTS; Ticket Data Greyhound
All modes	Census

NOTES: HPMS = Highway Performance Monitoring System (FHWA); FARS = Fatal Accident Reporting System (NHTSA); NASS = National Accident Sampling System (NHTSA); HUFSS = Highway User and Finance System (FHWA); Section 15 = Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System (UMTA); Census = Decennial Census (Bureau of the Census); AHS = Annual Housing Survey (Bureau of the Census); and NPTS = Nationwide Personal Transportation Study (FHWA).

mode. This is shown in Table 1. The major data gaps recognized by comparing data needs and available data are summarized below:

- Data for measurement of congestion;
- Data for system performance monitoring;
- Data on longer trips (over 100 mi) for all modes;
- Data on rural public transportation;
- Data on intercity rail and bus operations, facilities, and infrastructure;
- Data on new roads on new alignments;
- Data on highways by subgeographies such as suburbs and core area;
- Data on local road needs; and
- Data on traveler attitudes and perceptions.

Filling the Data Gaps

The following activities are suggested as ways to fill the data gaps discussed above:

1. A national congestion monitoring data set providing public information on trends in major U.S. cities is identified as a needed and useful undertaking to support national policy making and comparative analyses in individual metropolitan areas.

The goal of the plan would be to assemble on a quarterly basis a set of travel trend measures representative of all of the nation's metropolitan areas with a population of over a million. One important task would be to develop appropriate means for measuring and reporting congestion.

A major emphasis would be on change in congestion. That might mean an emphasis on peak period measurements at major facilities, with percentage changes between one month/quarter and that of the past year. One approach would be to obtain only a limited number of "representative" points per

metropolitan area, drawn from existing monitoring points, toll booths, bridges, transit counts, etc. There is no presumption that these areawide measures will be properly statistically weighted, unless such a system is in place in a given area and readily available. Preferably, downtown-oriented and suburban trends for each area would be separately monitored.

2. Consideration should be given to a continuing performance measurement process for metropolitan areas. The data set developed in a TRB study of performance measurement needs in 1976 (see Table 2) should form the basis for such a reevaluation. An NCHRP synthesis of effective practice in this area is warranted. Along this line, the mandated requirement for a continuing process of monitoring and reporting transportation trends in urban areas, which was rescinded in 1983, needs to be reconsidered. The utility of such a process is agreed to by many, but it is not clear that federal mandates must be the answer to achieving it.

3. There is a lack of data on longer trips. Data is required to evaluate intermodal concepts such as substitution of high-speed rail or vertical takeoff aircraft for travel under 400 mi. The national travel survey that was part of the NPTS data collection used to capture long trips on all modes has not been conducted since 1977. Consideration should be given to reinstating this collection effort. The US Travel Data Center currently collects data called the National Travel Survey. It is oriented toward tourism, but it does provide other useful information on longer trips. For specific city pair markets, however, special surveys to collect O-D movements by all modes may still be necessary.

4. An authoritative review of the relationship between transportation investment and economic development, productivity, and competitiveness, and the data required to support such analysis, should be undertaken.

5. Consideration should be given to the establishment of a national data collection effort and reporting of information for the passenger rail and intercity bus market, similar to that being accomplished for highways (by the HPMS) and urban public transit (by Section 15). Currently, such information may be available from Amtrak and Greyhound but is not easily obtainable in a consistent format.

6. Not a single consistent source of data was found for transit operations. UMTA collects data on urbanized transit operations, including some financial information. These data, however, do not cover rural areas. This may be covered in a separate Section 18 data process. Section 15 does not provide sufficient information on transit facilities and infrastructure. Specifically, information on terminal and maintenance facilities is not included with data on condition, needs, etc.

A national transit system condition data set, comparable to that used by the HPMS, would describe the number, size, and condition of fixed transit facilities, as well as all vehicles and significant ancillary equipment. Acquisition and/or operation initiation dates would be collected, along with the expected dates for major overhauls and/or replacements, based on consistently applied standards. Estimates of the costs associated with rehabilitation and replacement might also be included.

