334

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Transportation Trends and Current Research Activities

A Summary of TRB's Field Visit Program

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TABLE OF CONTENTS

INTRODUCTION

Each year, TRB staff members visit every state highway and transportation department, many universities, transit and other modal agencies, and industry. The objectives of the field visit program are (a) to learn of problems facing the visited organization and to pass on information pertinent to the solution of these problems (information that is based on research or the experiences of other states, industry, or educational institutions); (b) to learn of research activities in progress or contemplated in order to inform the visited organization of similar research being carried out elsewhere, thus preventing duplication of effort; and (c) to identify new methods and procedures that might have application elsewhere.

These annual visits provide the opportunity to collect and share transportation research information through direct personal interaction of TRB staff and the individuals visited. Although other forms of information transfer exist, e.g., publications and automated services, the visit program offers the unique advantage of one-on-one discussions to fully explore areas of mutual interest. Personal visits can also identify innovative or experimental work that will not be published for wide dissemination, but nevertheless is worth bringing to the attention of others.

Another benefit from the program is the opportunity to describe TRB's range of services to new people in the transportation agencies that support the Board. The visits also serve to identify potential candidates for TRB standing committees, NCHRP panels, and special project committees.

As in any activity that has been continuing for many years -- 43 to be exact -- the field visit program is periodically reviewed to assess how well it serves the needs of TRB's sponsors. Such a review is planned for late 1988, and input from all sources would be welcomed. Please send any comments you would like to offer to the Director, Technical Activities Division.

In FY'88 a special effort was initiated to contact various transportation user groups as part of the field visit program. The program review, mentioned above, will address in some detail the types of agencies visited and the relative benefits.

A summary of transportation trends and research activities identified during the FY '88 field visits is provided in the following pages. Eleven TRB staff members conducted these visits reaching hundreds of transportation professionals in all modes and subject areas. Requests for additional information should be directed to the appropriate staff member identified on page 2.

PLANNING AND ADMINISTRATION

Planning

Significant changes are taking place in state and urban planning activities. Current emphasis is on short-range problem solving and decision making; however, a notable exception is that an increasing number of states are updating long-range comprehensive highway plans. This trend is expected to continue as states assume increasing responsibilities for funding highway programs.

Multi-modal transportation planning continues to be emphasized in many states, as does the treatment of planning as an integral part of the overall management and decision-making process. The linking of planning, management, programming, financial planning, and project planning is being stressed. Interest is increasing in the development of public/private partnerships for financial support for transportation, as well as in gaining a better understanding of the complex relationships between transportation and economic development.

Demographic changes are affecting transport needs and requirements, particularly in the South and West. In one western region, the increased use of toll roads is being considered in order to alleviate congestion. Short-term needs are also being emphasized in many regions of the West in an effort to satisfy air quality standards. Stricter regulations are requiring state and local governments to develop alternative strategies to reduce vehicle miles of travel. Increasing attention is being given to such alternatives as flex-time and ridesharing.

The Consensus Transportation Program is receiving much attention from state and local governments. Various AASHTO standing committees have been active in the data-gathering phase, which is nearing completion. Sixty-three public hearings have been held in all the States under the auspices of the Program's Highway Policy Advisory Committee; the Highway Users Federation conducted the hearings. TRB's Futures Conference is scheduled for June 22-24 in Washington, DC, and 500 participants are expected. The Highway Users Federation has scheduled its Transportation Futures Conference for September 18-20, also in Washington, DC. The Transportation Alternatives Group (advisory group of key public and private sector organizations) has started the process of preparing alternatives (roles, responsibilities, financing alternatives, etc.) and will conduct a national forum later this year.

Finance

The past year has seen a continuing shift of financial responsibility from the federal government to the state and local governments. While federal highway obligation ceilings were reduced from $12.4 billion to $11.8 billion, motor fuel taxes in the states produced $14.1 billion and motor vehicle license taxes produced $7.7 billion, an annual increase of about 7%.

Fourteen states increased their motor fuel taxes in 1987 and four have increased them so far in 1988; increases generally ranged from 2¢ to 6¢ per gallon. Most legislatures are willing to consider 5¢ to 6¢ per gallon increases, either in a single year or staged over several years. Thirty-two states have fuel taxes over 14¢ per gallon, and nine of these states have taxes of 18 to 21¢ per gallon.

