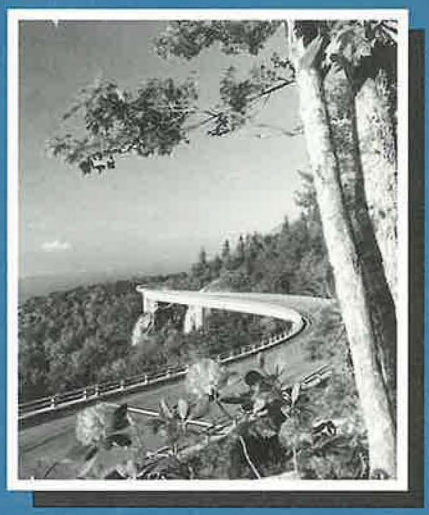
TRANSPORTATION OVERVIEW

A REPORT BY TRB TECHNICAL ACTIVITIES STAFF 1995-1996



Specialists in the Transportation Research Board Technical Activities Division are in a unique position to sense the current concerns and learn about the activities of the transportation community. The TRB Annual Meeting, Board-sponsored conferences and workshops, standing committees, publications, and contact with thousands of organizations and individuals provide staff with information from the public and private sectors in all modes of transportation.

A major source of this information is the annual state-visit program, through which TRB staff meet on site with each state transportation department, many universities, transit and other modal agencies, and industry representatives. The objectives of the state-visit program are to (a) learn of problems facing these organizations and to transmit information from states, industry, or educational institutions to help solve these problems; (b) learn of research activities that are in progress or contemplated and to exchange information on similar research being carried out elsewhere, preventing duplication of efforts; (c) identify new methods and procedures that might be applicable elsewhere; (d) identify innovative or experimental work that might not be widely published but is worthy of broader attention; (e) describe TRB's range of services to new staff at transportation agencies that support TRB; and (f) identify potential candidates for TRB committees.

Presented here is a snapshot of current issues, concerns, and activities in transportation in the United States, as witnessed by the TRB Technical Activities Division staff throughout fiscal year 1996.

Much uncertainty persists surrounding the reauthorization of surface transportation programs in "NEXTEA," as does apprehension about funding levels, agency restructuring, and shifts in responsibility between the federal government and the state and local governments. In the face of such uncertainty, various constituencies continue to posture to have their preferences implemented.

Some significant progress has taken place, however, such as the establishment of the National Highway System in 1995. In the move toward less federal control, the Interstate Commerce Commission has been dismantled, although a new Surface Transportation Board fulfills some of the ICC's functions within the U.S. Department of Transportation. The national speed limit has been eliminated, metrication mandates have been relaxed, and certain other federal requirements have been revoked. Many states have opted to continue practices formerly mandated by the federal government.

Although concerns about funding and future legislation were in clear evidence during the past year, safety issues dominated public attention to transportation, with hardly a mode spared. Eliminating the national speed limit raised questions about safe vehicle operation on roads designed and built for speeds below what are now allowable. The safety of workers and the public is also an issue as improvements increasingly are made on highways that remain open to traffic. Aviation safety has been in the headlines throughout the year, and accidents on passenger rail and transit systems have resulted in new safeguards to reduce the likelihood of future incidents. Although bleak media images of high-profile crashes are difficult to forget, the facts support the excellence of transportation safety in the United States in relation to the past and in comparison with other countries. Continued emphasis on safety by both the public and private sectors is expected.

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Photographs, page 11 (clockwise from top): Figg & Muller Engineering, Inc.; National Transit Institute; Sergio Rodriguez.

Institutional Concerns

Planning

Members of Congress are sponsoring hearings on the reauthorization of the Intermodal Surface Transportation Efficiency Act, and U.S. DOT is conducting focus-group meetings to determine changes needed in the successor legislation. Most states and metropolitan planning organizations report that ISTEA has had a positive impact on transportation planning and decision-making. Although modifications are anticipated, the general principles are expected to be retained. Proposed changes include redirection of federal regulation away from sanctions and mandates, simplification and reduction of federal clearances needed for transportation program delivery, and elimination of funding for demonstration set-asides.

At the recent TRB conference on statewide transportation planning in June 1996, participants identified the need to establish more comprehensive planning processes in each state to recognize differences in geography and demographics, goals for economic development, systems-analysis requirements of multimodal transportation, the roles and involvement of different institutional players, and the necessity of credible strategies to gain and maintain public support. States need to develop new analytical tools and related training programs to ensure the establishment of effective planning processes.

International and multistate planning issues are also receiving attention. Regional planning studies have been conducted by the states bordering Mexico; the Delta states; and the western states, which participated in a multistate freight study linking markets to Pacific Rim countries.

In 1995 Congress approved the National Highway System, the 255 803-kilometer (160,995-mile) backbone of the nation's transportation system for the 21st century. The system encourages states to focus on improving a limited number of high-priority routes with federal-aid funds. About 98 percent of all roads on the National Highway

System already exist, mostly as two-lane roads. Other major components of the system include the strategic highway corridor network and its major connectors, the Interstate highway system, 29 congressionally designated high-priority corridors, and highways that connect the system to major intermodal facilities.

Although the National Highway System includes only 4 percent of the nation's highways, the system carries 43 percent of the total traffic and 69 percent of combination truck traffic. Approximately 90 percent of the country's population lives within 8 kilometers (5 miles) of the system, including 93 percent of those living in small urban areas with populations of 5,000 to 50,000. The system provides access to work and markets, ports, airports, rail stations, national parks, and bordering countries, which translates into economic benefits for the nation.

Finance

The difficult task before the U.S. Congress is how to honor its commitment to a balanced budget while ensuring the economic vitality of the nation through preservation and expansion of transportation infrastructure and operations. In addition to the debate within Congress and with the administration over the funding level for the reauthorization of federal highway and transit programs, the formulas for distributing federal highway funds are being reassessed.

