*TRB's Field Visit Program Enters Its 43rd Year*

# CURRENT TRENDS AND DEVELOPMENTS

Started by the Transportation Research Board in 1945, the field visit program is a systematic personal interchange of information about research and research findings with administrators and professional staffs of all state highway and transportation departments, academic institutions, and transportation-related agencies and industry.

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 these organizations face and to pass on information based on research or the experiences of other states, industry, or educational institutions; (b) to learn of ongoing or contemplated research activities in order to inform the organization visited of similar research being carried out elsewhere, to prevent duplication of effort; and (c) to identify new methods and procedures that might have application elsewhere.

The annual visits provide TRB staff and the organizations they visit the opportunity to collect and share transportation research information face to face. In 1988 11 staff members visited hundreds of transportation professionals in all modes and subject areas. Although other forms of information transfer exist, such as publications and automated services, the field visit program offers the advantage of one-on-one discussions in which areas of mutual interest can be fully explored. TRB staff can also identify innovative or experimental work that will not be widely available, but nevertheless is worth bringing to the attention of others.

Field visits allow the staff 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, National Cooperative Highway Research Program (NCHRP) panels, and special project committees.

The field visit program has been periodically reviewed during its 43-year history to assess how well it serves the needs of TRB sponsors. Such a review is currently under way, and input from all sources would be welcomed. Comments should be sent to the Director, Technical Activities Division, TRB.

During the 1988 field visits, a special effort was made to contact various transportation user groups. The program review will describe the types of agencies visited and the relative benefits. A summary of transportation trends and research activities identified during the FY 1988 visits follows.

## Planning and Administration

### Planning

Many states continue to emphasize multimodal transportation planning and the treatment of planning as integral to decision making. Many states also stress the linking of planning, management, programming, financial planning, and project planning. Interest is increasing in developing public-private partnerships for financial support of transportation improvements, as well as in gaining a better understanding of the complex relationship between transportation and economic development.

Demographic changes are affecting transport needs and requirements, particularly in the South and West. In one western region, greater use of toll roads is being considered to alleviate congestion. Short-term planning needs are also being emphasized in many regions of the West to satisfy air quality standards. Stricter air quality 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 flextime and ridesharing.

### Finance

During 1988 there has been a continuing shift of financial responsibility from the federal government to state and local governments. Accordingly, 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 percent. Thirty-two states have fuel taxes greater than 14 cents per gallon, and 9 states have taxes of 18 to 21 cents 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 traffic demands in urban areas, state legislatures are permitting local option sales taxes and excise taxes on motor fuels to be imposed for local transportation purposes. They are also permitting impact fees and special benefits taxes to be used at local levels to provide transportation facilities needed to serve rapid suburban land development.

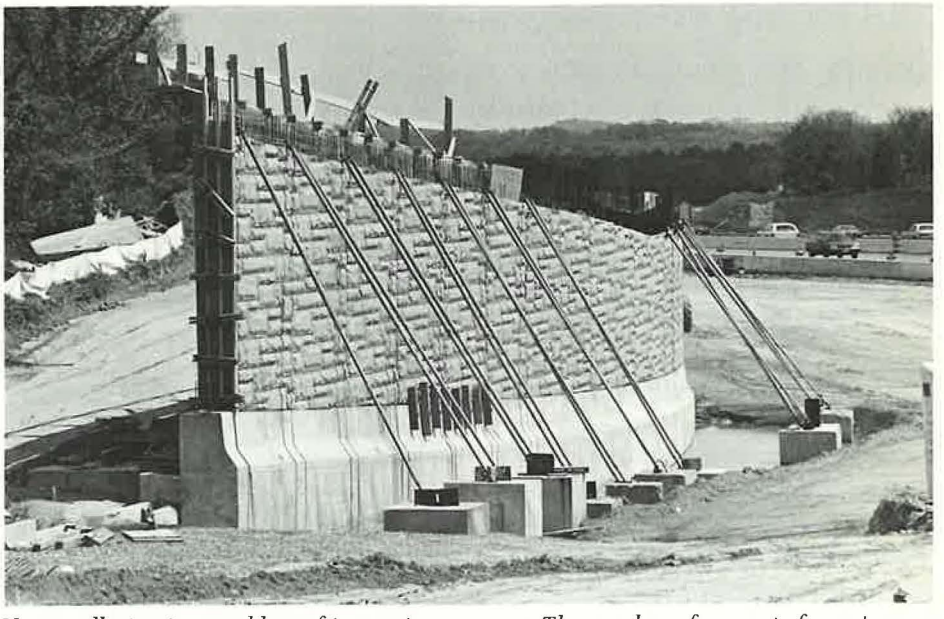
At the federal level, several new pieces of legislation and some court decisions now affect transportation. The