Many state legislatures are concerned about the formulas and criteria used for allocating road-user funds among the states, counties, urban areas, and the state's geographic regions. Unable to meet the traffic demands in urban areas, state legislatures are permitting local option sales taxes and excise taxes on motor fuels for local transportation purposes. They are also permitting the use of impact fees and special benefits taxes at local levels to provide transportation facilities needed to serve rapid suburban land development.

At the federal level, several new pieces of legislation and court decisions are affecting transportation. The anti-fuel-tax-evasion provision, enacted under the reconciliation bill, has shifted the point of diesel fuel taxation from the retail to the wholesale level. As a result, state and local governments have to apply for exemptions from payment of excise taxes on diesel fuels. Under the Tax Reform Act of 1986, gasoline tax collection was also moved from the point of sale to the wholesale level. However, states may continue to purchase gasoline at a tax-excluded price, and the vendor is responsible for obtaining the refund on taxes paid. Several states are also considering measures to curtail state fuel tax evasion.

The Federal Highway Trust Fund balance remains at $9 to $10 billion, partly because of its effect in calculating the federal deficit. In addition, several bills were proposed, but not passed, that would have added 10¢ to 30¢ per gallon to motor fuel taxes or $25 to $30 per barrel of crude oil to aid in deficit reduction.

The U.S. Supreme Court struck down retaliatory, discriminatory state taxes on non-domestic trucks. A sticker tax and an axle tax in one state were ruled unconstitutional. Eighteen states had enacted weight, distance, and axle retaliatory taxes meant to coerce other states' tax policies. State courts are overturning such laws.

The Tax Reform Act of 1986 also reduced the tax exemption on bonds issued by state and local governments. Private activity bonds issued by governments are no longer tax exempt, but government use bonds for highways continue to be exempt. Airports, public docks and wharves, and mass transit bonds are generally considered tax exempt, but the ability to arbitrage bond proceeds is restricted.

Manpower and Management

The "graying" of state transportation agencies continues, and in some states 30 to 40 percent of the professional engineering staff are eligible to retire. States have not reported difficulty in hiring new entry-level engineers, but there have been problems in retaining them after their training has been completed. The private sector is willing to pay higher salaries and promote more rapidly.

There is a growing concern regarding the career path of moving engineers into management roles. Top positions in a number of states have been declassified from civil service, and management rather than engineering professionals are being recruited.

Most states anticipate that only ten percent of their resources will be spent on new roads on new rights-of-way. The orientation is now toward upgrading and maintaining existing transportation facilities and, as a result, a major human resources problem will be to maintain high motivation and productivity of personnel. Many states are placing greater emphasis on engineers obtaining professional engineer certification.

In spite of productivity increases through the use of computer-aided-design systems, states have not been able to keep pace with their engineering needs and have increasingly relied on outside consultants. Productivity is being improved in many operating field districts through the use of lap-top computers and procedural improvements.

While there are differences in management practices among the states, there is a general pattern of the Departments of Transportation becoming more knowledgeable in dealing with the legislatures and with the public. NCHRP Project 20-24, "Research Program Design - Administration of Highway and Transportation Agencies," is currently underway and has the ultimate objective of providing useful tools to top-level management in carrying out their responsibilities.

ENVIRONMENT

Air quality in urban areas and the transportation and cleanup of hazardous materials continue to be major environmental problems. The Environmental Protection Agency estimates that 70 urban areas in 42 states did not meet the air quality standards by the December 31, 1987 deadline. In spite of much improved motor vehicle fuel efficiency, the increase in vehicle miles of travel in urban areas has prevented reaching air quality goals. In view of the lack of attainment of standards, the deadline was rolled back by Congress and sanctions including withholding of federal-aid highway funds were not imposed.

To avoid future sanctions states will have to improve vehicle inspection programs and traffic control plans, encourage high-occupancy vehicle programs and, in several areas, use "oxygenated fuels" containing methyl tertiary butyl ether. For example, one city plans to start using oxygenated fuels. As a result of the 6¢ per gallon gasohol fuel tax exemption, there will be a federal gas tax loss of $90 million from this single city. It is estimated that the federal gasohol exemption currently reduces revenues to the Highway Trust Fund by $450 million per year. Major increased use of gasohol without a repeal of the 6¢ federal fuel tax exemption could reduce the Highway Trust Fund by billions of dollars each year.

There is a continuing need for better coordination among agencies that respond to hazardous material spills. Of special concern is the training and coordination of highway and law enforcement personnel who are the initial responders at accident sites.