Without adequate funding, the ISTEA requirement for financially constrained planning and programming may force states and metropolitan areas to remove projects from long-range plans and transportation improvement programs. An alternative to program cuts is to identify new funding sources. The Federal Highway Administration is emphasizing its innovative-financing initiative, which allows existing transportation funds to be leveraged to attract private investment, permits the use of federal funding for toll roads, and promotes financial-management approaches to expedite the application of federal and nonfederal funds to project planning and construction.

Another innovative finance tool is the State Infrastructure Bank, which will provide loans, credit, capital reserves, low interest rates, lease agreements for transit projects, and bonding security for all types of transportation capital projects. As many as 10 states may join the pilot program, funded at $150 million in the 1997 DOT appropriation.

The recent market-driven spike in the pump price of gasoline has fostered a movement among some congressional leaders to reconsider the 4.3 cent federal motor fuel tax that is used to reduce the federal deficit. A bill to repeal the tax passed the House of Representatives but stalled in the Senate. Other congressional leaders are now lobbying to retain the tax and redirect it to the Highway Trust Fund.

NATIONAL TRANSIT INSTITUTE

Midcareer and entry-level transportation planners require additional training to address intermodal planning needs.

Current TRB projects relevant to finance include NCHRP Report 377, *Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements,* and a conference on innovative finance for transportation scheduled for summer 1997. At the request of FHWA, TRB also has convened a panel to review and provide input to the current federal Highway Cost Allocation Study, under which the assignment of highway costs to specific classes of users is being reexamined. The previous Highway Cost Allocation Study was completed in 1982; the new study, to be completed by the end of 1996, is needed because of major changes that have occurred in the structure of the federal-aid program and patterns of highway use.

Human Resources and Management

State departments of transportation throughout the country are under pressure to reduce the scale of their operations. In many cases a ceiling has been imposed on the number of employees, instead of a budgetary limit or reduction in expected services. Many state departments of transportation are contracting out portions of their operations.

Graduate education programs need to train the transportation leaders of the future to meet a new set of professional demands

Staff reductions come at the same time that many State DOTs are revising their missions away from an emphasis on facility design and construction and toward maintenance and operations. This combination of fewer employees and new responsibilities requires staff skills to be upgraded and revised. Transportation departments are launching major training programs and placing greater

SEA-LAND, INC.

The freight industry continues to forge new carrier alliances, rationalize services, and develop integrated information systems, all of which contribute to lower costs and more efficient delivery of goods.

emphasis on customer service. Management initiatives to achieve this end include flattening organizations through elimination of layers of middle management, decentralizing responsibilities to field offices, privatizing some functions, and instituting direct accountability for performance. Several states are reorganizing by function (e.g., planning, operations, construction, maintenance, and finance) instead of mode.

Still on the table at U.S. DOT are proposals to reorganize field offices for greater efficiency. Some of the smaller division offices may be consolidated, or selected responsibilities may be transferred to the regions.

Education

Under ISTEA, emphasis has shifted toward operational efficiency, preservation of the transportation system, and intermodalism. Graduate education programs need to train the transportation leaders of the future to meet a new set of professional demands. This will require education in systems analysis, information and communication technology, logistics, and familiarity with the next generation of vehicles and vessels to complement existing curricula in planning and design. To explore what universities are doing to meet this challenge, and what further structural and curriculum changes might be necessary, TRB and FHWA are sponsoring a conference on education and intermodal transportation in November 1997.

Intermodal and Modal Concerns

Intermodalism

Congress recognized the importance of intermodalism with the passage of ISTEA in 1991. Intermodalism, which in its broadest context is a systems approach to optimized transportation, continues at all levels of government. However, the concept of intermodalism and its practice remain a challenge. On one hand, ISTEA brought about new intermodal relationships and new approaches to the use of funds. On the other hand, the overall funding level remains inadequate to meet the needs. More comprehensive intermodal data are still needed, along with the development of intermodal planning models and the clear requirement for intermodal training for midcareer and entry-level transportation planners.

Intermodal leadership at the federal level is still evolving. At U.S. DOT the intermodal thrust of ISTEA prompted a reorganization proposal that would have consolidated the department's 10 agencies into 3: the U.S. Coast Guard, a new aviation administration, and a new integrated Intermodal Transportation Administration. The proposal was not implemented, in part because many organizations and groups prefer to interact with clearly defined modal entities. The future of the Federal Maritime Commission continues to be under debate.

Concurrent with developments at the federal level, state DOTs and metropolitan planning organizations have continued to grapple with intermodal and multimodal planning responsibilities as set forth by ISTEA. The required intermodal management system has now become optional for states. As states and metropolitan planning organizations grow into new responsibilities, they need greater financial and planning flexibility.

More effective technical tools are needed for environmental analysis, particularly for wetlands, surface water, visual quality, cultural resources, and social and economic impacts

Private-sector intermodalism began in earnest more than two decades ago. The freight industry continues to forge new carrier alliances, rationalize services, and develop integrated information systems, all of which contribute to lower costs and more efficient delivery of goods. But new competition is just over the horizon. Overseas operators have studied and adopted the U.S. approach to intermodalism and are deploying new features such as mega-container ships and automated con-

tainer yards, which will continue to challenge the U.S. intermodal freight industry.

Environment

Many practitioners believe that if the environmental regulations flowing from the National Environmental Policy Act, ISTEA, the Clean Air Act, and the Clean Water Act were better coordinated and easier to administer, compliance would yield better results for both the environment and transportation. Congress and state legislatures are being asked for streamlined regulations and more effective administrative tools for protecting and improving the environment while accommodating transportation needs.

More effective technical tools are also needed for environmental analysis, particularly for wetlands, surface water, visual quality, cultural resources, and social and economic impacts. Geographic information systems and computer-aided design hold promise. Some states are developing data-base overlays to display maps that allow DOTs to begin corridor or project planning with full knowledge of environmentally sensitive areas, and to select projects and alignments that are likely to meet the permitting agencies' requirements.