anti-fuel-tax-evasion provision, enacted under the reconciliation bill, has shifted the burden of taxation of diesel fuel from the retailer to the wholesaler. The Tax Reform Act of 1986 did the same for gasoline tax collection.

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 cents to 30 cents 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 nondomestic trucks. Eighteen states had enacted weight, distance, and axle retaliatory taxes intended 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 bonds used by governments for highways still are. Airports, public docks and wharves, and mass transit bonds are generally considered tax exempt, but the ability to arbitrage bond proceeds is restricted.



*Noise pollution is a problem of increasing concern. The number of requests for noise barriers along highways is growing rapidly.*

**Manpower and Management**

In some states, 30 to 40 percent of the professional engineering staff are eligible to retire. States have reported no difficulty in hiring new entry-level engineers but some difficulty in retaining them after they complete training. The private sector is willing to pay higher salaries and promote more rapidly.

There is growing concern about the career paths of engineers, specifically moving engineers into management. Top positions in a number of states have been reclassified non-civil service, and management instead of engineering professionals are being recruited.

In spite of increasing productivity with computer-aided-design systems, states have been unable to keep pace with their engineering needs and increasingly rely on consultants. Productivity is being improved in many operating field districts by using laptop computers and improving procedures.

## Environment

Air quality in urban areas and the transport and cleanup of hazardous materials continue to be major environmental problems. The Environmental Protection Agency estimates that 70 urban areas in 42 states failed to meet 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 most states from reaching air quality goals. Because the standards were not met, Congress extended the deadline, and sanctions, including withholding federal-aid highway funds, were not imposed.

There is continued need for better coordination among agencies that respond to hazardous material spills. Of special concern are training and coordinating highway and law enforcement personnel who respond first to accidents.

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

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

## Design

Personnel in a number of state design departments would benefit from greater exchange of information with their counterparts in other states. The American Association of State Highway and Transportation Officials' (AASHTO) electronic bulletin board lists an average of two items per week, which appears low considering its potential. A directory listing state personnel by counterpart would be helpful for facilitating 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 costs. Better designs may be achieved by greater use of data on frequency and cost of repair during design and by getting feedback from maintenance personnel. In urban areas there is a need to incorporate into design considerations the cost of traffic delays and public frustration caused by frequent repairs.

The Federal Highway Administration's February 8, 1988, ruling "Accommodations of Utilities: Longitudinal Use of Freeway Right-of-Way," is generating requests from some states for information on practices in other states.