There are 1.5 million underground storage tanks in the U.S. Gasoline stations and industrial sites storing petroleum and chemical products are frequently acquired in highway improvement projects. As highways in developed areas are reconstructed and widened, protection of water supplies from underground storage tank leaks is becoming an increasingly significant problem in right-of-way acquisition.

Aircraft noise is of continuing concern to residents near major airports. While the new generation of engines is quieter, the total number of take-offs and landings has increased sharply. Similar conditions exist for auto and truck transportation; any technical improvements in the noise characteristics of the vehicle are mostly offset by the increased amount of travel. Much attention is placed on noise barriers, and requests for new installations along freeways are growing rapidly.

DESIGN

Personnel in a number of state design sections would benefit from the greater exchange of information with their counterparts in neighboring and other states. Use of AASHTO's electronic bulletin board has reached a plateau of about two items per week, which seems low compared to its potential. A directory listing state personnel by counterpart groupings should be helpful for generating more state-to-state contacts.

Maintenance departments in some states consider improved designs for bridges and pavements to offer a partial solution to rising maintenance expenditures. Better designs may be achieved by greater utilization of frequency and cost-of-repair information in the design process. In urban areas there is a need to incorporate the cost of traffic delays (and public frustration) caused by frequent repairs into design considerations.

Use of CADD is reducing the need for consultant services in the design of both new and rehabilitated bridges.

The February 8, 1988 FHWA rule-making on "Accommodations of Utilities; Longitudinal Utility Use of Freeway Right-of-Way", which allows the individual states to decide when to permit utilities on highway rights-of-way, is generating requests from some states for information on other states' practices. A TRB publication, "Longitudinal Occupancy of Freeways by Utilities", 20-7/11 , July 1978, has good general information but only a paragraph on fiber-optic cables--the utility for which highway right-of-way is most often requested. A new TRB synthesis may be desirable.

MATERIALS AND CONSTRUCTION

Rutting of asphalt pavements continues to be a major concern for many states. Present research thinking for solving this problem tends toward large aggregates and away from dense graded mixes. NCHRP Project 9-6(1), "Asphalt Aggregate Mixture Analysis System", should contribute to the solution of this problem. There is continued interest in asphalt-rubber and more states are experimenting with fiber-reinforced asphalt mixes.

Much is being done, and reported, on durability of high-strength concrete mixes containing high-range water reducers and silica fume. Properly designed, prepared, placed, and cured mixes are exhibiting good durability.

Efforts to produce "Fast Track" concrete pavements that can be placed back in service within eight hours are still underway.

There is a continuing shortage of highway construction professionals and technicians in most states. This leads to more contracting for engineering services including construction management, inspection, and materials testing. Activity is increasing among both states and contractors in certification of technicians. The AASHTO Materials Reference Laboratory will begin its program of laboratory accreditation this summer. This service will be extremely important for those who must contract for material testing and for the laboratories that will do the testing.

TRB will be conducting a pooled-funds project for FHWA to define a research and development program in highway construction engineering management. There is also a TRB Task Force on Innovative Contracting Practices looking at possible changes to improve construction contracting.

SOILS, GEOLOGY AND FOUNDATIONS

An average of 8,000 pounds of crushed stone per person per year is required by the U.S. construction industry. About 50% of the crushed aggregate is used in portland cement concrete and asphalt cement. Another 30% is used for road surfaces and bases. The remaining 20% is used in other products. Research is being conducted in many states on use of crushed stone in asphalt mix and portland cement concrete, aggregate durability, reactive aggregates, mechanical stabilization of subgrades, and resilient modules and mechanistic design.

Most states are looking into the potential of using waste products as highway construction materials. Fly ash and bottom ash from coal-burning power plants appear to be the most common waste products being considered for both suitability and cost-effectiveness. Identification of heavy metals and other environmental pollutants in the waste products is also being considered.

In the area of soil stabilization, the general trend is towards the use of lime, fly ash, portland cement, or a combination of these admixtures. Jet grouting, chemical compaction, and dynamic compaction are some of the techniques used or being tried for ground improvements.

Use of engineering fabrics and soil reinforcement are becoming more common practices in the U.S. for the construction of embankments, retaining walls, and highway side slopes. Laboratory and large scale testing of geosynthetics has become more common, and efforts to develop specifications for engineering fabrics are underway in some states. Other uses of geosynthetics include silt fences and reinforcement of pavement layers. An NCHRP project is looking at the potential benefits of geosynthetics in flexible pavements.