Attainment of air-quality standards by target dates is an issue in many urban areas. Transportation makes a major contribution to three of the six major air pollutants targeted by the Clean Air Act: carbon monoxide, nitrogen oxides, and volatile organic compounds. Analysis has shown that most measures that reduce automobile travel either have a small impact on emissions or are politically unpalatable. The most promising emission-reduction transportation strategies are viewed as those related to cleaner-burning fuels, vehicle technology, and vehicle maintenance. Market-based measures (pricing), although unpopular with the public, remain under discussion in some places because they offer the additional benefits of congestion reduction and new revenue.

Much progress is being made to mitigate transportation noise. In 1996 work will be completed on the new Traffic Noise Model for highways. This work is sponsored by FHWA and the states, and the U.S. DOT, National Transportation Systems Center, is providing technical expertise. When completed, the model will make sophisticated but inexpensive highway-noise analysis available on microcomputers.

Executive Order 12898, Federal Actions to Address Environmental Justice, instructs all federal agencies to take positive steps to ensure that federally aided projects do not produce disproportionate adverse impacts on minority or low-income populations. In May 1996 the Environmental Protection Agency issued draft guidance making environmental justice an explicit part of NEPA review for federal projects.

Rail

For the ninth consecutive year, the freight railroads broke records in 1995, with total traffic of nearly 1.9 megagram-kilometers (1.3 trillion ton-miles). Traffic growth occurred in bulk commodities—notably grain—but was partially offset by a decline in intermodal traffic (trailers and containers) of 1.5 percent after 13 consecutive years of growth.

New technology is helping the railroads handle growing volumes of traffic and improve service. The introduction and increased use of alternating-current traction locomotives is lowering fuel costs and improving operational efficiencies. The electronic tagging of rail equipment was completed in 1995. Service benefits for carriers and shippers will result from timely, accurate automatic equipment identification.

With the merger of the Burlington Northern and Santa Fe railroads completed, the industry focus shifted to the Union Pacific Railroad's proposed purchase of Southern Pacific. Concerns were raised about the potential loss of competitive rail service in several major markets, but the newly created Surface Transportation Board at U.S. DOT approved the $5.4 billion merger in July 1996. The merger will produce a 49 890-kilometer (31,000-mile) rail network and reduce the number of U.S. railroads to five. As a condition of the purchase, Union Pacific–Southern Pacific will be required to provide trackage rights to Burlington Northern–Santa Fe in several major market areas, to maintain competitive rail service.

In the face of continuing financial constraints, the National Passenger Railroad Corporation (Amtrak) has looked to several states to help retain service on intercity routes. Providing higher-speed service in the Northeast Corridor remains a priority for Amtrak, and construction on electrification from New Haven to Boston

MASON

KING

Alternative-fuel vehicles, such as this Houston Metro bus powered by liquified natural gas, hold out promose for reducing pollutant emissions *(top)*.

Transportation designs that meet environmental needs include "deer crosswalk" systems developed by the Utah Department of Transportation to guide deer away from the roadside except at designated points.

For the ninth consecutive year, freight railroads broke traffic-volume records in 1995

began in summer 1996. Amtrak has also signed a contract to purchase new high-speed train sets for use in the corridor.

Several states continue to explore high-speed rail, but insufficient funds have delayed implementation. The state of Florida has made a long-term financial commitment to develop a high-speed rail system and in February 1996 selected a franchisee to carry out the development. The Federal Railroad Administration is conducting research on the safety and efficient operation of this technology to assist the states and Amtrak in implementation. Major focus areas are positive train control, new types of grade-crossing protection, and development of higher-speed nonelectric locomotives.

Downsizing of most Class 1 systems continues, with many secondary and branch lines being sold to regional and shortline railroads. Because the states reap economic benefits from continued rail-freight services provided by regionals and shortlines, public investment in track and facility rehabilitation is justified. Nearly one-half of the states have invested their own funds in rail-freight preservation projects in recent years. A number of states are using loan programs to maximize the use of existing funds, including federal funds granted in previous years. Alternative sources of funds are particularly important now because the federally funded Local Rail Freight Assistance Program was eliminated in 1996.

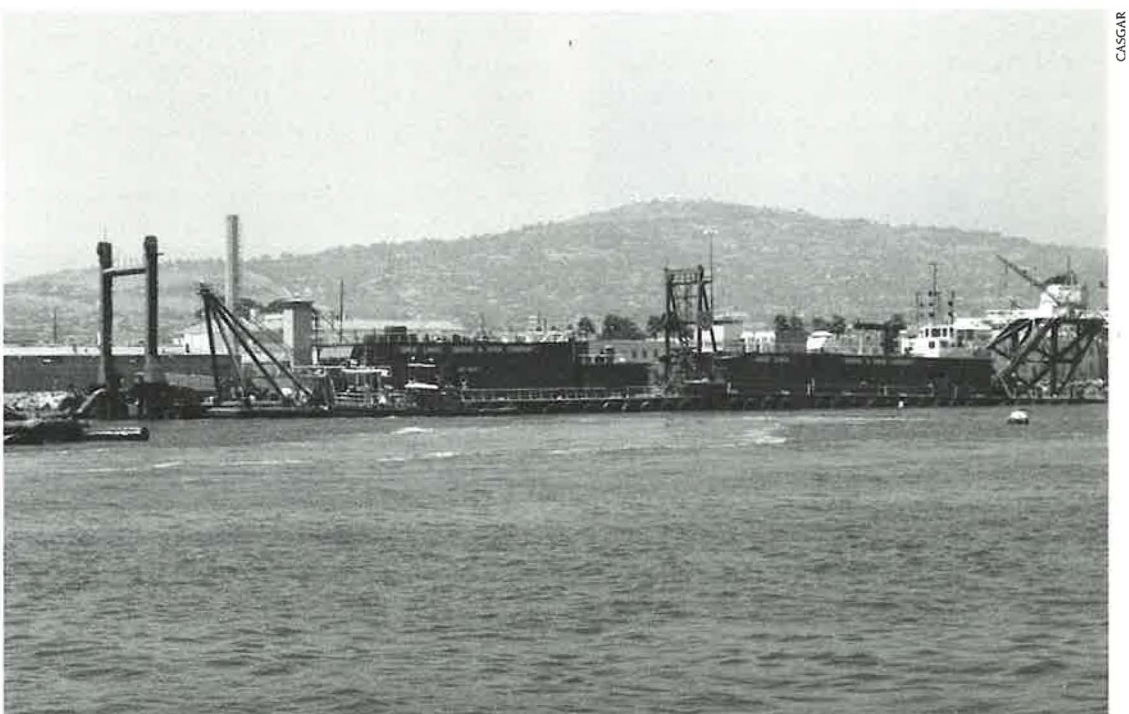
Although the railroad industry has enjoyed dramatic improvements in safety performance since deregulation, a rash of rail accidents in 1995 and 1996 heightened attention to railroad safety. Although these accidents are still under investigation, improved application of human factors in rail operations and the need to improve technology such as train-control systems are already being discussed.