Care would have to be exercised to ensure that the data collected were not more detailed than was necessary to support national-scale planning and policy analysis. This could be ensured by using a sampling procedure similar in concept to that used by the HPMS, collecting the data on a periodic

TABLE 2 SUMMARY OF PROPOSED DATA ELEMENTS

Data Element and Classification	Reporting Interval (years)	MPOs Affected	Implementation Phase
Highway data			
Road miles			
By functional classification	2	All	1
By geographic area	2	All ^a	1
Lane miles of arterials during peak period	2	All	1
By functional classification of arterials			
By number of lanes			
By geographical area			
By 1-way or 2-way direction			
Miles of reversible lanes	2	All	1
Vehicle miles of travel			
By functional classification ^b	2	All	1
By geographic area	2	All ^a	1
By vehicle type	4	- ^c	2
Passenger occupancy	4	- ^c	2
By vehicle type			
By geographic area			
CBD cordon measurement	4	- ^d	2
Passenger occupancy			
Vehicle type			
Traffic volume and congestion ^e	4	- ^f	2
Public transit data			
Land area within 1/4 mile of weekday transit service (population within band will be determined when census data become available)			
By number of boardable vehicles per 24 hour period	4	All	1
By geographic area	4	All ^a	1
Transit user survey	4	- ^d	2
Number of linked passenger trips			
Average linked trip distance			
Average linked trip time			
Trip purpose			
Rider characteristics			
Age			
Sex			
Income			
Whether handicapped			
Automobile availability			
Limited transit user survey	4	- ^f	1
Unlinked passenger trips			
Unlinked passenger miles or average unlinked trip distance			
Average unlinked trip time			
Rider characteristics			
Age			
Sex			
Race			
Handicapped			
Selected data from transit operators (classified by mode)	2	All	1
Annual unlinked passenger trips			
Annual revenue passengers			
Annual vehicle miles			
Annual revenue vehicle miles			
Number of revenue vehicles			
Age distribution of revenue vehicles			
Average age of revenue vehicles			
Demographic data			
Population			
By geographic area	2	All ^a	1
Dwelling units			
By geographic area	2	All ^a	1
Employment	2	All ^a	1
By geographic area			
By CBD			
Passenger vehicle registrations	2	All	1
By county located in or containing urbanized area			
By vehicle type			
Land areas	2	All	1
By urbanized area			
By central city			
By central business district			
By federal-aid system boundaries			
Measurement of system performance			
Highway system: land area and dwelling units within travel time contours ^g			
From CBD	2	- ^f	1
From airport	4	- ^f	2
From major non-CBD employment center	4	- ^f	2
From major non-CBD shopping center	4	- ^f	2
Transit system: land area and dwelling units within travel time contours ^g			
From CBD	2	- ^f	1

^aAreas with populations between 50,000 and 200,000 report only for urbanized areas.

^bIn phase 1, functional classifications are combined into 3 groups: Interstate, freeways, and expressways; principal and minor arterials; and collectors and locals. In phase 2, only the first 2 groups are used; collectors and locals are excluded.

^cOnly areas with population of 200,000 or more; a systemwide sampling method will be used.

^dOnly areas with population of 750,000 or more.

^eUnder consideration by FHWA.

^fOnly areas with population of 200,000 or more.

^gOnly areas with population of 200,000 to 750,000.

^hAfter census figures become available, dwelling units and population within contours will be calculated on a 4-year cycle.

basis but not every year. The triennial reviews required by Section 9 of the Urban Mass Transportation Act might provide a good opportunity to keep such a national system condition data base current.

7. Although the HPMS provides a wealth of information for national planning and decision making, a number of recommendations should be considered for the future:

- Congestion measures should be included in the HPMS.

Some possible improvements being considered by FHWA include sampling individual urbanized areas rather than sampling them collectively statewide; adding data items, if necessary, to allow calculation and reporting of congestion indices; and reviewing sample adequacy to allow calculation of congestion indexes for subareas of metropolitan areas.

- Coding should be included within the HPMS to allow identification and reporting for subgeography, such as suburbs and core areas. This would allow identifying area types with problems, such as the current suburban congestion.

- Data should be obtained on an aggregate measure of local road needs, which are not now obtained in the HPMS. This reporting should be by some method other than segment sampling. While good data on the condition of the Interstate system are available from the HPMS, the data are weaker for primary and secondary highways and of limited use for local systems, mainly because of progressively weaker statistical sampling.