## Materials and Construction

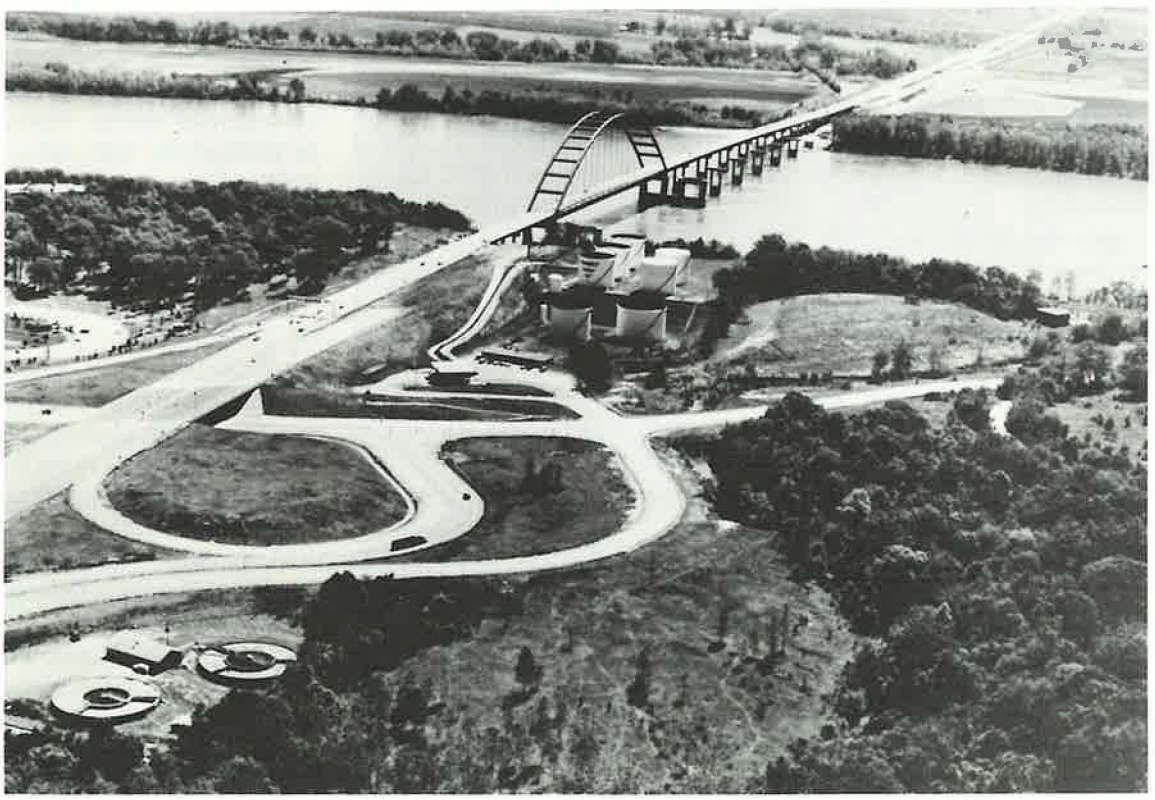
Rutting of asphalt pavements continues to be a major concern for many states. Present thinking on research for solving this problem tends to support the use of large aggregates rather than dense-graded mixes. NCHRP Project 9–6(1) Asphalt Aggregate Mixture Analysis System should contribute to the solution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

Substantial research is being conducted and reported on durability of high-strength concrete mixes that contain 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 8 hours are still under way.

The shortage of highway construction professionals and technicians continues in most states. This has led to more contracting for engineering services, including construction management, inspection, and materials testing. Both states and contractors are certifying more technicians.

## Soils, Geology, and Foundations

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



*Some state departments of transportation suggest that improved designs for bridges and pavements offer partial solutions to the problems of escalating maintenance costs. (I–255 over Mississippi River in St. Louis.)*

*Use of engineering fabrics and soil reinforcement is becoming more common for the construction of embankments and retaining walls.*

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 waste products is also being considered.

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

Use of engineering fabrics and soil reinforcement are becoming more common practices in the United States 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 under way in some states. Other uses of geosynthetics include silt fences and reinforcement of pavement layers.

Many states are giving more attention to the design of structure foundations. This interest is also reflected in some NCHRP research. One project is related to piles installed with vibratory drivers; other projects are investigating load factor design criteria for highway structure foundations and specifications for the design of foundations, retaining walls, and substructures.

The effect 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 pavements. There is growing interest in developing techniques for in situ determination of properties of soils.