Marine Transportation

Ports demand continual investment in improved operations, yet competition is intense for public funds for infrastructure development. Ports continue to struggle to protect port funds from diversion to nonmaritime activities. During 1995 the port industry invested more than $926 million in capital projects, a 27 percent increase over the amount spent in 1994. Ports and other freight interests must also continue to work closely with metropolitan planning organizations and state DOTs to ensure that the economic implications of efficient goods movement are fully considered. Several DOTs and MPOs have created freight advisory councils to help address these issues.

Progress has been limited in securing significant support for revitalizing the freight infrastructure, but in 1996 a list of intermodal connectors was developed for congressional consideration. Signi-ficant funds for port access were earmarked by Congress for the Alameda corridor project, which serves the ports of Los Angeles and Long Beach.

For the nation's deep-water ports, channel deepening, harbor maintenance, and dredged-material disposal strategies are at a crisis point.



CASGAR

The Port of Los Angeles is running a dredging operation in the Outer Harbor around the clock, seven days a week, to improve port operations for the new generation of larger vessels.

The most dramatic dredging plight faces the Port Authority of New York and New Jersey, which is engaged in a struggle to maintain its channels; the prospect of a negotiated solution is elusive. The difficulties involved in satisfying all concerns raised by the complex dredge project have led to what some characterize as institutional gridlock. Efforts by the Maritime Administration and others to solve this dilemma are under way.

Funding the necessary infrastructure for a cost-effective inland waterway system remains a major challenge. River traffic continues to expand; lock capacity and maintenance are seriously stressed. Operators are concerned that the Inland Waterways Trust Fund could be depleted by pressing construction needs, that operating costs could rise, and that meeting new safety requirements could present unprecedented challenges.

Enhanced ferry operations are under development in a number of states, including Alaska, California, New York, Massachusetts, and Washington, as well as in Puerto Rico. Passenger ferries into New York City have resurged. Inconsistencies in regulations and the complex and costly Americans with Disabilities Act regulations are major concerns of ferry operators.

Transit

Socioeconomic forces are dramatically changing urban landscapes and transit needs. The aging Baby Boom generation will soon require specialized transportation services, which transit agencies can provide. This phenomenon will cut across all economic classes and represents a growing political force for changes in transportation policy. The inner-city poor, who rely heavily on transit service, are growing as a sector in metropolitan areas, especially the working poor and the young. Development continues in suburban areas, where transit is even harder to support. Trip chaining (combining stops into a single trip) has become a necessity, most often for women in the work force. Many individuals have more than one job.

Regional land use and transportation have also been a concern of policy makers and planners for many years. Transportation decisions in large urban areas often appear easier to make than coordinated regionwide land use decisions, especially if these depend on city and county zoning for implementation. ISTEA provided the opportunity to address this difficulty by broadening participation in decision making to include transit providers and other stake holders. Funds may be transferred from highway to nonhighway uses. New management systems provide an opportunity

DALLAS MORNING NEWS/JUDY WALGREN

Light rail systems such as the Dallas Area Rapid Transit system, which opened in spring 1996, are becoming more prevalent in the United States.

to review decisions more comprehensively. However, such legislative innovations, no matter how important, are only a beginning in that the inertia caused by previous land use decisions is substantial. In many areas, land use policies both respond to and encourage individual and private-sector decisions to live or conduct business in low-density suburban or edge-city locations. Transit operators often lack the policy tools and finances to serve a dispersed clientele or to influence future land use decisions that might support transit service.

Commuter rail systems are currently operating in 18 metropolitan areas, with extensions and new starts planned in more than 20 areas

As these forces are making their presence known, actual transit service is improving in many areas. Commuter rail systems are currently operating in 18 metropolitan areas, with extensions and new starts planned in more than 20 areas. Light rail systems already have proven popular. Transit ridership has increased overall. A variety of efforts are being made to develop intermodal passenger facilities and establish mixed-use communities within walking distance of them; to apply flexible ISTEA funding to transit improvements; to experiment with location-efficient

mortgages, which would increase the borrowing power of businesses and households located in walkable neighborhoods; and to implement "turnkey" procurement approaches in large rail construction projects.

With the expansion of service in many areas, safety and security are integral to the planning process. Whether it be grade crossing and light rail or commuter rail, driver operator rules and practices, or major special events, continuing proactive review and planning are necessary, along with training and supervision. New technology, where appropriate, also offers substantial promise.

Federal funding changes during the past two years indicate that funding for transit service will continue to face challenges. In 1995 the Federal Transit Administration obligated $6.4 billion, more than $800 million of which was transferred from the Federal Highway Administration through the flexible funding provision in ISTEA. Most of these funds were used for bus projects. Four flexible ISTEA sources were used: the Surface Transportation Program, the Congestion Mitigation and Air Quality Improvement Program, Interstate Substitute Funds, and the FHWA earmark for special projects.

Regional and commuter carriers are the fastest-growing sector of commercial aviation

In 1996 total federal transit funding dropped by 12.7 percent. Hardest hit were formula grants (-17.6 percent), urban formula operating (-43.7 percent), elderly and disabled (-12.8 percent), and nonurban formula (-17.2 percent). It was estimated that more than 300 transit systems will have to cut service or raise fares 10 percent or more.