Many states are giving increased attention to design of structure foundations. This interest is also reflected in some NCHRP research. One

project is related to piles installed with vibratory drivers, and other projects are investigating load factor design criteria for highway structure foundations and specifications for the design of foundations, retaining walls, and substructures.

Effects of moisture on soil properties continues to be a major concern. Changes in soil properties related to freeze-thaw conditions are being addressed to minimize the detrimental effects on the pavements. There is a growing interest in developing techniques for in situ determination of properties of soils.

TRAFFIC OPERATIONS AND SAFETY

Traffic Operations

Urban traffic congestion is a highly visible national concern, as evidenced by AASHTO's 2020 Consensus Program and TRB's Future's Conference scheduled in June 1988. The Institute of Transportation Engineers' (ITE) conferences dealing with suburban congestion issues are drawing large audiences.

While all state departments of transportation have clear interests in building and maintaining systems, attention given to system operations seems to have a wide range. To some degree, this may reflect traditional separations of responsibility, e.g., states with a large urban constituency probably have greater involvement with operational matters. It very likely reflects economic conditions; the level of traffic engineering activity is higher in growing "Sunbelt" states than in so-called "Rustbelt" states. One northeastern state, which has only a few traffic engineers among its many municipalities, downgraded the level of its own traffic engineering unit some years ago. On the other hand, this year's traffic-oriented graduates at Berkeley are receiving salary offers of up to $31,000/year.

All states have common interests in materials and their usage in signing, striping, and signal controls. The use of raised pavement markers to improve wet night visibility seems to be increasing. But the preferences for water-based paint versus other bases, usage of thermoplastic markings in place of paint, use of high-intensity versus engineer-grade sheeting, or use of lighting versus no lighting vary considerably between agencies.

One emerging trend is the increased use of CADD systems for traffic engineering design and sign inventories in some states. Another is the use of "urban interchanges" (a revised form of diamond interchange) and studies of their effectiveness.

The circumstances of universities in both traffic engineering education and research are mixed. In general, there is a shortage of students (according to ITE and faculty reports), the quality of students is down, and the mix is frequently more than 50 percent foreign at the graduate level. There are not enough research dollars to support a reasonable level of graduate assistants according to some institutions. At the same time, many universities with transportation activities have successful Rural Technical Assistance Programs (RTAP) of technology transfer that are reaching small towns and counties.

State interest is increasing in research and development of in-vehicle guidance systems and for their extension into other forms of advanced technology applications. Private sector concerns about the Prometheus and AMTICS programs in Europe and Japan have produced a growing national awareness of the need for greater U.S. participation in this area. TRB has been focussing (through Annual Meeting sessions, committee activities, an NCHRP project, and an in-house review) on appropriate activities for the Board to pursue related to the application of advanced technologies to highway operations.

Traffic Safety

States and national safety research organizations are closely monitoring recent law changes related to increased speed limits, alcohol-impaired driving, and occupant restraint use.

A concern of many state officials is the change in federal compliance requirements for speed limits. Recent legislation permits states to raise the speed limit to 65 mph on certain highways; however, compliance requirements for roads posted at 55 mph remain in effect while no similar requirements exist for roads posted at 65 mph. In hearings before the House Public Works Committee's surface transportation subcommittee, testimony was presented showing that deaths on rural Interstate highways, now posted at 65 mph, have risen 18 to 22 percent. However, in some states there has also been an increase in vehicle miles driven on these roads. State officials are urging standards for compliance with the higher speed limits which have been enacted. There is also state interest in modifying the compliance formula.

On the issue of alcohol-impaired driving, legislative activity at the state level remains high. Over the past five years, the proportion of drivers involved in fatal crashes who were intoxicated decreased among all age groups. The most significant drop continued to be in the 16 to 19 year old age group. All states have adopted legislation to raise the minimum age for alcohol consumption to 21.

A report, issued by the Insurance Institute for Highway Safety (IIHS), provides a systematic look at the relationship between specific legislative solutions to the drinking driver problem and reduced fatalities. A positive payoff was identified for three types of alcohol-related driving laws: (1) per se laws that define driving under the influence using blood alcohol concentration (BAC) thresholds; (2) laws that require administrative suspension or revocation at the time of failing a chemical test, or refusing to take it; and (3) laws that mandate jail or community service for a first conviction to driving under the influence.