- Since the HPMS is based on statistical sampling of existing highways and roads and is designed to consider improvements to these, it does not deal with new roads on new alignments. New routes that have been constructed since sample selection should be included as quickly as possible. Consideration should be given to including descriptive information for future new routes when the facility is programmed.

- Encouragement should be given to urban boundary consistency between data sources. FHWA uses a federal-aid boundary definition in the HPMS, which may differ from those used by urban area planning agencies. Generally, boundaries should be larger than captured by the HPMS to include areas of growth such as those anticipated in 20-year forecasts.

8. Changes in highway finance data series should focus on improving the completeness and accuracy of information on local government capital outlay by functional system. Some states have not developed the capacity to report this information on a continuing basis, even though the data series was established 10 years ago. Improvements are needed to better serve the needs of the transportation community.

9. The NPTS is a valuable source of trend information and travel characteristics for all modes. However, the sampling rate has been decreasing over the years because of budgetary limitations, and the reporting of specific area characteristics has been restrained because of Census Bureau disclosure procedures. Much of this has been overcome by current plans to increase sample size through telephone interviews and the use of a private firm for collection. This collection effort, planned for 1990, should be funded and accomplished as planned.

10. The decennial census provides most of the demographic data used for national planning and decision making. Likewise, it provides the most complete information on commuting (the journey to work). Since effective national planning

relies heavily on available information from all areas of the nation, the current plan to produce the Census Transportation Planning Package (CTPP, formerly the UTPP) for all urbanized areas and states should be implemented.

11. Another area of data need is "felt" problems and trends with regard to the transportation system and service at the traveler level. This would relate to areas such as congestion, mobility, payoff of public expenditures, safety, costs versus benefits, and quality of life. This area of consumer attitude and perception is one that should be considered, because it is a major data gap on a national level.

12. Regarding data collected by individual states and urban areas, some attention needs to be directed toward making these more useful for national planning and decision making. Collections such as O-D surveys (internal and external), classification and count activities, and speed and delay surveys would be greatly enhanced for national planning purposes through some standardization, if only in the area of definition of terms (e.g., what is a trip) and stratifications used (e.g., modes and trip purposes) for some defined portion of each collection effort.

CONCLUSIONS/RECOMMENDATIONS

The purpose of this section is to present the key questions that should be considered in Phase 2 of this TRB project and beyond.

As described earlier in this paper, three data levels have been used in past national planning studies. At one level, broad policy issues are addressed with available data from existing sources, mostly in report form, with little new manipulation of the basic data sources and without analysis or modeling based on the original data sources. At another level, described for the 1974 DOT efforts, a new data reporting activity is defined and requested/required of the states and metropolitan areas. This effort results in considerable analytical and modeling-based activities. Depending on the detail requested, the costs can be quite high. A data collection and analysis function like that carried out in 1974 might cost in the range of \$10,000,000 today.

Current planning efforts have been based on available sources of information with some analysis and modeling. In some instances, the basic data files have been manipulated to provide required information. This approach is benefited today by the data bases that have been defined and collected on a regular basis, but originally designed for other purposes. These include, among others, the HPMS, Section 15, the NPTS, and the decennial census. Depending on the nature of future policy and planning efforts, any one or a combination of the above approaches may be appropriate.

In this paper, the focus has been on surface passenger data needs, available data sources, and data gaps. It will be left to others, and work in Phase 2, to further define the overall data approach.

A concern expressed by Francis Francois at the mid-year TRB Transportation Data and Information Systems Committee meeting should be stated here, even though it applies to all modes and market segments. Francois agrees that more effective ways to collect and analyze data and information must be found, but he warns that the challenge is to avoid information gridlock, being deluged with data and given high-

speed computers capable of whirling out more information than transportation professionals can digest and utilize. Hence, data gaps must be evaluated and filled only with data that can be efficiently and effectively used to fill important information needs.

Before the conclusions and recommendations specifically related to surface passenger data, a short summary is provided of comments and suggestions made at the mid-year conference that are appropriate for all transportation data.

First, consideration should be given to the establishment of a national data center for strategic planning and decision making. There is currently no central repository of data used for past national efforts—no corporate history. A considerable amount of data is now collected regularly, so there is something of a “national data base.” This base could be further enhanced by having the modal administrations work toward standardizing as much as possible with regard to geography, definition of terms, travel and performance measures, years collected, computer systems, adaption of uniform Geographic Information Systems (GISs), and data management systems. Data integration may well be achieved through GISs.