Federal mandates such as the Clean Air Act and Americans with Disabilities Act continue to divert funds from expanding transit service to other desirable public policy goals. Implementing ADA is both technically difficult and costly because of equipment and capital costs. Estimates of necessary expenditures for compliance range from $700 million to $900 million, most of which will be funded locally.

Aviation

Although commercial carriers are in the second year of record profits, there are many unanswered questions about the future of the industry, especially at the business- and general-aviation levels. Infrastructure problems are among the most difficult to resolve. Access to capital needed to rehabilitate and expand small and medium airports is critical and satisfactory solutions are not easy to find. Larger airports can generate adequate financing, but for smaller facilities the Airport Improvement Program has been and continues to be critical. The program's budget has declined from a 1992 high of $1.9 billion to its current $1.45 billion, with declining shares going to reliever and nonprimary commercial airports, and to general aviation—often seen as the seedbed for the industry's future. Proposed legislation offers various methods to finance the aviation infrastructure, and the industry is not in agreement as to which proposal offers the most efficient or equitable opportunities. The large commercial carriers, both major airlines and the regional and commuter lines, can pass reasonable cost increases on to their customers. Business and general-aviation representatives express concern that they may be unable to survive some proposals and that the potential impact on their industry is conceivably more severe, with negative long-term consequences for future generations of aviation enthusiasts and professionals. The only certainty so far is that the government's push toward privatization will have a major impact on the industry.

Despite recent profitability, the commercial-carrier industry is still well behind the average for U.S. industry as a whole. Although a portion of recent profits may be artificially induced by the expiration of the 10 percent domestic-ticket tax, all elements of the industry face continuing uncertainties in respect to government policy: Will fuel taxes be reinstated and for how long? Will the national airspace system be funded through user charges and if so, who pays and how?

Part of the industry's profitability can be traced to labor's past acceptance of reduced wages and benefits. However, evidence now shows that labor is ready to push more aggressively to share in new-found profits, which will certainly raise overall costs.

Although profitability has been a welcome change in recent times, labor costs and legislative action could easily put the industry back into the red. To remain profitable it is necessary to keep costs low. System delays have been reduced, but are still significant and in 1995 rising demand still outpaced capacity increases. Domestic travel alone is expected to increase 2 to 3 percent faster than gross domestic product. Cost-saving innovations and transformations are well under way: ticketless travel, which saves about $8 per passen-

ger; self-ticketing through home or office computers; and the promise of free flight, an integrated communication-navigation system that permits pilots to fly the most direct, efficient routes and, for the most part, frees them from the present aerial "highway" system.

Another significant trend is that of international alliances and code sharing, especially in North Atlantic markets. One result has been a blurring of the boundary between domestic and international air-carrier activity. FAA plans to focus some of its data collection and analysis capability on this trend.

A new version of the Integrated Noise Model for civilian aircraft is being prepared, which will integrate analysis of noise from military aircraft, provide better noise contours, and run on a microcomputer. Of even more significance, FAA, the National Aeronautics and Space Administration, and the aviation industry have begun work on development of a "stage four" commercial aircraft, quieter than any being built today.

Regional and commuter carriers continue to be the fastest-growing sector of commercial aviation, although for a number of reasons (equipment replacement, competition, hub changes, and highly publicized accidents, to name a few) the rate of growth has been relatively small over the past year. Passengers enplaned exceeded 57 million, with both revenue-passenger-miles and available seat-miles increasing about 6 percent. Traffic has expanded at double-digit rates since the 1970s, but this success is seen as being tied to, and existing at the pleasure of, major airline marketing partners. Two key elements of this growth are longer route segments and larger aircraft. Other technological advances such as more sophisticated and efficient aircraft and advanced navigation and communication systems are helping. However, current and pending legislation could impose dramatic changes. Regional airlines must now meet higher operations and safety standards previously associated only with major carriers, including shorter crew-duty hours and more stringent requirements for equipment, training, and documentation. Earlier trends toward eliminating real and perceived differences in standards between majors and regionals are accelerating rapidly. Directly and indirectly, these changes will cost money and affect profitability.

Although there is some confidence within the business aviation sector that it will grow, there is little optimism for a significant increase in new aircraft sales, and the competition is tough. Pending decisions on a user-financed national air-space system could have a significant impact on the future of this sector.