Administrative license suspension laws produced the largest fatality reduction, according to the IIHS study. As of January 1988, 45 states had BAC per se laws, but in only 23 states can a driver's license be administratively suspended when a driver is charged with a drinking and driving conviction. The remaining states still require a conviction before a driver's license can be taken.

From all indications, state motor vehicle occupant restraint laws are continuing to receive public and legislative support. At the same time, 24

states have statutes with limited enforcement potential. These states have "secondary enforcement" provisions which limit the circumstances under which motorists can be penalized for failing to obey the laws. Under secondary provisions, a motorist must be observed violating some other traffic law before he or she can be cited for failure to use a safety belt. In states with a "primary enforcement" provision, a motorist may be issued a citation whenever a motorist is seen not wearing a safety belt.

Increasing state activity is evident in a number of other safety-related areas. Many state officials recognize that the lack of complete and sound truck accident data handicaps efforts to develop countermeasure programs aimed at the truck safety problem. TRB is conducting studies on data needs which should provide guidance to the states. Some state police officials estimate that as many as one-third of the trucks in operation on the highway today cannot pass brake inspections. Development of the classified commercial driver license continues as states develop implementation plans. Motor vehicle administrators are also expressing increased interest and concern over the problems associated with the elderly driver. There appears to be a growing awareness of the need to cope with the problem of the elderly driver through education, and perhaps restrictive licenses when driving records warrant, in order to preserve the mobility of older drivers. A TRB study, soon to be completed, is expected to provide the states with recommendations in this area.

MAINTENANCE

Quality assurance, standard setting, worker protection, pavement maintenance, tort liability, and new equipment are receiving considerable attention. Congress requested the National Research Council to investigate the appropriateness of establishing federal standards for maintenance of federal-aid roads; however, the study was not funded this year. SHRP contracts were awarded during the year and represent the largest single year funding for maintenance related research.

Several research studies are underway relating to sign retroreflectivity standards. One state engineer with a new statewide sign inventory estimates that improved signing saves over six million dollars per year in tort liability claims.

There is a need to develop standards for emergency nighttime work, and a pilot study has been initiated to study the feasibility of night maintenance. Other efforts to improve workers' safety cover the reduction of exposure to traffic, public relation efforts, crash absorption devices, better signs, and improved vehicle lighting. To reduce maintenance worker accident exposure, the use of robots is being studied. At least two states have implemented "Give Them a Break" programs directed to the driving public. One state is working on specifications for "shadow" trucks, and truck-mounted crash cushions are in common use--one state has more than 500. Dummy radar transmitters are being used in a demonstration of the effect of such passive transmitters on traffic speed.

New asphalt binders and concrete additives are providing better paving materials. Asphalt additives from fibres to polymers are under test, although binder costs may increase as much as 25%. Use of polymers in binders for seal

coats seems to be showing good results. Experimental devices are available to restore load transfer across joints in portland cement concrete. Geotextiles and special edge drains that can be installed in narrow trenches along the edge of pavements are showing promise.

Tort liability suits are costly, and priority is being directed to the identification of high risk conditions throughout all operations. One state has established new "risk management engineer" positions.

New types of techniques and equipment include (1) hydrodemolition for removal of deteriorated concrete on road and bridges, introduced in Italy in 1980; (2) self-contained patching trucks; (3) improved self-propelled chip spreaders; and (4) advanced asphalt distributors.

Position locating devices provide a significantly increased capability for data acquisition and analysis. Global positioning systems, commonly used for setting survey ground control, are now available to establish positions at normal driving speeds. One state plans to utilize a kinematic differential global positioning system to establish the position of mile markers. An Etak system was placed in four vehicles--this system is used with a base map and a base station to enable minute-by-minute reports on the location of emergency vehicles. In addition, non-destructive data acquisition devices such as ground penetrating radar, infrared sensing, sonic devices, and videologging are improving the quality of information available to maintenance planners.

Interest continues in calcium magnesium acetate (CMA) as an alternate to sodium chloride as a pavement deicer. Legislatures in two states have directed their transportation departments to conduct experiments with farm-based CMA. However, to date the only commercial supply of CMA is based on use of acedic acid derived from crude oil or natural gas. One state DOT proposes use of pelletized CMA and CMA-coated sand on a new bridge.