## Traffic Operations and Safety

### Traffic Operations

Urban traffic congestion is a national concern, as widely reported in AASHTO'S 2020 Consensus Program and at TRB's Conference on Long-Range Trends and Requirements for the Nation's Highway and Public Transport Systems. This concern was also reflected at the Institute of Transportation Engineers' successful conferences dealing with suburban traffic congestion issues.

All state departments of transportation have a clear interest in building and maintaining systems, but attention given to system operations varies. States with a large urban population probably have greater involvement with operational matters, but the variation also reflects economic conditions. The level of traffic engineering activity is higher in growing Sun Belt states than in so-called Rust Belt 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 the University of California, Berkeley, received salary offers of up to $31,000 per year from government agencies in the West.

All states have common interests in materials and their use in signing, striping, and signal controls. But the preferences for water-based paint versus other bases and the use of thermoplastic markings and high-intensity versus engineer-grade sheeting for signs and highway lighting differ among states. Raised markers to improve visibility on wet pavements at night are increasingly applied.

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

Interest is increasing in research and development related to in-vehicle guidance systems and applications of advanced technology. Private-sector concerns about the Program for European Traffic with Highest Efficiency and Unprecedented Safety (PROMETHEUS) in Europe and the Advanced Mobile Traffic Information and Communication Systems (AMTICS) in Japan have generated a growing national awareness in the United States.

### Traffic Safety

States and national safety research organizations are closely monitoring recent changes in laws on higher speed limits, alcohol-impaired driving, and occupant-restraint use.

Many state officials are concerned about the change in federal compliance requirements for speed limits. In hearings before the House Public Works Committee's surface transportation subcommittee, testimony was presented showing that deaths on rural Interstate highways, with speed limits now posted at 65 mph, have risen 18 to 22 percent. However, in some states there has also

*Construction is under way to increase traffic capacity by widening I–270 in Washington, D.C.'s Maryland suburbs. The problems of highway congestion were addressed by TRB's Conference on Long-Range Trends and Requirements for the Nation's Highway and Public Transport Systems held in June.*

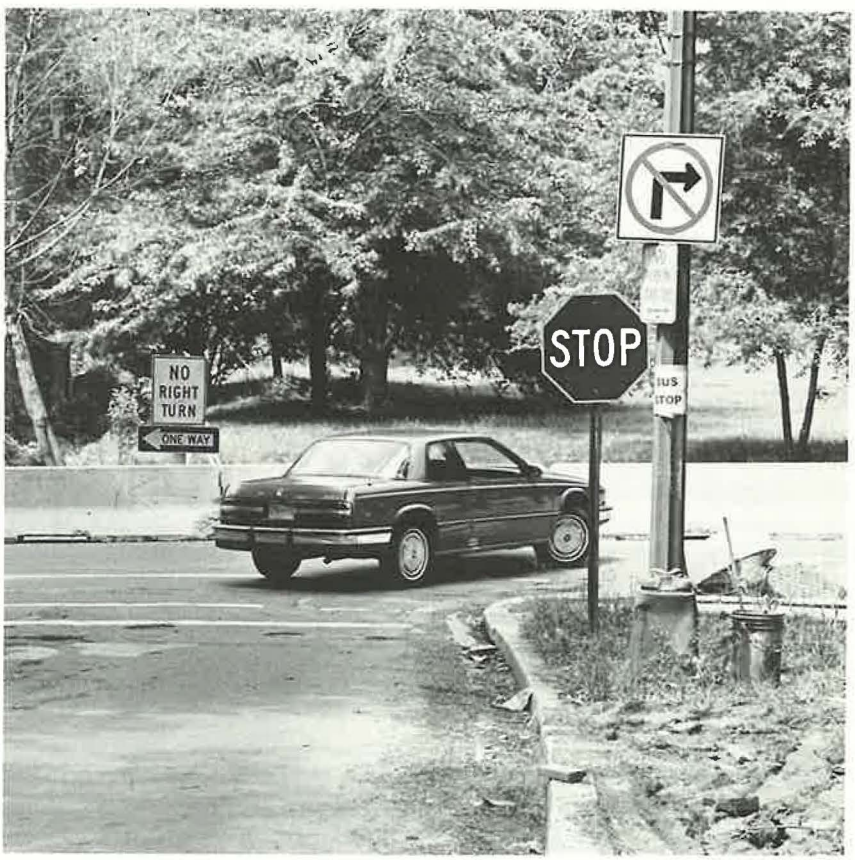
State motor vehicle occupant-restraint laws are continuing to receive public and legislative support. At the same time, 24 states have statutes with limited enforcement potential. These states have "secondary enforcement" provisions that limit the circumstances under which motorists can be penalized for failing to obey the laws.