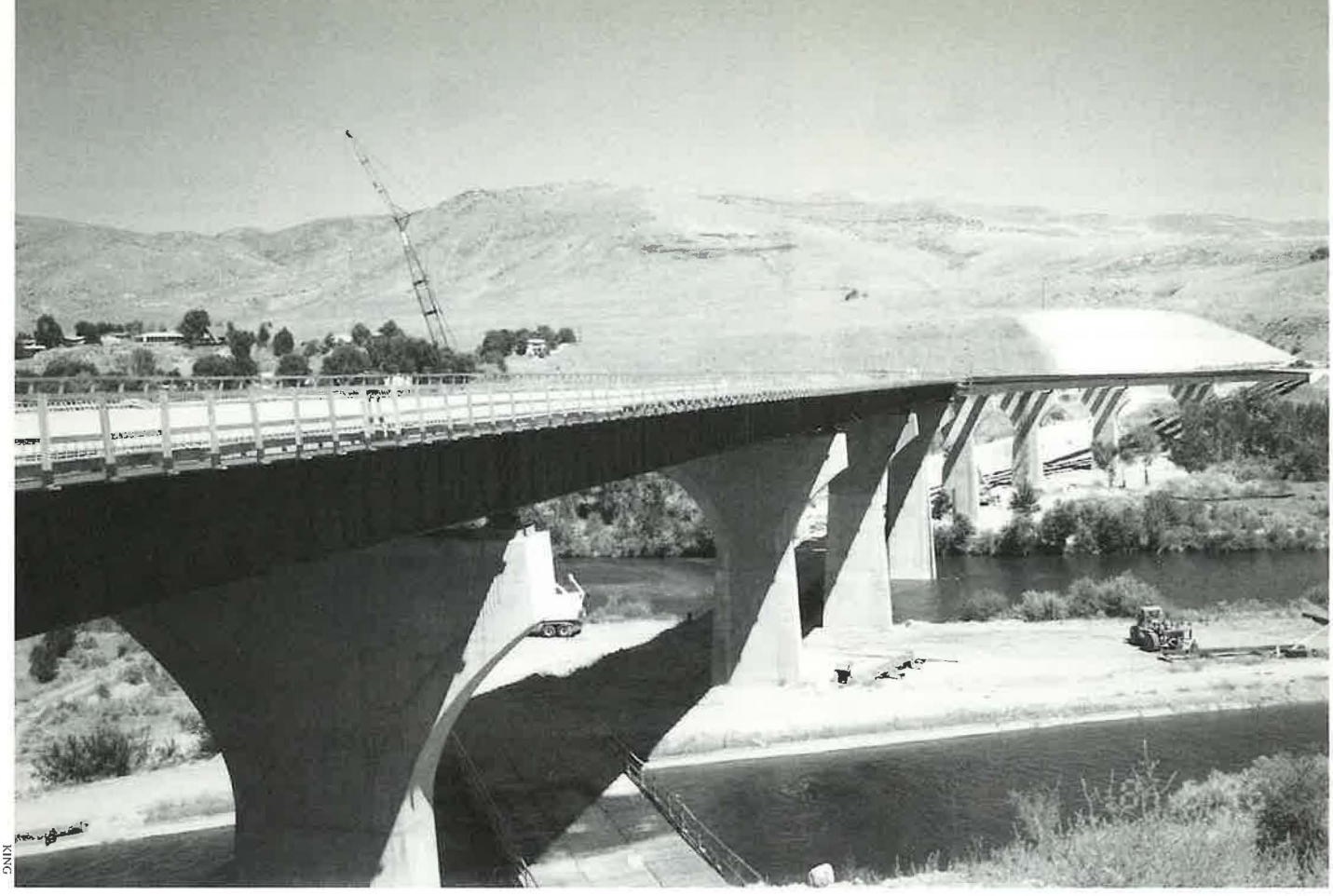
BREEN

Helena Regional Airport in Montana is among airports serving increased regional and commuter carrier traffic.

Technological advances, such as the Global Positioning System and free flight hold great promise, but free flight could prove a double-edged sword. Potential cost savings are enormous, especially for commercial carriers. However, the threat of reserving airspace solely for aircraft equipped with the sophisticated and expensive free-flight technology may force already hard-pressed general and business aviation into even less efficient operating conditions. If this threat materializes, serious political battles can be expected.

Fairly or unfairly, FAA receives considerable attention and criticism from both Congress and the public. Highly visible commercial-carrier accidents, enormous technological challenges, internal reorganization, declining budgets, uncertain future funding sources, and a reduced work force have combined to challenge FAA leadership. Public and congressional scrutiny will continue regardless of how the FAA is funded or whether it eventually resides within or outside the federal government structure. Legislative progress has been made toward less restrictive personnel and procurement rules, which are expected to give the agency more freedom to address work-force imbalances and to identify and apply more modern and efficient technologies to the national airspace system. However, many safety and financing concerns await resolution.

Although the U.S. commercial aviation system sets the world standard for safety, the psychological impact of recent air-carrier accidents has prompted considerable concern from leaders and the general public. This concern is translating into increased attention to the current administrative and regulatory structure, and one of the most



KING

When completed, this bridge segment of State Route 21 in Idaho will be the fourth-longest span in Idaho.

likely results will be an overall tightening of procedures and processes, and higher standards for equipment. Another result is likely to be increasing financial pressure on the industry and higher costs of air travel for the general public. Simultaneously achieving greater economic efficiency and higher safety standards will prove a real challenge for an already ferociously competitive industry.

Regional and district offices of state departments of transportation are being given increased authority and responsibility for highway design

Highway Transportation

Design

Many highway agencies, faced with reductions in personnel and organizational realignments, are contracting more design work to the private sector. Regional and district offices also are being given more authority and responsibility for design.

Although management systems such as those for pavement and bridges are no longer required, many states have realized benefits from their use and are continuing to maintain and upgrade their systems. The challenge is to integrate these systems to provide improved information for decision making. Researchers are using the Strategic Highway Research Program Long-Term Pavement Performance data base to better predict pavement performance, which will lead to improved pavement design and rehabilitation techniques for longer pavement life. Active areas of research include rapid, automated, nondestructive pavement testing for surface condition, structural support, and thickness; mechanistic and empirical pavement design; and new techniques for data collection, handling, and analysis.

Bridge designers are beginning to use specifications derived from the Load and Resistance Factor Design approach, and computer programs facilitating the designs are becoming available. The susceptibility of bridge piers and foundations to scour is also the subject of several NCHRP research efforts. TRB will conduct a workshop on this topic at the 76th Annual Meeting in 1997.

NCHRP Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features,* has become the basis for selection of new roadside safety appurtenances. International harmonization efforts continue on testing and evalua-

tion procedures for roadside safety features. TRB Circular 453, *Roadside Safety Issues Revisited,* was published in February 1996.

Metrication is another area in which mandates have been relaxed. Nonetheless, many states are proceeding to adopt the use of Standard International metric units for plans and specifications for construction contracts. AASHTO's Highway Task Force on Metrication is working to bring about a smooth transition to metric. The ASTM Manual E 380-91, *Standard Practice for Use of the International System of Units,* is a standard for federal agencies for conversion to metric. A clearinghouse at the Texas Transportation Institute is available to assist and share information in this area.

Materials and Construction

Materials and construction engineers are focusing on environmental issues, the use of waste or recycled materials in infrastructure, implementation of Strategic Highway Research Program products, and improvements to the quality of constructed projects when an increasing number of projects are constructed under traffic and with fewer experienced workers.

The ban on chlorinated solvents goes into effect in 1996. State agencies have been searching for an environmentally safe alternative to determine asphalt content in pavements, such as biodegradable solvents or the nuclear asphalt-cement content gauge. The ignition oven (a high-temperature oven that incinerates the asphalt), has already been adopted as the specified procedure by a few states, and others are currently evaluating the procedure.