Disposal of lead based paint, sandblasted from existing bridges, is posing problems in some states because the lead causes the sand to be classed as a hazardous material. Some sandblasting operations can produce between 300 and 500 tons of sand per day.

TRANSIT, AVIATION, RAIL, AND WATER TRANSPORT

Transit

Transit funding constraints, especially at the federal level, continue to be the major difficulty facing transit managers. Emphasis is now being placed on improved internal management through performance monitoring of transit operations. Service is monitored by productivity indicators such as vehicle miles per employee, passenger and employee accidents per 100,000 vehicle miles, on-time performance, and miles between road calls. Staffing ratios, such as administrative staff per operating employee and number of vehicles per mechanic, are also used. Fiscal indicators include operating cost per passenger, subsidy per passenger, and operating ratio.

While there is a general perception that public transportation is primarily an urban and Northeast issue, it is becoming increasingly more apparent that

transit is a critical element of any region's economic vitality. A number of efforts are underway at local and state levels to demonstrate the interdependence of public transit and the economic health of a region. Some research is underway, public awareness programs have been initiated, and relationships between transit officials and the business community are being arranged to promote more cooperative efforts.

Last year, TRB published the results of a year-long study of the nation's public transportation research program. The need for this study grew out of a concern that research funding had decreased sharply in recent years. The federal government, who has been the major and almost sole provider of funding support for transit research, has reduced spending from a high of $90 million in 1981 to around $13 million this year. This dramatic funding reduction has generated considerable concern that insufficient effort is being expended for solving problems that confront the local transit operator. The transit industry reacted favorably to the proposal in the TRB report to establish a $10 million per year, operator-oriented, problem-solving research program to be funded from a required set-aside by local operators of 1/2% of their federal formula grant funds. The American Public Transit Association has assumed the leadership for broadening industry support for such a research program, selecting an appropriate organizational structure for program administration, and for seeking the required legislation.

Aviation

Among state aviation agencies the chief concerns are preservation of essential air service to small communities, upkeep of general aviation airports, and protecting small airports from encroaching and incompatible urban development. Funding for aviation at the state level remains low and generally inadequate for the needs of local development and general aviation interests. Typically, resources are directed to maintenance of existing facilities, with little--if any--available to support aviation-related R&D by state agencies.

In late 1987 Congress passed a three-year extension of the Airport and Airway Improvement Act, authorizing a general increase in funding levels of about 40 percent above the average for 1982-1987. Despite this increased funding, the high remaining balance in the Airport and Airway Trust Fund and the adequacy of proposed outlays for modernization of the air traffic control system and airport expansion remain contentious issues. There is also concern in the aviation industry about the lagging schedule of implementing air traffic control system improvements and the lack of a vigorous national program to increase airport capacity.

During the year, public complaint about air travel delay, airport congestion, and service quality intensified, prompting the U.S. Department of Transportation to press airlines for revision of their scheduling practices and to institute a system for reporting flight delays and cancellations. Public concern about safety also mounted in the wake of two major crashes, sharp increase in reports of near misses, fines for maintenance violations levied on several airlines by the Federal Aviation Administration, and--most recently--announcement of a comprehensive safety inspection of aircraft.

Numerous legal and administrative remedies have been proposed, including closer government supervision of airline scheduling, wider reporting of service quality indicators, greater restraint of airline mergers and competitive practices, hiring more controllers to cope with increased air traffic, more rigorous enforcement of safety regulations, and reorganization of FAA as an independent agency.

Passenger enplanements continued to grow, reaching 469 million in 1987 (an increase of 9% over 1986). Operating profit and net profit for airlines, as a whole, rose even more steeply to $2.75 billion and $0.75 billion, respectively; but the picture for individual carriers was mixed. Five major airlines showed net profits of $100 million or more, two were marginally profitable, and four posted net losses as high as $500 million. The trend toward consolidation in the industry slowed from the pace of 1985-1986, even though the one major merger that did occur in 1987 was one of the largest in airline history. The effects of industry consolidation are most clearly seen in market share; the eight largest airlines now control about 92 percent of passenger traffic.

Regional airlines had a prosperous year, even though the number of firms declined overall. Of those that remain, an increasing percentage are subsidiaries or affiliates of major airlines. The number of independent regional airlines is at an all-time low.