Many state officials recognize that the lack of complete and accurate truck accident data handicaps efforts to develop countermeasure programs aimed at the truck safety problem. TRB is conducting studies on data needs that should provide guidance to the states. Some state police officials estimate that as many as one-third of the trucks on the highways today cannot pass brake

been an increase in vehicle miles of travel on these roads. State officials are urging standards for compliance with the higher speed limits. There is also interest in modifying the compliance formula.

On the issue of alcohol-impaired driving, legislative activity at the state level remains high. Over the past 5 years, the proportion of drivers involved in fatal crashes who were intoxicated decreased among all age groups. The most significant drop continued to be among 16 to 19 year olds. All states have adopted legislation to raise the minimum age for alcohol consumption to 21.

A report issued by the Institute for Highway Safety examines 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: (a) per se laws that define driving under the influence using blood alcohol concentration thresholds; (b) laws that require administrative suspension or revocation at the time of failing a chemical test or refusing to take it (the most successful of the three in reducing fatalities); (c) laws that mandate jail or community service for a first conviction for driving under the influence.




*NO RIGHT TURN sign is unheeded by driver. Sign legibility and conspicuity were among numerous safety topics examined in TRB's* Special Report 218: Transportation in an Aging Society.

inspections. Development of the classified commercial driver license continues as states develop plans to implement it. Motor vehicle administrators are also expressing increased interest and concern over the problem associated with the elderly driver. A TRB study published in October 1988 (*Special Report 218: Transportation in An Aging Society: Improving Mobility and Safety for Older Persons*) provides the states with recommendations.

## Maintenance

Quality assurance, standard setting, worker protection, pavement maintenance, tort liability, and new equipment are receiving considerable attention. Strategic Highway Research Program contracts were awarded during the year and represent the largest single-year funding for maintenance-related research.

Several research studies on sign reflectivity standards are under way. One state engineer with a new statewide sign inventory estimates that improved signing saves more than $6 million per year in tort liability claims.

There is a need to develop standards for emergency nighttime work; researchers in a pilot study will examine the feasibility of night maintenance. Other efforts to improve worker safety cover the reduction of exposure to traffic, public relations efforts, crash absorption devices, better signs, and improved vehicle lighting. One state is working on specifications for "shadow" trucks, and truck-mounted crash cushions are commonly used—one state has more than 500. Dummy radar transmitters are being used to show the effect of such passive transmitters on traffic speed.

New asphalt binders and concrete additives are providing better paving materials. Asphalt additives from fibers to polymers are being tested, although binder costs may increase as much as 25 percent. Use of polymers in binders for seal coats appears 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 given to identifying high-risk conditions throughout all operations. One state has established new positions for "risk management engineer."

New types of techniques and equipment include (a) hydrodemolition, introduced in Italy in 1980, for removing deteriorated concrete from roads and bridges; (b) self-contained patching trucks; (c) improved self-propelled chip spreaders; and (d) advanced asphalt distributors.

Position-locating devices provide a significantly increased capability for data acquisition and analysis. An Etak system, which is used with a base map and a base station to enable minute-by-minute reports on the location of emergency vehicles, was placed in four vehicles. In addition, nondestructive 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 alternative to sodium chloride as a pavement deicer. Two state legislatures have directed their transportation departments to conduct experiments with CMA on farms. To date, however, the only commercial supply of CMA is based on use of acetic acid derived from crude oil or natural gas.