Second, this industry must learn to speak to the various receptors of transportation information in their language. Data should be collected, analyzed, and reported in terms understandable to the press, the public at large, government decision makers, and industry heads. A major focus should be on taxpayer/consumer interests. With regard to providing such information, it would be useful to develop and publish an annual state-of-the-system and service report across all modes and transportation markets.

Third, a renegotiation of data partnerships—who collects what data for whom—should be investigated. National planning should capitalize on all useful existing data sources, such as state and metropolitan area collections. Such data usefulness for national planning suffers from a lack of standardized definitions for items such as modes, purposes, and geography. Local efforts are not consistent. The question to be answered is, can local data be aggregated for national use? At the moment, the most useful data comes from specially designed collections (such as the HPMS and Section 15). As much as possible federal reporting should be an incidental by-product of local data, or at least be based on data useful at the state and local levels.

Finally, time series data are very important. The problem is that those responsible for data collection efforts often do not wish to change collection procedures, data items, and definitions because of the interest in trends. This must be somehow balanced against a need to develop more consistent information between collection efforts and data more in tune with current and foreseen issues.

Regarding surface passenger data and data gaps, the following is desired based on the investigations made for this paper:

- A data system is needed to measure and monitor congestion, system performance, and mobility across all modes.
- Data are required to measure and evaluate “felt” consumer/traveler problems and trends in terms of attitudes and perceptions.
- Information for all modes is required on longer trips (those over 100 mi) to provide for the study of new technologies and substitutions between modes.

- A data system for intercity rail and bus systems needs to be developed. The data collected by the carriers should be a prime point of investigation.

- For highways, the HPMS is the best data source. FHWA is currently considering improvements related to pavement data, traffic data, and urban boundary considerations. Other specific recommendations include obtaining data on new facilities or new alignments; inclusion of congestion measures; a level of geography improvements, such as identifying individual urbanized areas and subgeographies such as the suburbs; and gathering at least aggregate information on local roads.

- For public transit, Section 15 reporting has been the most useful source. This source does not cover rural areas. It provides good data on operations and financial aspects. Data should be considered relative to safety and security; obtaining a better handle on systems conditions; financial requirements related to rehabilitation and replacement; and fixed facilities, vehicles, and significant ancillary equipment.

- The NPTS should be conducted in 1990. It provides considerable trend information for all modes. Mechanisms should be continuously investigated for increasing sample size and the reporting of information for specific geographic areas (such as individual urbanized areas and portions of urbanized areas). Additionally, definitions of terms and geography should be evaluated to provide consistency with other data sources, such as the decennial census.

- With regard to the decennial census and the CTPP, it is recommended that the plan to consider a consolidated purchase of the 1990 package be implemented. Having this data on a national basis would be extremely useful. Likewise, the statewide package currently being considered should be implemented along with the traditional urban package.

APPENDIX A

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Unpublished Works

The talks at the TRB conference that provided input to this paper are listed below, along with any unpublished written material prepared by the presenters. Other unpublished materials are also listed. A considerable amount of material in this paper comes from these sources.

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APPENDIX B

Summary of Mid-year Meeting and Conference Workshop Sessions

The program for the mid-year meeting and conference of the TRB Transportation Data and Information Systems Committee held in October 1989 included three concurrent workshops. These workshops on urban, statewide, and national data and information system needs resulted in the development of a number of recommendations. The chairperson of each workshop summarized the findings, which have been compiled and edited as appropriate for this paper.

Urban Workshop Report by Alan Pisarski

Strategic Planning/Policy Issues

The urban workshop began with an assessment of current trends and issues in the urban planning process and their relationship to data requirements.

First, it was concluded that the pendulum is swinging back toward longer-range thinking, to supplement rather than replace the recent short-range focus of planning. The future emphasis will be on both factors, rather than on one or the other. Highway operations planning is an example of the short-term focus; land use planning is an example of the focus on the longer term. Second, the scale of activities is again balanced between broad regional efforts and highly localized troubleshooting activities. All of these trends will place extensive information burdens on the planning process.