Although the federal requirement for the use of scrap rubber tires has been revoked, state transportation agencies continue to evaluate other waste materials and by-products as engineering materials on their own initiatives or pursuant to state legislative mandates. The May–June 1996 issue of *TR News* was devoted to this topic.

State agencies continue to work toward full implementation of the asphalt-binder and mix-design specifications developed during SHRP (Superpave™). Most states have already sent technicians to Superpave training classes, and many are experimenting with the performance-graded asphalt binders in preparation for the nationwide implementation of the asphalt-binder specifications in 1997.

The implementation of quality control/quality assurance specifications, specifically those for asphalt and portland cement concrete paving, is becoming an accepted practice among state highway agencies. In addition to placing the quality-control responsibility on the contractor, where the industry agrees it belongs, the specifications provide opportunities for more effective use of experienced state work forces, whose numbers are declining.

State agencies are showing interest in innovative contracting practices, such as "A plus B" (cost plus time) bidding, lane rental, warranties, and design-build contracts. A plus B bidding encourages early completion and has become routine on projects deemed appropriate at a number of state agencies.

Soils, Geology, and Foundations

Landslides and rockfall, innovative tests for evaluating conventional and unconventional materials, and issues related to bridge foundations and subsurface drainage continue to be major concerns for state geotechnical engineers. Wetland mitigation, leaking underground storage tanks, and contaminated soils are also of importance.

Development of procedures to effectively identify, predict, prevent, and mitigate highway-slope failures and rockfalls along transportation facilities are under way in some states. Interest is being shown in management procedures for rating, predicting, controlling, and mitigating landslide and rockfall hazards, and methods for selecting appropriate mitigation measures. A comprehensive source of information on all aspects of landslides and rockfall is TRB Special Report 247, *Landslides: Investigation and Mitigation,* published in 1996.

Although federal requirements have been relaxed, state transportation agencies continue to evaluate waste materials and by-products as engineering materials

Innovative aggregate test methods are needed to determine the properties of aggregate, as well as of unconventional materials such as waste and recycled materials and dredge spoils. There is also a need to correlate these properties to the performance of pavements, bridge decks, and unbound aggregate bases. The results of such efforts would be useful in developing performance-based speci-

fications and determining appropriate applications for unconventional materials.

State agencies have tried several approaches over the years to mitigate pavement damage caused by moisture. Current efforts are directed to the use of permeable base, underdrain, filters, outlets, and edgedrains including the prefabricated geocomposite edgedrains. A NCHRP synthesis of highway research on pavement subsurface drainage systems is expected to be published in 1996.

Maintenance

The consistent theme in operational and research solutions to maintenance challenges is the transition of practice from an art to a science. Safety for the traveling public and workers continues to be a priority for transportation agencies. The emphasis is on the consistent application of signing, improving the safety of nighttime operations, educating drivers about work-zone hazards (moving-maintenance and snowplow operations), and training state, county, city, utility, and construction workers in the safe and efficient accomplishment of maintenance activities.

Each dollar invested in appropriately timed preventive pavement maintenance will result in three- to four-fold savings in future rehabilitation costs

New technologies, materials, and procedures are being introduced into most aspects of maintenance. In winter maintenance, roadway weather information systems and anti-icing technology with new materials and equipment are examples of changes for which associated training and experience are necessary. New snowplow designs have been introduced that allow more control of the removed materials with reductions in the "vehicle snow cloud" and higher operating speeds during snow removal. Efforts also are under way to introduce the use of personal computers to input maintenance activity data, to share weather-forecasting information with the traveling public, and to investigate the feasibility of measuring surface friction during snow operations.

Maintenance of an aging roadway system with fewer employees is contributing to the increased use of contracts and expanding interest in total quality management. Contractors are used primarily for projects that can be easily defined and inspected, including guardrail repair, bridge painting, joint sealing, bridge-deck repair, roadside-vegetation spraying and mowing, and drainage-pipe replacement and repair. The critical element in an effective contract maintenance program is the establishment of competition.

Preventive-maintenance strategies for pavements, structures, and equipment have decreased the need for rehabilitation or repair. For example, agencies using preventive pavement maintenance indicate an increase in portland cement concrete life of 9 to 10 years, and asphalt-concrete and overlaid pavements of 5 to 6 years in addition to decreases in demand maintenance. Each dollar invested in appropriately timed preventive pavement maintenance has been reported to save $3 to $4 in future rehabilitation costs. The most cost-effective strategy is viewed as performing preventive maintenance activities on the better-rated pavements first and then funding the rehabilitation of the poorer-rated pavements.

The primary environmental maintenance issues are waste disposal, worker health and safety, and removal of lead paint from bridge structures. The integration of environmental considerations into maintenance operations and the development and sharing of best environmental-maintenance practices are priorities for those working in maintenance. The equipment-maintenance community is interested in information on the anticipated impact of government regulations; the application of new and foreign technology; the management of human resources and worker safety; the decision process for purchasing, renting, and leasing; and new developments in equipment-management systems.

Traffic Operations

Almost 50 percent of the nation's urban freeways are estimated to be operating at capacity during peak hours. Americans lose more than 2 billion hours and businesses lose $40 billion a year to traffic congestion. U.S. DOT estimates that traffic congestion costs each driver $1,500 each year. This congestion will continue to increase as travel demand outpaces our ability to expand our road system.

The national Intelligent Transportation Systems program, which started with the Intelligent Vehicle Highway Systems Act in ISTEA, is still the major research focus in traffic operations. This $660 million program has served as a catalyst for building and deploying a core infrastructure that

will move intelligent transportation systems from research and development into everyday use. U.S. DOT estimates that this technology can deliver up to two-thirds of the new travel capacity required in congested major urban corridors over the next 10 to 20 years for less than 25 percent of the cost of traditional road building. As announced by Secretary of Transportation Federico Peña at TRB's 75th Annual Meeting in January 1996, the U.S. DOT Intelligent Transportation Infrastructure initiative provides the building blocks to effectively deploy, integrate, and operate systems for traffic-signal control, freeway management, transit management, incident management, electronic fare payment, electronic toll collection, multimodal traveler information, and highway-rail crossing protection.