Industry experts at the TRB Future of Aviation Conference held in October 1987 and at the 1988 Annual Meeting focused attention on the continuing efforts of the industry to adjust to deregulation. They also emphasized that expected growth in air travel over the remainder of the century will place severe strain on the air traffic control system and on airports where capacity is already insufficient. The dominance of major airlines makes it difficult for small airlines and regional carriers that are not affiliated with major carriers to gain access to airport facilities and services. General aviation interests are similarly affected and find it even more difficult to use major airports.

Aircraft sales remained robust in 1987, particularly exports which climbed to $24.7 billion due in part to the declining value of the dollar against foreign currencies. Domestic sales were also strong and are expected to remain so in the coming decade, during which U.S. carriers face investments of as much as $60 billion to modernize their aging fleets.

Sales of general aviation and corporate aircraft and helicopters remain depressed and are not expected to rally in the near term. The availability of used aircraft and the high price of new aircraft are the biggest obstacles to sales. Increased attention is being directed to advanced tilt-rotor aircraft that combine the performance advantages of helicopters and conventional turboprop aircraft. Provided some technical and landing-site problems can be overcome, tilt-rotor aircraft offer attractive prospects for short-haul service into and out of metropolitan areas where noise or space restrictions now prevent feeder-distributor operations.

Rail

Restructuring of the rail industry continues, requiring public sector responses in many instances where loss of service, or at least loss of

competitive service, threatens the existence of rail users and may preclude economic development.

Federal funds provided through the Local Rail Service Assistance Program for state rail planning and programs have been dwindling in recent years. The future of this program is uncertain because its authorization terminates September 30, 1988. This year most states received only planning funds, with a few states receiving earmarked project funds. As a result, approximately half the states have developed their own programs to preserve essential rail freight services. Most of the state programs provide funds for branch line rehabilitation projects, many fund rail line acquisitions, a few fund intermodal facilities, and several provide operating subsidies. Many states, however, lack a predictable funding base to continue their rail programs from year to year.

The dramatic growth in privately-financed regional railroads has come to an abrupt end as a result of a recent court decision that gives labor unions the right to participate in negotiations of sales of railroads and branch lines where the purchaser does not intend to employ all existing workers. Regional railroads were formed through sales of secondary routes by Class I railroads to smaller, lower-cost operators saving many lines from eventual abandonment. The success of these sales was based on the ICC's approval without the imposition of labor protection requirements. The court decision will be appealed to the Supreme Court. In the meantime, rail labor has begun negotiations with one Class I carrier on a proposed compromise procedure that may allow some line sales to go forward.

State rail officials are opposed to re-regulation of the rail industry. The improved financial health of the industry since 1980 is credited largely to innovative marketing of rail and intermodal services and has resulted in better track conditions and more responsive service. Improved transportation and logistical services are provided through the growing use of intermodal connections, both with carriers in other modes (rail, truck, and water) and through direct ownership of different modal carriers in a single company. Intermodal traffic is the railroad's most rapidly growing sector, but profits have not kept up because of competitive pressures on rates. Improved productivity from new intermodal technology such as stack trains and carless or unibody trains (e.g., RoadRailers) are improving profit margins, particularly where special labor operating contracts have been negotiated.

The rail industry faces national labor contract negotiations this year, and some innovative approaches have been proposed to bring crew requirements in line with new equipment and operating procedures.

The development of high-speed rail passenger systems is of interest to a number of states. Florida is currently reviewing proposals for a system to serve Tampa, Orlando, and Miami. The Coalition of Northeast Governors (CONEG) is working with Amtrak and the Federal Railroad Administration to test several types of European equipment on the Northeast Corridor between New York and Boston, where the track geometry severely limits the operating speeds of Amtrak's present equipment. If these tests are successful, the introduction of new equipment could shorten trip times (without large capital expenditures to realign the track), making rail more competitive with air service.

Water

Only about half the states are funding port planning and development projects. During the past 10 years, 14 states have spent $669 million in port construction projects. States and local port authorities are primarily concerned with developing general cargo facilities and container handling docks.

Under the Federal Water Resources Development Act of 1986, state and local governments are required to provide between 10% and 50% (depending on the channel depth) of the costs for harbor dredging and channel deepening. This was formerly 100% funded through the U.S. Army Corps of Engineers.

Principal issues facing state water transportation programs are:

- improving ports to attract economic development,
- improving landside access to ports,
- reconstructing bridges to minimize constraints on highway and waterway traffic, and
- aging of ferryboats.