Disposal of lead-based paint sandblasted from existing bridges is posing problems in some states; the sand is classified as a hazardous material because it contains lead. 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.

Although there is a general perception that public transportation is primarily an urban issue in the Northeast, it is becoming increasingly apparent that transit is a critical element of any region's economic vitality. Research is under way at local and state levels to demonstrate the interdependence of public transit and the economic health of a region. 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 (*Special Report 213, Research for Public Transit: New Directions*). The transit industry reacted favorably to the proposal in the 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 ½ percent of their federal formula grant funds. The American Public Transit Association has assumed the leadership for broadening industry support for such a research program and has selected an appropriate organizational structure for program administration, and for seeking the required legislation.

### Aviation

In late 1987, Congress passed a 3-year extension of the Airport and Airway Improvement Act, authorizing an increase in funding of about 40 percent above the 1982–1987 level. Despite this

*Aerial view of Newark International Airport highlights its function as a multimodal transportation facility.* (photograph from The Port Authority of New York and New Jersey)

action, the aviation industry is concerned about the lagging schedule of modernizing the air traffic control system and the lack of adequately funded national programs to increase airport capacity.

Public complaint about air travel delay, airport congestion, and service quality persists, prompting the Department of Transportation to press for revision of airline schedules and to institute a system for reporting flight delays and cancellations. Public concern about safety also mounted in the wake of several major airplane crashes, sharp increase in reports of near-misses, and fines for maintenance violations levied on several airlines by the Federal Aviation Administration (FAA). To address the problem, FAA instituted a comprehensive aircraft safety inspection program, revised the routing of aircraft in heavily used flight corridors, and, most recently, imposed restrictions on flights at Chicago's O'Hare International Airport.

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 additional controllers to cope with increased air traffic, more rigorous enforcement of safety regulations, and reorganization of FAA as an independent agency.

Among state aviation agencies, chief concerns are preservation of essential air service to small communities, maintenance of general aviation airports, and protection of 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 research and development by state agencies.

The number of passenger enplanements continues to grow and is expected to reach 491 million in 1988 (an increase of 56 percent since 1980). As a whole, the airline industry has enjoyed rising operating and net profit, but the picture for individual carriers is mixed. In 1987 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 has slowed from the pace of 1985-1986, even though the one major merger that oc-

curred 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.

Airline industry experts at the TRB 1988 Annual Meeting focused 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 a 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.

### Rail

Restructuring of the rail industry continues, requiring public-sector responses in many instances in which loss of service, or at least loss of competitive service, threatens the existence of rail users and may preclude economic development. As a result of dwindling federal funds, approximately one-half of 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.

Most state rail officials are opposed to reregulation 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 when special labor operating contracts have been negotiated.

A number of states have shown interest in the development of high-speed rail passenger systems. Florida is considering a system to serve Tampa, Orlando, and Miami. The Coalition of Northeast Governors 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 one-half of 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 percent (depending on the channel depth) of the costs for harbor dredging and channel deepening. This was formerly 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.

## CALL FOR ARTICLES

Professionals in the transportation community are invited to submit topical articles on innovative or state-of-the-art aspects related to all transportation modes for publication in *TR News*. Articles that highlight the role played by research are preferred. Feature articles should be 1,500 to 3,000 words in length and accompanied by appropriate, high-quality illustrations and corresponding captions. Short items for the News Briefs section are also invited.

Readers are encouraged to submit letters to the Editor that offer comments on the information and views expressed in published articles, or in general discuss issues or raise questions related to transportation research or to TRB activities.

All articles and letters received are subject to review by the Editorial Board of *TR News* for suitability for publication and to editing for purposes of style, clarity, and length. For further guidelines on submitting full-length articles or news items, see Information for Contributors on the inside back cover.