Dramatic changes in the demographic, economic, and spatial character of metropolitan centers have challenged local planning capabilities. The lack of adequate financial resources and supporting programs to produce adequate data has retarded the effectiveness of metropolitan planning.

The prime issue is highway congestion, in both urban and suburban areas. Parts of the congestion concern include the relating of existing facilities and services to the new circumferential patterns of contemporary commuting. Although most critical in high-growth areas, congestion effects are being felt in all parts of the nation. The adequacy of current planning tools and data to forecast and assess prospective demand and evaluate alternative responses is in serious question.

Beyond congestion issues are those issues relating to obtaining greater capacity and efficiency in the use of existing facilities, including operational and management improvements for highways and transit. The ability to evaluate the effectiveness and consequences of various supply-and-demand

“management” schemes is a critical need for the current planning process. The growing issue of non-work-related travel and congestion emphasizes the need for comprehensive planning rather than simply commuter-related planning.

A final set of issues relates to the linkage of transportation to overall land use concerns, access to low-cost housing, and the problems of dealing with rapid growth.

Conclusions/Recommendations

- The mandated requirement for a continuing process of monitoring and reporting transportation trends in urban areas that was rescinded in 1983 needs to be reconsidered. The utility of such a process is agreed to by all, but it is not clear that federal mandates must be the answer to achieving it.

- The program to produce the special journey-to-work package—the CTPP—is the single highest priority for meeting urban data requirements and should be fully supported by local governments, MPOs, states, and federal agencies.

- UMTA and FHWA should undertake programs that encourage and support collateral data collection activities in the 1990s to complement the decennial census data collection effort. These collateral activities should include surveying of nonwork trips, urban freight data needs, and external travel, particularly in small metropolitan areas.

- Consideration should be given to a continuing performance measurement process for metropolitan areas. The data set developed in a study of performance measurement needs in 1976 should form the basis for such a reevaluation. An NCHRP synthesis of effective practice in this area is warranted.

- A national congestion monitoring data set providing public information on traffic trends in major U.S. cities was identified as a needed and useful undertaking to inform national policy makers and support comparative analyses in individual metropolitan areas.

- A condition and performance monitoring capability for transit, akin to the HPMS on highways, is needed, particularly to gain knowledge of capital reconstruction needs for fixed transit facilities. A parallel highway program related to UMTA Section 15 reporting would be desirable.

Statewide Workshop Report by Michael Meyer

Strategic Planning/Policy Issues

- Facility maintenance, rehabilitation, condition, and performance;
 - Intermodalism;
 - Safety;
 - Congestion;
 - Mobility planning (need good definition);
 - Payoffs of investment in terms of equity, economic development, and environmental impacts;
 - Non-federal-aid system;
 - Trucking/commercial travel;
 - Noncapital strategies;
 - Corridor preservation;
 - Road pricing; and
 - Fund apportionment.

Gaps in the Data

- Trucking;
 - New roads on new alignments;
 - Transit data;
 - Access to intermodal facilities such as airports and ports;
 - Performance measures;
 - Before-and-after data to measure results of improvements;
 - Nonwork, non-home-based work trips;
 - Cost/benefit information;
 - Traveler attitudes; and
 - Usefulness of GIS technology.

Conclusions/Recommendations

- There needs to be greater coordination between data bases that state DOTs use, such as pavement management systems and the HPMS. FHWA should take the lead in fostering coordination and implementation of standards in terminology.

- GIS technology should facilitate the above coordination. Steps need to be taken to disseminate information on availability and uses of GISs with emphasis on keeping it simple to foster quicker implementation.

- Further research and implementation of the results of collection of data on trucks, such as automated vehicle detection and crescent study procedures, are needed.

- Data are needed for evaluating intermodal concepts, such as substitution of high-speed rail for air in trips under 400 mi, better access between highways and ports, and cost allocation between modes.

- User benefits are important measures. What do they mean to other parts of society and the economy, such as economic development and the environment?

- An authoritative review should be made of the relationship between transportation investment and economic development, productivity, and competitiveness, along with a determination of the data required.

- Performance/level-of-service data are required. The HPMS should be modified to include such a measure, if possible.

- Sufficient data on rural and nonurban areas have already been collected. Complete data bases across each state are needed to allow consistency in planning between urban and rural areas.

- A strategy should be established for collecting state transit facility condition data.