Although the full integrated system described by Secretary Peña does not currently exist, many urban areas and rural communities already have some elements in place. For example, many states are developing advanced traffic-management centers, which control traffic at the corridor level, integrating real-time data from areawide surveillance and detection systems.

It is still too early to tell what impact the recision of the national speed limit will have on operations and safety. The recision has reopened discussion of speed-related issues ranging from what realistic speed limits are and how they should be set to the conflicts among design speed, operating speed, speed laws, accidents, and enforcement.

Light-emitting-diode devices are rapidly being introduced into the transportation market as the advancement of semiconductor technology makes them technically and financially feasible for public agencies seeking alternative illumination technologies to reduce life-cycle costs. Although this technology is relatively new, it has achieved rapid acceptance in traffic-control products, such as signal lamps and changeable message signs, because of perceived cost-effectiveness. The principal benefits of light-emitting diodes are lower power consumption and improved durability.

TRB

Federal and state officials are targeting safety issues related to railroad-highway grade intersections.

Most state DOTs are currently testing LEDs for acceptability. It remains to be demonstrated that light-emitting-diode signals will meet applicable standards for color and intensity, will not adversely affect the safety or operations of the roadway, and will be economically advantageous. TRB will conduct a symposium on light-emitting-diode applications in transportation during 1997.

Following the tragic bus and train accident in Fox River Grove, Illinois, U.S. DOT formed a task force on grade-crossing safety to investigate and assess the many issues involved in traffic signal preemption at highway-rail intersections. In addition, many states conducted site inspections of their railroad-highway grade intersections to assess the safety of the crossings. The major issues of concern are related to the interconnections between the highway and rail signals, preemption of highway signals, provision of adequate pedestrian clearance when a signal is preempted, and vehicle storage between rail lines and highway

RODRIGUEZ

Repeal of the federal maximum speed limit in 1995 has raised questions about safe vehicle operation on roads designed and built for speeds below those now allowed.

intersections. Although conclusions have not yet been reached, preliminary findings indicate that new guidelines will be necessary to adequately address the many preemption issues.

Safety

Highway-traffic fatalities increased 2.5 percent in 1995 to 41,700. Since mileage driven increased 1.9 percent, the death rate stayed approximately at the 1994 level of 1.7 deaths per 161 million kilometers (100 million miles).

Interest in the fatigued-driver issue continues. In 1995 about one-half of the New York State Thruway's shoulders were grooved with rumble strips; the Thruway Authority reported an 83 percent decline in drowsy-driver crashes.

Traffic-law enforcement not only attacks the greater problem of traffic deaths, which outnumber murder deaths 1.5 to 1, but significantly contributes to crime prevention and enforcement. Using routine traffic enforcement, the Selective Traffic Enforcement Program, or Highway Criminal Interdiction Program, police are actively addressing violent crime while enforcing traffic laws. In Dayton, Ohio, a 10-member traffic-enforcement strike force netted 184 felony and 107 misdemeanor arrests in eight months. It also recovered 22 stolen vehicles. Grand Prairie, Texas, used a seven-officer traffic unit for traffic-law enforcement. In one year 7 percent of traffic-enforcement stops ended with criminal arrests ranging from murder to driving while intoxicated, and 28 percent of all such arrests came from traffic stops. Similar results have been reported in California, New York, North Carolina, and South Carolina.

The National Highway Traffic Safety Administration estimates that the direct economic benefits of highway safety programs exceed their costs by 9 to 1. Including pain and suffering and loss of life in the cost-benefit calculation changes the ratio to 31 to 1. One specific example is California's Administrative Per Se law for drinking drivers. There was a 9.4 to 13.4 percent reduction in "had been drinking" fatal and severe injury crashes the year the law became effective and a 12.7 percent reduction the following year.

Traffic crashes are often thought to be mainly a cost to insurance companies, private individuals, and taxpayers. A NHTSA and Network of Employers for Traffic Safety study demonstrated that highway crashes cost employers more than $53 billion per year. The typical cost to an employer of an on-the-job traffic crash was $110,000.

The value of traffic records data bases was clearly demonstrated during 1995 and 1996. Seven states (Hawaii, Maine, Missouri, New York, Pennsylvania, Utah, and Wisconsin) that use the CODES software to link crash records with medical and financial data participated in a study of motorcycle helmet and seat belt use. NHTSA researchers used CODES data bases to show that inpatient medical charges for unbelted vehicle drivers involved in a crash were 55 percent higher than those for drivers who were belted ($13,937 versus $9,004). Helmets are 67 percent effective in preventing brain injuries from motorcycle crashes. This type of analysis demonstrates the value of linking various data bases to identify specific crash

Safety management systems, although no longer mandatory, are still used in some form by state DOTs

SPICHER

Pavement grooves along New Jersey Turnpike help prevent accidents by alerting drowsy drivers who might otherwise run off the road.

problems and costs and to evaluate traffic safety countermeasures.

For many years numerous states have conducted a variety of programs for drivers exceeding certain citation thresholds. The California Department of Motor Vehicles conducted a 20-year evaluation of its negligent-operator treatment program. Using the evaluation system developed by Caltrans, they evaluated the development and evolution of the program, finding that all its components had a significant effect on reducing the rate of subsequent traffic citations throughout the 20-year time period. Crashes were significantly reduced.

Advanced technology is being applied toward improving pedestrian safety and flow while optimizing traffic flow. Detection of pedestrians by video to more effectively control pedestrian and traffic signals is being tried in several cities. Phoenix, Arizona, will install video pedestrian detection at one site in 1996. A technology used in San Francisco to assist the disabled at street crossings calls for the pedestrian to carry a device the size of a garage-door opener. On approaching a signalized crossing, the pedestrian activates the device and receives a message about the crossing and signal phase.

Safety management systems, although no longer mandatory, are being continued in some form by state DOTs. Several states have already seen benefits from the improved communication, organization, use of data, and cooperation stemming from an effective safety management system.