- At least 2 percent of all federal transportation aid to metropolitan areas and states should go to transportation planning and research, with data collection, data management, and analysis a major part of a transportation research and planning effort.

- Consistency is needed in aviation data and analysis to relate national airspace planning to physical plans at airports.

- Better information on fuel consumption and evasion of taxes is needed, as this is important for use in the allocation of funds.

- The 1990 census should be used to see how the models and forecasts might be improved.

- To avoid information gridlock, a review of data collection management strategies should be made. The TRB Transportation Data and Information Systems Committee should do a prototypical study of what a good data management system should be.

Recommendations for National Data by Gary Maring

This workshop considered five markets: urban/suburban, rural, intercity passenger, intercity freight, and international.

Strategic Planning/Policy Issues

- Urban/suburban
 - congestion,
 - System management,
 - Infrastructure rehabilitation/expansion,
 - Land use/transportation integration, and
 - Funding flexibility.
- Rural
 - Infrastructure preservation,
 - Local rural road needs,
 - Rail branch line abandonment, and
 - Rural mobility problems.
- Intercity passenger
 - Airport/airway congestion,
 - Major highway corridor congestion,
 - New intercity air/rail technology, and
 - Funding flexibility.
- Intercity freight
 - Truck size and weight,
 - User fee equity,
 - Economic deregulation,
 - Tax/registration uniformity, and
 - Safety/hazardous materials.
- International
 - Competitiveness,
 - Port connections, and
 - Container standards and weights.

Gaps in the Data

- Urban/suburban
 - Consistency in urban boundary definition,
 - Measurement of congestion, and
 - Geographic specificity.
- Rural
 - Rural public transportation and
 - Local road needs.
- Intercity passenger—lack of national travel survey for long trips.
 - Intercity freight
 - Commodity transportation survey,
 - Intermodal movements, and
 - Air cargo.
 - International—domestic leg of foreign commerce.

Conclusions/Recommendations

- Urban
 - Consistency between data bases should be encouraged for urban boundaries of metropolitan areas. FHWA uses a Federal aid boundary definition, which may be different from those used by urban area studies. The urban boundary

should be larger than that captured in the HPMS. The boundaries should be extended to include areas of growth (20-year forecasts).

—Uniform measures of congestion should be developed. One recommendation would be lane miles at some level of service (e.g., LOS D). Data items should be included in the HPMS, if they are not now included, to calculate congestion.

—The HPMS should include some coding to allow identification of subarea geography, such as the suburbs. This would allow identifying area types with problems, such as the current suburban congestion.

—Develop means within the HPMS for measuring trip length to aid in activities such as functional classification and determining systems of national significance. More than volume is required. A measure such as trip length is probably necessary.

—The Section 15 data base should be expanded to provide condition data on fixed plants.

● Rural

—Data not obtained in the HPMS are needed on an aggregate measure of local road needs. These data should be gathered by some method other than segment sampling.

—For short-line railroads, some measure of the abandonment impact on local roads and the agricultural economy is required. Financial and flow data would be desirable.

● Intercity Passenger

—There is a lack of data on longer trips. The National Travel Survey used to capture long trips on all modes. This is especially important when considering new technology and proposals for activities such as substitution of high-speed rail for intermediate length trips (100 to 400 mi), tilt engine vertical take-off aircraft, etc. There is a need to collect information on longer trips by all modes.

—There is a need for information on intercity buses and rural bus service, including financial and flow data.

● Intercity Freight

—There is a lack of commodity O-D data. The last Commodity Transportation Survey was done in 1977. The impact of changes since then due to deregulation and changes in sizes and weights is not clear. Better data across modes are required.

—There is a need for better truck safety data by truck configuration and a way to relate accident data to exposure data.

● International

—Better data and analysis on international flows should be obtained. Data are collected, but they are not well reported and compiled. For example, the impact of containers on the road system must be measured.

● Other

—Relative to all modes and markets, the GIS concept provides the mechanism to coordinate data bases on a common basis, especially as related to networks and flows.

—There should be a reevaluation of partnerships in data collection at three levels:

1. Between federal agencies: Agriculture, DOT, Energy, Census, etc.;
2. Between federal, state, and local agencies; and
3. In government: Private relative to deregulation, privatization, etc.